StorageWorks™

24 Device, 8-Bit SCSI Bus (Wide Device Compatible) RAID Subsystem Shelf (SWXSS-08)

User's Guide

EK–SMCPJ–UG. A01

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, October 1996

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

The SCSI port should be connected only with shielded data cables. Digital recommends cables such as BN21K and BN31G. These are available in 2M, 3M, 5M and 20M lengths.

Printed in USA

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Revision Record

This Revision Record provides a concise publication history of this guide. It lists the guide 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 Storage Shelf.

Revision Level	**Date**	**Summary of Changes**
EK-SMCPJ-UG. A01	October 1996	Original release.

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 information for the StorageWorks RAID Storage Shelf.

Intended Audience

This guide is intended for people who will install and maintain the StorageWorks RAID Storage Shelf in the field. The user should have a general understanding of basic SCSI terminology and installation procedures.

Document Structure

This guide contains the following chapters:

Chapter 1: Introduction

Introduction presents an overview of the RAID Storage Shelf, describes its major components, and provides a discussion of power options.

Chapter 2: Configuring the RAID Shelf

Configuring the RAID Shelf describes the basic rules for configuring the RAID shelf**.** This chapter lists the components supplied with the shelf and upgrade kit, and the components required to make the system operational.

Chapter 3: Error Analysis and Fault Isolation

Error Analysis and Fault Isolation describes the errors, faults, and significant events that can occur during the RAID initialization and normal operation.

Chapter 4: Replacing Components

Replacing Components describes the procedures to remove and install the field-replaceable components in the RAID shelf.

Appendix A: Shelf Installation

Shelf Installation describes how to install an SWXSS-08 RAID shelf into an SWXSC-D Series Data Center Cabinet.

Associated Documents

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

Document	Order Number
StorageWorks SWXRC-04 RAID Controller User's Guide	EK–SMCS1–UG
StorageWorks Solutions SWXSC-D Series Data Center Cabinet Installation and User's Guide	EK–SMCPF–IG
Departmental Storage Cabinet Installation Guide	EK–SMCPE–IG

Conventions

This guide uses the following documentation conventions:

Style Conventions

Style	Meaning
plain monospace type	Text
boldface type	For the first instance of terms being defined in text, in the glossary, or both.
italic type	*For emphasis, manual titles, chapter summaries, keyboard key names*.

1

Introduction

This chapter describes the 24 device, RAID (redundant array of independent disks) subsystem shelf (SWXSS-08). The SWXSS-08 (commonly referred to as the RAID shelf) is shown in Figure 1–1. This description includes shelf features, layout, 8-bit Small Computer System Interface (SCSI) bus, power, cabling, StorageWorks building blocks (SBBs), and general user information.

NOTE

The RAID subsystem shelf requires at least one SWXSC-series array controller for proper operation. This user's guide only discusses controller replacement procedures. For detailed descriptions of the individual controllers, please refer to the specific controller documentation.

1.1 Product Overview

The RAID shelf, shown in Figure 1–1, is a member of the Digital StorageWorks family of shelves that contains StorageWorks storage devices, power supplies, and controllers. Table 1–1 is a list of the RAID shelf components

Figure 1–1 RAID Subsystem Shelf

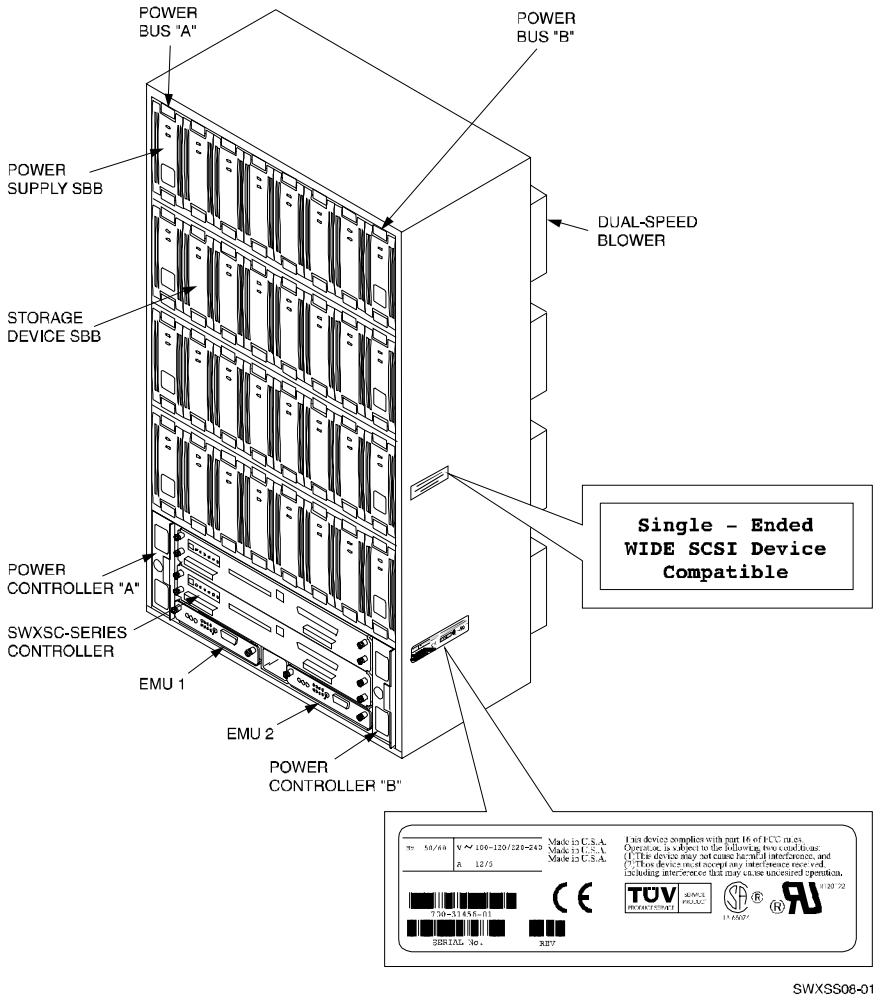


Table 1–1 RAID Shelf Components

Component	Order No.	Power Configurations		
		Basic (4+0	**Standard (4+1**	**Redun-dant (4+4)**
Blower (dual speed	BA35X–MD	8	8	8
Environmental Monitor Unit (EMU	BA35X–EA	1	1	2
Power controller	BA35X–HE	1	1	2
Shelf Power Supply (150W)	BA35X–HD	4	5	8
Customer Specified Options				
SWXSC-series Controller	Maximum of 2			
SWXSC-series Cache Memory Module	Maximum of 2			
Storage Devices Based on 6 SCSI buses; minimum of one device per bus)	**SBB Size** 3½-inch	**Minimum** 6	**Maximum** 24	

CAUTION

The specific storage devices installed must be compatible with the SWXSC-series controller and each other.

The following are the major features of the RAID Shelf:

- All major components, can be replaced using either the hot-swap methods (see Chapter 4 for detailed information).
- Extensive fault monitoring and reporting capability to include the following:
  - device operational status
  - storage device removal
  - storage device installation
  - operating temperature
  - shelf blower failure
  - incorrect voltage
  - power supply failure

- Automatic initiation of system protection actions
- Six, single-ended, 8-bit *INTERNAL* SCSI buses
- SCSI buses are configured and terminated
- No SCSI cables required to connect controllers to devices

The RAID shelf can accommodate any 8-bit and 16-bit SBB. However, installing a disk storage device with a rotational speed of 7200 rpm or greater, such as an SWXD3-SE, requires one of the following special cooling configurations:

- An SWXSC-DA/DB cabinet with the improved fan plenum
- An SWXSC-DA/DB cabinet fan tray upgrade (SW8XF)

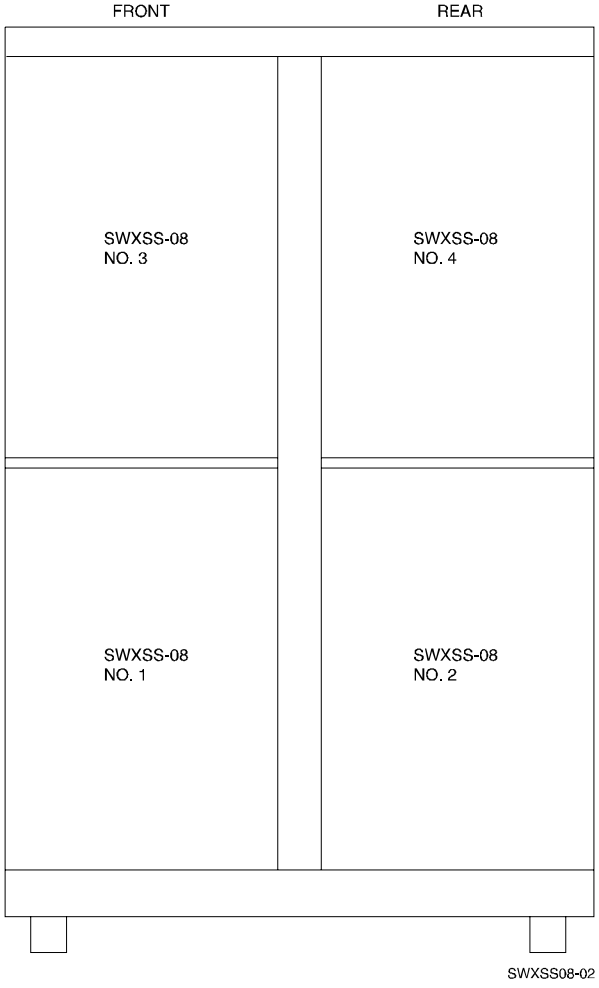
Figure 1–1 shows the locations of the major RAID shelf components.

1.2 RAID Shelf Cabinet Locations

The number of RAID subsystem shelves that can be installed in an SWXSC-DA/DB data center cabinet depends on the cabinet fan plenum.

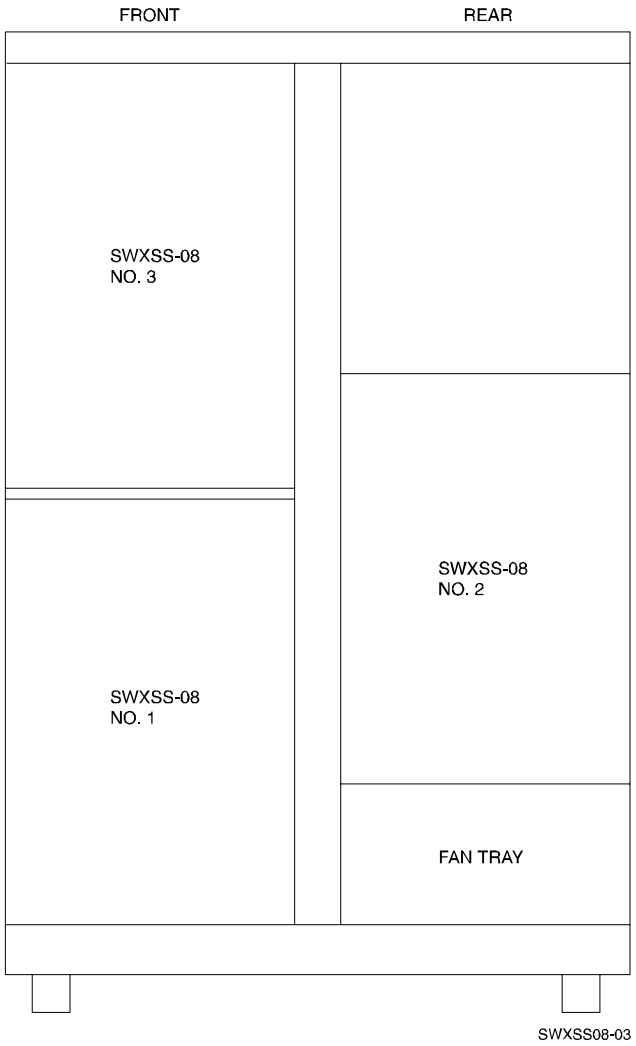
The improved fan plenum provides cooling for a maximum of four RAID subsystem shelves (see Figure 1–2). (This figure also shows the shelf loading sequence.)

Figure 1–2 SWXSC-DA/DB without Fan Tray (Side View)



Installing 7200 rpm drives in a RAID shelf requires an SWXSC-DA/DB cabinet with either the improved fan plenum or a fan tray. Installing the fan tray limits the number of RAID subsystem shelves to *three*. As shown in Figure 1–3, the second RAID shelf is installed *directly above* the fan tray.

Figure 1–3 SWXSC-DA/DB with Fan Tray (Side View)



1.3 RAID Shelf Power

The major components of the RAID shelf power control and distribution are:

- Cabinet cable distribution unit (CDU
- Power controller with a power on/off switch, noise filters, surge suppression, and **electromagnetic interference** (**EMI**) filters
- Shelf SBB power supplies that convert the ac input to +12 V dc and +5 V dc

CAUTION

A minimum of four operational power supplies is required for operation of the following RAID shelf components:

2 – EMUs
2 – Controllers
2 – Cache Memories
24 – 3½-inch SBBs

When there are less than four operational shelf power supplies, the RAID shelf will cease operating to preserve and protect the data.

