StorageWorks™

Getting Started

RAID Array 310 V3.1 for IBM AIX 4.1.4, 4.1.5 and 4.2.0

Installation Guide

Second Edition, April 1997

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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 guide.

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 Subsystem.

Revision Level	Date	Summary of Changes
EK–SMRAD–IG. A01	September 1996	Original release.
EK–SMRAD–IG. B01	April 1997	Updated to add support for HSOF V3.1 and StorageWorks Command Console 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:

- Getting Started

- Unpacking and setting-up the RAID Array 310 Subsystem

- Creating an initial controller configuration using the Command Line Interpreter (CLI)

- Installing the RAID Array 310 software onto IBM systems running AIX 4.1.4, 4.1.5 and 4.2.0

Intended Audience

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

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Document Structure

This guide contains the following topics:

Getting Started

Getting Started contains an overview for preparing and installing the RAID Array 310 for IBM. This section summarizes the major steps in the installation process.

Chapter 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 cache battery.

Chapter 2: Creating an Initial Controller Configuration

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

Chapter 3: Installing the StorageWorks RAID Array 310 Software for IBM on 4.1.4. 4.1.5 and 4.2.0.

This chapter describes how to install RAID Array 310 software on IBM systems running AIX 4.1.4, 4.1.5 and AIX 4.2.0. The information includes organizing your system and existing files, loading the RAID software onto your hard disk, and creating Logical Volume Groups and file systems.

Chapter 4: Installing and Configuring the Command Console Agent

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

Chapter 5: Installing the Command Console Client

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

Appendix A: Configuration Guidelines and Records

Appendix A contains a list of guidelines and records that will assist in optimizing the performance of your RAID Array 310 system.

Appendix B: Upgrading Controller Software

Appendix B contains the procedures for backing up and upgrading the controller software.

Appendix C: Configuring STRIPEsets, MIRRORsets and Striped MIRRORsets

Appendix C contains information on how to configure STRIPEsets, MIRRORsets and Striped MIRRORsets for your RAID Array 310 controller.

Appendix D: IBM AIX 4.1.4, 4.1.5 and 4.2.0 Bootability

This appendix contains a list of guidelines for bootstrapping your RAID Array 310 subsystem Logical Unit to a RS/6000 system.

Table 1 Associated Documents

Document Title	Order Number
RAID Array 310 for IBM Release Notes	*(AA–QWTDA–TE)*
RAID Array 310 Configuration and Maintenance Guide	*(EK–SMCS2–UG)*
RAID Array 310 Deskside Subsystem Hardware User's Guide	*(EK–SMCPL–UG)*
RAID Array 310 Command Console User's Guide	*(AA–R24LA–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 filenames
plain monospace type	Text
italic type	For emphasis and manual titles
#	Represents the AIX system prompt. Do not type it as part of information given here as to be input by the user.

In addition, the following naming convention is followed in describing RAID levels:

Table 3 Nomenclature Conventions

RAID Advisory Board Description	RAID Array 310 Usage
RAID 0	STRIPEset
RAID 1	MIRRORset
RAID 0+1	STRIPED MIRRORset
RAID 5/3	RAIDset

Getting Started

This section provides an overview for preparing and installing RAID Array 310 for IBM. Detailed information is contained in Chapters 1 through 5 and Appendix D.

Thank you for purchasing a StorageWorks RAID Array 310 Subsystem. The following is an overview of the installation steps that are required.

> **NOTE**
>
> Installing the StorageWorks RAID Array 310 Subsystem requires a general understanding of the following:
> - IBM RS/6000 Computer Systems
> - AIX 4.1.4, 4.1.5 or AIX 4.2.0
> - Basic hardware installation procedures
> - Or, contact your service representative for installation assistance.

The major steps for installing the components of the StorageWorks RAID Array 310 Subsystem are as follows:

1. Unpacking and setting up the RAID Array 310 Subsystem (Chapter 1)

2. Configuring the RAID Controller using the Command Line Interpreter (Chapter 2).

3. Installing the IBM SCSI-2 differential/wide adapter and connecting the SCSI cable from the host to the Subsystem (see related IBM documents).

4. Performing the software installation procedure that allows the operating system to configure the RAID Array 310 (Chapter 3).

5. Installing the Command Console Agent (Chapter 4).

6. Installing and Configuring the Command Console Client (Chapter 5).

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
- Connect the RAID Array 310 to the IBM RS6000 system
- Inventory the contents of the StorageWorks RAID Array 310 Subsystem
- Follow your normal procedures to back up your system files

The StorageWorks RAID Array 310 Subsystem provides the following components:

- *RAID Array 310 Configuration and Maintenance Guide (EK-SMCS2-UG)*
- *RAID Array 310 Deskside Subsystem Hardware User's Guide (EK-SMCPL-UG)*
- The StorageWorks RAID Array 310 Subsystem
- Serial cabling kit (see Section 1.7.1) for connecting the maintenance port of the controller to the serial port of the host computer, a personal computer, or a terminal
- Power Cables (2)
- Enclosure Keys

Pre-installation Steps

Before starting your installation, follow these steps:

1. Verify user supplied hardware and software (system requirements). The StorageWorks RAID Array 310 Subsystem requires the following user-supplied hardware and software:

    *   RS/6000 Series Computer System

        *   A CD-ROM drive

        *   An available Micro Channel or PCI adapter slot

        *   2 MB of disk space for temporary and 2 MB of disk space for regular use

        *   The associated system hardware manual

    *   Appropriate tools to service your computer

    *   The IBM AIX operating system, versions 4.1.4, 4.1.5 or 4.2.0

2. Verify the StorageWorks RAID Array 310 platform kit components. The Storage Works RAID Array 310 Platform SWBK-CB Kit provides the following components:

    *   This guide and release notes

    *   The CD-ROM

    *   An IBM FC2416 or FC2412 SCSI-2 differential/wide Adapter (except when an "adapterless kit" has been ordered)

    *   When using an FC2412 or FC2416 adapter, a BN31R SCSI cable with a right-angle high density 68-pin connector on one end, and a straight, high-density 68-pin Centronics connector on the other end. When using an FC2409 or FC6209 adapter, a BN21G SCSI cable with two, straight, high-density 68-pin connectors at each end

Installation Overview

The following overview provides a road map to assist you during the installation process. Detailed procedures are provided in the subsequent chapters in this guide. Depending on your specific configuration requirements, you may not need to perform all the tasks listed.

1. Perform the pre-installation steps.

2. Unpack, locate and set up the RAID Array 310 Subsystem, which includes:

    *   Positioning the RAID Array Subsystem

    *   Connecting the RAID 310 Array maintenance port to the IBM host computer or PC via an interface cable (RJ12 connector to serial port on the host)

    *   Charging the write-back cache batteries.

3. Plan out your storagesets, which means "mapping out" your Stripeset, Mirrorset and RAIDset configuration for the disks to be configured as your RAID Array. A useful tool for this purpose is the blank configuration record forms provided in Appendix A.

4. Establish a communications link to the RAID 310 Array via the maintenance port on the controller, a serial port on a PC and a communications program.

5. After establishing the link, access the Command Line Interpreter (CLI) and create an initial controller configuration per system requirements. Chapter 2 provides detailed instruction on how to configure your system using the CLI.

6. Install the host adapter in an available host computer Micro Channel slot.

7. Use the System Management Interface Tool (SMIT) and verify that the host adapter is properly installed and configured. Refer to Organizing Your System in Chapter 3.

8. Connect the SCSI cable from the host to the RAID 310 Array Subsystem.

9. Mount the software medium. The RAID Array 310 software and AIX support files are provided on a CD-ROM. Follow the instructions provided in Chapter 3 to extract the installation script.

10. Execute the software installation script.

Perform a System Backup

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

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 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 StorageWorks RAID Array software (*Chapter 3*)

- Installing the Command Console Agent (*Chapter 4*)

- Installing and configuring the Command Console Client (*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
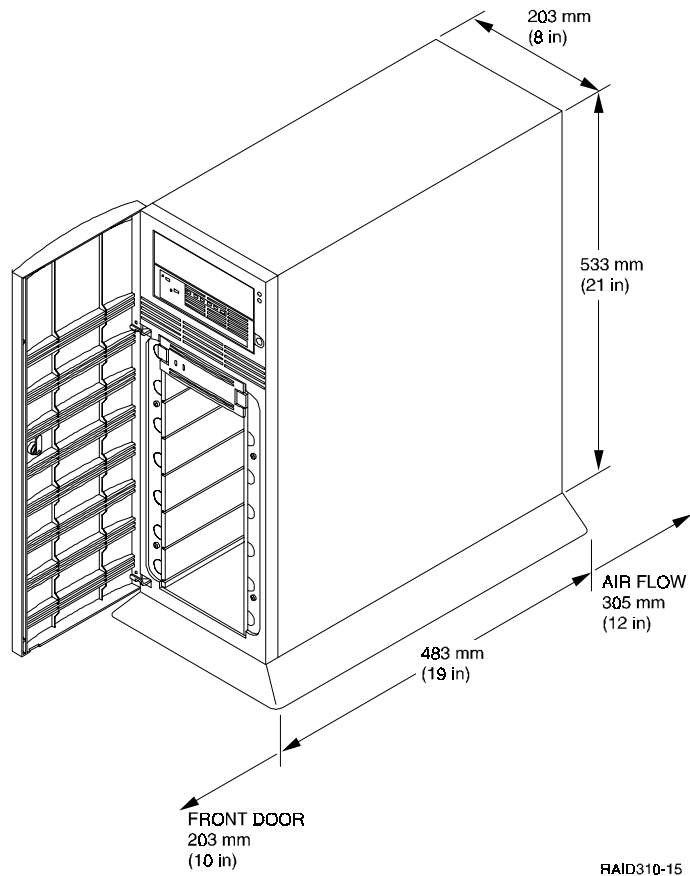
1.3   Unpacking the RAID Array 310

