StorageWorks™

Getting Started

RAID Array 310 V3.1 for Solaris 2.x

Installation Guide

EK–SMRA8–IG. C01

Digital Equipment Corporation
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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 310 Deskside Subsystem.

Revision Level	Date	Summary of Changes
EK–SMRA8–IG. A01	March 1996	Original release
EK–SMRA8–IG. B01	August 1996	Corrects commands to install host adapter packages on the hard disk.
EK–SMRA8–IG. C01	April 1997	Updated to add support for HSOF V3.1 and StorageWorks Command Console (SWCC) V1.1B.

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 310 Deskside Subsystem
- How to create an initial controller configuration
- How to install the SCSI host adapter into the host system
- Software installation of the RAID Array 310

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Intended Audience

This guide is intended for administrators of StorageWorks RAID Array 310 Subsystems. Installing the StorageWorks RAID Array 310 Subsystem and Manager for Sun requires a general understanding of UNIX system administration and SBus products installation procedures.

Document Structure

This guide contains the following chapters:

Chapter 1: Unpacking and Setting Up Your RAID Array 310 Subsystem Components

Unpacking and Setting Up Your RAID Array 310 Subsystem Components describes how to unpack and place the RAID Array 310 Subsystem. It also describes how to connect ac power, make the serial interface connection between the RAID Array 310 and the host, recharge the controller cache battery, and install disk SBBs in the enclosure.

Chapter 2: Creating an Initial Controller Configuration

Creating an Initial Controller Configuration describes how to create an initial configuration for the RAID controller. It also briefly describes the CLI (Command Line Interpreter) and how to access it.

Chapter 3: Installing the SCSI Host Adapter Hardware

Installing the SCSI Host Adapter Hardware prepares your array for first time use and connects your workstation and subsystem through the host adapter board. This chapter, along with your workstation and the associated StorageWorks RAID Array 310 Subsystem manuals, provides for preparing and installing the host adapter and the subsystem enclosure.

Chapter 4: Installing the SCSI Host Adapter Driver on Solaris 2.x

Installing the SCSI Host Adapter Driver on Solaris 2.x describes the steps for installing the associated device drivers onto Sun systems running Solaris 2.4, 2.5, or 2.5.1. The installation includes organizing your system and existing files, setting up a RAID environment, and loading the RAID CD-ROMs on to your hard disk.

Chapter 5: Installing and Configuring the Command Console Agent

Installing and Configuring the Command Console Agent contains instructions for installing Command Console, a Graphical User Interface (GUI), and creating your first volume.

Chapter 6: Installing the Command Console Client

Installing the Command Console Client describes how to install a copy of the Command Console (CC) Client on each of your client systems.

Chapter 7: System Administration of the RAID 310 for Sun

System Administration of the RAID 310 for Sun describes how to prepare LUNs for use by the Sun system.

Appendix A: Host Adapter Error Messages

This appendix provides a list of host adapter error messages as returned by the array controller. This information, along with the SCSI sense and error codes, can be used for monitoring performance of the array and for troubleshooting.

Appendix B: Configuration Recommendations

This appendix suggests a list of items to optimize the performance of your RAID Array 310 subsystem.

Appendix C: Upgrading Controller Software

This appendix contains the procedures for backing up and upgrading the controller software.

Appendix D: Configuring STRIPEsets, MIRRORsets, and Striped MIRRORsets

This appendix supplements Chapter 2 and contains instructions for configuring STRIPEsets, MIRRORsets, and Striped MIRRORsets.

Associated Documents

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

Table 1 Associated Documents

Document Title	Order Number
StorageWorks RAID Array 310 Configuration and Maintenance Guide	*EK–SMCS2–UG*
RAID Array 310 Deskside Subsystem Hardware User's Guide	*EK–SMCPL–UG*
StorageWorks Command Console User's Guide	*AA–R24LA–TE*
Release Notes	*AV–QWT8A–TE*

Conventions

This guide uses the following documentation conventions:

Table 2 Style Conventions

Style	Meaning
boldface monospace type	To be input by the user and file names
`plain monospace type`	Text
italic type	For emphasis, manual titles, utilities, menus, screens, and filenames
#	Represents the Solaris system prompt. Do not type it as part of information given here as to be input by the user.

Table 3 Supported Operating System References Conventions

This Reference to Operating Systems	Means these Versions of the Operating System
Solaris 2.x	Solaris 2.4, 2.5, or 2.5.1

Getting Started

This section provides an overview for preparing and installing the RAID Array 310 for Solaris in your Sun host system. Detailed information is contained in Chapters 1 through 7.

Thank you for purchasing a StorageWorks RAID Array 310 Subsystem. You should have received the following:

- StorageWorks RAID Array 310 Manager for Solaris platform kit
- StorageWorks RAID Array 310 Subsystem

> **NOTE**
>
> Installing the StorageWorks RAID Array 310 Subsystem requires a technical understanding of the following:
> - Sun Computer Systems
> - RAID array concepts
> - Solaris 2.x Operating System
> - Basic hardware installation procedures

- Or, contact your supplier or service representative for installation assistance.

The major steps for installing and setting up the StorageWorks RAID Array 310 Subsystem include the following:

1. Performing the pre-installation steps listed below.
2. Unpacking and locating the RAID Array 310 Subsystem and charging the write-back cache module batteries (Chapter 1)
3. Connecting the maintenance terminal and establishing communications (Chapter 2)
4. Using the Command Line Interpreter (Chapter 2)
5. Creating an Initial Configuration (Chapters 2 and 4)
6. Unpacking and installing the host adapter in your host system and connecting the host adapter to the RAID controller (Chapter 3)
7. Install the SCSI Host Adapter Driver on Solaris (Chapter 4)
8. Create device entries and filesystems on the units configured in Step 5 (Chapter 4)
9. Installing and configuring the Command Console Agent (Chapter 5)
10. Installing the Command Console Client (Chapter 6)

Pre-installation Steps:

Before starting your installation, follow these pre-installation steps:

- Back up your system files using your normal procedure.
- Verify the availability of user-supplied hardware and software.
- Inventory the contents of the StorageWorks RAID Array 310 Subsystem platform kit.
- Inventory the contents of the StorageWorks RAID Array 310 Subsystem.

Perform a System Backup

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

Verify User-Supplied Hardware and Software (System Requirements)

The StorageWorks RAID Array 310 Subsystem requires the following user-supplied hardware and software:

- The associated system hardware manual(s)
- Appropriate tools to service your computer
- The Sun Solaris operating system

Inventory the StorageWorks RAID Array 310 Subsystem Platform Kit Components

The Storage Works RAID Array 310 Platform Kit provides the following components:

NOTE

Adapterless kits are also available.

- An Sbus SCSI-2 Host Adapter
- SCSI cable with two straight high-density 68-pin connectors (BN21G)
- Media containing software to connect RAID Array 310 to the host adapter
- Release Notes containing version-specific instructions for system installation
- The DIGITAL License Agreement

Inventory the StorageWorks RAID Array 310 Subsystem Components

The StorageWorks RAID Array 310 Subsystem provides the following components:

- The StorageWorks RAID Array 310 Deskside Subsystem Enclosure
- *RAID Array 310 Deskside Subsystem Hardware User's Guide*
- *RAID Array 310 Configuration and Maintenance User's Guide*
- This *Getting Started – RAID Array 310 for Sun Solaris 2.x Installation Guide*
- A cable, plus adapters, for connecting the maintenance port of the RAID controller to the serial port of your system, PC, or maintenance terminal
- Power Cables (2)
- Enclosure keys
- RAID Array 310 Controller Firmware License Keys

NOTE

Retain the Firmware License Keys information in a safe place. They are required if it becomes necessary to reinitialize the RAID Array Controller.

1

Unpacking and Setting Up Your RAID Array 310 Subsystem Components

This chapter describes the site preparation and unpacking procedures for the RAID Array 310 Subsystem. It also describes the procedure to recharge the controller write-back cache battery and making the CLI interface connection between the subsystem and the host system or maintenance terminal.

1.1 Introduction

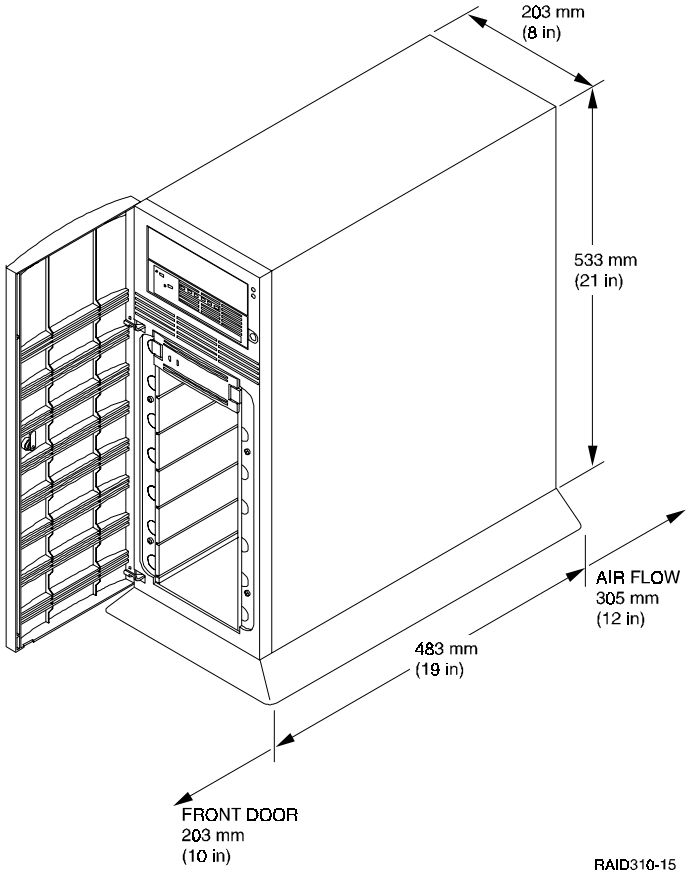
The installation of your RAID Array 310 subsystem is accomplished by performing the following seven major steps:

- Unpacking and setting up the mechanical configuration (*Chapter 1*)
- Connecting ac power and recharging the controller cache battery (*Chapter 1*)
- Making the serial interface connection between the RAID Array 310 and the host system or maintenance terminal (*Chapter 1*)
- Creating an initial RAID array controller configuration (*Chapter 2*)
- Installing the SCSI host adapter and making the SCSI connection to the host (*Chapter 3*)
- Installing the software driver for the SCSI host adapter (*Chapter 4*)
- Integrating the RAID Array 310 disk subsystem into the Sun host (*Chapter 5*)

1.2 Site Preparation

Before installing the subsystem, make sure that adequate space is available in front of the enclosure for opening the front door (10 inches clearance) and around the enclosure for adequate airflow. See Figure 1–1 for specific space requirements.

Figure 1–1 Minimum Installation Clearance Measurements



1.3 Unpacking the RAID Array 310

The shipping containers provide maximum protection for the subsystem and all components. We recommend that you unpack the subsystem in the installation area.

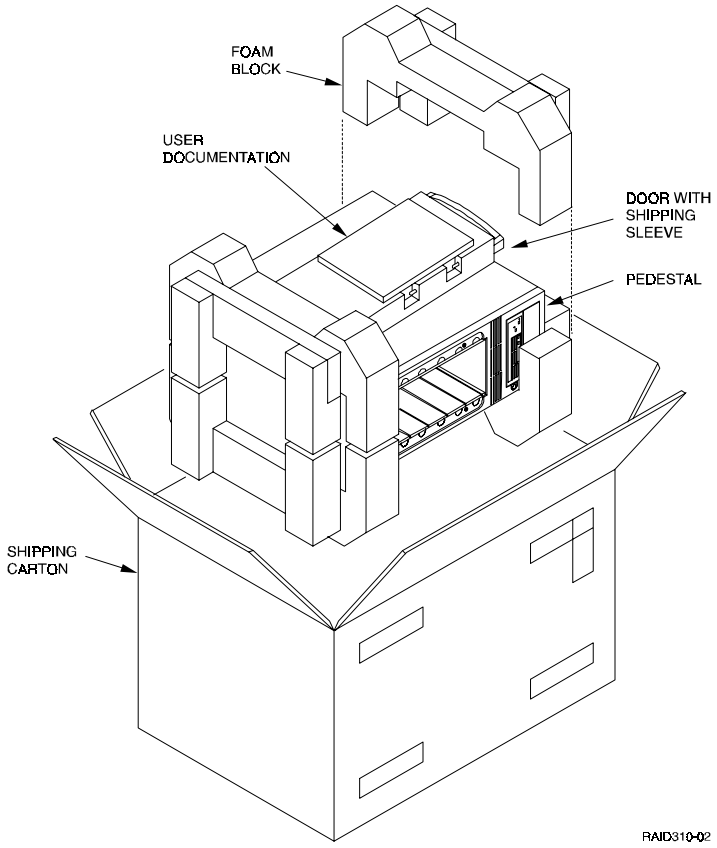
NOTE

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

Refer to Figure 1–2 and complete the following procedure to unpack the subsystem:

1. Orient the shipping container as shown.
2. Open the container to remove the subsystem and packing material.
3. Remove the top foam blocks.
4. Remove the door.
5. Remove the subsystem.
6. Replace all packing material in the shipping container and store it for future use.

Figure 1–2 Unpacking the RAID Array 310



1.4 Preparing the RAID Array 310 for Operation

Preparing the RAID Array 310 for operation involves the following procedures:

1. Mounting the base as described in Section 1.5.
2. Mounting the door.
3. Installing the disk SBB's.
4. Connecting the power, SCSI bus, and CLI serial cables.
5. Configuring the RAID Array 310.
6. Charging the controller cache battery.
7. Checking the subsystem for proper operation.

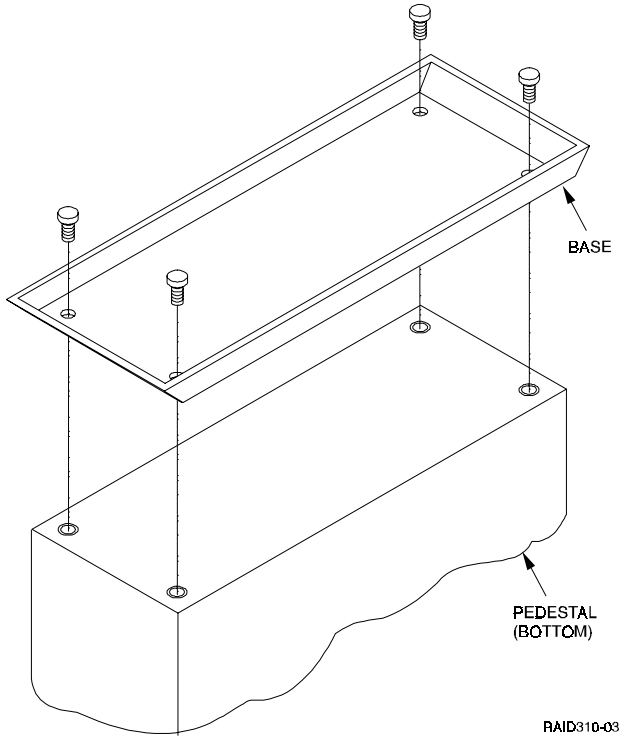
1.5 Mounting the Base

Mount the stabilizing base to the subsystem as follows:

1. Place the subsystem on its top.
2. Align the base with the bottom of the subsystem as shown in Figure 1–3.

3. Install the four hex-head screws through the base into the subsystem and tighten the screws using a 3/16 (5 mm) hex-head or flat-head screwdriver.
4. Set the subsystem on its base and continue the installation process.