For a detailed description of the power configurations, to include power cord connections, please see Chapter 2. As described in the following sections, there are three possible power configurations for each RAID shelf:

- Basic—four shelf power supplies; no redundant supplies (4+0)
- Standard—four shelf power supplies plus one redundant supply (4+1)
- Redundant—four shelf power supplies plus four redundant supplies (4+4); two power controllers; two CDUs

1.3.1 Power Requirements

The ac input power is routed from the wall outlet through a cabinet cable distribution unit (CDU) and then to a power entry controller. These power controllers can use either of the following input voltages:

- 100–120 V ac, 60 Hz, single-phase, 12A
- 220–240 V ac, 50 Hz, single-phase, 6A

1.3.2 Basic (4+0) Power Configuration

The basic configuration has the following components:

4 - Shelf Power Supplies
1 - AC Power Controller
1 - CDU

Digital does not recommend using this configuration. *Any one* of the following error conditions will cause the RAID shelf to cease operation and can cause the loss or corruption of data:

- Failure of a *single* shelf power supply
- Power controller failure
- CDU failure or loss of ac input to CDU

1.3.3 Standard (4+1) Power Configuration

This is the basic power configuration recommended by Digital. Should a shelf power supply fail, you would be able to replace it before a second shelf supply fails. The standard power configuration has the following components:

5 - Shelf Power Supplies
1 - AC Power Controller
1 - CDU

Any one of the following error conditions will cause the RAID shelf to cease operation and can cause the loss or corruption of data:

- Failure of *two* shelf power supplies
- Power controller failure
- CDU failure or loss of ac input to CDU

1.3.4 Redundant (4+4) Power Configuration

For complete protection of data, Digital recommends this power configuration. The redundant power configuration provides complete redundancy for all components of the power system. Loss or corruption of data can occur only when *any one* of the following *multiple* error conditions (for example, failure of five shelf power supplies occurs before you take corrective action).

- Failure of *five* shelf power supplies
- Failure of *both* power controllers
- Failure of *both* CDUs
- Loss of ac input to *both* CDUs

For full redundant power operation, two separate ac power sources and two CDUs are required. The second ac source provides power to controller "B." Controller "B" distributes the ac power through the four *gray* power cords to shelf power SBBs at the *right* end of the device shelves.

Controller "A" distributes the ac power through the five, *black* power cords.

- In all configurations, the four shelf power SBBs on the *left* side of the shelf are connected to this bus with the black power cords
- For the standard configuration, a power supply is installed at the *right* end of the top device shelf and the black (power bus "A") cord is connected

NOTE

The black power cord at the upper right corner of the RAID shelf is only used for the standard (4+1) configuration. It is not used for either the basic or redundant (4+4) configurations.

1.3.5 Shelf Power Supplies

CAUTION

The RAID subsystem shelves require shelf power supplies rated for at least 150 W. Lower rated supplies, such as the 131 W BA35X–HA, cannot be used in the RAID shelf.

The power supply SBB, shown in Figure 1–4, converts the ac voltage from the power controller to +5 V dc and +12 V dc and distributes these voltages throughout the RAID shelf. The maximum capacity of the RAID shelf is eight shelf power supplies. A minimum of four operable power supply SBBs is required for system operation.

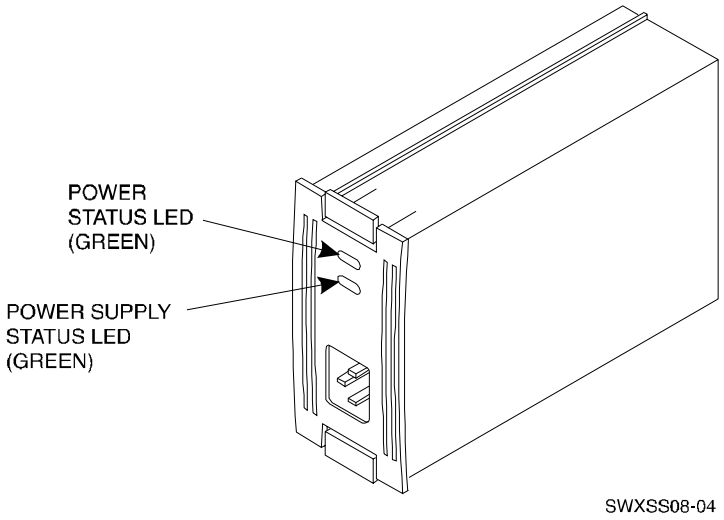
The 4+1 redundant power supply configuration is the recommended *standard* configuration. In this configuration power bus "A" is expanded by adding a fifth power supply in the rightmost position of the top drive shelf. This supply is connected to power bus "A" by the black power cord. As long as any four of these supplies are operational, the RAID shelf is operational. The failure of a second supply places the RAID shelf controller in a reset state. This precludes further data processing and prevents the corruption or loss of the stored data.

With 4+4 full redundant power, the RAID shelf can survive multiple power supply faults. To fully realize the benefits of the 4+4 configuration, modify the cabinet power distribution as follows:

- Add a second CDU
- Connect the CDUs to different ac distribution circuits

The four shelf power supplies on the left end of the shelf are connected to power bus “A” with the black power cords. The four shelf power supplies on the right end of the shelf are connected to power bus “B” with the gray power cords. See Section 2.1 for a detailed discussion of power configurations.

Figure 1–4 Typical Shelf Power Supply SBB



1.4 Error Detection and Reporting

The RAID shelf error detection and reporting function has two major elements — the fault bus and EMU. For a detailed discussion of error detection, fault reporting, and correction see Chapter 3.

1.4.1 Fault Bus

- The RAID shelf fault bus monitors shelf operation and reports fault conditions to the SWXSC-series array controllers and the EMU. The controller and EMU then report the error condition to the user. The fault bus monitors the following conditions:

- Storage device removal (SWAP_L)
- Storage device installation (SWAP_L)
- Blower failure (SHELF_OK)
- Shelf power supply failure (SHELF_OK)
- SBB failure (FAULT_CLK, FAULT_DATA)

The fault bus consists of four shelf backplane signals routed to the port connectors on the array controllers.

- **Shelf Status Signal**

  The SHELF_OK status signal indicates the state of the shelf power (ac and dc) and blower operation

- **SBB Swap Signal**

  The SWAP_L signal is asserted whenever an SBB is either removed from or inserted in the RAID shelf

- **SBB Fault Signals**
- The SBB amber light emitting diode (LED) displays either the storage device address or indicates a device fault. This device fault LED is controlled by the fault clock (FAULT_CLK) and the fault data (FAULT_DATA) control signals

For a detailed technical description of the fault bus please refer to the *High Availability Storage Subsystem Fault Bus Engineering Specification* . The controller uses the fault bus signals in the manner described in the controller specifications.

1.4.2 Environmental Monitor Unit (EMU)

The EMU provides protection against catastrophic RAID shelf faults. Together, the EMU and the controller warn the user of existing or impending failures using one or more of the following error reporting systems:

- A user-enabled EMU audible alarm
- EMU LEDs
- SBB LEDs
- Controller operator control panel (OCP) LEDs
- Error messages on the maintenance terminal
- Error messages on the host interface

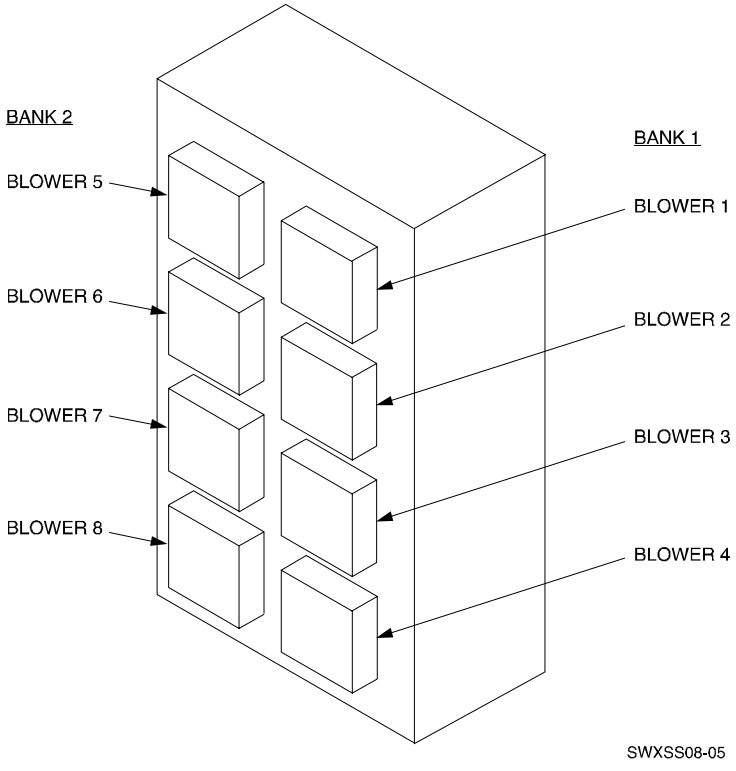
In some instances, the EMU automatically initiates corrective actions.

1.5 Shelf Cooling

As shown in Figure 1–5, the RAID shelf has eight rear-mounted blowers that pull air in from the front of the cabinet; through the SBBs, controllers, and EMUs; and exhaust it out the rear. +12 V dc to operate the blowers is available on the shelf backplane connectors. The blower status signals are routed through the same connectors to the shelf backplane and the EMU. All operational blowers are turned up to high speed when the following conditions exist:

- When a high warning temperature condition is detected by the EMU
- When a blower malfunctions
- When a blower is removed
- When a blower is not rotating at the correct speed

Figure 1–5 Dual-Speed Blowers



1.6 RAID Array Controller

The RAID array controller provides a means of connecting the SWXRC-04 array controller to the RAID shelf 8-bit, single-ended, SCSI bus. To provide complete controller redundancy you can install two controllers with cache memories as described in *StorageWorks SWXRC-04 RAID Controller User's Guide.* The controller documentation describes:

- Connecting a maintenance terminal to set initial controller parameters
- Configuring the controllers
- Determining the proper method for replacing SBBs (hot swap or warm swap)

The controller firmware revision level determines the devices supported by each controller. See the system-specific *Release Notes* for a list of supported storage devices.

The RAID shelf supports the SWXRC-04 RAID array controller. Table 1 –2 shows the standard features of the SWXRC-04 RAID array controller.

CAUTION

To replace a write-back cache module, you must use the procedures in *StorageWorks SWXRC-04 RAID Controller User's Guide.*

Table 1–2 Summary of SWXRC-04 Controller Product Features

Feature	SWXRC-04 Controller
Host system bus	SCSI-2, fast, wide, differential
Host protocol	SCSI-2
Storage device bus	SCSI-2, fast, narrow, single-ended
Storage device protocol	SCSI-2
Number of SCSI device ports	6
Number of SCSI-2 devices per port (SWXSS-02 SBB shelf)	6 (or 7)†
Number of SCSI-2 devices per port (SWXSC-AA storage enclosure)	4
Maximum number of SCSI-2 devices (SWXSS-02 SBB shelves)	36 (or 42)†

Table 1–2 Summary of SWXRC-04 Controller Product Features (*Continued*)

Maximum number of SCSI-2 devices (SWXSC-AA storage enclosure)	24
Dual-redundant configurations	Yes
Controller warm swap	Yes
Read cache module	32 MB
Write-back cache module	32 MB
Mixed disks and tapes‡	No tape support
Tape media loaders	No tape media loader support
Device warm swap	Yes
Controller-based device exercisers	Yes
Preferred ID preservation	Yes
Spontaneous messages to maintenance terminal	Yes
RAID level support	0, 1, 0+1, 3, 5
Program card firmware update	Yes (by replacing or downloading the card)
Error detection code (EDC)	Validation of program card firmware
Error correction code (ECC) on cache and shared memory	Yes
Tagged command queuing	Yes
Power fail write non-volatile journal	Yes
Data integrity and byte parity (all buses/memory)	Yes

†The dual-redundant controller configuration supports up to six devices per port. Non-redundant configurations support up to seven devices per port, but this sacrifices a convenient upgrade to high-availability and redundant/backup power options.

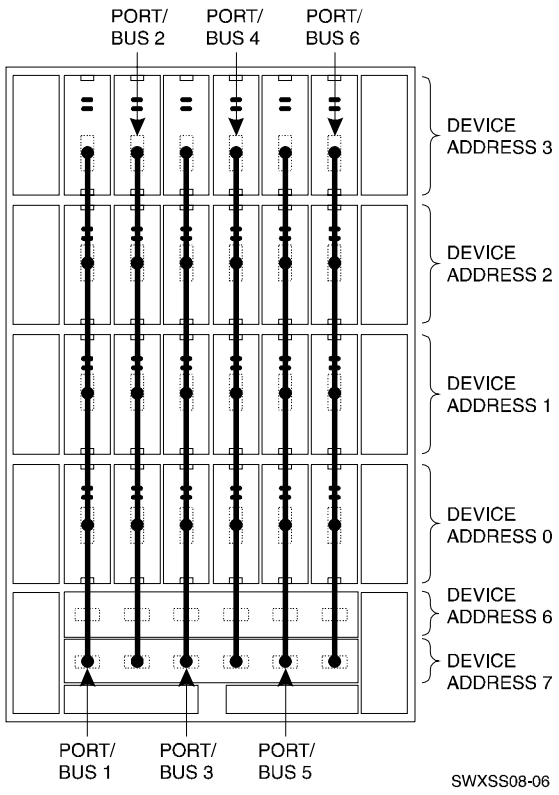
‡On the same or different ports.

