StorageWorks™

Upgrade Procedures
RAID Array 410
to RAID Array 450

Installation Guide

Order Number: EK–SM410–UP. A01

First Edition, December 1996

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Revision Record

This Revision Record provides a concise publication history of this manual. It lists the manual revision levels, release dates, and reasons for the revisions. It also describes how the changes to affected pages are marked in the manual.

The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the Revision Level column, with the last entry denoting the latest revision. This publication supports the StorageWorks RAID Array 450 Subsystem.

Revision Level	Date	Summary of Changes
EK–SM410–UP	December 1996	Initial release.

About This Guide

This section defines the audience of the guide and describes its contents and structure. In addition, this section identifies the conventions used in the guide and provides a list of related documents.

The StorageWorks Upgrade Procedures for RAID Array 410 to RAID Array 450 Installation Guide

This guide describes the upgrade procedures required to convert the RAID Array 410 Subsystem to a RAID Array 450 Subsystem.

Intended Audience

This guide is for system administrators and users who need to upgrade a RAID Array 410 Subsystem to a RAID Array 450 Subsystem.

Organization

This guide contains a separate chapter for upgrading the RAID Array 410 Subsystem to the RAID Array 450 subsystem on six different platforms.

Each chapter provides:

- A procedure for recording the current configuration.

- Shutting down the RAID Array 410 Subsystem.

- Physically removing the 410 controller and cache module(s).

- Physical installation of the 450 cache module(s), controller(s), and new External Cache Battery.

- Verification of system configuration.

- Procedures for setting the RAID Array 450 controller parameters.

Chapter 1: Digital Unix

Chapter 2: HP–UX

Chapter 3: IBM AIX

Chapter 4: Sun Solaris

Chapter 5: Windows NT–PCI

Chapter 6: Netware

Conventions

This guide uses the following conventions:

Style	Meaning
boldface mono-space type	A command to be input by the user
plain mono-space type	Screen text
italic type	For emphasis, manual titles, utilities, menus, screens, and filenames
[*italic mono-space type in brackets*]	A variable (without brackets) to be input by the user

Special Notices

This guide uses the following to emphasize specific information.

WARNING

WARNING indicates the presence of a hazard that can cause personal injury if the hazard is not avoided.

CAUTION

CAUTION indicates the presence of a hazard that might damage hardware or corrupt software.

NOTE

Notes provide additional information.

Related Documentation

The table below identifies related documentation by title and order number.

Document Title	Order Number
Getting Started RAID Array 450 for Digital Unix	AA–R1ZWA–TE
Getting Started RAID Array 450 for HP–UX	AA–R21FA–TE
Getting Started RAID Array 450 for IBM–AIX	AA–R21KA–TE
Getting Started RAID Array 450 for Sun Solaris	AA–R20RA–TE
Getting Started RAID Array 450 for Windows NT–Intel	AA–R21ZA–TE
Getting Started RAID Array 450 for Windows NT–Alpha	AA–R21VA–TE
Getting Started RAID Array 450 for Netware 4.1	AA–R229A–TE

1

Upgrading the RAID Array 410 to RAID Array 450 for Digital UNIX

This chapter describes procedures to upgrade the controller and cache modules for the Digital UNIX platform.

This chapter describes how to upgrade the RAID Array 410 controller and cache module in both single and dual-redundant controller configurations. Included in this upgrade are the following:

- Controller module
- Cache module
- External cache battery (ECB) and cable
- This document

1.1 Upgrade Road Map

Replacing controller module(s) and cache module(s) involves several considerations:

- Ensuring that your system meets the upgrade prerequisites described in Section 1.1.1 below
- Preparing your host system for the upgrade
- Recording RAID subsystem configuration
- Replacing the controller(s) and cache module(s)
- Restoring the RAID subsystem configuration
- Upgrading the host system configuration

> **NOTE**
>
> You should determine the exact system configuration that you are servicing (a nonredundant controller or both dual-redundant controllers) before proceeding to the following sections, as each procedure varies and has different consequences.

This procedure documents single controller to single controller upgrades and dual-redundant to dual-redundant controller upgrades only. To upgrade a single controller to a dual-controller configuration, first perform the single to single upgrade and then add the second controller using the procedure described in Chapter 1, Paragraph 1.8 of the *Getting Started – RAID Array 450 for Digital UNIX*.

1.1.1 Upgrade Prerequisites

Before upgrading the RAID Array 410 controller(s) and cache module(s), please review the following:

- If necessary, upgrade your operating system before the controller and cache module upgrade is attempted.

- One platform kit is required for each controller. Among other things, the platform kit includes the HSOF Version 5.0 Program Card required for controller operation

- Included with the RAID Array 450 Version 5.0 software is the StorageWorks Command Console (SWCC) Agent.

- The controller (s) and all storagesets must be in normal running condition.

- During this upgrade procedure do not add, remove, or move any devices. Any device configuration changes can be made after the upgrade is completed and verified.

- After removing the old controller, return the controller and PC card in accordance with the instructions contained in the customer letter found in the RAID Array 450 platform kit.

1.1.2 Tools Required

You need the following tools to remove or replace the controller module:

- ESD (ElectroStatic Discharge) strap

- Medium blade screwdriver for module replacement

- Small blade screwdriver for trilink and external cache battery cable fasteners

1.1.3 Precautions

In general, you should follow routine ESD protection procedures when handling controller modules and cache modules and when working around the cabinet and shelf that houses the modules.

Follow these guidelines to further minimize ESD problems:

- Use ESD wrist straps, antistatic bags, and grounded ESD mats when handling controllers and cache modules.

- Obtain and wear an ESD wrist strap on your wrist. Make sure the strap fits snugly.

- Attach the lead on the ESD strap to a convenient cabinet grounding point.

- After removing a module from the shelf, place the module into an approved antistatic bag or onto a grounded antistatic mat.

- Remain grounded while installing a replacement module.

CAUTION

Follow program card guidelines or damage to the program card and controller software can result.

1.2   Preparing Your Host System

Before starting the upgrade process you will need to prepare your system. This includes performing a complete system backup, recording the volume group configurations, and shutting down the system.

1.2.1 Backup Data Files

As a precaution before starting this procedure you should backup the entire system, especially data stored on the RAID Array.

1.2.2 Shut Down the Host System

Unmount from the host system any units that are accessed through the RAID Array 410 that is about to be upgraded. Follow the proper procedures to shutdown the host system.

1.3   Making a Serial Connection with the RAID Controller

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID Controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software.

See the *CLI Reference Manual* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal.

1.3.1 Connecting the Cable

To connect a maintenance terminal to a RAID controller follow these steps:

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.

2. Plug the serial connector into the 9-pin serial port/com port 1 of the maintenance terminal. If a 9-pin serial port is not available, use the 9-pin to 25-pin adapter (P/N: 12-45238-01) supplied with your StorageWorks RAID Array 450 Subsystem.

3. Plug the RJ12 connector from the maintenance terminal into the maintenance port on the RAID Array 410 controller (see Figure 1–1).

4. Set the terminal communications parameters to:
   - 9600 baud
   - 8 bits
   - 1 stop bit
   - No parity

Figure 1–1 Making a Serial Connection to the SWXRC–04 Controller
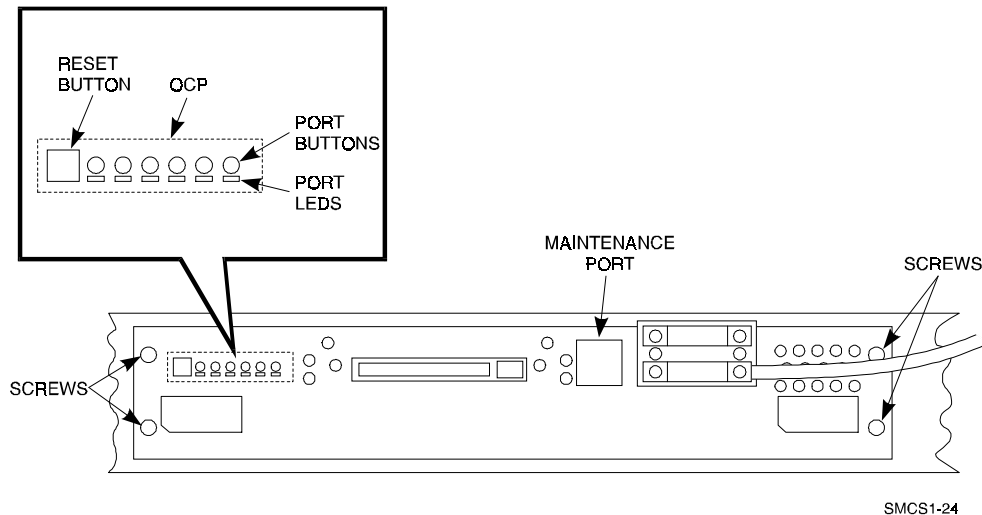
1.3.2 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
swxrc>
```

1.4   Recording Your Configuration Data

In the following steps, you need to record your configuration for use later in this procedure.

First, record the controller configuration:

```
swxrc> show this_controller full
```

Fill in the controller configuration forms below:

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

Configured for dual-redundancy

SCSI address 7

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____

Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

CACHE_POLICY = _____

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

If you have dual controllers, enter the following command:

```
swxrc> show other_controller full
```

Fill in the blanks below.

Controller:

    SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

    Configured for dual-redundancy

    SCSI address 6

    Time: NOT SET

Host port:

    SCSI target(s) _____ Preferred target(s) _____

Cache:

    32 megabyte write cache, version 2

    Cache is GOOD

    Battery is GOOD

    No unflushed data in cache

    CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

    CACHE_POLICY = _____

    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 9600 baud, eight bit, no parity, 1 stop bit

    Operation control: 00000004 Security state code: 95018

    Configuration backup disabled

In the following steps, you should record your configuration for future reference.

Next, verify the Logical Units you have configured:

swxrc> **show units full**

The controller responds with a display similar to that shown below:

```
LUN                                             USES
------------------------------------------------------------
D100                                            R5
  Switches:
          RUN               NOWRITE_PROTECT       READ_CACHE
          NOWRITEBACK_CACHE
          MAXIMUM_CACHED_TRANSFER_SIZE = 32
  State:
          ONLINE to this controller
          Not reserved
          Write cache good
          PREFERRED_PATH = THIS_CONTROLLER
  Size:   16750956 blocks
D300                                            DISK520
  Switches:
          RUN               NOWRITE_PROTECT       READ_CACHE
          WRITEBACK_CACHE
          MAXIMUM_CACHED_TRANSFER_SIZE = 1024
  State:
          ONLINE to this controller
          Not reserved
          Write cache good
          PREFERRED_PATH = THIS_CONTROLLER
  Size:   8377528 blocks
```

Record, and mark when enabled, the information in the following table. The top line shows how to record entries for D100 of the sample "**show units full**".

Table 1–1 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CHUNK XFER SIZE
D100	*R5*	*X*		*X*	*X*	*32*

Next, verify the storagesets you have configured:

```
swxrc> show storage full
```

The controller responds with a display similar to that shown below:

```
Name          Storageset        Uses          Used by
S28           stripeset         DISK130       D100
                                DISK230
                                DISK330
                                DISK430
                                DISK530
                                DISK630
   Switches:
    CHUNKSIZE = 256 blocks
   State:
      DISK130 (member  0) is NORMAL
      DISK230 (member  1) is NORMAL
      DISK330 (member  2) is NORMAL
      DISK430 (member  3) is NORMAL
      DISK530 (member  4) is NORMAL
      DISK630 (member  5) is NORMAL
   Size:   50268168 blocks
S29           stripeset         DISK120       D200
                                DISK200
                                DISK300
   Switches:
      CHUNKSIZE = 256 blocks
   State:
      DISK120 (member  0) is NORMAL
      DISK200 (member  1) is NORMAL
      DISK300 (member  2) is NORMAL
   Size:   25134084 blocks
R5            raidset           DISK210       D300
                                DISK310
                                DISK400
   Switches:
      POLICY (for replacement) = BEST_PERFORMANCE
      RECONSTRUCT (priority) = NORMAL
      CHUNKSIZE = 256 blocks
   State:
      DISK210 (member  0) is NORMAL
      DISK310 (member  1) is NORMAL
      DISK400 (member  2) is NORMAL
   Size:   25134084 blocks
SPARESET     spareset
FAILEDSET    failedset
   Switches:
      AUTOSPARE
```

Record the above information in the Storageset Table (Table 1–2). The first row shows how to record for R5 of the sample "**show storage full**".

Table 1–2 Storageset Table

NAME	STORAGE SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK-SIZE
R5	RAIDSET	DISK210 DISK310 DISK410	D300	BEST PERFOR MANCE			NORMAL	256
FAILEDSET	AUTOSPARE			NOAUTOSPARE				

1.5   Remove RAID Array 410 Controller and Cache Modules

1.5.1 Unmount Filesystems that Reside on the RAID Array From the Host Operating System.

If you have not already done so as instructed in Section 1.2.2, you must now unmount from the host system any units that are accessed through a SWXRC-04 controller and follow the proper procedures that are specific for your operating system to shutdown the system.

1.5.2 Use the SHUTDOWN Command Before Turning Off Controller Power

To turn off the power to your controller subsystem make sure you turn off the power properly by using the following steps:

CAUTION

If the correct steps for turning off the power to an SWXRC-04 controller are not followed, there is a potential for loss of data that may exist on any devices connected to the array.

CAUTION

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

---

1. Invoke the **shutdown** command from the maintenance terminal.

2. For dual-redundant configurations, shutdown each controller one at a time. From the maintenance terminal connected to the maintenance port of one controller, use both of the following commands:

    ```
    swxrc>      shutdown other_controller

    swxrc>      shutdown this_controller
    ```

3. In a nonredundant controller configuration, you need only use the command:

    ```
    swxrc>      shutdown this_controller
    ```

4. Turn off the power to the RAID subsystem only when the controller **shutdown** command has successfully completed.

1.5.3 Controller Module Removal

Use the following procedure to remove the controller module. Repeat the procedure for dual-redundant controller configurations.

1. Access the controller modules in the cabinet.

2. Unsnap and remove the ESD shield covering the program card by pulling out on the two retainer buttons.

3. Remove the program card by pushing the eject button on the controller panel. Pull the card out and save it.

Figure 1–2 RAID Array 410 Controller Panel
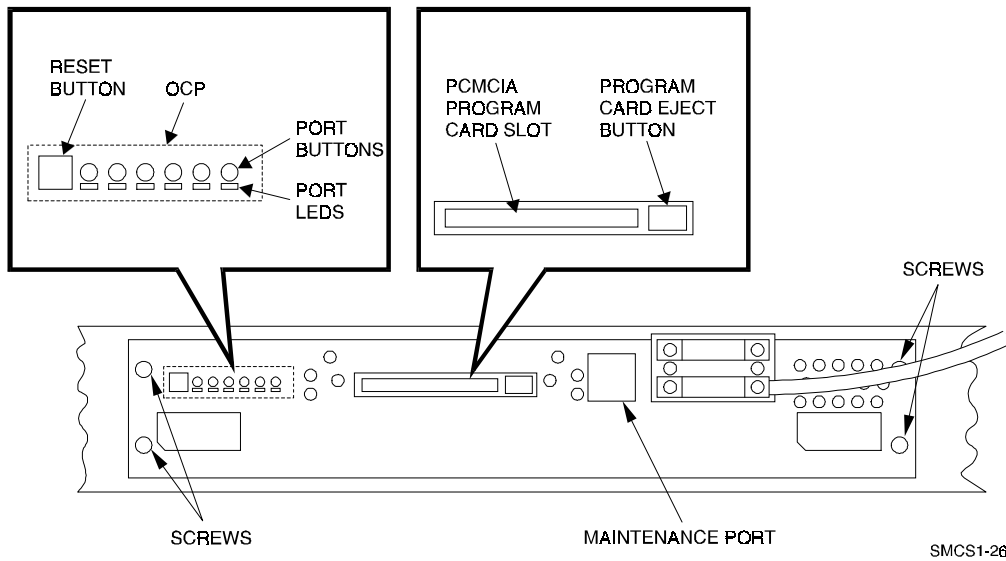
4. With a small blade screwdriver, loosen the captive screws on the trilink connector (see Figure 1-3) and remove the trilink from the front of the controller. Do *not* remove cables or terminators from the trilink or you will interrupt the host SCSI bus. You will have to work around any SCSI cable or terminator connections when removing the trilink.

Figure 1–3 Trilink Connector
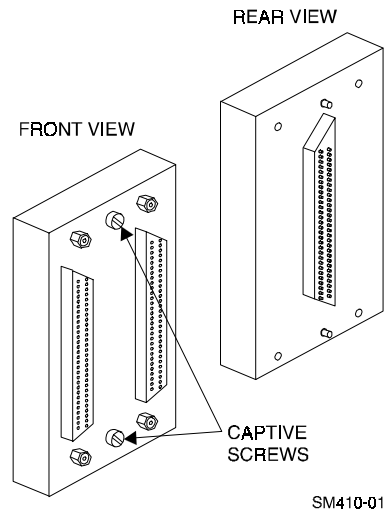
5. Remove the maintenance terminal cable (if attached).

6. Loosen the four mounting screws (refer to Figure 1-2) on each side of the front panel with a medium blade screwdriver.

7. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

8. Slide the module out of the shelf (noting which rails the module was seated in) and place on an approved ESD work surface or mat.

1.5.4 Cache Module Removal

1. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

2. Slide the write-back cache module out of the shelf, noting which rails it was seated in, and place it on an approved nonconductive ESD mat.

WARNING

Do not allow the write-back cache to contact any conductive surface, or injury and/or equipment damage may result.

1.6 Installing the RAID Array 450 Cache Module, Controller, and ECB

1.6.1 Installing the Cache Module

Use the following procedure to install the write-back cache module:

1. Slide the write-back cache module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using a flat blade screwdriver.

1.6.2 Installing the Controller Module

1. To install the controller module, slide the module into the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the flat blade screwdriver.

4. Reconnect the trilink connector and host cables.

1.6.3 Installing the External Cache Battery

1. Select an unused SBB slot and push the External Cache Battery module in until it seats.

2. Connect one end of the battery cable to the battery module.

1.7 Connecting the Controller and Cache Module

Use this procedure to connect the controller and cache module in a single controller configuration. For a dual-redundant controller configuration, repeat steps 1.6.1 and 1.6.2 and then continue below.

To setup your subsystem for single controller operation, as shown in Figure 1−4, follow these steps:

1. Attach one trilink connector to each controller port.

2. For a single subsystem configuration, attach a terminator to one port of the trilink connector and the host SCSI cable to the other port.

   For a multiple subsystem configuration, jumper the two trilink connectors together with a short bus cable. On the remaining port of either trilink connector, attach a terminator. Finally, attach the SCSI bus cable to the last available port.

Figure 1–4 Attaching the Connecting Cables
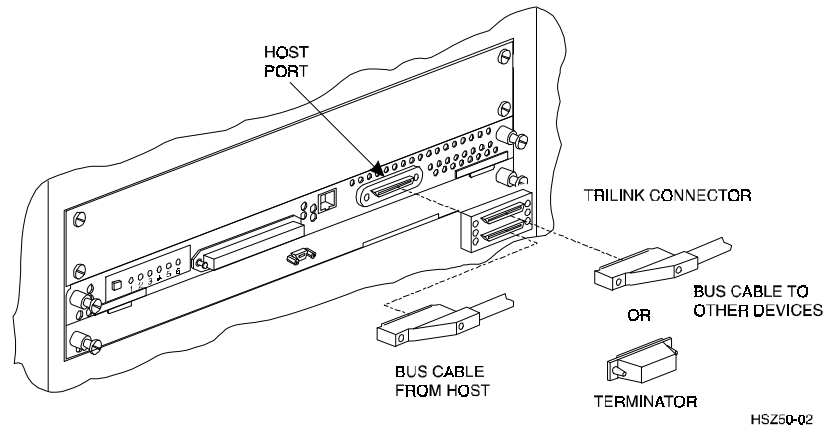
Figure 1–5 Connecting the Cache Module to the Cache Battery
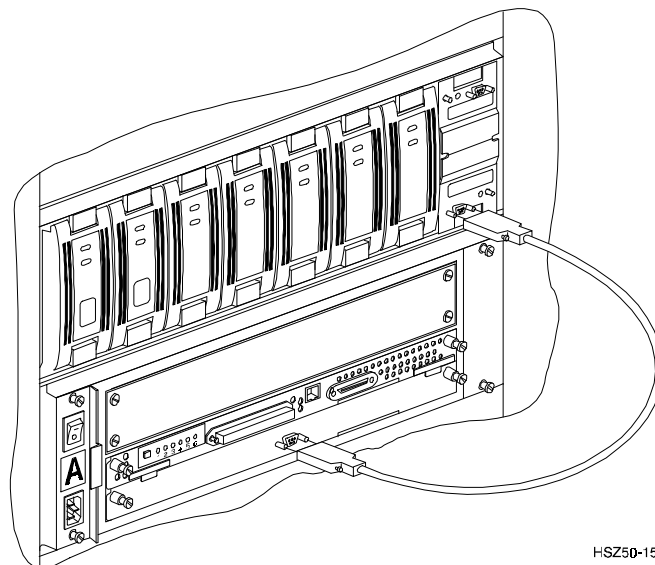
3. Connect the cache module to the external cache battery (ECB) SBB as shown in Figure 1−5.

4. Insert the new program card into the new controller. The program card eject button extends when the card is fully inserted.

5. Snap the ESD shield into place over the program card.

6. Power ON the entire subsystem.

7. If the controller initializes correctly, its green reset LED begins to flash at 1 time per second. If an error occurs during initialization, the OCP displays a code. If necessary, refer to Chapter 1, *Troubleshooting* in the *Servicing your StorageWorks Subsystem, HSZ50 Array Controller, HSOF Version 5.0* to analyze the code.

1.8 Making a Serial Connection with the RAID Controller

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID Controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software.

See the *CLI Reference Manual* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal.

1.8.1 Connecting the Cable

To connect a maintenance terminal to a RAID controller follow these steps:

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.

2. Plug the serial connector into the 9-pin serial port/com port 1. If a 9-pin serial port is not available, use the 9-pin to 25-pin adapter (P/N: 12-45238-01) supplied with your StorageWorks RAID Array 450 Subsystem.

3. Plug the RJ12 connector from the maintenance terminal into the maintenance port on the RAID Array 450 controller (see Figure 1–6).

4. Set the terminal communications parameters to:
    -   9600 baud
    -   8 bits
    -   1 stop bit
    -   No parity

Figure 1–6 Making a Serial Connection to the HSZ50 Controller
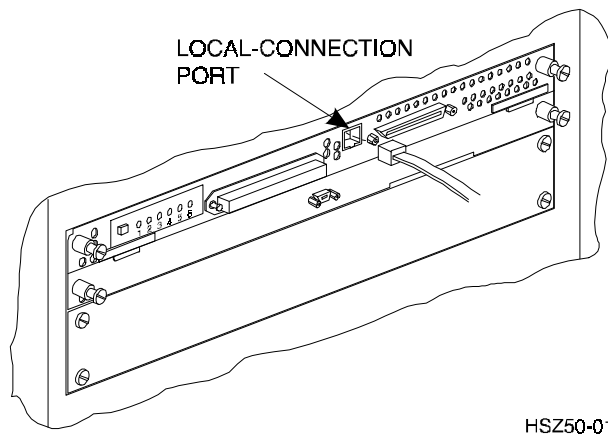
1.8.2 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
HSZ>
```