Figure 1–3 Mounting the Base



1.6 Connecting the Subsystem Power Cords

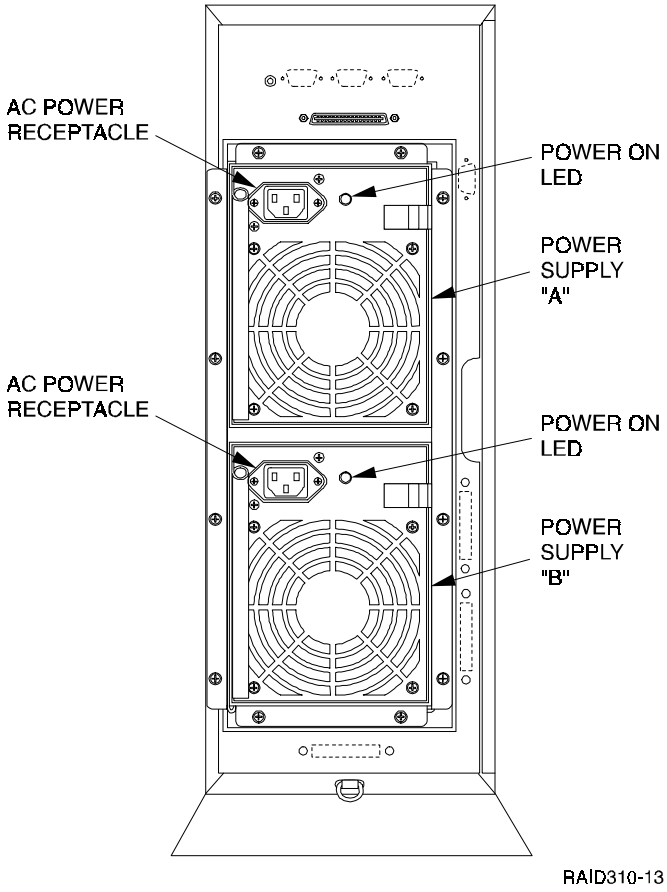
The subsystem contains two identical power supplies which provide redundant power to the RAID Array 310. Each supply is equipped with an ac power receptacle for connection to a 125 or 250 V ac power source. The power supply automatically senses and switches itself to accommodate either power source. Table 1–1 lists and describes the DIGITAL power cords available for the subsystem. Since these cords are country-specific, ensure that your cords match those listed in Table 1–1 for your installation.

Obtain the correct power cords for your ac power source and connect them between the ac receptacles on the power supplies (Figure 1–4) and the ac outlets (the power supply automatically senses the voltage level and will work with either voltage). For optimal fault tolerant operation, connect the supplies to independent ac sources.

Table 1–1 Country-Specific Power Cords

Country	Length	Order No.
Australia	2.5 m	BN19H-2E
C. Europe	2.5 m	BN19C-2E
Denmark	2.5 m	BN19K-2E
India	2.5 m	BN19S-2E
Ireland	2.5 m	BN19A-2E
Israel	2.5 m	BN18L-2E
Italy	2.5 m	BN19M-2E
Japan	2.5 m	BN27S-2E
N. Zealand	2.5 m	BN19H-2E
S. Africa	2.5 m	BN19S-2E
Switzerland	2.5 m	BN19E-2E
U. K.	2.5 m	BN19A-2E
U. S.	2.5 m	BN27S-2E

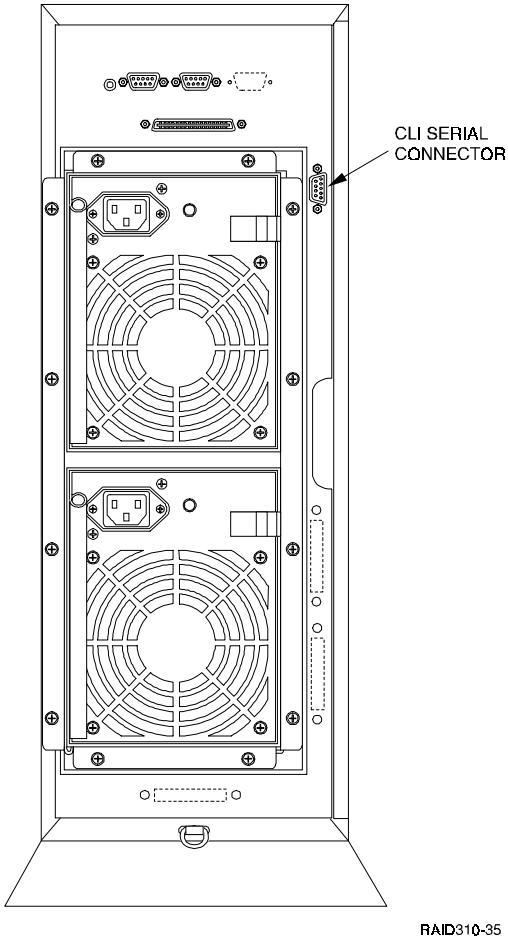
Figure 1–4 Subsystem AC Power Receptacles



1.7 Connecting the CLI Serial Interface

The RAID Array 310 requires a terminal or terminal emulation program connected to the CLI serial connector on the rear panel of the subsystem (see Figure 1–5). The serial interface is set to 9600 baud, with 8 data bits, 1 stop bit, and no parity.

Figure 1–5 Subsystem CLI Serial Connector



1.7.1 Cabling Kit

Locate and open the cabling kit that was shipped with your RAID Array 310 subsystem. The kit should contain the following components:

Table 1–2 Cabling Kit Components

Qty	DIGITAL Part No.	Wiring	Description
1	BC16E–10	NA	10-foot Terminal Cable
2	H8571–J	Straight through	DB-9-pin "J" Female to Cable Connector
1	H8575–A	Straight through	Cable to 25-pin Female Connector
1	H8575–D	Crossed	Cable to 25-pin Male Connector
1	H8575–E	Straight through	Cable to 25-pin Male Connector

1.7.2 Serial Connection

From the components listed in Table 1–2, construct a cable to connect the DB-9 CLI serial connector on the subsystem to your terminal or the host serial port.

1.7.3 Terminal Connection

Refer to your terminal documentation for terminal setup instructions.

1.7.4 Solaris "tip" Connection

Using the H8575-E 25-pin adapter, make a connection to the Sun system. The *tip* utility can be used for terminal emulation to the RAID Array 310. See "man tip" for a detailed description of the *tip* utility. The serial interface on your Solaris host varies between systems. In general, the "tip" utility uses "`/etc/remote`" as a setup file. You may have to add an entry to the file for your serial port. At a minimum, you need to find the *line identifier* for your serial port (i.e. "hardwire").

As an example, to establish a *tip* connection to the RAID Array 310 from /dev/term/a or /dev/term/b of a Sparc system. Examine the file */etc/remote*. There should be an entry of the form,

```
hardwire:\
        /dev/term/b:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
```

If necessary, edit the file to select /dev/term/a or /dev/term/b as appropriate, and ensure that the ’br’ parameter (baud rate) is set to 9600.

Once the /etc/remote file has been modified the tip session is started by typing,

#tip hardwire

tip will print “connected.”

Press RETURN a few times to display the controller CLI prompt, “HSZ20 >“. If the prompt is displayed, the *tip* session has been successfully started. If no prompt is seen, the serial port may be misconfigured or used by another application. See Peripherals Administration in the Solaris System Administrators Answerbook for more details about configuring serial ports.

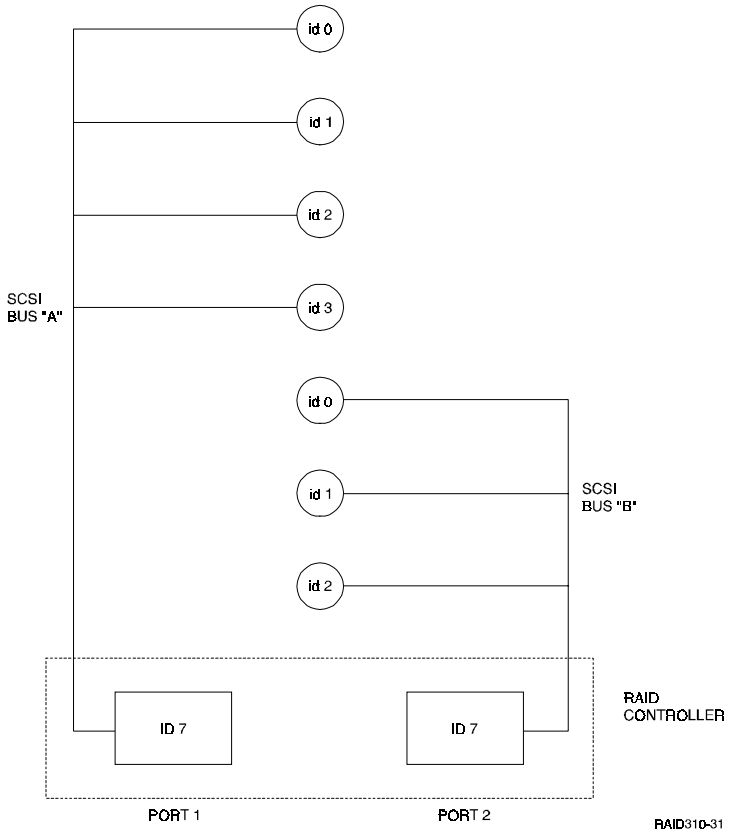
1.7.5 CLI Serial Interface Verification

Entering the CLI command “SHOW THIS_CONTROLLER” causes the controller to display its description banner verifying the serial connection.

1.8 Installing Disk SBBs in the RAID Array 310 Enclosure

You may install the disk drive SBBs into the RAID Array 310 enclosure at this time. 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. Figure 1–6 shows a layout of the SCSI bus ports and corresponding SCSI ID assignments in the enclosure. Refer to *Chapter 3, Configuration Rules and Restrictions*, included with your system.

Figure 1–6 StorageWorks SCSI Bus Port and Default SCSI ID Assignment



1.9 Charging the RAID Array Controller Cache Battery

The Cache Module in the controller contains a battery that may have discharged since the time it was factory-installed.

CAUTION

Loss of power before the write-back cache battery is fully charged may result in the loss of data.

We recommend that you take this opportunity now to recharge the batteries. This is accomplished by performing the following:

Apply power to the controller by pressing the power switch on the front of the subsystem. You should hear a momentary audible tone (beep), and see the indicator LEDs illuminate. In addition, a green LED on the front panel of the subsystem should flash at approximately one Hz.

Power on the subsystem for a minimum of 6 hours. The battery will be fully re-charged in the time specified.

NOTE

The controller cache battery LED will continue to flash after the subsystem is powered off.

2

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, declaring the storagesets as units to the host, and verifying and recording your final configuration.

2.1 Introduction

The RAID Array 310 controller can be configured with CLI commands using a terminal or a PC terminal emulator. The emulator should be connected from the PC to the RAID Array serial interface or via the Command Console GUI interface.

Before configuring the storagesets, an initial check using the CLI interface must be made on the state of the controller. For setting up the GUI, you will also need to set up an initial configuration using the CLI interface. Sections 2.1 through 2.5 describe this process.

The Command Console GUI runs on an Intel-based PC with either Windows 95 or Windows NT. It can be used via the serial interface to the RAID Array 310 or by using a networked connection (TCP/IP) to the host with which the RAID Array is connected. In that case, an agent must be installed on the host system. Chapter 4 describes this process.

The agent communicates with the RAID array through a SCSI interface. At least one storage device must be configured on the RAID Array so that the GUI can communicate with the RAID Array via the agent. Sections 2.5 through 2.7.3 describe this procedure.

2.2 What is the CLI?

The Command Line Interpreter (CLI) is the user interface to the RAID Array Controller. Using a connection between the controller's maintenance port and a Maintenance Terminal, 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 RAID Array 310 Configuration and Maintenance Guide for detailed descriptions of all CLI commands.

NOTE

The Maintenance Terminal can be any VT100 compatible terminal or terminal emulator. e.g.:

PC with a terminal emulation program, such as the Microsoft Windows Terminal program. You can also use most commercially-available communications programs. DEC VT100 or compatible terminal. On UNIX systems, ‘tip’, 'kermit', or ‘cu’ (see man pages) can be used as terminal emulation program.

2.3 Accessing the CLI

Access the CLI using a maintenance terminal. As an example we will describe the use of a PC with a terminal emulation program being used as a maintenance terminal. Refer to Section 1.7 in Chapter 1 of this guide (*Connecting the CLI Serial Interface*) for a description of how to connect the maintenance terminal to the RAID 310 controller if necessary.

2.3.1 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

2.3.2 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

```
HSZ20>
```

2.4 Show Initial Configuration

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

```
HSZ20> SHOW THIS_CONTROLLER FULL
```

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

```
CONTROLLER:
      HSZ20 CX44332211 FIRMWARE V31Z-0, HARDWARE A02
      SCSI ADDRESS 7
      TIME: NOT SET
HOST PORT:
      SCSI TARGET(S) (0, 1, 2) NO PREFERRED TARGETS
CACHE:
      16 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
      NO CACHE_UPS
      HOST FUNCTIONALITY MODE=A
LICENSING INFORMATION:
      RAID (RAID OPTION) IS ENABLED, LICENSE KEY IS VALID
      WBCA (WRITEBACK CACHE OPTION) IS ENABLED, LICENSE KEY IS
VALID
      MIRR (DISK MIRRORING OPTION) IS ENABLED, LICENSE KEY IS
VALID
EXTENDED INFORMATION:
      TERMINAL SPEED 9600 BAUD,EIGHT BIT,NO PARITY,1 STOP BIT
      OPERATION CONTROL:0000004 SECURITY STATE CODE:85780
      CONFIGURATION BACKUP DISABLED
```

Examine the display to verify the following information:

Controller SCSI target number is recommended to be set to 0.
If the target number is not 0, use the following commands to set the SCSI target ID for the controller (ensure that there are no other SCSI devices using the same IDs as configured for the RAID Array 310 controller):

```
HSZ20> SET THIS_CONTROLLER ID=0
```

or

```
HSZ20> SET THIS_CONTROLLER ID=(0, 1, 2)
```

If you want to use multiple SCSI Ids (as is done in the following examples).

