



Getting Started

RAID Array 410 for Solaris 1.x

Installation Guide

Order Number: EK-SMRA2-IG. A01

Digital Equipment Corporation
Maynard, Massachusetts

First Edition, January 1995

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

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

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

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

© Digital Equipment Corporation 1995. All Rights Reserved

Printed in U. S. A

The following are trademarks of Digital Equipment Corporation:
DEC, RAID Array 110, StorageWorks, and the Digital Logo.

UNIX is a registered trademark of UNIX Systems Laboratories, Inc., a wholly owned subsidiary of Novell, Inc.

Sun, SunOS, and Solaris are trademarks or registered trademarks of Sun Microsystems, Inc.

All SPARC trademarks are registered trademarks of SPARC International, Inc., SPARCstation licensed exclusively to Sun Microsystems, Inc.

UNIX is a registered trademark of UNIX Systems Laboratories, Inc., a wholly owned subsidiary of Novell, Inc.

PT is a trademark or registered trademark of Performance Technologies, Incorporated

All other trademarks and registered trademarks are the property of their respective owners.

About This Guide	v
Revision Record	vii
Getting Started	ix
1 Unpacking the SWXRA-Yx RAID Array 410 Subsystem	
1.1 Site Preparation	1-1
1.2 Unpacking the SWXRA-Yx.....	1-2
1.3 Removing the SWXRA-Yx from the Pallet.....	1-3
1.4 Placing the SWXRA-Yx RAID Array 410.....	1-4
2 Creating an Initial Controller Configuration	
2.1 What is the CLI?	2-1
2.2 Accessing the CLI	2-1
2.2.1 Connect the PC to the Controller.....	2-1
2.2.2 Start the Communications Program	2-2
2.2.3 Establish the Connection with the Controller.....	2-2
2.3 Show Initial Configuration	2-2
2.4 Remove Default Logical Unit	2-3
2.5 Add Disks to the Configuration	2-4
2.6 Create a RAIDset.....	2-5
2.6.1 Initialize the RAIDset.....	2-5
2.6.2 Add the RAIDset as a Logical Unit	2-6
2.6.3 Set Writeback Cache	2-6
2.7 Create a STRIPEset	2-6
2.7.1 Initialize the STRIPEset	2-7
2.7.2 Add the STRIPEset as a Logical Unit.....	2-7
2.8 Add Individual Disks as Logical Units.....	2-8
3 Installing the SBus SCSI-2 Host Adapter	
3.1 Preparing and Installing the SBus SCSI-2 Host Adapter	3-1
3.1.1 Preparing to Install the Host Adapter	3-1
3.1.2 Installing the Host Adapter in 600MP SPARCserver and SPARCstations 10 and 20	3-2
3.1.3 Installing the Host Adapter in All Other Systems (except 600MP SPARCserver and SPARCstations 10 and 20).....	3-4

4 Installing the StorageWorks RAID Array 410 Device Drivers for Solaris 1.x

4.1	Installing the StorageWorks RAID Array 410 Device Drivers for Solaris 1.x.....	4-1
4.1.1	Loading the Device Drivers onto Hard Disk.....	4-1
4.1.2	Installing Device Drivers and Configuring the Kernel	4-2
4.1.3	Verifying Proper Installation of Drivers	4-5
4.2	Preparing LUNs for Use by the System	4-5
4.2.1	Labeling LUNs with a User-Supplied format.dat Entry	4-5
4.2.2	Filesystem Creation and Tuning.....	4-10

Appendix A Configuration Records – Blank Forms

Figures

1-1	Minimum Installation Clearance Measurements	1-1
1-2	Unpacking the SWXRA-Yx.....	1-2
1-3	Installation of Ramp on Shipping Pallet	1-3
3-1	Backplate Adapter	3-2
3-2	The SBus Card Retainers.....	3-2
3-3	The SBus Card Connects by Gently Pressing on the Corners of the Board.....	3-3
3-4	The SBus Card Mounting Plate in a 600MP SPARCserver or a SPARCstation 10 or 20	3-3
3-5	The SBus Card Mounting Plate Hooked Into the System Unit Back Panel SBus Card Retainers.....	3-4
3-6	How the Notches on the SBus Card Line up with the tabs on the System Unit Back Panel	3-4

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.

Intended Audience

This guide is intended for administrators of StorageWorks RAID Array 410 Subsystems. Installing the StorageWorks RAID Array 410 Subsystem and device drivers for Solaris 1.x requires a general understanding of UNIX system administration and SBus products installation procedures.

Document Structure

This guide contains the following chapters:

Chapter 1: Unpacking

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

Chapter 2: Creating an Initial Controller Configuration

Creating an Initial Controller Configuration describes the Command Line Interpreter (CLI), how to access it and use it to create an initial controller configuration.

Chapter 3: Installing the SBus SCSI-2 Host Adapter

Installing the SBus SCSI-2 Host Adapter specifies system requirements, lists the contents of the platform kit, and provides the procedures for preparing your system and installing the SBus SCSI-2 host adapter.

Chapter 4: Installing StorageWorks RAID Array 410 Device Drivers for Solaris 1.x

Installing the StorageWorks RAID Array 410 Device Drivers for Solaris 1.x describes loading the device drivers onto hard disk, installing the PTISP and td drivers, changing the ptisp_conf.c parameters file, kernel configuration, and preparing the LUNs for use by the filesystem.

Associated Documents

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

Table 1 Associated Documents

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

Conventions

This guide uses the following documentation conventions:

Table 2 Style Conventions

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

Table 3 Supported Operating System References Conventions

This Reference to Operating Systems	Means These Versions of the Operating Systems
Solaris 1.x	SunOS 4.1.3.x

Revision Record

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

The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the Revision Level column, with the last entry denoting the latest revision. This publication supports the StorageWorks RAID Array 410 Subsystem.

