



Getting Started

RAID Array 410 for HP-UX

Installation Guide

Order Number: EK-SMRA3-IG. C01

**Digital Equipment Corporation
Maynard, Massachusetts**

Third Edition, April 1995

The disclosure of this information does not grant to the user a license under any patents, pending patents, trademarks, or copyrights or other rights of Digital Equipment Corporation, or of any third party.

This software is proprietary to and embodies the confidential technology of Digital Equipment Corporation.

Possession, use or copying of the software described in this publication is authorized only pursuant to a valid written license from Digital Equipment Corporation or an authorized sublicensor.

Digital Equipment Corporation makes no representation that the use of its products in the manner described in this publication will not infringe on existing or future patent rights, nor do the descriptions contained in this publication imply the granting of licenses to make, use, or sell equipment or software in accordance with the description.

© Digital Equipment Corporation 1995. All Rights Reserved

Printed in U. S. A

The following are trademarks of Digital Equipment Corporation:
DEC, RAID Array 410, StorageWorks, and the Digital Logo.

UNIX is a registered trademark of UNIX Systems Laboratories, Inc, a wholly owned subsidiary of Novell, Inc. All other trademarks and registered trademarks are the property of their respective owners.

About This Guide	v
Revision Record	vii
Getting Started	ix
1 Unpacking the SWXRA-Yx RAID Array 410 Subsystem	
1.1 Site Preparation	1-1
1.2 Unpacking the SWXRA-Yx	1-2
1.3 Removing the SWXRA-Yx from the Pallet	1-3
1.4 Placing the SWXRA-Yx RAID Array 410.....	1-4
2 Creating an Initial Controller Configuration	
2.1 What is the CLI?	2-1
2.2 Accessing the CLI	2-1
2.1.1 Connect the PC to the Controller.....	2-1
2.1.2 Start the Communications Program	2-2
2.2.3 Establish the Connection with the Controller.....	2-2
2.3 Show Initial Configuration	2-2
2.4 Dual-Redundant Controller Configuration	2-3
2.5 Remove Default Logical Unit.....	2-4
2.6 Add Disks to the Configuration	2-5
2.7 Create a RAIDset	2-6
2.7.1 Initialize the RAIDset	2-6
2.7.2 Add the RAIDset as a Logical Unit	2-6
2.7.3 Set Writeback Cache	2-7
2.8 Create a STRIPEset	2-7
2.8.1 Initialize the STRIPEset	2-7
2.8.2 Add the STRIPEset as a Logical Unit.....	2-7
2.9 Add Individual Disks as Logical Units	2-8
2.10 Create a MIRRORset.....	2-9
2.10.1 Initialize the MIRRORset.....	2-9
2.10.2 Add the MIRRORset as a Logical Unit	2-9
2.11 Create a STRIPE MIRRORset.....	2-10
2.11.1 Initialize the MIRRORset.....	2-10
2.11.2 Create a STRIPE MIRRORset	2-10
2.11.3 Initialize the STRIPE MIRRORset.....	2-10
2.11.4 Add the STRIPE MIRRORset as a Logical Unit	2-10
3 Installing the StorageWorks RAID Array 410 Hardware	
3.1 Prepare and Install the HP-PB Adapter	3-1
3.1.1 Preparing to Install the Host Adapter.....	3-1
3.1.2 Installing the Host Adapter.....	3-2

3.1.2.1	Select an Available Double-High Adapter Slot	3-3
3.1.2.2	Verify the Setting of the SCSI ID DIP Switches	3-4
3.1.2.3	Insert the HP-PB Host Adapter in the Available Slot	3-5
3.1.2.4	Connect Cable to Adapter Connector.....	3-6
3.2	Installing the Subsystem.....	3-7

4 Preparing HP-UX 9.04 for Use with the StorageWorks RAID Array Controller

4.1	Installing the HP-UX Device Driver	4-1
4.1.1	Determine the Interface Required.....	4-1
4.1.2	Verify the Availability of the Required Device Driver	4-2
4.1.3	Create a disktab Entry.....	4-3
4.1.4	Set the SCSI Bus Address of the RAID Array Controller.....	4-3
4.1.5	Reboot the System and Verify the Successful Installation	4-3
4.1.6	What to Do Next	4-4

Appendix A Configuration Records – Blank Forms

Figures

1-1	Minimum Installation Clearance Measurements.....	1-1
1-2	Unpacking the SWXRA-Yx.....	1-2
1-3	Installation of Ramp on Shipping Pallet.....	1-3
3-1	Adapter Faceplate LEDs	3-2
3-2	Rear View of HP9000 Series 800 Computer	3-3
3-3	Host Adapter Board.....	3-4
3-4	Host Adapter Board DIP Switches	3-5
3-5	Inserting the Host Adapter Board.....	3-5
3-6	Back of Host Computer with Host Adapter Board Installed	3-6
3-7	Host Adapter Board with Cable Attached	3-7

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 410 Subsystem.

Revision Level	Date	Summary of Changes
EK-SMRA3-IG. A01	January 1995	Original release. This release supports StorageWorks RAID Array for HP-UX.
EK-SMRA3-IG. B01	February 1995	Updated with corrections to text.
EK-SMRA3-IG. C01	April 1995	Updated to support RAID Array 410 Firmware Release 2.5

About This Guide

This section identifies the audience of this guide and describes the contents (chapter by chapter) and structure. In addition, this section includes a list of associated documents and the conventions used in this guide.

This guide provides the following:

- Description of how to unpack and assemble the RAID Array 410 Subsystem
- Using the Command Line Interface (CLI)
- How to install the HP-PB Host Adapter board into the HP 9000 Series 800 computer system
- Configuration of the RAID Array using CLI

Intended Audience

This guide is intended for administrators of StorageWorks RAID Array 410 Subsystems. Installing the StorageWorks RAID Array 410 Subsystem requires a general understanding of UNIX system administration and product installation procedures

Document Structure

This guide contains the following chapters:

Chapter 1: Unpacking The SWXRA-Yx RAID Array Subsystem

Unpacking describes how to unpack and place the SWXRA-Yx Office Expansion RAID Enclosure.

Chapter 2: Creating an Initial Controller Configuration

Using the Command Line Interface to Set Up RAID Environment describes the specific CLI commands required to set up the SWXRC-04 RAID Controller.

Chapter 3: Installing the StorageWorks RAID Array 410 Hardware

Installing describes the steps required to install the host adapter in the host computer.

Chapter 4: Preparing HP-UX 9.04 for Use with the StorageWorks RAID Array Controller

Preparing describes the procedures required to install the necessary disk drivers so that the HP-UX operating system will be able to communicate with the StorageWorks RAID Array.

Associated Documents

In addition to this guide, the following documentation is useful to the reader:

Table 1 Associated Documents

Document Title	Order Number
<i>SWXSC-AA Office Expansion RAID Enclosure User's Guide</i>	EK-SMCPD-UG. A01
<i>StorageWorks RAID Controller User's Guide</i>	EK-SMCS1-UG. A01

Conventions

This guide uses the following documentation conventions:

Table 2 Style Conventions

Style	Meaning
boldface monospace type	To be input by the user
plain monospace type	Screen text
<i>italic type</i>	For emphasis, manual titles, utilities, menus, screens, and filenames
#	Represents the HP-UX system prompt. Do not type it as part of information given here as to be input by the user.

Getting Started

This section provides an overview for preparing and installing RAID Array 410 for HP-UX. Detailed information is contained in Chapters 1 through 4.

Thank you for purchasing a StorageWorks RAID Array 410 Subsystem. You received the following:

- StorageWorks SWXRA-Yx RAID Array 410 Subsystem: a RAID controller, disk drives, a StorageWorks storage expansion enclosure, the SWXRC-04 RAID Controller User's Guide, and the SWXSC-AA Office Expansion RAID Enclosure User's Guide.
- StorageWorks SWHK8-CB RAID Array 410 Manager for HP platform kit: an HP-PB FWD (Fast Wide Differential) SCSI-2 Host Adapter, host cable, a cable for connecting the maintenance port of the controller to the serial port of a personal computer (RJ12 to 9-pin serial).

The major steps for installing all of the components of the StorageWorks RAID Array 410 Subsystem, include the following:

1. Configuring the RAID Controller using the Command Line Interface (Chapter 2 of this guide).
2. Installing the HP-PB Fast/Wide High-Performance SCSI Adapter (Chapter 3 of this guide).
3. Loading the device drivers (Chapter 4 of this guide).

