StorageWorks™

SWXSC-AA Office Expansion RAID Enclosure

User's Guide

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Revision Record

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

The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the *Revision Level* column, with the last entry denoting the latest revision.

Revision Level	Date	Summary of Changes
EK–SMCPD-UG.–A01	November 1994	Original release

About This Guide

This section identifies the users of this guide and describes the contents and structure. In addition, it includes a list of conventions used in this guide.

StorageWorks SWXSC-AA Office Expansion RAID Enclosure User's Guide

This guide provides a product overview and installation information for the SWXSC-AA Office Expansion RAID Enclosure.

Intended Audience

This guide is intended for any user who is responsible for installing, configuring, and repairing the SWXSC-AA RAID Enclosure.

Document Structure

This guide contains the following chapters:

Chapter 1: Introduction

Introduction provides a product overview of the StorageWorks SWXSC-AA Office Expansion RAID Enclosure. It also describes its components, features, and operating functions.

Chapter 2: Unpacking and Installation

Unpacking and Installation describes how to unpack and install the SWXSC-AA Office Expansion RAID Enclosure.

Chapter 3: Configuration Rules and Restrictions

Configuration Rules and Restrictions describes system configurations, power cord routing, system redundancy, power configurations, and the SWXSC-AA SCSI buses. It also discusses the recommended loading sequence for the RAID controller and how to apply ac power ot the SWXSC-AA enclosure.

Chapter 4: Error Analysis and Fault Isolation

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

Chapter 5: Removal and Installation Procedures

Removal and Installation Procedures describes the procedures to remove and install the Field Replaceable Units (FRUs) in the SWXSC-AA enclosure.

Conventions

This guide uses the following conventions:

Documentation Conventions

Style	Meaning
boldface type	**For emphasis**
Italic type	*For emphasis and manual titles*

Related Documentation

For additional information on the RAID controller and storage device replacement, refer to the following StorageWorks documents:

Document	Document Part Number
SWXRC-04 RAID Controller User's Guide	*EK-SMCS1-UG*
UNIX Systems and PC Networks Configuration Guide	*EK-MMVP-CG*

1

Introduction

This chapter describes the SWXSC-AA Office Expansion RAID Enclosure including the unit layout, dimensions, and the Small Computer System Interface (SCSI-2) connections (ports) for StorageWorks building block (SBB) shelves.

1.1   Product Overview

The SWXSC-AA, as shown in Figure 1–1, is a member of Digital's StorageWorks family of modular enclosures. The enclosure can accommodate both data storage and controller combinations. The SWXSC-AA has the following capabilities:

- StorageWorks compatible

- Holds up to twenty-four 3½-inch SBBs

- Redundant RAID controller/cache modules

- Redundant shelf power supplies

- Redundant environmental monitoring units (EMUs)

- Redundant ac power entry controllers

- Hot/warm swap of all field replaceable units (FRUs)