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
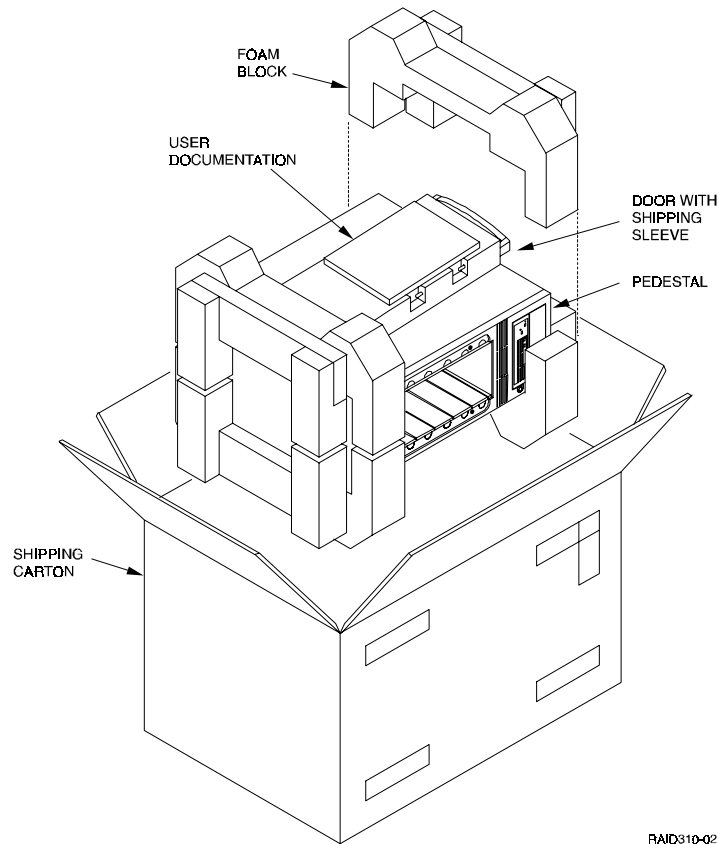
1.4   Preparing the RAID Array 310 for Operation

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 Storage Building Blocks (SBB's).

4.   Connecting the power, SCSI bus, and CLI serial cables.

5.   Charging the controller cache battery.

6.   Configuring the RAID Array 310.

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
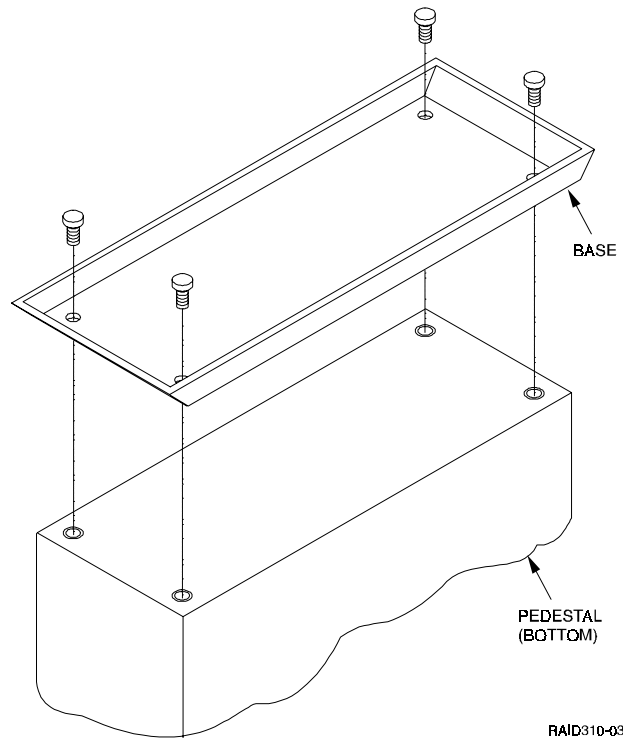
1.6   Connecting the Subsystem Power Cords

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 Vac 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
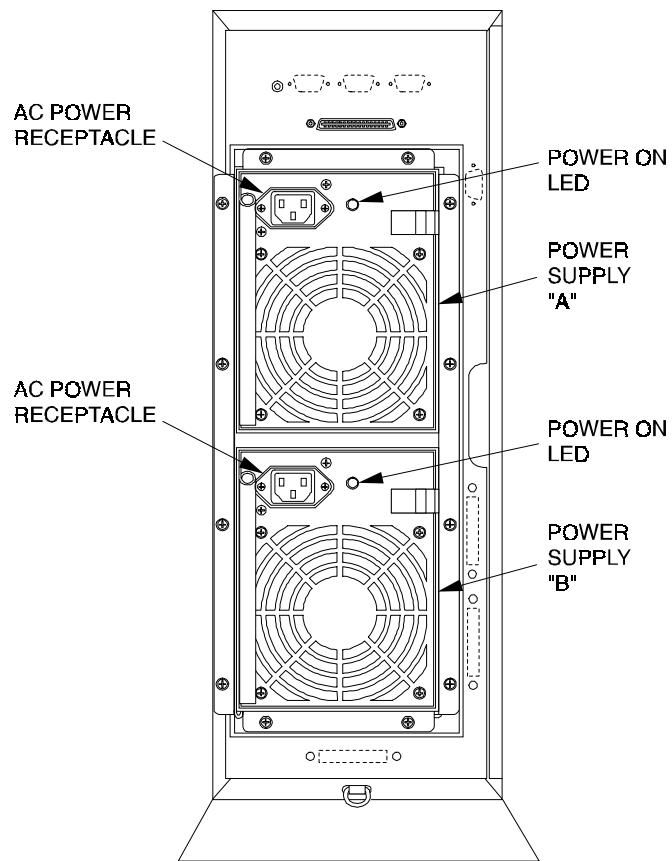
RAID310-13

1.7 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 doing 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 to fully charge the battery.

NOTE

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

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.

Figure 1–5 StorageWorks SCSI Bus Port and Default SCSI ID Assignment
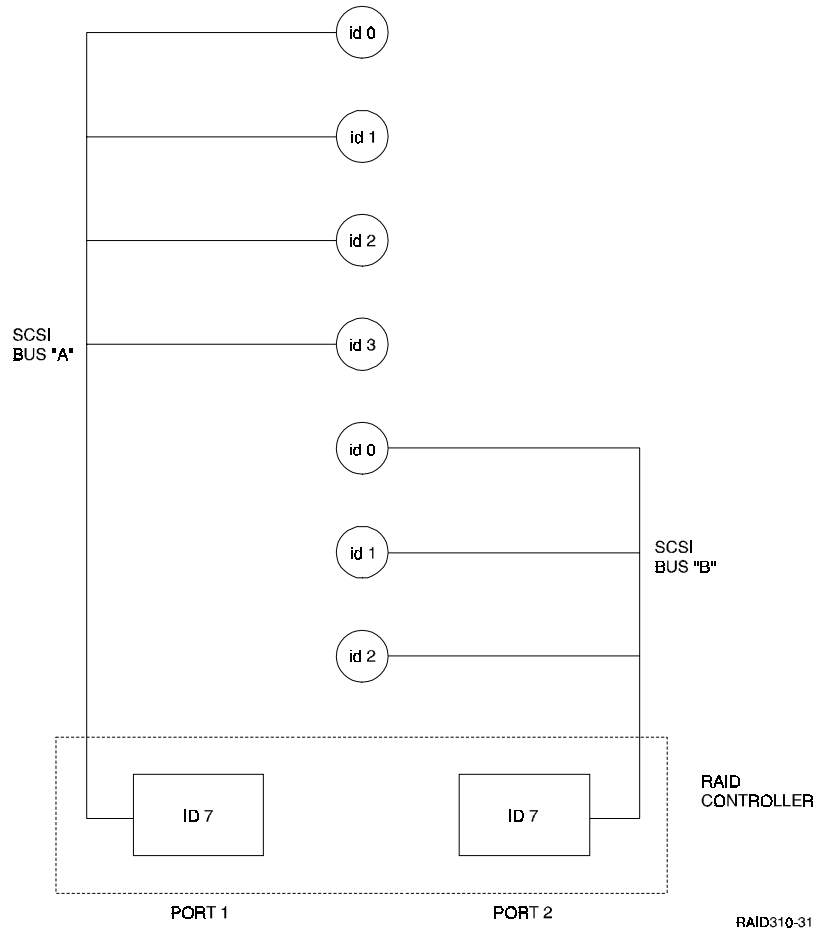
1.9   Connecting the CLI Serial Interface

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 inter-face default settings are 9600 baud, with 8 data bits, 1 stop bit, and no parity.