Note

Installing the StorageWorks RAID Array 410 Subsystem requires a general understanding of the following:

- HP 9000 Series 800 Computer Systems
- HP-UX
- Basic hardware installation procedures
- Or, contact your service representative for installation assistance.

Before starting your installation, follow these steps:

- Verify the availability of user-supplied hardware and software.
- Inventory the contents of the StorageWorks RAID Array 410 Subsystem platform kit.
- Inventory the contents of the StorageWorks RAID Array 410 Subsystem.
- Follow your normal procedures to back up your system files.

Verifying User Supplied Hardware and Software (System Requirements)

The StorageWorks RAID Array 410 Subsystem requires the following user-supplied hardware and software:

- HP 9000 Series 800 Computer System
 - An available Double-high Adapter Slot
 - The associated system hardware manual
- Appropriate tools to service your computer
- The HP-UX operating system V 9.04.

Verifying The StorageWorks RAID Array 410 Platform Kit and Subsystem Components

The Storage Works RAID Array 410 Platform SWHK8-CB Kit provides the following components:

- This guide.
- Release Notes
- A HP-PB Fast Wide High Performance SCSI Adapter.
- A BN21K-05 SCSI cable, three meters long, with a right-angle high-density 68-pin connector on one end and a straight high-density 68-pin connector on the other.

The StorageWorks RAID Array 410 Subsystem SWXRA-Yx provides the following components:

- The SWXSC-AA Office Expansion RAID Enclosure User's Guide.
- The SWXRC-04 RAID Controller User's Guide.
- The StorageWorks RAID Array 410 Subsystem .
- A cable for connecting the maintenance port of the controller to the serial port of a personal computer.
- 9-pin to 25-pin adapter
- Power Cable.
- Keys.
- RAID Array 410 Controller Firmware License Keys.

NOTE

Retain the Firmware License Keys information in a safe place. It may be required to reinitialize the RAID Array Controller.

Perform a System Backup

Follow normal procedures to backup your system before installing the subsystem.

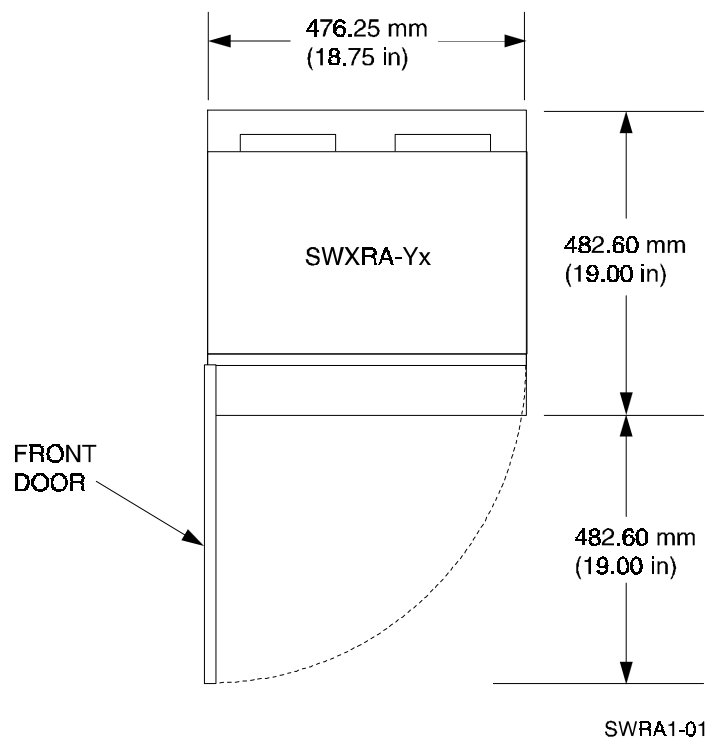
Unpacking The SWXRA-Yx RAID Array 410 Subsystem

This chapter describes the site preparation and unpacking procedures for the SWXRA-Yx RAID Array 410 Subsystem.

1.1 Site Preparation

The SWXRA-Yx RAID Array 410 Subsystem is designed for installation in Federal Communications Commission (FCC) Class A environments. Before installing the SWXRA-Yx, make sure that adequate space is available in front of the enclosure for opening the front door (19 inches clearance) and around the enclosure for adequate airflow. See Figure 1–1 for specific space requirements.

Figure 1–1 Minimum Installation Clearance Measurements



1.2 Unpacking the SWXRA-Yx

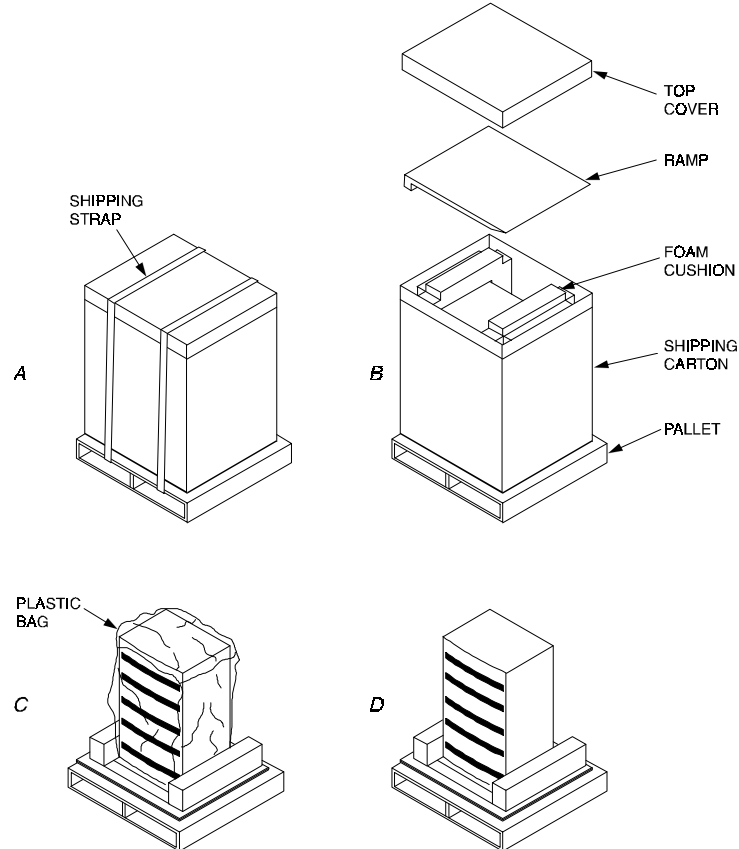
The SWXRA-Yx RAID Array 410 is packed in a corrugated carton attached to a wooden shipping pallet, as shown in Figure 1–2A. Unpack the SWXRA-Yx as follows:

NOTE

Before unpacking the equipment, inspect the shipping carton for signs of external damage. Report any damage to the local carrier and to your sales representative.

1. Remove the shipping straps (Figure 1–2A).
2. Remove the top cover (Figure 1–2B).
3. Remove the ramp from the top of the shipping carton (Figure 1–2B) and set it aside for subsequent use in moving the SWXRA-Yx off the pallet.
4. Remove the two foam cushions from the top of the SWXRA-Yx container (Figure 1–2B).
5. Remove the sealed cardboard box packed beside the subsystem unit. It contains cable and documentation.
6. Remove the cardboard carton surrounding the SWXRA-Yx(Figure 1–2B).
7. Remove the plastic barrier bag (Figure 1–2C).
8. Once the SWXRA-Yx is exposed (Figure 1–2D), examine the equipment for any apparent damage. Report any such problems immediately to your sales representative.

Figure 1–2 Unpacking the SWXRA-Yx RAID Array 410



SW300-09

1.3 Removing the SWXRA-Yx from the Pallet

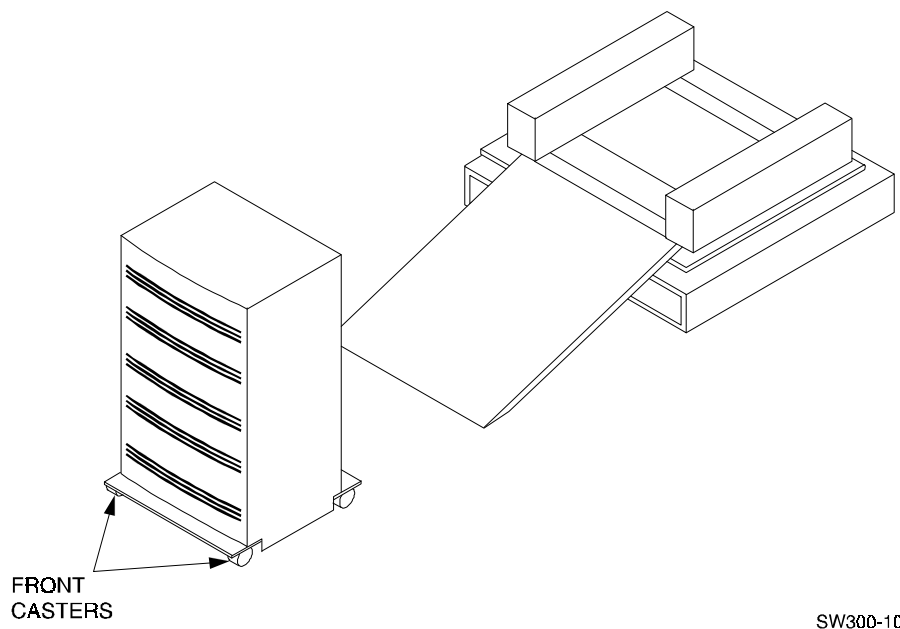
Use the following procedure to remove the SWXRA-Yx from the shipping pallet:

WARNING

Serious personnel injury may result if correct safety precautions are not taken during the removal procedure.