- Compatible with the High Availability Storage Subsystem Fault Bus

Figure 1–1 SWXSC-AA Office Expansion RAID Enclosure
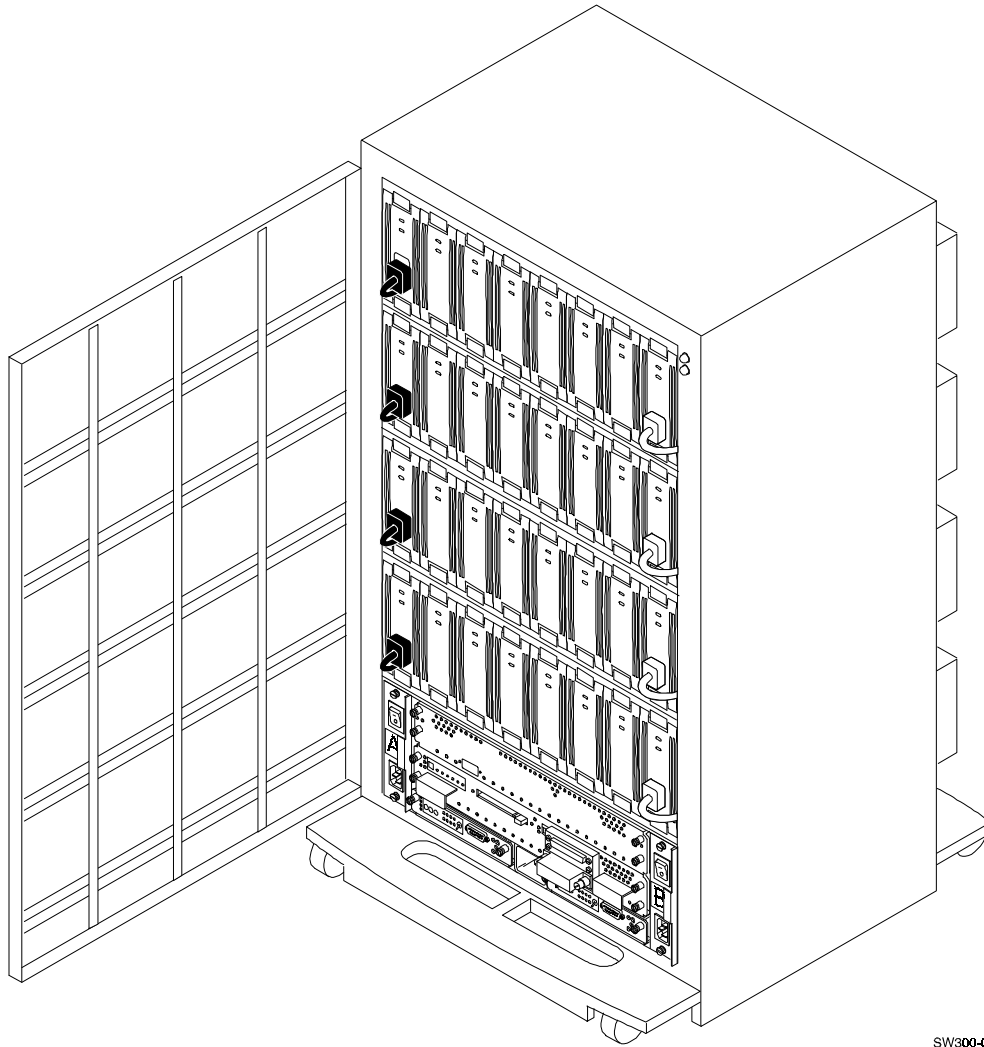
SW300-01

1.2   Major Components

Figure 1–2 shows the major components of the SWXSC-AA.

1.2.1 AC Power Entry Controller

The ac power entry controller provides the system on/off switch, ac power to all power supply SBBs, noise filtering, surge suppression, and electromagnetic interference (EMI) filtering. The ac power entry controller A provides power to the four power supply SBBs on power supply bus A. This is a minimum power configuration (4+0) for the system.

In the 4+1 configuration, the four power supply SBBs on power supply bus A are provided with additional redundancy by the power supply SBB located in the top shelf of power supply bus B.

In the SWXSC-AA, an auxiliary ac power source and a second ac power entry controller may be used to supply ac power to a second power supply SBB in each shelf. If the primary ac power source, or ac power entry controller A fails, the shelf remains powered by the ac power entry controller B. As shown in Figure 1–3, this configuration provides complete power redundancy to the shelf's devices.