Figure 1 –6 Subsystem CLI Serial Connector
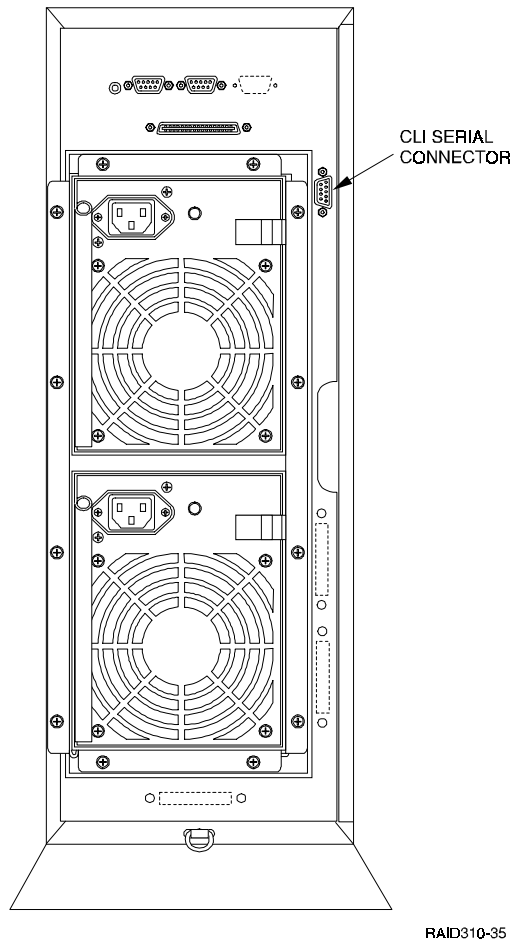
1.9.1 Cabling Kit

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

1.9.2 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 as follows:

- If making a connection to an IBM RS 6000 server serial interface use the BC16E cable, a 9-pin H8571-J connector, and a 25-pin H8575-A connector.

1.9.3 Terminal Connection

Refer to your terminal documentation for terminal setup instructions.

1.9.4 Setting-up the Serial Line using SMIT

To add a tty, use the System Manager Interface Tool (SMIT) to execute the "smit tty" command. Check the list of options if the tty port to be used is already available. If not, use the "Add a TTY" option to add the tty port to be used for the RAID Array 310. The tty type to be used is "RS232". Then, select the serial port to be used. In the "Add a TTY" window, make sure the option "Enable Program?" is set to off. This option disables tty's running on the same port.

Next, run **`/usr/lib/uucp/uucpadm`** and select option 1. Complete the menu as follows (depending on the tty port you want to use).

> Type: Direct
> Line 1: tty0
> Line 2: -
> Class: 9600
> Dialer: direct

Exit the menu with CTRL U.

Establish the connection with the controller.

1. Now you can access the RAID Array 310 with the command:

   ```
   cu -m -l /dev/tty0
   ```

2. Press the Enter key. You should see the CLI prompt, which looks similar to: HSZ20>. If no prompt is seen, the serial port may be misconfigured or used by another application. See the "Installing Terminals and Modems" information in the IBM manual.

1.9.5 CLI Serial Interface Verification

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

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

2.1   What is the CLI?

The Command Line Interpreter (CLI) is the user interface to the 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. For example:
>
> 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 a terminal emulation program.

2.2   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 1.9 in Chapter 1 of this guide (*Connecting the CLI Interface*) for a description of how to connect the maintenance terminal to the RAID 310 controller if necessary.

2.2.1 Start the Communications Program

1. Start the communications program on your PC or UNIX host.

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

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

2.2.2 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>
```

2.3   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 V27Z-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=B
       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 B for IBM AIX

HSZ20> **SET THIS_CONTROLLER HOST_FUNCTION=B**

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.

2.4   Use Caution when Powering Off the RAID Array 310

The RAID Array 310 controller uses a writeback cache to speed up disk-write I/O operations. As a result, data is kept in the controller's memory and flushed to disk at a later time. The flush time is determined by the value in the CACHE_FLUSH_TIMER (see item 3, Section 2.3). When power to the RAID Array 310 is switched off and no controller shutdown CLI command is issued, data could get lost. The data is stored in cache memory and the batteries keep the memory "powered". After approximately 100 hours, the batteries are fully discharged and data is lost. Consequently, when the RAID Array 310 is powered up again LUNs may not be visible to the host. This condition can be resolved by issuing the CLEAR_ERRORS LOST_DATA command.

IMPORTANT

To avoid the condition described above, always issue the following CLI command prior to powering off the RAID Array 310:

SHUTDOWN THIS_CONTROLLER

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.

```
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, device bus Target 0, and LUN 0. DISK210 corresponds to the disk located on Bus 2, controller Target 1, and LUN 0.

Depending on the type of raidsets you want to create, follow the guidelines in the next four sections listed below to create your configuration. Throughout this document, the following references apply:

- Stripeset refers to RAID 0
- Mirrorset refers to RAID 1
- Striped Mirrorset refers to RAID 0+1
- RAIDset refers to RAID 5

NOTE

When creating containers (a number of disks in a set), the following warning may be issued by the controller: ***Warning 3000: This storage set is configured with more than one disk per port. This causes degradation in performance.*** Since the HSZ20 controller does not have more than two ports, this warning can be ignored.

2.6 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 C, depending on the type of storageset you want to use.

The agent needs exclusive access to one storageset, the so-called communications LUN.

The steps to be taken to configure a partitioned storageset is described in the next section.

2.7 Create a RAIDset (Configuration Example 1)

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 the Figure 2–1 below. The example above contains disks from two different buses.

Figure 2–1 RAIDset Configuration Example
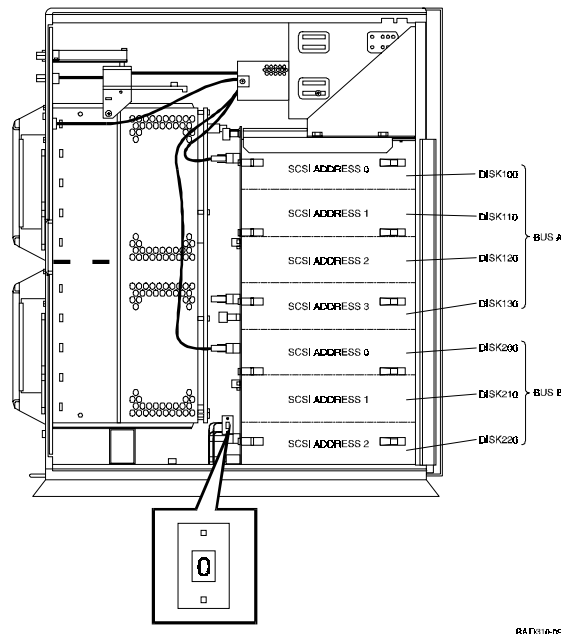
2.7.1 Initialize the RAIDset

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,

```
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.* As the SAVE_CONFIGURATION option is optional, it is used in some cases in the following examples.

2.7.2   Add the RAIDset and the Communication LUN as Logical Units

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.

```
HSZ20> create_partition RAIDS0 blocks=1

      HSZ20> add unit d0 RAIDS0 partition=1
```

This creates a partition with the size of one block on a storageset named RAIDS0. D0 means SCSI ID 0 LUN 0, which may be different for your particular situation.

This new unit can now by used as a communications LUN during the installation of the agent as described in Chapter 4.

Now create a data partition:

```
HSZ20> show RAIDS0
```

Using this output, you can see the remaining free blocks available for the data part of the storageset.

```
HSZ20> create_partition RAIDS0 blocks=xxxx
```

Where xxxx represents the number of free blocks of RAIDS0 identified by the *show* command:

```
HSZ20> add unit D1 RAIDS0 partition=d
```

Where d represents the partition number created in the previous command.

D1 means SCSI ID 0 LUN 1, which may be different for your situation.

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.

2.8   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 the SAVE_CONFIGURATION command and how to restore the configuration in case of a controller replacement.

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

3

Installing the StorageWorks RAID Array 310 Software for IBM on 4.1.4, 4.1.5 and 4.2.0

This chapter describes the StorageWorks RAID Array 310 Software for IBM and the steps for installing it onto IBM systems running AIX 4.1.4, 4.1.5 or AIX 4.2.0. The installation steps include organizing your system and existing files, loading the RAID software onto your hard disk, and creating Logical Volume Groups and file systems.

NOTE

Prior to installing this software, make sure that the RAID Controller Write-back Cache battery is fully charged. This is accomplished by supplying power to the RAID Controller for a minimum of 6 hours.

3.1   Installing the RAID Software for IBM on AIX

The procedures for installing the RAID Software for IBM on AIX require that you be familiar with the *System Management Interface Tool (SMIT)*. See the "*System Management Interface Tool"* section in the *System Management Guide: Operating System and Devices* for more information on the use of *SMIT*.

Installing the RAID software on AIX requires the following major steps:

- Organizing Your System (Section 3.2)

- Loading and installing the RAID Array 310 Software onto the hard disk (Section 3. 3)

- Changing the Maximum LUN System Setting (Section 3.4)

- Uninstalling RAID Array 310 (Section 3.5)

NOTE

When AIX is upgraded to a higher level (AIX 4.1.4 to AIX 4.2.0), all *config* information for the RAID Array 310 is removed during the upgrade process. The install script has to be used to re-enter the *config* information. Use the **-u** (upgrade) option of the installation script.

3.2   Organizing Your System

For new installations, perform the following procedure prior to installing the StorageWorks software:

CAUTION

DO NOT plug the SCSI cable into the RAID controller connector at this time.

---

1. After installing the SCSI-2 Differential Fast/Wide Host Adapter, reboot the system *without* the SCSI cable connected to the RAID controller. When the "console login" prompt appears, log into the system as root.

2. Ensure that the SCSI-2 Differential Fast/Wide Host Adapter has been installed in the system and configured by typing the following command and verifying the resulting display:

    # **lsparent -C -k scsi_scb -H && lsparent -C -k scsi**

    The display differs for Micro Channel and PCI Bus Systems.

    For MicroChannel bus systems:

    ```
    name    status     location description
    ascsi0 Available 00-05    Wide SCSI I/O Controller Adapter
    ascsi1 Available 00-06    Wide SCSI I/O Controller Adapter
    scsi1  Available 00-07    SCSI I/O Controller
    scsi0  Available 00-00-0S Standard SCSI I/O Controller
    vscsi0 Available 00-05-00 SCSI I/O Controller Protocol Device
    vscsi1 Available 00-05-01 SCSI I/O Controller Protocol Device
    vscsi2 Available 00-06-00 SCSI I/O Controller Protocol Device
    vscsi3 Available 00-06-01 SCSI I/O Controller Protocol Device
    ```

    On MicroChannel subsystems this command displays the SCSI adapters currently configured into the system. SCSI adapters with external SCSI expansion capability will have a -01 as the last field under the location column heading. If your system includes only one adapter with external expansion capability, then only one vscsi line will be displayed that contains a -01. If your system contains multiple adapters with external expansion capability, then multiple vscsi lines will be displayed as in the example above. If either no vscsi lines are displayed, or no vscsi line with a -01 location is displayed, then the operating system has not correctly configured the device. Recheck the hardware installation and retype this command.

    Once you have determined that the vscsi device is configured correctly, check that the vscsi adapter with the -01 location is listed as "Available" in the status column. If the device is listed as "Defined" then the operating system has not correctly configured the device. In that case, recheck the hardware installation and retype the command shown at the beginning of Step 2.

    For PCI bus systems:

    ```
    name    status    location   description
    scsi0 Available 04-C0           Wide SCSI I/O Controller
    scsi1 Available 04-02           Wide SCSI I/O Controller
    ```

On PCI bus systems this command displays the Wide SCSI I/O controllers currently configured into the system. If your system contains multiple controllers then a number of them will be listed. Ensure that the all numeric location field (for example, 04-02) corresponds to the slot where the Wide SCSI I/O controller (IBM FC2409) is installed and that the status field is listed as available.

If the device is not listed or is shown as *Defined*, then the operating system has not correctly configured the device. In that case, check the hardware installation and retype the command shown at the beginning of this Step 2.

3. Determine the following:
    – SCSI target address of your RAID controller configured in Section 2.
    – Number of consecutive Logical Unit Numbers (LUNs) configured on the RAID controller.

4. Check for previously installed RAID software by typing:

    ```
    # odmget -quniquetype=disk/scsi/HSZ50 PdDv
    ```

5. If you locate previously installed RAID software (i.e., `odmget` command produces some output), delete the existing RAID software using the following commands:

    ```
    # odmdelete -o PdDv -q uniquetype=disk/scsi/HSZ50
    # odmdelete -o PdAt -q uniquetype=disk/scsi/HSZ50
    # odmdelete -o PDiagAtt -q DType=HSZ50
    # odmdelete -o PDiagDev -q DType=HSZ50
    # odmdelete -o errnotify -q en_rtype=HSZ50
    ```

6. Install the SCSI cable between the host adapter and the array subsystem. Route the right angle connector end of the cable under the Subsystem enclosure and up through the front access hole nearest to the controller connector. Install the connector with the cable dressed to the right by firmly pushing it onto the controller's mating connector. Tighten the two screws on the cable connector.

3.3   Loading the StorageWorks Software onto the Hard Disk

The StorageWorks software consists of the RAID Array software installation scripts, the AIX support files, and the Command Console (CC) Agent. Installation and operation of the software will require temporary and permanent space on your hard disk. You will need approximately 4 Mbytes of permanent space on your hard disk to use the StorageWorks software and an additional 2 Mbytes of temporary space on your hard disk for installation purposes.

The StorageWorks software consists of:

*   An installation and configuration script
*   ODM database files
*   ODM catalog files
*   The Command Console Agent

Loading the StorageWorks software requires the following major steps:

*   Mounting the CD-ROM which contains the software.
*   Extracting the files from the file archive to a temporary storage area.
*   Executing the installation and configuration script.

3.3.1 Copying the File Archive from CD-ROM to Temporary Storage

Before the installation script or upgrade script can be run, the file archive that contains the StorageWorks software will need to be copied from the CD-ROM to a temporary directory. The scripts can then be executed. You will need approximately 2 MBytes of temporary space to load the file archive from CD-ROM.

1. Insert the StorageWorks software distribution CD-ROM into the drive.

2. Login as root (superuser).

3. Change the directory to a temporary storage area (/tmp). For example, type:

    # **cd /tmp**

4. Create a directory into which the file archive can be loaded:

    # **mkdir ra310**

5. Change to that directory:

    # **cd ra310**

6. Mount the CD-ROM*:*

    # **mount -vcdrfs -r /dev/cd0 /mnt**

    (Note: the name of /dev/cd0 *may be different on your system.)*

7. Extract the file archive from the CD-ROM by entering the following command:

    # **tar xvf /mnt/agents/stm_aix310.tar**

8. All of the files necessary to complete the StorageWorks Software installation have now been copied to this directory.

9. If you are upgrading or reinstalling, use option 2 of the installation script to get to the upgrade option.

3.3.2 Executing the Installation Script

Perform the following procedure to install the StorageWorks software onto your system:

1. Enter the following command and press RETURN.

    # **./stgwks_aix310.sh**
    The installation options menu appears:

```
StorageWorks and Command Console Agent

Installation and Configuration Menu

StorageWorks Options:

1) Install StorageWorks software

2) StorageWorks Maintenance

Agent Options:

3) Install Agent

4) Agent Maintenance

Q) Quit

Enter Selection: 1
```

2. Type **1** to install StorageWorks Software. The Copyright Notice and the following information will be displayed:

```
Copyright Digital Equipment Corp.  1994, 1995, 1996. All rights reserved.

Restricted Rights:  Use, duplication by the U.S. Government is subject

to restriction as set forth in subparagraph (c) (1) (ii) of DFARS

252.227-7013, or in FAR 52.227-19, or in FAR 52.227-14 Alt. III, as

applicable.

Portions of this software are proprietary to and embody the confidential

technology of Digital Equipment Corporation. Possession, use, or copying of

this software and media is authorized only pursuant to a valid written

license from Digital or an authorized sublicensor.

Checking User . . . . . . . . . . . . . . . . . . . . . . . . . .    [ OK ]

Checking AIX Revision Level . . . . . . . . . . . . . . . . . .    [ OK ]

Checking that SCSI-2 Adapter is installed
and correctly configured . .                                       [ OK ]

Checking for previous HSZ20 software installation . .              [ OK ]

Checking for ODM add file . . . . . . . . . . . . . . . . . . . .  [ OK ]

Checking for ODM catalog file . . . . . . . . . . . . . . . . . .  [ OK ]

                    --**ALL CHECKS PASSED**--
```

3. Once all of the checks have been successfully completed, you will be asked about the RAID Array 310 configuration. In order for the system to recognize the devices attached to the RAID Array 310, the Target ID (TID) and at least one Logical Unit Number (LUN) must have been created on the 310 via the Command Line Interface (CLI). The system can correctly configure the RAID Array 310 with multiple TIDs and multiple LUNs per TID subject to the following restrictions:

- LUNs must start with LUN 0

- LUNs created for each TID must be consecutive with no gaps

- When multiple TID's have been created, the same number of LUNs per TID must also have been created

- If your computer system is equipped with two RAID Array 310 storage subsystems, the number of LUNs configured on each subsystem must be the same

- If your computer system is equipped with multiple FWD SCSI-2 Adapters, all of the restrictions above apply to each RAID Array 310 subsystem attached to each adapter

- The following examples are allowable RAID Array 310 configurations as they *will* be correctly recognized and configured by the RS/6000:

- TID 4 and LUN 0

- TID 4 and LUN 0 and LUN 1

- TID 6 and LUN 0 and LUN 1 and LUN 2

- TID 4 and LUN 0, TID 6 and LUN 0

The following examples are illegal RAID Array 310 configurations as they *will not* be correctly recognized and configured by the AIX:

- TID 4 and LUN 5 – AIX would create hdisk devices for TID 4, LUNs 0 through 5.

- TID 4 and LUN 5 and LUN 6 – AIX would create TID 4, LUNs 0 through 6.

- TID 6 and LUN 1 and LUN 4 and LUN 6 – AIX would create TID 6, LUNs 0 through 6.

- TID 4 and LUN 5, TID 6 and LUN 5 – AIX would create TID 4, LUNs 0 through 5, and TID 6, LUNs 0 through 5.

- TID 4 and LUN 0, TID 6 and LUN 0 and LUN 1 – AIX would create TID 4, LUNs 0 and 1, and TID 6, LUNs 0 and 1.

4. Answer the following prompt with the correct number of LUNs configured in your system and press RETURN.

```
Please enter the number of consecutive LUN's, 1..8, that have been
configured on the RAID Array 310:
```

For the correct examples previously listed, the answers to this question would be: 1, 2, 3 and 1.

5. After the correct number of LUNs is entered, the installation script verifies that the answer is within the range of 1 through 8 and continues execution until the following information is displayed. (*Note: Processing time is approximately 2 minutes.)*

```
Maximum LUNS configured = 4 . . . . . . . . . . . .  . . . . . [ OK ]
 Editing RAID Array 310 ODM Database file . . . . . . . . . . . .[ OK ]
 Adding HSZ20 to ODM Database . . . . . . . . . . . . . . . . .[ OK ]
 Adding HSZ20.add .414 to ODM Database . . . . . . . . . . . . [ OK ]
 Moving ODM Catalog into place . . . . . . . . . . . . . . . . [ OK ]
 Configuring HSZ20 into system . . . . . . . . . . . . . . . . [ OK ]
 Saving base configuration . . . . . . . . . . . . . . . . . . [ OK ]
 Issuing bosboot command, please standby . . . . . . . . . . . [ OK ]
 Copying installation files to HSZ20 directory . . . . . . . . [ OK ]
                  --** RA310 Installation Complete**--
```

This display lists the RAID Array 310 devices that have been configured into the system and recognized by the operating system.

This ends the first part of the installation.

Via menu option 2 (StorageWorks Maintenance), there is an option to create Logical Volumes and File Systems on the RAID Array 310 that can be used if you are not familiar using SMIT. The normal procedure is to use SMIT. If you are not using this option, continue with Section 3.4.

The installation script determines the maximum amount of storage provided by the current set of devices attached to the RAID Array 310. The script allows the user to choose the size of each file system. Any storage space not allocated to a file system during the installation can be used to extend the file systems at a later date or create additional logical volumes.

NOTE

Answering "Y" in the following step, will allow the installation script to create the Logical Volume Groups, Logical Volumes, file systems, and mount points for the devices attached to the RAID Array 310. This option is useful for users that are not familiar with the Logical Volume Manager and creation of a file system organization.

Answering "N" will cause the installation script to perform a small amount of cleanup and complete the installation, without creating any of the filesystem components necessary to utilize the RAID Array 310 devices. This option is desirable for the user who understands how to utilize the Logical Volume Manager to tailor the file systems to their requirements.

---

6. Enter the answer to the following prompt and press RETURN.