1.7 SCSI Buses

The factory-configured six 8-bit SCSI buses and the associated ports and device addresses are shown in Figure 1–6. The configuration rules for these single-ended SCSI buses are as follows:

- All devices and ports in the same column are on the same SCSI bus or port
- Termination boards are installed on the top, rear of the backplane
- Each terminator board terminates two buses (that is, Bus 1 –Bus 2, Bus 3–Bus 4, and Bus 5–Bus 6)
- All the devices in the same horizontal row (device shelf) have the same device address
- Device addresses are determined by the backplane connector into which the device is inserted
- The RAID shelf does not use device addresses 4 and 5
- Device addresses 4 and 5 can only be used when the SBB has a device address switch

Figure 1–6 RAID Shelf 8-Bit SCSI Buses



1.8 Storage Device SBBs

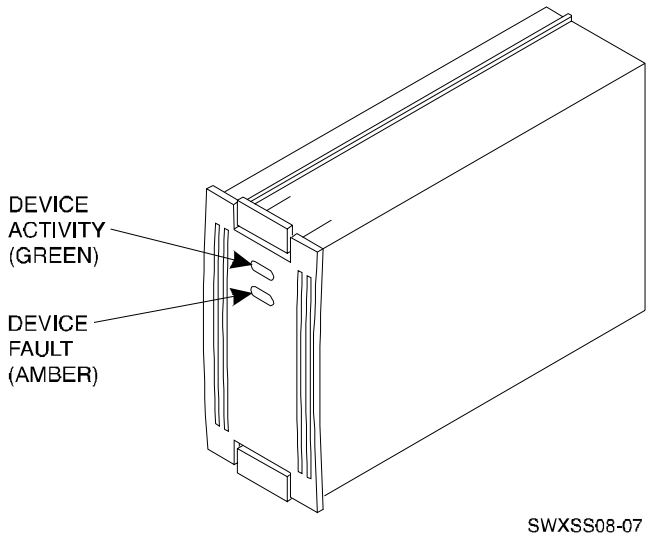
Figure 1–7 shows the 3½-inch storage device SBB. The RAID shelf can accommodate 24 SBBs, each occupying one slot.

The 8-bit SCSI device addresses can be assigned in the following ways:

- By the backplane connector
- With the SCSI device address switch mounted on the rear of some 3½-inch SBBs

For detailed information about SCSI device addressing, see the *StorageWorks Solutions Shelf and SBB User's Guides.*

Figure 1–7 Typical 3½-Inch Storage SBB



2

Configuring the RAID Shelf

This chapter describes the basic rules for configuring a RAID shelf. Table 2–1 list the components required for an operational RAID subsystem. The first part of the table lists the components supplied with the shelf and the upgrade kit. The second part lists the components required to make the system operational, the configure-to-order (CTO) components.

Table 2–1 RAID Subsystem Shelf Components

SWXSS-08 Standard Components	**Qty**		
Dual Speed Blowers	8		
Environmental Monitor Unit (EMU)	1		
Power Entry Controller	1		
Power Entry Controller ac Power Cord—Black	1		
Power Entry Controller ac Power Cord—Gray	1		
Shelf ac Power Cord—Black	5		
Shelf ac Power Cord—Gray	4		
Customer Specified Components	**Min**	**Max**	**Plan**
3½-Inch Storage SBBs	6	24	**24**
Environmental Monitor Unit (EMU)	1	2	**2**
SWXSC-Series Controller with Cache Memory	1	2	**2**
Power Entry Controller	1	2	**2**
Power Entry Controller ac Power Cords	1	2	**2**
SCSI Cables: Controller to Host	A/R	A/R	N/A
Shelf Power Supplies	4	8	**8**

Configuration information in this chapter is based on the components shown in the "Plan" column of Table 2–1.

2.1 Power Configurations

The RAID subsystem shelf can be configured for dual ac power which includes the following components:

- Two ac power controllers
- Two cable distribution units (CDUs)
- Separate ac power sources for the CDUs

This is the *optimum* ac power configuration and is recommended for use with the 4+4 redundant shelf power configuration. These configurations provide the maximum protection for your data.

Table 2–2 lists the RAID shelf power configurations. To easily identify the ac power controller providing power to the power bus, different colored (black and gray) power cords are used:

- Black power cords are connected to power entry controller A
- Gray power cords are connected to power entry controller B

Table 2–2 RAID Shelf Power Configurations

Bus Type	Power Supply Locations	Power Cords	
		Bus A (Black)	Bus B (Gray)
Power Supply Bus "A" (Single Power Controller)			
Basic (4+0)	Single SBB power supply in Slot A on each shelf.	4	0
Standard (4+1))	Single SBB power supply in Slot A on each shelf. Single SBB power supply in Slot B, top shelf.	5	0
Power Supply Buses "A" and "B" (Dual Power Controllers)			
Redundant (4+4)	SBB power supplies in Slots A and B on each shelf.	4	4

2.2 Power Distribution

The ac power is distributed to the RAID shelf power supplies over two separate ac power buses—power bus "A" and power bus "B." Each bus has its own ac input power source, power controller, and power cords.

2.2.1 Power Bus "A"

The power controller A, located in the lower left corner of the RAID shelf, provides power for all three power configurations. All the black power cords are connected to power bus "A."

The *basic* power bus configuration (see Figure 2–1) has only one ac power controller (power controller "A") and four shelf power supplies (one per storage shelf). Digital does not recommend using this configuration in that the failure of a single shelf power supply will place RAID shelf controller in the reset state.

Figure 2–2 shows the *standard* (4+1) power configuration for power bus "A." In this configuration a second shelf power supply is installed at the right end of the top shelf. It is connected to the "A" bus using the black power cord. Digital recommends this configuration to provide basic power redundancy.

NOTE

The black power cords are all connected to power controller "A".

Figure 2–1 Basic (4+0) RAID Shelf Power Configuration

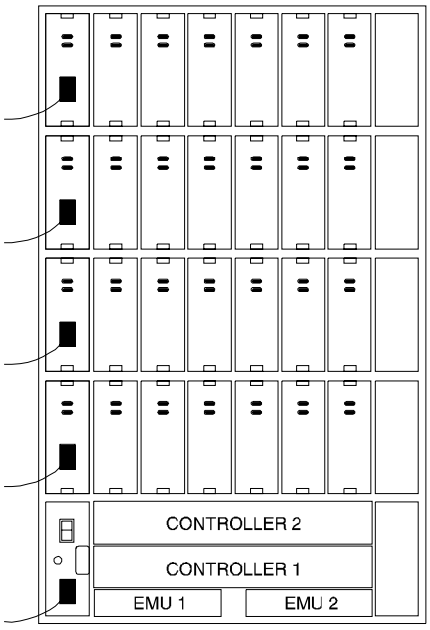
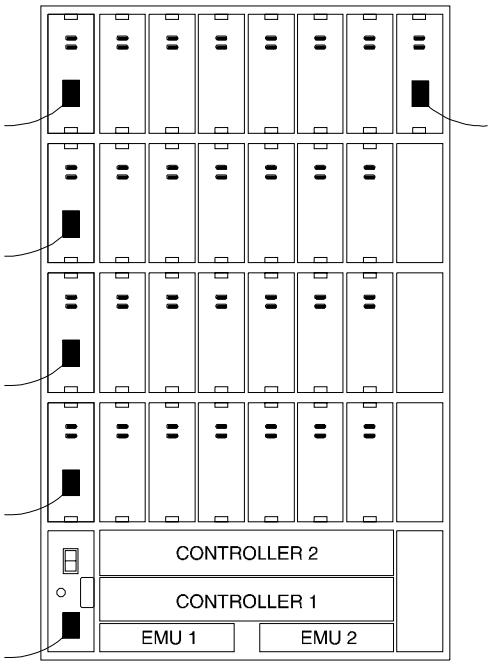


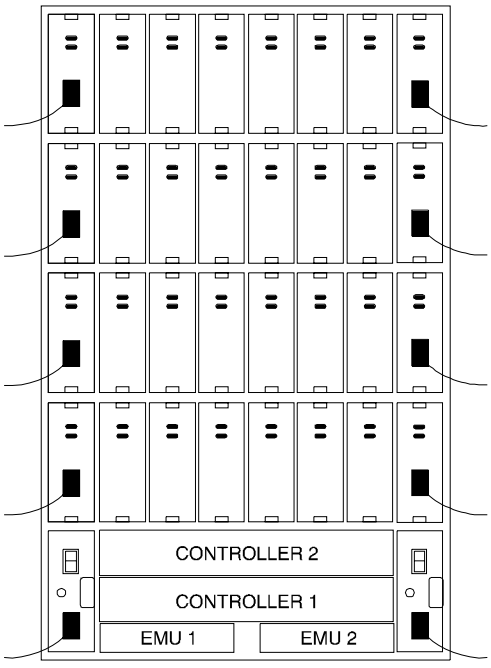
Figure 2–2 Standard (4+1) RAID Shelf Power Configuration



2.2.2 Power Bus "B"

Power Bus “B” is only used in the redundant (4+4) power configuration (see Figure 2–3). Power controller “B” provides power to four shelf power supplies at the right end of the shelves (gray power cords).

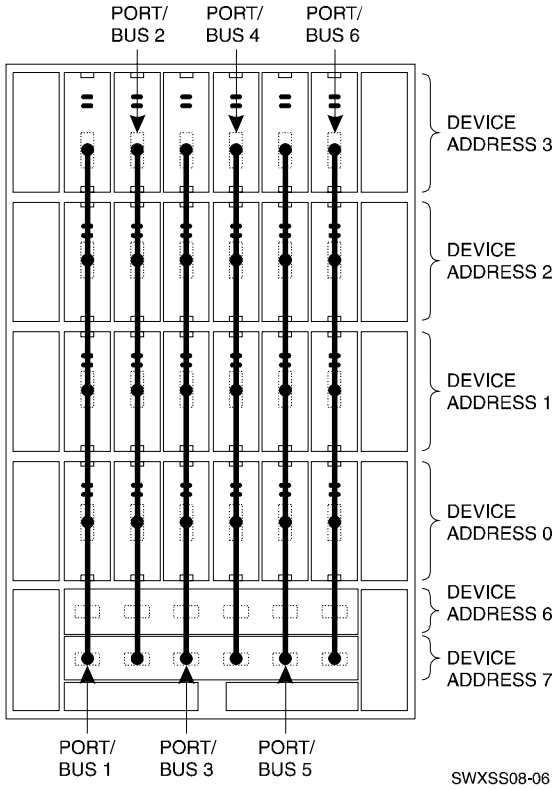
Figure 2–3 Redundant (4+4) RAID Shelf Power Configuration



2.3 SCSI Bus Configurations

The six single-ended, 8-bit SCSI buses are oriented vertically on the RAID shelf backplane. Each bus connects a controller port connector to one device connector on each device shelf for a total of four devices per SCSI bus (device addresses 0 through 3). The two SWXSC-series array controllers device side, SCSI initiator device addresses are preset by slot location to device addresses 6 and 7, as shown in Figure 2–4.

Figure 2–4 RAID Shelf SCSI Buses



2.4 RAID Controller Configurations

For information on RAID and other controller configurations, see the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

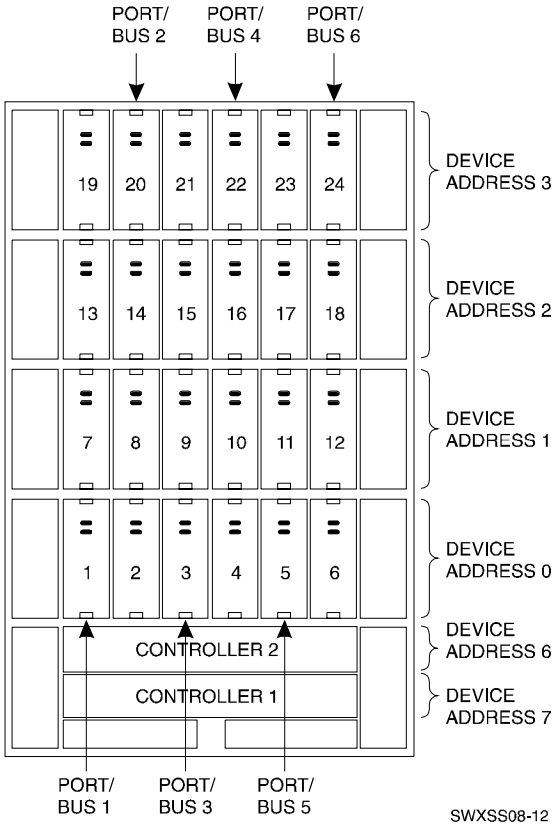
2.5 Installation Sequence

For the most effective RAID operation, install the controllers and SBBs in the following sequence (see Figure 2–5).

1. Install the *first* controller in slot 7.
2. Install the *second* controller in slot 6.
3. Install the *first* storage device SBB at the left end of the bottom shelf (Device Address 0, SCSI Bus 1). Completely fill the bottom shelf from left to right.

4. Once the bottom shelf is full, install the next SBB starting at the left end of the second shelf (Device Address 1, SCSI Bus 1). Completely fill the second shelf from left to right.
5. Once the second shelf is full, install the next SBB starting at the left end of the third shelf (Device Address 2, SCSI Bus 1). Completely fill the third shelf from left to right.
6. Once the third shelf is full, install the next SBB starting at the left end of the top shelf (Device Address 3, SCSI Bus 1). Completely fill the third shelf from left to right.

Figure 2–5 Controller and SBB Installation Sequence



3

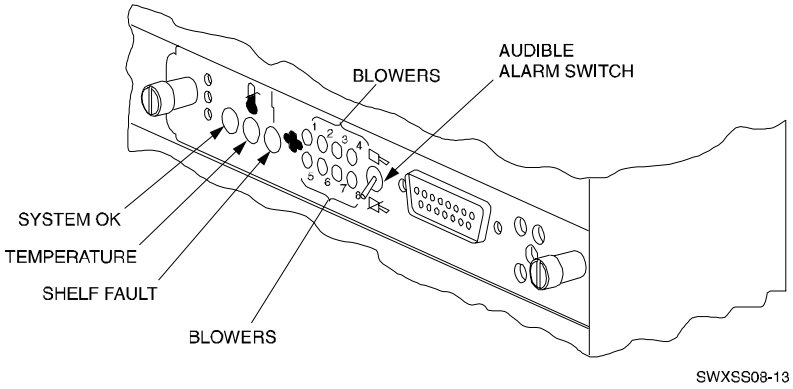
Error Analysis and Fault Isolation

This chapter describes the errors, faults, and significant events that can occur during the RAID initialization and normal operation. The error and event descriptions isolate failures to a user-replaceable component.

3.1 Error Reporting

RAID shelf error conditions are displayed on the EMU front panel LEDs (Figure 3–1).