1. Attach the ramp to the shipping pallet by fitting the lip of the ramp into the groove on the pallet, as shown in Figure 1–3.
2. Lift the lock lever on each front caster to its *up* position so that the SWXRA-Yx enclosure can be moved.

Figure 1–3 Installation of Ramp on Shipping Pallet



WARNING

We recommend that three people be assigned to the task of unloading the SWXRA-Yx array from its shipping pallet. Failure to use sufficient personnel may result in personnel injury and equipment damage.

CAUTION

Do not drop the SWXRA-Yx array from a height of more than two inches, as serious structural damage can result.

3. Grasping the sheet metal base assembly, carefully lift the rear of the SWXRA-Yx enclosure over the “hump” in the center of the pallet and then roll the SWXRA-Yx enclosure off the pallet and down the ramp to the floor. If any further lifting of the SWXRA-Yx is required, grasp the sheet metal base assembly on the side and lift it carefully.
4. Retain the shipping container and all packing materials.

1.4 Placing the SWXRA-Yx RAID Array 410

Use the following procedure to move the SWXRA-Yx to its designated site:

WARNING

To prevent damage to the SWXRA-Yx and injury to personnel,
make sure to provide a clear path for the casters.

1. Roll the SWXRA-Yx enclosure to the desired location.
2. If required, engage the lock on each front caster to prevent the enclosure from moving.

Creating an Initial Controller Configuration

This chapter contains instructions for creating an initial configuration for your RAID Array Controller. It also briefly describes the CLI (Command Line Interpreter) and how to access it. The configuration steps include verifying the default configuration, adding drives, creating and initializing RAIDsets, STRIPEsets, MIRRORsets, and STRIPE MIRRORsets identifying the storageset as a unit to the host, and verifying and recording your final configuration.

2.1 What is the CLI?

The Command Line Interpreter (CLI) is the user interface to the SWXRC-04 RAID Array Controller. Using a connection between the controller's maintenance port and a PC's serial output port, the CLI can be used to view and modify the controller's configuration. The CLI can also be used to access reports and diagnostic tools. This chapter specifies the CLI commands required to create an initial configuration for the controller.

See “*Command Line Interpreter*” in the *SWXRC-04 RAID Array Controller User's Guide* for detailed descriptions of all CLI commands.

2.2 Accessing the CLI

Access the CLI using a PC with a terminal emulation program, such as the Microsoft Windows Terminal program. You can also use most commercially-available communications programs.

2.2.1 Connect the PC to the Controller

Follow the steps below to connect the controller to a serial port on a PC.

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector on one end and a 9-pin serial connector on the other end.
2. Plug the RJ12 connector into the jack on the controller.
3. Plug the serial connector into an available 9-pin serial port on the PC. If your PC does not have a 9-pin serial port, use the 9-pin to 25-pin adapter supplied with your StorageWorks RAID Array 410 Subsystem. Note which serial port you used, since you will need that information in the communications program.

2.2.2 Start the Communications Program

1. Start the communications program on your PC.
2. Set the communications program to use the serial port that is connected to the controller.
3. Set the communications parameters to:
 - 9600 baud
 - 8 bits
 - 1 stop bit
 - No parity

2.2.3 Establish the Connection with the Controller

From your communication program, issue a connect command to establish a connection with the controller, and then press the Enter key. You should see the CLI prompt, which looks similar to

```
SWXRC>
```

2.3 Show Initial Configuration

The RAID Array 410 Subsystem has been preconfigured with a controller at ID0 (SCSI target 0) and a single drive logical unit D0.

Enter the following command to verify the controller's parameters:

```
SWXRC> SHOW THIS_CONTROLLER FULL
```

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

```
CONTROLLER:
  SWXRC-04 CX44332211 FIRMWARE V25Z-0, HARDWARE A02
  SCSI ADDRESS 7
  TIME: NOT SET
HOST PORT:
  ⊇ SCSI TARGET(S) (0)
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=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:0000004 SECURITY STATE CODE:85780
```

Examine the display to verify the following information:

☞ Controller SCSI target number should be 0

If the target number is not 0, use the following commands to set a SCSI target ID for the controller:

```
SWXRC> SET THIS_CONTROLLER ID=0
```

```
SWXRC> RESTART THIS_CONTROLLER
```

☒ Cache condition should be GOOD

If the Cache condition is BAD then call your sales person for unit service or replacement of the Cache module.

☐ Battery condition should be GOOD

If the Battery condition is LOW then allow the battery to charge with the subsystem power on for at least 6 hours. The battery must be fully charged to protect the data in the Write Back Cache. If the Battery condition is LOW after 6 hours of charging then call your sales person for unit service or replacement of the Batteries.

NOTE

The subsystem can be configured with the Battery condition LOW however the Write Back Cache cannot be initialized.

☐ License key should be VALID

If the License key is INVALID then enter the following:

```
SWXRC> RUN FLS
```

and follow the menu driven program to enable the license. You will need the WRITE-BACK CACHE, RAID5, and MIRROR License Key page that is provided in the subsystem documentation package.

2.4 Dual-Redundant Controller Configuration

An optional controller and cache can be added to the SWXRC-04 RAID Array on the same host SCSI bus. This is called a dual-redundant controller configuration.

Dual redundant controllers offer automatic, intelligent failover of attached storage devices in the event of a controller failure. Up to four SCSI targets and 36 SCSI devices can be supported by the two controllers in a dual-redundant configuration

In a dual-redundant configuration, one terminal can set both controller configurations. Installation procedures for the second controller can be found in Chapter 9 of *the SWXRC-04 RAID Controller User's Guide* (EK-SMCS1-UG). After installation of both controllers, use the CLI to define the controllers' parameters in the following order from a terminal connected to one controller:

Check the cache and battery conditions of the other controller using the following command:

```
SWXRC> SHOW OTHER_CONTROLLER FULL
```


- Cache condition should be GOOD
If the Cache condition is BAD then call your sales person for unit service or replacement of the Cache module.
- Battery condition should be GOOD
If the battery condition is LOW, allow the battery to charge with the subsystem power on for at least 6 hours. The battery must be fully charged to protect the data in the Write Back Cache. If the battery condition is still listed as LOW after 6 hours of charging, call your sales person for unit service or replacement of the batteries.

Set the controller SCSI target number:

```
SWXRC> SET THIS_CONTROLLER ID=0  
SWXRC> SET THIS_CONTROLLER PERFERRED_ID=0
```

Enter the following command to copy parameters to the other controller – the one the terminal is not connected to:

```
SWXRC> SET FAILOVER COPY=THIS_CONTROLLER  
SWXRC> RESTART OTHER_CONTROLLER  
SWXRC> RESTART THIS_CONTROLLER
```

Enter the following commands to verify the preceding parameters were set:

```
SWXRC> SHOW THIS_CONTROLLER FULL  
SWXRC> SHOW OTHER_CONTROLLER FULL
```

2.5 Remove Default Logical Unit

The subsystem was configured at the factory with a single drive (DISK100) as a logical unit (D0) available to the host. In order to configure the array, it is necessary to remove the logical unit. Use the following CLI command to do so.

```
SWXRC> DELETE D0
```

NOTE

The last character in the command is a zero, not the letter “oh”.