Revision Level	Date	Summary of Changes
EK-SMRA2-IG. A01	January 1995	Original release. This release supports installation of the host adapter and device drivers for the StorageWorks RAID Array 410 for Solaris 1.x.

Getting Started

This section provides an overview for preparing and installing the StorageWorks RAID Array 410 for Solaris 1.x. The main chapters of this manual contain detailed information about the procedures listed here.

NOTE

References in this manual to Solaris 1.x should be assumed to mean SunOS 4.1.3.x

Getting Started

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

- StorageWorks SWXRA-Yx RAID Array 410 Subsystem: a RAID controller, disk drives, a StorageWorks storage expansion enclosure, the SWXRC-04 RAID Controller User's Guide, and the SWXSC-AA Office Expansion RAID Enclosure User's Guide.
- StorageWorks SWSK-CB RAID Array 410 for Solaris 1.x platform kit: an SBus FWD (Fast Wide Differential) SCSI-2 Host Adapter, host cable, the device driver software distribution media, a cable for connecting the maintenance port of the controller to the serial port of a personal computer, and the StorageWorks RAID Array 410 for Solaris 1.x Installation Guide.

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

1. Unpacking and Installing the SWXRA-Yx Office Expansion RAID Enclosure (Chapter 1 of this guide).
2. Configuring the RAID Controller using the Command Line Interface (Chapter 2 of this guide).
3. Installing the SBus SCSI-2 Host Adapter (Chapter 3 of this guide).
4. Installing the RAID Array 410 Device Drivers for Solaris 1.x (Chapter 4 of this guide).

Note

Installing the StorageWorks RAID Array 410 Subsystem for Solaris 1.x requires a general understanding of the following:

- SPARCsystems
- Solaris 1.x
- Basic hardware installation procedures
- Or, contact your service representative for installation assistance.

Before starting your installation, follow these steps:

- Verify the availability of user-supplied hardware and software.
- Inventory the contents of the StorageWorks RAID Array 410 Subsystem platform kit.

Verifying User Supplied Hardware and Software (System Requirements)

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

- SPARCstation (except SPARCstation 1), SPARCserver, or SPARCcenter host
 - A 3.5-inch (1.44 MB) floppy drive, or a CD-ROM drive
 - An available SBus slot
 - The associated system hardware manual
- Appropriate tools to service your computer
- The Solaris 1.x operating system.

Verifying The StorageWorks RAID Array 410 Subsystem and Platform Kit

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

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

NOTE

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

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

- This guide.
- The StorageWorks for RAID Array 410 for Solaris 1.x Release Notes.
- An SBus FWD SCSI-2 Host Adapter.
- A BN21K-05 SCSI cable, five meters long, with a right-angle high-density 68-pin connector on one end and a straight high-density 68-pin connector on the other.
- StorageWorks RAID Array 410 for Solaris 1.x device driver distribution media, one 3.5-inch (1.44-MB) diskettes.

Perform a System Backup

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

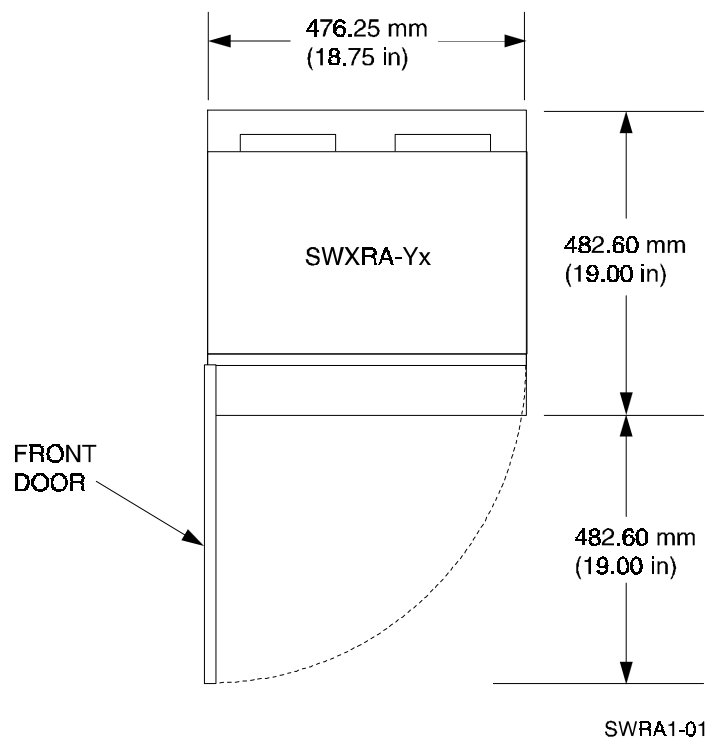
Unpacking The SWXRA-Yx RAID Array 410 Subsystem