Figure 1–2 SWXSC-AA Components (Cabinet Removed for Clarity)
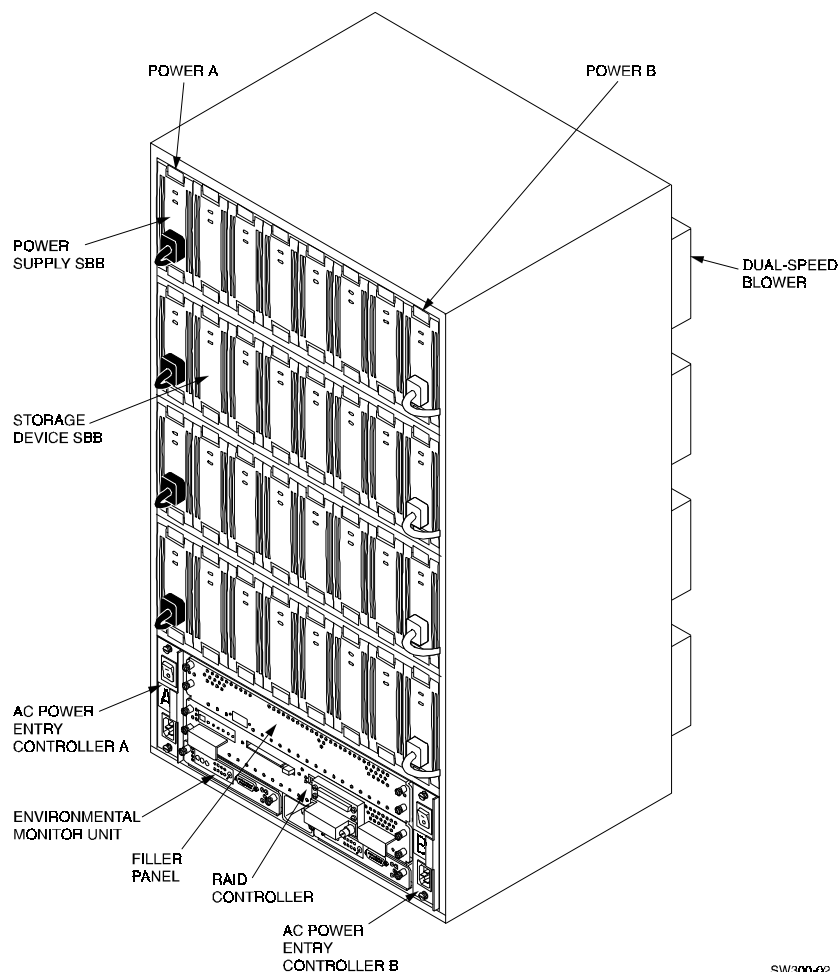
For 4+4 redundancy, the ac power entry controller B provides power to the four power supply SBBs on power supply bus B. See Chapter 3 for additional information on power configurations.

Figure 1–3 SWXSC-AA Power Configuration
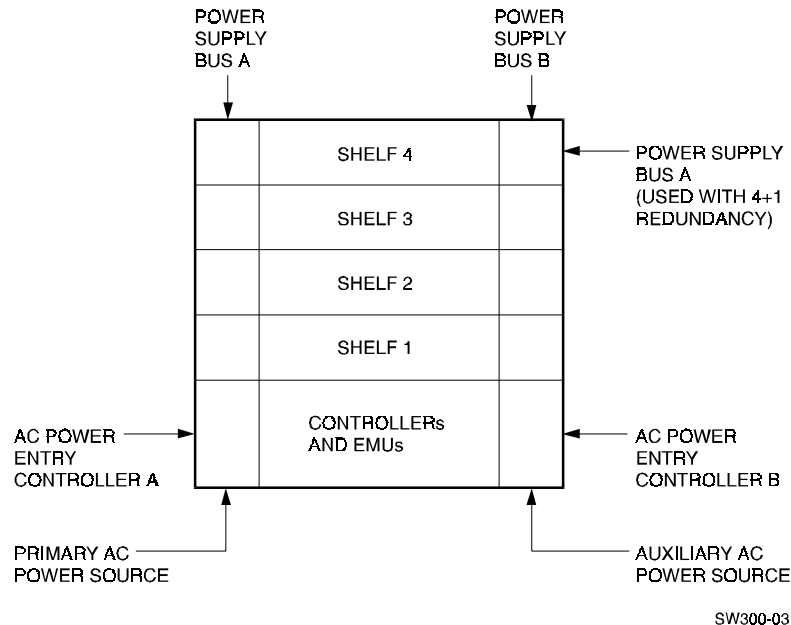
1.2.2 The High-Availability Storage Subsystem Fault Bus

The SWXRC-series controllers use the StorageWorks high-availability storage subsystem fault bus to monitor certain fault conditions in the subsystem's shelves and enclosure. The fault bus, which is not a FRU, offers the following features:

- Notification when a device is physically removed from or inserted into the storage subsystem.

- Notification of a failure associated with a device shelf or an enclosure component (for example, a shelf blower).

- Visual indication of bus/device status, facilitating fault isolation by the user.