2.6 Add Disks to the Configuration

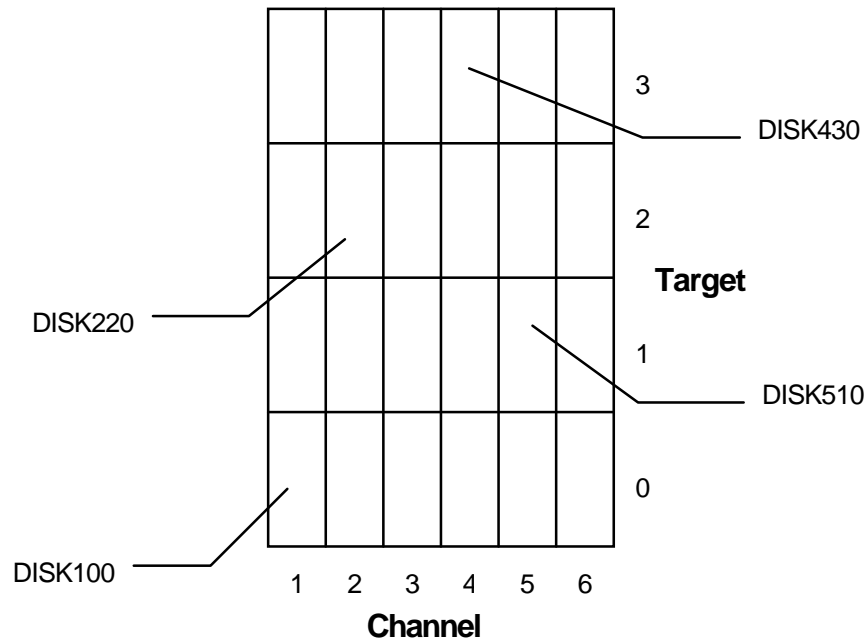
The CONFIG utility locates and adds disks to the controller. Run the CONFIG utility whenever you add new disks to the controller. Enter the following command to start the configuration utility. The disk numbers will correspond to the disk locations for your subsystem.

```
SWXRC> RUN CONFIG
```

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

```
CONFIG LOCAL PROGRAM INVOKED
CONFIG IS BUILDING ITS TABLES AND DETERMINING WHAT DEVICES EXIST ON
THE SUBSYSTEM. PLEASE BE PATIENT.
ADD DISK110 1 1 0
ADD DISK200 2 0 0
ADD DISK210 2 1 0
ADD DISK300 3 0 0
ADD DISK310 3 1 0
ADD DISK400 4 0 0
ADD DISK410 4 1 0
ADD DISK420 4 2 0
ADD DISK430 4 3 0
ADD DISK500 5 0 0
ADD DISK510 5 1 0
ADD DISK520 5 2 0
ADD DISK530 5 3 0
ADD DISK600 6 0 0
ADD DISK610 6 1 0
ADD DISK620 6 2 0
ADD DISK630 6 3 0
CONFIG - NORMAL TERMINATION
```

In this example, the controller has located 17 new disks. Note that CONFIG did not list DISK100 because the controller was already aware of that disk. The 3 digit number associated with each disk corresponds to Channel Number, Target Number and Controller Logical Unit Number. The Controller Logical Unit Number will always be 0. DISK400, in this example, corresponds to the disk located on Channel 4, on controller Target 0, and Controller Logical Unit 0. DISK510 corresponds to the disk located on Channel 5, controller Target 1, and Controller Logical Unit 0. The following diagram shows the mapping of Channels and Targets for the Office Expansion RAID Enclosure:



2.7 Create a RAIDset

If you require RAIDsets to be available to the host as Logical Units, you must now combine disks into a RAIDset. RAIDsets must have at least three members, and can have as many as fourteen. This example creates two three member RAIDsets using the ADD RAIDSET command.

```
SWXRC> ADD RAIDSET RAID_SET_1 DISK100 DISK200 DISK300
```

```
SWXRC> ADD RAIDSET RAID_SET_2 DISK400 DISK500 DISK600
```

In this example, “RAID_SET_1” and “RAID_SET_2” are the names of the RAIDset, and they are followed by a list of disks to be included in each RAIDset. The names of the RAID sets are user selectable. Performance of your RAIDsets will be optimized if each RAIDset includes disks from different channels as shown in the example.

2.7.1 Initialize the RAIDset

Before you can put the RAIDset(s) into service, they must be initialized.

When you initialize a RAIDset, a chunksize must be specified. A chunksize is the number of blocks of data that is transferred at one time. By using the default chunksize, the controller will optimize the chunksize by selecting a number equal to the number of blocks in one track of disk data. We recommend using the default chunksize.

```
SWXRC> INITIALIZE RAID_SET_1 CHUNKSIZE=DEFAULT
```

```
SWXRC> INITIALIZE RAID_SET_2 CHUNKSIZE=DEFAULT
```

NOTE

Valid chunksizes are 16 – 682 blocks. You should use a larger chunksize for applications that make a lot of I/O requests. Use a smaller chunksize for applications that make relatively few I/O requests, but need to move large amounts of data with each request.

2.7.2 Add the RAIDset as a Logical Unit

To make a RAIDset available to the host computer, you must identify it as a host logical unit. The unit number is a one or three digit number preceded by “D”. The unit number identifies the controller’s target number and the RAIDset as the Logical Unit (LUN) connected to the target. Units identified with controller target number 0 have a single digit number which corresponds to LUN number. For example, D5 would be target 0, LUN 5. Units identified with controller targets 1, 2 and 3 use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit to the LUN number. For example, D205 would be target 2, LUN 5. You must now identify the RAIDsets as Host Logical Units by using the ADD UNIT command.

```
SWXRC> ADD UNIT D0 RAID_SET_1
```

```
SWXRC> ADD UNIT D1 RAID_SET_2
```

This example uses the controller target of 0 (specified earlier with the SET_THIS_CONTROLLER command) and LUN 0 and 1 as the digits in D0 and D1, since the two RAIDsets are the first and second units identified on the controller.

NOTE

For some operating systems, Logical Units must be sequential. They must begin with D0 and be followed by D1, D2, D3, etc.

The final step in creating the RAIDset is to enable the writeback cache. A single CLI command enables that feature for the entire RAIDset:

```
SWXRC> SET D0 WRITEBACK_CACHE
```

```
SWXRC> SET D1 WRITEBACK_CACHE
```

Where: D0 and D1 represent the host logical units of the RAIDsets described above.

2.8 Create a STRIPEset

If you require STRIPE sets to be available to the host as Logical Units, you must now combine disks into a STRIPEset. STRIPEsets must have at least two members, and can have as many as fourteen. This example creates a three member STRIPEset using the ADD STRIPESET command.

```
SWXRC> ADD STRIPESET STRIPE_SET_1 DISK110 DISK210 DISK310
```

In this example, “STRIPE_SET_1” is the name of the STRIPEset, and it is followed by a list of the disks to be included in the STRIPEset. The names of the STRIPEsets are user selectable. Performance of your STRIPEsets will be optimized if each STRIPEset includes disks from different channels as shown in the example on page 2-5.

2.8.1 Initialize the STRIPEset

Before you can put the STRIPEset into service, it must be initialized.

When you initialize a STRIPEset, a chunksize must be specified. A chunksize is the number of blocks of data that are transferred at one time. By using the default chunksize, the controller will optimize the chunksize by selecting a number equal to the number of blocks in one track of disk data. We recommend using the default chunksize.

```
SWXRC> INITIALIZE STRIPE_SET_1 CHUNKSIZE=DEFAULT
```

NOTE

Valid chunksizes are 16 – 32768 blocks. You should use a larger chunksize for applications that make a lot of I/O requests. Use a smaller chunksize for applications that make relatively few I/O requests, but need to move large amounts of data with each request.

2.8.2 Add the STRIPEset as a Logical Unit

To make a STRIPEset available to the host computer, you must identify it as a host logical unit. The unit number is a one or three digit number preceded by “D”. The unit number identifies the controller’s target number and the STRIPEset as the Logical Unit (LUN) connected to the target. Units identified with controller target number 0 have a single digit number which corresponds to LUN number. For example, D5 would be target 0, LUN 5. Units identified with controller targets 1, 2 and 3 use a 3 digit number. The first digit

corresponds to the controller target number, the second digit is always 0 and the third digit to the LUN number. For example, D205 would be target 2, LUN 5. You must now identify the STRIPESets as Host Logical Units by using the ADD UNIT command.

```
SWXRC> ADD UNIT D2 STRIPE_SET_1
```

This example uses the controller target of 0 (specified earlier with the SET_THIS_CONTROLLER command) and LUN 2 as the digit in D2, since the STRIPEset is the third unit identified on the controller.

NOTE

For some operating system, Logical Units must be sequential.
They must begin with D0 and be followed by D1, D2, D3, etc.

The final step in creating the STRIPEset is to enable the writeback cache. A single CLI command enables that feature for the entire STRIPEset:

```
SWXRC> SET D2 WRITEBACK_CACHE
```

Where: D2 represents the host logical unit of the STRIPEset described above.