1.9   **Restoring RAID Subsystem Configuration**

1.9.1 Setting Target IDs for the Controller

Set the SCSI IDs to be used for your storage sets. Dual controllers need preferred ID's restored also. These ID's were recorded in Section 1.4 "SHOW THIS_CONTROLLER". Use up to four ID's for the controller while avoiding the ID of the host adapter (normally ID7). For this example, use SCSI IDs 0, 1, 2, and 3. Enter the command:

        HSZ> **set this_controller id=(0,1,2,3)**

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Either press and release the green Reset switch or enter the command:

        HSZ> **restart this_controller**

For dual-redundant configurations enter:

        HSZ> **set failover copy=this_controller**

When the CLI finishes initializing, set the preferred IDs. For example, if the preferred IDs are 0 and 1, enter the command:

        HSZ> **set this_controller preferred_id=(0,1)**

1.9.2 Add Disks to Configuration

        HSZ> **run config**

1.9.3 Recreate Storagesets

<table>
<tr><td align="center">NOTE</td></tr>
<tr><td>Use the CLI "add" command to recreate the Storagesets in the following command examples but DO NOT initialize the storageset using the "init" command or you will lose all data on the storageset.</td></tr>
</table>

Recreate the storagesets recorded earlier.

        HSZ> **add stripeset** *container-name.....*

        HSZ> **add mirrorset** *container-name disk-device.....*

        HSZ> **add raidset** *container-name.....*

Where *container-name* is the name of the appropriate type of storageset container and *disk- device* is a list of devices that are part of the storageset.

1.9.4 Recreate Units

> **NOTE**
>
> The unit-number refers to the entries in the "LUN" column of Table 1-1. The container-name refers to the "USES" entries in Table 1-1. Also, the existing chunksize will be maintained in the new controller. The chunksize cannot be changed because you cannot use the "initialize" command.

Recreate the units recorded earlier in the Logical Unit Table (Table 1–1).

> HSZ> **add unit** [*unit-number*] [*container-name*]

Use the **add unit** command once for each **LUN** entry in the table.

View the units just created.

> HSZ> **show unit full**

Compare all parameters in this listing with Logical Unit Table (Table 1–1). Change the unit settings to be the same as those listed in the table using the **set** command where necessary.

The format of the **set** command for each item in the Logical Unit Table (Table 1–1)is shown below for easy reference. Use only the entries that pertain your configuration.

> RUN
>
> > HSZ> **set** [*unit-number*] **run**
> >
> > HSZ> **set** [*unit-number*] **norun**
>
> WRITE_PROTECT
>
> > HSZ> **set** [*unit-number*] **write_protect**
> >
> > HSZ> **set** [*unit-number*] **nowrite_protect**
>
> WRITEBACK_CACHE
>
> > HSZ> **set** [*unit-number*] **writeback_cache**
> >
> > HSZ> **set** [*unit-number*] **nowriteback_cache**
>
> READ_CACHE
>
> > HSZ> **set** [*unit-number*] **read_cache**
> >
> > HSZ> **set** [*unit-number*] **noread_cache**
>
> MAXIMUM_CACHED_TRANSFER_SIZE

HSZ> **set** [*unit-number*] **maximum_cached_transfer_size=**[*number*]

> > > where [*number*] is a number from 1 through 1024.

1.9.5 Enable Storageset Options

> **NOTE**
>
> The [*name*] refers to the entries in the "NAME" column of Table 1-2.

View the storagesets just created.

```
HSZ> show storageset full
```

Compare all the parameters in the listing with the Storageset Table (Table 1–2). Change the storageset parameters to be the same as shown in the table using the **set** command where necessary.

The format of the **set** command for each item in the Storageset Table (Table 1–2) is shown below for easy reference. Use only the entries that pertain to your configuration.

POLICY
```
HSZ> set [name] policy=best_performance
HSZ> set [name] policy=best_fit
HSZ> set [name] nopolicy
```
READ_SOURCE
```
HSZ> set [name] read_source=least_busy
HSZ> set [name] read_source=round_robin
HSZ> set [name] read_source=[uses]
```
             where [*uses*] is a <u>single</u> disk.

COPY
```
HSZ> set [name] copy=normal
HSZ> set [name] copy=fast
```
RECONSTRUCT
```
HSZ> set [name] reconstruct=normal
HSZ> set [name] reconstruct=fast
```
AUTOSPARE
```
HSZ> set failedset autospare
HSZ> set failedset noautospare
```

1.9.6 Verify Configuration

Before the host system is powered-on it is advisable to recheck the RAID Array 450 configuration with the pre-upgrade RAID Array 410 configuration. In this process compare the new settings with the original settings recorded on the blank forms provided in this document. Specifically check:

- Host Port SCSI Target(s), Host Port Preferred Target(s), Cache Policy and HOST_FUNCTIONALITY settings recorded on the **Controller Table**.

- SHOW DEVICES lists all disks installed and recorded on the **Devices Table**

- SHOW UNITS displays all of the logical units and storagesets previously recorded on the **Logical Units Table**

- SHOW STORAGESETS lists all of the containers recorded on the **Storagesets Table**:

    - Check logical unit *Used by* each of the storagesets

    - Check *Name* and *Type* of each storageset

    - Check devices in use by (*Uses*) each storageset

    - Show *storageset_ name* lists proper storageset attributes

1.10   Power-on Host System

Now that the RAID Array 450 configuration has been verified, the host system may be powered-on. Since the configuration has been modified, the system may require additional time to complete it's initialization. Once the system has completed the bootstrap process login as the *root* user and continue to the next step.

1.11   Add Device Recognition into Kernel (Digital Unix 3.2)

1. Log in as root
2. `cd /sys/data`
3. `cp cam_data.c  cam_data.c.org`
4. Using your favorite editor open the "`cam_data.c`" file for editing.
5. Search for the word "HSZ40"

At this point you should have found an entry that looks like:

```
/* HSZ40 */
{"DEC     HSZ4", 12, DEV_HSZ40, (ALL_DTYPE_DIRECT << DTYPE_SHFT) | SZ_HARD_DISK
 | SZ_RAID ,
 (struct pt_info *)ccmn_hsx01_sizes, NULL, DEC_MAX_REC, NO_DENS_TAB,
 NO_MODE_TAB,
 (SZ_LONG_STO_RETRY | SZ_DYNAMIC_GEOM | SZ_DISPERSE_QUE | SZ_REORDER),
 NO_OPT_CMDS, 90, 74, DD_REQSNS_VAL |
 DD_INQ_VAL,
 36, 160
},
```

```
Duplicate this entry.  Then replace all occurrences of "HSZ4" with "HSZ5"  The
duplicate entry will then look like the one below. If you would prefer; you can
just type in the entry below but the cut/paste is easier and less prone to error.
/* HSZ50 */
{"DEC    HSZ5", 12, DEV_HSZ50, (ALL_DTYPE_DIRECT << DTYPE_SHFT) | SZ_HARD_DISK
 | SZ_RAID ,
 (struct pt_info *)ccmn_hsx01_sizes, NULL, DEC_MAX_REC, NO_DENS_TAB,
 NO_MODE_TAB,
 (SZ_LONG_STO_RETRY | SZ_DYNAMIC_GEOM | SZ_DISPERSE_QUE | SZ_REORDER),
 NO_OPT_CMDS, 90, 74, DD_REQSNS_VAL |
 DD_INQ_VAL,
 36, 160
},
```

7. Save and Exit the editor.

8. `cd  /usr/include/io/common`

9. `cp devio.h  devio.h.org`

10. Using your favorite editor open the "devio.h" file for editing.

11. Locate the following line:

```
#define DEV_HSZ40  "HSZ40"    /* SCSI multi-spindle RAID disk */
```

12. Copy the above line and change both HSZ40s to HSZ50s. The resulting line looks like the one below.

```
#define DEV_HSZ50  "HSZ50"    /* SCSI multi-spindle RAID disk */
```

13.   Save and Exit the editor.

14.   `cd /sys/conf`

15.   Rebuild your kernel using the "`doconfig -c {SYSTEM_NAME}`" command. For more information consult the man page on "doconfig."

16.   Make a backup copy of your current kernel.

17.   The output of the `doconfig` indicates the location of the new kernel. Copy the new kernel into the root directory.

18.   Re-boot your system.

1.12   Installing StorageWorks Software

To install the StorageWorks Software for Digital UNIX, follow the steps from the *Getting Started – RAID Array 450 V5.0 for Digital UNIX.*

1.13   Congratulations

This completes the RAID Array 450 Upgrade Procedure. The system should be ready to place on-line. If you cannot activate your system, specific troubleshooting or data restoration may be required.

2

Upgrading the RAID Array 410 to RAID Array 450 for HP–UX

This chapter describes procedures to upgrade the RAID Array 410 controller and cache modules for the HP–UX platform.

This chapter describes how to upgrade the RAID Array 410 controller and cache modules in both single controller and dual-redundant controller configurations. Included in this upgrade are the following:

- Controller module

- Cache module

- External Cache Battery (ECB) and cable

- This document

2.1   Upgrade Road Map

Replacing a controller module involves several considerations:

- Ensuring that your system meets the upgrade prerequisites described in Section 2.1.1 below

- Preparing your host system for the upgrade

- Recording RAID subsystem configuration

- Replacing the controller(s) and cache module(s)

- Restoring the RAID subsystem configuration

- Upgrading the host system configuration

2.1.1 Upgrade Prerequisites

Before upgrading the RAID Array 410 controller(s) and cache module(s), please review the following:

- The RAID Array 450 is supported on HP-UX 10.01 and higher only. If necessary, upgrade your operating system before the controller and cache module upgrade is attempted.

- One platform kit is required for each controller(s). Among other things the platform kit includes the HSOF Version 5.0 Program Card required for controller operation.

- Included with the RAID Array 450 Version 5.0 software is the StorageWorks Command Console (SWCC) Agent. The SWCC Agent requires a dedicated communications LUN for normal operation. This LUN requires only a minimal amount of storage, 1 block. While it is not difficult to create the communications LUN, it does require that a device be available. Instructions on how to create the communications LUN can be found in Chapter 2 of the *Getting Started–RAID Array 450 for HP-UX* .
- This procedure documents existing RAID Array 410 single controller to single controller upgrades and dual-redundant to dual-redundant controller upgrades only. To upgrade a single controller to a dual-controller configuration, first perform the single to single upgrade and then add the second controller using the procedure described in Chapter 1, Section 1.8 of the *Getting Started–RAID Array 450 for HP-UX.*
- The controller(s) and all storagesets must be in normal running conditions. Ensure that the RAID Array is operating normally, that is, no failed drives, controllers, batteries, or storagesets.
- During this upgrade procedure do not add, remove, or move any devices. Any device configuration changes can be made after the upgrade is completed and verified.
- After removing the old controller, return the controller and PC card in accordance with the instructions contained in the customer letter found in the RAID Array 450 platform kit.

2.1.2 Tools Required

You need the following tools to remove or replace the controller module:

- ESD (ElectroStatic Discharge) strap

- Medium blade screwdriver for module replacement

- Small blade screwdriver for trilink and external cache battery cable fasteners

2.1.3 Precautions

In general, you should follow routine ESD protection procedures when handling controller modules and cache modules and when working around the cabinet and shelf that houses the modules.

Follow these guidelines to further minimize ESD problems:

- Use ESD wrist straps, antistatic bags, and grounded ESD mats when handling controllers and cache modules

- Obtain and wear an ESD wrist strap on your wrist. Make sure the strap fits snugly.

- Attach the lead on the ESD strap to a convenient cabinet grounding point.

- After removing a module from the shelf, place the module into an approved antistatic bag or onto a grounded antistatic mat.

- Remain grounded while installing a replacement module.

> **CAUTION**
>
> Follow program card guidelines or damage to the program card and controller software can result.

2.2   Preparing Your Host System

Before starting the upgrade process you will need to prepare your system. This includes performing a complete system backup and shutting down the system.

2.2.1 Backup the System

As a precaution before starting this procedure you should backup the entire system, especially data stored on the RAID Array.

2.2.2 Shut Down the System

Unmount from the host system any units that are accessed through the RAID Array 410 that is about to be upgraded. Follow the proper procedures to shutdown the host system.

2.3   Making a Serial Connection with the RAID Controller

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software.

See the *CLI Reference Manual* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal.

2.3.1 Connecting the Cable

To connect a maintenance terminal to a RAID controller follow these steps:

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.

2. Plug the serial connector into the 9-pin serial port/com port 1 of the maintenance terminal. If a 9-pin serial port is not available, use the 9-pin to 25-pin adapter (P/N: 12-45238-01) supplied with your StorageWorks RAID Array 410 Subsystem.

3. Plug the RJ12 connector from the maintenance terminal into the maintenance port on the RAID Array 410 controller (see Figure 2–1).

4. Note which serial port you use; you will need that information if using a communications program.

Figure 2–1 Making a Serial Connection to the 410 Controller
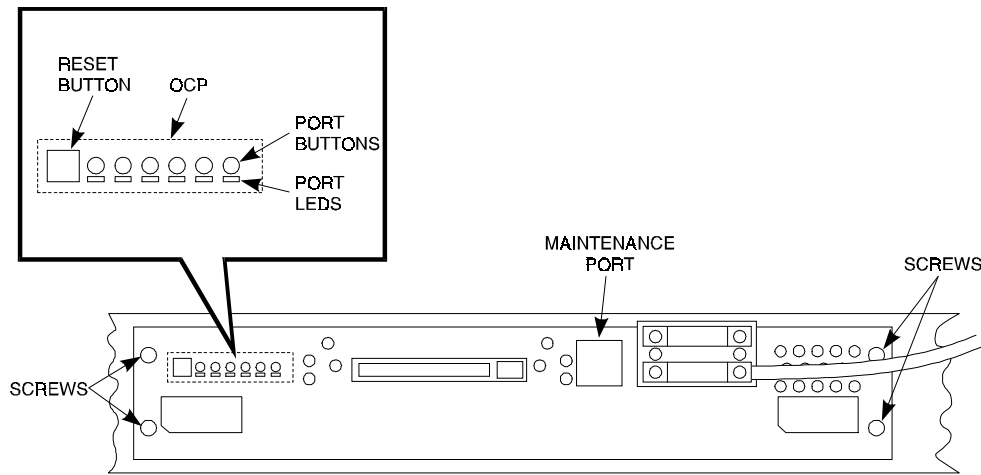
2.3.2 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
swxrc>
```

2.4 Recording Your Subsystem Configuration Data

In the following steps, you need to record your configuration for use later in this procedure.

First, record the controller configuration:

```
swxrc> show this_controller full
```

Fill in the controller configuration forms below:

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

Not configured for dual-redundancy

SCSI address 7

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____

Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

CACHE_POLICY = _____

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

If you have dual controllers, enter the following command:

swxrc> **show other_controller full**

Controller:

    SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

    Configured for dual-redundancy

    SCSI address 6

    Time: NOT SET

Host port:

    SCSI target(s) _____ Preferred target(s) _____

Cache:

    32 megabyte write cache, version 2

    Cache is GOOD

    Battery is GOOD

    No unflushed data in cache

    CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

    CACHE_POLICY = _____

    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 9600 baud, eight bit, no parity, 1 stop bit

    Operation control: 00000004 Security state code: 95018

    Configuration backup disabled

Next, record the Logical Units you have configured:

```
                SWXRC> show unit full

LUN                                     USES
-----------------------------------------------------------------
D100                                    S28
     SWITCHES:
      RUN                NOWRITE_PROTECT            READ_CACHE
      WRITEBACK_CACHE
      MAXIMUM_CACHED_TRANSFER_SIZE = 32
     STATE:
        ONLINE TO THIS CONTROLLER
        NOT RESERVED
        PREFERRED_PATH = THIS_CONTROLLER
     SIZE: 20547350 BLOCKS
D200                                    M1
     SWITCHES:
      RUN                NOWRITE_PROTECT            READ_CACHE
      WRITEBACK_CACHE
      MAXIMUM_CACHED_TRANSFER_SIZE = 32
     STATE:
      ONLINE TO THIS CONTROLLER
      NOT RESERVED
      PREFERRED_PATH = THIS_CONTROLLER
     SIZE: 4109470 BLOCKS
D300                                    R5
     SWITCHES:
      RUN                NOWRITE_PROTECT            READ_CACHE
      WRITEBACK_CACHE
      MAXIMUM_CACHED_TRANSFER_SIZE = 32
     STATE:
      ONLINE TO THIS CONTROLLER
      NOT RESERVED
      PREFERRED_PATH = THIS_CONTROLLER
     SIZE: 8216924 BLOCKS
```

Record, and mark when enabled, the information in the following table. The top line shows how to record entries for D300 of the sample.

Table 2–1 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CACHED TRANSFER SIZE
D300	R5	X		X	X	32

Next, verify the storagesets you have configured:

```
swxrc> show storage full
```

The controller responds with a display similar to that shown below:

```
NAME           STORAGESET      USES         USED BY
S28            STRIPESET       DISK130      D100
                               DISK230
                               DISK330
                               DISK430
                               DISK530
                               DISK630
    SWITCHES:
     CHUNKSIZE = 256 BLOCKS
    STATE:
      NORMAL
      DISK130 (MEMBER  0) IS NORMAL
      DISK230 (MEMBER  1) IS NORMAL
      DISK330 (MEMBER  2) IS NORMAL
      DISK430 (MEMBER  3) IS NORMAL
      DISK530 (MEMBER  4) IS NORMAL
      DISK630 (MEMBER  5) IS NORMAL
    SIZE:   50268168 BLOCKS
M1     MIRRORSET        DISK400      D200
                               DISK500
     SWITCHES:
        POLICY (FOR REPLACEMENT) = BEST_PERFORMANCE
        COPY (PRIORITY) = NORMAL
        READ_SOURCE = LEAST_BUSY
         MEMBERSHIP = 2, 2 MEMBERS PRESENT
     STATE:
       NORMAL
       DISK400 (MEMBER 0) IS NORMAL
       DISK500   (MEMBER  1) IS NORMAL
     SIZE: 4109470 BLOCKS
R5             RAIDSET         DISK210      D300
                               DISK310
                               DISK410
    SWITCHES:
       POLICY (FOR REPLACEMENT) = BEST_PERFORMANCE
       RECONSTRUCT (PRIORITY) = NORMAL
       CHUNKSIZE = 256 BLOCKS
    STATE:
       NORMAL
       DISK210 (MEMBER  0) IS NORMAL
       DISK310 (MEMBER  1) IS NORMAL
       DISK410 (MEMBER  2) IS NORMAL
     SIZE:   25134084 BLOCKS
SPARESET       SPARESET
FAILEDSET      FAILEDSET
    SWITCHES:
       AUTOSPARE
```

Record the storageset information in Storageset Table (Table 2–2). The first row shows how to record for R5 of the sample:

NOTE

Not all column headings apply to all storagesets.

Table 2–2 Storageset Table

NAME	STORAGE-SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK-SIZE
R5	RAIDSET	DISK210 DISK310 DISK410	D300	BEST PERFOR-MANCE			NORMAL	256
FAILEDSET	AUTOSPARE				NOAUTOSPARE			

2.5   Remove RAID Array 410 Controller and Cache Modules

2.5.1 Unmount Filesystems that Reside on the RAID Array From the Host Operating System.

If you have not already done so as instructed in Section 2.2.2, you must now unmount from the host system any units that are accessed through a RAID Array 410 controller and follow the proper procedures that are specific for your operating system to shutdown the system.

2.5.2 Use the SHUTDOWN Command to Turn Off Controller Power

To turn off the power to your RAID subsystem make sure you turn off the power properly by using the following steps:

CAUTION

If the correct steps for turning off the power to a RAID Array 410 controller are not followed, there is a potential for loss of data that may exist on any devices connected to the array.

CAUTION

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

---

1. Invoke the **shutdown** command from the maintenance terminal.

2. For dual-redundant configurations, shutdown each controller one at a time. From the maintenance terminal connected to the maintenance port of one controller, use both of the following commands:

    swxrc>   **shutdown other_controller**

    swxrc>   **shutdown this_controller**

3. In a nonredundant controller configuration, you need only use the command:

    swxrc>   **shutdown this_controller**

4. Turn off the power to the RAID subsystem only when the controller **shutdown** command has successfully completed.

2.5.3   Controller Module Removal

Use the following procedure to remove the controller module. Repeat the procedure for dual-redundant controller configurations.

1. Access the controller modules in the cabinet.

2. Unsnap and remove the ESD shield covering the program card by pulling out on the two retainer buttons.

3. Remove the program card by pushing the eject button on the controller panel. Pull the card out and save it.

CAUTION

Never remove a controller while it is still servicing devices. Doing so may destroy data.

Figure 2–2 RAID Array 410 Controller Panel
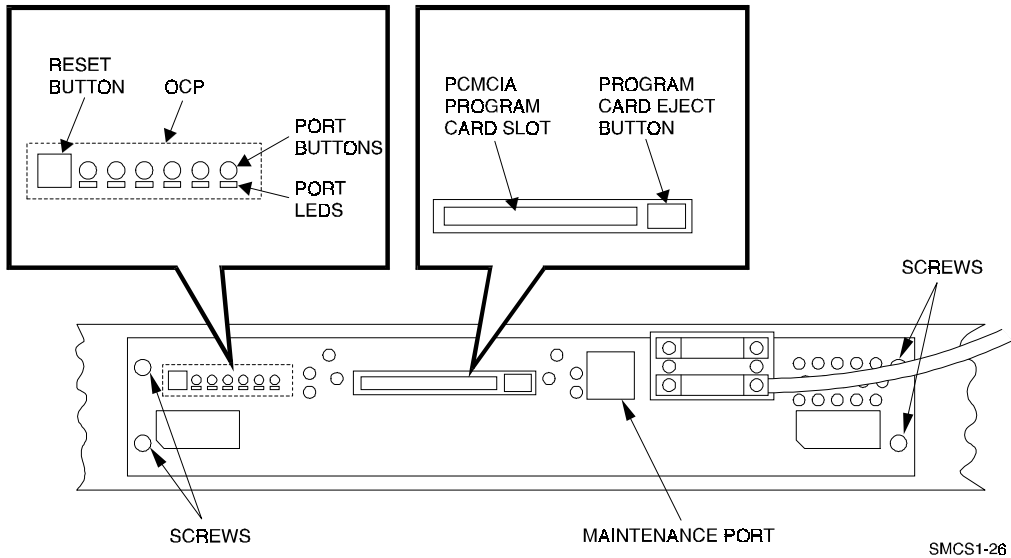
4. With a small blade screwdriver, loosen the captive screws on the trilink connector (see Figure 2–3) and remove the trilink from the front of the controller. Do *not* remove cables or terminators from the trilink or you will interrupt the host SCSI bus. You will have to work around any SCSI cable or terminator connections when removing the trilink.

Figure 2–3 Trilink Connector
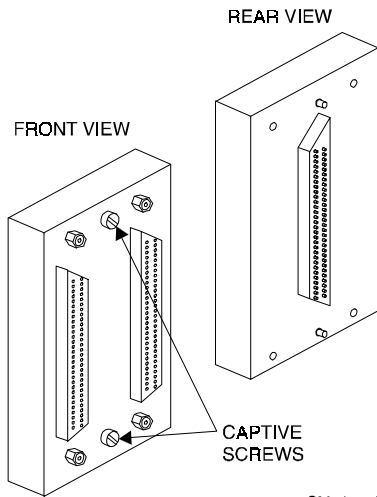
5. Remove the maintenance terminal cable (if attached).

6. Loosen the four mounting screws (refer to Figure 2–2) on each side of the front panel with a medium blade screwdriver.

7. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

8. Slide the module out of the shelf (noting which rails the module was seated in) and place on an approved ESD work surface or mat.

2.5.4 Cache Module Removal

1. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

2. Slide the write-back cache module out of the shelf, noting which rails it was seated in, and place it on an approved nonconductive ESD mat.

> **WARNING**
>
> Do not allow the write-back cache to contact any conductive surface, or injury and/or equipment damage may result.

2.6   Installing the RAID Array 450 Cache Module, Controller, and ECB

2.6.1 Installing the Cache Module

Use the following procedure to install the write-back cache module:

1. Slide the write-back cache module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the medium flat blade screwdriver.

2.6.2 Installing the Controller Module

1. To install the controller module, slide the module into the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the medium flat blade screwdriver.

2.6.3 Installing the External Cache Battery

1. Select an unused SBB slot and push the External Cache Battery module in until it seats.

2. Connect one end of the battery cable to the battery module using the small flat blade screwdriver.

2.7 Connecting the Controller and Cache Module

Use this procedure to connect the controller and cache module in a single controller configuration. For a dual-redundant controller configuration, first repeat steps 2.6.1 and 2.6.2 for the second controller.

To setup your subsystem for single controller operation, as shown in Figure 2–4, follow these steps:

1. Attach the trilink connector to the controller port.

2. For a single subsystem configuration, attach a terminator to the available port of the trilink connector.

   For a multiple subsystem configuration, attach one end of a second bus cable to the available port of the trilink connector.

Figure 2–4 Attaching the Connecting Cables
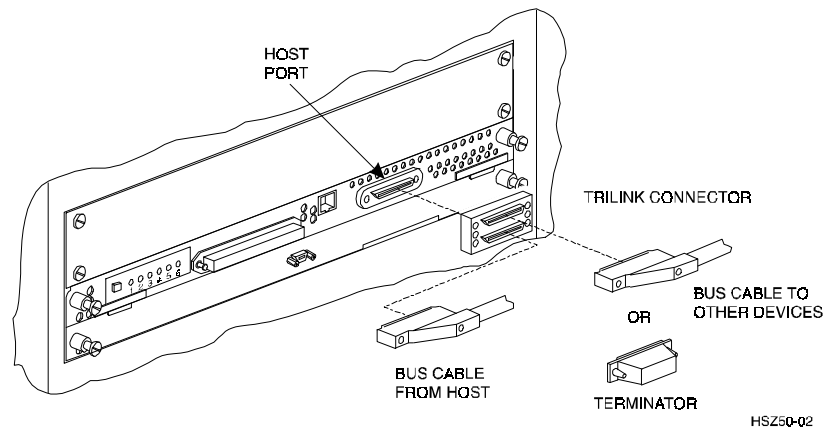
3. Connect the cache module to the external cache battery (ECB) SBB as shown in Figure 2–5.

Figure 2–5 Connecting the Cache Module to the Cache Battery
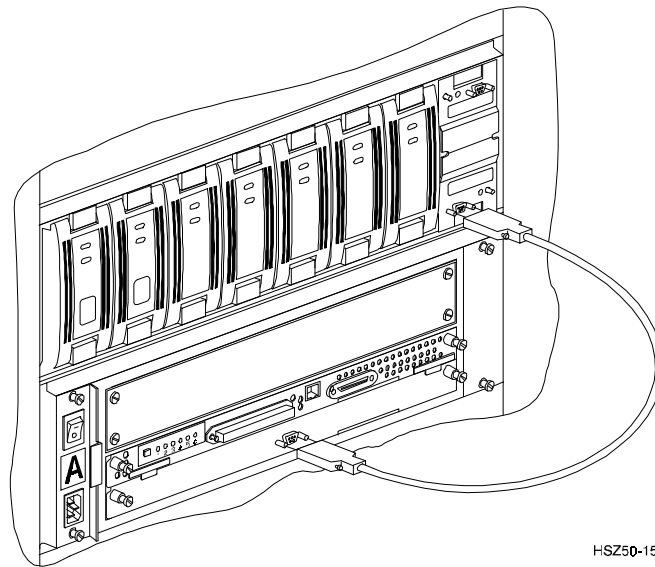
4. Connect a maintenance terminal to the maintenance port of the new controller.

5. Insert the program card into the new controller(s). The program card eject button extends when the card is fully inserted.

6. Snap the ESD shield into place over the program card.

7. Power ON the RAID subsystem.

8. If the controller initializes correctly, its green reset LED begins to flash once per second. If an error occurs during initialization, the OCP displays a code. If necessary, refer to Chapter 1, *Troubleshooting* in the *Servicing your StorageWorks Subsystem, HSZ50 Array Controller, HSOF Version 5.0* to analyze the code.

2.8   Making a Serial Connection with the RAID Controller

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software.

See the *CLI Reference Manual* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal.

2.9   Restoring RAID Subsystem Configuration

2.9.1 Setting Target IDs for the Controller

Set the SCSI IDs to be used for your storagesets to the IDs that were recorded in Section 2.4 under "SHOW THIS CONTROLLER". In this example, SCSI IDs 0, 1, 2, and 3 are used. Enter the command:

```
HSZ> set this_controller id=(0,1,2,3)
```

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Enter the command:

```
HSZ> restart this_controller
```

Wait for the prompt.

Set the controller's operating mode:

```
HSZ> set this_controller host_function=a
```

For dual-redundant configurations enter:

```
HSZ> set failover copy=this_controller
```

When the CLI finishes initializing, set the preferred IDs. For example, if the preferred IDs are 0 and 1, enter the command:

```
HSZ> set this_controller preferred_id=(0,1)
```

2.9.2 Add Disks to Configuration

```
HSZ> run config
```

2.9.3 Recreate Storagesets

NOTE

Use the CLI "add" command to recreate the Storagesets in the following command examples but **DO NOT** initialize the storageset using the "init" command or you will lose all data on the storageset.

Recreate the storagesets recorded earlier in the Storageset Table (Table 2–2). Use the **add** command once for each of the storagesets in the table. If your configuration contains mirrorsets, create them first. Add the remaining storagesets (raidsets, stripesets, and sparesets) in any order. The **add** command has the following format:

```
HSZ> add [storageset] [name] [uses]
```

Remember, if the storageset is a striped mirrorset, the form of the command line is slightly different than shown.

Example:

```
HSZ> add stripeset [name] [mirrorset] [mirrorset]
```

2.9.4 Enable Storageset Options

View the storagesets just created.

```
HSZ> show storageset full
```

Compare all the parameters in the listing with the Storageset Table (Table 2–2). Change the storageset parameters to be the same as shown in the table using the **set** command where necessary.

The format of the **set** command for each item in the Storageset Table (Table 2–2) is shown below for easy reference. Use only the entries that pertain to your configuration.

POLICY

```
HSZ> set [name] policy=best_performance
HSZ> set [name] policy=best_fit
HSZ> set [name] nopolicy
```

READ_SOURCE

```
HSZ> set [name] read_source=least_busy
HSZ> set [name] read_source=round_robin
HSZ> set [name] read_source=[uses]
```

                    where [uses] is a single disk.

COPY

```
HSZ> set [name] copy=normal
HSZ> set [name] copy=fast
```

RECONSTRUCT

```
HSZ> set [name] reconstruct=normal
HSZ> set [name] reconstruct=fast
```

AUTOSPARE

```
HSZ> set failedset autospare
HSZ> set failedset noautospare
```

2.9.5 Recreate Units

Recreate the units recorded earlier in the Logical Unit Table (Table 2–1). The existing chunksize will be maintained in the new controller. The chunksize cannot be changed because you cannot use the "initialize" command.

```
HSZ> add unit [LUN] [uses]
```

Use the **add unit** command once for each [*LUN*] entry in the table.

2.9.6 Enable Previous Options

View the units just created.

```
HSZ> show unit full
```

Compare all the parameters in this listing with the Logical Unit Table (Table 2–1). Change the unit settings to be the same as those listed in the table using the **set** command where necessary.

The format of the **set** command for each item in the Logical Unit Table (Table 2–1) is shown below for easy reference. Use only the entries that pertain your configuration.

RUN

```
HSZ> set [LUN] run
HSZ> set [LUN] norun
```

WRITE_PROTECT

```
HSZ> set [LUN] write_protect
HSZ> set [LUN] nowrite_protect
```

WRITEBACK_CACHE

```
HSZ> set [LUN] writeback_cache
HSZ> set [LUN] nowriteback_cache
```

READ_CACHE

```
HSZ> set [LUN] read_cache
HSZ> set [LUN] noread_cache
```

MAXIMUM_CACHED_TRANSFER_SIZE

```
HSZ> set [LUN] maximum_cached_transfer_size=[number]
```

where [*number*] is 1 through 1024.

2.9.7 Verify Configuration

Before the host system is powered-on it is advisable to recheck the RAID Array 450 configuration with the pre-upgrade RAID Array 410 configuration. In this process compare the new settings with the original settings recorded on the blank forms provided in this document. Specifically check:

- Host Port SCSI Target(s), Host Port Preferred Target(s), Cache Policy and HOST_FUNCTIONALITY settings recorded on the **Controller Table**.

- SHOW DEVICES lists all disks installed and recorded on the **Devices Table**

- SHOW UNITS displays all of the logical units and storagesets previously recorded on the **Logical Units Table**

- SHOW STORAGESETS lists all of the containers recorded on the **Storagesets Table**:

  - Check the logical unit *Used by* each of the storagesets

  - Check the *Name* and *Type* of each storageset

  - Check the devices in use by each storageset in the *Uses* column

2.10   Power-on Host System

Now that the RAID Array 450 configuration has been verified, the host system may be powered-on. Since the configuration has been modified, the system may require additional time to complete it's initialization. Once the system has completed the bootstrap process login as the *root* user and continue to the next step.

2.11   Removing Existing StorageWorks Manager

The RAID Manager and Monitor Utilities used with the V2.7 software and RAID Array 410 controller is not compatible with the upgraded V50 software and RAID Array 450 controller. Remove these utilities from your system as follows:

1. Exit the raidcf410 window if it is open from the FILE pull-down menu.

2. Stop the monitor utility (type **raidmon stop**)

3. Delete the Manager and Monitor Utilities.

    Change directory to the utilities area,

    > Type **cd $RAIDHOME410**

    Get a listing of the utilities area,

    > Type **ls**

    The directory will contain bin and etc subdirectories, and usually a raid.log and raid_mon.lock are present.

Delete these files and directories, type `rm -r *`.

4. Edit the .profile file in korn shell or .cshrc file in c shell to remove the path to the utilities (`$RAIDHOME410`).

5. Remove any Manager/Monitor Utility autostart features that may have been added to "`inittab`", ".`rc`" or other.

2.12 Upgrade the Host Configuration

The StorageWorks Software for HP-UX consists of installation scripts and the Command Console (CC) Agent. If you wish to utilize the Command Console Agent, follow the steps described in *Getting Started - RAID Array 450 V5.0 for HP-UX.*

2.12.1 Installing the CC Agent

To install the Command Console Agent follow these steps from the *Getting Started - RAID Array 450 V5.0 for HP-UX.*

- As described in the Upgrade Prerequisites section (2.1.1), the CC Agent requires a Communications LUN for the HP/9000 system to interface with the RAID Array 450.

  Create a communications LUN as described in *Chapter 2 - Creating a Communications LUN.*

- Load the StorageWorks software as described *in Chapter 4 - Installing the Command Console Agent on Your Host System.*

2.13 Congratulations

This completes the RAID Array 450 Upgrade Procedure. The system should be ready to place on-line. If you cannot activate your system, specific troubleshooting or data restoration may be required.

3

Upgrading the RAID Array 410 Controller to RAID Array 450 for IBM AIX

This chapter describes procedures to upgrade the RAID Array 410 controller and cache modules for the IBM AIX platform.

This chapter describes how to upgrade the RAID Array 410 controller and cache modules in both single controller and dual-redundant controller configurations. Included in this upgrade are the following:

- Controller module
- Cache module
- External Cache Battery (ECB) and cable
- This document

3.1 Upgrade Road Map

Replacing a controller module involves several considerations:

- Ensuring that your system meets the upgrade prerequisites described in Section 3.1.1 below
- Preparing your host system for the upgrade
- Recording the RAID subsystem configuration
- Replacing the controller(s) and cache module(s)
- Restoring the RAID subsystem configuration
- Upgrading the host system configuration

3.1.1 Upgrade Prerequisites and Considerations

Before upgrading the RAID Array 410 controller(s) and cache module(s), please review the following:

- The RAID Array 450 is supported on AIX 4.1.4 and 4.2 only. If necessary, upgrade your operating system before the RAID Array 450 controller and cache module upgrade is attempted.

- Systems that will be upgraded from AIX 3.2.5 to AIX 4.2 should be backed up prior to the AIX and RAID Array 450 controller upgrades. The use of this method ensures that full and complete backups of a functioning system are made before any changes are undertaken.

- One platform kit is required for each controller. In addition to other components, the platform kit includes the HSOF Version 5.0 Program Card required for controller operation.

- Included with the RAID Array 450 Version 5.0 software is the StorageWorks Command Console (SWCC) Agent. The SWCC Agent requires a dedicated communications LUN for normal operation. This LUN requires only a minimal amount of storage, 1 block. While it is not difficult to create the communications LUN, it does require that a device be available. Instructions on how to create the communications LUN can be found in Chapter 2 of the *Getting Started RAID Array 450 for IBM AIX.*

- This procedure documents existing RAID Array 410 single controller to single controller upgrades and dual-redundant to dual-redundant controller upgrades only. To upgrade a single controller to a dual-controller configuration, first perform the single to single upgrade described herein. Once that upgrade is complete, add the second controller using the procedure described in Chapter 1, Section 1.8 of the *Getting Started RAID Array 450 for IBM AIX.*

- During this upgrade procedure do not add, remove, or move any devices. Any device configuration changes can be made when the upgrade is completed and verified. Ensure that the RAID Array is operating normally, that is, no failed drives, batteries, or storagesets.

- After removing the old controller, return the controller and PC Card in accordance with the instructions contained in the customer letter found in the RAID Array 450 platform kit.

3.1.2 Tools Required

You need the following tools to remove or replace the controller module:

- ESD (ElectroStatic Discharge) strap

- Medium blade screwdriver for module replacement

- Small blade screwdriver for trilink and external cache battery cable fasteners

3.1.3 Precautions

In general, you should follow routine ESD protection procedures when handling controller modules and cache modules and when working around the cabinet and shelf that houses the modules.

Follow these guidelines to further minimize ESD problems:

- Use ESD wrist straps, antistatic bags, and grounded ESD mats when handling controllers and cache modules.

- Obtain and wear an ESD wrist strap on your wrist. Make sure the strap fits snugly.

- Attach the lead on the ESD strap to a convenient cabinet grounding point.

- After removing a module from the shelf, place the module into an approved antistatic bag or onto a grounded antistatic mat.

- Remain grounded while installing a replacement module.

CAUTION

Follow program card guidelines or damage to the program card and controller software can result.

3.2   Preparing Your Host System

Before starting the upgrade process you will need to prepare your system. This includes performing a complete system backup, recording the mount points, device and volume group configurations, and shutting down the system.

3.2.1 System Backup Procedure

As a precaution against data loss, before starting this procedure you should backup the RAID system. This includes creating a bootable, full system backup (*mksysb*) and individual Level 0 backups of each filesystem. The following backup procedures do not address the creation of backups for non-filesystem devices such as raw devices, database volume groups or database logical volumes. Consult the backup documentation included with your database software for instructions on backing up customized database logical devices.

To create a full system backup use the System Management Interface Tool, *SMIT*. This is done by selecting the following *SMIT* menu choices:

1.   System Storage Management (Physical & Logical Storage)

2.   System Backup Manager

3.   Back Up the System

4.   Enter the Backup Device name or use the List (F4) function key to show all of the available devices.

5.   Select the desired device from the list and depress Enter to create the backup.

6.   Once the backup is complete, remove the tape from the drive, write-protect the tape and label it accordingly.

To create individual Level 0 backups of each filesystem use the System Management Interface Tool, *SMIT*. This is done by selecting the following *SMIT* menu choices:

1. System Storage Management (Physical & Logical Storage)

2. File Systems

3. Backup a File System

4. Enter the name of the filesystem to backup or use the List (F4) function key to show all of the filesystems.

5. Select the desired filesystem from the list and depress Enter to return to the previous menu.

6. Enter the Backup Device name or use the List (F4) function key to show all of the available backup devices.

7. Select the desired device from the list and depress Enter to return to the backup menu.

8. After all of the required fields have been completed, depress Enter to start the backup.

9. Once the backup is complete, remove the tape from the drive, write-protect the tape and label it accordingly.

3.2.2 Record Device Configurations

In the following device configuration table, record the output of the command:

```
# lsdev -HCc disk
```

Table 3–1 Device Configurations

HDISK NAME	STATUS	LOCATION	DESCRIPTION

3.2.3 Record Volume Group Configurations

In the following volume group configuration table, record the output of the command:

    # **lspv**

Table 3–2 Volume Group Configurations

HDISK NAME	PHYSICAL VOLUME ID NUMBER	VOLUME GROUP NAME

3.2.4 Record Mount Points

In the following mount point table, record the output of the command:

> # **lsvg -o | lsvg -i -l**

Table 3–3 Mount Points

VOLUME GROUP NAME	LV NAME	MOUNT POINT

3.2.5 Shutdown the System

Shutdown the operating system using your normal procedure. Once the system has halted, power it OFF.

3.3 Making a Serial Connection with the RAID Controller

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software.

Refer to the *SWXRC–04 RAID Array Controller User's Guide* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal or a PC.

3.3.1 Connecting the Cable

To connect a maintenance terminal or PC to a RAID controller follow these steps:

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.

2. Plug the serial connector into the 9-pin serial port/com port 1 of the PC. If a 9-pin serial port is not available on a PC, use the 9-pin to 25-pin adapter (P/N: 12-45238-01) supplied with your StorageWorks RAID Array 450 Subsystem.

3. Plug the RJ12 connector from the PC or maintenance terminal into the maintenance port on the RAID Array 410 controller (see Figure 3–1).

4. Note which serial port you use because you will need that information if using a communications program.

Figure 3–1 Making a Serial Connection to the Controller
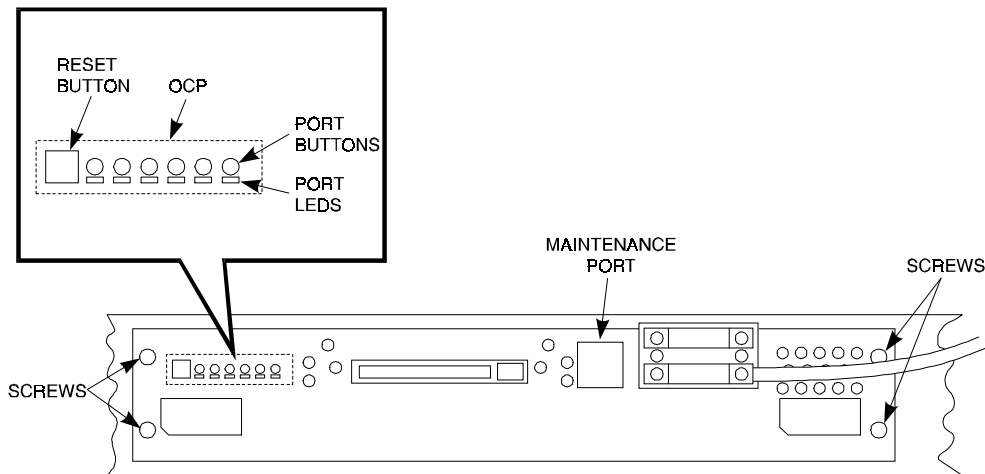
3.3.2 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
swxrc>
```

3.4   Recording Your Configuration Data

In the following steps, you need to record your configuration for use later in this procedure.