1.2.3   Environmental Monitor Unit (EMU)

Once the SWXSC-AA enclosure is powered up, it will operate normally until a fault condition is detected by the EMU. In addition to the fault bus functions provided by the fault clock, fault data, and device swap signals, the EMU performs the following functions during routine operations:

- Monitors and controls the cabinet blowers

- Monitors the power supplies

- Senses cabinet temperature

- Monitors the power supply voltage

If the EMU detects a fault condition, it will respond as follows:

- Turns on the appropriate LED on the EMU panel

- Turns on the Fault (amber) LED located on the upper right corner on the front of the SWXSC-AA

- Activates the audible alarm (if enabled)

1.2.4   RAID Controllers

The card cage assembly contains two slots in the enclosure cabinet for controller and cache memory modules. Each slot contains two sets of module guide rails to ensure proper mechanical mounting as well as power and signal interfaces for the the two modules. The controller is installed in the top set of guide rails and the cache module is installed in the bottom. The assembly allows for the mounting of two controllers to provide redundancy.

NOTE

This manual covers minimal controller functionality. All other information on controllers, such as a list of storage devices controlled by individual controllers and controller-terminal connections, is covered in the specific controller documentation.

The RAID controllers provide a connection between a host computer and an array of SCSI-2 compatible storage devices. A terminal is plugged into the controller during subsystem installation to set initial controller parameters. The SWXSC-AA can be configured for controller dual redundancy. See the *StorageWorks SWXRC-04 RAID Controller User's Guide* for details.

1.2.5 Dual Speed Blowers

As shown in Figure 1–4, the SWXSC-AA enclosure has eight rear-mounted blowers, which pull air from the front of the cabinet through the rear. Connectors on the backplane provide the +12V dc power to operate the blowers. Logic signals allow the status of the shelf blowers to be monitored by the EMU. All operational blowers are turned up to high speed when the following conditions exist:

- If the EMU detects a high warning temperature condition

- If a blower is defective or removed

- If a blower's speed falls below the set point

Figure 1–4 Dual Speed Blowers (Cabinet Removed for Clarity)

BLOWER 5

BLOWER 6

BLOWER 7

BLOWER 8

BLOWER 1

BLOWER 2

BLOWER 3

BLOWER 4
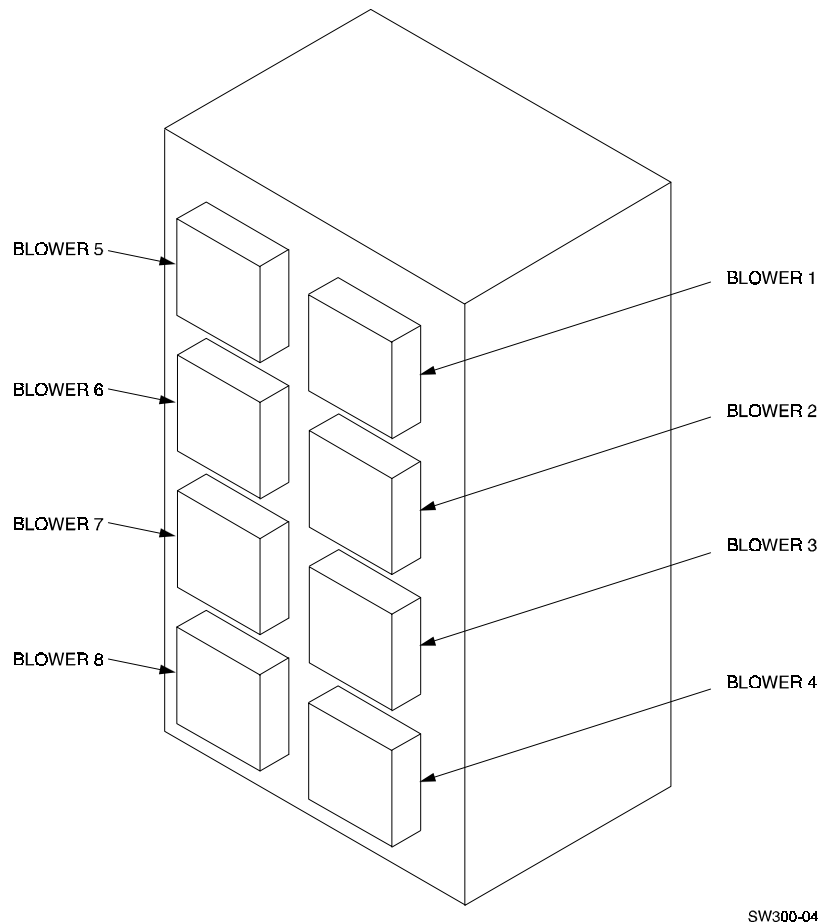
SW300-04

1.2.6 Power Supply SBBs

NOTE

The SWXSC-AA enclosure does not support the SWXBP-SA or BA35X-HA power supplies.