Cache condition should be GOOD
If the Cache condition is BAD then call your sales person for unit service.

Battery condition should be GOOD
If the battery condition is LOW, allow the battery to charge with the subsystem power on for up to 6 hours. The battery must be fully charged to protect the data in the Write Back Cache. If the battery condition is still LOW after 6 hours of charging, then call your sales person for unit service.

NOTE

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

You can use the ADD RAIDSET and ADD MIRRORSET commands, regardless of the write-back cache battery condition. However, if the CACHE_POLICY is set to A and the battery is low, the controller does not allow access to any RAIDsets or mirrorsets. CACHE_POLICY A requires that the cache batteries be fully charged before you can use RAIDsets or mirrorsets.

CACHE_POLICY should be A

```
HSZ20> SET THIS_CONTROLLER CACHE_POLICY=A
```

Host function mode must be set to A for Solaris

```
HSZ20> SET THIS_CONTROLLER HOST_FUNCTION=A
```

License key should be VALID
If the License key is INVALID then enter the following:

```
HSZ20> 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.

Configuration backup can be enabled or disabled
Configuration backup will keep RAID Array controller configuration stored on disk, for detailed information regarding configuration backup see the *RAID Array 310 Configuration and Maintenance User's Guide.*

To cause the changed settings on the controller to take effect, restart the controller by:

```
HSZ20> RESTART THIS_CONTROLLER
```

NOTE

Up to 14 devices can be supported by the RAID Array 310 controller, the controller can represent up to 4 target ID's on the Host SCSI-bus.

You can increase the number of addressable units by setting the controller to respond to up to 4 target ID's, as long as those IDs are not used by any other device on the host bus. For example,

SET THIS_CONTROLLER ID=(0,1,2,3)

would set the controller to respond to any of the four IDs. If you set the controller to more than one ID, you must enclose the numbers with parentheses and separate them with commas.

After the RESTART command is initiated, it can take up to 60 seconds for the "CLI" prompt to re-appear.

2.5 Add Disks to the Configuration

The CONFIG utility locates and adds disks to the controller configuration. Run the CONFIG utility whenever you add new disks to the controller. Enter the following command to start the configuration utility:

```
HSZ20> RUN CONFIG
```

The controller responds with a display similar to that shown below. The disk numbers will correspond to the disk locations for your subsystem. (See Figure 2–1.)

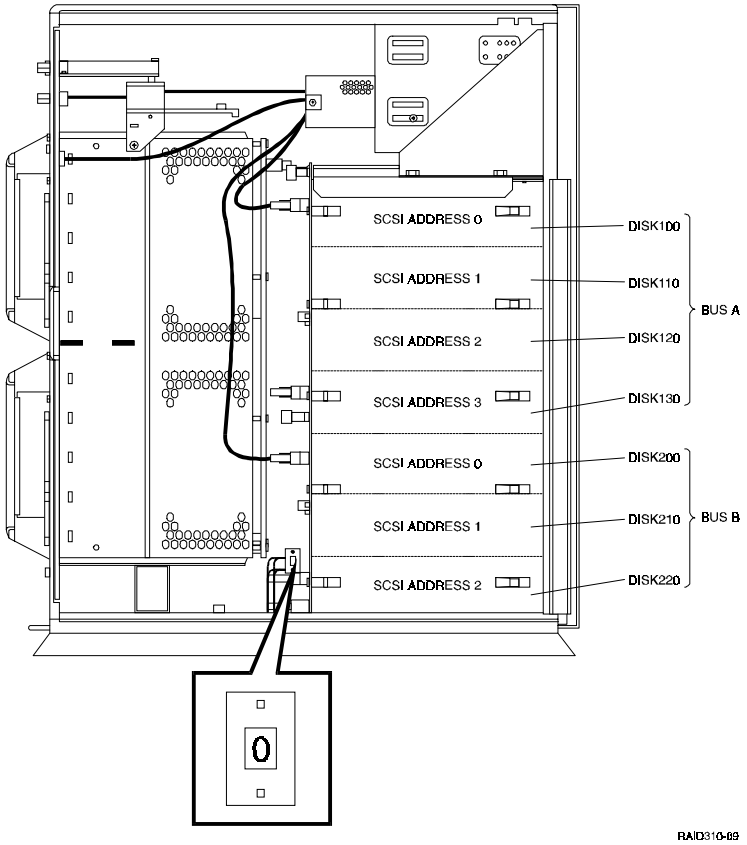
```
Config Local Program Invoked

Config is building its tables and determining what devices exist
on the subsystem. Please be patient.

add disk100 1 0 0
add disk110 1 1 0
add disk120 1 2 0
add disk130 1 3 0
add disk200 2 0 0
add disk210 2 1 0
add disk220 2 2 0
Config – Normal Termination
```

In the previous example, the controller has located 7 new disks. The 3 digit number associated with each disk corresponds to Bus Number, Target Number and Logical Unit Number (LUN). The LUN is always 0. DISK100, in this example, corresponds to the disk located on Bus 1, controller Target 0, and LUN 0. DISK210 corresponds to the disk located on Bus 2, controller Target 1, and LUN 0.

If you want to create a RAIDset for RAID 5, follow the guidelines in Section 2.7. For other raidsets, as listed below, follow the guidelines in Appendix D:

- STRIPEset refers to RAID 0
- MIRRORset refers to RAID 1
- Striped MIRRORset refers to RAID 0+1

Figure 2–1 Distribution Example



2.6 Setting Up a Communications LUN for a Command Console

Before installing the agent on the host system, at least one storage device must be configured on the RAID Array 310. This can be any type of storage device.

Select a storageset that you plan to configure and that is not likely to change. This storageset will also be used by the agent to communicate with the RAID Array. Deleting this storageset (LUN) later will break the connection between the agent and the RAID Array. Create the communications LUN as described in section 2.7 or Appendix D, depending on the type of storageset you want to use.

2.7 Create a RAIDset

The next sections contain examples of two different sets of configuration. Create a RAIDset, Mirrorset, and Stripeset show one set and Create a Striped Mirrorset shows the second set.

If your site requires RAIDsets for storage, you must assign disks to each RAIDset. RAIDsets must have at least three members, and can have as many as fourteen. This example creates one 3-member RAIDsets using the ADD RAIDSET command.

```
HSZ20> ADD RAIDSET RAIDS1 DISK100 DISK200 DISK110
```

In this example, "RAIDS1" is the name of the RAIDsets, and they are followed by a list of disks to be included in each RAIDset. The names of the RAIDsets are user-defined. Performance of your RAIDsets will be optimized if each RAIDset includes disks from different buses as shown in Figure 2–1. The example above contains disks from two different buses.

2.7.1 Initialize the RAIDset

You must initialize RAIDsets before you can put them into service.

When you initialize a RAIDset, you can specify a chunksize. A chunksize is the number of blocks of data that is transferred to a raidset member at one time. By using the default chunksize, the controller will select a chunksize that works well for most site requirements. Refer to the *RAID Array 310 Configuration and Maintenance Guide* for the specific default chunksize. When no chunksize is specified, the default value is used.

```
HSZ20> INITIALIZE RAIDS1
```

or if the save configuration option is used,

```
HSZ20> INITIALIZE RAIDS1 CHUNKSIZE=DEFAULT SAVE_CONFIGURATION
```

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. When no CHUNKSIZE is specified, the default value is automatically used. Refer to *the RAID Array 310 Configuration and Maintenance Guide* for more detailed information.

The SAVE_CONFIGURATION option can be used to save the controller configuration on the disk(s) defined in the containerset. In case of a controller failure, it is possible to retrieve the configuration information from the failed controller to the new controller. It is advised to use this option on more than one disk in different containersets so that the information is stored in a redundant manner. For detailed information describing this option and the way of retrieving controller information in case of a controller replacement, refer to the *RAID Array 310 Configuration and Maintenance Guide.*

2.7.2 Add the RAIDset as a Logical Unit

To make a RAIDset available to the host computer, you must add it as a host logical unit with a unique unit number. The unit number is a one or three digit number preceded by "D", such as "D0" or "D102". The unit number consists of the controller's target ID and the Logical Unit (LUN) of the RAIDset for the target. Each target ID can have up to eight LUNs, numbered 0–7.

- Units identified with controller target ID 0 have a single digit number which corresponds to the LUN number. For example, D5 would be target 0, LUN 5.
- Units identified with all other controller targets (1–7) use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit is the LUN number. For example, D205 would be target 2, LUN 5.

Identify the RAIDsets as host logical units by using the ADD UNIT command.

```
HSZ20> ADD UNIT D0 RAIDS1
```

This example creates LUN 0 for controller target ID 0 (specified earlier with the *set this_controller* command).

2.7.3 Set Writeback Cache

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