Figure 3–1 EMU Front Panel



All RAID subsystem shelf error conditions are processed by the EMU which performs the following functions during routine operations:

- Monitors and controls the cabinet blowers
- Monitors the power supplies
- Senses shelf temperature
- Monitors the power supply voltage

When the EMU detects one or more of the following fault conditions, it implements the following actions:

- Enables the audible alarm
- Turns on the amber shelf fault LED
- Turns on one or more EMU panel LEDs

As shown in Figure 3–1, the front panel LEDs display shelf status information. Any error condition can cause the audible alarm to sound.

NOTE

The audible alarm can only operate when the EMU front panel audible alarm switch is in the up (enabled) position.

The EMU front panel LEDs (see Figure 3–2) display the status of the RAID shelf (SYSTEM OK), the temperature (TEMPERATURE), shelf error conditions (SHELF FAULT), and the status of the individual blowers and banks of blowers (BLOWERS). When the RAID shelf is functioning properly only the SYSTEM OK LED is on.

Figure 3–2 EMU LED Indicators

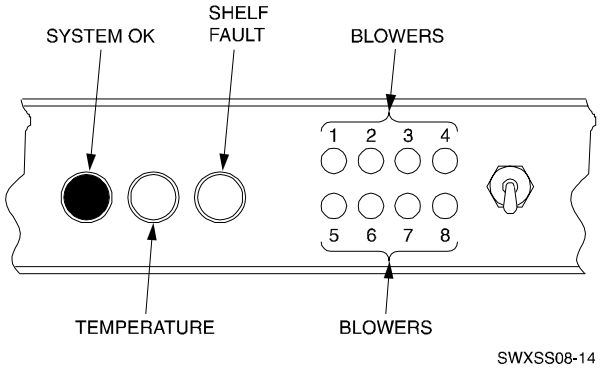
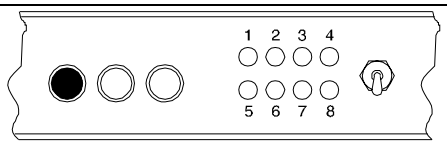
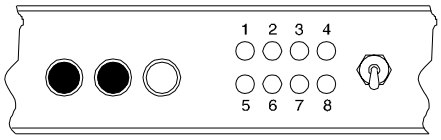
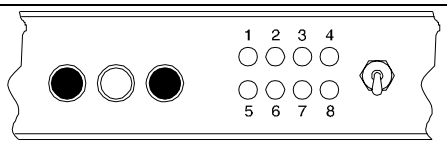
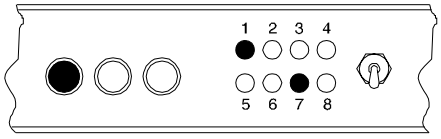
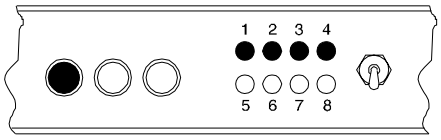


Table 3–1 is a summary of the basic EMU LED displays, the RAID subsystem status, and corrective actions:

Table 3–1 EMU RAID Shelf Status Indications

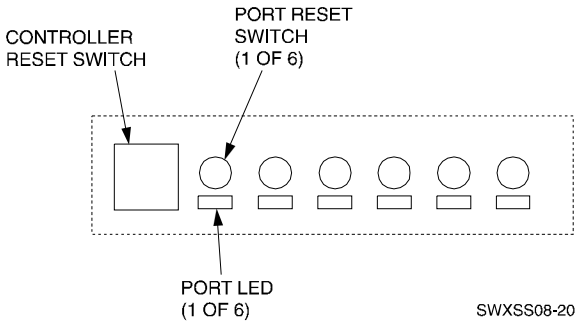
When the EMU LED display is…	the subsystem status is…
 SWXSS08-15	The RAID shelf is fully operational.
 SWXSS08-16	The shelf temperature is above 35°C (95°F). All blowers are operating at high speed. Determine and correct the cause of this condition as quickly as possible. When the temperature exceeds 50°C (122°F), the EMU places the controller in the RESET state. This will halt all data transfers thereby preventing the loss or corruption of data.
 SWXSS08-17	There is a shelf power problem. Observe the power supply LEDs to determine the defective supply and replace it.
 SWXSS08-18	One or more blowers are non-operational. In this example Blowers 1 and 7 are non-operational and must be replaced.
 SWXSS08-19	Either a blower is not installed or it is installed incorrectly. In this example, the error condition is caused by a Bank 1 blower. Check Blowers 1, 2, 3, and 4 to isolate the blower causing the problem and install it properly.

3.2 Controller Error Conditions

A typical SWXSC-series operator control panel (OCP), such as the SWXRC-04 OCP (see Figure 3–3), has the following switches and indicators:

- Controller reset switch with an embedded green status LED
- Six SCSI port (bus) reset switches
- Six amber SCSI bus status LEDs

Figure 3–3 Typical OCP



The green controller reset LED indicates the controller and the host interface status. This LED flashes constantly once the controller initialization is complete and the firmware is functioning. Pressing this switch resets the controller.

The amber port LEDs are off when the bus is functioning properly. A port LED that is on or flashing indicates that a device on the bus is not functioning properly.

Pressing and holding any port reset switch will quiesce the bus and turns on the amber LED. Depending on the controller, you may have to quiesce a bus and replace a storage device. For further information about requirements for quiescing the bus to replace an SBB, see the *StorageWorks SWXRC-04 RAID Controller User's Guide*.

NOTE

The exact arrangement of switches and LEDs may vary by controller type.

3.3 Storage Device Fault Notification

The storage device SBB is a 3½-inch form factor as shown in Figure 3 –4. The two LEDs display the SBB status and have three states: on, off, and flashing.

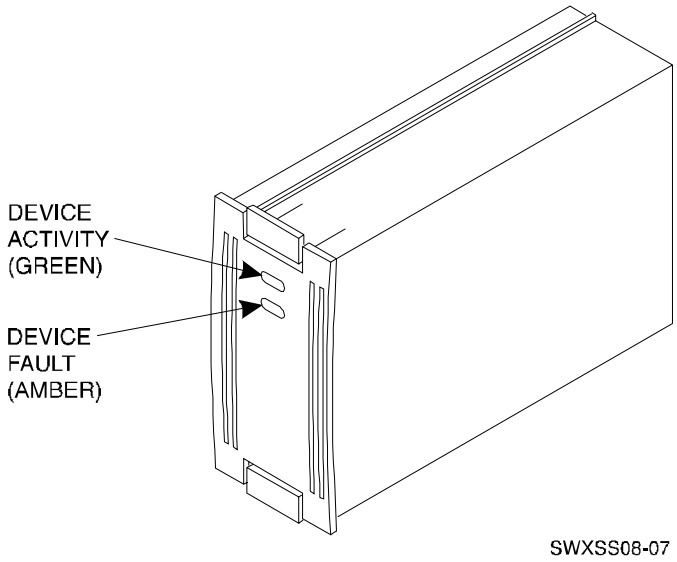
- The green LED is the device activity LED and is on or flashing when the SBB is active

CAUTION

Removing a storage SBB when the device activity (upper) LED is on or flashing can cause the loss or corruption of data.

- The amber LED is the device fault LED and indicates an error condition or configuration problem when it is either on or flashing

Figure 3–4 Typical 3½-Inch Storage SBB



3.4 Power Supply Fault Notification

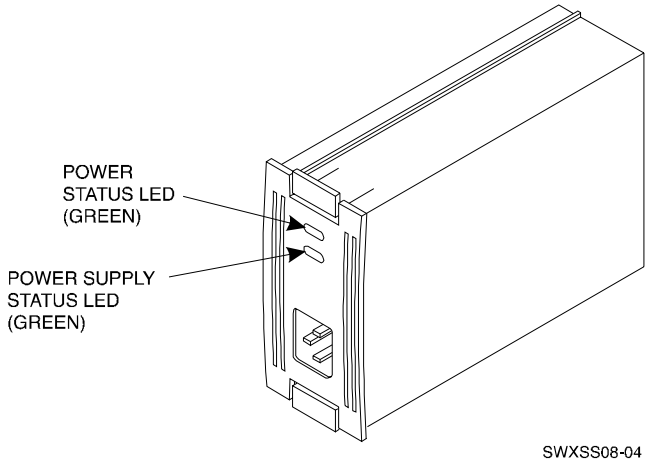
Each power supply SBB has two green LEDs (Figure 3 –6) that display the power supply status. The LEDs indicate the power bus and supply status (see table 3 –2).

- The upper LED is the power bus status LED
- The lower LED is the power supply status LED

Table 3–2 Shelf Power Supply Status LEDs

When the LED display is . . .	The RAID shelf power status is . . .
	All the power supplies on the *associated* power bus are functioning properly.
	At least one power supply on the associated power bus has malfunctioned. This supply is operating properly.
	Either there is no ac power to this supply or this power supply should be replaced.

Figure 3–6 RAID Shelf Power Supply (3½-Inch SBB)



3.5 Dual-Speed Blowers

CAUTION

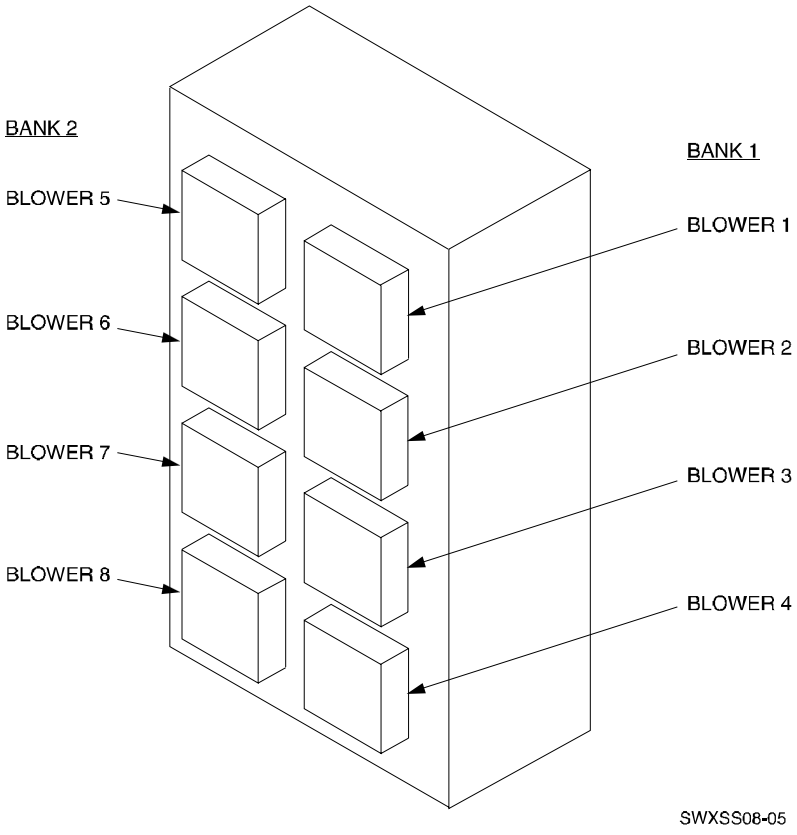
The RAID subsystem shelves use only dual-speed blowers – Model BA35X–MD. The single-speed blower – Model BA35X–MA– is not an acceptable substitute and cannot be used as a replacement.

As shown in Figure 3–7, the RAID shelf has eight rear-mounted blowers that pull air in from the front of the cabinet; through the SBBs, controllers, and EMUs; and exhaust it out the rear. +12 V dc to operate the blowers is available on the shelf backplane connectors. The blower status signals are routed through the same connectors to the shelf backplane and the EMU. All operational blowers are turned up to high speed when the following conditions exist:

- When a high warning temperature condition is detected by the EMU
- When a blower malfunctions
- When a blower is removed
- When a blower is not rotating at the correct speed

The EMU monitors the blower status logic signals, displays error conditions, and controls the blower operating speed.

Figure 3–7 Dual-Speed Blower Locations



4

Replacing Components

This chapter describes the procedures to remove and install the following components in the RAID shelf: SBB shelf power supply, SBB storage device, EMU, dual-speed blower, and power entry controller.

4.1 Replacing a Controller or a Cache Module

Replacing SWXSC-series array controllers and cache memories are complex, controller-specific procedures. Therefore, these procedures are not within the scope of this publication.

The controller user's guides and service manuals contain the complete procedures for replacing these devices.

4.2 Replacing an SBB Storage Device

Replacing an SBB involves quickly removing and replacing a storage device or power supply using either the warm-swap or the hot-swap method depending upon the capabilities of the controller. The differences between these two methods are as follows:

hot-swap—A method of device replacement whereby the complete system remains online and active during device removal or insertion. The device being removed or inserted is the only device that cannot perform operations during this process.

warm-swap—A method of device replacement whereby the complete system remains online during device removal or insertion. A single SCSI bus may be halted for a brief period of time during device insertion or removal. No bus activity is permitted while the device is being inserted.

The method used to replace a device must preserve the data integrity and either the controller or the operator must determine that the swap is necessary. The SBB swap methods can be used to add a device.

The controller determines that a device is bad by receiving no response from the device or detecting excessive errors from the device

- The operator decides to remove a device by examining the controller operator control panel (OCP) codes, the SBB LEDs, system messages, or system error log information

CAUTION

Both the hot and warm-swap methods support removing and replacing a *single* storage SBB. You must repeat the complete procedure for each SBB you are replacing.

4.2.1 Before You Replace a Storage SBB

CAUTION

Installing a different model device requires you to reconfigure the subsystem

Whenever you replace a storage SBB you must consider the following factors:

- The replacement device *must be* the same (or the same model with a larger storage capacity) as the one being replaced
- You do not need electrostatic discharge (ESD) protection, such as an ESD wrist strap, to replace an SBB. However, you can cause ESD damage by touching the SBB connector
- Always use both hands to remove or install an SBB

4.2.2 SBB Replacement

The procedures for replacing a storage SBB accomplish the following:

- Preserve data integrity
- Reduce the time a port and the associated devices are not available
- Makes sure that the controller performs in a predictable manner

Removing or inserting a storage SBB generates the SWAP_L low signal. Table 4–1 describes the expected controller responses.