The SWXBP-SB power supply SBB, shown in Figure 1–5, converts ac input from the ac power entry controller to +5V dc and +12 V dc for use by the SWXSC-AA components. The SWXSC-AA enclosure provides connections for up to eight power supply SBBs. The SWXSC-AA enclosure requires a minimum of four operable power supply SBBs for system operation.

The SWXSC-AA enclosure is designed for redundant power. In the 4+1 configuration, the four power supply SBBs on power supply bus A are provided with additional redundancy by the power supply SBB located in the top shelf of power supply bus B. This redundant power supply SBB connects to a black power cord. Power is provided to the SWXSC-AA until such time as there are less than four operating power supply SBBs. If this condition is reached, the SWXSC-AA enclosure will be held in a reset state from that time on.

With 4+1 redundant power supplies, the SWXSC-AA enclosure can sustain a single power supply failure and continue to operate successfully. With 4+4 redundant power supplies, the SWXSC-AA enclosure can sustain multiple power supply faults. When 4+4 full redundant power supplies are used, input power may be connected to two separate utility power sources. In this configuration, the power supply SBBs on power supply bus A connect to black power cords, while the power supply SBBs on power supply bus B connect to white power cords. See Chapter 3 for further discussion of power configurations.

Figure 1–5 SWXBP-SB 3½-Inch Power Supply SBB

COMMON POWER
SUPPLY STATUS
LED (GREEN)

POWER SUPPLY
STATUS LED
(GREEN)

SW300-05
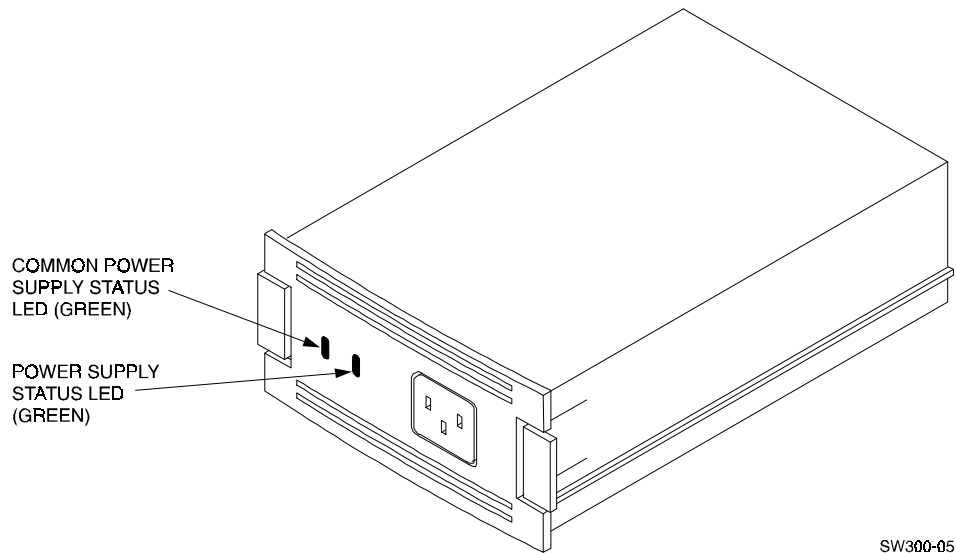
1.2.7   Storage Device SBBs

The storage device SBB is a 3½-inch industry-standard plastic carrier, as shown in Figure 1–6. The SWXSC-AA enclosure provides space for twenty four 3½-inch SBBs. Each SBB occupies one slot in a shelf.

The disk drive SCSI bus address for the storage SBBs is assigned on the basis of the shelf backplane connector into which that SBB connects.