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

1.1 Site Preparation

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

Figure 1–1 Minimum Installation Clearance Measurements



1.2 Unpacking the SWXRA-Yx

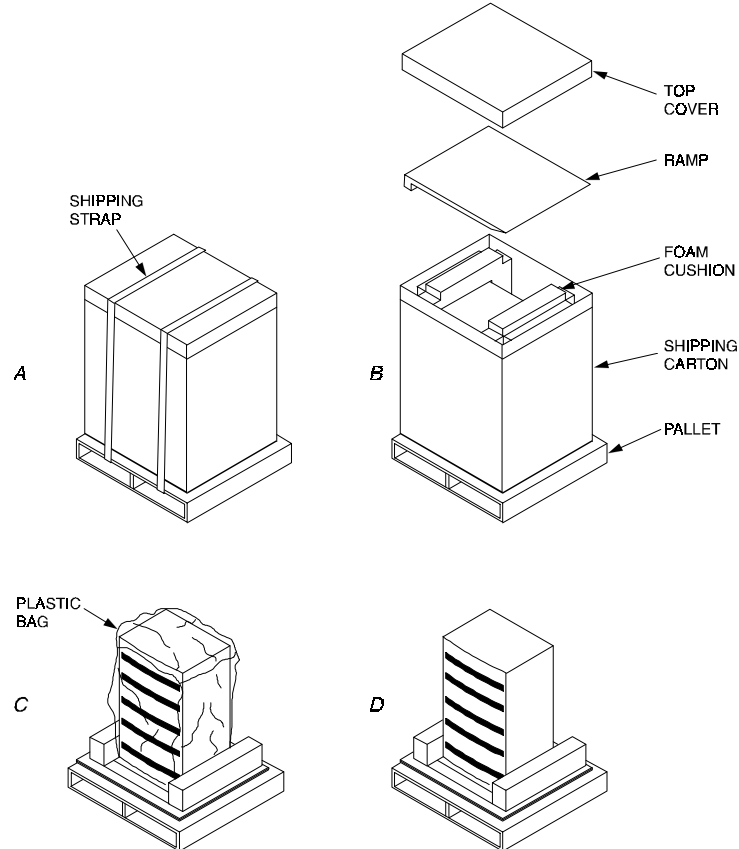
The SWXRA-Yx RAID Array 410 is packed in a corrugated carton attached to a wooden shipping pallet, as shown in Figure 1–2A. Unpack the SWXRA-Yx as follows:

NOTE

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

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

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



SW300-09

1.3 Removing the SWXRA-Yx from the Pallet

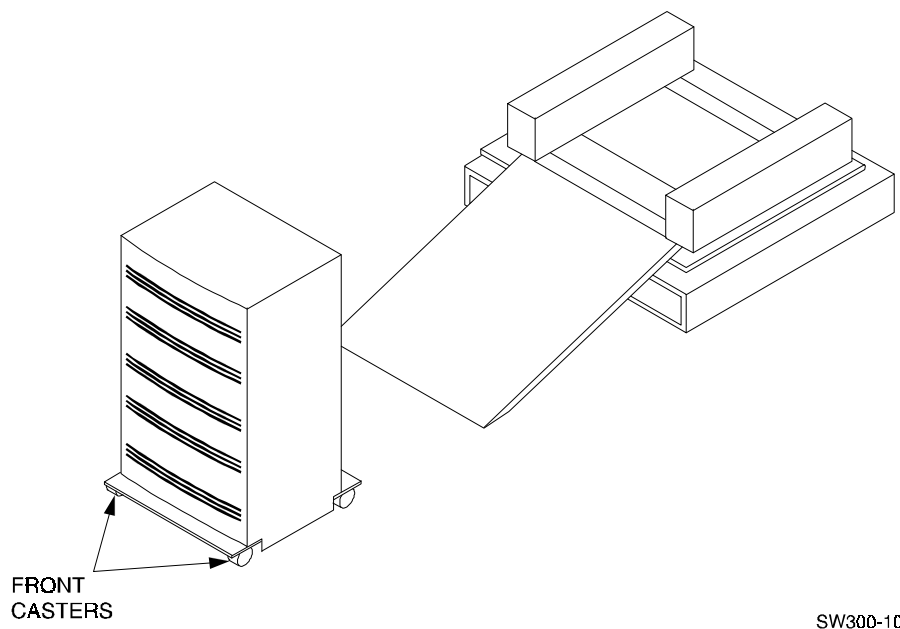
Use the following procedure to remove the SWXRA-Yx from the shipping pallet:

WARNING

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

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

Figure 1–3 Installation of Ramp on Shipping Pallet



WARNING

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

CAUTION

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

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

1.4 Placing the SWXRA-Yx RAID Array 410

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

WARNING

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

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

Creating an Initial Controller Configuration

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

2.1 What is the CLI?

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

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

2.2 Accessing the CLI

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

2.2.1 Connect the PC to the Controller

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

1. Locate the connecting cable that came with the RAID subsystem. It has an RJ12 connector on one end and a 9-pin serial connector on the other end.
2. Plug the RJ12 connector into the jack on the controller.
3. Plug the serial connector into an available 9-pin serial port on the PC. Note which serial port you used, since you will need that information in the communications program.

2.2.2 Start the Communications Program

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

2.2.3 Establish the Connection with the Controller

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

```
SWXRC>
```

2.3 Show Initial Configuration

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

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

```
SWXRC> SHOW THIS_CONTROLLER FULL
```

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

```
Controller:
  SWXRC-04 CX44332211 Firmware XVDV-0, Hardware AX01
  SCSI address 7
  Time: NOT SET
  Host port:
  ❶ SCSI target(s) (0)
Cache:
  32 megabyte write cache, version 2
  ❷ Cache is GOOD
  ❸ Battery is GOOD
  No unflushed data in cache
  CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
Licensing Information:
  ❹ RAID (RAID5_Writeback Cache) is ENABLED, License key is VALID
  ❺ WBCA (Writeback Cache ONLY) is ENABLED, License key is VALID
Extended Information:
  Terminal speed 9600 baud,eight bit,no parity,1 stop bit
  Operational control:0000004 Security state code:85780
```

Examine the display to verify the following information:

- ❶ Controller SCSI target number should be 0

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

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

```
SWXRC> RESTART THIS_CONTROLLER
```

- ❷ Cache condition should be GOOD

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

- ❸ Battery condition should be GOOD

If the Battery condition is LOW then allow the battery to charge with the subsystem power on for at least 5 hours. The battery must be fully charged to protect the data in the Write Back Cache. If the Battery condition LOW after 5 hours of charging then call your sales person for unit service or replacement of the Batteries.

NOTE

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

- ❹❺ License key should be VALID

If the License key is INVALID then enter the following:

```
SWXRC > RUN FLS
```

and follow the menu driven program to enable the license. You will need the RAID5 License Key page that was provided in the subsystem documentation package.