2.9 Add Individual Disks as Logical Units

Before you can put an individual disk into service, it must be initialized:

```
SWXRC> INITIALIZE DISK410
```

```
SWXRC> INITIALIZE DISK510
```

If you require individual Disks to be available to the host as Logical Units, you must now identify the Disks as Host Logical Units by using the ADD UNIT command.

```
SWXRC> ADD UNIT D3 DISK410
```

```
SWXRC> ADD UNIT D4 DISK510
```

In this example, disks DISK410 and DISK510 were identified to the host as units D3 (Target 0, LUN 3) and D4 (Target 0, LUN 4) respectively.

NOTE

For some operating systems Logical Units must be sequential.
They must begin with D0 and be followed by D1, D2, D3, etc.

If a disk in a RAIDset goes bad, the controller will replace it with a disk from the Spareset, if one exists. If there is no Spareset, the RAIDset will run “reduced,” and you should replace the disabled disk as soon as possible. We recommend allocating one drive as a spareset.

If you chose to leave one or more drives as a Spareset for the RAIDset, you must now configure that in the controller. To create the Spareset, identify the drive(s) using the ADD SPARESET command.

```
SWXRC> ADD SPARESET DISK610
```

In this example, DISK610 was identified to the controller as a Spareset.

2.10 Create a MIRRORset

If you require MIRRORsets to be available to the host as Logical Units, you must now combine disks into a MIRRORset. MIRRORsets must have at least two members, and can have as many as six. This example creates a two member MIRRORset using the ADD MIRRORSET command.

```
SWXRC> ADD MIRRORSET MIRROR_SET_1 DISK120 DISK220
```

In this example, “MIRROR_SET_1” is the name of the MIRRORset, and it is followed by a list of the disks to be included in the MIRRORset. The names of the MIRROR sets are user selectable. Performance of your MIRROR sets will be optimized if each MIRRORset includes disks from different channels as shown in the example.

2.10.1 Initialize the MIRRORset

Before you can put the MIRRORset into service, it must be initialized.

```
SWXRC> INITIALIZE MIRROR_SET_1
```

2.10.2 Add the MIRRORset as a Logical Unit

To make a MIRRORset available to the host computer, you must identify it as a host logical unit. The unit number is a one or three digit number preceded by “D”. The unit number identifies the controller’s target number and the MIRRORset as the Logical Unit (LUN) connected to the target. Units identified with controller target number 0 have a single digit number which corresponds to LUN number. For example, D5 would be target 0, LUN 5. Units identified with controller targets 1, 2 and 3 use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit to the LUN number. For example, D400 would be target 4, LUN 0. You must now identify the STRIPESets as Host Logical Units by using the ADD UNIT command.

```
SWXRC> ADD UNIT D400 MIRROR_SET_1
```

This example uses the controller target of 4 and LUN 0.

NOTE

For some operating systems Logical Units must be sequential.
They must begin with D0 and be followed by D1, D2, D3, etc.

The final step in creating the MIRRORset is to enable the writeback cache. A single CLI command enables that feature for the entire MIRRORset:

```
SWXRC> SET D400 WRITEBACK_CACHE
```

Where: D400 represents the host logical unit of the MIRRORset described above.

2.11 Create a STRIPE MIRRORset

If you require STRIPE MIRROR sets to be available to the host as Logical Units, you must now combine MIRRORsets into a STRIPEset. STRIPEsets must have at least two members, and can have as many as fourteen. These examples create 2, two member MIRRORsets using the ADD MIRRORSET command.

```
SWXRC> ADD MIRRORSET MIRROR_SET_3 DISK320 DISK420
```

```
SWXRC> ADD MIRRORSET MIRROR_SET_4 DISK520 DISK620
```

In these examples, “MIRROR_SET_3” and “MIRROR_SET_4” are the names of the MIRRORsets, and it is followed by a list of the disks to be included in the MIRRORsets.

2.11.1 Initialize the MIRRORsets

Before you can put the MIRRORsets into a STRIPE MIRRORset, they must be initialized.

```
SWXRC> INITIALIZE MIRROR_SET_3
```

```
SWXRC> INITIALIZE MIRROR_SET_4
```

2.11.2 Create a STRIPE MIRRORset

To create the STRIPEset from the two MIRROR sets you must combine them into a STRIPEset. STRIPE MIRRORsets must have at least two members, and can have as many as fourteen. This example creates a two member STRIPEset using the ADD STRIPESET command.

```
SWXRC> ADD STRIPESET STRIPE_MIRROR MIRROR_SET_3  
MIRROR_SET_4
```

In this example, “STRIPE_MIRROR” is the name of the STRIPE MIRRORset, and it is followed by a list of MIRRORsets to include in the STRIPEset. The name of the STRIPEset is user selectable. Performance of your STRIPE MIRRORset will be optimized if each MIRRORset includes disks from different channels.

2.11.3 Initialize the STRIPE MIRRORset

Before you can put the STRIPE MIRRORset into service, it must be initialized.

When you initialize a STRIPEset, a chunksize must be specified. A chunksize is the number of blocks of data that are transferred at one time. By using the default chunksize, the controller will optimize the chunksize by selecting a number equal to the number of blocks in one track of disk data. We recommend using the default chunksize.

```
SWXRC> INITIALIZE STRIPE_MIRROR CHUNKSIZE=DEFAULT
```

NOTE

Valid chunksizes are 16 – 32768 blocks. You should use a larger chunksize for applications that make a lot of I/O requests. Use a smaller chunksize for applications that make relatively few I/O requests, but need to move large amounts of data with each request.

2.11.4 Add the STRIPE MIRRORset as a Logical Unit

To make a STRIPE MIRRORset available to the host computer, you must identify it as a host logical unit. The unit number is a one or three digit number preceded by “D”. The unit number identifies the controller’s target number and the MIRRORset as the Logical Unit (LUN) connected to the target. Units identified with controller target number 0 have a single digit number which corresponds to LUN number. For example, D500 would be target 5, LUN 0. Units identified with controller targets 1, 2 and 3 use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit to the LUN number. For example, D205 would be target 2, LUN 5. You must now identify the STRIPEsets as Host Logical Units by using the ADD UNIT command.

```
SWXRC> ADD UNIT D500 STRIPE_MIRROR
```

NOTE

For some operating systems Logical Units must be sequential.
They must begin with D0 and be followed by D1, D2, D3, etc.

The final step in creating the MIRRORset is to enable the writeback cache. A single CLI command enables that feature for the entire MIRRORset:

```
SWXRC> SET D500 WRITEBACK_CACHE
```

Where: D500 represents the host logical units of the STRIPE MIRRORset described above.

You have now completed all the steps required to create an initial configuration for your controller. In the following steps, you should verify and record your configuration for future reference. Additional worksheets are provided in Appendix A for recording future new or modified configurations.

First, verify the Logical Units you have configured:

```
SWXRC> SHOW UNITS
```

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

LUN	USES
D0	RAID_SET_1
D1	RAID_SET_2
D2	STRIPE_SET_1
D3	DISK410
D4	DISK510
D400	MIRROR_SET_1
D500	STRIPE_MIRROR

Record the information in the following table:

Next, verify the StorageSets you have configured:

```
SWXRC> SHOW STORAGESETS
```

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

Name	StorageSet	Uses	Used by
STRIPE_MIRROR	stripeset	MIRROR_SET_3 MIRROR_SET_4	D500
STRIPE_SET_1	stripeset	DISK110 DISK210 DISK310	D2
MIRROR_SET_1	mirrorset	DISK120 DISK220	D400
MIRROR_SET_3	mirrorset	DISK320 DISK420	STRIPE_MIRROR
MIRROR_SET_4	mirrorset	DISK520 DISK620	STRIPE_MIRROR
RAID_SET_1	raidset	DISK100 DISK200 DISK300	D0
RAID_SET_2	raidset	DISK400 DISK500 DISK600	D1
SPARESET	spareset	DISK610	
FAILEDSET	failedset		

JBOD devices are not displayed in this report. To display JBOD devices, enter the following:

```
SWXCR> SHOW DEVICES
```

Record the above information in the following table. In the event of a controller failure, the information that is recorded here will assist you in reconstruction of the storageset on your RAID Array 410.

Installing the StorageWorks RAID Array 410 Hardware

In preparing your array for first time use, you need to connect your workstation and subsystem through the host adapter board. This chapter, along with your workstation and the associated StorageWorks RAID Array 410 Subsystem manuals, provides instructions for preparing and installing the host adapter and the subsystem enclosure.