```
HSZ20> SET D0 WRITEBACK_CACHE
```

Where D0 represents the host logical units of the RAIDsets created above.

2.7.4 Verify and Record Your Configuration

NOTE

Your configuration may be saved on disk using the SAVE CONFIGURATION command. Refer to the *RAID Array 310 Configuration and Maintenance Guide* for a detailed description of this command.

You have now completed all the steps required to create an initial configuration on your controller.

3

Installing the SCSI Host Adapter Hardware

In preparing your array for first time use, you need to connect your workstation to the subsystem through the SCSI host adapter board. This chapter, along with your workstation and the associated StorageWorks RAID Array 310 Subsystem manuals, provides for preparing and installing the host adapter and the subsystem enclosure.

NOTE

References to Solaris 2.x are used interchangeably with Solaris versions 2.4, 2.5, or 2.5.1 throughout this guide.

3.1 Getting Started

At this point you have assembled your StorageWorks RAID Array 310 Subsystem and CLI serial interface to your host or maintenance terminal according to the instructions outlined in Chapter 1. In this chapter you will:

- Install the SCSI host adapter in the Sun host system
- Connect the StorageWorks RAID Array 310 Subsystem hardware to the Sun host

NOTE

Installing the StorageWorks RAID Array 310 Subsystem and host adapter hardware for Sun requires a general understanding of the following:

- SPARC systems
- Solaris administration
- Basic hardware installation procedures

or, contact your reseller or 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 310 Subsystem platform kit
- Follow your normal procedures to back up your system files

3.1.1 Verifying User Supplied Hardware and Software (System Requirements)

The StorageWorks RAID Array 310 Subsystem requires the following user-supplied hardware and software:

- SPARCstation (except SPARCstation 1 and SPARCcenter 2000), SPARCserver, or SPARCcenter host
  - A CD-ROM drive
  - An available SBus slot for the SCSI adapter
  - 5 MB of disk space for installation and regular use
  - The associated system hardware manual
- Appropriate tools to service your computer
- The Solaris 2.4, 2.5, or 2.5.1 operating system

3.1.2 Verifying The StorageWorks RAID Array 310 Platform Kit and Subsystem Components

The StorageWorks RAID Array 310 Platform Kit provides the following components:

- This guide
- The StorageWorks for RAID Array 310 V3.1 for Sun Release Notes
- The DIGITAL License Agreement
- An SBus SCSI-2 Host Adapter
- A BN21G-xx SCSI cable with two straight high-density 68-pin connectors
- StorageWorks RAID Array 310 for Sun distribution media on one CD-ROM disk

The RAID Array 310 Subsystem provides the following components:

- The *RAID Array 310 Deskside Subsystem Hardware User's Guide*
- *The RAID Array 310 Configuration and Maintenance User's Guide*
- The StorageWorks RAID Array 310 Deskside Subsystem RAID Enclosure
- A cable, plus adapters, for connecting the maintenance port of the controller to the serial port of a personal computer, video terminal, or Sun computer system
- Power cables
- Enclosure Keys
- RAID Array 310 Controller Firmware License Keys

NOTE

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

3.1.3 Backing up Your System

Follow your normal procedures to back up your system before installing the subsystem and the RAID software.

3.2 Preparing and Installing the SBus SCSI-2 Host Adapter

The RAID subsystem runs off the provided SCSI-2 Host Adapter. The SBus SCSI-2 host adapter is an SBus-to-SCSI fast 16-bit differential host adapter. You connect your computer to the RAID Array 310 Subsystem through the host adapter and a connecting cable.

You need the following before you begin:

- The SBus SCSI-2 host adapter board (use precautions to protect the board from static discharge)
- Your computer system hardware manual
- Appropriate tools to service your computer
- The BN21G-xx SCSI cable with two straight high density 68-pin connectors

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

3.2.1 Preparing to Install the SBus Host Adapter

Before performing the installation of the host adapter in your Sun system, take precautions to protect the board from electrostatic discharge. Then perform the following steps:

NOTE

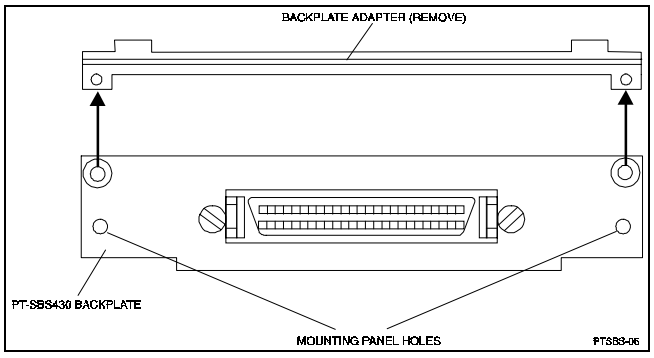
The installation procedure varies depending upon which model of the SPARC system you are using. Watch for model specific deviations throughout this procedure.

1. Cleanly shut down the Sun System.
2. Power down the SPARCstation and attached peripherals.
3. Open your system. Refer to the system manual for help in completing this procedure.
4. Proceed to Section 3.2.2 or 3.2.3 depending on the model of your host system.

3.2.2 Installing the Host Adapter in SPARCstations 10 and 20

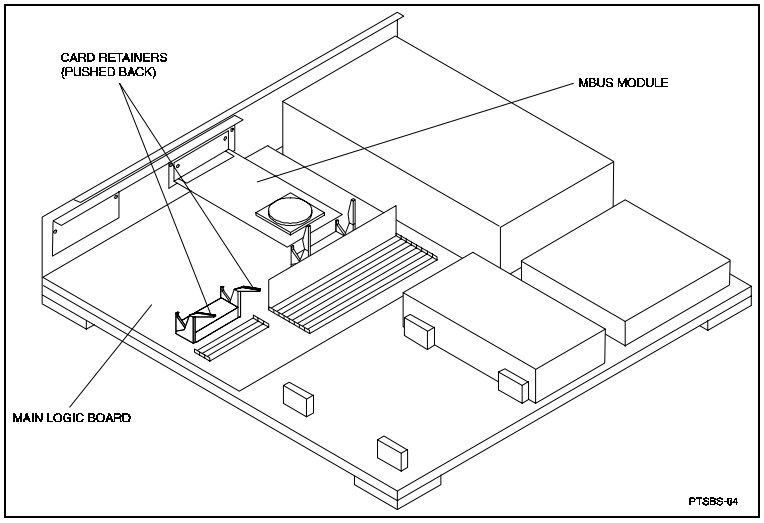
1. Unscrew the two small Phillip-head screws to remove the back plate adapter, shown in Figure 3–1, from the Sbus to FWD SCSI-2 host adapter.

Figure 3–1 Backplate Adapter



2. Locate the lowest numbered SBus slot available in your Sun system. Refer to your system manual for Sbus slot numbering. Use this slot to install the host adapter so that device addresses will not change if you add a board later.
3. Push back both retainers on the selected SBus slot in your Sun system as shown in Figure 3–2.

Figure 3–2 The SBus Card Retainers

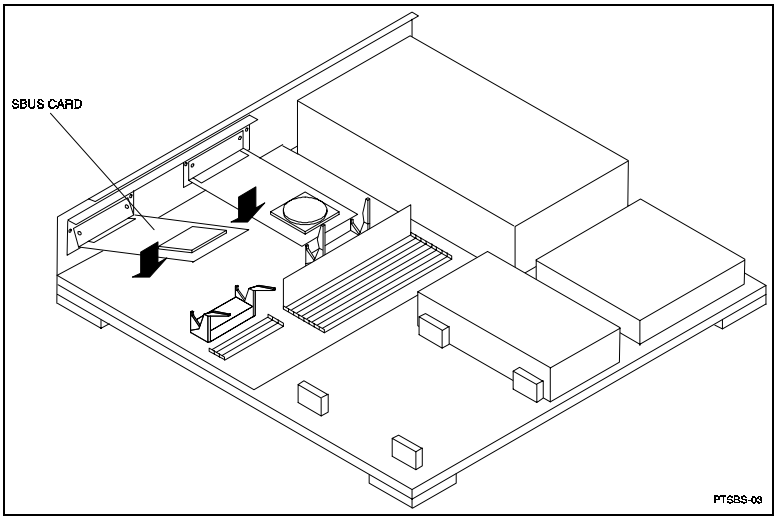


CAUTION

The plastic board retainer on the host adapter fits against the cover and holds the SBus card in place. It is not a handle; it can break if you use it to insert or remove the board.

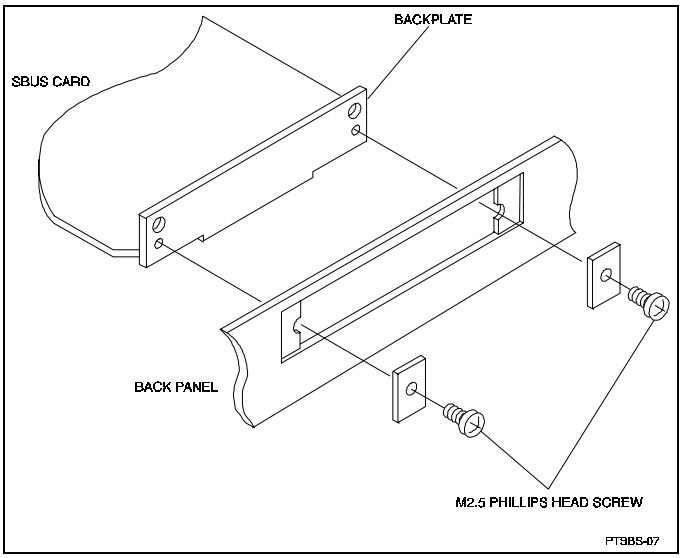
4. Align the host adapter connector with the SBus slot socket and gently push the connector into the socket by pressing on the corners of the board as shown in Figure 3–3.

Figure 3–3 The SBus Card Connects by Gently Pressing on the Corners of the Board



5. Screw the backplate of the SBus card to the system unit back panel as shown in Figure 3–4.

Figure 3–4 The SBus Card Mounting Plate in a SPARCstation 10 or 20



6. Push the SBus slot retainers forward onto the SBus host adapter board, locking it into place.
7. Tighten any screws that you loosened and close the system.
8. Proceed to Section 3.3 to install your subsystem.

3.2.3 Installing Host Adapter in All Other Systems (Except SPARCstations 10 and 20)

1. Slide the board at an angle into the top of the Sun system back panel as shown in Figure 3–5.
2. Hook the host adapter mounting plate (shown in Figure 3–5) upward into the back panel of the system unit. As you swing the board down towards the card retainers, the back panel tabs will align the SBus card vertically and horizontally in the back panel cutout.

   If the card does not swing into position easily, adjust the horizontal position of the SBus card so that the notches on the card line up with the tabs on the back panel as shown in Figure 3–6.

Figure 3–5 The SBus Card Mounting Plate Hooked Into the System Unit Back Panel SBus Card Retainers

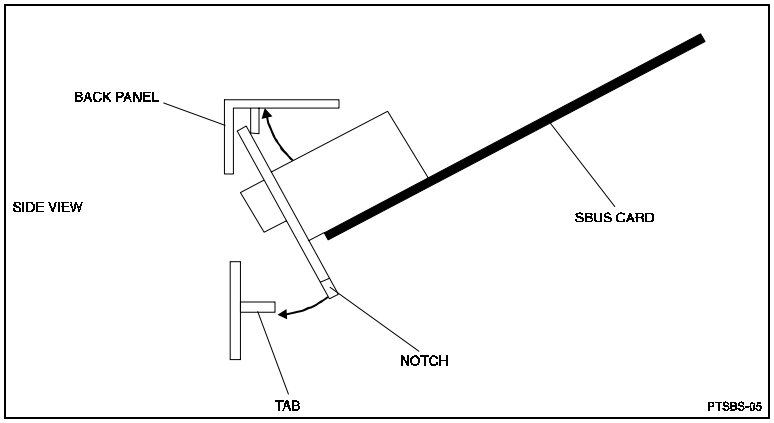
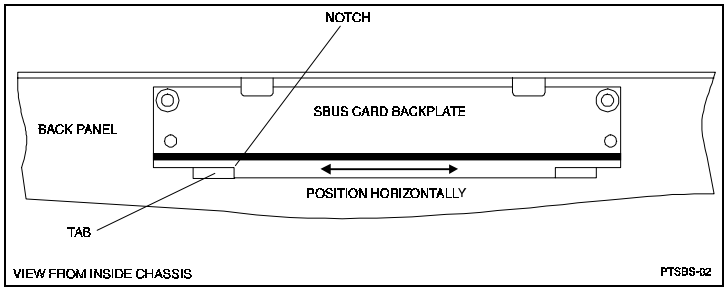


Figure 3–6 How the Notches on the SBus Card Line up with the Tabs on the System Unit Back Panel



3. Align the host adapter connector with the Sbus slot socket and gently push the connector into the socket by pressing on the corners of the board as shown in Figure 3–6.
4. Push the Sbus slot retainers forward onto the Sbus host adapter board locking it in place.
5. Tighten any screws that you loosened and close the system.
6. Reconnect any cables from the peripheral devices.

3.3 Installing the Subsystem

1. Using the keys provided, unlock the RAID 310 Array Enclosure.
2. Install any additional disk StorageWorks Building Blocks (SBBs) up to a maximum of seven SBBs. Holding the SBB 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 BN21G-xx cable between the host system and the SCSI bus connector on the rear panel of the subsystem. Similarly, connect the (other end) straight connector to the host system S-bus SCSI adapter.

4

Installing the SCSI Host Adapter Driver on Solaris 2.x

This chapter describes the StorageWorks RAID Array 310 Software for Sun, and the steps for installing it and associated device drivers onto Sun systems running Solaris 2.4, 2.5, or 2.5.1. The installation steps include organizing your system and existing files, setting up a RAID environment, and loading the RAID CD-ROMs onto your hard disk.

NOTES

References in this manual to Solaris 2.x should be assumed to mean Solaris 2.4, 2.5, or 2.5.1.

The # symbol represents the system prompt.

4.1 Installing the SCSI Host Adapter Driver for Sun on Solaris 2.x

The procedures for installing the RAID 310 software for Sun on 2.x require you to be familiar with adding and removing *packages*. See the "*Adding and Removing Packages"* section in the *Solaris System Configuration and Installation Guide* for more information about *packages*.

Installing the host adapter driver on Solaris 2.x requires the following major steps:

- Organizing Your System and Existing RAID Software Files (Section 4.1.1)
- Installing RAID Array 310 CC agent packages onto the hard disk (Section 4.1.2)
- Post-Installation Tasks (Section 4.2)

4.1.1 Organizing Your System and Existing RAID Software Files

Perform the following procedures prior to installing:

1. Back up your system according to your normal procedure.
2. Delete any existing DECptisp package using the command # **`pkgrm DECptisp`**

4.1.2 Installing the CC Agent Packages onto the Hard Disk

The CC Agent software consists of the DECptisp (SCSI adapter driver) and the DECswm310 (the CC Agent) packages.

Installing the RAID array 310 Manager packages requires the following major steps:

> **NOTE**
>
> Skip step 2 below, if your RAID subsystem is connected to the Sun DWIS/S, P/N x1062A, host adapter.

1. Mounting the CD-ROM.
2. Loading the *DECptisp* package.
3. Loading the *DECswm310* package.
4. Rebooting your computer.
5. Configuring the *DECswm310* package.

> **NOTE**
>
> An installation session example is shown in detail at the end of this appendix.

4.1.2.1 Mounting the CD-ROM

1. Check whether the volume management daemon (vold) is currently running. Type:

   # **ps -ea | grep vold**

2. Follow the steps below for "vold currently running" or "vold not currently running," as applicable:

If *vold* <u>is</u> currently running, then:

a. Insert the CD-ROM into the CD-ROM drive.

b. Use the *mount* command to check that the volume manager has automatically mounted the CD-ROM, by typing:

```
# mount
```

> **NOTE**
>
> The system may take a few seconds to mount the CD-ROM. If the mount command does not indicate that the CD-ROM has been mounted, wait a short interval and then repeat the command.

c. Change to the Solaris directory, type:

cd /cdrom/stgwks310_v31/agents/

If *vold* is not currently running, then:

a. Insert the CD-ROM into the CD-ROM drive.

b. Mount the CD-ROM. For example, type:

```
# mount -F hsfs -r /dev/dsk/c0t6d0s2 /cdrom
```

c. Change to the Solaris directory, type:

```
# cd  /cdrom/agents/
```

d. Go on to Section 4.1.2.2 (loading DECptisp) if you are using the supplied PTI SBS440A SCSI adapter, or skip to section 4.1.2.3 (loading DECswm310) if you are using the Sun SCSI X1062A adapter.

4.1.2.2 Loading DECptisp

> **NOTE**
>
> Skip this section if you are using the Sun DWIS/S, P/N X1062A, host adapter.

To install the SCSI host adapter driver files, ***DECptisp***, follow these steps.

Type:

```
# ./install_stgwks
```

A menu appears listing the available packages. Enter **q** at any prompt if you want to quit this installation process.

Select the ***DECptisp*** package or hit *ENTER* to install both packages. This will load the ***DECptisp*** package and the ***DECswm310*** package in one step.

> **NOTE**
>
> Unlike previous installations, you do not have to reboot between package installations.

4.1.2.3 Loading *DECswm310*

1. Select the ***DECswm310*** package.
2. Follow the on-line instructions.
3. After installation, press **q** to exit *pkgadd*. The *pkgadd* program prompts you to reboot your computer system. Before rebooting, you may want to modify the files "sd.conf" in the /kernel/drv directory if you selected "quit" at the “continue with edit option”from the "select SCSI adapter" menu during the install.

4. Check that the following shared libraries are available in */usr/lib*. If any are missing, you will have to load them from the Solaris distribution media before proceeding.

   libsocket.so.1

   libnsl.so.1

   libthread.so.1

   libc.so.1

   libdl.so.1

   libintl.so.1

   libmp.so.1

   libw.so.

> **NOTE**
>
> As delivered, these files support the configuration of LUNs 0 through 7 at SCSI targets 0 through 6. Removing unused target and LUN entries from these files will decrease the time spent on RAID SCSI bus scans at system boot but makes them unavailable to your system.

To reboot, do the following:

```
# cd /
# shutdown -y -i6 -g0
```

Then wait for the *Console Login* prompt.

> **NOTE**
>
> During boot you may see a message like:
> WARNING:
> /sbus@1,f8000000/PTI,ptisp@2,1000/sd@s,1
> (sd32):
> corrupt label - wrong magic number
>
> This is because a LUN you configured earlier is not yet labeled.

4.2 Post-Installation Tasks

After completing the procedures in this guide, you need to perform the following which is described in Chapter 5:

- Label the new LUN(s) as created in Chapter 2
- Optimize filesystem performance

5

Installing and Configuring the Command Console Agent

This chapter contains instructions for installing Command Console, a Graphical User Interface (GUI), and creating your first volume.

5.1 Introduction

This chapter describes how to install and use Command Console software to create your first volume, a 5/3 RaidSet. Do the sections in order. At the end of this chapter you will have created your first logical volume.

Procedure summary:

- Install Command Console software.
- Launch Command Console.
- Establish communications with the controller over the serial port.

Connection methods:

There are three ways to connect to your RAID 310 Array.

- Serial Port – This method is covered in this chapter and is the recommended method for local, direct connection to your array. Select a method to create your first volume. Sun uses CLI.
- SCSI Bus – A local connection method, SCSI bus connection is covered in the Command Console User's Guide.
- Network Connection – You can communicate with your RAID 310 Array over a TCP/IP network. Communication is by means of the agent process. Paragraph 5.5 of this chapter describes this method.

A note on communicating over a network:

If you are planning to configure and monitor your RAID Array 310 over a network, one volume must be created for network communications. This volume, the "communications" volume, is created using the serial port. DIGITAL recommends creating and designating a RAID 5/3 volume as the "communications" volume. RAID 5/3 is highly reliable and provides the most stable communication link. Once the communications logical unit is created, the SWCC Agent can be installed.

5.2 Installing Command Console Software in the Management Station

Command Console installs from the *RAID_ARRAY310_V31* CD-ROM disk using a standard Windows installation routine. Command Console installs on an Intel-based Windows 95 or an Intel- based Windows NT platform. (The platform is referred to as the Management Station.) The program is self-extracting and stores Command Console into the directory `C:\Command_Console` by default. You have the option to change the disk or directory location. To install Command Console:

1. Place the disk in the CD-ROM drive.
2. Open the File menu in the Program Manager.
3. Select the `RUN` option.
4. In the text box, type

   drive_letter:**`\client\install`** and click OK.

5. Follow the instructions in the setup program to complete the installation.

> **NOTE**
>
> The Management Station must be either an Intel- based Windows NT platform or an Intel-based Windows 95 platform.

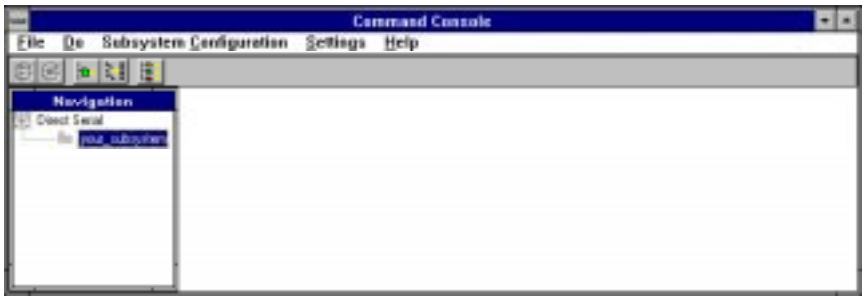
5.3 Launching Command Console

Launch the Local Version (serial port communications) of Command Console by typing:

`swcc.exe direct`

in the *RUN* dialog command-line box and pressing Enter. Command Console displays the Control Panel (Figure 5–1).

Figure 5–1 Command Console's Control Panel



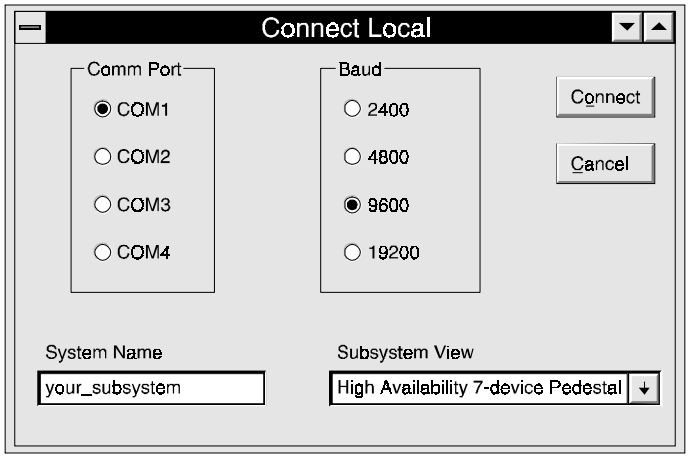
A Divider Bar splits the Control Panel into two smaller windows: the Navigation Window (on the left) and the Subsystem Window (on the right). The Subsystem Window lets you view, configure and monitor the storage subsystem shown in the Navigation Window. The Control Panel also has a Menu Bar and below it a Toolbar. For more information on Command Console's windows, menus, and tools, refer to the *Command Console User's Guide*.

5.4 Establishing Communications with the 310 Array

The simplest connection to your storage subsystem is a direct, cable connection from the Management Station (the host system running Command Console) to one of the storage subsystem's serial maintenance ports. To establish a serial connection proceed as follows:

1. Launch the Local Version of Command Console.
2. Select the **Settings | Controller Communications | Serial** command to display the dialog box shown in Figure 5–2.

Figure 5–2 Connect Local Dialog Box (for Serial Connection)



3. Select the appropriate communications port and select the 9600 baud rate for your subsystem.

> **NOTE**
>
> Default communication parameters for the RAID 310 controller are 9600 baud, 8 bits, no parity, one stop bit.

4. Enter a name for your storage subsystem or leave the default name.
5. Click on *Connect.*

> **NOTE**
>
> Command Console connects to the subsystem's controller by means of its serial maintenance port and the subsystem icon turns green. A red icon indicates a communication problem between Command Console and your subsystem. If communication problems occur, recheck the connection and the settings.

5.5 Communicating over a Network

To communicate with your RAID Array 310 over a network, two software applications are required: an agent and a client. The client is a Graphical User Interface which installs and runs on a system designated as a Management Station. From the Management Station you can configure and monitor your RAID Array. The agent installs and runs unseen in the background on the storage subsystem's host computer. First you install the agent and then the client. Together the two provide the software link required for communication over a network.

The Agent:

The agent runs on the host system as a server application and connects to Command Console via the TCP/IP network protocol. To establish communication over a network, you must install the agent in the storage subsystem's host system.

The agent provides the software interface between the host storage subsystem and any number of Command Console (client) sessions running on either the host or remote system, allowing you to configure and monitor your storage subsystem from many locations.

The agent provides access protection and asynchronous fault notification. You can configure the agent to use TCP notification to Command Console or SNMP notification to an SNMP-compatible monitoring application.

The Client:

In this document the client is called Command Console. Command Console is the control interface for your RAID Array. Before you can communicate with your storage subsystem over a network, the subsystem and host system must be added to Command Console's database.

NOTE

The Management Station must be either an Intel- based Windows NT platform or an Intel-based Windows 95 platform.

5.6 Agent Connection Licensing

The basic network version of Command Console comes with a built-in license to connect to one agent program. To run more than one agent, you must purchase a multi-agent license.

The license number determines the number of agents you can connect Command Console (the client) to. The Command Console **Settings | License Upgrade** command accesses the license number dialog box.

5.7 Before You Start

- Your system resources must meet the minimum requirements listed in Table 5–1.

Table 5–1 Minimum Management Station System Requirements

Host Feature	Requirement
PC Requirements	Intel 486, 66 MHz, 16 MB memory, 1 MB free disk space, and CD-ROM drive
Operating System	Microsoft Windows 95, Windows NT 3.51 or NT 4.0
Network Connection	TCP/IP-compatible network card
Controller Compatibility	StorageWorks RAID 310 controller running operating firmware Version 3.1 or higher.

- Decide if you need password protection for the agent's host system. You may specify a password during the agent's installing routine.
- You will also need the IP name of Command Console's host system and you need to name the storage subsystem(s) connected to the agent's host system.
- You need to have installed TCP/IP services on your NT server.
- You need to have created a "communications" volume on your RAID 310 Array using Command Console and a serial port connection and assigned a Windows NT drive letter to the "communications" volume using the Disk Administrator.

5.8 Installing and Configuring the CC Agent

5.8.1 Selecting the CC Agent Installation and Configuration Method

You must install and run the CC Agent for Solaris on each SPARC system you wish to manage from a CC Client over the network.

The fastest and most user-friendly method of configuring the CC Agent is to use the configuration script. Use of the script is the recommended method for configuring the CC Agent. To install automatically, using the script, go to Section 5.8.2.

If you wish, however, you can manually install and configure the CC Agent by copying the files off CDROM and editing the CC Agent's configuration files with a text editor.

5.8.2 Installing and Configuring Automatically

NOTE

Prior to installing the CC Agent, ensure that the write-back cache battery is fully charged. This is accomplished by supplying power to the RAID controller for a minimum of 5-6 hours.

References in this manual to Solaris 2.x should be assumed to mean Solaris 2.4, 2.5, or 2.5.1.

The # symbol represents the system prompt.

The procedures for installing the CC Agent for Sun on Solaris 2.x require familiarity with adding and removing *packages, and general Unix System Administration skills*. See the "*Adding and Removing Packages"* section in the *Solaris System Configuration and Installation Guide* for more information about *packages*.

Installing the CC Agent on Solaris 2.x requires the following major steps:

- Preparing for the Installation
- Loading RAID Array 310 Manager packages onto hard disk (Section 5.8.4)
- Setting up your CC Agent environment (Section 5.8.3)

5.8.3 Preparing for the Installation

Back up your system according to your normal procedure.

5.8.4 Setting up your CC Agent Environment

To set up your CC Agent Environment, follow these steps:

1. Select a system user with superuser privileges (for example: root) as the RAID administrator.
2. Log in as the RAID Administrator.
3. To find a file system with at least 250 KB free space, type:

   # df -k
4. Choose a base directory in which to install the CC Agent software. A good choice is /opt. Remember which directory you specified, you will need to know this when running the installation script.
5. Please refer to the section titled Loading *DECswm310* in Chapter 4 for more information on the installation of the CC agent software. The CC agent software is contained in the *DECswm310* package.

NOTE

The "base directory" (referred to when installing the CC Agent Software package) will have a steam subdirectory created under it. This is the directory that the files will be installed to.

5.8.5 Configuring the CC Agent

5.8.5.1 Starting the Configuration Script

To configure the CC Agent, run the *config_stgwks* script in *"basedirectory"/steam/bin:*

Type:

```
#cd "basedirectory"

#./config_stgwks
```

This displays the main menu shown in Figure 5–3.

Figure 5–3 Main Menu

```
                ----  RAID Array 310 v3.1 Configuration Menu ----

   Agent Admin Options                Storage Subsystem Options
   ---------------------------        -------------------------
     1) Change Agent Password         12) View Subsystems
     2) Change SNMP Enterprise OID    13) Add a Subsystem
     3) Start/Stop the Agent          14) Remove a Subsystem
     4) Toggle Agent Startup on System Boot  15) Modify a Subsystem
     5) Uninstall Agent

   Agent Notification Options         Client Options
   ---------------------------------  -----------------
     6) Toggle Error Log Notification      16) View Clients
     7) Toggle Mail Notification           17) Add a Client
     8) View Mail Notification List        18) Remove a Client
     9) Add User to Mail Notification List 19) Modify a Client
    10) Remove User from Mail Notification List
    11) Modify Mail Notification List

   Exit:                              Escape:
   ----                               ---------
     q) Quit                          ^C) Escape (control-c)
Enter Selection: 12
```

5.8.5.2 Choosing a Password

Select *1* from the *Agent Admin Options* group to set a password to protect your storage subsystems from unauthorized access. Any client with configuration privileges will be asked for this password when attempting to configure the storage subsystem.

5.8.5.3 Adding a Subsystem

Any disk belonging to the subsystem can be used for this procedure, but don't delete the LUN from the subsystem when reconfiguring, as this breaks the communication link to the CC Agent for the entire subsystem.

From the *Storage Subsystem Options* group, select *12***,** to *View Subsystems.* An empty table displays. Before starting the CC Agent, you must add at least one subsystem you wish to communicate with. The subsystem name is arbitrary, but use only lower-case characters to specify it. Associate the name with a storage subsystem by picking a LUN name; for example, *clt0d0*, which the *format* command output displays as belonging to the RAID subsystem. This is evident from the controller number and SCSI target address used.

Append **s2** to *format's c*l*t*m*d*n* when entering as the *character special file name*, as a partition is required.

Check that this partition exists by entering *format's partition* and *print* commands.

Enter a monitoring interval; for example, 20 seconds, and press the Enter key twice to return to the *Main Menu.*

5.8.5.4 Adding a CC Client

From the *Client Options* group, select *19, View Clients* to see the authorized client list. *Steamd* will not run on an empty client file, so *localhost* has been added, with Error Notification turned off. If you add clients, it's all right to remove *localhost*, with the provision that *localhost* must be retained if all other clients are removed.

When adding a client, enter the client's network name (for example, winpc); which is an access privilege code. Specify 2 if the manager/client is allowed to configure the subsystem. Also add an Error Notification Level (1 for TCP sockets, 2 for SNMP protocol, or 3 for both).

5.8.5.5 Restarting the CC Agent

After you make any changes to the CC Agent, the CC Agent daemon must be stopped and restarted. This ensures that the changes to the configuration files are interpreted.

5.8.6 Preparing LUNs for Use by the System

Each LUN created on the RAID Array 410 appears as a SCSI hard disk to the host. Therefore, it must be labeled before it can be used and, in most instances, a new file system must be created.

5.8.6.1 Labeling LUNs

A LUN is labeled using the */etc/format* utility. The label contains information about the LUN such as controller-type, geometry, and partitions. More details about the use of the format utility may be found in the *Sun 2.x Adding and Maintaining Peripherals* Manual.

5.8.6.2 Labeling a LUN Automatically Using the Format Utility

Sun Solaris releases 2.4 and above have the capability of automatically generating a label for SCSI disks. To access this capability while in the *format* utility, select the desired disk, then from the *type* menu, select "0".

Example:

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c0t3d0 <SUN0424 cyl 1151 alt 2 hd 9 sec 80>/.../sd@3,0
1. c1t0d0 <DEC-HSZ20–V31Z cyl 12841 alt 2 hd 14 sec57>/sd@0,0
Specify disk (enter its number): 1
selecting c1t0d0
[disk formatted]
FORMAT MENU:
        disk-           select a disk
        type-           select (define) a disk type
        partition  -    select (define) a partition table
        current    -    describe the current disk
        format     -    format and analyze the disk
        repair     -    repair a defective sector
        label      -    write label to the disk
        analyze    -    surface analysis
        defect     -    defect list management
        backup     -    search for backup labels
        verify     -    read and display labels
        save       -    save new disk/partition definitions
        inquiry    -    show vendor, product and revision
        volname    -    set 8-character volume name
        quit
format> type
AVAILABLE DRIVE TYPES:
0.  Auto configure
1.  Quantum ProDrive 80S
2.  Quantum ProDrive 105S
3.  CDC Wren IV 94171-344
4.  SUN0104
5.  SUN0207
6.  SUN0327
7.  SUN0340
8.  SUN0424
9.  SUN0535
10.  SUN0669
11. SUN1.0G
12. SUN1.05
13. SUN1.3G
14.  SUN2.1G
15.  other
Specify disk type (enter its number)[19]: 0
configured with capacity of 4.89GB
cyl 12841 alt 2 hd 14 sec 57>
selecting c1t0d0
[disk formatted]
format> label
Ready to label disk, continue? yes
format> quit
```

Note that the default partition layout when using the automatic mode is of the form,

. partition 0: ~128MB

partition 1: ~128MB

partition 2: entire disk

partition 6: partition 2 - (partition 0 + partition 1)

partitions 3,4,5,7: empty

NOTE

You may modify the partition table by entering "partition" at the format menu prompt level. Label the disk after any changes to the partition table are made.

After creating the custom *format.dat* entry use the format utility to label the LUN. More details about the creation of *format.dat* entries may be found in the Sun *Solaris 2.x Adding and Maintaining Peripherals* Manual.

5.8.7 Installing and Configuring the CC Client

Follow the instructions in Chapter 6 to install the CC Client on a Windows 95 or Windows NT platform. Note that your network connection must be working properly, before the CC Client will connect to your CC Agent. For more information, refer to your system and/or network documentation.

5.8.8 Filesystem Creation and Tuning

Before the new LUN can be used by the system, a new filesystem must be created on each partition that will be mounted. The *newfs* command is used to create filesystems, and the *tunefs* command is used to modify existing filesystems. See the man pages for the *newfs* and *tunefs* commands for more information.