First, record the configuration of the controller(s):

swxrc> **show this_controller full**

Fill in the controller configuration forms below (dual-redundant example shown):

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

Configured for dual-redundancy with ZG43700109

In dual-redundant configuration

SCSI address 7

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____

Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

CACHE_POLICY = _____

Host Functionality Mode = B

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

If you have dual controllers, enter the following command:

```
swxrc> show other_controller full
```

Controller:

      SWXRC-04 ZG43700109 Firmware V27Z-0, Hardware A02

      Configured for dual-redundancy with ZG43700116

          In dual-redundant configuration

      SCSI address 6

      Time: NOT SET

Host port:

      SCSI target(s) _____ Preferred target(s) _____

Cache:

      32 megabyte write cache, version 2

      Cache is GOOD

      Battery is GOOD

      No unflushed data in cache

      CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

      CACHE_POLICY = _____

      Host Functionality Mode = B

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 9600 baud, eight bit, no parity, 1 stop bit

      Operation control: 00000004 Security state code: 95018

      Configuration backup disabled

Record the Logical Units you have configured:

```
swxrc> show unit full
```

The controller responds with a display similar to that shown below:

```
LUN                                      Uses
_____
D0                                       RAIDS0
     Switches:
       RUN          NOWRITE_PROTECT            READ_CACHE
       WRITEBACK_CACHE
       MAXIMUM_CACHED_TRANSFER_SIZE = 32
     State:
       ONLINE to this controller
       Not reserved
       Write cache good
       PREFERRED_PATH = THIS_CONTROLLER
     Size: 8216924 blocks

D100                                     MIR10A
     Switches:
       RUN          NOWRITE_PROTECT            READ_CACHE
       WRITEBACK_CACHE
       MAXIMUM_CACHED_TRANSFER_SIZE = 32
     State:
       ONLINE to this controller
       Not reserved
       Write cache good
       PREFERRED_PATH = THIS_CONTROLLER
     Size: 4109470 blocks

D200                                     MIRST200
     Switches:
       RUN          NOWRITE_PROTECT            READ_CACHE
       WRITEBACK_CACHE
       MAXIMUM_CACHED_TRANSFER_SIZE = 32
     State:
       ONLINE to the other controller
       Write cache good
       PREFERRED_PATH = OTHER_CONTROLLER
     Size: 8218940 blocks

D300                                     STRIPE300
     Switches:
       RUN          NOWRITE_PROTECT            READ_CACHE
       WRITEBACK_CACHE
       MAXIMUM_CACHED_TRANSFER_SIZE = 32
     State:
       ONLINE to the other controller
       Write cache good
       PREFERRED_PATH = OTHER_CONTROLLER
     Size: 8218940 blocks
```

Record, and mark when enabled, the information in the following table. The top line shows how to record entries for logical unit D0.

Table 3–4 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CACHED TRANSFER SIZE
D0	RAIDS0	X		X	X	32

Next, verify the storagesets you have configured:

```
swxrc> show storageset full
```

The controller responds with a display similar to that shown below:

```
Name            Storageset        Uses            Used by
------------------------------------------------------------

MIRST200        stripeset         MIR20A          D200
                                  MIR20B
      Switches:
        CHUNKSIZE = 256 blocks
      State:
        MIR20A   (member  0) is NORMAL
        MIR20B   (member  1) is NORMAL
      Size: 8218940 blocks
STRIPE300       stripeset         DISK510         D300
                                  DISK610
      Switches:
        CHUNKSIZE = 256 blocks
      State:
        DISK510  (member  0) is NORMAL
        DISK610  (member  1) is NORMAL
        Size: 8218940 blocks
MIR10A          mirrorset         DISK400         D100
                                  DISK500
      Switches:
        POLICY (for replacement) = BEST_PERFORMANCE
        COPY (priority) = NORMAL
        READ_SOURCE = LEAST_BUSY
        MEMBERSHIP = 2, 2 members present
      State:
        DISK400  (member  0) is NORMAL
        DISK500  (member  1) is NORMAL
      Size: 4109470 blocks
MIR20A          mirrorset         DISK110         MIRST200
                                  DISK210
      Switches:
        POLICY (for replacement) = BEST_PERFORMANCE
        COPY (priority) = NORMAL
        READ_SOURCE = LEAST_BUSY
        MEMBERSHIP = 2, 2 members present
      State:
        DISK110  (member  0) is NORMAL
        DISK210  (member  1) is NORMAL
      Size: 4109470 blocks
```

```
Name            Storageset      Uses            Used by
------------------------------------------------------------

MIR20B          mirrorset       DISK310         MIRST200
                                DISK410
     Switches:
       POLICY (for replacement) = BEST_PERFORMANCE
       COPY (priority) = NORMAL
       READ_SOURCE = LEAST_BUSY
       MEMBERSHIP = 2, 2 members present
     State:
       DISK310  (member  0) is NORMAL
       DISK410  (member  1) is NORMAL
     Size: 4109470 blocks

RAIDS0          raidset         DISK100         D0
                                DISK200
                                DISK300

     Switches:
       POLICY (for replacement) = BEST_PERFORMANCE
       RECONSTRUCT (priority) = NORMAL
       CHUNKSIZE = 256 blocks
     State:
       NORMAL
       DISK100  (member  0) is NORMAL
       DISK200  (member  1) is NORMAL
       DISK300  (member  2) is NORMAL
     Size: 8216924 blocks

SPARESET        spareset        DISK600

FAILEDSET       failedset
     Switches:
       AUTOSPARE
```

Record the storageset information in the table below. The first row shows an example of data recorded for a raidset.

NOTE

Not all column headings apply to all storagesets.

Table 3–5 Storageset Table

NAME	STORAGE-SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK-SIZE
RAIDS0	RAIDSET	DISK100	D0	BEST PERFOR-MANCE			NORMAL	256
		DISK200						
		DISK300						
FAILEDSET	AUTOSPARE				NOAUTOSPARE			

3.5   Remove RAID Array 410 Controller and Cache Modules

3.5.1 Use the SHUTDOWN Command to Turn Off Controller Power

To turn off the power to your RAID subsystem make sure you turn off the power
properly by using the following steps:

CAUTION

If the correct steps for turning off the power to an
SWXRC-04 controller are not followed, there is a
potential for loss of data that may exist on any
devices connected to the array.

CAUTION

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

---

1. Invoke the **shutdown** command from the maintenance terminal.

2. For dual-redundant configurations, shutdown each controller, one at a time. From the
    maintenance terminal connected to the maintenance port of one controller, use both
    of the following commands:

    swxrc> **shutdown other_controller**

    swxrc> **shutdown this_controller**

3. In a single controller configuration, you need only use the command:

    swxrc> **shutdown this_controller**

4. Turn off the power to the RAID subsystem only when the controller **shutdown**
    command has successfully completed.

3.5.2 Controller Module Removal

Use the following procedure to remove the controller module. Repeat the procedure for
dual-redundant controller configurations.

1. Access the controller modules in the cabinet.

CAUTION

Never remove a controller while it is still servicing
devices. Doing so may destroy data.

---

2. Unsnap and remove the ESD shield covering the program card by pulling out on the
    two retainer buttons.

3. Remove the program card by pushing the eject button on the controller panel. Pull
    the card out and return it according to the instructions provided.

Figure 3–2 RAID Array 410 Controller Panel
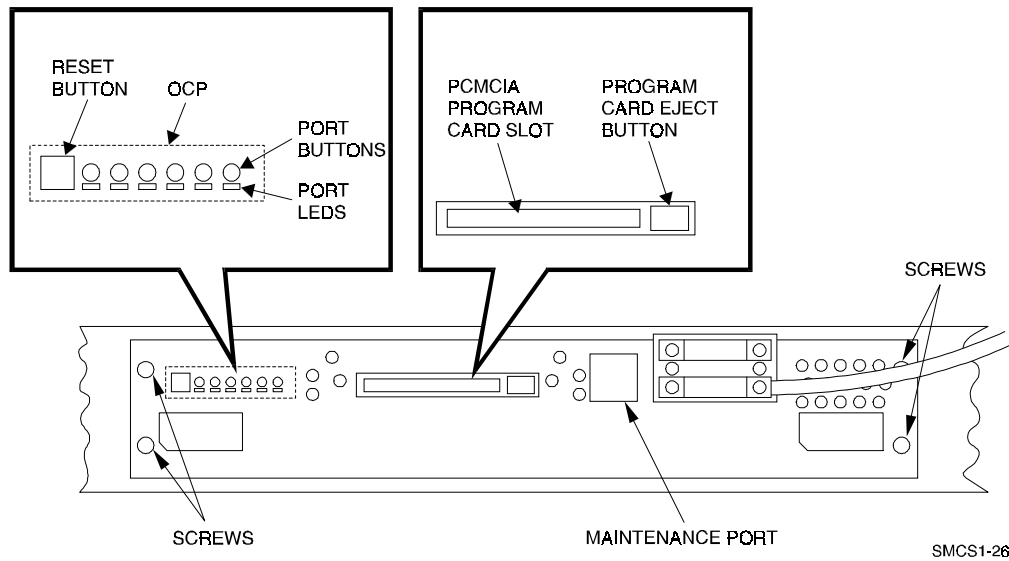
4. With a small blade screwdriver, loosen the captive screws on the trilink connector (see Figure 3-3) and remove the trilink from the front of the controller. If the new RAID Array 450 includes a trilink, move the cables and terminator to the new trilink once the controller is installed. If the new controller does not include a trilink, simply attach the existing trilink and cables to the new controller once it is installed in the shelf backplane.

Figure 3–3 Trilink Connector
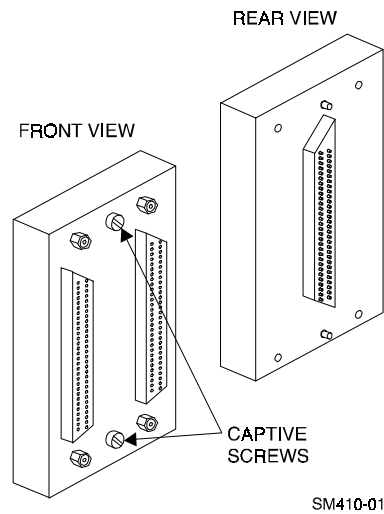
5. Remove the maintenance terminal cable (if attached).

6. Loosen the four mounting screws (refer to Figure 3-2) on each side of the front panel with a medium blade screwdriver.

7. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

8. Slide the module out of the shelf (noting which rails the module was seated in) and place on an approved ESD work surface or mat.

3.5.3 Cache Module Removal

1. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

2. Slide the write-back cache module out of the shelf, noting which rails it was seated in, and place it on an approved grounded conductive ESD mat.

> **WARNING**
>
> Do not allow the write-back cache to contact any conductive surface, or injury and/or equipment damage may result.

3.6 Installing the RAID Array 450 Cache Module, Controller, and ECB

3.6.1 Installing the Cache Module

Use the following procedure to install the write-back cache module:

1. Slide the write-back cache module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the medium blade screwdriver.

3.6.2 Installing the Controller Module

1. To install the controller module, slide the module into the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the medium blade screwdriver.

4. Reconnect the trilink connector and host cables.

3.6.3 Installing the External Cache Battery

1. Select an unused SBB slot and push the External Cache Battery module in until it seats.

2. Connect one end of the battery cable to the battery module using the small blade screwdriver.

3.7 Connecting the Controller and Cache Module

Use this procedure to connect the controller and cache module in a single controller configuration. For a dual-redundant controller configuration, repeat steps 3.6.1 and 3.6.2.

To setup your subsystem for single controller operation, as shown in Figure 3−4, follow these steps:

1. Attach the trilink connector to the controller port.

2. For a single subsystem configuration, attach a terminator to the available port of the trilink connector.

   For a multiple subsystem configuration, attach one end of a second bus cable to the available port of the trilink connector.

Figure 3–4 Attaching the Connecting Cables
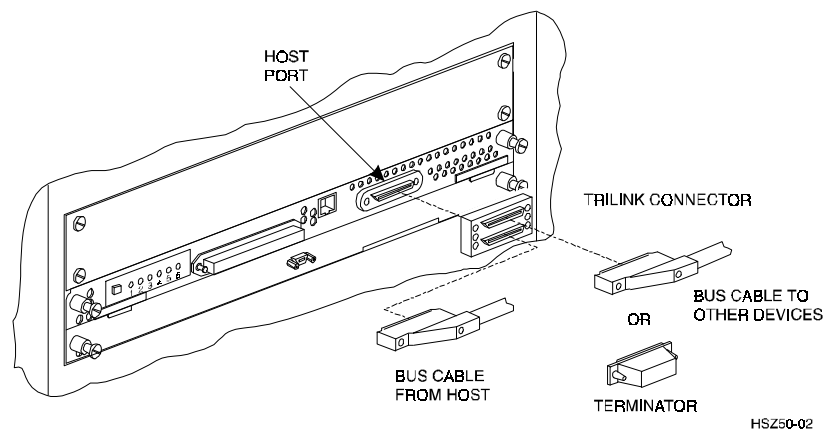
3. Connect the cache module to the external cache battery (ECB) SBB as shown in Figure 3−5.

Figure 3–5 Connecting the Cache Module to the Cache Battery
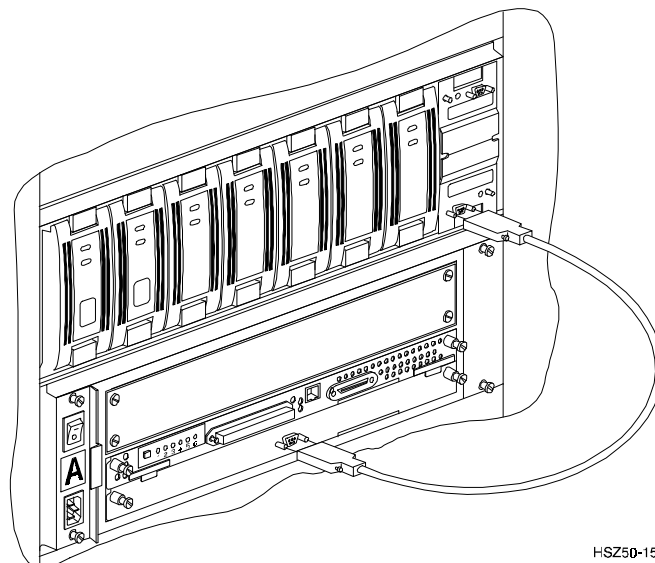
4. Connect a maintenance terminal to the maintenance port of the new controller.

5. Insert the Version 5.0 program card(s) into the new controller(s). The program card eject button extends when the card is fully inserted.

6. Snap the ESD shield into place over the program card.

7. Power ON the RAID subsystem.

8. If the controller initializes correctly, its green reset LED begins to flash once per second. If an error occurs during initialization, the OCP displays a code. If necessary, refer to Chapter 1, *Troubleshooting* in the *Servicing your StorageWorks Subsystem, HSZ50 Array Controller, HSOF Version 5.0* to analyze the code.

3.8 Making a Serial Connection with the RAID Controller

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software.

See the *CLI Reference Manual* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal or a PC.

3.9 Restoring RAID Subsystem Configuration

3.9.1 Setting Target IDs for the Controller

Set the SCSI IDs to be used for your storagesets to the IDs that were recorded in Section 3.4 under "SHOW THIS CONTROLLER." In this example, SCSI IDs 0, 1, 2, and 3 are used. Enter the command:

```
HSZ> set this_controller id=(0,1,2,3)
```

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Enter the command:

```
HSZ> restart this_controller
```

Set the controller's operating mode:

```
HSZ> set this_controller host_function=B
```

For dual-redundant configurations enter:

```
HSZ> set failover copy=this_controller
```

When the CLI finishes initializing, set the preferred IDs. For example, if the preferred IDs for this controller are 0 and 1, enter the command:

```
HSZ> set this_controller preferred_id=(0,1)
```

3.9.2 Add Disks to Configuration

```
HSZ> run config
```

3.9.3 Recreate Storagesets

> **NOTE**
>
> Use the CLI "add" command to recreate the storagesets in the following command examples but **DO NOT** initialize the storageset using the "init" command or you will lose all data on the storageset.

Using the information recorded on the Storageset Table (Table 3–5), recreate the storagesets. Use the **add** command once for each of the storagesets in the table. If your configuration contains mirrorsets, create them first. Add the remaining storagesets (raidsets, stripesets, and sparesets) in any order. The **add** command has the following format:

```
HSZ> add [storageset] [name] [uses]
```

3.9.4 Enable Storageset Options

View the storagesets just created.

```
HSZ> show storageset full
```

Compare all the parameters in this listing with the Storageset Table (Table 3–5). Change the storageset parameters to be the same as shown in the table using the **set** command where necessary.

The format of the **set** command for each item in the storageset table is shown below for easy reference. Use only the entries that pertain to your configuration.

POLICY
```
HSZ> set [name] policy=best_performance
HSZ> set [name] policy=best_fit
HSZ> set [name] nopolicy
```

COPY
```
HSZ> set [name] copy=normal
HSZ> set [name] copy=fast
```

READ_SOURCE
```
HSZ> set [name] read_source=least_busy
HSZ> set [name] read_source=round_robin
HSZ> set [name] read_source=[uses]
```

> where [uses] is a single disk.

RECONSTRUCT
```
HSZ> set [name] reconstruct=normal
HSZ> set [name] reconstruct=fast
```

AUTOSPARE
```
HSZ> set failedset autospare
HSZ> set failedset noautospare
```

Note that the unit ("USED BY" column) will be assigned in the next subsection. Also, the existing chunksize will be maintained in the new controller. The chunksize cannot be changed because you cannot use the "initialize" command.

3.9.5 Recreate Units

Recreate the units recorded earlier in the Logical Unit Table (Table 3–4).

       HSZ> **add unit** [*LUN*] [*uses*]

Use the **add unit** command once for each [*LUN*] entry in the table.

3.9.6 Enable Previous Unit Options

View the units just created.

       HSZ> **show unit full**

Compare all the parameters in this listing with the Logical Unit Table (Table 3–4). Change the unit settings to be the same as those listed in the table using the **set** command where necessary.

The format of the **set** command for each item is shown below for easy reference. Use only the entries that pertain to your configuration.