2.4 Remove Default Logical Unit

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

```
SWXRC> DELETE D0
```

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

2.5 Add Disks to the Configuration

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

```
SWXRC> RUN CONFIG
```

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

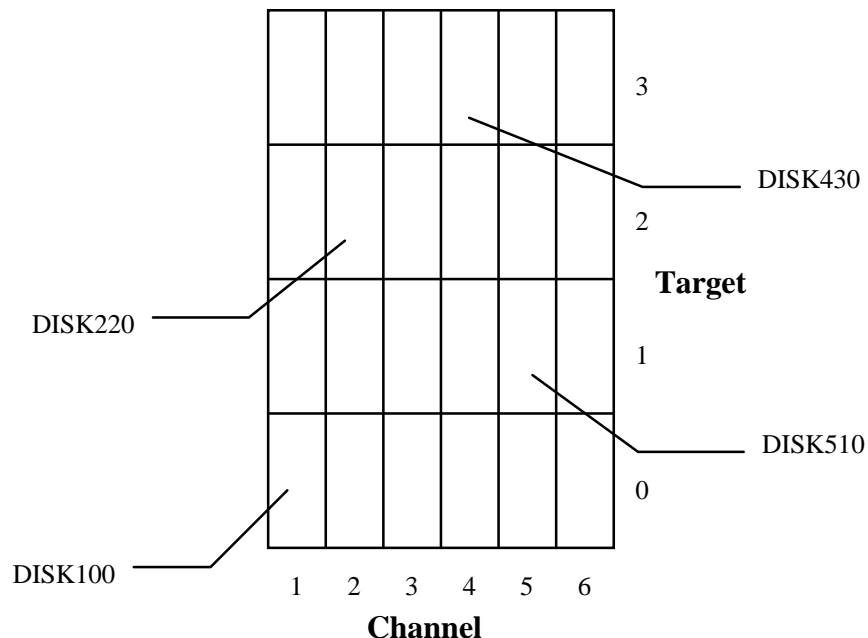
```
Config Local Program Invoked

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

add disk110 1 1 0
add disk200 2 0 0
add disk210 2 1 0
add disk300 3 0 0
add disk310 3 1 0
add disk400 4 0 0
add disk410 4 1 0
add disk500 5 0 0
add disk510 5 1 0
add disk600 6 0 0
add disk610 6 1 0

Config - Normal Termination
```

In this example, the controller has located 11 new disks. Note that CONFIG did not list DISK100 because the controller was already aware of that disk. The 3 digit number associated with each disk corresponds to Channel Number, Target Number and Controller Logical Unit Number. The Controller Logical Unit Number will always be 0. DISK400, in this example, corresponds to the disk located on Channel 4, on controller Target 0, and Controller Logical Unit 0. DISK510 corresponds to the disk located on Channel 5, controller Target 1, and Controller Logical Unit 0. The following diagram shows the mapping of Channels and Targets for the Office Expansion RAID Enclosure:



2.6 Create a RAIDset

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

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

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

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

2.6.1 Initialize the RAIDset

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

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

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

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

NOTE

Valid chunksizes are 17 – 1043 blocks. You should use a larger chunksize for applications that make a lot of I/O requests. Use a smaller chunksize for applications that make relatively few I/O requests, but need to move large amounts of data with each request.

2.6.2 Add the RAIDset as a Logical Unit

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

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

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

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

NOTE

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

2.6.3 Set Writeback Cache

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

```
SWXRC> SET RAID_SET_1 WRITEBACK_CACHE
```

```
SWXRC> SET RAID_SET_2 WRITEBACK_CACHE
```

2.7 Create a STRIPEset

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

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

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

2.7.1 Initialize the STRIPESet

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

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

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

NOTE

Valid chunksizes are 17 – 1043 blocks. You should use a larger chunksize for applications that make a lot of I/O requests. Use a smaller chunksize for applications that make relatively few I/O requests, but need to move large amounts of data with each request.

2.7.2 Add the STRIPESet as a Logical Unit

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

```
SWXRC> ADD UNIT D2 STRIP_SET_1
```

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

NOTE

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

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

```
SWXRC> SET STRIPE_SET_1 WRITEBACK_CACHE
```

2.8 Add Individual Disks as Logical Units

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

```
SWXRC> ADD UNIT D4 DISK410
```

```
SWXRC> ADD UNIT D5 DISK510
```

In this example, disks DISK410 and DISK520 were identified to the host as units D4 (Target 0, LUN 4) and D5 (Target 0, LUN 5) respectively.

NOTE

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

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

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

```
SWXRC> ADD SPARESET DISK610
```

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

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

First, verify the Logical Units you have configured:

```
SWXRC> SHOW UNITS
```

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

LUN	Uses
D0	RAID_SET_1
D1	RAID_SET_2
D2	SPARE_SET_1
D3	DISK410
D4	DISK510

Record the information in the following table:

Date _____	
LUN	Uses

Next, verify the StorageSets you have configured:

SWXRC> SHOW STORAGESETS

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

Name	StorageSet	Uses	Used by
RAID_SET-1	raidset	DISK100 DISK200 DISK300	D0
RAID_SET_2	raidset	DISK400 DISK500 DISK600	D1
STRIPE_SET_1	stripeset	DISK110 DISK210 DISK310	D2
SPARESET	spareset	DISK610	
FAILEDSET	failedset		

Record the information in the following table:

Installing the SBus SCSI-2 Host Adapter

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

NOTE

References in this manual to Solaris 1.x should be assumed to mean SunOS 4.1.3.x

3.1 Preparing and Installing the SBus SCSI-2 Host Adapter

The SBus SCSI-2 host adapter is an SBus-to-SCSI fast 16-bit differential host adapter. You connect your computer to the StorageWorks RAID Array 410 Subsystem through the host adapter and a connecting cable.