```
RAID Array 310 Configuration Information

name      status        location       description
hdisk1   Available     00-03-01-40    DEC HSZ20 RAID Array 310
hdisk2   Available     00-03-01-41    DEC HSZ20 RAID Array 310
hdisk3   Available     00-03-01-42    DEC HSZ20 RAID Array 310
hdisk4   Available     00-03-01-43    DEC HSZ20 RAID Array 310
Please answer Y/N (Yes or No) to the following question.
 Would you now like to create the Logical Volume Group(s)
that will contain the RAID Array 310 devices ?
```

The following messages are displayed only if the user answered "Y" to allow the installation script to create the default set of Logical Volume Group(s).

> **NOTE**
>
> Answering "1" in the following step will result in all of the devices listed under the "RAID Array 310 Configuration Information" display to be included in one Logical Volume Group.
>
> Answering "2" will result in the creation of one Logical Volume Group for each device listed under the "RAID Array 310 Configuration Information" display.

```
Beginning Logical Volume Group Creation

This installation script can create two different types of Logical

Volume Groups. The script can:

1. Create a Logical Volume Group which contains all of the RAID Array
310 devices currently configured, or

2. Create one Logical Volume Group for each individual RAID Array 310
device that is currently configured.

Please specify 1 or 2:
```

7. Enter 1 or 2 depending how your RAID array is configured and how you would like your storage organized and press RETURN.

8. If "1" is entered, all of the devices listed will be included in one Logical Volume Group as shown on the following page (All Devices Included in One Logical Volume Group). If "2" is entered, one new Logical Volume Group will be created for each device configured on the RAID Array 310 as shown on page 3–10.

```
A new Logical Volume Group will be created and all of the configured RAID
Array 310 devices will be added to that group.
Creating Logical Volume Group - RAID310lvg00 . . . . . . . . . .[OK]
Activating Logical Volume Group - RAID310lvg00 . . . . . . . . .[OK]
```

```
20000 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-00 ...Created OK...Mounted OK

17952 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-01 ...Created OK...Mounted OK

15904 megabytes available
```

```
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-02...Created OK...Mounted OK

13856 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-03 ...Created OK...Mounted OK

11808 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-04 ...Created OK...Mounted OK
9760 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-05 ...Created OK...Mounted OK

7712 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-06 ...Created OK...Mounted OK

5664 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-07 ...Created OK...Mounted OK

3616 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->2048
File system - RA310-08 ...Created OK...Mounted OK
```

```
1568 megabytes available
Please specify the size of the filesystem to be created in megabytes.
Default is 2048 megabytes. Enter zero to exit filesystem creation
- -->1568
File system - RA310-09 ...Created OK...Mounted OK


Exiting file system creation for Logical Volume Group raidlvg0
```

New HSZ20 RAID Array 310 Filesystem Information

Filesystem	Total KB	free	%used	iused	%iused	Mounted on
/dev/lv00	2097152	2031288	3%	16	0%	/RA310-00
/dev/lv01	2097152	2031288	3%	16	0%	/RA310-01
/dev/lv02	2097152	2031288	3%	16	0%	/RA310-02
/dev/lv03	2097152	2031288	3%	16	0%	/RA310-03
/dev/lv04	2097152	2031288	3%	16	0%	/RA310-04
/dev/lv05	2097152	2031288	3%	16	0%	/RA310-05
/dev/lv06	2097152	2031288	3%	16	0%	/RA310-06
/dev/lv07	2097152	2031288	3%	16	0%	/RA310-07
/dev/lv08	2097152	2031288	3%	16	0%	/RA310-08
/dev/lv09	1605632	1555200	3%	16	0%	/RA310-09

New Logical Volumes by Volume Group

```
raidlvg0:
```

LV NAME	TYPE	LPs	PPs	PVs	LV STATE	MOUNT POINT
loglv00	jfslog	1	1	1	open/syncd	N/A
lv00	jfs	512	512	1	open/syncd	/RA310-00
lv01	jfs	512	512	1	open/syncd	/RA310-01
lv02	jfs	512	512	1	open/syncd	/RA310-02
lv03	jfs	512	512	1	open/syncd	/RA310-03
lv04	jfs	512	512	1	open/syncd	/RA310-04
lv05	jfs	512	512	1	open/syncd	/RA310-05
lv06	jfs	512	512	1	open/syncd	/RA310-06
lv07	jfs	512	512	1	open/syncd	/RA310-07
lv08	jfs	512	512	1	open/syncd	/RA310-08
lv09	jfs	392	292	1	open/syncd	/RA310-09

```
HSZ20 Installation Complete
Creating Logical Volume Group - RA310lvg00 with device hdisk2  .[OK]
Activating Logical Volume Group - RA310lvg00 . . . . . . . . .. [OK]
Creating Logical Volume Group - RA310lvg01 with device hdisk3  .[OK]
Activating Logical Volume Group - RA310lvg01 . . . . . . . . .. [OK]


Filesystem creation for Logical Volume Group RA310lvg00.
-------------------------------------------------------


14008 megabytes available
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
Enter zero to exit filesystem creation.
-->8000
File system - RA310-00 ...Created OK...Mounted OK


6008 megabytes available
```

```
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
Enter zero to exit filesystem creation.
-->4008
File system - RA310-01 ...Created OK...Mounted OK

2000 megabytes available
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
```

```
Enter zero to exit filesystem creation.
-->2010
The requested filesystem size exceeds the amount
of free space left. Please enter a smaller size.

2000 megabytes available
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
Enter zero to exit filesystem creation.
-->2000
File system - RA310-02 ...Created OK...Mounted OK
Exiting file system creation for Logical Volume Group raidlvg0.


Filesystem creation for Logical Volume Group RA310lvg1.
-------------------------------------------------------


8000 megabytes available
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
Enter zero to exit filesystem creation.
-->3000
File system - RA310-03 ...Created OK...Mounted OK
5000 megabytes available
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
Enter zero to exit filesystem creation.
-->2000
File system - RA310-04 ...Created OK...Mounted OK

3000 megabytes available
Please specify the size of the filesystem to be
created in megabytes. Default is 2048 megabytes.
Enter zero to exit filesystem creation.
-->0
Exiting file system creation for Logical Volume Group RA310lvg0.


New HSZ20 RAID Array 310 Filesystem Information
-------------------------------------------------

```

```
Filesystem     512-blocks     Free %Used    Iused %Iused Mounted on
/dev/lv00      16384000 15869632    3%       16      0% /RA310-00
/dev/lv01       8208384  7950640    3%       16      0% /RA310-01
/dev/lv02       4096000  3967344    3%       16      0% /RA310-02
/dev/lv03       6144000  5951056    3%       16      0% /RA310-03
/dev/lv04       4096000  3967344    3%       16      0% /RA310-04


New Logical Volumes by Volume Group
---------------------------------
```

```
raidlvg0:
LV NAME            TYPE      LPs   PPs   PVs  LV STATE      MOUNT
POINT
loglv00            jfslog    1     1     1    open/syncd    N/A
lv00               jfs       2000  2000  1    open/syncd    /RA310-00
lv01               jfs       1002  1002  1    open/syncd    /RA310-01
lv02               jfs       500   500   1    open/syncd    /RA310-02
raidlvg1:
LV NAME            TYPE      LPs   PPs   PVs  LV STATE      MOUNT
POINT
loglv01            jfslog    1     1     1    open/syncd    N/A
lv03               jfs       750   750   1    open/syncd    /RA310-03
lv04               jfs       500   500   1    open/syncd    /RA310-04


RA310 Installation Complete
StorageWorks and Command Console Agent
Installation and Configuration Menu
_____


StorageWorks Options:
--------------------
1) Install StorageWorks software
2) StorageWorks Maintenance


Agent Options:
-------------
3) Install Agent
4) Agent Maintenance

Q) Quit

Enter Selection: q
```


3.4   Changing the Maximum LUN System Setting

The AIX operating system maintains an ODM data base parameter for the maximum number of Logical Unit Numbers configured on the RAID Array 310. At installation time the user is asked for the maximum number of LUNs configured on the RAID Array 310. Since that value is subject to change by the addition of new storage devices and reconfiguration with the CLI, the ODM parameter will need to be changed as well. Changing this system setting is made possible through the use of the following script. The script will ask for the new number of LUNs and then ask whether to reconfigure AIX. The following command invokes the reconfiguration script. The screen display follows the command.

> # **`cd /usr/stgwks/HSZ20`**
>
> # **`./change_max_hsz20_luns`**

You can also use the **Change LUN** option from the *Install* script.

After the command is entered the following is displayed:

```
Copyright Digital Equipment Corp. 1994, 1995 1996. All rights reserved.