   RUN
     HSZ> **set** [*LUN*] **run**
     HSZ> **set** [*LUN*] **norun**

   WRITE_PROTECT
     HSZ> **set** [*LUN*] **write_protect**
     HSZ> **set** [*LUN*] **nowrite_protect**

   READ_CACHE
     HSZ> **set** [*LUN*] **read_cache**
     HSZ> **set** [*LUN*] **noread_cache**

   WRITEBACK_CACHE
     HSZ> **set** [*LUN*] **writeback_cache**
     HSZ> **set** [*LUN*] **nowriteback_cache**

   MAXIMUM_CACHED_TRANSFER_SIZE

     HSZ> **set** [*LUN*] **maximum_cached_transfer_size=**[*n*]

                 where [*n*] is a number from 1 through 1024.

3.9.7 Verify Configuration

Before the host system is powered-on, it is advisable to recheck the RAID Array 450 configuration against the pre-upgrade RAID Array 410 configuration. In this process compare the new settings with the original settings recorded on the tables included in this chapter. Specifically, check the following:

- **show this_controller** and **show other_controller** lists the values for the Host Port SCSI Target(s), Host Port Preferred Target(s), and Host Functionality Mode settings recorded on the **Controller Configuration Forms**

- **show units** displays all of the logical units and storagesets previously recorded on the **Logical Unit Table**

- **show storagesets** lists all of the containers recorded on the **Storageset Table**:

  - Check the logical unit *Used by* each of the storagesets

  - Check the *Name* and *Type* of each storageset

  - Check the devices in use by each storageset in the *Uses* column

3.10 Power-on Host System

Now that the RAID Array 450 configuration has been verified, the host system may be powered-on. Since the configuration has been modified, the system may require additional time to complete its initialization. Once the system has completed the bootstrap process, login as the *root* user and continue to the next step.

3.11 Upgrading Host Configuration

3.11.1 Install StorageWorks Software

The StorageWorks Software for IBM consists of installation scripts, AIX support files and the Command Console (CC) Agent. AIX support for the RAID Array 450 may be installed independent of the CC Agent. If you do not wish to utilize the Command Console Agent or your RAID Array 450 configuration does not have the additional resources necessary to support its operation, follow the steps described in "Installing AIX Support Files"*.* If additional, unused devices are available on the RAID Array 450 and you wish to utilize the CC Agent, follow the steps described in "Installing AIX Support Files and CC Agent".

3.11.2 Installing AIX Support Files

To install only the AIX support files, follow these steps in the *Getting Started - RAID Array 450 V5.0 for IBM*, *Chapter 3 - Installing the StorageWorks Software for IBM on AIX*. Since this is an upgrade it will only be necessary to:

- Load the StorageWorks software onto hard disk - Section 3.3

- Copy the file archive from CDROM to temporary storage - Section 3.3.1

- Upgrade the StorageWorks software - Section 3.5

- Reboot the system

- Verify that the host has located and configured all of the RAID Array 450 devices by entering:

    # **lsdev -HCc disk**

- Once all of the devices have been located, proceed to Section 3.11.4, "Activating the Logical Volume Groups"

3.11.3 Installing AIX Support Files and CC Agent

To install the AIX support files and the Command Console Agent, follow these steps from the *Getting Started - RAID Array 450 V5.0 for IBM*:

As described in the Upgrade Prerequisites section (3.1.1), the CC Agent requires a Communications LUN for the RS/6000 to interface with the RAID Array 450.

- Create a communications LUN as described in *Chapter 2 - Creating a Communications LUN.*

- Load the StorageWorks software as described *in Chapter 3 - Installing the StorageWorks Software for IBM on AIX.* Since this is an upgrade it will only be necessary to:

    - Load the StorageWorks software onto hard disk - Section 3.3

    - Copy the file archive from CDROM to temporary storage - Section 3.1.1

    - Upgrade the StorageWorks software - Section 3.5

    - Reboot the system

    - Login as the root user to determine the disk configured as the Communications LUN. The following command will list the disk devices currently configured. Make note of the disk with the Target and LUN combination that corresponds to the Communications LUN:

        # `lsdev -HCc disk`

    - Install the Command Console Agent on your Host System - Chapter 4

    - Once all of the devices have been located, proceed to the next step, "Activating the Logical Volume Groups"

3.11.4 Activating the Logical Volume Groups

Use the System Management Interface Tool, *SMIT*, to activate the Logical Volume Groups. This is done by selecting the following *SMIT* menu choices:

1. System Storage Management (Physical & Logical Storage)

2. Logical Volume Manager

3. Volume Groups

4. Activate a Volume Group

5. Enter the Volume Group name or use the List (F4) function key to show all of the Volume Groups.

6. Select the desired group from the list and depress Enter to activate the Volume Group.

7. After each of the Volume Groups have been activated, the filesystem(s) contained therein may be mounted with the *SMIT* utility or the *mount* command.

8. Once all of the Volume Groups have been activated and their filesystems mounted, the disk devices previously used on the RAID Array 410 may be removed. Follow the steps in section 3.11.6 to remove them.

3.11.5 Recreating Filesystem Mount Points

After an AIX Preservation Upgrade only, the filesystem mount points need to be recreated. Using the information recorded in the Mount Point Table (Table 3–3), recreate the mount points with the command:

> # **mkdir** [*mount point*]

Now the filesystem(s) can be mounted with the *SMIT* utility or the *mount* command.

3.11.6 Removing Previously Defined Devices

The disk device names that were used by the RAID Array 410 are no longer necessary and may be removed. This process includes listing the devices and then logically removing them from the system. To list all of the disk devices present on your system:

> # **lsdev -HCc disk**

The name and location of the devices on your system will be different. Only the

"Defined DEC SWXRC–04 RAID Array 410"

or the

"Defined Other SCSI Disk Drive"

devices should be removed. Those devices will be displayed as:

```
name     status  location       description
hdiskx  Defined 00-01-01-2,0 DEC SWXRC-04 RAID Array 410
hdiskx  Defined 00-01-01-2,0 Other SCSI Disk Drive
```

Verify the location of the devices to be deleted using the information recorded in the Device Configurations Table (Table 3–1).

To remove the defined devices substitute the correct disk number (**x**) from the list above and enter the following command for each device that needs to be removed:

> # **rmdev -l hdisk[x] -d**

3.12 Congratulations

This completes the RAID Array 450 Upgrade Procedure. The system should be ready to be placed on-line. If you cannot activate your system, specific troubleshooting or data restoration may be required.

4

Upgrading the RAID Array 410 to RAID Array 450 for Sun Solaris

This chapter describes procedures to remove and replace the controller and cache modules of the RAID Array 410 when operating on Solaris 2.4 and 2.5 platforms.

This chapter describes how to remove and replace the controller and cache modules in both single controller and dual-redundant controller configurations. Included in this upgrade are the following:

- Controller module

- Cache module

- External cache battery (ECB) and cable

- This document

4.1   Controller Upgrade Roadmap

Replacing a controller module involves several considerations:

- Ensuring that your system meets the upgrade prerequisites described in Section 4.1.1 below

- Preparing your host system for the upgrade

- Recording the RAID subsystem configuration

- Replacing the controller(s)

- Restoring RAID Configuration

NOTE

You should determine the exact system configuration that you are servicing (a nonredundant controller or both dual-redundant controllers) before proceeding to the following sections, as the procedures vary and have different consequences.

4.1.1 Upgrade Prerequisites

Before replacing the RAID Array 410 controller(s) and cache module(s), please review the following:

- The RAID Array 450 is supported on Sun Solaris Versions 2.4, 2.5, and 2.5.1. If necessary, upgrade your operating system before the controller and cache module upgrade is attempted.

- Included with the RAID Array 450 Version 5.0 software is the StorageWorks Command Console (SWCC) Client and Agent. These replace the Sun RAID Array 410 Manager.

- This procedure documents single controller to single controller upgrades and dual-redundant to dual-redundant controller upgrades only. To upgrade a single controller to a dual-controller configuration, first perform the single to single upgrade and then add the second controller using the procedure described in Chapter 1, Section 1.8 of the *Getting Started RAID Array 450 for Sun Solaris.*

- During this upgrade procedure, do not add, remove, or move any devices. Any device configuration changes can be made after the upgrade is completed and verified.

- Ensure that the RAID Array is operating normally, that is, no failed drives, batteries, or storagesets.

- After removing the old controller, return the controller and PC Card in accordance with the instructions contained in the customer letter found in the RAID Array 450 platform kit.

4.1.2 Tools Required

You need the following tools to remove or replace the controller module:

- ESD (ElectroStatic Discharge) strap

- Medium blade screwdriver for module replacement

- Small blade screwdriver for trilink and external cache battery cable fasteners

4.1.3 Precautions

In general, you should follow routine ESD protection procedures when handling controller modules and cache modules and when working around the cabinet and shelf that houses the modules.

Follow these guidelines to further minimize ESD problems:

- Use ESD wrist straps, antistatic bags, and grounded ESD mats when handling controllers and cache modules.

- Obtain and wear an ESD wrist strap on your wrist. Make sure the strap fits snugly.

- Attach the lead on the ESD strap to a convenient cabinet grounding point.

- After removing a module from the shelf, place the module into an approved antistatic bag or onto a grounded antistatic mat.

- Remain grounded while installing a replacement module.

CAUTION

Follow program card guidelines or damage to the program card and controller software can result.

4.2 Preparing Your Host System

Before starting the upgrade process you will need to prepare your system by performing a complete system backup.

4.2.1 Backup the System

As a precaution before starting this procedure you should backup the entire system, especially data stored on the RAID Array.

4.2.2 Unmount the RAID Box

Unmount from the host system any units that are accessed through the RAID Array 410 that is about to be upgraded.

4.3 Making a Serial Connection with the RAID Controller

4.3.1 Controller Serial Communication Parameters

You must make a serial connection to the RAID controller to access the Command Line Interpreter (CLI). The CLI is the user interface built into the RAID controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's software

See the *CLI Reference Manual* for detailed descriptions of all CLI commands.

You can make a serial connection to the RAID controller from a maintenance terminal, or by using a communications program.

- 9600 baud
- 8 bits
- 1 stop bit
- No parity

4.3.2 Connecting the Cable

To connect a maintenance terminal to a RAID controller follow these steps:

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.

2. Plug the serial connector into the 9-pin serial port/com port 1 of the maintenance terminal. If a 9-pin serial port is not available, use the 9-pin to 24-pin adapter (P/N 12-45238-01) supplied with your StorageWorks RAID Array 410 Subsystem.

3. Plug the RJ12 connector into the maintenance port on the RAID controller

4. Note which serial port you use because you will need that information if using a communications program.

Figure 4–1 Making a Serial Connection to the Controller
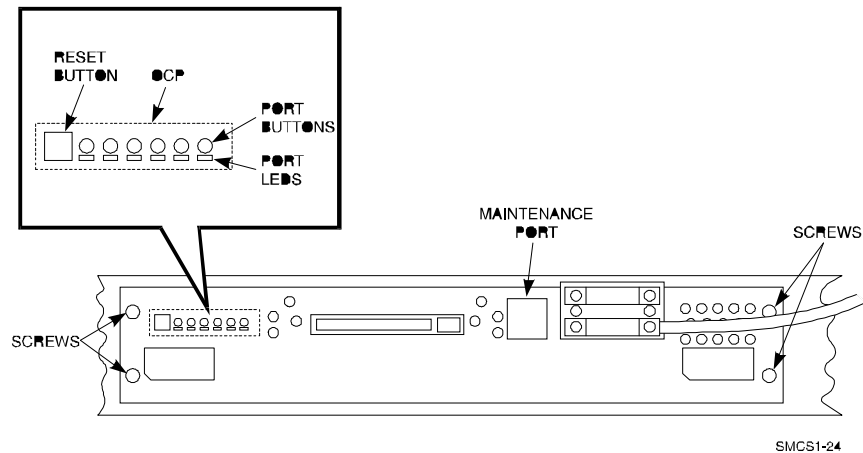
4.3.3 Establishing Connection with a SPARC System

To set up your SPARC system for connection to the 410 controller, follow these steps:

1. Use a serial cable to connect the serial port on the SPARC system to the serial port on the RAID array controller.

2. If you use a SUN A/B Serial Splitter Cable, you may need to modify the *remote* file to specify the A-port as follows:
   Open the file `/etc/remote` with an editor.
   Locate the lines:
   ```
   hardwire:\
   :dv=/dev/ttyb:br#9600
   ```
   Change `ttyb` to `ttya`.
   Save the file.

   To specify the B-port:
   Open the file `/etc/remote` with an editor.
   Locate the lines:
   ```
   hardwirea:\
   :dv=/dev/ttyb:br#9600
   ```
   Change `ttyb` to `ttya`.
   Save the file.

3. Open a *terminal window* from the Desktop Program menu.

4. Start the Terminal Interface Program (TIP), at the prompt type:

   `tip hardwire`

   and press the Enter key.

5. Press the Enter key again and the CLI prompt appears in the window similar to the following:
   ```
   swxrc>
   ```

You now have a tip connection to the controller, which may be closed by entering "**~.**".

4.3.4 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
swxrc>
```

4.4   Recording Your Configuration Data

In the following steps, you need to record your configuration for use later in this procedure.

4.4.1 For Either Single or Dual-redundant Controllers

First, verify the controller's configuration:

```
swxrc> show this_controller full
```

Fill in the blanks below.

> Controller:
>
> > SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02
> >
> > Not configured for dual-redundancy (or Dual-redundant configuration)
> >
> > SCSI address 7
> >
> > Time: NOT SET
>
> Host port:
>
> > SCSI target(s) _____ Preferred target(s) _____
>
> Cache:
>
> > 32 megabyte write cache, version 2
> >
> > Cache is GOOD
> >
> > Battery is GOOD
> >
> > No unflushed data in cache
> >
> > CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
> >
> > CACHE_POLICY = _____
> >
> > 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 9600 baud, eight bit, no parity, 1 stop bit
> >
> > Operation control: 00000004 Security state code: 95018
> >
> > Configuration backup disabled

4.4.2 For Dual Controllers Only

Verify the other controller's configuration:

```
swxrc> show other_controller full
```

Fill in the blanks below.

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

In dual-redundant configuration

SCSI address 6

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____

Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

CACHE_POLICY = _____

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

4.4.3 Record Logical Units

Verify the Logical Units by entering:

```
        swxrc> show unit full
LUN                                        Uses
------------------------------------------------
D100                                  S28

    Switches:
      RUN            NOWRITE_PROTECT           READ_CACHE
      WRITEBACK_CACHE
      MAXIMUM_CACHED_TRANSFER_SIZE = 32

    State:
      ONLINE to this controller
      Not reserved
      PREFERRED_PATH = THIS_CONTROLLER

    Size: 20547350 blocks

D200                                  M1
     Switches:
      RUN            NOWRITE_PROTECT           READ_CACHE
      WRITEBACK_CACHE
      MAXIMUM_CACHED_TRANSFER_SIZE = 32

     State:
      ONLINE to this controller
      Not reserved
      PREFERRED_PATH = THIS_CONTROLLER

     Size: 4109470 blocks

D300                                  R5

    Switches:
      RUN            NOWRITE_PROTECT           READ_CACHE
      WRITEBACK_CACHE
      MAXIMUM_CACHED_TRANSFER_SIZE = 32

     State:
      ONLINE to this controller
      Not reserved
      PREFERRED_PATH = THIS_CONTROLLER

     Size: 8216924 blocks
```

Record, and mark when enabled, the information in the following table. The top line shows how to record entries for D300 of the sample.

Table 4–1 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CACHED TRANSFER SIZE
D300	R5	X		X	X	32

Next, verify the storagesets you have configured:

        swxrc> **show storagesets full**

The controller responds with a display similar to that shown below:

```
Name            Storageset          Uses          Used by
----------------------------------------------------------------------
S28             stripeset           DISK130       D100
                                    DISK230
                                    DISK330
                                    DISK430
                                    DISK530
                                    DISK630
Switches:

      CHUNKSIZE = 256 blocks
State:
  NORMAL
  DISK130 (member  0) is NORMAL
  DISK230 (member  1) is NORMAL
  DISK330 (member  2) is NORMAL
  DISK430 (member  3) is NORMAL
  DISK530 (member  4) is NORMAL
  DISK630 (member  5) is NORMAL
Size:  50268168 blocks

M1              mirrorset           DISK400       D200
                                    DISK500
Switches:
      POLICY (for replacement) = BEST_PERFORMANCE
      COPY (priority) = NORMAL
      READ_SOURCE = LEAST_BUSY

           MEMBERSHIP = 2, 2 members present
    State:
        NORMAL
        DISK400 (member 0) is NORMAL
        DISK500   (member  1) is NORMAL
    Size: 4109470 blocks