To create a new filesystem, use the following command:

```
# newfs -C7 -d0  /dev/dsk/c1t0d0s2
```

To modify an existing filesystem use:

```
# tunefs -a7 -d0 /dev/dsk/c1t0d0s2
```

These commands set *maxcontig* to 7 and *rotational delay* to 0. These recommendations may not optimize your system performance so you may want to experiment with other values.

6

Installing the Command Console Client

This chapter describes how to install a copy of the Command Console (CC) Client on each of your client systems.

6.1 Introduction

The Command Console (CC) Client is the Graphical User Interface (GUI) for configuring and monitoring your StorageWorks RAID Array 310 subsystem. It runs only on an Intel-based Windows 95 or Windows NT system. Install the Client software on your system using the information described below.

6.2 Installing the Client Program

NOTE

The version of Command Console that is bundled with StorageWorks RAID Arrays is licensed to manage a single array on one host server. To manage multiple hosts from a client management station, Command Console Plus must be purchased.

Install a copy of the Command Console Client program on each of the Intel-based systems on your network from which you want to configure or monitor a StorageWorks RAID Array 310 subsystem.

Before you can install Client, make sure that the system you'll be installing it on meets the minimum requirements listed in Table 6–1.

Table 6–1 Minimum CC Client System Requirements

Architecture	Intel 486/66 MHz, 16 MB memory, 10 MB free disk space, CD-ROM drive
Operating system	Windows NT 3.51 (build 1057 or later) or Windows 95 (build 950 or later)
Graphics Subsystem	VGA or better.
Input devices	Keyboard, mouse
Modem	Optional
Serial port (for connection via serial port only)	Standard, PC serial port capable of at least 9600 baud.
Network adapter	TCP/IP-compatible network .
Controller compatibility	Controller running operating firmware Version 3.1 or higher.

NOTE

To ensure a complete installation, uninstall Command Console before replacing it with another version.

To install Command Console on Windows NT:

1. Place the RAID 310 upgrade CD in the CD-ROM drive.
2. Open the File menu in the Program Manager.
3. Select the RUN option.
4. In the text box, type **`drive_letter:\client\install`** and click OK.
5. Follow the instructions in the setup program to complete the installation.

To install Command Console on Windows 95:

1. Place the CD in the CD-ROM drive.
2. Select “My Computer”.
3. Double click on the CD-ROM drive icon.
4. Double click on the “client” icon.
5. Double click on “install.bat” icon.
6. Follow the instructions in the setup program to complete the installation.

Your Client program is installed!

Repeat these steps to install a copy of CC client on each of the systems from which you want to configure and monitor a StorageWorks RAID Array 310 subsystem.

This completes the installation of the Command Console Client.

6.3 Uninstalling Command Console

To uninstall Command Console, click the “Remove Command Console” icon in Windows NT. In Windows 95, use the “Add/Remove Programs” utility in the Control Panel.

7

System Administration of the RAID Array 310 for Sun

This chapter describes how to prepare LUNs for use by the Sun system (including how to label the LUN and how to create a file system).

7.1 Preparing LUNs for Use by the System

Each LUN created on the RAID Array 310 appears as a SCSI hard disk to the host. Therefore, it must be labeled before it can be used and, in most instances, a new file system must be created.

7.1.1 Labeling LUNs

A LUN is labeled using the *Solaris/format* utility. The label contains information about the LUN such as controller-type, geometry, and partitions. More details about the use of the format utility may be found in the Sun Solaris 2.x Adding and Maintaining Peripherals Manual.

Sun Solaris releases 2.4, 2.5, and 2.5.1 have the capability of automatically generating a label for SCSI disks. To access this capability while in the format utility, select the desired disk, then from the type menu select “0”.

Example,

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c0t3d0 <SUN0424 cyl 1151 alt 2 hd 9 sec 80>/.../sd@3,0
1. c1t0d0 <HSZ20 cyl 12841 alt 2 hd 14 sec57>/sd@0,0
Specify disk (enter its number): 1
selecting c1t0d0
[disk formatted]
FORMAT MENU:
        disk-           select a disk
        type-           select (define) a disk type
        partition  -    select (define) a partition table
        current    -    describe the current disk
        format     -    format and analyze the disk
        repair     -    repair a defective sector
        label      -    write label to the disk
        analyze    -    surface analysis
        defect     -    defect list management
        backup     -    search for backup labels
        verify     -    read and display labels
        save       -    save new disk/partition definitions
        inquiry    -    show vendor, product and revision
        volname    -    set 8-character volume name
        quit
format> type
```

```
AVAILABLE DRIVE TYPES:
0.  Auto configure
1.  Quantum ProDrive 80S
2.  Quantum ProDrive 105S
3.  CDC Wren IV 94171-344
4.  SUN0104
5.  SUN0207
6.  SUN0327
7.  SUN0340
8.  SUN0424
9.  SUN0535
10.  SUN0669
11. SUN1.05
12. SUN1.3G
13.  SUN2.1G
14.  other
Specify disk type (enter its number)[19]: 0
c1t0d0: configured with capacity of 4.89GB
<HSZ20-V31Z cyl 12841 alt 2 hd 14 sec 57>
selecting c1t0d0
[disk formatted]
format> label
Ready to label disk, continue? yes
format> quit
```

Note that the default partition layout when using the automatic mode is of the form,

partition 0: ~128MB

partition 1: ~128MB

partition 2: entire disk

partition 6: partition 2 - (partition 0 + partition 1)

partitions 3,4,5,7: empty

NOTE

You may modify the partition table by entering "partition" at the format menu prompt level. Don't forget to label the disk after any changes are made.

7.1.2 Filesystem Creation and Tuning

Before the new LUN can be used by the system, a new filesystem must be created on each partition that will be mounted. The *newfs* command is used to create filesystems, and the *tunefs* command is used to modify existing filesystems. See the man pages for the *newfs* and *tunefs* commands for more information.

To create a new filesystem, use the following command:

```
# newfs -C7 -d0  /dev/dsk/c1t0d0s2
```

To modify an existing filesystem use:

```
# tunefs -a7 -d0 /dev/dsk/c1t0d0s2
```

These commands set *maxcontig* to 7 and *rotational delay* to 0. These recommendations may not optimize your system performance so you may want to experiment with other values.

Congratulations!

You have completed the installation of your RAID ARRAY 310.

A

Host Adapter Error Messages

This appendix provides a list of host adapter error messages as returned by the array controller. This information, along with the SCSI sense and error codes, can be used for monitoring performance of the array and for troubleshooting.

A.1 Host Adapter Error Messages

This section lists the error messages for the PT-SBS440A host adapter. Controller errors have priority over SCSI errors. These errors are reported during operation and usually just result in an error report. The upper level target drivers will rerun the command that failed. These messages may appear on the system console, as well as being logged. Table A–1 lists messages that may be displayed while the *ptisp* driver is first trying to attach. All of these messages mean that the *ptisp* driver was unable to attach. These messages are preceded by "ptisp%d" (where "%d" is the instance number of the PT-SBS440A controller).

Table A–1 Error Messages from the Host Adapter

Device in slave-only slot, unused The SBus device has been placed in a slave-only slot and will not be accessible; move the device to a non-slave-only SBus slot.
Device is using a hilevel intr The device was configured with an interrupt level that cannot be used with this ptisp driver; check the SBus device.
Failed to alloc soft state Driver was unable to allocate space for the internal state structure. Driver did not attach to device; SCSI devices will be inaccessible.
Bad soft state Driver requested an invalid internal state structure. Driver did not attach to device; SCSI devices will be inaccessible.
Unable to map registers Driver was unable to map device registers; check for bad hardware. Driver did not attach to device; SCSI devices will be inaccessible.
Cannot add intr Driver was not able to add the interrupt routine to the kernel. Driver did not attach to device; SCSI devices will be inaccessible.
Unable to attach Driver was unable to attach to the hardware for some reason that may be printed. Driver did not attach to device; SCSI devices will be inaccessible.

Table A–2 lists messages than can be displayed at any time. These messages are printed with the full device pathname followed by the shorter form described above.

Table A–2 General Error Messages

Firmware should be < 0x%x bytes

Firmware size exceeded allocated space; will not download firmware. This message could mean that the firmware was corrupted, somehow; check the *ptisp* driver.

Firmware checksum incorrect

Firmware has an invalid checksum and will not be downloaded.

Chip reset timeout

ISP1000 failed to reset in the time allocated; check for bad hardware.

Stop firmware failed

Stopping the firmware failed; check for bad hardware.

Load ram failed

Unable to download new firmware into the ISP1000 chip.

DMA setup failed

The DMA setup failed in the host adapter driver on a *scsi_pkt*; this condition will return TRAN_BADPKT to a SCSI target driver.

Bad request pkt

The ISP firmware rejected the packet as being set up incorrectly. This will cause the ptisp driver to call the target completion routine with the reason of CMD_TRAN_ERR set in the *scsi_pkt*. Check the target driver for correct set up of the packet.

Bad request pkt header

The ISP firmware rejected the packet as being set up incorrectly. This situation will cause the *ptisp* driver to call the target completion routine with the reason of CMD_TRAN_ERR set in the *scsi_pkt*. Check the target driver for correct set up of the packet.

Polled command timeout on %d.%d

A polled command experienced a timeout; the target device, as noted by the target LUN (%d.%d) information, may not be responding correctly to the command, or the ISP1000 chip may be hung. This condition will cause an error recovery to be initiated in the *ptisp* driver.

Firmware error

The ISP1000 chip encountered a firmware error of some kind. This error will cause the *ptisp* driver to attempt error recovery by resetting the chip.

Received unexpected SCSI reset

The ISP1000 chip received an unexpected SCSI reset and has initiated its own internal error recovery, which will return all the *scsi_pkt* with reason set to CMD_RESET.

Fatal timeout on target %d.%d

The *ptisp* driver found a command that had not completed in the correct amount of time; this condition will cause error recovery by the *ptisp* driver. The device that experienced the timeout was at target LUN (%d.%d). This message may mean a bad device or bad cabling.

Table A–2 General Error Messages (continued)

Fatal error, resetting interface The *ptisp* driver is doing error recovery. This condition will cause all outstanding commands that have been transported to the *ptisp* driver to be completed via the *scsi_pkt* completion routine in the target driver with reason of CMD_RESET and status of STAT_BUS_RESET set in the *scsi_pkt*.
Error: TERMPWR fuse opened – check The resettable TERMPWR fuse on the PT-SBS440A controller has opened. This condition indicates that a short exists on the TERMPWR line on the SCSIbus cable. Find the source of the short and remove the short from the cable.
Error: TERMPWR shorted or missing – The TERMPWR line is a source of +5 volts dc. It is used to power the terminators on the SCSIbus. If the PT-SBS440A detects that the voltage is missing (actually, that it is less than 0.7 Vdc), the ptisp driver will report that condition by using this message.
Single-Ended SCSI device detected on A single-ended SCSI device has been detected on the bus of a PT-SBS440A-D differential controller. The SCSIbus will not operate in this condition; find which device is the wrong type and disconnect it from the SCSI bus.
TERMPWR Fuse Returned to Normal (OK) This message is printed when the fuse on the PT-SBS440A controller returns to its “normal” or operational condition.
TERMPWR Returned to Normal (OK) This message is printed when the TERMPWR voltage level returns to approximately +5 volts dc.

B

Configuration Recommendations

This appendix suggests a list of items to optimize the performance of your RAID Array 310 subsystem.

B.1 Recommendations

Use the following guidelines to configure the RAID Array 310 subsystem to achieve optimal performance:

- Configure your RAID Array 310 to contain multiple devices or storagesets rather than one.
- Make use of the controller's two ports (channels). When you add devices to the controller, add some of the devices and storagesets to each of the controller ports. Distributing your devices and storagesets over both controller ports allows parallel activities to occur through the controller.
- Distribute your device or storageset units across the four possible target SCSI IDs for the controller. Specify a unique target SCSI ID for the first four device or storageset units that you configure. Any additional device or storageset units will need to share one of the target SCSI IDs; however, the load will already be fairly balanced.
- Avoid configuring multiple mirrorsets with the first member on the same port to speed up access. For example:

  add mirrorset m1 disk100 disk200
  add mirrorset m2 disk210 disk110

  Since the first named device in a mirror set is the first accessed, this will balance the load across the SCSI busses

- For write performance dependent applications, turn **on** the writeback cache. (The writeback cache is turned off by default.)
- Set the size of the maximum_cache_transfer of each unit to the largest size allowable, 1024, so that all transfers get cached. Otherwise, transfers that exceed the maximum_cache_transfer size would not get cached.

C

Upgrading Controller Software

This appendix contains the procedures for backing up and upgrading the controller software.

C.1 Backing Up Your System

Before performing the upgrade, backup all data and files from your RAID Array 310 subsystem.

C.2 Saving the RAID Array 310 Configuration

In the following steps, you need to record your configuration for use in the event that the configuration is not correctly preserved during the software upgrade.

First, record the controller configuration. Display the controller info by using the CLI command:

```
HSZ20> show this_controller full
```

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

Fill in the blanks below.