Table 4–1 Controller Response to SBB Replacement

Action	Expected Controller Response
Removing a storage device when data is not being transferred.	Related port LED lights.
Removing a storage device during a data transfer operation.	The controller checks all data for validity.
Installing a storage device.	The controller begins the storage device configuration process.

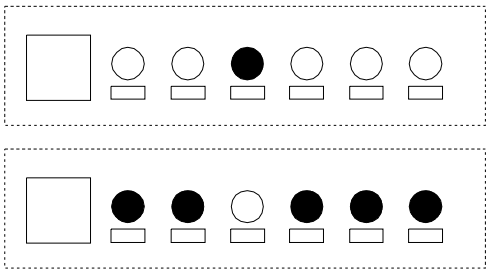
In general, the procedure for replacing an SBB is the same for all controllers. However, there may be significant operating system or firmware differences. Therefore the following procedure is an *outline*. Refer to the controller user documentation for the detailed procedure you should use.

In general, replacing an SBB requires you to complete the following procedure:

1. Dismount the device.
2. Quiesce the SCSI bus (port). The controller OCP LEDs display indicates the bus status and when you can remove or insert an SBB. You can quiesce only *one* port at a time.
3. You can remove or install an SBB *only* when the controller OCP LEDs indicate:

- There is no I/O activity on the device bus
- Removing or installing an SBB will not cause loss or corruption of data

The port LEDs indicate this condition by flashing in an alternating pattern. For example, when you quiesce port 3 and I/O has halted, the OCP LED pattern alternates as follows:



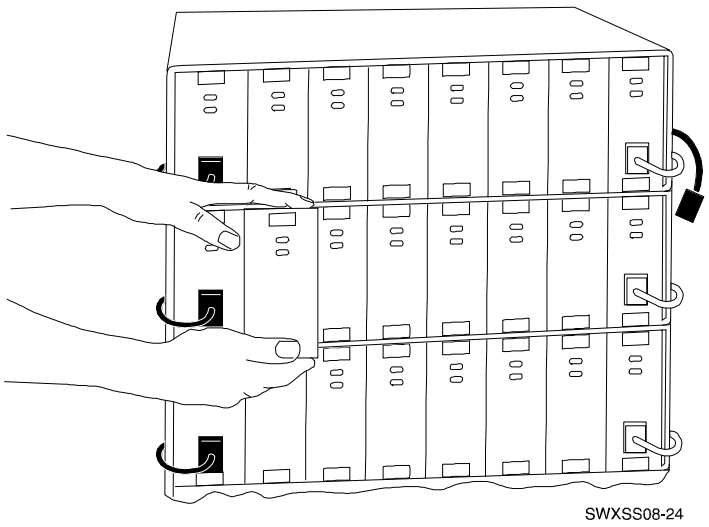
SWXSS08-23

4. Remove the SBB by pressing the two mounting tabs together to release it from the shelf, and pull it out using both hands (see Figure 4 –1).
5. Insert the replacement SBB into the guide slots and firmly push it into the shelf until the mounting tabs snap into place.
6. Observe the status LEDs for the following indications:

- The green device activity LED is either on, flashing, or off
- The amber device fault LED is off

7. The controller should automatically configure the replacement SBB (See the *StorageWorks SWXRC-04 RAID Controller User's Guide).*

Figure 4–1 Removing a Storage Device SBB



Fir additional information on storage device replacement, see the *StorageWorks SBB User's Guide* or the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

4.3 Replacing Shelf Blowers

You can install a dual speed shelf blower only one way and have it operate properly. The blower connector and the guide allow you to insert the unit without the possibility of a connector mismatch.

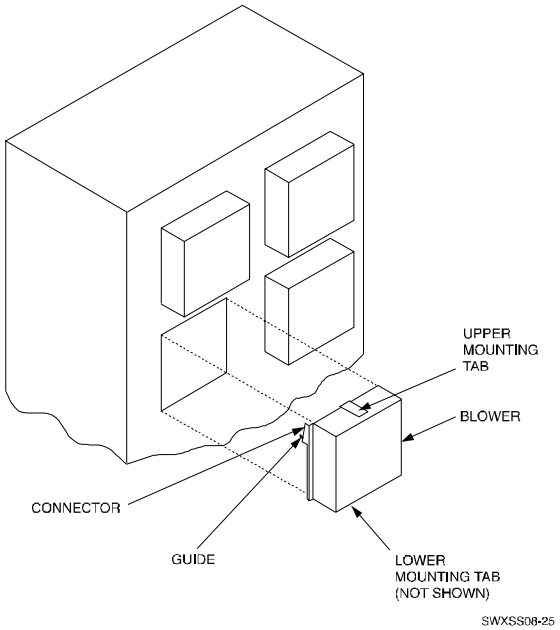
CAUTION

Operating a RAID shelf with a blower removed significantly changes the air flow pattern and reduces air flow through the shelf and devices. This can cause an overtemperature condition. Therefore, you should not remove a blower unless you can replace it within one minute.

To remove a blower (Figure 4–2), complete the following procedure:

1. Remove the blower safety screw.
2. Press the upper and lower blower mounting tabs together to release the blower and pull the blower straight out.

Figure 4–2 Dual Speed Blower Replacement



To replace a dual-speed blower, refer to Figure 4 –2 and complete the following procedure:

1. Orient the replacement blower so the connector and guide pin line up with the blower opening on the rear panel.
2. Push the blower straight in, making sure the upper and lower mounting tabs snap in place.
3. Install the blower safety screw.

4.4 Replacing a Shelf Power Supply

The basic procedure for removing and replacing shelf power supplies is the same as for replacing storage devices. Power supply SBBs normally can be replaced while power is applied to the shelf and the other power supplies.

There are two methods for replacing power supply SBBs —the **hot-swap** method and the **cold-swap** method. The cold swap involves removing all power from a power bus. Unless you are using a full redundant (4+4) power configuration, this will turn off the RAID shelf and can result in the loss or corruption of data.

The light emitting diodes (LEDs) on the front of the SBB indicate the status, either operational or non-operational.

- Normally you use the warm swap method when both LEDs are off
- The cold-swap method is normally used only during initial installation. The power is removed from the RAID shelf and all devices are inactive. None of the devices are operational until the power is restored

Use the following procedure to replace a power supply SBB:

CAUTION

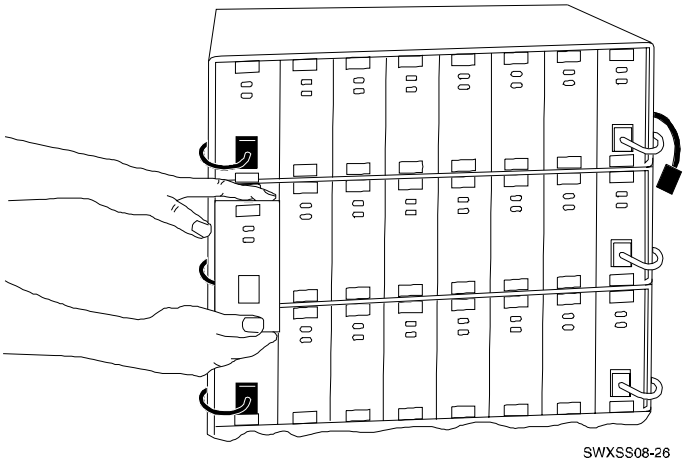
To prevent ESD (electrostatic discharge) damage to an SBB, do not touch the SBB connector.

1. As shown in Figure 4–3, press the two mounting tabs together to release the power supply SBB from the shelf.
2. Use both hands and pull the power supply SBB out of the shelf.

CAUTION

Always use both hands when removing a power supply.

Figure 4–3 Removing a Power Supply SBB



Use the following procedure to install a power supply SBB:

1. Insert the replacement power supply SBB into the guide slots and push it in until it is fully seated and the mounting tabs engage the shelf.
2. Connect the power cord to the power supply SBB.
3. After input power is applied, observe the power supply SBB LEDs to make sure the power supply is functioning properly. Both status LEDs should be on.

4.5 Replacing an EMU

EMUs can be removed and installed without turning off the RAID shelf as described in the following sections.

Use the following procedure to remove an EMU:

NOTE

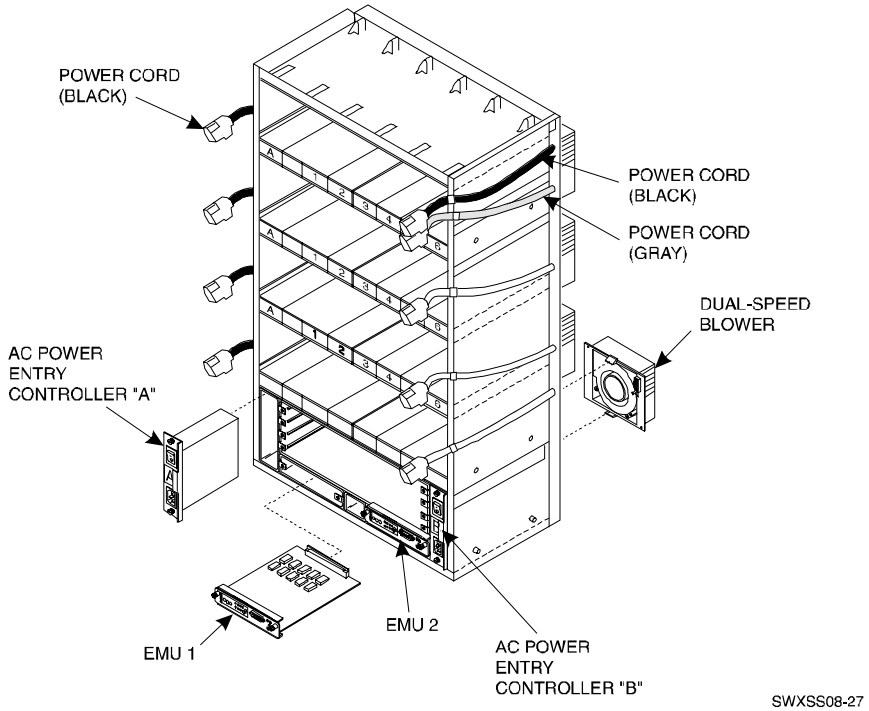
This component can be removed and installed while power is on. When there are two EMUs, one can be hot-swapped without affecting system operation.

1. Loosen the two retaining screws.
2. Use a gentle back-and-forth rocking motion to loosen the EMU from the backplane.
3. Pull the EMU straight out to disconnect it from the backplane.

Use the following procedure to install an EMU:

1. Insert the replacement EMU into the guide slots and push it in against the backplane connector.
2. Use a gentle back-and-forth rocking motion while pushing in to seat the EMU into the backplane. Press firmly in on the EMU until it is fully seated.
3. Tighten the two retaining screws.

Figure 4–4 Replacing an EMU



4.6 Replacing a Power Entry Controller

WARNING

Removing and installing a power controller is to be performed only by qualified service personnel. Failure to comply may result in injury or death as a result of electric shock.

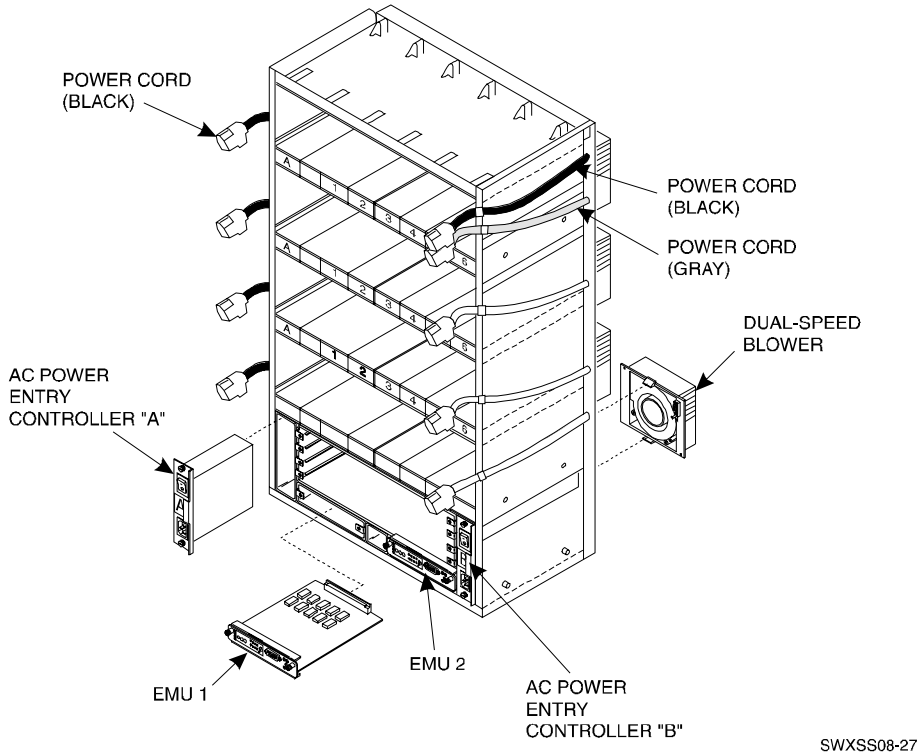
Use the following procedure to remove a power entry controller (see Figure 4 –5):

1. Turn the power controller off by pressing 0 on the on/off switch.
2. Disconnect the ac input power cord.
3. Loosen the two retaining screws.
4. Pull the power controller from the RAID shelf enclosure.