3.1 Prepare and Install the HP-PB Host Adapter

The HP-PB adapter is a SCSI-2 fast wide (16-bit) differential host adapter. The host computer is connected to the StorageWorks RAID Array 410 Subsystem through the host adapter and a connecting cable.

You need the following before you begin:

- The HP-PB host adapter board (use precautions to protect the board from static discharge)
- Your computer system hardware manual
- Appropriate tools to service your host computer
- The BN21K-05 SCSI cable, three meters long, with a right angle high density 68-pin connector on one end and a straight high density 68-pin connector on the other

Refer to your system manual for additional reference information on installing a host adapter.

3.1.1 Preparing to Install the Host Adapter

Before installing the host adapter in your HP 9000, Series 800 host system, take precautions to protect the board from electrostatic discharge. Then perform the following steps:

1. Shut down your operating system using the following command:

```
# shutdown -h 0
```
2. When the “System has halted, OK to turn off power or reset system” message is displayed, power down the host computer and all attached peripherals. Disconnect power cables from the host computer.

CAUTION

To protect the board from static discharge, wear an electrostatic discharge (ESD) wrist strap. If a wrist strap is unavailable, ground yourself by touching a bare metal surface on the computer chassis. Do not remove the board from its anti-static protective cover until instructed to do so in the following procedures.

WARNING

Failure to remove power from the host computer and peripherals may introduce a personal hazard, or may result in damage to the host computer or loss of stored data.

3. Open the host computer. Refer to your system manual for assistance in completing this procedure.

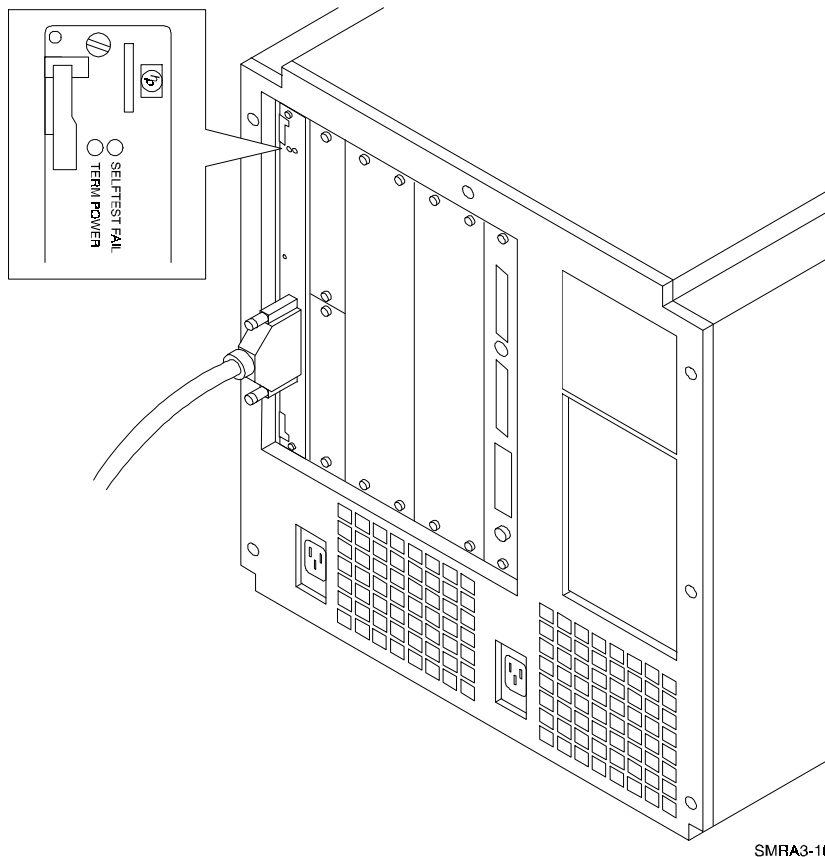
3.1.2 Installing the Host Adapter

The following steps must be performed to successfully install the HP-PB host adapter:

- Select an available double-high adapter slot.
- Verify the setting of the SCSI ID dip switches.
- Insert the HP-PB host adapter in the available slot.
- Connect cable to adapter connector.

The faceplate of the adapter contains two LEDs (see Figure 3-1). A green LED (Term Pwr) illuminates to indicate that the adapter is supplying termination power to the SCSI Bus. An amber LED (SelfTest Fail) illuminates to indicate that the adapter failed its self-test procedure.

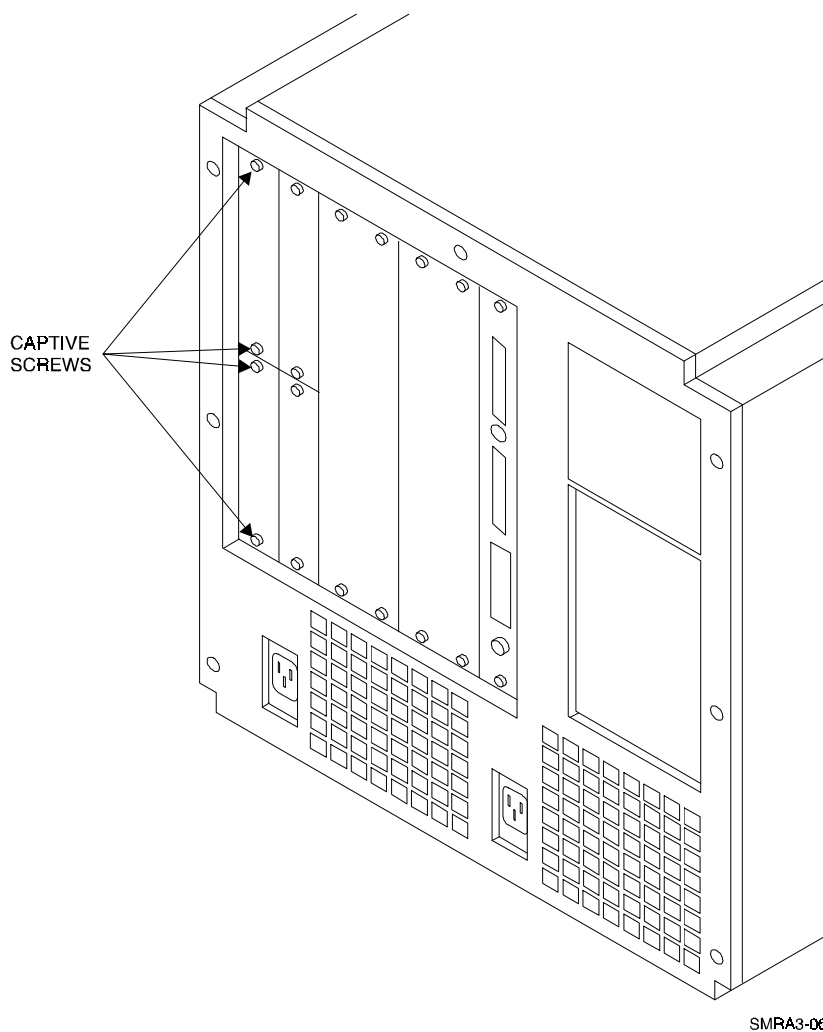
Figure 3-1 Adapter Faceplate LEDs



3.1.2.1 Select an Available Double-High Adapter Slot

The rear of the host computer has several slots in which to mount single-high and double-high adapters (see Figure 3-1). Note that HP-PB adapter requires one double-high slot. A double-high slot comprises two single-high slots.

Figure 3–2 Rear View of HP 9000 Series 800 Computer

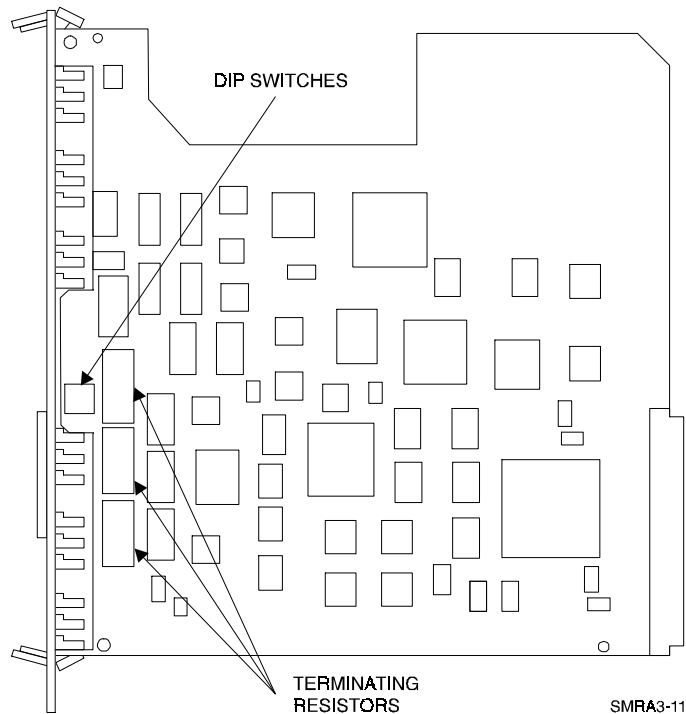


1. Select an available double-high slot.
2. Loosen the captive screws holding the single-high slot cover plates and remove the two cover plates for the two single-high slots.
3. Remove the single-high slot divider to create a double-high slot.