```
Controller:
        HSZ20 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:
        16 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
```

C.2.1 Record Logical Units

List the Logical Units by entering:

```
HSZ20> 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
```

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

Table C–1 Logical Unit Table

LUN	USES	RUN	WRITE PROTECT	READ CACHE	WRITEBACK CACHE	MAX CACHED TRANSFER SIZE
D100	S28	X		X	X	32

Next, list the storagesets you have configured:

```
HSZ20> SHOW STORAGESETS FULL
```

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

```
Name          Storageset          Uses          Used by
-------------------------------------------------------
S28           stripeset           DISK130       D100
                    DISK220
Switches:
      CHUNKSIZE = 256 blocks
State:
  NORMAL
  DISK130 (member  0) is NORMAL
  DISK220 (member  1) is NORMAL
  Size:  50268168 blocks
M1            mirrorset           DISK100       D200
                    DISK110
Switches:
      POLICY (for replacement) = BEST_PERFORMANCE
      COPY (priority) = NORMAL
      READ_SOURCE = LEAST_BUSY
            MEMBERSHIP = 2, 2 members present
```

Record the storageset information in the Storageset Table (Table C–2). The first row shows how to record for S28 of the sample:

NOTE

Not all column headings apply to all storagesets.

Table C–2 Storageset Table

NAME	STORAGE-SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECON-STRUCT	CHUNK -SIZE
S28	Stripeset	DISK130 DISK220	D100					256

C.3 Upgrading Controller Software Using Windows NT

To upgrade software on these subsystems to Version V31Z, copy a new version of the software image from the CD−ROM, on which the new software image was distributed, to the controller. To do this, you need the following:

- The software distribution CD−ROM that came in the StorageWorks RAID Array 310 upgrade kit.
- Windows 3.1 or 3.11, Windows for WorkGroups, Windows NT, or Windows 95 running on a PC with a CD−ROM drive and a serial connection to the RAID Array subsystem.
- A terminal emulation program that runs the Kermit protocol and supports binary transfers.

In addition, stop any terminate-and-stay-ready (TSR) programs, such as screen savers, that may be running on that server.

It takes approximately 40 minutes to download the new software image at 19200 baud. To begin upgrading the controller software, start and setup the terminal emulation program as specified below.

NOTE

If you are using Windows 95 or Windows NT 4.0, skip to section C.5.

C.4 Windows NT 3.51 Procedures

1. Open the Windows *Accessories* and click to highlight the *Terminal* program.
2. Select *File* from the menu bar and click *Copy* or *F8* to copy the Terminal icon. Change the group name from Accessories to RAID Manager or Command Console. (This step is optional).
3. If you copied Terminal to either the RAID Manager or Command Console group, go to that group now.
4. Click on *Terminal* to highlight the icon.
5. Click *File* from the menu bar followed by *Properties*. From the Properties menu:
    - Change the icon description name from Terminal to HSZ Term.
    - Press the Tab key which highlights **TERMINAL.EXE**. Now press the right arrow cursor key once. Next, press the spacebar and type: *HSZ.TRM***.** Click the OK button.

6. Double-click the HSZ term icon. You should receive the error message, "Cannot find the settings file HSZ.TRM". Click *OK*. After the Terminal Program starts, select the *Communications* option from the *Settings* menu. Set these communication parameters:
    - Baud rate = 9600
    - Data Bits = 8 (default)
    - Stop Bits = 1(default)
    - Parity = None (default)
    - Flow Control = Xon/Xoff (default) or None
    - Connector = (appropriate Com port)
7. Click *File* from the Terminal menu bar and choose *Save As…*. Type in HSZ.TRM. Click *OK*.

> **NOTE**
>
> It is recommended that the window be maximized while upgrading the firmware or when running other diagnostics.

Click *OK* when you complete the settings.

Press the Enter key and the default prompt appears.

8. Set the controller prompt by typing:

```
set this_controller prompt=HSZ20>
```

> **NOTE**
>
> Wherever "HSZ20>" is the string, it should be 1 to 16 characters long and enclosed in quotes.

9. To change the controller's baud rate to 19200, type:

```
set this_controller terminal_speed=19200
```

10. Change the Terminal program's baud rate to match the controller's.

> **NOTE**
>
> Remember to change the Command Console software baud rate from 9600 to 19200.

11. Press the Enter key and the HSZ20> prompt appears. Now you are ready to begin downloading the software.

C.4.1 Downloading the Software

To download the new software, follow these steps:

1. Insert the distribution CD-ROM containing the binary file of the new software image into a CD-ROM drive of a computer connected to the RAID Array controller.
2. Copy the firmware image from the CD-ROM software directory (\firmware\v3.1) into a temporary directory on the system disk.
3. Start the terminal program with the communications settings as specified above.
4. Press the *Enter* key to get to the `HSZ20>` prompt.
5. Invoke the CLCP utility, at the `HSZ20>` prompt, type: ***`run clcp`***.

```
Select an option from the following list:

Code Load and Patch Utility Main Menu

          0:  Exit

          1:  Enter Code LOAD utility

          2:  Enter Code PATCH utility

Enter option number (0..2) ? 1
```

6. Type: **1** and press Return. The utility displays the following message:

```
You have selected the Code Load Utility.  This utility is used to
load a new software image into the program card currently inserted
in the controller.

Type ^Y or ^C (then RETURN) at any time to abort code load.

The code image may be loaded using SCSI Write Buffer commands
through the SCSI Host Port, or using KERMIT protocol through the
Maintenance Terminal Port.

          0:  Exit

          1:  Enter the SCSI Host Port

          2:  Use the Maintenance Terminal Port

Enter option number (0..2) [0] ? 2
```

7. Type: **2** and press the Return key. The utility displays the following message:

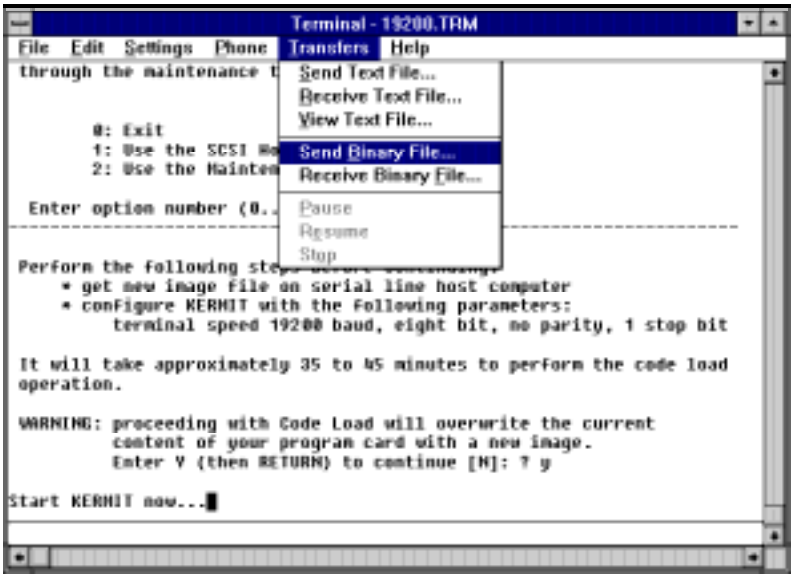
```
-------------------------------------------

Perform the following steps before continuing:

   *get new image file on the serial line host computer

   *configure KERMIT with the following parameters:

    terminal speed 19200 baud, eight bit, no parity, 1 stop bit

It will take approximately 35 to 45 minutes to perform the code load
operation.

WARNING:  proceeding with Code Load will overwrite the current
content of your program code with a new image. Enter Y (then RETURN)
to continue
```

```
[N] ? y

   Start KERMIT now…
```

8. Exit any MS-Windows sessions and select *Binary Transfers* from the *Settings* menu to start Kermit.
9. Select *Kermit* and click *OK*.
10. Select *Send Binary File* from the *Transfers* menu to begin downloading the new software as shown in Figure C-1

> **CAUTION**
>
> You must use a binary transfer mode. Failure to use a binary transfer mode will result in corruption of the controller software.

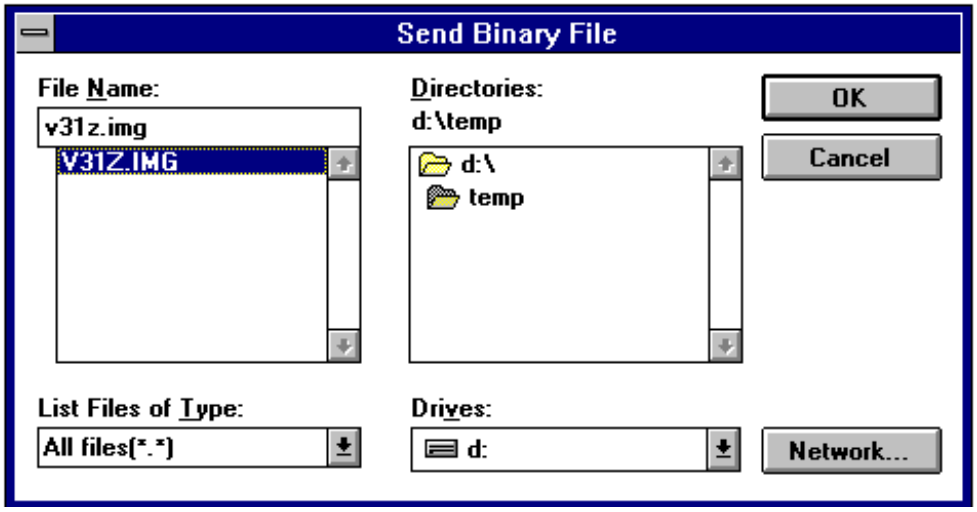
Figure C–1 Select Send Binary Files from the Transfers Menu



11. Select the V31Z.IMG file and Click OK as shown in Figure C-2.

> **NOTE**
>
> The following figures show a sample software version level and not the software version level that you will actually download. The correct software version level is specified in the text of this procedure.

Figure C–2 Select the V31Z.IMG File



When the download completes, the utility displays the following message before reprogramming the controller's program care:

CAUTION

Do not interrupt the power to the RAID subsystem while the CLCP Utility reprograms the controller. The CLCP utility saves the software in non-volatile RAM on the controller. Any interruption of this procedure will result in the inability of the subsystem to reboot.

```
KERMIT file transferred successfully.
Program card is being re-programmed with new file.
*** Do not interrupt this step ***
  Manufacturer code read from memory card= 8989
  Device Code read from memory card= bdbd
```

12. If the main menu appears, press 0 to exit the utility.
13. Verify that this process successfully copied the new version of the software onto the controller.

    At the CLI prompt, type:

    ```
    HSZ20> show this_controller
    ```

The CLI displays information indicating the current software version of the controller similar to the following:

```
Controller Model: HSZ20

Serial Number: CX54300265 Hardware version: A02(02)

 Software Version:V31Z
Informational Report
Instance Code:  0102030A
Last Failure Code:86000020 (No Last Failure Parameters)

Controller:

          HSZ20 CX54300265 Firmware V31Z, Hardware A02

          Not configured for dual-redundancy

          SCSI address 7

          Time: NOT SET

Host Port:

           SCSI target(s) (0, 1, 2, 3), Preferred target(s)

           (0, 1, 2, 3)

            TRANSFER_RATE_REQUESTED = 10MHZ

Cache:

           16 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

           NOCACHE_UPS

           Host Functionality Mode = A.
```

C.5 Firmware Upgrade Procedures for Windows 95 and Windows NT 4.0

Before beginning, connect a serial line between the com port on your PC and the serial port on the RAID Array 310. To begin upgrading the controller software, start and set up the terminal emulation program as specified below:

1. Click the *Start* button and cursor to the Program menu. At the right of the menu bar, highlight *Accessories.*
2. To the right of Accessories, select *Hyperterminal*. Click the *Hyperterminal* menu to create a new terminal session.
3. Enter *HSZ Term* as the Connection Description name. Press the *Tab* key once and select the *OK* icon.

4. At the "Connect To" menu, change the connection settings for your particular system setup by pressing the *Enter* key. Choose the appropriate com port for your system and click *OK*.

> **NOTE**
>
> COM1 is the default connection setting.

5. Change the Port Settings baud rate from 2400 to 9600 bits per second.
6. Select *Xon/Xoff* or *Non*e as the Flow Control setting. Click *OK*. This will return you to your newly-created Terminal session.
7. Press the *Enter* key again and you should receive the default prompt. At the prompt, type *?*. The controller will provide a list of available commands.

> **NOTE**
>
> For a list of additional command options, type the command followed by a space plus a ?.

8. Click *File* at the menu bar. Choose Save, to save the configuration you have just created.
9. Set the controller prompt by typing at the prompt:

```
set this_controller prompt="HSZ20>"
```

> **NOTE**
>
> Wherever the controller prompt is HSZ20>, its string should be 1 to 16 characters long and enclosed in quotes.

10. Change the controller's baud rate to 19200 by typing:

```
HSZ20> set this_controller terminal_speed=19200
```

11. Change the Terminal's baud rate to match the controller's.

> **CAUTION**
>
> Remember to change the Command Console software baud rate from 9600 to 19200.

12. Press the *Enter* key and the `HSZ20>` prompt appears. Now you are ready to begin downloading the software.

C.5.1 Downloading the Software

To download the new software, follow these steps:

> **NOTE**
>
> The Code Load/Code Patch (CLCP) Utility messages shown are for a RAID Array 310 Subsystem. The CLCP Utility messages for other RAID Array subsystems are similar.

1. Insert the distribution CD−ROM containing the binary file of the new software image into a CD−ROM drive of a computer connected to the RAID Array controller.
2. Copy the firmware image from the CD−ROM software directory - *D:\firmware\v31z.img* onto a temporary directory on the system disk.
3. Start the terminal program with the communications settings as specified above.
4. Press the *Enter* key to get to the `HSZ20>` prompt.
5. Invoke the CLCP utility, at the `HSZ20>` prompt, type: **`run clcp`**.

```
Select an option from the following list:

Code Load and Patch Utility Main Menu

          0:  Exit

          1:  Enter Code LOAD utility

          2:  Enter Code PATCH utility

Enter option number (0..2) ? 1
```

6. Type: 1 and press the Return key. The utility displays the following message:

```
You have selected the Code Load Utility.  This utility is used to
load a new software image into the program card currently inserted
in the controller.

Type ^Y or ^C (then RETURN) at any time to abort code load.

The code image may be loaded using SCSI Write Buffer commands
through the SCSI Host Port, or using KERMIT protocol through the
Maintenance Terminal Port.

          0:  Exit

          1:  Enter the SCSI Host Port

          2:  Use the Maintenance Terminal Port

Enter option number (0..2) [0] ? 2
```

7. Type: 2 and press the Return key. The utility displays the following message:

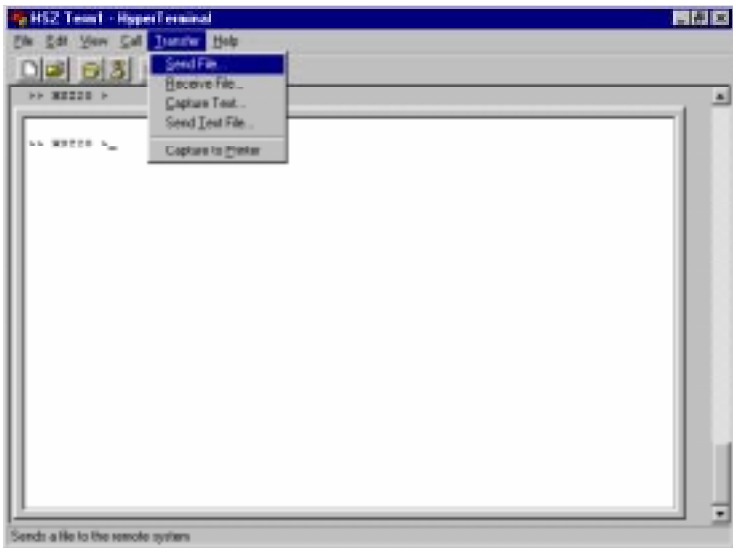
```
Perform the following steps before continuing:
```

- get new image file on the serial line host computer
- * configure KERMIT with the following parameters:
- terminal speed 19200 baud, eight bit, no parity,
- 1 stop bit

```
It will take approximately 35 to 45 minutes to perform the code load
operation.