You need the following before you begin:

- The SBus SCSI-2 host adapter board (use precautions to protect the board from static discharge)
- Your computer system hardware manual
- Appropriate tools to service your computer
- The BN21K-05 SCSI cable, five meters long, with a right angle high density 68-pin connector on one end and a straight high density 68-pin connector on the other

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

3.1.1 Preparing to Install the Host Adapter

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

NOTE

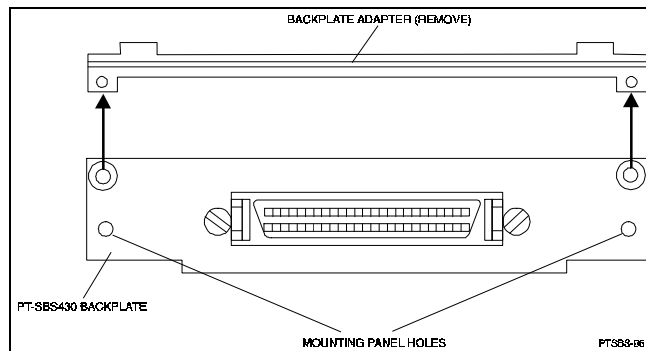
The installation procedure varies depending upon which model of the SPARCstation you are using. Watch for model specific deviations throughout this procedure.

1. Power down the SPARCstation and attached peripherals.
2. Open your system. Refer to your system manual for assistance in completing this procedure.

3.1.2 Installing the Host Adapter in 600MP SPARC Server and SPARCstations 10 and 20

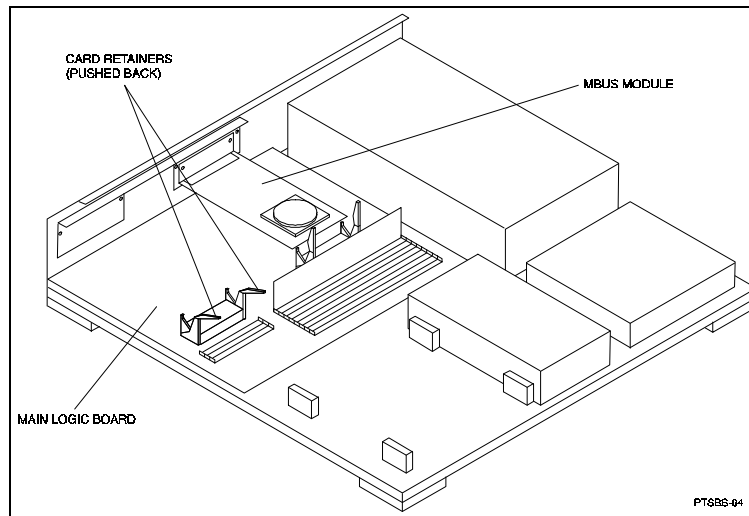
1. Unscrew two small phillips-head screws to remove the back plate adapter, shown in Figure 3–1, from the SBus to FWD SCSI-2 host adapter.

Figure 3–1 Backplate Adapter



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

Figure 3–2 The SBus Card Retainers

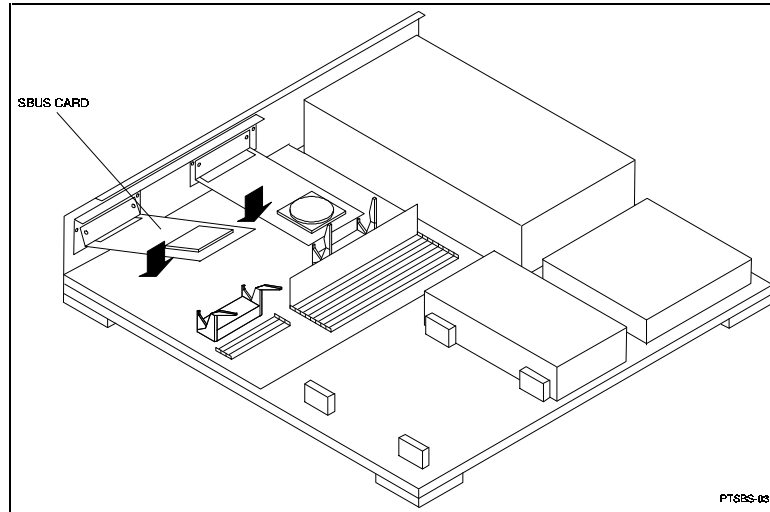


CAUTION

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

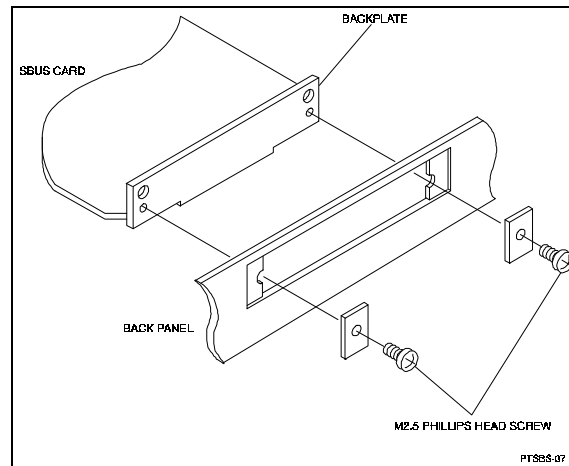
4. Align the host adapter connector with the SBus slot socket and gently push the connector into the socket by pressing on the corners of the board, as shown in Figure 3–3.

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



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

Figure 3–4 The SBus Card Mounting Plate in a 600MP SPARCserver or a SPARCstation 10 or 20



6. Push the SBus slot retainers forward onto the SBus host adapter board, locking it into place.
7. Tighten any screws that you loosened, and close the system.