Restricted Rights: Use, duplication by the U.S. Government is subject
to restriction as set forth in subparagraph (c) (1) (ii) of DFARS
252.227-7013, or in FAR 52.227-19, or in FAR 52.227-14 Alt. III, as
applicable.

Portions of this software are proprietary to and embody the
confidential technology of Digital Equipment Corporation. Possession, use,
or copying of this software and media is authorized only pursuant to a
valid written license from Digital or an authorized sublicensor.
Checking User Privileges...OK

Please enter the total number of consecutive LUN's, 1...8,
that are now configured on the RAID Array 310: 5
Maximum LUN's configured = 5          ...OK
Changing RAID Array 310 ODM Database file...OK

Please answer Y/N (Yes or No) to the following question.
Would you like to run cfgmgr to configure the new LUN's ? y
Configuring HSZ20 into system...OK
Saving base configuration...OK
Issuing bosboot command, please standby...OK

RAID Array 310 Configuration Information
----------------------------------------
name    status    location     description
hdisk1 Available 00-02-01-40 DEC HSZ20 RAID Array 310
hdisk2 Available 00-02-01-41 DEC HSZ20 RAID Array 310
hdisk3 Available 00-02-01-42 DEC HSZ20 RAID Array 310
hdisk5 Available 00-02-01-43 DEC HSZ20 RAID Array 310
hdisk6 Available 00-02-01-44 DEC HSZ20 RAID Array 310
RAID Array 310 Reconfiguration Complete.
```

3.5 Uninstalling RAID Array 310

If at some point you want to uninstall the RAID Array 310 from your system, the following command will invoke an uninstall script and all traces will be removed. Since all logical volume groups, logical volumes and filesystems that reside on the RAID Array 310 will be deleted, this script should be used with extreme caution.

```
# cd /usr/stgwks/HSZ20
```

```
# ./uninstall310_31.sh
```

```
This uninstall program will remove all traces of the RAID Array 310 from
the system. All RAID Array 310 filesystems will be deleted from the system.
Are you sure you want to remove all traces of the RAID Array 310 from your
system?
Please answer OK or N ok
```

If you respond with the "OK" response, the system starts the deletion process. The uninstall script will not remove the ODM entries for the RAID Array 310 if the root volume group is installed on the device.

```
Unmounting and removing filesystems /RA310-00 . . . .    [DONE]

**All filesystems on RA310 are unmounted and mountpoints are removed

Removing RAID logical volume RA310lvg0 . . . . . . . .    [DONE]
removing RAID logical volume RA310lvg1 . . . . . . . .    [DONE]

        **--All Volume Groups of the RA310 are removed now ** --

Removing RAID Logical Volume Group information . . . .    [DONE]
Removing mount points . . . . . . . . . . . . . . . . . [DONE]
Removing RAID device from configuration database . . . . .    [DONE]
Removing RAID Device entry from ODM database . . . . . . .    [DONE]
Deleting directory /usr/stgwks/HSZ20 . . . . . . . . . . .    [DONE]

Uninstall completed...
```

4

Installing the Command Console Agent on Your Host System

This chapter describes how to install a copy of the Command Console (CC) Agent on each of your host systems connected to StorageWorks RAID Array 310 subsystems automatically, using the installation and configuration script.

4.1 Installing and Configuring CC Agent

Command Console (CC) Agent is a companion application to the Command Console (CC) Client graphical user interface (GUI) program. CC Agent serves as Client's assistant in configuring, operating, and monitoring your host's storage subsystems. CC Agent runs on your host system as a server application. It connects to CC Client sessions via the TCP/IP network protocol, as shown in Figure 4−1.

CC Agent can also be used as a standalone application without the CC Client. In this mode of operation, referred to as Agent Only, the CC Agent monitors the status of the subsystem and provides local and remote notification in the event of a failure. Local notification can be via email and/or the Syslog Facility. Remote notification can be made via SNMP messages to an SNMP Monitor. The CC Client is not required for these types of notification. In order to configure the subsystem, use of the CC Client or the CLI would be required.

Figure 4–1 Command Console Client/Agent Connection
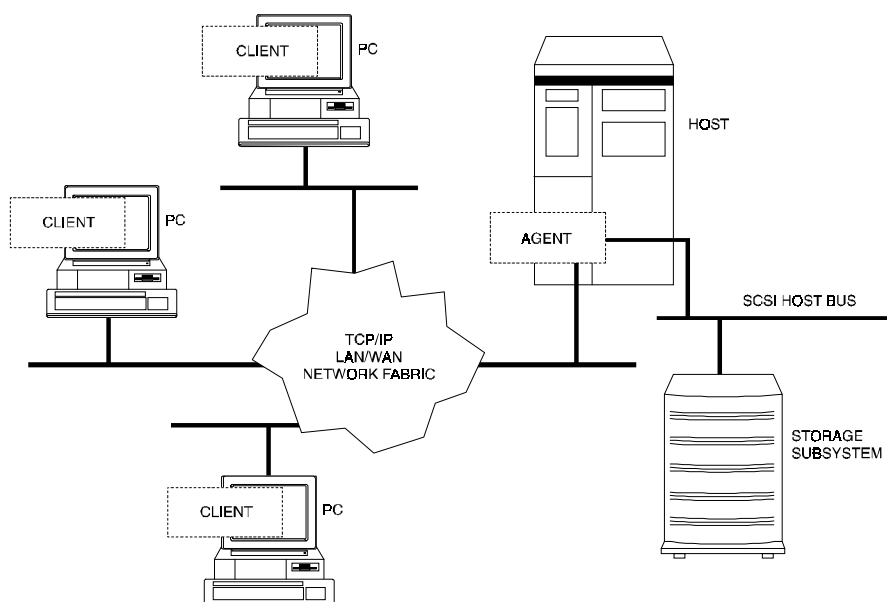
CC Agent also provides asynchronous fault notification. The program monitors your host's storage subsystems and sends notification messages to all Client sessions connected to it the moment a fault occurs. You can configure CC Agent to use TCP/IP notification to Client and SNMP notification to an SNMP-compatible monitoring application.

4.1.1 Minimum Requirements

CC Agent is designed to operate with Command Console Client Version 1.1 for Windows NT and Windows 95.

Before you can install a CC Agent:

- Your host's system resources must meet the minimum requirements specified in Table 4–1

- You must have created the communications logical unit on each storage subsystem to which you want to connect. If your subsystems do not each contain at least one logical unit, see Chapter 2 to use the controller's command line interpreter (CLI) software to create one. Subsystems without at least one volume are invisible to CC Agent and the host operating system.

Table 4–1 Minimum System Requirements

Host Features	Requirements
Architecture	IBM RS/6000 2 MB free space in /tmp directory, 4 MB free space for CC Agent installation directory
Operating System	IBM AIX Version 4.1.4, 4.1.5 or 4.20
Controller Compatibility	Controller running operating firmware Version 5.0.

4.1.2 Selecting a CC Agent Installation and Configuration Method

You must install and run CC Agent for IBM AIX on each RS/6000 system you wish to connect to the 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 4.1.3.

If you wish, however, you can manually configure the CC Agent by editing the Agent's configuration files with a text editor. To configure the CC Agent manually, go to Appendix B.

4.1.3 Installing and Configuring Automatically

The install program performs the installation using software retrieved from the CD-ROM in Section 3.3.1. You must have access to the superuser (root) account to perform this installation.

You need to gather some information prior to starting the installation. See Table 4–2. Entries in Table 4–2 appearing with a * specify the information you need prior to starting the installation.

The CC Agent will automatically start when you install it and will restart automatically if it stops for any reason.

To install and configure CC Agent automatically, follow these steps:

1. Log on to the host system as root (superuser).

2. Type: **cd /tmp/** to change your working ra310 directory to the /tmp directory containing the CC Agent software loaded from CD–ROM.

3. Type: **./stgwks_aix310.sh** to start the StorageWorks Installation and Configuration script. The StorageWorks Installation and Configuration script menu appears:

StorageWorks and Command Console Agent
Installation and Configuration Menu

StorageWorks Options:

1) Install StorageWorks software

2) StorageWorks Maintenance

Agent Options:

3) Install Agent

4) Agent Maintenance

Q) Quit

Enter Selection: 3

---

4. Type: **3** to install the CC Agent.

5. Follow the text-based prompts and enter the appropriate information. Table 4−2 guides you in responding to many of the prompts.

**Table 4–2 Information you Need Prior to Installing and How to Respond to
Install Program Prompts**

Information Required to Complete Installation	How to Respond
Target directory for installation	/usr/stgwks is the AIX recommended directory for StorageWorks. It contains the software you installed in Chapter 3. You need a directory with a minimum of 4 MB of space available. Type the name of a directory and the install program automatically creates it if it doesn't already exist.
*Port that the Command Console Client GUI uses to communicate with the Command Console Agent for subsystem configuration and maintenance.	*Default is 4998. If the default port is already used, press N and specify a new port. See Appendix F, *Editing Services File* for more information.
*Port number that the Command Console Agent uses to send notifications to the Command Console Client GUI.	*Default is 4999. If the default port is already used, press N and specify a new port. See Appendix F, Editing Services File for more information.
The directory which contains the device special files.	AIX device special files are located in the /dev directory.
A password to gain access to the agent to configure the subsystem with the GUI.	Enter a 4 - 16 character password. The install program does not echo what you type.
*The name of CC Agent manufacturer and the Enterprise object identifier for use with its MIB, so that it can operate with other SNMP applications.	*Enter Digital Equipment Corporation as the CC Agent manufacturer.
*The Enterprise Object Identifier (OID) is a vendor specific value used to identify SNMP messages.	*Enter: 36.2.15.21
*Names of the host systems on which you will run the Client.	*Enter the Network names for the hosts from which you will run the GUI.
Level of access a client has for communicating with the storage subsystems. The possible options are: 0 = Overall Status 1 = Detailed Status 2 = Configuration	You can give a client configuration level access only if you specified an access password.

Table 4–2 Information you Need Prior to Installing and How to Respond to Install Program Prompts (cont.)

Information Required to Complete Installation	How to Respond
How do you want a CC Agent server to notify a client when an error condition occurs? Notification schemes available are: 0 = No Error Notification 1 = Notification via a TCP/IP Socket 2 = Notification via the SNMP protocol 3 = Notification via both TCP/IP and SNMP	Selecting this option results in: 0 = No notification over network, but local notification through e-mail and an entry in the CC Agent error log file. 1 = Notification messages sent to the GUI and local notification sent through e-mail and an entry in the CC Agent error log file. 2 = Notification messages sent to the SNMP monitor and local notification sent through e-mail and an entry in the CC Agent error log file. 3 = Notification messages sent to the GUI, the SNMP monitor, and local notification sent through e-mail and an entry in the CC Agent error log file.
Do you want email notification of errors or failures on the RAID subsystem? *If yes to email notification, specify email address and notification level. 1 = Fatal error only 2 = Warning and fatal errors 3 = Info, warning and fatal errors	Type Y to receive email and syslog notification. Type N for syslog notification only. *Enter email address and notification level for each user. 1 = Notification for serious errors, which require immediate attention. 2 = Notification for serious errors and warning messages. 3 = Notification for serious errors, warnings and informational messages.
Names of your subsystems.	Specify unique names for each subsystem in your configuration.
*The character special file name for accessing the storage subsystem (for example, hdisk4).	*Enter the device name that your operating system assigned to the communications logical unit that you created in Chapter 2. To determine the device name type: **lsdev -Cc disk** Then locate the hdisk that corresponds to the communications LUN.

Your CC Agent program is installed. It was automatically started if you typed Y to start the CC Agent during the installation. It will restart automatically after a system reboot or if it stops for any reason.

You have now completed the installation of your RAID Array 310.

> **NOTE**
>
> If you wish to install the Command Console Client at this point, proceed to Appendix B.

4.2 System Clean Up

Having successfully completed the installation of the StorageWorks software and the CC Agent, it is now possible to delete the temporary directory. For example, type:

`#` **`rm -r /tmp/ra310`**

4.3 Running CC Agent

Your Agent program was automatically started when you installed it, and it was installed to restart automatically if the system is rebooted or it stops for any reason.

The installation script places an entry in the "/etc/inittab" file to implement automatic execution of the Agent. The tag field in the file is "steam".

4.4 Reconfiguring CC Agent

You can reconfigure previously-installed Agents using the configuration and installation program. To reconfigure an Agent, execute the *./stgwks_aix.sh*, script in */usr/stgwks*, the StorageWorks Installation and Configuration, directory (*/usr/stgwks)* and follow the prompts to CC Agent maintenance.

4.5 Uninstalling CC Agent

You can remove the CC Agent program using the Agent Maintenance option from the *stgwks_aix.sh* Bourne-shell script.

To remove the Agent follow these steps:

1. Run the *./stgwks_aix310.sh* script from the */usr/stgwks* directory.
2. Select option 4, Agent Maintenance.
3. Select option 5, Uninstall Agent, from the Agent Configuration Menu.

Uninstalling CC Agent stops the agent and removes all of its files.

5

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.

5.1 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 Intel PC-based Windows 95 or Windows NT. Install the Client software on your system using the information described below.

5.2 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 5–1.

Table 5–1 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 or 4.0 (build 1057 or later) or Windows 95 (build 950 or later)
Graphics Subsystem	SVGA or better. 800 x 600 minimum screen resolution.
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 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. Refer to Appendix B to start it.

5.3   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.

A

Configuration Guidelines and Records

This appendix contains a list of guidelines and record tables that will assist in optimizing the performance of your RAID Array 310 System.

Use the following guidelines to, as appropriate, to optimize you system performance.

1. Evenly distribute the devices across separate ports. This permits parallel activities on the controller's available ports to the attached devices.

2. Intermix higher and lower performance devices on the same port, that is, use 7200 rpm and 5400 rpm drives on the same port.

3. Evenly set preferred targets across two controllers.

4. Evenly distribute logical units across separate targets; that is, use different SCSI IDs, if possible. The RAID Array 310 supports a maximum of four SCSI IDs.

5. Allow the simultaneous running of as many processes as possible. This takes advantage of tag command queuing and multi-controller ports.

6. Avoid configuring multiple mirrorsets with the first member being on the same port. That is:

    ```
    add mirrorset m1 disk100 disk200

    add mirrorset m2 disk210 disk110
    ```

    The default mirrorset read selection algorithm will choose the first member of the mirrorset it the mirrorset does not already have a read queue.

7. If write performance is important, the writeback cache should be turned ON for each unit. The default value is OFF.

8. For optimal performance, the number of concurrently running processes should be at least six. This effectively utilizes the six channels of the RAID controller to process requests concurrently.

9. If transfer sizes are small (less than 8 KB), use the default "maximum cached transfer size" (32). Transfers that exceed the default "maximum cached transfer size" will never go into the cache. For most random access benchmarks, it is best to set this number high (for example, 1024).

Date_____	
LUN	Uses

Date_____			
Name	StorageSet	Uses	Used by

Date_____	
LUN	Uses

Date_____

Name	StorageSet	Uses	Used by

Date_____	
LUN	Uses

Date_____

Name	StorageSet	Uses	Used by

Date_____	
LUN	Uses

Date_____

Name	StorageSet	Uses	Used by

B

Upgrading Controller Software

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

NOTE
For upgrading the firmware in the RAID Array 310, a PC running either Windows 3.11, Windows 95 or Windows NT is needed.

B.1 Backing up your system

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

B.2 Saving the RAID Array 310 V3.1 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 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:
            ZG43700116 HSZ20 Controller Software, 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 (5 seconds)
                CACHE_POLICY = _____
                    Host Functionality Mode = ( Netware =B,     Windows NT=D,
            OpenVMS=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
```