Use the following procedure to install a power entry controller:

1. Place the on/off switch on the replacement power controller to the off (0) position.
2. Insert the replacement power controller into the RAID shelf enclosure.
3. Tighten retaining screws.
4. Connect the ac input power cord.
5. Turn on the power controller by pressing the on/off switch to on.

Figure 4–5 Replacing a Power Entry Controller



A

Shelf Installation

This appendix describes how to install an SWXSS-08 RAID Shelf into an SWXSC-D-Series Data Center Cabinet. However, it does not address the following: integrating the RAID shelf into the system, the host computer system, the SCSI command set, and the SCSI controller.

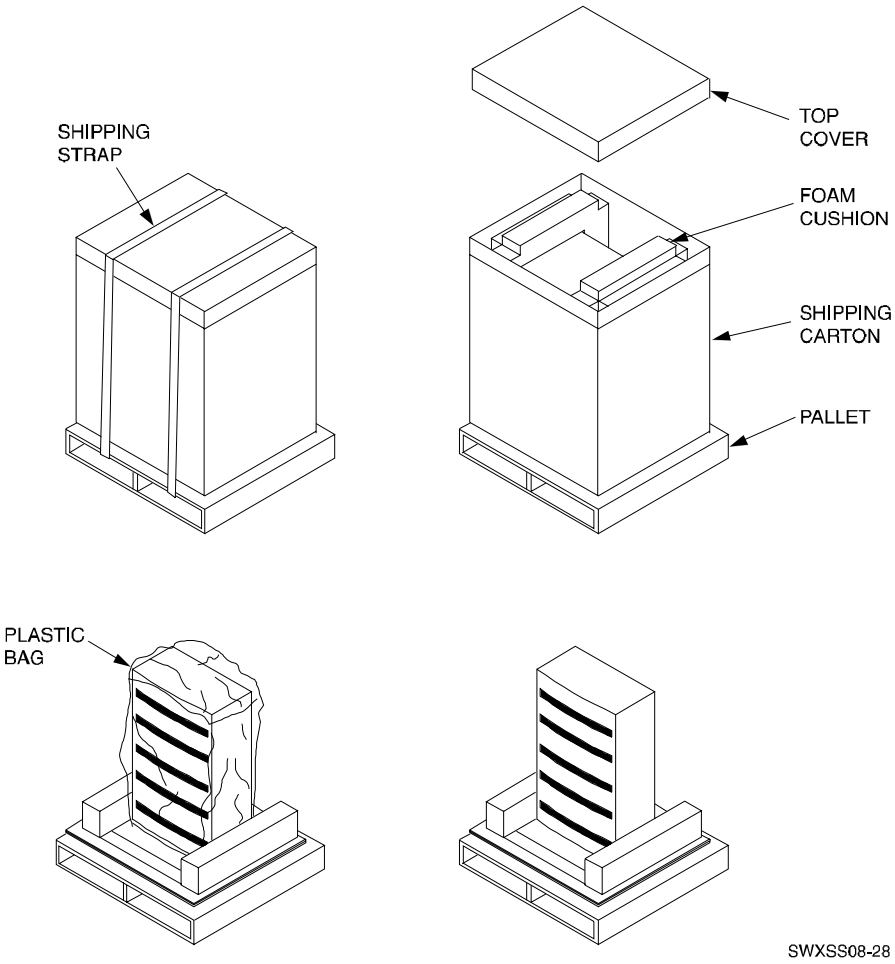
A.1 Unpacking the RAID Shelf

The RAID shelf (SWXSS-08) and the BA35X-RA RAID shelf kit are shipped separately. The RAID shelf is packed in a shipping carton attached to a wooden shipping pallet as shown in Figure A–1.

NOTE

Refer to the StorageWorks Solutions SWXSC-D Series Data Center Cabinet Installation and User's Guide (EK–SMCPF–IG) for temperature and humidity stabilization procedures.

Figure A–1 Unpacking the RAID Shelf



Proceed as follows to unpack the RAID shelf:

1. Cut the shipping straps and remove the top cover.
2. Some units are packaged in a plastic bag. If the unit is packaged in a bag, leave the bag in place until the unit has adjusted to the local temperature and humidity.
3. Remove the shipping carton from the pallet.
4. Remove the RAID shelf from the shipping pallet.
5. Once unpacked, examine the RAID shelf exterior for any apparent damage. Report such problems immediately.
6. Retain the shipping container and all packing materials.

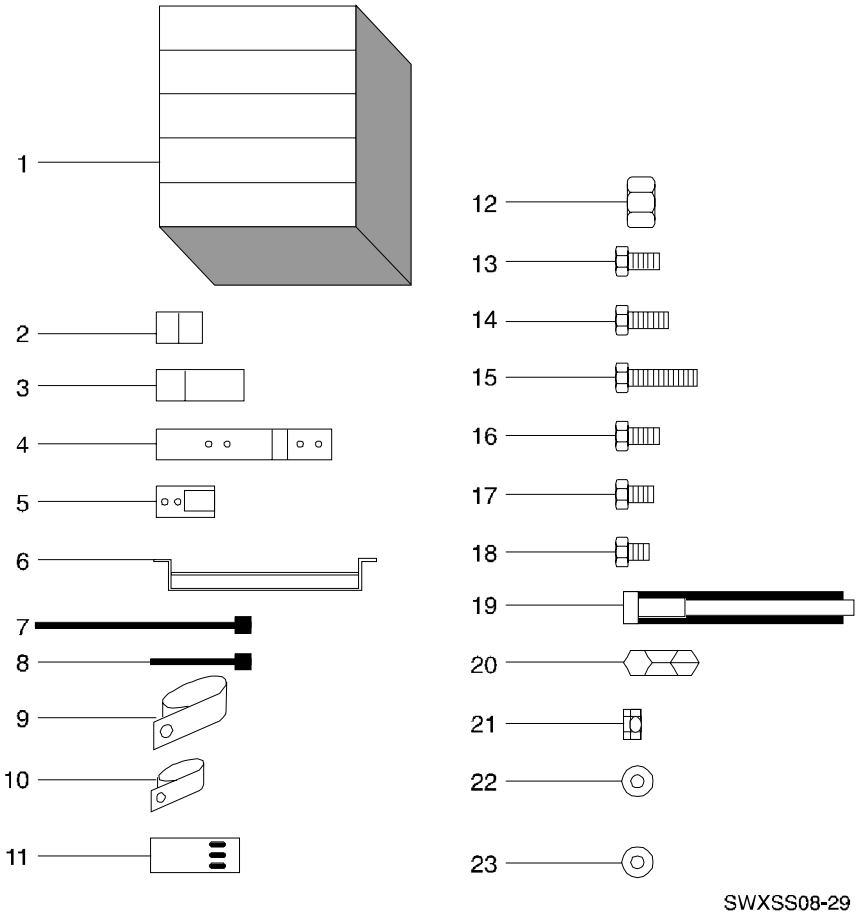
A.2 Inventorying the Upgrade Kit

Unpack and verify the contents of the BA35X-RA upgrade kit against the parts list by checking the index items in Table A –1 with the numbered items in Figure A–2. When all kit parts have been verified and the RAID shelf has been received, proceed to section A.3, Opening the Cabinet.

Table A–1 RAID Upgrade Kit Parts List

Index	Description	Qty
1	RAID Shelf	Ref
2	Front retainer bracket	2
3	Rear retainer bracket	2
4	Slide mount bracket	4
5	Slide mount bracket extension	4
6	Cable way bracket	1
7	Power cord (black)	1
8	Power cord (gray)	1
9	Cable clamp, 1 inch	2
10	Cable clamp, ½ inch	6
11	CDU label	2
12	KEPS nut, 10-32, 0.375 inch	4
13	Screw, 10-32 Pan, 0.500 inch	16
14	Screw, 10-32 Pan, 0.750 inch	4
15	SEMS screw, 6-32 Pan, 1.250	2
16	SEMS screw, 10-32 Pan, 0.625	28
17	SEMS screw, 6-32 Pan, 0.375	2
18	Machine screw, 8–32 Flt, 0.250	8
19	Extension slide	4
20	Hex spacer	2
21	U-nut, 10-32, 0.615L x 0.520W	18
22	Flat washer, SST	2
23	Flat washer, S/PAS	2

Figure A–2 RAID Shelf Upgrade Kit



A.3 Opening the Cabinet

This installation requires free access to the front, rear, and side of the cabinet. If required, separate the cabinet from adjacent ones and proceed as follows:

WARNING

Hazardous voltages are present within the cabinet. Use extreme caution to avoid shock and/or personal injury.

1. Open the front and rear cabinet doors to access the CDU and the RAID shelf mounting positions.
2. Remove the cabinet side panel (CDU side). Refer to the *StorageWorks Solutions SWXSC-D–Series Data Center Cabinet Installation and Users Guide.*
3. Spin down all disk drives and halt all tape drives in the cabinet.
4. Switch the CDU front panel circuit breaker to OFF (0).
5. Disconnect the CDU power cable from the power source.
6. Disconnect the host computer to isolate the cabinet electrically.

A.4 Preparing the RAID Shelf

The RAID shelf is shipped with five black and four gray power cords, eight dual-speed blowers, one environmental monitor unit (EMU), and one ac power controller (see Figures A–3 and A–4).

Figure A–3 RAID Shelf Front View

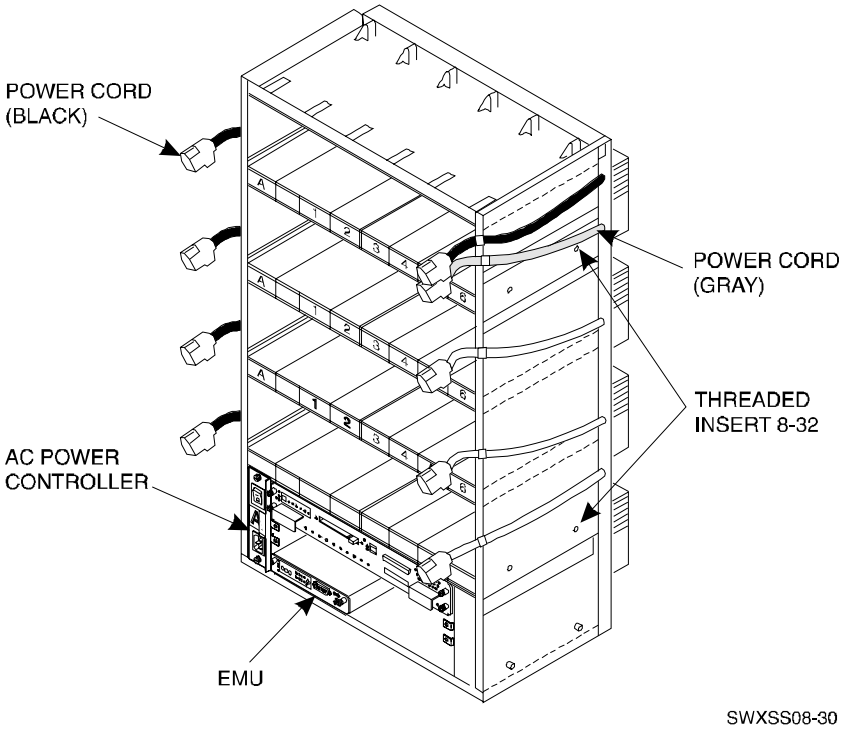
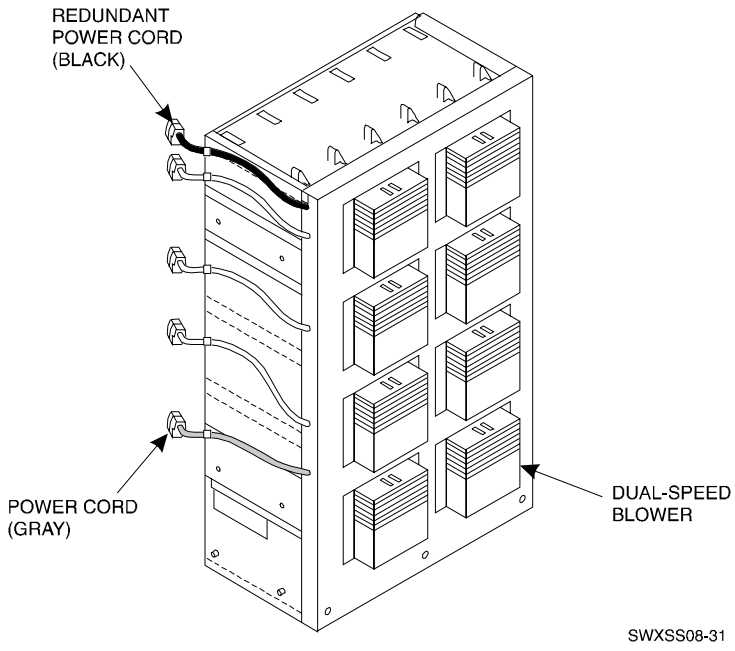


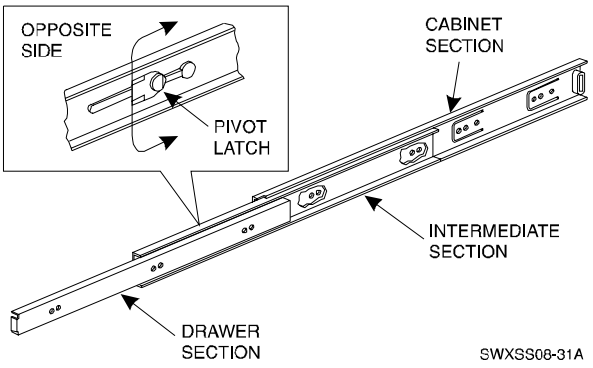
Figure A–4 RAID Shelf Rear View



A.5 RAID Shelf Slide

The three-section slide, drawer section, intermediate section, and cabinet section extends to 16 inches (see Figure A–5).