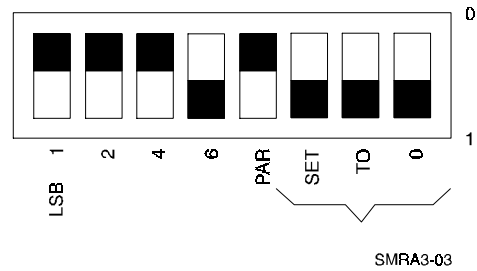
3.1.2.2 Verify the Setting of the SCSI ID DIP Switches

1. Remove the HP-PB board from its protective packaging being careful to hold the board by the face plate or board edges. Do not touch the electronic components or the board etches.
2. Locate the DIP switches on the adapter board (see Figure 3-3).

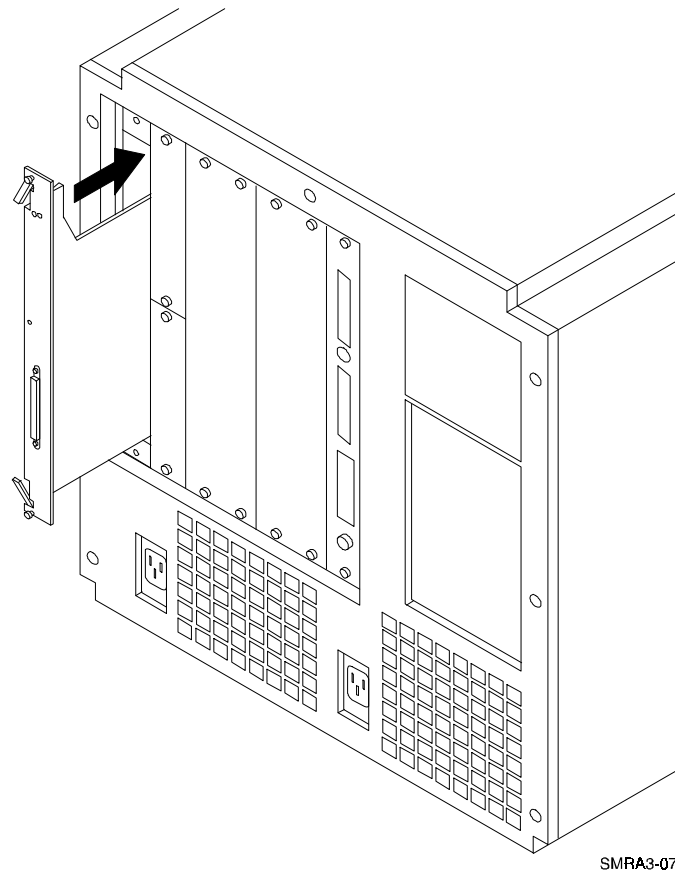
Figure 3-3 Host Adapter Board



The DIP switches are used to set the SCSI address of the adapter. By convention, the SCSI address of a host adapter is normally 7, providing it with the highest priority among the eight devices that can be attached to an 8-bit bus. The switches are preset at address 7 (Figure 3-4) and should not be changed unless there are multiple SCSI adapters on the same SCSI bus. If a second host adapter is installed, the address of the second board should be set to 6. If a change must be made, set the switches to a unique address so that no two devices on the bus have the same address. Make sure to set the address so that the host adapter has the highest possible priority.

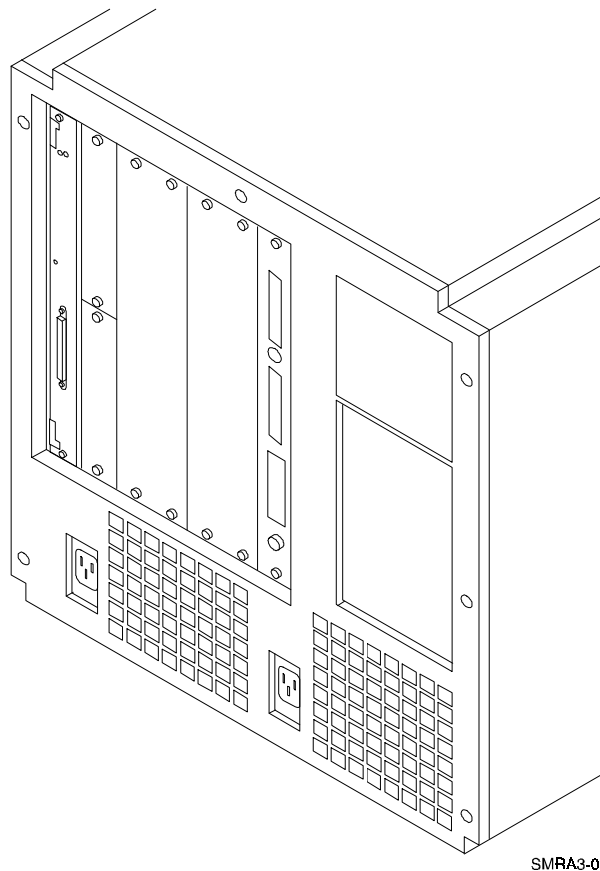
Figure 3-4 Host Adapter Board DIP Switches**3.1.2.3 Insert the HP-PB Host Adapter in the Available Slot**

1. Using both hands, hold the host adapter by the faceplate of board edges. Do not touch the electronic components or the board etches.
2. Carefully align the host adapter up with the preformed grooves at the top and bottom of the slot.
3. Gently slide the host adapter into the slot making sure that the host adapter's external cable connector is towards the bottom of the host computer. This assures that the board's internal connector properly aligns with the connector on the backplane of the host computer (see Figure 3- 5).

Figure 3-5 Inserting the Host Adapter Board

4. When the host adapter comes in contact with the host computer's backplane, firmly press the board inward so that the host adapter connector is fully mated with the backplane.
5. Fold in the extractor levers.
6. Secure the host adapter to the host computer using the two captive screws on the host adapter (Figure 3-6).

Figure 3-6 Back of Host Computer with Host Adapter Board Installed

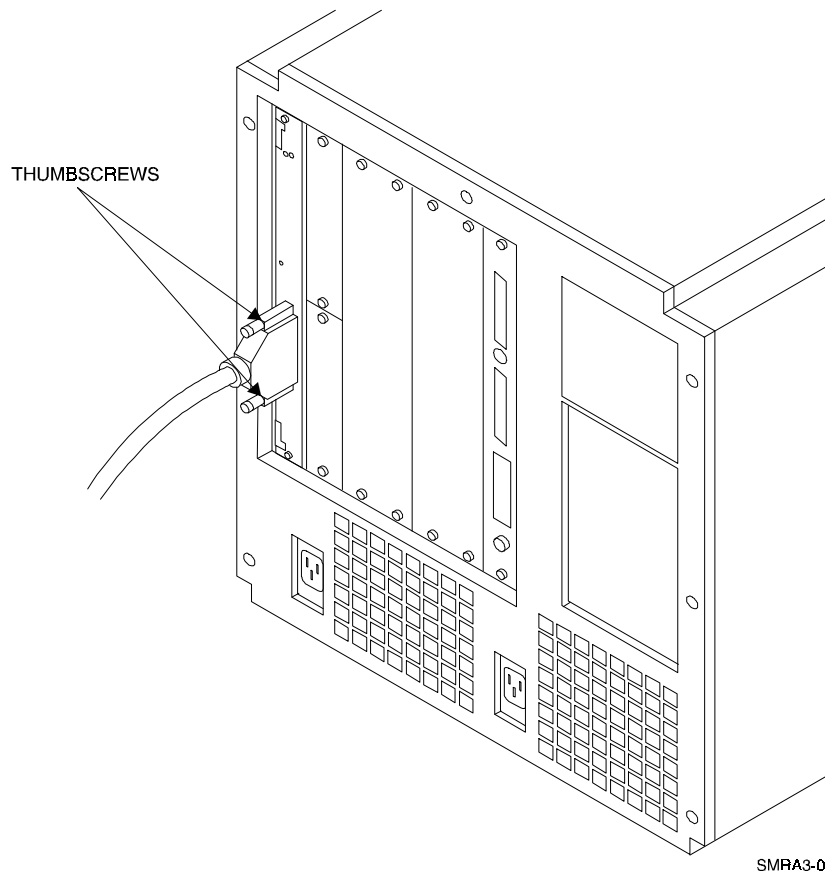


3.1.2.4 Connect Cable to Adapter Connector

1. Locate the cable provided as part of the RAID Subsystem Kit.
2. Check the cable's straight connector pins for proper alignment. Straighten any bent pins.
3. Insert the cable's straight connector into the connector on the host adapter.
4. Secure the cable to the host adapter by tightening the two screws on the connector (see Figure 3-7).