B.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 B–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:

    SWXRC> **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 B–2). The first row shows how to record for S28 of the sample:

NOTE

Not all column headings apply to all storagesets.

Table B–2 Storageset Table

NAME	STORAGE SET	USES	USED BY	POLICY	COPY	READ SOURCE	RECONS TRUCT	CHUNK SIZE
S28	Stripeset	DISK130 DISK220	D100					256
FAILED SET	AUTOSPARE	NOAUTOSPARE						

B.3 Upgrading Controller Software Using a PC

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 which came in the StorageWorks RAID Array for the RAID 310 kit.

- Windows 3.1 and 3.11, Windows for Work Groups, 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 in the following example.

NOTE

If you are using Windows 95 or Windows NT 4.0, skip to section 1.4.

B.4 Windows 3.1/3.11, Windows for Work Groups, or 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)

   Click OK when you complete the settings.

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 the controller prompt is "HSZ20>", its string 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 programs baud rate to match the controller's. Select *Communications* option from the *Settings* menu. When the Communications window appears, set the baud rate to *19200* and click OK.

> **NOTE**
>
> Remember to change the RAID Manager and/or 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.

12. 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.

B.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 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. 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 B-1.

CAUTION

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

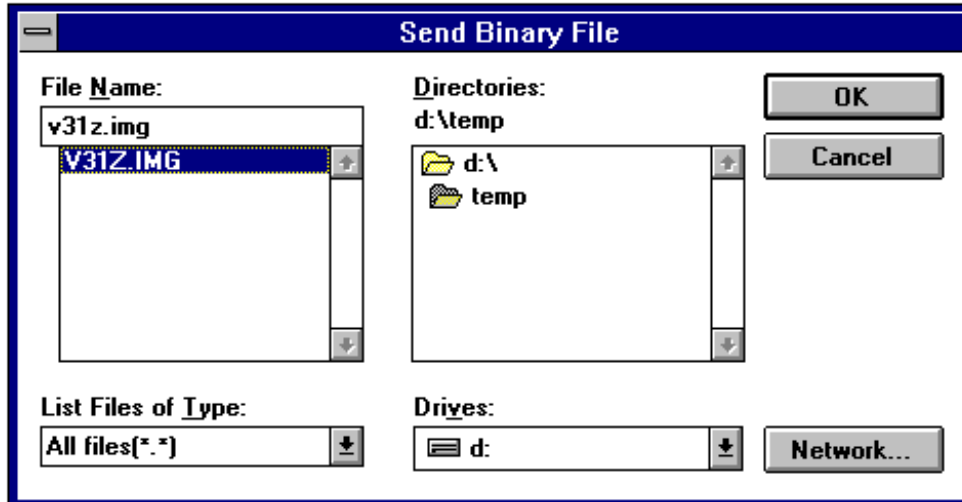**Figure B–1 Select Send Binary Files from the Transfers Menu**
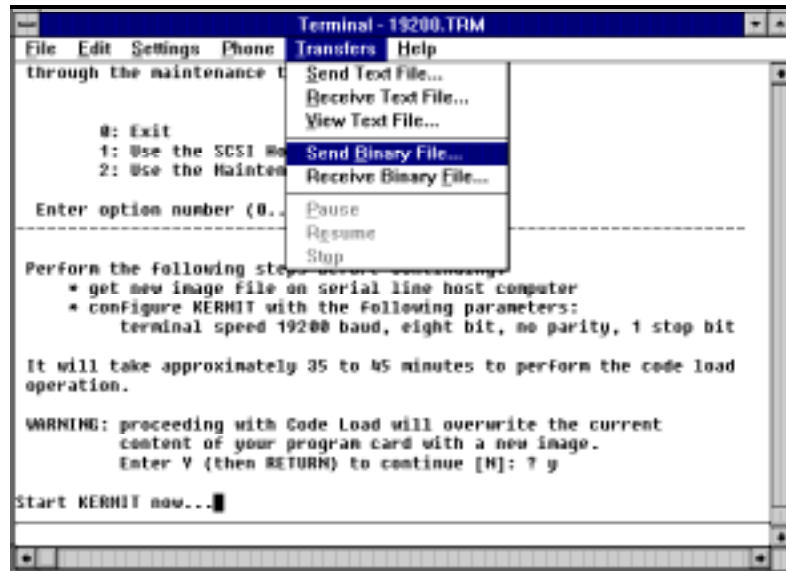
11. Select the V31Z.IMG file and Click OK as shown in figure B-2.