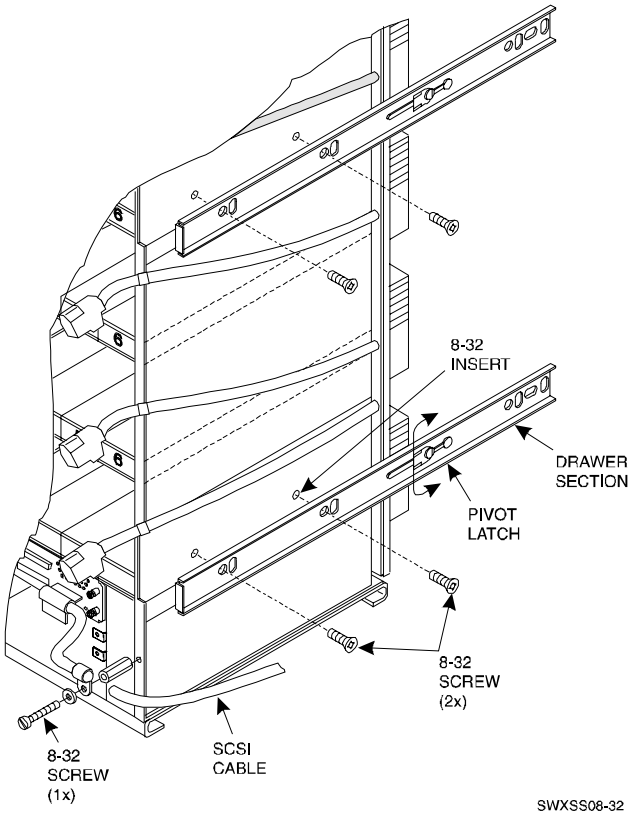
Figure A–5 RAID Shelf Slide



Pivot the latch between the drawer section and the intermediate section to remove the drawer section. Proceed as follows to install the slide drawer section onto a RAID shelf:

1. Position the slide drawer section over the threaded insert on the side of the enclosure and fasten with two 8-32 machine screws (see Figure A –6).
2. Repeat step 1 until the four slide drawer sections are installed.

Figure A–6 Installing the Shelf Slide



A.6 Installing the RAID Subsystem Shelf

A.6.1 Cabinet Preparation

There are four RAID shelf mounting positions in an SWXSC-D cabinet without a fan tray assembly installed. There are two RAID shelf front mounting positions, and two rear mounting positions (see Figure A –7).

WARNING

Cabinet rail edges may be sharp and can slice or abrade skin and cable insulation.

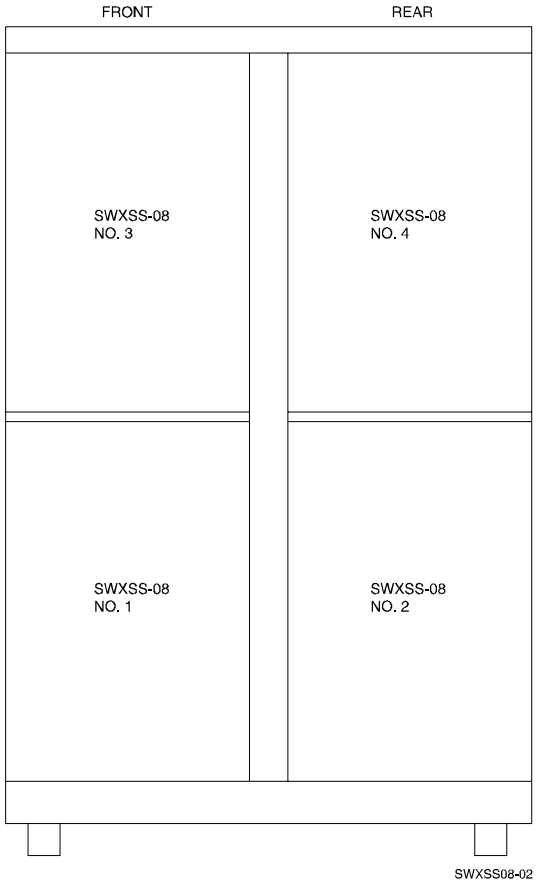
Remove all existing shelves and mounting brackets from the RAID shelf mounting position and store as required.

NOTE

If your SWXSC-D cabinet contains a fan tray assembly in the bottom rear mounting position, it must be removed to install a RAID shelf in this cabinet location. To remove a fan tray assembly, perform the following procedure.

1. Disconnect the power cord from the left front panel of the assembly.
2. Remove the shroud attached to the front panel of the assembly by removing the two upper mounting screws from each side of the front panel.
3. Remove the two lower screws from each end of the front panel and remove the assembly.
4. Replace the screw securing the power cable tie to the appropriate hole in the cabinet rail.

Figure A–7 Shelf Mounting Positions, Side View



A.6.2 Preparing the CDU

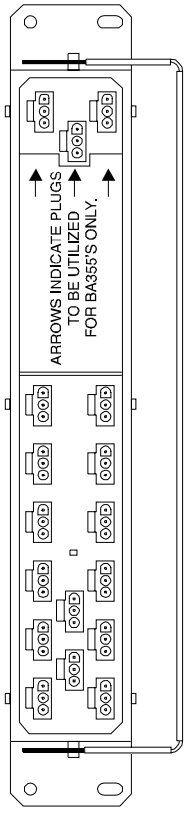
The CDU preparation requires a power cord connected from the RAID shelf to the CDU and a label on the CDU to indicate which plugs to use. Proceed as follows to prepare the CDU for a RAID shelf installation:

NOTE

A second CDU label is ONLY applied to the CDU when a fourth RAID shelf is installed.

1. Loosen the four mounting screws and pull out the CDU.
2. Examine the CDU label and reposition any power cords that are in the CDU label application area.
3. Remove the CDU label from the backing paper and place it over the connectors on the CDU back panel (see Figure A –20).
4. Connect the RAID shelf power cord into one of the three available connectors on the CDU.
5. Push the CDU back into its mounting position and tighten the four mounting screws.

Figure A–8 CDU Label Position

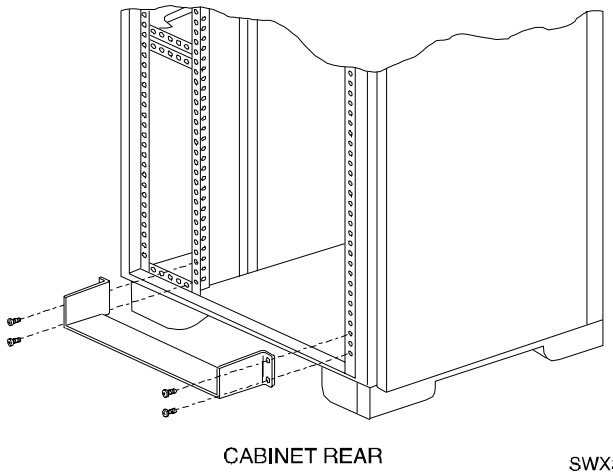


A.6.3 Installing the Cable Way

Cabinets without the fan tray assembly require a cable way to prevent the cables from being damaged when the RAID shelf is pulled forward on its slides. Proceed as follows to install the cable way:

1. Make sure that a space is available on the cabinet rear, bottom three holes.
2. Install U-nuts on the cabinet vertical rail holes 58 and 60 on each side of the cabinet (see Figure A–9).
3. Position the cable way on the cabinet vertical rail and fasten each side with two screws.

Figure A–9 Cable Way



A.6.4 Installing the Front Slide Mount Bracket

Install four slide mount brackets on the cabinet vertical rails for each RAID shelf. Proceed as follows to install the slide mount brackets:

WARNING

Cabinet rail edges may be sharp and can slice or abrade skin and cable insulation.

1. Determine the correct slide mount bracket position by checking the locator holes on the corresponding vertical cabinet rail (see Figure A –10).
   Example:

   The first shelf brackets are installed at hole location numbers 34, 37, 54, and 56 (hole locations are the same cabinet front or rear).
2. Position the bracket behind the outer flange of the cabinet vertical rail (see Figure A–11).
3. Using the bracket as a template, mark the two U-nut inner flange locations on the cabinet vertical rail.
4. Remove the bracket and install the two U-nuts on the cabinet vertical rail inner flange.
5. Position and fasten the bracket to the cabinet vertical rail inner flange with two 10-32 Pan, 0.625-inch screws.

Figure A–10 Hole Locations

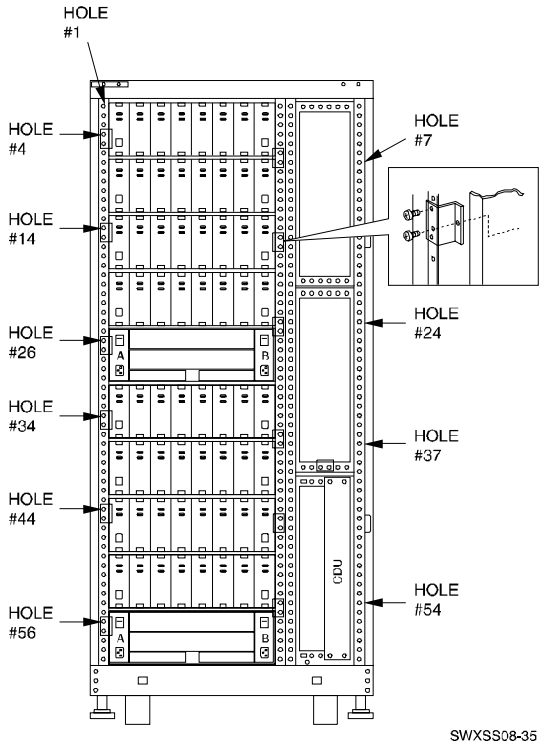
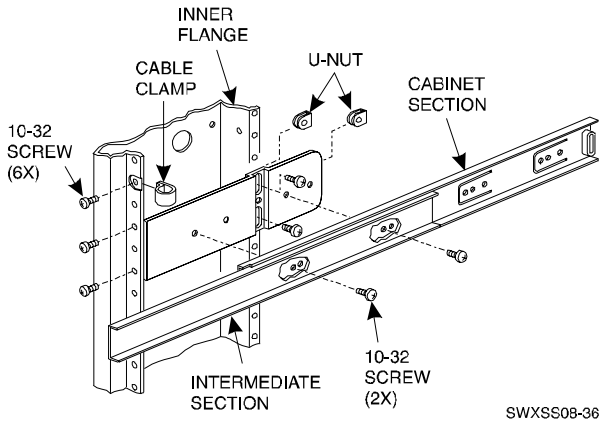


Figure A–11 Front Slide Mount Bracket



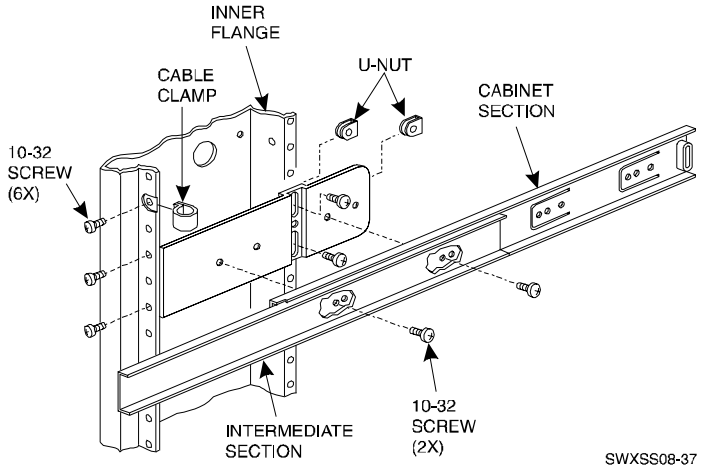
6. Fasten the bracket to the cabinet vertical rail outer flange with two 10-32 Pan, 0.625-inch SEMS screws.
7. Repeat steps 1 through 6 for each of the four slide mount bracket locations.

A.6.5 Installing the Front Cabinet Slide

Proceed as follows to attach the intermediate and cabinet sections to the mounting bracket:

1. Align the slide intermediate and cabinet sections to the mounting bracket (see Figure A–12).
2. Fasten the slide to the bracket with two 10-32 Pan, 0.500-inch screws.

Figure A–12 Slide Installation



A.6.6 Installing the Rear Slide Mount Bracket

Install four slide mount brackets on the cabinet vertical rails for each RAID shelf. The cabinet rear is deeper than the cabinet front and also requires four slide mount bracket extensions. Proceed as follows to install the slide mount brackets:

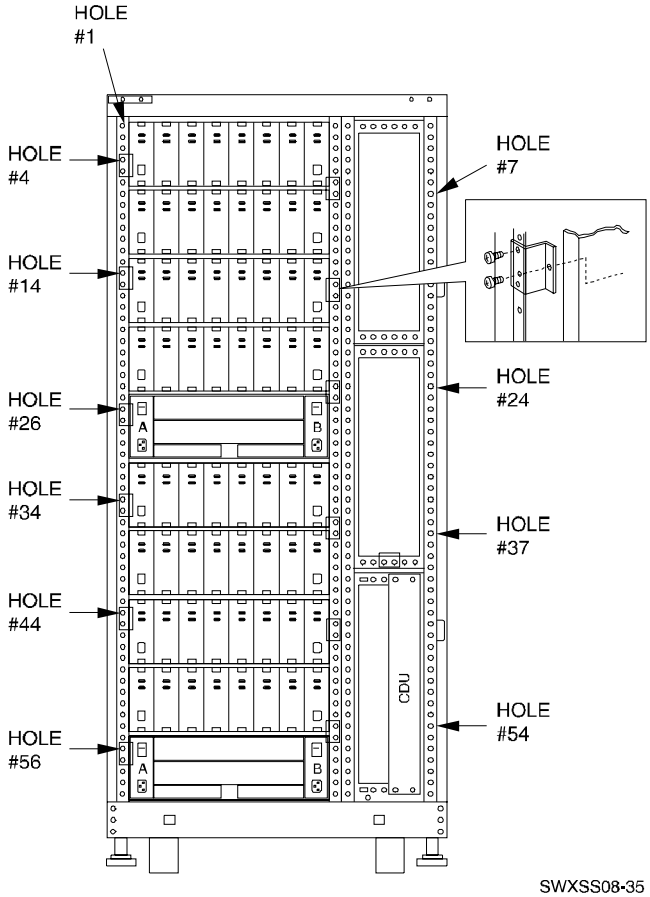
WARNING

Cabinet rail edges may be sharp and can slice or abrade skin and cable insulation.