WARNING:  proceeding with Code Load will overwrite the current
content of your program code with a new image. Enter Y (then RETURN)
to continue

[N] ? y

   Start KERMIT now…
```

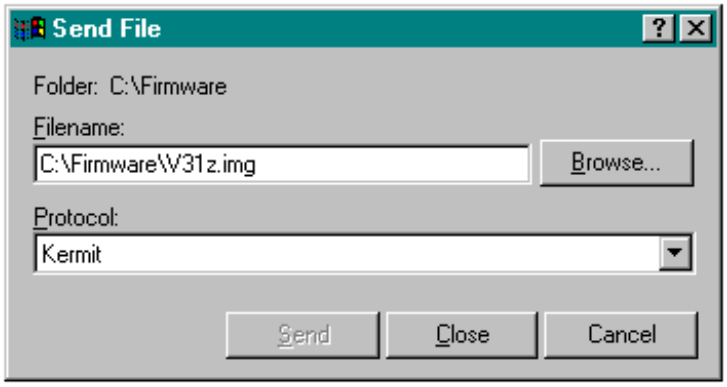
8. Select *Send File* from the *Transfer* menu.

Figure C–3 Select Send File from the Transfer Menu



9. Type the location of the firmware image file (V31Z.IMG) in the Filename box. Select *Kermit* in the Protocol box and click the *Send* button.

Figure C–4 Select the V31Z.IMG File



When the download completes, the utility displays the following message before reprogramming the controller's program care:

CAUTION

Do not interrupt the power to the RAID subsystem while the CLCP Utility reprograms the controller. The CLCP utility saves the software in non-volatile RAM on the controller. Any interruption of this procedure will result in the inability of the subsystem to reboot.

```
KERMIT file transferred successfully.
Program card is being reprogrammed with new file.
*** Do not interrupt this step ***
  Manufacturer code read from memory card= 8989
  Device Code read from memory card= bdbd
```

10. If the main menu appears, press 0 to exit the utility.
11. Verify that this process successfully copied the new version of the software onto the controller.
12. At the CLI prompt, type:

    ```
    HSZ20> show this_controller
    ```

    The CLI displays information indicating the current software version of the controller similar to the following:

    ```
    Controller Model: HSZ20
    Serial Number: CX54300265 Hardware version: A01
    Firmware Version:V31Z-0
    Informational Report
    Instance Code:  0102030A
    Last Failure Code:86000020 (No Last Failure Parameters)
     HSZ20>show this_controller
    ```

```
Controller:
          HSZ20 CX54300265 Firmware V31Z–0, Hardware A02
          Not configured for dual-redundancy
          SCSI address 7
          Time: NOT SET
Host Port:
           SCSI target(s) (0, 1, 2, 3), Preferred target(s) (0, 1,
           2, 3)
            TRANSFER_RATE_REQUESTED = 10MHZ
Cache:
           16 megabyte write cache, version 2
           Cache is GOOD
           Battery is GOOD
           No unflushed data in cache
           CACHE_FLUSHED_TIMER = DEFAULT (10 seconds)
           CACHE_POLICY = A
           NOCACHE_UPS
           Host Functionality Mode = A.
```

C.6 Reverting to Software Image Version 2.7

To request release V2.7, substitute V27Z.IMG for V31Z.IMG in the previous section as the correct software image filename. V27Z.IMG is stored in directory (firmware\V27).

C.7 Manual RAID Array 310 Configuration Restoration

The configuration of the storage sets on the RAID array 310 is usually unaffected by changing the software version. The configuration parameters, however, should be logged before performing any upgrade.

D

Configuring STRIPEsets, MIRRORsets, and Striped MIRRORsets

This appendix supplements Chapter 2 and contains instructions for configuring STRIPEsets, MIRRORsets, and Striped MIRRORsets.

D.1 Create a STRIPEset (Configuration Example 1)

If your site requires STRIPEsets for storage, you must assign disks to each STRIPEset. STRIPEsets 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.

```
HSZ20> ADD STRIPESET STRIPE1 DISK130 DISK220
```

In this example, "STRIPE1" 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-defined. Performance of your STRIPEsets will be optimized if each STRIPEset includes disks from different buses as shown in Figure 2–1 in Chapter 2. The example above contains disks from different buses.

D.1.1 Initialize the STRIPEset

You must initialize STRIPEsets before you can put them into service.

When you initialize a STRIPEset, you can optionally specify a chunksize. The chunksize is the number of blocks of data that are transferred at one time or the width of the stripe. By using the default chunksize, the controller will select a chunksize that works well for most site requirements.

```
HSZ20> INITIALIZE STRIPE1 SAVE_CONFIGURATION
```

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.

D.1.2 Add the STRIPEset as a Logical Unit

To make a STRIPEset available to the host computer, you must add it as a host logical unit with a unique unit number. The unit number is a one or three digit number preceded by "D", such as "D0" or "D102". The unit number is made of the controller's target ID and the Logical Unit (LUN) of the STRIPEset for the target. Each target ID can have up to eight LUNs, numbered 0–7.

- Units identified with controller target ID 0 have a single digit number which corresponds to the LUN number. For example, D5 would be target 0, LUN 5.
- Units identified with all other controller targets (1–7) use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit is the LUN number. For example, D205 would be target 2, LUN 5.

Identify the STRIPEsets as host logical units by using the ADD UNIT command.

```
HSZ20> ADD UNIT D100 STRIPE1
```

This example creates LUN 0 for controller target ID 1 (specified earlier with the SET THIS_CONTROLLER command).

D.1.3 Set Writeback Cache

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

```
HSZ20> SET D100 WRITEBACK_CACHE
```

Where D100 represents the host logical unit of the STRIPEset created above.

D.2 Create a MIRRORset (Configuration Example 1)

If your site requires MIRRORsets for storage, you must assign disks to each 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.

```
HSZ20> ADD MIRRORSET MIRROR1 DISK120 DISK210
```

In this example, "MIRROR1" 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 MIRRORsets are user-defined. Performance of your MIRRORsets will be optimized if each MIRRORset includes disks from different buses as shown in Figure 2–1 in Chapter 2. The example above contains disks from two different buses.

D.2.1 Initialize the MIRRORset

You must initialize a MIRRORset before you can put it into service.

```
HSZ20> INITIALIZE MIRROR1
```

D.2.2 Add the MIRRORset as a Logical Unit

To make a MIRRORset available to the host computer, you must add it as a host logical unit with a unique unit number. The unit number is a one or three digit number preceded by "D", such as "D0" or "D102". The unit number is made of the controller's target ID and the Logical Unit (LUN) of the MIRRORset for the target. Each target ID can have up to eight LUNs, numbered 0–7.

- Units identified with controller target ID 0 have a single digit number which corresponds to the LUN number. For example, D5 would be target 0, LUN 5.
- Units identified with all other controller targets (1–7) use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit is the LUN number. For example, D205 would be target 2, LUN 5.

Identify the MIRRORsets as host logical units by using the ADD UNIT command.

```
HSZ20> ADD UNIT D200 MIRROR1
```

This example uses the controller target ID of 2 and LUN 0.

D.2.3 Set Writeback Cache

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

```
HSZ20> SET D200 WRITEBACK_CACHE
```

Where D200 represents the host logical unit of the MIRRORset created above.

D.3 Create a Striped MIRRORset (Configuration Example 2)

If your site requires striped MIRRORsets for storage, you must assign disks to MIRRORsets and then assign the MIRRORsets to a STRIPEset.

D.3.1 Create the MIRRORsets

MIRRORsets must have at least two members, and can have as many as six. This example creates 2, two-member MIRRORsets using the ADD MIRRORSET command.

```
HSZ20> ADD MIRRORSET MIRROR3 DISK100 DISK200

HSZ20> ADD MIRRORSET MIRROR4 DISK110 DISK210
```

In this example, "MIRROR3" and "MIRROR4" are the names of the MIRRORsets, and they are followed by a list of the disks to be included in each MIRRORsets.

D.3.2 Create a STRIPEset from the MIRRORsets

Striped 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.

```
HSZ20> ADD STRIPESET MIRSTR1 MIRROR3 MIRROR4
```

In the previous example, "MIRSTR1" is the name of the striped MIRRORset, and it is followed by a list of MIRRORsets to include in the STRIPEset. The name of the STRIPEset is user-defined. Performance of your striped MIRRORset will be optimized if each MIRRORset includes disks from different buses.

D.3.3 Initialize the Striped MIRRORset

You must initialize the striped MIRRORset before you can put it into service.

When you initialize a STRIPEset, you can optionally specify a chunksize. The chunksize is the number of blocks of data that are transferred at one time. By using the default chunksize, the controller will select a chunksize that works well for most site requirements.

```
HSZ20> INITIALIZE MIRSTR1 SAVE_CONFIGURATION
```

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.

D.3.4 Add the Striped MIRRORset as a Logical Unit

To make a striped MIRRORset available to the host computer, you must add it as a host logical unit with a unique unit number. The unit number is a one or three digit number preceded by "D", such as "D0" or "D102". The unit number is made of the controller's target ID and the Logical Unit (LUN) of the striped MIRRORset for the target. Each target ID can have up to eight LUNs, numbered 0–7.

- Units identified with controller target ID 0 have a single digit number which corresponds to the LUN number. For example, D5 would be target 0, LUN 5.
- Units identified with all other controller targets (1–7) use a 3 digit number. The first digit corresponds to the controller target number, the second digit is always 0 and the third digit is the LUN number. For example, D205 would be target 2, LUN 5.

Identify the striped MIRRORset as a host logical unit by using the ADD UNIT command.

```
HSZ20> ADD UNIT D300 MIRSTR1
```

Where 300 represents the host logical unit of the striped MIRRORset created above.

D.3.5 Set Writeback Cache

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

```
HSZ20> SET D300 WRITEBACK_CACHE
```

Where D300 represents the host logical unit of the striped MIRRORset described above.

D.4 Add Individual Disks as Logical Units (Configuration Example 2)

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

```
HSZ20> INITIALIZE DISK120
```

```
HSZ20> INITIALIZE DISK220
```

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.

```
HSZ20> ADD UNIT D1 DISK120
```

```
HSZ20> ADD UNIT D2 DISK220 SAVE_CONFIGURATION
```

In this example, disk DISK120 and DISK220 are identified to the host as units D1 (Target 0, LUN 1) and D2 (Target 0, LUN 2) respectively.

D.5 Create a Spareset

If a disk in a RAIDset or MIRRORset goes bad, the controller will replace it with a disk from the Spareset, if one exists. If the Spareset is empty, a RAIDset will run “reduced,” and you should replace the disabled disk as soon as possible. For maximum availability, you should keep at least one drive in the spareset.

The Spareset always exists in the controller configuration, even if there are no drives assigned to it. Assign drives to the Spareset with the ADD SPARESET command.

```
HSZ20> ADD SPARESET DISK130
```

In this example, DISK130 was assigned to the Spareset.

D.6 Failed Set

Failed drives are automatically added in the FAILEDSET. Failed drives that are replaced with new drives that do not contain metadata can be automatically placed in the SPARESET. To enable this feature, use the command:

```
HSZ20> SET FAILEDSET AUTOSPARE
```

You can remove or insert devices at any time, with the following restrictions:

- Do not remove or insert devices before the CLI prompt appears during a controller initialization.
- Do not insert devices while the controller is still recognizing a device removal (indicated by flashing LEDs).
- Do not remove or insert devices while the controller is running a local program such as DILX or VTDPY.
- Wait 50 seconds after inserting one disk drive before inserting a second disk drive.

The Auto New Spare feature only operates when the newly-inserted disk drive does not contain any metadata, such as a disk drive from the factory. You can use the transportable function to initialize a used device so that it no longer contains metadata by issuing the following CLI commands:

```
HSZ20> SET disk-name TRANSPORTABLE
HSZ20> INITIALIZE disk-name
```

To initialize additional disks, simply remove the first disk and replace it with another, then retype the INITIALIZE command. You do not need to reenter the ADD DISK or SET TRANSPORTABLE commands as long as you use the same SCSI location.

When the drive is moved into the spareset, some metadata is written on it and it is no longer transportable. Additional metadata is written on it when it is moved from the spareset into a RAIDset or MIRRORset.

D.7 Verify and Record Your Configuration

NOTE

Your configuration may be saved on disk using the SAVE CONFIGURATION command. Refer to the *RAID Array 310 Configuration and Maintenance Guide* for a detailed description of this command.

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

First, verify the Logical Units you have configured:

```
HSZ20> SHOW UNITS
```

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

Configuration Example 1:

```
LUN    Uses
----------------------------------------
D100   STRIPE1
D200   MIRROR1
```

Configuration Example 2:

```
LUN    Uses
----------------------------------------
D1     DISK120
D2     DISK220
D300   MIRSTR1
```

Record the information in the following table:

Date_____	
LUN	Uses

Next, verify the storagesets you have configured:

```
HSZ20> SHOW STORAGESETS
```

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

Configuration Example 1:

```
Name              Storageset    Uses           Used by
------------------------------------------------------------------
STRIPE1           stripeset     DISK130        D100
                                DISK220
MIRROR1           mirrorset     DISK120        D200
                                DISK210
RAIDS1            raidset       DISK100        D0
                                DISK200
                                DISK110
FAILEDSET         failedset
```

Configuration Example 2:

```
Name              Storageset    Uses           Used by
------------------------------------------------------------------
MIRSTR1           stripeset     MIRROR3        D300
                                MIRROR4
MIRROR3           mirrorset     DISK100        MIRSTR1
                                DISK200
MIRROR4           mirrorset     DISK110        MIRSTR1
                                DISK210
SPARESET          spareset      DISK130
```

Record the information in the following table. In the event of a controller failure, the information that you recorded here will assist you in reconstruction of the storagesets on your RAID Array 310.

Record the information in the following table:

Date_____			
Name	Storageset	Uses	Used By

Single-device units and devices that have not been added to units are not shown in this report. To display these devices, enter the following:

```
HSZ20> SHOW DEVICES
```

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

Configuration Example 1:

```
Name        Type  Port Targ Lun                Used by
------------------------------------------------------------
DISK100     disk     1    0    0                RAIDS1
DISK110     disk     1    1    0                RAIDS1
DISK120     disk     1    2    0                MIRROR1
DISK130     disk     1    3    0                STRIPE1
DISK200     disk     2    0    0                RAIDS1
DISK210     disk     2    1    0                MIRROR1
DISK220     disk     2    2    0                STRIPE1
```

Configuration Example 2:

```
Name       Type  Port Targ Lun                Used by
------------------------------------------------------------
DISK100    disk     1    0    0                MIRROR3
DISK110    disk     1    1    0                MIRROR4
DISK120    disk     1    2    0                D1
DISK130    disk     1    3    0                SPARESET
DISK200    disk     2    0    0                MIRROR3
DISK210    disk     2    1    0                MIRROR4
DISK220    disk     2    2    0                D2
```

Record the information in the following table:

Date_____

Name	Type	Port Targ Lun	Used By