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 B–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 Software 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 = 10MB
Cache:
16 megabyte write cache, version 2
Cache is GOOD
Battery is GOOD
No unflushed data in cache
CACHE_FLUSHED_TIMER = 5 (seconds)
CACHE_POLICY = A
Host Functionality Mode = D.
```

B.5   Windows 95 and Windows NT 4.0 Upgrade Procedures

To begin upgrading the controller software, start and set up the terminal emulation program as specified in the following example:

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 setting. Press the Tab key once and select the OK icon.

4. Click the Settings menu and select VT100 emulation.

5. 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.

NOTE

COM1 is the default connection setting.

6. Change the Port Settings baud rate from 2400 to 9600 bits per second.

7. Select Xon/Xoff or None as the Flow Control setting. Press the Enter key. This will return you to your newly-created Terminal session.

8. 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 ?.

9. Click File at the menu bar. Choose Save, to save the configuration you have just created.

10. Set the controller prompt by typing at the prompt. (This step is optional):

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.

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

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

> **CAUTION**
>
> Remember to change the RAID Manager and/or 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.

13. 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.

B.5.1 Downloading the Software

To download the new software, follow these directions:

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\v3.1* 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. 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 B-3.

CAUTION

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

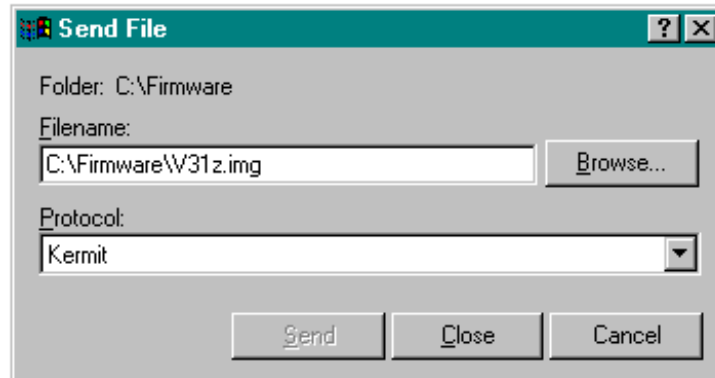**Figure B–3 Select Send File from the Transfer Menu**
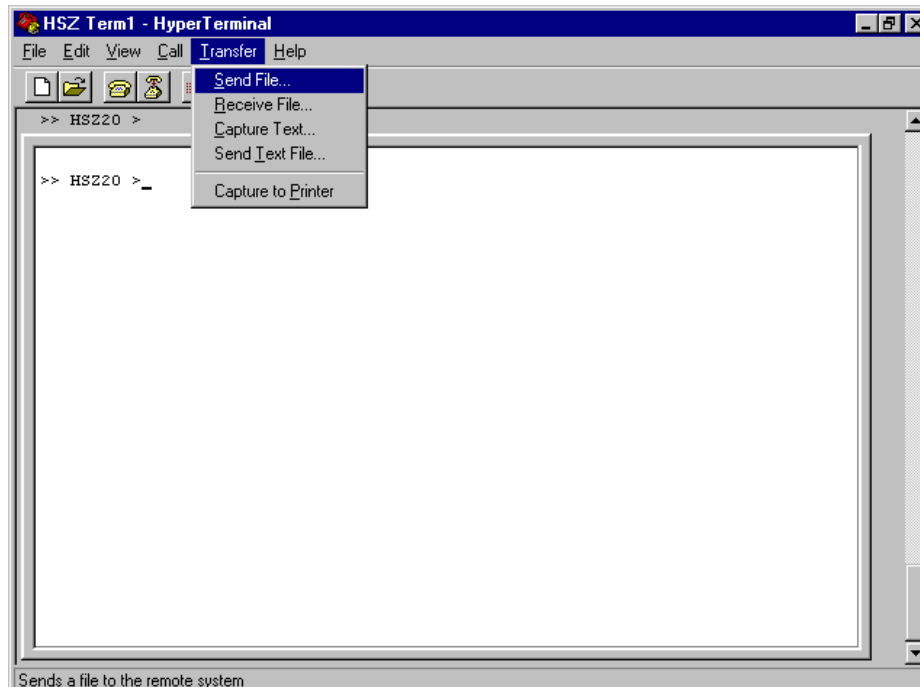
11. Select the V31Z.IMG file and click OK.

NOTE

The following figure shows 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 B–4 Select the V31Z.IMG "Send 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
```

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.

14. 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)
HSZ20>show this_controller
Controller:
          HSZ20 CX54300265 Software 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 = 10MB
Cache:
16 megabyte write cache, version 2
Cache is GOOD
Battery is GOOD
No unflushed data in cache
CACHE_FLUSHED_TIMER = 5 (seconds)
CACHE_POLICY = A
Host Functionality Mode = D.
```

B.6 Reverting to Software Image Version 2.7

For reversions to release V2.7, substitute V27Z.IMG for V31Z.IMG in the previous
section (step 2) as the correct software image filename. V27Z.IMG is stored in directory
\firmware\V27.

B.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.

C

Configuring STRIPEsets, MIRRORsets, and Striped MIRRORsets

This appendix provides instructions for configuring STRIPEsets, MIRRORsets and Striped MIRRORsets.

C.1   Create a Stripeset

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. The example above contains disks from different buses.

C.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.

C.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).

C.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.

C.2   Create a Mirrorset

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. The example above contains disks from two different buses.

C.2.1 Initialize the Mirrorset

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

```
HSZ20> INITIALIZE MIRROR1
```

C.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 (specified earlier with the SET THIS_CONTROLLER command).

C.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.

C.3   Create a Striped Mirrorset

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

C.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. As in Section C.3.2, the names of the mirrorsets are user-defined.

C.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.

C.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.

C.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 mirror set created above.

C.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
```

This example uses a controller target ID of 3 and LUN 0 (specified earlier with the SET THIS_CONTROLLER command).

C.4   Add Individual Disks as Logical Units

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.

C.5   Add Drives to the 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.

C.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

IBM AIX 4.1.4, 4.1.5 and 4.2.0 Bootability

This appendix contains a list of guidelines for bootstrapping your RAID Array 310 subsystem Logical Unit to a RS/6000 system.

Firmware Version 5.0 supports the ability to bootstrap the RS/6000 from a RAID Array 310 subsystem Logical Unit. That is, you can install AIX directly onto a RAID Array 310 subsystem Logical Unit from the AIX Distribution Kit. For AIX 4.1.4, 4.15 and 4.20, the ability to boot AIX from a RAID Array 310 subsystem logical unit depends upon the composition, size and type of the storageset. Consult the following tables for the supported storageset configurations.

NOTE

The ability to Initial Program Load (IPL) the operating system from the 2416 and 2412 Fast/Wide SCSI-2 Differential Adapters is not supported on all RS/6000 systems. Consult IBM Announcement Numbers 194-145 and 195-188 for the list of systems with IPL capability on the 2416 and 2412 adapters.

1.05 GB Disk

	AIX 4.1.4		AIX 4.2	
	Number of Drives		**Number of Drives**	
Storagesets	**Min**	**Max**	**Min**	**Max**
Raidset	3	14	3	14
Stripeset	2	14	2	14
Mirrorset	2	6	2	6
Stripe Mirrorset*	2	14	2	14
JBOD	1	n/a	1	n/a

* The number listed for the stripe mirrorset is the number of mirrorsets that can be striped. The mirrorset can contain between 2 and 6 disks.

n/a = not applicable.

2.1 GB Disk

	AIX 4.1.4		AIX 4.2	
	Number of Drives		**Number of Drives**	
Storagesets	**Min**	**Max**	**Min**	**Max**
Raidset	3	14	3	14
Stripeset	2	14	2	14
Mirrorset	2	6	2	6
Stripe Mirrorset*	2	14	2	14
JBOD	1	n/a	1	n/a

* The number listed for the stripe mirrorset is the number of mirrorsets that can be striped. The mirrorset can contain between 2 and 6 disks.

n/a = not applicable.

4.3 GB Disk

	AIX 4.1.4		AIX 4.2	
	Number of Drives		**Number of Drives**	
Storagesets	**Min**	**Max**	**Min**	**Max**
Raidset	3	9	3	14
Stripeset	2	8	2	14
Mirrorset	2	6	2	6
Stripe Mirrorset*	2	8	2	14
JBOD	1	n/a	1	n/a

* The number listed for the stripe mirrorset is the number of mirrorsets that can be striped. The mirrorset can contain between 2 and 6 disks.

n/a = not applicable.

Once the AIX installation onto the RAID Array 310 subsystem has been completed, execute the install script *./stgwks_aix.sh* to add the StorageWorks software to the system. Once the upgrade script has been completed, reboot the RS/6000 to complete the installation.