3.1.3 Installing the Host Adapter in All Other Systems (except 600 SPARCserver and SPARCstations 10 and 20)

1. Slide the board at an angle into the top of the Sun system back panel, as shown in Figure 3-5.
 2. Hook the host adapter mounting plate (shown in Figure 3-5) upward into the back panel of the system unit. As you swing the board down towards the card retainers, the back panel tabs will align the SBus card vertically and horizontally in the back panel cutout.
- If the card does not swing into position easily, adjust the horizontal position of the SBus card so that the notches on the card line up with the tabs on the back panel, as shown in Figure 3-6.

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

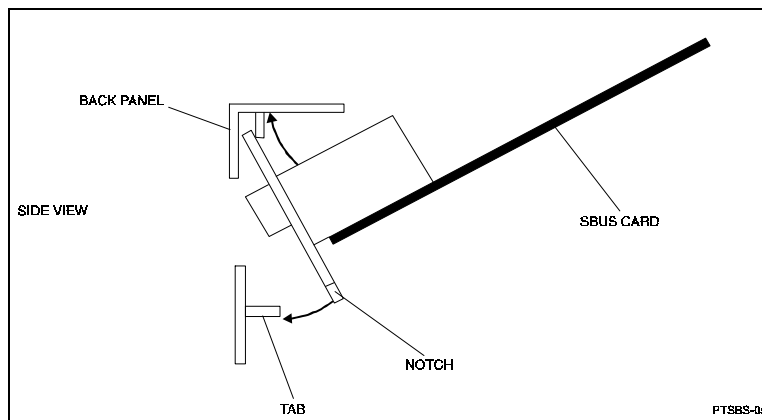
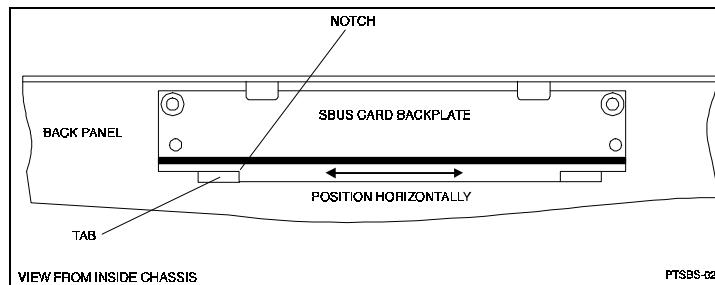


Figure 3-6 How the Notches on the SBus Card Line up with the tabs on the System Unit Back Panel



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

This completes the host adapter installation. Now go on to install the device drivers.

Installing the StorageWorks RAID Array 410 Device Drivers for Solaris 1.x

This chapter describes the steps for installing StorageWorks RAID Array 410 device drivers onto Sun systems running Solaris 1.x. The steps include loading device drivers onto your hard disk, installing the device drivers, reconfiguring the kernel, labeling LUNs, and creating and tuning filesystems.

4.1 Installing the StorageWorks RAID Array 410 Device Drivers for Solaris 1.x

Installing the device drivers for Solaris 1.x or later requires the following major steps (a sample script of the Solaris 1.x installation appears in an Appendix):

- Loading software from distribution media onto hard disk (Section 4.1.1)
- Installing device drivers and Configuring the Kernel (Section 4.1.2)

In addition, after completing the procedures to install the device drivers, you need to perform the following procedures:

- Verify Proper Installation of the Device Drivers (Section 4.1.3)
- Label LUNs with a User-Supplied format.dat Entry (Section 4.2.1)
- Create and Tune Filesystems (Section 4.2.2)

4.1.1 Loading the Device Drivers onto Hard Disk

To load the device drivers onto hard disk, follow these steps:

NOTE

The symbol # indicates the system prompt. Do not type # when typing the commands specified in this section.

1. Back up your system according to your normal procedure.
1. Change to the `/tmp` directory, enter: # **cd /tmp**
2. Insert the installation diskette into the floppy diskette drive.
3. Enter: # **bar -xZfv <device_name>**
where the `device_name` is the path name of the raw device file for the floppy drive.
For example, # **bar -xZfv /dev/rfd0c**

4.1.2 Installing Device Drivers and Configuring the Kernel

You must install the following device drivers required by the RAID Array 410:

- Host adapter driver (ptisp.o)
- Disk driver (tddriver.o)

In addition to installing the device drivers, you must also reconfigure the kernel.

To install the SBus SCSI host adapter driver and the RAID disk driver, follow these steps:

1. Determine the architecture type of the system, type: `# uname -m`
The output will indicate either sun4c or sun4m. In the instructions that follow, substitute sun4c or sun4m for sun4? as appropriate.
2. Copy the following files, type:

```
# cd /tmp
# cp ptisp.sun4?.o      /usr/sys/sun4?/OBJ/ptisp.o
# cp ptisp_conf.c     /usr/sys/scsi/adapters/ptisp_conf.c

# mkdir /usr/sys/scsi/targets/td
# cp td.load /usr/sys/scsi/targets/td
# cp td.modload /usr/sys/scsi/targets/td
# cp tddriver.sun4?.o
  /usr/sys/scsi/targets/td/tddriver.o

# cp scsiinfo /usr/etc/scsiinfo
```
3. Make a backup copy of the `/usr/sys/sun4?/conf/files` file, type:

```
# cp /usr/sys/sun4?/conf/files /usr/sys/sun4?/conf/files.nodecraid
```

Edit `/usr/sys/sun4?/conf/files` and add the following lines to the end:

```
scsi/adapters/ptisp.c      optional ptisp scsibus device-driver
scsi/adapters/ptisp_conf.c optional ptisp scsibus
```
4. Make a backup copy of the `/etc/rc.local` file, type:

```
# cp /etc/rc.local /etc/rc.local.nodecraid
```

Edit `/etc/rc.local` and add the following lines to the end, type:

```
echo Loading td driver...
/usr/sys/scsi/targets/td/td.load
```
5. Create a new configuration file so that Solaris 1.x can build a new UNIX Kernel. In this example the current configuration file is named GENERIC. Substitute the name of your current kernel for GENERIC where appropriate. Make a copy of the current configuration file, type:

```
# cd /usr/sys/sun4?/conf
# cp GENERIC DECRAID
```
6. Edit the new configuration file as follows:

- a. Locate the *scsibus* entries (normally near the bottom of the file)
- b. Add the following line to the configuration file, type:

```
device-driver ptisp      #PT-SBS440A FWD SCSI Device  
Driver
```

This entry should appear only once in the file.