CAUTION

Do not connect the other end of the cable until instructed to do so. Doing so may damage the host computer and or the RAID Controller.

Figure 3–7 Host Adapter Board with Cable Attached

3.2 Installing the Subsystem

1. Using the keys provided, unlock the RAID Array Enclosure.
2. Install any additional disk StorageWorks Building Blocks (SBBs) up to a maximum of 24 SBBs. Begin with the lowest uninstalled row and add SBBs from left to right. To install an SBB, hold it in both hands, insert it into the guide slots, and firmly push it into the shelf until the mounting tabs snap in place.
3. Install the BN21K-05 three meter cable between the host system and the RAID Controller.
 - Route the right angle connector end of the cable under the SWXRA-Yx Subsystem enclosure and up through the front access hole nearest to the connector on the RAID controller.
 - Install the connector with the cable dressed to the right by firmly pushing it onto the controller's mating connector.
 - Secure it by tightening the 2 screws on the cable connector.
4. Install the power cable. Connect the female end of the power cable to the RAID Controller power controller located at the lower right front corner of the array. Plug the power cable into a 110/220 VAC line voltage source (the power supply automatically senses the voltage level and will work with either voltage).

5. Prior to configuring the RAID Array 410 as described in Chapter 2, power on the RAID Controller for a minimum of 6 hours. The Write-Back Cache Module contains a battery that may have discharged since the time it was factory-installed. If you attempt to initiate any RAID commands when the battery is not charged, unspecified results may occur. The battery will be fully recharged in the time specified.
6. Once the RAID Array is configured as described in Chapter 2 and the RAID Array is connected to the host computer, the system can be brought up.

Preparing the HP9000 Series 800 HP-UX 9.04 For Use with the StorageWorks RAID Array Controller

This chapter describes the steps for installing the required device drivers onto HP 9000 Series 800 systems running HP-UX 9.04. The installation steps include organizing your system and existing files, and loading the device driver(s) to communicate through the HP-PB SCSI Adapter to the StorageWorks RAID Array Controller.

NOTE

Prior to performing these procedures, ascertain that the SWXRC-04 RAID Array Controller Write-Back Cache battery is fully charged. This is accomplished by supplying power to the RAID Array Controller for a minimum of 6 hours.

4.1 Installing the HP-UX Device Driver

The procedures for installing HP-UX device driver(s) require you to be familiar with following Hewlett-Packard technical manuals:

- *Installing Peripherals* (Part Number B3108-90004)
- *System Administrator Tasks* (Part Number B3108-90005)
- *How HP-UX Works: Concepts for the System Administrator* (Part Number B2355-90029)

Installing the disk driver on HP-UX requires the following major steps:

- Determine the interface required (Section 4.1.1)
- Verify the availability of the required device driver (Section 4.1.2)
- Create a disktab entry (Section 4.1.3)
- Set the SCSI Bus address of the RAID Array Controller (Section 4.1.4)
- Reboot the system and verify the successful installation (Section 4.1.5)

4.1.1 Determine the Interface Required

The device drivers you will need for the StorageWorks RAID Array Controller are SCSI3 and disc3. These drivers are software configurable and are a standard part of the HP-UX operating system. Device files are automatically created for this device when you follow the procedures listed in this section.

For most installations, you will not need all the detailed information given in the following table. However, if you intend to customize your system's configuration, you will need to refer to "*Setting Up Devices Using HP-UX Commands*" in the *Installing Peripherals* manual and you will need the information listed in Table 4-1. If you need more information on minor numbers, see "*Device Files and Minor Numbers*" in the *Installing Peripherals* manual.

Table 4–1 Disk Setup Information

Item	Description
Interface card	HP-PB Fast/Wide High-Performance SCSI Adapter
Disk Drivers Required	disc3, scsi3, cio_ca0
Disk Block-mode major number	7
Disk Character-mode major number	13
Minor number format	See " <i>Device Files and Minor Numbers</i> " in the <i>Installing Peripherals</i> manual

Before proceeding, back up your system according to you normal procedures.

4.1.2 Verify the Availability of the Required Device Driver

Verify that the disc3 device driver is included in your current kernel configuration file (usually /etc/conf/gen/s800). To do this, type:

```
lsdev 7 (7 is the major number specified in Table 4-1)
```

If the device driver is part of your current kernel configuration file, the system will return a message showing the major number, device driver name, and device class.

If this is the case, proceed to the next step.

If the system returns the message *****no such driver*****, you will have to edit the kernel configuration file to include the necessary drives and then reconfigure the kernel. You can either:

Use SAM for the whole procedure, or

Edit the kernel using commands.

4.1.2.1 Using SAM

1. Run SAM.
2. Highlight and open Kernel Configuration
3. Highlight and open Drivers
4. Add the necessary drivers

Use SAM's help system to complete the task or refer to "*Adding Device Drivers Using SAM*" in the *Installing Peripherals* manual.

4.1.2.2 Editing the Kernel Using Commands

1. Edit the kernel configuration file using a text editor.
2. Reconfigure the kernel using the **uxgen** command.

Refer to "*Setting up Devices Using HP-UX Commands*" in the *Installing Peripherals* manual.

4.1.3 Create a disktab Entry

1. Save a copy of your current disktab entries. Type:

```
# cp /etc/disktab /etc/disktab.bak
```

2. Add a new disktab entry. Type:

```
# disksecn -dn SWXRC-04 >> /etc/disktab
```

and supply the following values:

```
type:                winchester
sector size:         1024
#sectors /track:     84
#tracks/cylinder:    16
#cylinders:          1529
revolutions/minute: 5400
```

4.1.4 Set the SCSI Bus Address of the RAID Array Controller

The SCSI bus address for the RAID Array Controller is set in “*Creating an Initial Configuration*” in Chapter 2 of this guide.

4.1.5 Reboot the System and Verify the Successful Installation

NOTE

Before proceeding, the RAID Array Controller must be configured. See “*Creating an Initial Configuration*” in Chapter 2 of this guide.

1. Shutdown the HP system and ensure that all power switches on the RAID Array Controller and on the Series 800 computer system are in the off position.
2. Connect the cable between the HP-PB Adapter’s connector on the back of the Series 800 and the connector on the front of the RAID Array Controller. This cable is a differential to differential connection and is 3 meters in length. This will not affect the single-ended SCSI Bus contained in the RAID Array.
3. Turn on power to the RAID Array system.
4. Turn on power to the Series 800 Computer.
5. During the boot process, device “special” files are created for each logical unit configured on the RAID Array Controller and a Logical Unit (LU) number is assigned to each storage set configured on the RAID Array Controller.

6. Verify that the RAID Array Controller was added to HP-UX: Type the command:

```
ioscan -f
```

Each storageset configured on the RAID Array (see Chapter 2) will appear as a disk device on the HP system. For each storageset, you will see an entry similar to the following:

<u>Class</u>	<u>LU</u>	<u>H/W Path</u>	<u>Driver</u>	<u>H/W Status</u>	<u>S/W Status</u>
disk	7	40.0.0	scsi3.target.disc3	ok(hexadecimal entity id#)	ok

4.2 What To Do Next

The HP-UX operating system has now been modified to communicate with the RAID Array Controller. Refer to the *System Administration Tasks* manual for instructions on the following tasks:

- Adding the RAID storageset to volume groups
- Creating file systems or swap area in logical volumes
- Determining the mount point directory on your system
- Using the **mount** command to mount the device on your system
- Editing the */etc/checklist* file if you want this device mounted each time you boot the system.

Congratulations!
You have completed the installation of your
RAID ARRAY 410.



Configuration Records – Blank Forms

This contains copies of the two tables used in Section 2 to record the configuration of your system. If additional copies are required, these tables can be reproduced as necessary.