R5                raidset           DISK210       D300
                                    DISK310
                                    DISK410
Switches:
        POLICY (for replacement) = BEST_PERFORMANCE
        RECONSTRUCT (priority) = NORMAL
        CHUNKSIZE = 256 blocks
State:
        NORMAL
        DISK210 (member  0) is NORMAL
        DISK310 (member  1) is NORMAL
        DISK410 (member  2) is NORMAL
Size:  25134084 blocks
SPARESET     spareset
FAILEDSET    failedset
Switches:
        AUTOSPARE
```

Record the storageset information in the Storageset Table (Table 4–2). The first row shows how to record for R5 of the sample:

NOTE

Not all column headings apply to all storagesets.

Table 4–2 Storageset Table

NAME	STORAGE-SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK-SIZE
R5	RAIDSET	DISK210 DISK310 DISK410	D300	BEST PERFOR-MANCE			NORMAL	256
FAILEDSET	AUTOSPARE				NOAUTOSPARE			

4.5 Remove RAID Array 410 Controller and Cache Modules

4.5.1 Unmount Filesystems that Reside on the RAID Array From the Host Operating System.

Unmount from the host system any units that are accessed through a SWXRC-04 controller.

4.5.2 Using the SHUTDOWN Command and Turning Off Controller Power

---

CAUTION

If the correct steps for turning off power to an SWXRC-04 are not followed, there is a potential for loss of data that may exist on any devices connected to the array

---

CAUTION

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

---

1. For dual-redundant configurations, shutdown each controller one at a time. From the maintenance terminal connected to the maintenance port of one controller, use both of the following commands:

   swxrc> **shutdown other_controller**

   swxrc> **shutdown this_controller**

   In a Nonredundant controller configuration, you need only use the command:

   swxrc> **shutdown this_controller**

2. Turn off the power to the RAID subsystem only when the controller **shutdown** command has successfully completed, (ie. no response to keyboard).

4.5.3 Controller Module Removal

Use the following procedure to remove the controller module. Repeat the procedure for dual-redundant controller configurations.

1. Access the controller modules in the cabinet.

2. Unsnap and remove the ESD shield covering the program card by pulling out on the two retainer buttons.

3. Remove the program card by pushing the eject button on the controller. Pull the card out and return it to Digital Equipment Corporation.

Figure 4–2 RAID Array 410 Controller Panel
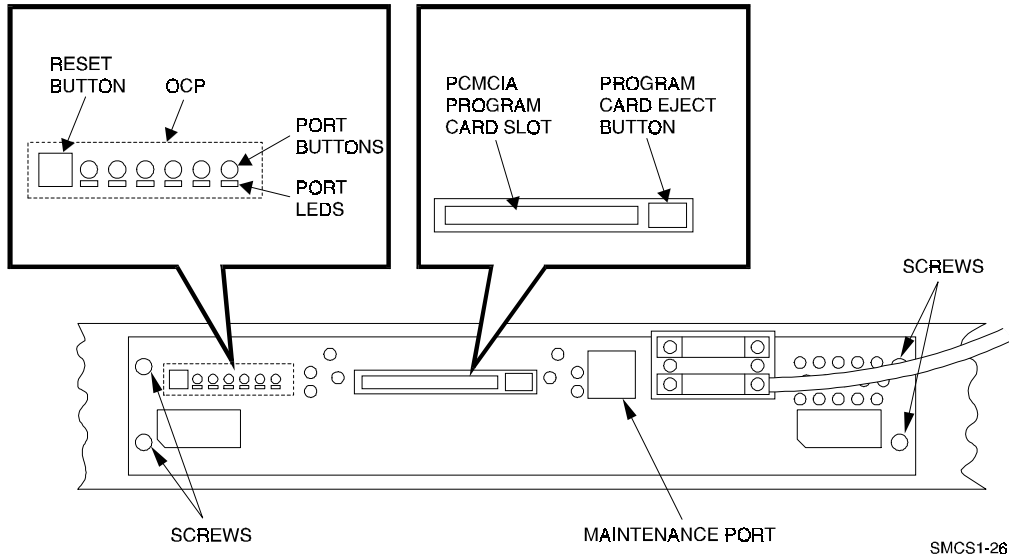
4. With a small blade screwdriver, loosen the captive screws on the trilink connector (see Figure 4–3) and remove the trilink from the front of the controller. Removing cables or terminators from the trilink will interrupt the host SCSI bus, preventing access to other SCSI devices.

Figure 4–3 Trilink Connector
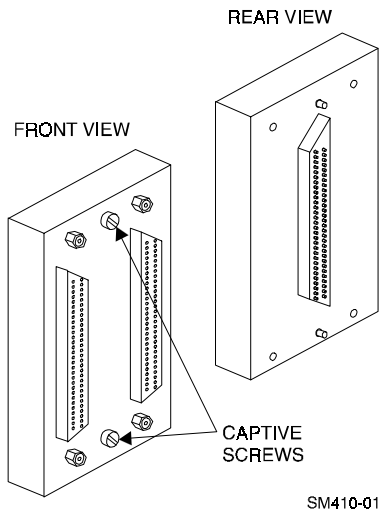
5. Remove the maintenance terminal cable (if attached).

6. Loosen the four mounting screws (refer to Figure 4–2) on each side of the front panel with a medium blade screwdriver.

7. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

8. Slide the module out of the shelf (noting which rails the module was seated in) and place on an approved ESD work surface or mat.

4.5.4 Cache Module Removal

1. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

2. Slide the write-back cache module out of the shelf, noting which rails it was seated in, and place it on an approved nonconductive ESD mat.

WARNING

Do not allow the write-back cache to contact any conductive surface, or injury and/or equipment damage may result. Dispose of it properly because it contains a lead-acid battery.

4.6   Installing the RAID Array 450 Cache Module(s), Controller(s), and ECB

4.6.1 Installing the Cache Module

Use the following procedure to install the new cache module:

1. Slide the cache module into the slot where the old cache was..

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated.

3. Tighten the two screws on the front panel using a flat blade screwdriver.

4.6.2 Installing the Controller Module

1. To install the new controller module, slide the module into the shelf where the old one resided.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated.

Tighten the two screws on the front panel using the flat blade screwdriver. Do not over tighten the screws.

4.6.3 Installing the ECB (External Cache Battery)

1. Select any unused SBB (System Building Block) slot and push the External Cache Battery (ECB) module in until it seats.

2. Connect one end of the battery cable to the battery module.

Repeat steps 4.6.1 and 4.6.2 for the other controller if using a dual-redundant configuration.

4.7   Connecting the Controller and Cache Module

1. Reattach the trilink connector(s) to the controller(s).

2. For a single subsystem configuration, attach a terminator to the available port of the trilink connector.

    For a multiple subsystem configuration, attach one end of a second bus cable to the available port of the trilink connector.

3. Connect the cache module to the external cache battery (ECB) SBB as shown in Figure 4–4.

Figure 4–4 Connecting the Cache Module to the Cache Battery
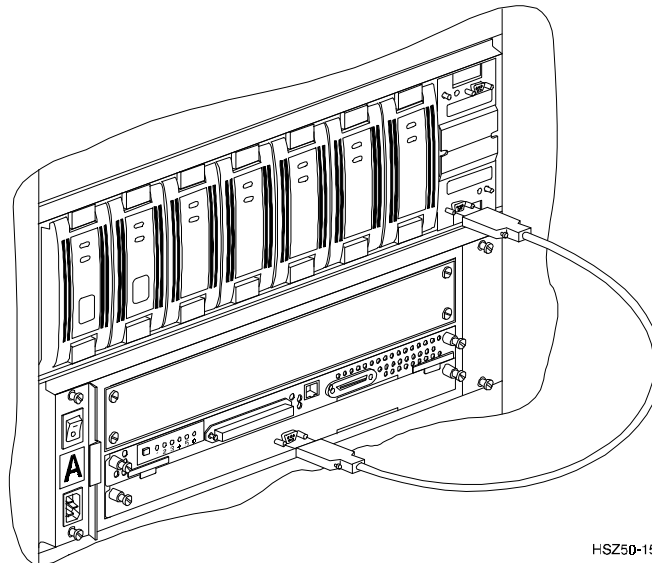
3. Connect a maintenance terminal to the maintenance port of the new controller, or lower controller if you installed two.

4. Insert the new program card(s) into the controller(s). The program card eject button extends when the card is fully inserted.

5. Snap the ESD shield into place over the program card(s).

6. Power ON the entire subsystem.

7. If the controller(s) initializes correctly, the green reset LED(s) begins to flash at 1 once per second. If an error occurs during initialization, the OCP displays a code. If necessary, refer to Chapter 1, *Troubleshooting* in the *Servicing your StorageWorks Subsystem, HSZ50 Array Controller, HSOF Version 5.0* to analyze the code.

When installing dual-redundant configurations, disregard the "`controller's misconfigured`" messages

4.8 Restoring RAID Array Configuration

4.8.1 Entering CLI Commands

The CLI supports the following Command Line Editing functions:

Table 4–3 CLI Recall and Edit Commands

Key	Function
Up arrow or Ctrl/B, Down Arrow or Ctrl/N	Steps backward and forward through the five most recent CLI commands.
Left Arrow or Ctrl/D, Right Arrow or Ctrl/F	Moves the cursor left or right in a command line.
Ctrl/E	Moves the cursor to the end of the line.
Ctrl/H or Backspace	Moves the cursor to the beginning of the line.
Ctrl/J or Linefeed	Deletes the word to the left of the cursor.
Ctrl/U	Deletes characters from the beginning of the line to the cursor.
Ctrl/A	Toggles between insert mode and overstrike mode. The default setting is insert mode, which allows you to insert characters at the cursor location, moving the existing characters to the right. Overstrike mode replaces existing characters when you type. The CLI returns to insert mode at the beginning of each line.
Ctrl/R	Recalls the contents of the command line. This is especially helpful if the system issues a message that interrupts your typing.

4.8.2 For a Single Controller Only

After power-on wait for the HSZ> prompt, then enter:

> HSZ> **clear cli**

Set the SCSI IDs to be used for your storage sets. These ID's were recorded in Section 4.4. "SHOW THIS CONTROLLER". Use up to four ID's for the controller while avoiding the ID of the host adapter (normally ID7). This example uses SCSI IDs 0, 1, 2, and 3. Enter a command similar to the following but using your unique SCSI target addresses:

Example: HSZ> **set this_controller id=(0,1,2,3)**

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Enter the command:

> HSZ> **restart this_controller**

Wait for the **HSZ>** prompt then set time according to the following example:

Example:

```
HSZ> set this_controller time = 21–JAN–1997:13:30:00
```

Check the controller configuration by entering:

```
HSZ> show this_controller
```

4.8.3 For Dual-redundant Configurations Only

After power-on wait for the HSZ> prompt, then enter:

```
HSZ> clear cli
```

Set the SCSI IDs to be used for your storage sets. These ID's were recorded in Section 4.4. "SHOW THIS CONTROLLER". Use up to four ID's for the controller while avoiding the ID of the host adapter (normally ID7). This example uses SCSI IDs 0, 1, 2, and 3. Enter a command similar to the following but using your unique SCSI target addresses:

Example: `HSZ> set this_controller id=(0,1,2,3)`

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Do not restart yet.

Set the SCSI targets preferred to this controller by entering the IDs that were recorded in Section 4.4. "SHOW THIS CONTROLLER". Use up to four IDs for the controller while avoiding the ID of the host adapter (normally ID7). This example uses SCSI IDs 0 and 2. Enter a command similar to the following but using your unique SCSI target addresses:

Example: `HSZ> set this_controller preferred id = (0,2)`

Wait for the **HSZ>** prompt then enter:

```
HSZ> set failover copy = this_controller
```

Now restart the controllers by entering:

```
HSZ> restart other_controller
HSZ> restart this_controller
```

After restart wait for **HSZ>** prompt, then set time according to the following example:

Enter:

```
HSZ> set this_controller time = 21–JAN–1997:13:30:00
```

Check configuration by entering:

```
HSZ> show this_controller
HSZ> show other_controller
```

Note that the configuration commands in Sections 4.9, 4.10, and 4.11 need only be run on one of the dual-redundant controllers.

4.9 Add Disks to Configuration

Enter the following command so the new controller(s) will scan for disk drives.

```
HSZ> run config
```

4.10   Recreate Storagesets

> **NOTE**
>
> Use the CLI "add" command to recreate the Storagesets in the following command examples but **DO NOT** initialize the storageset using the "init" command or you will lose all data on the storageset.

Recreate the storagesets recorded earlier in the Storageset Table (Table 4–2). Use the **add** command once for each of the storagesets in the table. If your configuration contains mirrorsets, create them first. Add the remaining storagesets (raidsets, stripesets, and sparesets) in any order. The **add** command has the following format:

```
HSZ> add [storageset] [name] [uses]
```

Remember, if the storageset is a striped mirrorset, the form of the command line is slightly different than shown.

Example:

```
HSZ> add stripeset [name] [mirrorset] [mirrorset]
```

4.10.1 Enable Storageset Options

View the storagesets just created.

```
HSZ> show storageset full
```

Compare all the parameters in the listing with the Storageset Table (Table 4–2). Change the storageset parameters to be the same as shown in the table using the **set** command where necessary.

The format of the **set** command for each item in the storageset table is shown below for easy reference. Use only the entries that pertain to your configuration.

POLICY
```
HSZ> set [name] policy=best_performance
HSZ> set [name] policy=best_fit
HSZ> set [name] nopolicy
```

READ_SOURCE
```
HSZ> set [name] read_source=least_busy
HSZ> set [name] read_source=round_robin
HSZ> set [name] read_source=[uses]
            where [uses] is a single disk.
```

COPY
```
HSZ> set [name] copy=normal
HSZ> set [name] copy=fast
```

RECONSTRUCT
```
HSZ> set [name] reconstruct=normal
HSZ> set [name] reconstruct=fast
```

AUTOSPARE
```
HSZ> set failedset autospare
HSZ> set failedset noautospare
```

Note that the unit ("USED BY" column) will be assigned in the next subsection. Also, the existing chunksize will be maintained in the new controller. The chunksize cannot be changed because you cannot use the "initialize" command.

4.11   Recreate Units

Recreate the units recorded earlier in the Logical Unit Table (Table 4–1).

```
HSZ> add unit [LUN] [uses]
```

Use the **add unit** command once for each [*LUN*] entry in the table.

4.11.1 Enable Previous Options

View the units just created.

```
HSZ> show unit full
```

Compare all the parameters in this listing with the Logical Unit Table (Table 4–1). Change the unit settings to be the same as those listed in the table using the **set** command where necessary.

The format of the **set** command for each item in the Logical Unit Table (Table 4–1)is shown below for easy reference. Use only the entries that pertain your configuration.

RUN
```
HSZ> set [LUN] run
HSZ> set [LUN] norun
```
WRITE_PROTECT
```
HSZ> set [LUN] write_protect
HSZ> set [LUN] nowrite_protect
```
WRITEBACK_CACHE
```
HSZ> set [LUN] writeback_cache
HSZ> set [LUN] nowriteback_cache
```
READ_CACHE
```
HSZ> set [LUN] read_cache
HSZ> set [LUN] noread_cache
```
MAXIMUM_CACHED_TRANSFER_SIZE
```
HSZ> set [LUN] maximum_cached_transfer_size=[number]
```
                where [*number*] is a number from 1 through 1024.

4.12   Verify Configuration

Before the host system is powered-on it is advisable to recheck the RAID Array 450 configuration with the pre-upgrade RAID Array 410 configuration. In this process compare the new settings with the original settings recorded on the blank forms provided in this document. Specifically check:

- Host Port SCSI Target(s), Host Port Preferred Target(s), Cache Policy and HOST_FUNCTIONALITY settings recorded on the **Controller Table**

- SHOW DEVICES lists all disks installed and recorded on the **Devices Table**

- SHOW UNITS displays all of the logical units and storagesets previously recorded on the **Logical Units Table**

- SHOW STORAGESETS lists all of the containers recorded on the **Storagesets Table**:

  - Check logical unit *Used by* each of the storagesets

  - Check *Name* and *Type* of each storageset

  - Check devices in use by each storageset, *Uses* column

  - Show *storageset_ name* list proper storageset attributes

4.13   Shutdown Host System and Reboot

Now that the RAID Array 450 configuration has been verified, the host system may be rebooted using the command:

boot -r

Once the system has completed the bootstrap process login as the *root* user and continue to the next step.

4.13.1 Sun Solaris Prerequisites

The RAID Array 450mhas been qualified on the following Sun Solaris versions and patch levels:

Version	Patch
2.4	101945-04
2.5	103936-01
2.5.1	103934-01

If you are running Solaris 2.3, you will need to upgrade the Operating System to one of the versions listed above.

4.14 Removing Existing StorageWorks Manager

The RAID Manager and Monitor Utilities used with the V2.7 software and RAID Array 410 controller is not compatible with the upgraded V50 software and RAID Array 450 controller. Remove these utilities from your system as follows:

1. Exit the raidcf410 window if it is open from the FILE pull-down menu.

2. Stop the monitor utility (type "**/etc/init.d/raidmon_d stop**").

3. Edit the .profile file in korn shell or .cshrc file in c shell to remove the path to the utilities ($RAIDHOME410).

If you have a version of StorageWorks manager installed, then enter the following:

> **# pkginfo | grep DEC**

you should then see:

> **DECptisp**
>
> **DECswm410**

or just:

> **DECswm410**

depending on your specific host adapters.
First use the command:

> **# pkgrm DECswm410**

then use the command:

> **# pkgrm DECptisp**

to remove the existing software. It is not necessary to reboot at this point.

4.15 Installing StorageWorks Software:

To install the StorageWorks Software for Sun, follow the steps from the *Getting Started-RAID Array 450 V5.0 for Sun.*

4.16 Congratulations

This completes the RAID Array 450 Upgrade Procedure. The system should be ready to place on-line. If you cannot activate your system, specific troubleshooting or data restoration may be required.

5

Upgrading the RAID Array 410 to RAID Array 450 for Windows NT

This chapter describes procedures to remove and replace the controller and cache modules for the Windows NT platform.

This chapter describes how to remove and replace the controller and cache modules in both single controller and dual-redundant controller configurations. Included in this upgrade are the following:

- Controller module

- Cache module

- External Cache Battery (ECB) and cable

- This document

5.1 Upgrade Road Map

Replacing a controller module involves several considerations:

- Upgrading the host system configuration

- Ensuring that your system meets the upgrade prerequisites described in Section 5.1.1 below

- Preparing your host system for the upgrade

- Recording RAID subsystem configuration

- Replacing the controller(s)

- Restoring the RAID subsystem configuration

NOTE

You should determine the exact system configuration that you are servicing (a nonredundant controller or both dual-redundant controllers) before proceeding to the following sections, as each procedure varies and has different consequences.

5.1.1 Upgrade Prerequisites

Before upgrading the RAID Array 410 controller(s) and cache module(s), please review the following:

- The RAID Array 450 is supported on WNT 3.51 and WNT 4.0. If you are running WNT 3.51, upgrade your HSZ controller driver (HSZDISK.SYS) to Version 2.51 or later. If you are running WNT 4.0, upgrade your HSZ controller driver (HSZDISK.SYS) to Version 3.01 or later. You may obtain the latest driver at our web site - `www.storage.digital.com`.

- Included with the RAID Array 450 Version 5.0 software is the StorageWorks Command Console (SWCC), a graphical user interface capable of configuring and monitoring your RAID 450 subsystem.

- One platform kit is required for each controller. In addition to other components, the platform kit includes the HSOF Version 5.0 Program Card required for controller operation.

- This procedure documents existing RAID Array 410 single controller to single controller upgrades and dual-redundant to dual-redundant controller upgrades only. To upgrade a single controller to a dual-controller configuration, first perform the single to single upgrade and then add the second controller using the procedure described in Chapter 1 of the *Getting Started RAID Array 450 for Windows NT-Intel/PCI* or *Getting Started RAID Array 450 for Windows NT-Alpha.*

- The controller(s) and all storagesets must be in normal running conditions.

- During this upgrade procedure do not add, remove, or move any devices. Any device configuration changes can be made after the upgrade is completed and verified.

- After removing the old controller, return the controller and PC card in accordance with the instructions contained in the customer letter found in the RAID Array 450 upgrade kit.

5.1.2 Tools Required

You need the following tools to remove or replace the controller module:

- ESD (ElectroStatic Discharge) strap

- Medium blade screwdriver for module replacement

- Small blade screwdriver for trilink and external cache battery cable fasteners

5.1.3 Precautions

In general, you should follow routine ESD protection procedures when handling controller modules and cache modules and when working around the cabinet and shelf that houses the modules.

Follow these guidelines to further minimize ESD problems:

- Use ESD wrist straps, antistatic bags, and grounded ESD mats when handling controller modules and cache modules

Prior to handling the controller module or cache module, follow these grounding guidelines.

- Obtain and wear an ESD wrist strap on your wrist. Make sure the strap fits snugly.

- Attach the lead on the ESD strap to a convenient cabinet grounding point.

- After removing a module from the shelf, place the module into an approved antistatic bag or onto a grounded antistatic mat.

- Remain grounded while installing a replacement module.

CAUTION

Follow program card guidelines or damage to the program card and controller software can result.

5.2 Preparing Your Host System

Before starting the upgrade process you will need to prepare your system. This includes performing a complete system backup, recording the volume group configurations, and shutting down the system.

5.2.1 Backup Data Files

As a precaution before starting this procedure you should backup the entire system, especially data stored on the RAID Array.

5.2.2 Shut Down the Host System

Follow the proper procedures to shutdown the host system.

Figure 5–1 Making a Serial Connection to the 410 Controller
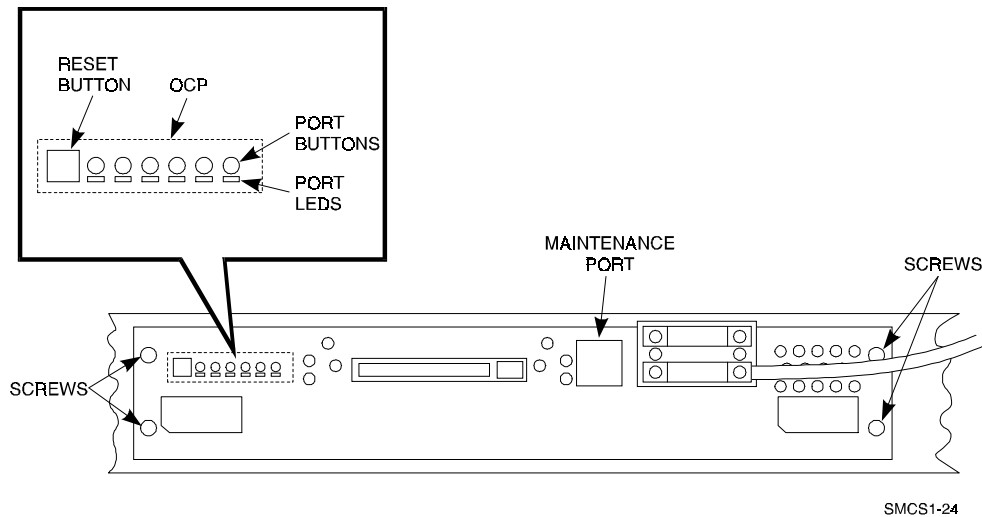
5.3   Attach a Maintenance Terminal

A hardware maintenance terminal is a PC with a serial port.

Follow this procedure to connect a maintenance terminal. Set your terminal at 9600 baud, 8 data bits, 1 stop bit, and no parity. Refer to your terminal documentation for terminal setup instructions. Connect one end of the terminal cable to the serial port of the PC and connect the other end of the terminal cable to the maintenance port on the controller.

5.3.1 Accessing the CLI

To access the CLI through a maintenance terminal, connect the terminal to your PC and use Terminal or Hyperterminal in Windows NT, Windows 95, or Windows for WorkGroups 3.11 to access the CLI.

5.3.2 Exiting the CLI

When using a maintenance terminal, you cannot exit the CLI. Entering the EXIT command merely restarts the CLI and redisplays the controller type and any last fail error information.

5.3.3 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

        `swxrc>`

5.4   Recording Your Configuration Data

In the following steps, you need to record your configuration for use later in this procedure.

First, record the controller configuration. Record the following information in the blanks below (SCSI Targets, Preferred Targets, Cache Flush Timer, Cache Policy, and Host Functionality Mode):

```
swxrc> show this_controller full
```

Fill in the blanks below.

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

Configured for dual-redundancy

SCSI address 6

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____
Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = _____

CACHE_POLICY = _____

Host Functionality Mode = D

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

If you have dual controllers, enter the following command:

swxrc> **show other_controller full**

Fill in the blanks below.

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

Configured for dual-redundancy

SCSI address 7

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____

Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

CACHE_POLICY = _____

Host Functionality Mode = D

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

In the following steps, you should record your configuration for future reference.

Next, record the Logical Units you have configured:

swxrc> **show units full**

The controller responds with a display similar to that shown below:

```
LUN                                    Uses
_____
D100                                   S28
    Switches:
     RUN               NOWRITE_PROTECT            READ_CACHE
     WRITEBACK_CACHE
     MAXIMUM_CACHED_TRANSFER_SIZE = 32
    State:
       ONLINE to this controller
       Not reserved
       PREFERRED_PATH = THIS_CONTROLLER
    Size: 20547350 blocks
D200                                   M1
    Switches:
     RUN               NOWRITE_PROTECT            READ_CACHE
     WRITEBACK_CACHE
     MAXIMUM_CACHED_TRANSFER_SIZE = 32
    State:
     ONLINE to this controller
     Not reserved
     PREFERRED_PATH = THIS_CONTROLLER
    Size: 4109470 blocks
D300                                   R5
    Switches:
     RUN               NOWRITE_PROTECT            READ_CACHE
     WRITEBACK_CACHE
     MAXIMUM_CACHED_TRANSFER_SIZE = 32
    State:
     ONLINE to this controller
     Not reserved
     PREFERRED_PATH = THIS_CONTROLLER
    Size: 8216924 blocks
```

Record, and mark when enabled, the information in the following table. The top line shows how to record entries for D300 of the sample.

Table 5–1 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CACHED TRANSFER SIZE
D300	R5	X		X	X	32

Next, record the storagesets you have configured:

```
swxrc> show storagesets full
```

The controller responds with a display similar to that shown below:

```
Name            Storageset          Uses           Used by
S28             stripeset           DISK130        D100
                                    DISK230
                                    DISK330
                                    DISK430
                                    DISK530
                                    DISK630
    Switches:
     CHUNKSIZE = 256 blocks
    State:
       NORMAL
       DISK130 (member  0) is NORMAL
       DISK230 (member  1) is NORMAL
       DISK330 (member  2) is NORMAL
       DISK430 (member  3) is NORMAL
       DISK530 (member  4) is NORMAL
       DISK630 (member  5) is NORMAL
    Size:  50268168 blocks
M1              mirrorset           DISK400        D200
                                    DISK500
     Switches:
       POLICY (for replacement) = BEST_PERFORMANCE
       COPY (priority) = NORMAL
       READ_SOURCE = LEAST_BUSY
       MEMBERSHIP = 2, 2 members present
     State:
       NORMAL
       DISK400 (member 0) is NORMAL
       DISK500  (member  1) is NORMAL
     Size: 4109470 blocks
R5              raidset             DISK210        D300
                                    DISK310
                                    DISK410
    Switches:
       POLICY (for replacement) = BEST_PERFORMANCE
       RECONSTRUCT (priority) = NORMAL
       CHUNKSIZE = 256 blocks
    State:
       NORMAL
       DISK210 (member  0) is NORMAL
       DISK310 (member  1) is NORMAL
       DISK410 (member  2) is NORMAL
    Size:  25134084 blocks
SPARESET        spareset
FAILEDSET       failedset
    Switches:
       AUTOSPARE
```

Record the storageset information in the Storageset Table (Table 5–2).The first row shows how to record for R5 of the sample.

NOTE

Not all column headings apply to all storagesets.

Table 5–2 Storageset Table

NAME	STORAGE-SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK-SIZE
R5	RAIDSET	DISK210 DISK310 DISK410	D300	BEST PERFOR-MANCE			NORMAL	256
FAILEDSET	AUTOSPARE				NOAUTOSPARE			

5.5   Remove RAID Array 410 Controller and Cache Modules

5.5.1 Use the SHUTDOWN Command and Turn Off Controller Power

To turn off the power to your controller subsystem make sure you turn off the power properly by using the following steps:

CAUTION

If the correct steps for turning off the power to an SWXRC-04 controller are not followed, there is a potential for loss of data that may exist on any devices connected to the array.

CAUTION

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

---

1. For dual-redundant configurations, shutdown each controller one at a time. From the maintenance terminal connected to the maintenance port of one controller, use both of the following commands:

    ```
    swxrc>     shutdown other_controller

    swxrc>     shutdown this_controller
    ```

2. In a Nonredundant controller configuration, you need only use the command:

    ```
    swxrc>     shutdown this_controller
    ```

3. Turn off the power to the RAID subsystem only when the controller **shutdown** command has successfully completed.

5.5.2 Controller Module Removal

Use the following procedure to remove the controller module. Repeat the procedure for dual-redundant controller configurations.

1. Unsnap and remove the ESD shield covering the program card by pulling out on the two retainer buttons.

2. Remove the program card by pushing the eject button on the controller OCP. Pull the card out and save it.

Figure 5–2 Trilink Connector
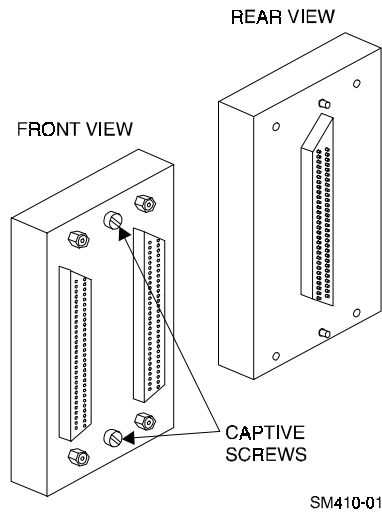
3. With a small blade screwdriver, loosen the captive screws on the trilink connector (see Figure 5–2) and remove the trilink from the front of the controller. Do *not* remove cables or terminators from the trilink or you will interrupt the host SCSI bus. You will have to work around any SCSI cable or terminator connections when removing the trilink.

Figure 5–3 RAID Array 410 Controller Panel
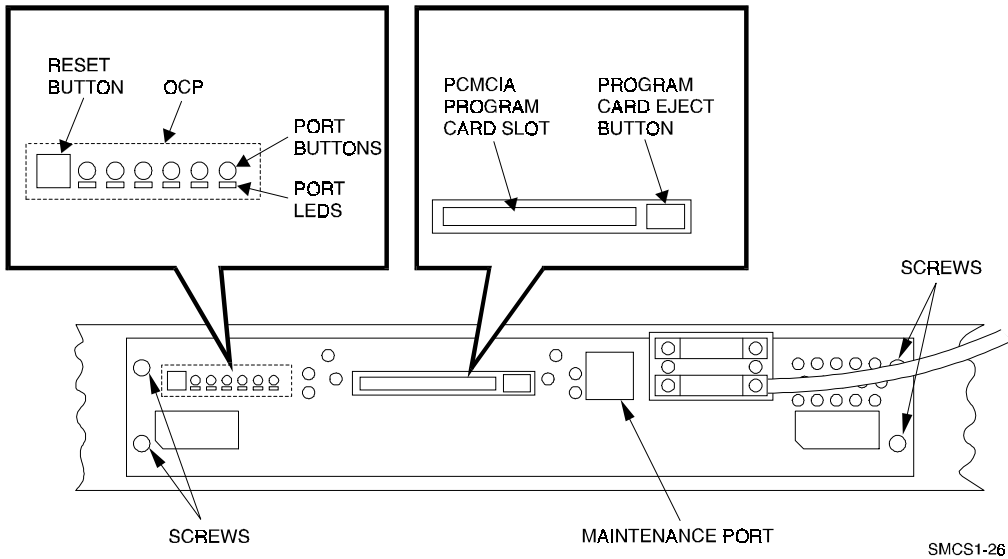
4. Remove the maintenance terminal cable (if attached).

5. Loosen the four mounting screws (refer to Figure 5–3) on each side of the front panel with a blade screwdriver.

6. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

7. Slide the controller module out of the shelf (noting which rails the module was seated in) and place on an approved ESD work surface or mat.

5.5.3 Cache Module Removal

1. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

2. Slide the write-back cache module out of the shelf (noting which rails it was seated in) and place it on an approved ESD work surface or mat.

> **WARNING**
>
> Do not allow the write-back cache to contact any conductive surface, or injury and/or equipment damage may result.

5.6   Installing the RAID Array 450 Cache Module, Controller, and ECB

5.6.1 Installing the Cache Module

Use the following procedure to install the write-back cache module:

1. Slide the write-back cache module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using a flat blade screwdriver.

5.6.2 Installing the Controller Module

Use the following procedure to install the controller module:

1. Slide the controller module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the flat blade screwdriver.

5.6.3 Installing the External Cache Battery

1. Select an unused SBB slot and push the External Cache Battery module in until it seats.

2. Connect one end of the battery cable to the battery module.

Use this procedure to connect the controller and cache module in a single controller configuration. For a dual-redundant controller configuration, repeat steps 5.6.1 and 5.6.2 and then continue below.

5.7 Connecting the Controller and Cache Module

To setup your subsystem for controller operation, as shown in Figure 5–4, follow these steps:

1. Reconnect the trilink connector to the controller host port.

Figure 5–4 Attaching the Connecting Cables
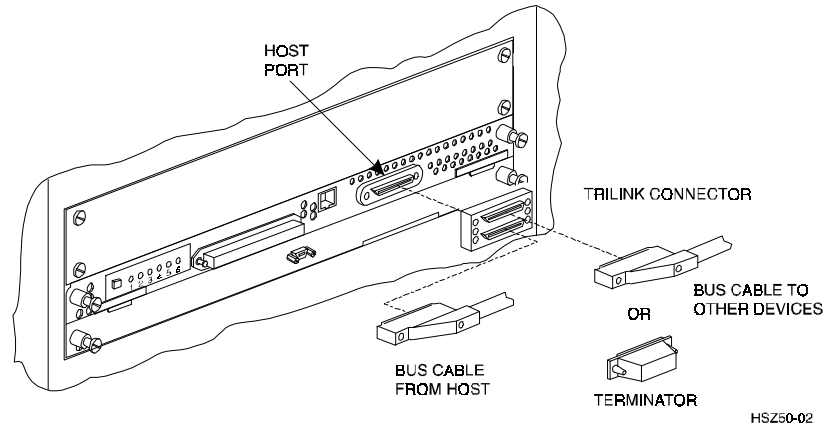
2. Connect the cache module to the external cache battery (ECB) SBB as shown in Figure 5–5.

Figure 5–5 Connecting the Cache Module to the External Cache Battery
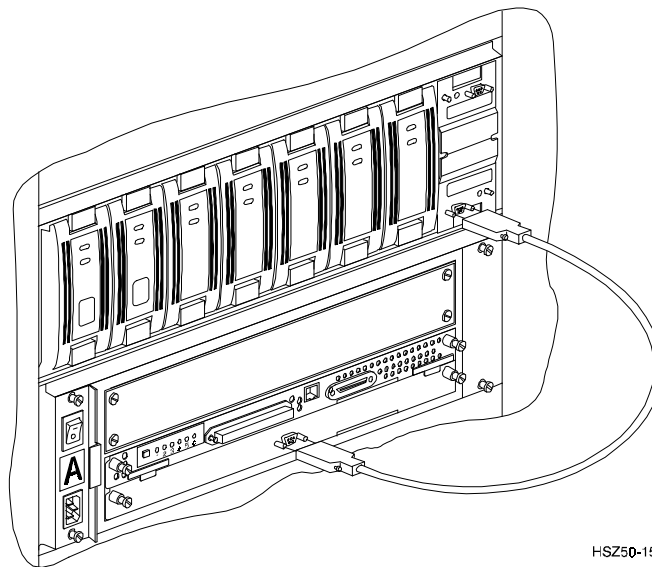
3. Reconnect the maintenance terminal to the maintenance port of the new RAID controller as shown in Figure 5–6.

Figure 5–6 Making a Serial Connection to the HSZ50 Controller
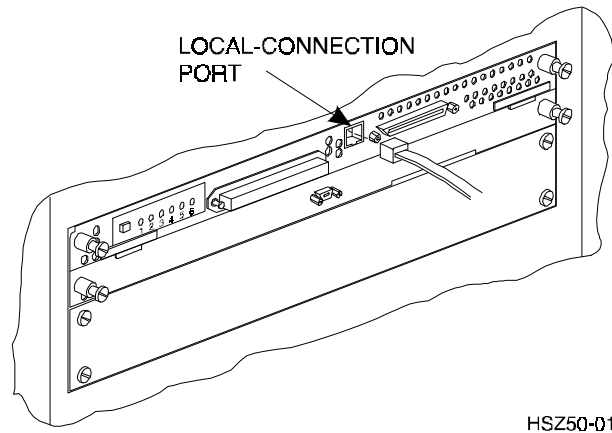
4. Insert the new program card with HSOF Version 5.0 into the new controller. The program card eject button extends when the card is fully inserted.

5. Snap the ESD shield into place over the program card.

6. Power ON the entire subsystem.

7. If the controller initializes correctly, its green reset LED begins to flash once per second. If an error occurs during initialization, the OCP displays a code. If necessary, refer to Chapter 1, *Troubleshooting* in the *Servicing your StorageWorks Subsystem, HSZ50 Array Controller, HSOF Version 5.0* to analyze the code.

5.8   Establishing Connection with a PC

To establish a connection between you PC and controller, you must use a communications program. Follow these steps to make the connection:

1. Start a communication program on your PC.

2. Set the communications program to use the serial port that is connected to the controller.

3. Set the terminal communications parameters to:

   - 9600 Baud

   - 8-bits

   - 1 stop bit

   - No parity

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

        HSZ>

5.9 Restoring RAID Subsystem Configuration

5.9.1 Setting Target IDs for the Controller

Set the SCSI IDs to be used for your storagesets to the IDs that were recorded in Section 3.4 under "SHOW THIS CONTROLLER." In this example, SCSI IDs 0, 1, 2, and 3 are used. Enter the command:

```
HSZ> set this_controller id=(0,1,2,3)
```

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Enter the command:

```
HSZ> restart this_controller
```

Wait for the prompt.

Set the controller's operating mode:

```
HSZ> set this_controller host_function=D
```

For dual-redundant configurations enter:

```
HSZ> set failover copy=this_controller
```

When the CLI finishes initializing, set the preferred IDs. For example, if the preferred IDs are 0 and 1, enter the command:

```
HSZ> set this_controller preferred_id=(0,1)
```

5.9.2 Add Disks to Configuration

```
HSZ> run config
```

5.9.3 Recreate Storagesets

> **NOTE**
>
> Use the CLI "add" command to recreate the Storagesets in the following command examples but **DO NOT** initialize the storageset using the "init" command or you will lose all data on the storageset.

Recreate the storagesets recorded earlier in the Storageset Table (Table 5–2). Use the **add** command once for each of the storagesets in the table. If your configuration contains mirrorsets, create them first. Add the remaining storagesets (raidsets, stripesets, and sparesets) in any order. The **add** command has the following format:

```
HSZ> add [storageset] [name] [uses]
```

If the storageset in the previous example (from Table 5–2) is a raidset, the form of the command line you would type is:

```
HSZ> add raidset r5 disk210 disk310 disk410
```

If the storageset is a striped mirrorset, the form of the command line is slightly different than shown.

Example:

```
HSZ> add stripeset [name] [mirrorset] [mirrorset]
```

5.9.4 Enable Storageset Options

View the storagesets just created.

```
HSZ> show storageset full
```

Compare all the parameters in the listing with the Storageset Table (Table 5–2). Change the storageset parameters to be the same as shown in the table using the **set** command where necessary.

The format of the **set** command for each item in the storageset table is shown below for easy reference. Use only the entries that pertain to your configuration.

```
POLICY
      HSZ> set [name] policy=best_performance
      HSZ> set [name] policy=best_fit
      HSZ> set [name] nopolicy

READ_SOURCE
      HSZ> set [name] read_source=least_busy
      HSZ> set [name] read_source=round_robin
      HSZ> set [name] read_source=[uses]

                where [uses] is a single disk.

COPY
      HSZ> set [name] copy=normal
      HSZ> set [name] copy=fast
```

RECONSTRUCT
```
HSZ> set [name] reconstruct=normal
HSZ> set [name] reconstruct=fast
```

AUTOSPARE
```
HSZ> set failedset autospare
HSZ> set failedset noautospare
```

Note that the unit ("USED BY" column) will be assigned in the next subsection. Also, the existing chunksize will be maintained in the new controller. The chunksize cannot be changed because you cannot use the "initialize" command.

5.9.5 Recreate Units

Recreate the units recorded earlier in the Logical Unit Table (Table 5–1). Use the **add unit** command once for each **LUN** entry in the table.

Example:
```
HSZ> add unit [LUN] [uses]
```

If the unit in the previous example (from Table 5–1) is D300 the form of the command line you would type is:
```
HSZ> add unit d300 r5
```

5.9.6 Enable Previous Options

View the units just created.
```
HSZ> show unit full
```

Compare all the parameters in this listing with the Logical Unit Table (Table 5–1). Change the unit settings to be the same as those listed in the table using the **set** command where necessary.

The format of the **set** command for each item in the Logical Unit Table (Table 5–1) is shown below for easy reference. Use only the entries that pertain your configuration.

RUN
```
HSZ> set [LUN] run
HSZ> set [LUN] norun
```

WRITE_PROTECT
```
HSZ> set [LUN] write_protect
HSZ> set [LUN] nowrite_protect
```

WRITEBACK_CACHE
```
HSZ> set [LUN] writeback_cache
HSZ> set [LUN] nowriteback_cache
```

READ_CACHE
```
HSZ> set [LUN] read_cache
HSZ> set [LUN] noread_cache
```

MAXIMUM_CACHED_TRANSFER_SIZE

```
HSZ> set [LUN] maximum_cached_transfer_size=[number]
```

where [*number*] is a number from 1 through 1024.

5.9.7 Verify Configuration

Before the host system is powered-on it is advisable to recheck the RAID Array 450 configuration with the pre-upgrade RAID Array 410 configuration. In this process compare the new settings with the original settings recorded on the blank forms provided in this document. Specifically check:

- Host Port SCSI Target(s), Host Port Preferred Target(s), Cache Policy and HOST_FUNCTIONALITY settings recorded on the **Controller Table**.

- SHOW UNITS displays all of the logical units and storagesets previously recorded on the **Logical Units Table**

- SHOW STORAGESETS lists all of the containers recorded on the **Storagesets Table**:

    - Check logical unit *Used by* each of the storagesets

    - Check *Name* and *Type* of each storageset

    - Check devices in use by (*Uses*) each storageset

    - Show *storageset_ name list* proper storageset attributes

5.10 Power-on Host System

Now that the RAID Array 450 configuration has been verified, the host system may be powered-on. Since the configuration has been modified, the system may require additional time to complete its initialization. Once the system has completed the bootstrap process, login as "*administrator"* and invoke "*disk administrator*" to verify that the RAID volumes are visible by the host:

5.11 Install StorageWorks Agent

Refer to Chapter 5 of *Getting Started RAID Array 450 for Windows NT-Intel/PCI* or *Getting Started RAID Array 450 for Windows NT-Alpha.*

5.12 Install StorageWorks Command Console

Refer to Chapter 3 of *Getting Started RAID Array 450 for Windows NT-Intel/PCI* or *Getting Started RAID Array 450 for Windows NT-Alpha.*

5.13 Congratulations

This completes the RAID Array 450 Upgrade Procedure. The system is now ready to be placed on-line.

6

Upgrading the RAID Array 410 to RAID Array 450 for NetWare–PCI

This chapter describes procedures to remove and replace the controller and cache modules for the NetWare–PCI platform.

This chapter describes how to upgrade the 410 controller and cache module for single controller configurations. Included in this upgrade are the following:

- Controller module

- Cache module

- External cache battery (ECB) and cable

- This document

6.1 Upgrade Road Map

Replacing controller module and cache module involves several considerations:

- Ensuring that your system meets the upgrade prerequisites described in Section 6.1.1 below

- Preparing your host system for the upgrade

- Recording RAID subsystem configuration

- Replacing the controller and cache module

- Restoring the RAID subsystem configuration

- Upgrading the host system configuration

This procedure documents single controller to single controller upgrades only.

6.1.1 Upgrade Prerequisites

Before upgrading the RAID Array 410 controller and cache module, please review the following:

- One platform kit is required for each controller. In addition to other components, the platform kit includes the HSOF Version 5.0 Program Card required for controller operation.

- This procedure documents existing RAID Array 410 single controller to single controller only.

- The controller and all storagesets must be in normal running condition.

- During this upgrade procedure do not add, remove, or move any devices. Any device configuration changes can be made after the upgrade is completed and verified.

- After removing the old controller, return the controller and PC card in accordance with the instructions contained in the customer letter found in the RAID Array 450 upgrade kit.

6.1.2 Tools Required

You need the following tools to remove or replace the controller module:

- ESD (ElectroStatic Discharge) strap

- Medium blade screwdriver for module replacement

- Small blade screwdriver for trilink and external cache battery cable fasteners

6.1.3 Precautions

In general, you should follow routine ESD protection procedures when handling controller modules and cache modules and when working around the cabinet and shelf that houses the modules.

Follow these guidelines to further minimize ESD problems:

- Use ESD wrist straps, antistatic bags, and grounded ESD mats when handling controller modules and cache modules.

- Obtain and wear an ESD wrist strap on your wrist. Make sure the strap fits snugly.

- Attach the lead on the ESD strap to a convenient cabinet grounding point.

- After removing a module from the shelf, place the module into an approved antistatic bag or onto a grounded antistatic mat.

- Remain grounded while installing a replacement module.

CAUTION

Follow program card guidelines or damage to the program card and controller software can result.

6.2 Preparing Your Host System

Before starting the upgrade process you will need to prepare your system. This includes performing a complete system backup, recording the volume group configurations, and shutting down the system.

6.2.1 Backup Data Files

As a precaution before starting this procedure you should backup the entire system, especially data stored on the RAID Array.

6.2.2 Shut Down the Host System

Follow the proper procedures to shutdown the host system.

Figure 6–1 Making a Serial Connection to the 410 Controller
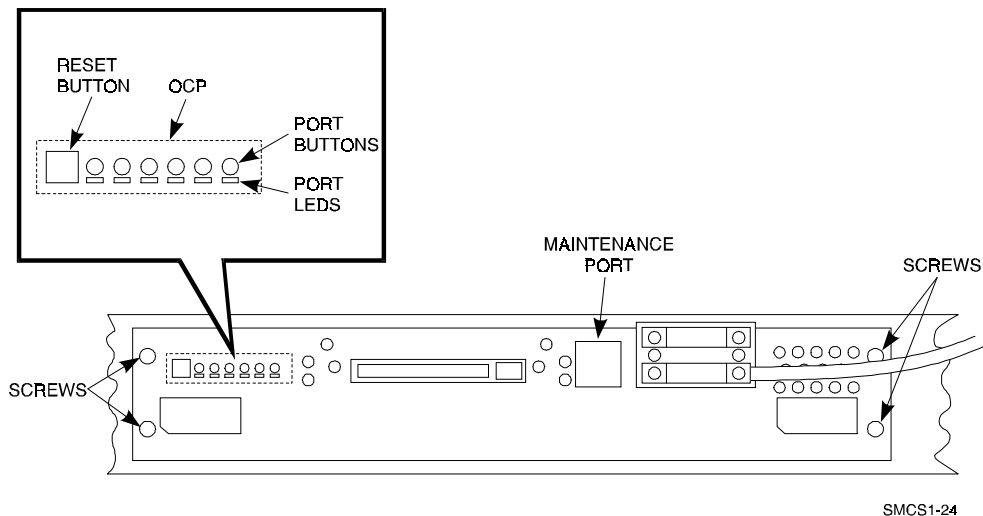
6.3 Attach a Maintenance Terminal

A hardware maintenance terminal is a PC with a serial port.

Follow this procedure to connect a maintenance terminal. Set your terminal at 9600 baud, 8 data bits, 1 stop bit, and no parity. Refer to your terminal documentation for terminal setup instructions. Connect one end of the terminal cable to the serial port of the PC and connect the other end of the terminal cable to the maintenance port on the controller.

6.3.1 Accessing the CLI

To access the CLI through a maintenance terminal, connect the terminal to your PC and use Terminal or Hyperterminal in Windows NT, Windows 95, or Windows for WorkGroups 3.11 to access the CLI.

6.3.2 Exiting the CLI

When using a maintenance terminal, you cannot exit the CLI. Entering the EXIT command merely restarts the CLI and redisplays the controller type and any last fail error information.

6.3.3 Establishing Connection with a Maintenance Terminal

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
swxrc>
```

6.4 Recording Your Configuration Data

In the following steps, you need to record your configuration for use later in this procedure.