- c. Define the new *scsibus*.

Calculate the SCSI bus number of the configuration entry for the newly installed host adapter as follows:

1. Refer to your Sun system hardware manual to determine the sequence of the SBus slots.
2. Starting from the first SBus slot, count in ascending SBus slot order the number of installed SCSI adapters.
3. The number which you get for the host adapter in your count is the SCSI bus number of its configuration entry.

NOTE

If you add additional host adapters:

- The *scsibus* numbers of existing host adapter configuration entries might change depending upon the position of the SBus slot in which you install any additional host adapters.
- Count the number of installed SCSI adapters again as described in Steps 4a-4c.
- Modify the configuration file as described in Section 4.2.2

This number will hereafter be referenced as N.

Enter here: _____ = N

- d. Add the following lines to the configuration file, type:

```
scsibusN at ptisp  
disk sr% at scsibusN target 5 lun 0
```

Where N was the number calculated in step c and % is one higher than any other sr entry in the configuration file. For example,

```
scsibus1 at ptisp  
disk sr3 at scsibus1 target 5 lun 0
```

NOTE

The td driver is an enhanced SCSI disk driver that allows the use of tagged command queuing between the LUNs of the RAID Array 410 and the SCSI host adapter. This driver is not statically linked into the kernel, it is loaded dynamically at boot time. The sr3 device in the example above is merely a placeholder to prevent the boot time auto configuration code from disabling the host adapter because there are no devices associated with it. The td driver will load normally later in the boot process. There is no physical device associated with the sr3 device entry.

7. Make a backup copy of the file `/usr/sys/scsi/conf/scsi_confdata.c`, type:

```
# cp /usr/sys/scsi/conf/scsi_confdata.c \  
  /usr/sys/scsi/conf/scsi_confdata.c.nodecraid
```

Modify `/usr/sys/scsi/conf/scsi_confdata.c` as follows:

Replace the line,

```
int scsi_ncmds_per_dev = NCMDS_PER_DEV;
```

with,

```
int scsi_ncmds_per_dev = 64;
```

8. Now, run the `config` program using the new configuration file, type:

```
# /usr/etc/config DECRAID
```

9. When `config` finishes, run `make` to build the new kernel, type:

```
# cd ../DECRAID
```

```
# make
```

10. When `make` finishes, move the new kernel to the system root directory. Remember to make a copy of the old kernel in case of a problem with the new version, type:

```
# cp /vmunix /vmunix.nodecraid
```

```
# mv vmunix /vmunix
```

This completes the driver installation and kernel configuration.

11. Now, reboot the system. The system boots using the new kernel. Follow section 4.1.3 during the boot process.

4.1.3 Verifying Proper Installation of Drivers

To verify the *ptisp* driver is running, look for a message similar to the following during the boot process:

```
ptisp0 at SBus slot n 0x800000 pri x
```

where *n* is the slot number of the adapter and *x* is the interrupt level.

To verify that the *td* driver has loaded on the LUNs configured on the RAID Array 410, look for a message similar to the following during the boot process:

```
td_init: VDLOAD: vdp->vdd_vaddr = 0xff148000
td0 at ptisp0 target 1 lun 0
td0: <DEC-SWXRC-04-V21Z cyl 15433 alt 2 hd 8 sec 83>
```

Now go on to prepare the LUNs for use by the system.

4.2 Preparing LUNs for Use by the System

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

4.2.1 Labeling LUNs with a User-Supplied *format.dat* Entry

A LUN is labeled using the */etc/format* utility. The label contains information about the LUN such as controller-type, geometry, and partitions. More details about the use of the *format* utility may be found in *Maintaining Disks* in the *System & Network Administration* manual for SunOS Release 4.1.x.

After creating a LUN, a corresponding *format.dat* entry should be created.

To create a site-specific *format.dat* entry, you need to do the following:

- Obtain the disk geometry information from the *scsiinfo* utility
- Create a site-specific *format.dat* entry, including *disk_type* and partition definitions

NOTE

scsiinfo is a nonsupported utility supplied to ease the task of creating *format.dat* entries. For more information about *scsiinfo* unpack the *scsiinfo.shar* archive on the distribution floppy by copying the file to a suitable directory and executing the command "sh *scsiinfo.shar*". The executable, *scsiinfo* has been supplied with the distribution, so there is no need to compile the utility.

To obtain the disk geometry information using the *scsiinfo* utility:

1. Execute the *scsiinfo* command using the *-f* and *-F* options on the raw device entry for the desired LUN. For example,

```
# scsiinfo -f /dev/rtd0c
```

and,

```
# scsiinfo -F /dev/rtd0c
```

2. To create a site-specific *format.dat* entry:

Edit */etc/format.dat*.

- a. Use the *format.dat* entries that already exist as a model to add an entry in the *format.dat* file with the information supplied by the *scsiinfo -f* command.
- b. Use the *format.dat* entries that already exist as a model, and the information obtained from the *scsiinfo -F* command to create the partition portion of the entry:
 - Assign SCSI as the value of *ctrl*, using the letters a through h as partition identifiers
 - Each partition identifier correlates to two numbers separated by a comma. The first number is the starting cylinder for the partition and the second number is the number of sectors in the partition.

NOTE

SunOS limits the size of any single partition to 2GB (4194304 sectors). Keep this in mind when creating the disk partitions.