1. Determine the correct slide mount bracket location by checking the locator holes on the corresponding cabinet rail vertical (see Figure A –13).
   Example:

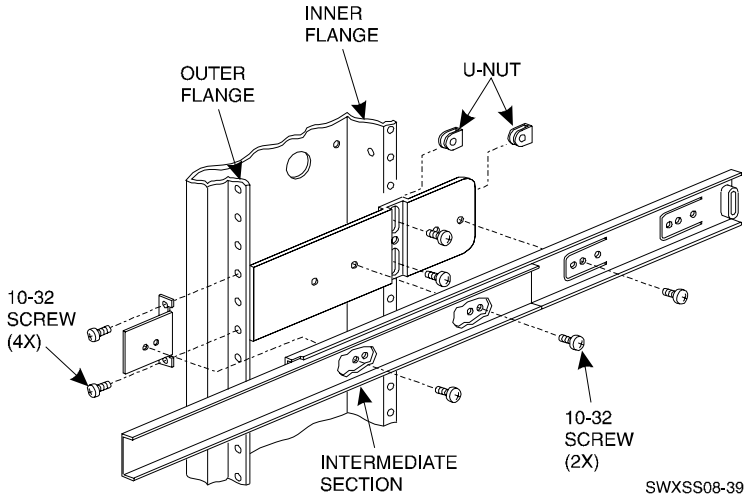
   The first shelf brackets are installed at hole locations numbers 34, 37, 54, and 56 (Hole locations are the same cabinet front or rear).

Figure A–13 Rear Hole Locations



2. Position the bracket behind the outer flange of the cabinet vertical rail (see Figure A–14).
3. Using the bracket as a template, mark the two U-nut mounting holes on the cabinet vertical rail inner flange.

Figure A–14 Rear Slide Mount Bracket



4. Remove the bracket and install two U-nuts in the marked places on the cabinet vertical rail inner flange.
5. Position and fasten the bracket to the cabinet vertical rail inner flange with two 10-32 Pan, 0.625-inch SEMS screws.
6. Position the bracket extension on the outside edge of the outer flange and fasten the bracket extension to the bracket with two 10-32 Pan, 0.625-inch SEMS screws.
7. Repeat steps 1 through 6 for each of the four slide mount bracket positions.

A.6.7 Installing the Rear Cabinet Slide

Proceed as follows to attach the intermediate and cabinet sections of the slide to the cabinet:

1. Align the two sections of the shelf slide to the mounting bracket (see Figure A–14).
2. Fasten the slide to the bracket with two 10-32 Pan, 0.500-inch screws.
3. Fasten the shelf slide to the bracket extension with one 10-32 Pan, 0.500-inch screw.

A.6.8 Power Cord Installation

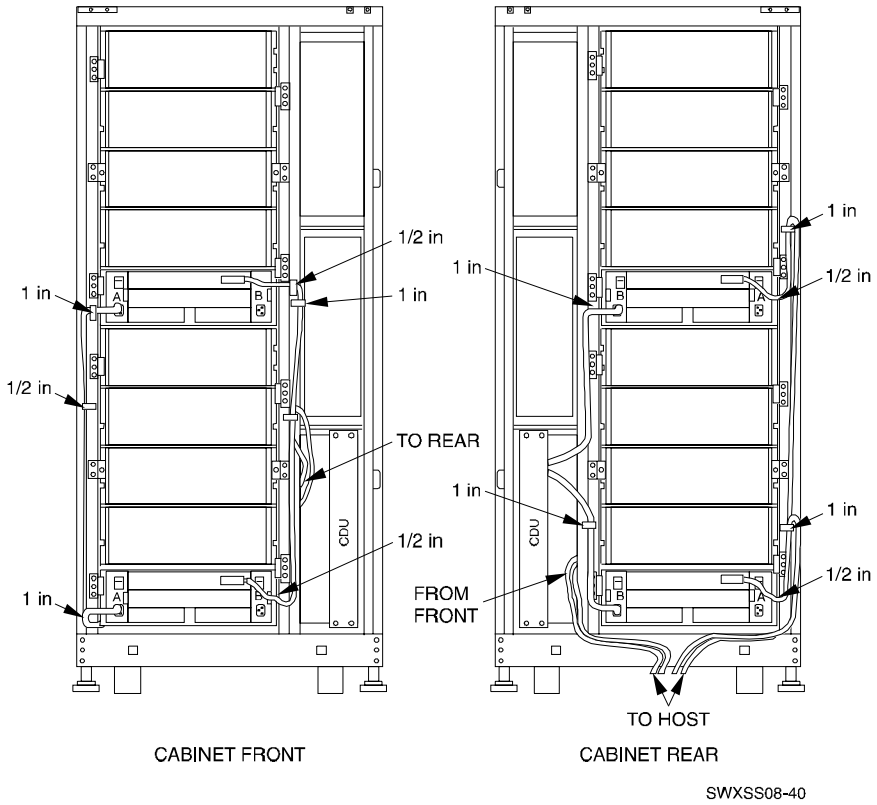
The power cord is routed from the CDU to the connector on the ac power controller. Proceed as follows to install the power cord:

NOTE

Use ½-inch cable clamps as required to fasten the power cord to the cabinet.

1. Route the power cord along the inside of the cabinet and up, until the power cord plug is at the approximate location of the RAID shelf ac power controller.(see Figure A–15).

Figure A–15 Power Cord Routing



2. Route the power cord through a one-inch cable clamp (fits loosely) on the cabinet vertical rail. You must have at least 16 inches of power cord slack to route from the one-inch clamp to the ac power controller connector.

A.7 Installing the RAID Shelf

Proceed as follows to install the RAID shelf into a mounting position in the SWXSC-D cabinet:

1. Place the RAID shelf in front of the selected mounting position.

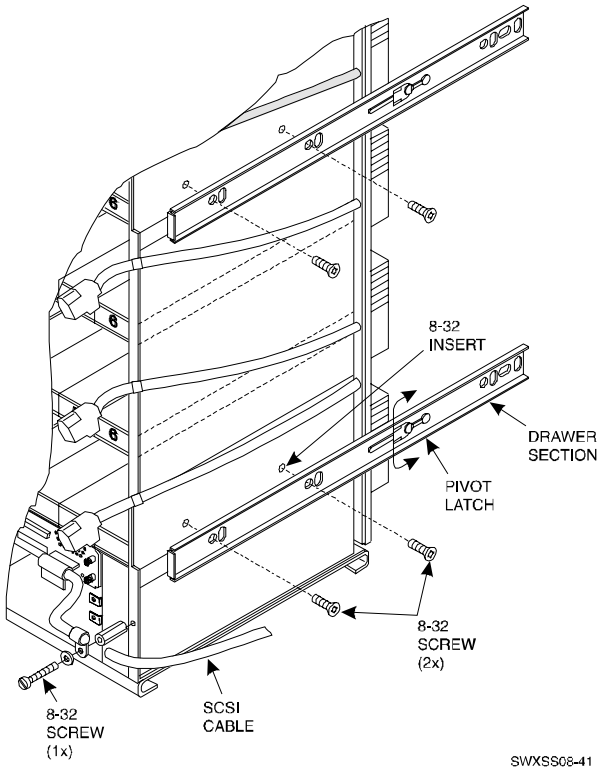
> **WARNING**
>
> The enclosure weighs more than 50 pounds and could cause serious injury to personnel. Use two people to lift the enclosure into the mounting position.

2. Lift the enclosure to the mounting position and align the slide drawer section with the slide intermediate section in the cabinet (see Fig ure A–17).

> **NOTE**
>
> There will be a slight resistance on the slides until the enclosure is pushed completely into the cabinet.

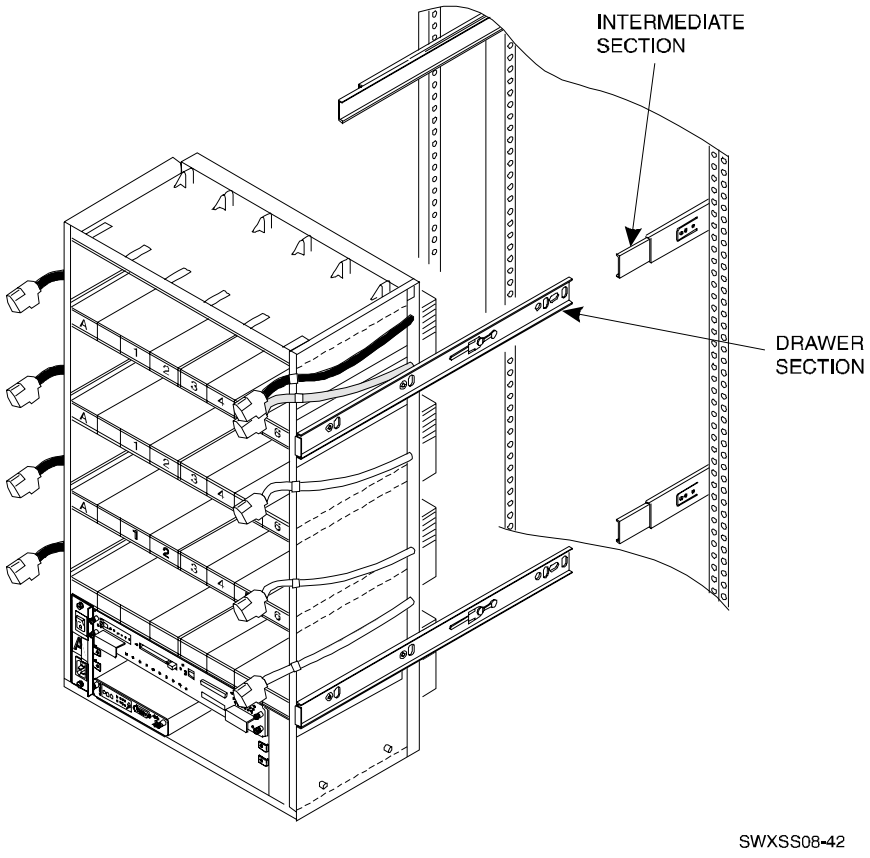
3. Push the enclosure into the cabinet until the slide pivot latch is engaged. The enclosure should slide easily into and out of the cabinet.
4. Connect the black power cord to the ac power controller and tighten the ½-inch cable clamp.
5. Connect the SCSI cable connector to the RAID shelf SCSI connector (see Figure A–16).

Figure A–16 SCSI Cable Connection



6. Fasten the SCSI cable to the bottom right side of the RAID shelf with a ½-inch cable clamp attached to a spacer. Route the SCSI cable through a one- inch clamp on the cabinet vertical rail, then out the bottom of the cabinet via the cable way.
7. Fasten a retainer bracket to each side of the RAID shelf with two screws (see Figure A–13).
8. Install the cabinet side panel.
9. Reconnect the host computer.
10. Connect the power cable from the CDU to the power source.
11. Switch the circuit breaker on the CDU to ON (1).
12. Restart all disk and tape drives and check them for proper operation.
13. Close and secure the cabinet doors. Reposition the cabinet if required.

Figure A–17 Mounting the RAID Shelf



Glossary

array controller

A device that exercises control over the SCSI bus, for example, an HSZ40 disk array controller.

cold-swap

A method of device replacement that requires that power be removed from *all* shelves in a cabinet. This method is used when conditions preclude the use of a warm-swap or hot-swap method.

See also **warm-swap** and **hot-swap**.

controller

A hardware line device that manages communications over a line. Controllers can be point-to-point, multipoint, or multiple line controllers.

electromagnetic interference

See **EMI**

electrostatic discharge

See **ESD**

ESD

Electrostatic discharge. The discharge of a potentially harmful static electric voltage as a result of improper grounding.

host

The primary or controlling computer in a multiple computer network.

hot-swap

A method of device replacement whereby the complete system remains online and active during device removal or insertion. The device being removed or inserted is the only device that cannot perform operations during this process.

See also **cold-swap** and **warm-swap**.

quiesce

To make a bus inactive or dormant. The operator must quiesce SCSI bus operations, for example, during a device warm swap.

RAID

Redundant array of independent disks. A set of storage techniques devised to increase the performance and availability of a storage subsystem.

SBB

System building block. A modular carrier plus the individual mechanical and electromechanical interface required to mount it into a shelf. Any device conforming to shelf mechanical and electrical standards is considered an SBB.

SCSI

Small Computer System Interface. This interface defines the physical and electrical parameters of a parallel I/O bus used to connect computers and a maximum of seven SBBs. The StorageWorks system implementation uses SCSI-2, which permits the synchronous transfer of 8-bit data at rates of up to 10 MB/s.

warm-swap

A method of device replacement whereby the complete system remains online during device removal or insertion. The system bus may be halted for a brief period of time, during device insertion or removal. No booting or loading of code is permitted except on the device being inserted.

See also cold-swap and hot-swap.

Reader's Comments

Manual Order Number:

EK–SMCPJ–UG

24 Device, 8-Bit SCSI Bus (Wide Device Compatible) RAID Subsystem Shelf (SWXSS-08) User's Guide

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Manual Rating	**Excellent**	**Good**	**Fair**	**Poor**
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Completeness (adequate information)	[ ]	[ ]	[ ]	[ ]
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Organization (logical sequence of information)	[ ]	[ ]	[ ]	[ ]
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