First, record the controller configuration. Record the following information in the blanks below (SCSI Targets, Preferred Targets, Cache Flush Timer, Cache Policy, and Host Functionality Mode):

```
swxrc> show this_controller full
```

Fill in the controller configuration forms below:

Controller:

SWXRC-04 ZG43700116 Firmware V27Z-0, Hardware A02

Not configured for dual-redundancy

SCSI address 7

Time: NOT SET

Host port:

SCSI target(s) _____ Preferred target(s) _____
Cache:

32 megabyte write cache, version 2

Cache is GOOD

Battery is GOOD

No unflushed data in cache

CACHE_FLUSH_TIMER = _____

CACHE_POLICY = _____

Host Functionality Mode = B

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 9600 baud, eight bit, no parity, 1 stop bit

Operation control: 00000004 Security state code: 95018

Configuration backup disabled

In the following steps, you should record your configuration for future reference.

Next, record the Logical Units you have configured:

```
swxrc> show units full
```

The controller responds with a display similar to that shown below:

```
LUN                                      Uses
-------------------------------------------------------------------
D100                                     S28
    Switches:
     RUN                NOWRITE_PROTECT            READ_CACHE
     WRITEBACK_CACHE
     MAXIMUM_CACHED_TRANSFER_SIZE = 32
    State:
      ONLINE to this controller
      Not reserved
      PREFERRED_PATH = THIS_CONTROLLER
    Size: 20547350 blocks
D200                                     M1
    Switches:
     RUN                NOWRITE_PROTECT            READ_CACHE
     WRITEBACK_CACHE
     MAXIMUM_CACHED_TRANSFER_SIZE = 32
    State:
     ONLINE to this controller
     Not reserved
     PREFERRED_PATH = THIS_CONTROLLER
    Size: 4109470 blocks
D300                                     R5
    Switches:
     RUN                NOWRITE_PROTECT            READ_CACHE
     WRITEBACK_CACHE
     MAXIMUM_CACHED_TRANSFER_SIZE = 32
    State:
     ONLINE to this controller
     Not reserved
     PREFERRED_PATH = THIS_CONTROLLER
    Size: 8216924 blocks
```

Record, and mark when enabled, the information in the following table. The top line shows how to record entries for D300 of the sample.

Table 6–1 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CACHED TRANSFER SIZE
D300	R5	X		X	X	32

Next, record the storagesets you have configured:

```
swxrc> show storagesets full
```

The controller responds with a display similar to that shown below:

```
Name           Storageset          Uses          Used by
S28            stripeset           DISK130       D100
                                   DISK230
                                   DISK330
                                   DISK430
                                   DISK530
                                   DISK630
    Switches:
     CHUNKSIZE = 256 blocks
    State:
       NORMAL
       DISK130 (member  0) is NORMAL
       DISK230 (member  1) is NORMAL
       DISK330 (member  2) is NORMAL
       DISK430 (member  3) is NORMAL
       DISK530 (member  4) is NORMAL
       DISK630 (member  5) is NORMAL
    Size:  50268168 blocks
M1             mirrorset           DISK400       D200
                                   DISK500
     Switches:
       POLICY (for replacement) = BEST_PERFORMANCE
       COPY (priority) = NORMAL
       READ_SOURCE = LEAST_BUSY
       MEMBERSHIP = 2, 2 members present
     State:
       NORMAL
       DISK400 (member 0) is NORMAL
       DISK500   (member  1) is NORMAL
     Size: 4109470 blocks
R5             raidset             DISK210       D300
                                   DISK310
                                   DISK410
    Switches:
       POLICY (for replacement) = BEST_PERFORMANCE
       RECONSTRUCT (priority) = NORMAL
       CHUNKSIZE = 256 blocks
    State:
       NORMAL
       DISK210 (member  0) is NORMAL
       DISK310 (member  1) is NORMAL
       DISK410 (member  2) is NORMAL
    Size:  25134084 blocks
SPARESET      spareset
FAILEDSET     failedset
    Switches:
       AUTOSPARE
```

Record the storageset information in the Storageset Table (Table 6–2). The first row shows how to record for R5 of the sample:

NOTE

Not all column headings apply to all storagesets.

Table 6–2 Storageset Table

NAME	STORAGE-SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK-SIZE
R5	RAIDSET	DISK210 DISK310 DISK410	D300	BEST PERFOR-MANCE			NORMAL	256
FAILEDSET	AUTOSPARE				NOAUTOSPARE			

6.5   Remove RAID Array 410 Controller and Cache Modules

6.5.1 Use the SHUTDOWN Command and Turn Off Controller Power

To turn off the power to your controller subsystem make sure you turn off the power properly by using the following steps:

CAUTION

If the correct steps for turning off the power to an SWXRC-04 controller are not followed, there is a potential for loss of data that may exist on any devices connected to the array.

CAUTION

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

---

1. Invoke the **shutdown** command from the maintenance terminal.

2. From the maintenance terminal, use the command:

    ```
    swxrc> shutdown this_controller
    ```

3. Turn off the power to the controller subsystem only when the controller **shutdown** command has successfully completed.

6.5.2 Controller Module Removal

Use the following procedure to remove the controller module.

1. Unsnap and remove the ESD shield covering the program card by pulling out on the two retainer buttons.

2. Remove the program card by pushing the eject button on the controller OCP. Pull the card out and save it.

3. With a small blade screwdriver, loosen the captive screws on the trilink connector (see Figure 6–2) and remove the trilink from the front of the controller. Do *not* remove the 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.

Figure 6–2 Trilink Connector
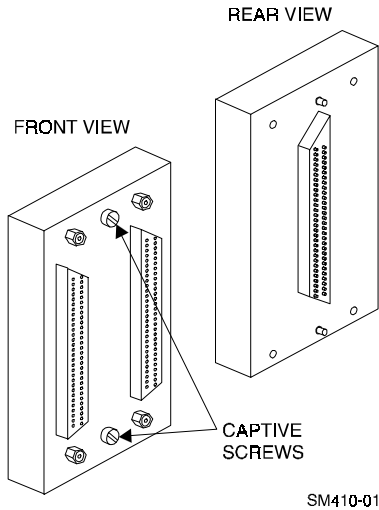
4. Remove the maintenance terminal cable (if attached).

5. Loosen the four mounting screws (refer to Figure 6–3) on each side of the front panel with a medium blade screwdriver.

Figure 6–3 RAID Array 410 Controller Panel
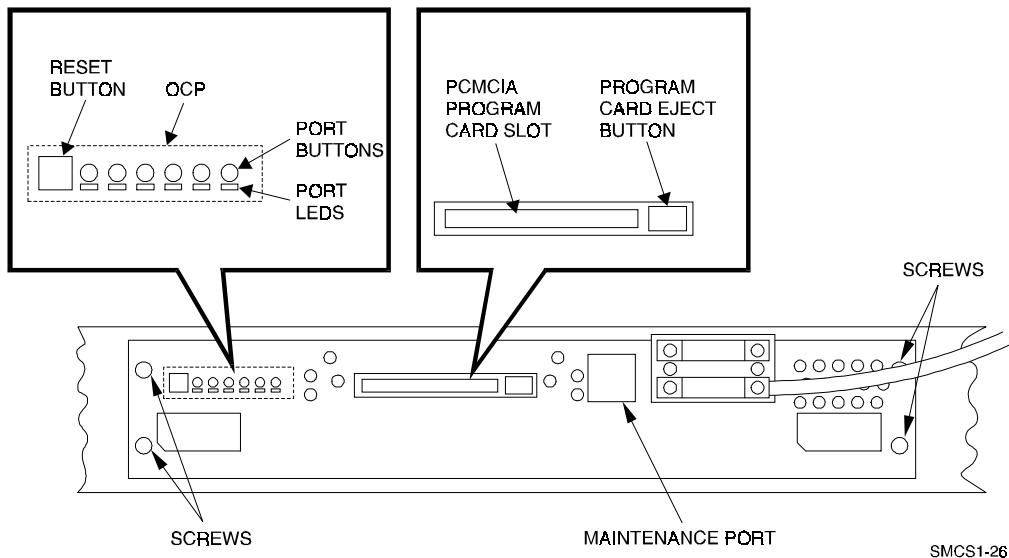
6. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

7. Slide the module out of the shelf (noting which rails the module was seated in) and place on an approved ESD work surface or mat.

6.5.3 Cache Module Removal

1. Use a gentle up-and-down rocking motion to loosen the module from the shelf backplane.

2. Slide the write-back cache module out of the shelf (noting which rails it was seated in) and place it on an approved ESD work surface or mat.

WARNING

Do not allow the write-back cache to contact any conductive surface, or injury and/or equipment damage may result.

6.6   Installing the RAID Array 450 Cache Module, Controller, and ECB

6.6.1 Installing the Cache Module

Use the following procedure to install the write-back cache module:

1. Slide the write-back cache module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using a flat blade screwdriver.

6.6.2 Installing the Controller Module

Use the following procedure to install the controller module:

1. Slide the controller module into the appropriate slot in the shelf.

2. Use a gentle up-and-down rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated. Finally, press firmly once more to make sure the module is seated.

3. Tighten the two screws on the front panel using the flat blade screwdriver.

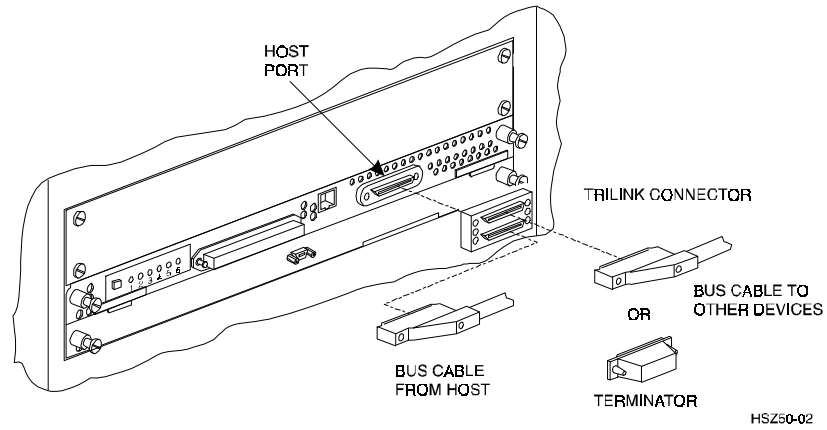### 6.6.3 Installing the External Cache Battery

1. Select an unused SBB slot and push the External Cache Battery module in until it seats.

2. Connect one end of the battery cable to the battery module.

6.7   Connecting the Controller and Cache Module

Use this procedure to connect the controller and cache module in a single controller configuration as shown in Figure 6–4.
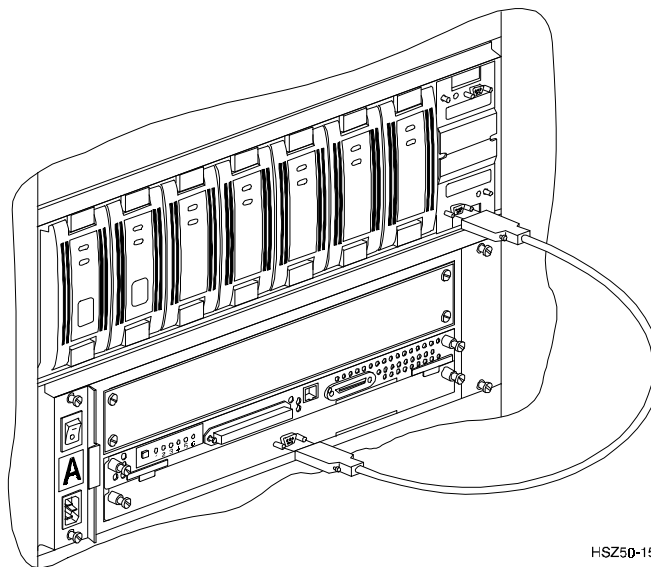
1. Reconnect the trilink connector and host cables and attach the trilink connector to the controller host port.

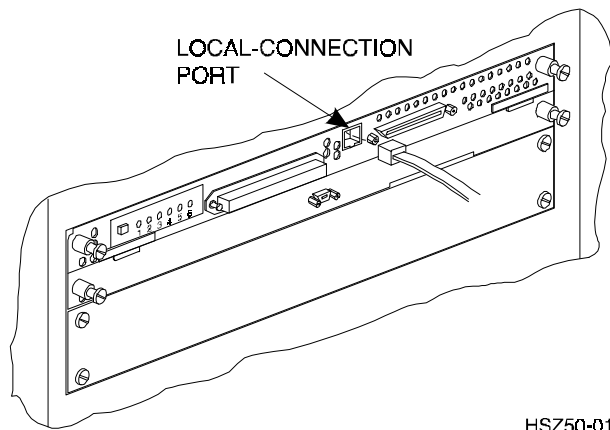**Figure 6–4 Attaching the Connecting Cables**

2. Connect the cache module to the external cache battery (ECB) SBB as shown in Figure 6–5.

Figure 6–5 Connecting the Cache Module to the External Cache Battery

3. Connect a maintenance terminal to the maintenance port of the new controller as shown in Figure 6–6.

Figure 6–6 Making a Serial Connection to the HSZ50 Controller

4. Insert the new program card with HSOF Version 5.0 into the new controller. The program card eject button extends when the card is fully inserted.

5. Snap the ESD shield into place over the program card.
6. Power ON the entire subsystem.

7. If the controller initializes correctly, its green reset LED begins to flash once per second. If an error occurs during initialization, the OCP displays a code. If necessary, refer to Chapter 1, *Troubleshooting* in the *Servicing your StorageWorks Subsystem, HSZ50 Array Controller, HSOF Version 5.0* to analyze the code.

6.8   Establishing Connection with a Maintenance Terminal

To establish a connection between you PC and controller, you must use a communications program. Follow these steps to make the connection:

1. Start a communication program on your PC.

2. Set the communications program to use the serial port that is connected to the controller.

3. Set the terminal communications parameters to:

   - 9600 Baud

   - 8-bits

   - 1 stop bit

   - No parity

After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

        HSZ>

6.9   Restoring RAID Subsystem Configuration

6.9.1 Setting Target IDs for the Controller

Set the SCSI IDs to be used for your storagesets to the IDs that were recorded in Section 3.4 under "SHOW THIS CONTROLLER." In this example, SCSI IDs 0, 1, 2, and 3 are used. Enter the command:

```
HSZ> set this_controller id=(0,1,2,3)
```

The CLI will indicate that a restart of the controller is necessary for the change to take effect. Enter the command:

```
HSZ> restart this_controller
```

Wait for the prompt.

Set the controller's operating mode:

```
HSZ> set this_controller host_function=B
```

6.9.2 Add Disks to Configuration

```
HSZ> run config
```

6.9.3 Recreate Storagesets

> **NOTE**
>
> Use the CLI "add" command to recreate the Storagesets in the following command examples but **DO NOT** initialize the storageset using the "init" command or you will lose all data on the storageset.

Recreate the storagesets recorded earlier in the Storageset Table (Table 6–2). Use the **add** command once for each of the storagesets in the table. If your configuration contains mirrorsets, create them first. Add the remaining storagesets (raidsets, stripesets, and sparesets) in any order. The **add** command has the following format:

```
HSZ> add [storageset] [name] [uses]
```

If the storageset in the previous example (from Table 6–2) is a raidset, the form of the command line you would type is:

```
HSZ> add raidset r5 disk210 disk310 disk410
```

If the storageset is a striped mirrorset, the form of the command line is slightly different than shown.

Example:

```
HSZ> add stripeset [name] [mirrorset] [mirrorset]
```

6.9.4 Enable Storageset Options

View the storagesets just created.

```
HSZ> show storageset full
```

Compare all the parameters in the listing with the Storageset Table (Table 6–2). Change the storageset parameters to be the same as shown in the table using the **set** command where necessary.

The format of the **set** command for each item in the storageset table is shown below for easy reference. Use only the entries that pertain to your configuration.

POLICY

```
HSZ> set [name] policy=best_performance
HSZ> set [name] policy=best_fit
HSZ> set [name] nopolicy
```

READ_SOURCE

```
HSZ> set [name] read_source=least_busy
HSZ> set [name] read_source=round_robin
HSZ> set [name] read_source=[uses]
```
              where [uses] is a single disk.

COPY

```
HSZ> set [name] copy=normal
HSZ> set [name] copy=fast
```

RECONSTRUCT

```
HSZ> set [name] reconstruct=normal
HSZ> set [name] reconstruct=fast
```

AUTOSPARE

```
HSZ> set failedset autospare
HSZ> set failedset noautospare
```

Note that the unit ("USED BY" column) will be assigned in the next subsection. Also, the existing chunksize will be maintained in the new controller. The chunksize cannot be changed because you cannot use the "initialize" command.

6.9.5 Recreate Units

Recreate the units recorded earlier in the Logical Unit Table (Table 6–1).

```
HSZ> add unit [LUN] [uses]
```

Use the **add unit** command once for each **LUN** entry in the table.

If the unit in the previous example (from Table 6–1) is D300 the form of the command line you would type is:

```
HSZ> add unit d300 r5
```

6.9.6 Enable Previous Options

View the units just created.

```
HSZ> show unit full
```

Compare all the parameters in this listing with the Logical Unit Table (Table 6–1). Change the unit settings to be the same as those listed in the table using the **set** command where necessary.

The format of the **set** command for each item in the Logical Unit Table (Table 6–1) is shown below for easy reference. Use only the entries that pertain your configuration.

RUN

```
HSZ> set [LUN] run
HSZ> set [LUN] norun
```

WRITE_PROTECT

```
HSZ> set [LUN] write_protect
HSZ> set [LUN] nowrite_protect
```

WRITEBACK_CACHE

```
HSZ> set [LUN] writeback_cache
HSZ> set [LUN] nowriteback_cache
```

READ_CACHE

```
HSZ> set [LUN] read_cache
HSZ> set [LUN] noread_cache
```

MAXIMUM_CACHED_TRANSFER_SIZE

```
HSZ> set [LUN] maximum_cached_transfer_size=[number]
```

where [number] is a number from 1 through 1024.

6.9.7 Verify Configuration

Before the host system is powered-on it is advisable to recheck the RAID Array 450 configuration with the pre-upgrade RAID Array 410 configuration. In this process compare the new settings with the original settings recorded on the blank forms provided in this document. Specifically check:

- Host Port SCSI Target(s), Host Port Preferred Target(s), Cache Policy and HOST_FUNCTIONALITY settings recorded on the **Controller Table**.

- SHOW UNITS displays all of the logical units and storagesets previously recorded on the **Logical Units Table**

- SHOW STORAGESETS lists all of the containers recorded on the **Storagesets Table**:

  - Check logical unit *Used by* each of the storagesets

  - Check *Name* and *Type* of each storageset

  - Check devices in use by (*Uses*) each storageset

  - Show *storageset_ name list* proper storageset attributes

6.10   Power-on Host System

Once the system is powered up, load ***install.nlm*** and verify that the RAID volumes are visible by the host:

6.11   Install StorageWorks Command Console

Refer to Chapter 3 of *Getting Started RAID Array 450 for NetWare–PCI.*

6.12   Congratulations

This completes the RAID Array 450 Upgrade Procedure. The system is now ready to be placed on-line.

Reader's Comments

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