After creating the custom *format.dat* entry use the *format* utility to label the LUN. More details about the creation of *format.dat* entries may be found in the *Maintaining Disks* in the *System and Network Administration Manual*.

For example,

```
# scsiinfo -f /dev/rtd0c
Disk:          DEC SWXRC-04
Formatted Capacity: 28766289 sectors (14383144 kbytes)
Sector size:   512 bytes
Physical Cylinders: 21151
Heads:        16
Sectors per track (Avg.) 85
Tracks per zone: 1
Alternate Sectors per zone: 1
Alternate Tracks per zone: 0
Rotational speed: 3600 rpm
```

```

# scsiinfo -F /dev/rtd0c
disk_type = "DEC SWXRC-04" \
    : ctlr = SCSI : fmt_time = 29 \
    : trks_zone = 1 : atrks = 0 : asect = 1 \
    : ncyl = 21149 : acyl = 2 : pcyl = 21151 : nhead = 16 : nsect = 85 \
    : rpm = 3600 : bpt = 49980

partition = "DEC SWXRC-04" \
    : disk = "DEC SWXRC-04" : ctlr = SCSI \
    : c = 0, 28762640

# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
  0. td0 at pti0 slave 8
     td0: <drive type unknown>
  1. sd0 at esp0 slave 24
     sd0: <SUN0424 cyl 1151 alt 2 hd 9 sec 80>
  2. sd1 at esp0 slave 8
     sd1: <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>
Specify disk (enter its number): 0
selecting td0:

AVAILABLE DRIVE TYPES:
  0. Quantum ProDrive 80S
  1. Quantum ProDrive 105S
  2. CDC Wren IV 94171-344
  3. SUN0104
  4. SUN0207
  5. SUN0320
  6. SUN0327
  7. SUN0424
  8. SUN0535
  9. SUN0669
 10. SUN1.0G
 11. SUN1.05
 12. SUN1.3G
 13. SUN2.1G
 14. other
Specify disk type (enter its number): 14
Enter number of data cylinders: 21149
Enter number of alternate cylinders [2]:
Enter number of physical cylinders [21151]:
Enter number of heads: 16
Enter number of data sectors/track: 85
Enter rpm of drive [3600]:
Enter disk type name (remember quotes): "Big_Disk"
selecting td0: <Big_Disk>
[disk formatted, no defect list found]
No defined partition tables.
format> partition

```

PARTITION MENU:

- a - change 'a' partition
- b - change 'b' partition
- c - change 'c' partition
- d - change 'd' partition
- e - change 'e' partition
- f - change 'f' partition
- g - change 'g' partition
- h - change 'h' partition
- select - select a predefined table
- name - name the current table
- print - display the current table
- label - write partition map and label to the disk
- quit

partition> **print**

Current partition table (unnamed):

partition a - starting cyl	0, # blocks	0 (0/0/0)
partition b - starting cyl	0, # blocks	0 (0/0/0)
partition c - starting cyl	0, # blocks	0 (0/0/0)
partition d - starting cyl	0, # blocks	0 (0/0/0)
partition e - starting cyl	0, # blocks	0 (0/0/0)
partition f - starting cyl	0, # blocks	0 (0/0/0)
partition g - starting cyl	0, # blocks	0 (0/0/0)
partition h - starting cyl	0, # blocks	0 (0/0/0)

partition> **a**

partition a - starting cyl	0, # blocks	0 (0/0/0)
----------------------------	-------------	-----------

Enter new starting cyl [0]:

Enter new # blocks [0, 0/0/0]: **4194304**

partition> **b**

partition b - starting cyl	0, # blocks	0 (0/0/0)
----------------------------	-------------	-----------

Enter new starting cyl [0]: **3084**

Enter new # blocks [0, 0/0/0]: **4194304**

partition> **c**

partition c - starting cyl	0, # blocks	0 (0/0/0)
----------------------------	-------------	-----------

Enter new starting cyl [0]: **6168**

Enter new # blocks [0, 0/0/0]: **4194304**

partition> **d**

partition d - starting cyl	0, # blocks	0 (0/0/0)
----------------------------	-------------	-----------

```
Enter new starting cyl [0]: 9258
Enter new # blocks [0, 0/0/0]: 4194304
partition> e

    partition e - starting cyl    0, # blocks    0 (0/0/0)

Enter new starting cyl [0]: 12336
Enter new # blocks [0, 0/0/0]: 4194304
partition> f

    partition f - starting cyl    0, # blocks    0 (0/0/0)

Enter new starting cyl [0]: 15420
Enter new # blocks [0, 0/0/0]: 4194304
partition> g

    partition g - starting cyl    0, # blocks    0 (0/0/0)

Enter new starting cyl [0]: 18504
Enter new # blocks [0, 0/0/0]: 3596816
partition> print
Current partition table (unnamed):
    partition a - starting cyl    0, # blocks 4194304 (3084/0/64)
    partition b - starting cyl 3084, # blocks 4194304 (3084/0/64)
    partition c - starting cyl 6168, # blocks 4194304 (3084/0/64)
    partition d - starting cyl 9258, # blocks 4194304 (3084/0/64)
    partition e - starting cyl 12336, # blocks 4194304 (3084/0/64)
    partition f - starting cyl 15420, # blocks 4194304 (3084/0/64)
    partition g - starting cyl 18504, # blocks 3596816 (2644/11/41)
    partition h - starting cyl    0, # blocks    0 (0/0/0)

partition> label
Ready to label disk, continue? yes

partition> quit
format> quit
```

4.2.2 Filesystem Creation and Tuning

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

To create a new filesystem, use a command similar to the following:

```
# newfs -C7 -d0 /dev/rtd0h
```

To modify an existing filesystem use:

```
# tunefs -a7 -d0 /dev/rtd0h
```

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

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



Configuration Records – Blank Forms

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

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 _____			
Name	StorageSet	Uses	Used by