Figure 1–6 Representative 3½-Inch Disk Drive SBB
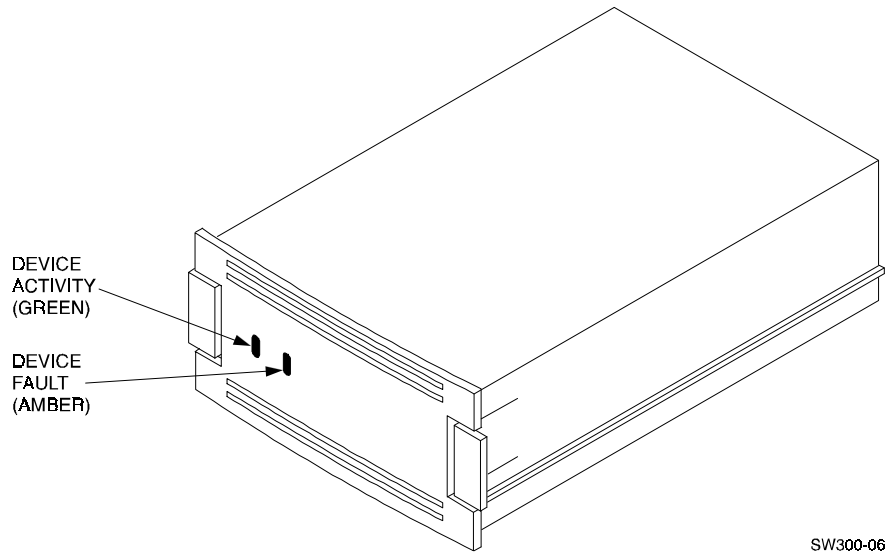
1.3   SWXSC-AA SCSI Buses

The six fast single-ended SCSI-2 buses run vertically and attach to four devices per SCSI bus
(Ids 0 through 3). The two RAID controller SCSI initiator Ids are either 6 or 7 and are
determined by the slot numbers as shown in Figure 1–7.

Figure 1–7 SWXSC-AA SCSI Buses

2
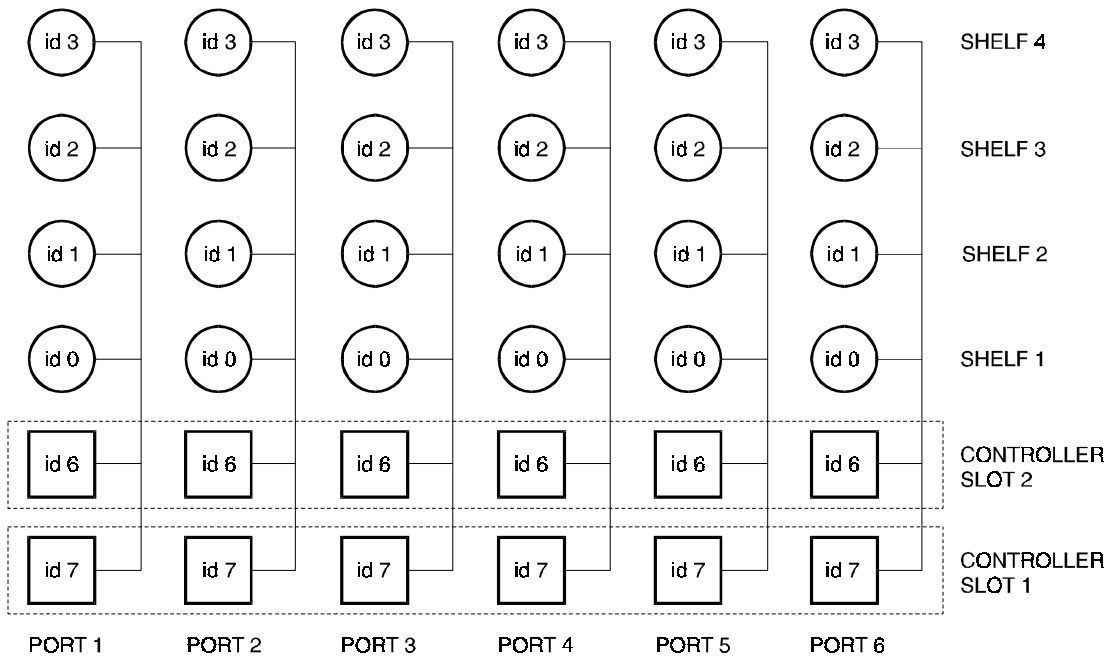
Unpacking and Installation

This chapter describes the site preparation, unpacking, installation, and power-up procedures for the SWXSC-AA Office Expansion RAID Enclosure.

2.1   Site Preparation

The SWXSC-AA enclosure is designed for installation in Federal Communications Commission (FCC) Class A environments. Before installing the SWXSC-AA, 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 2–1 for specific space requirements.

Figure 2–1 Minimum Installation Clearance Measurements
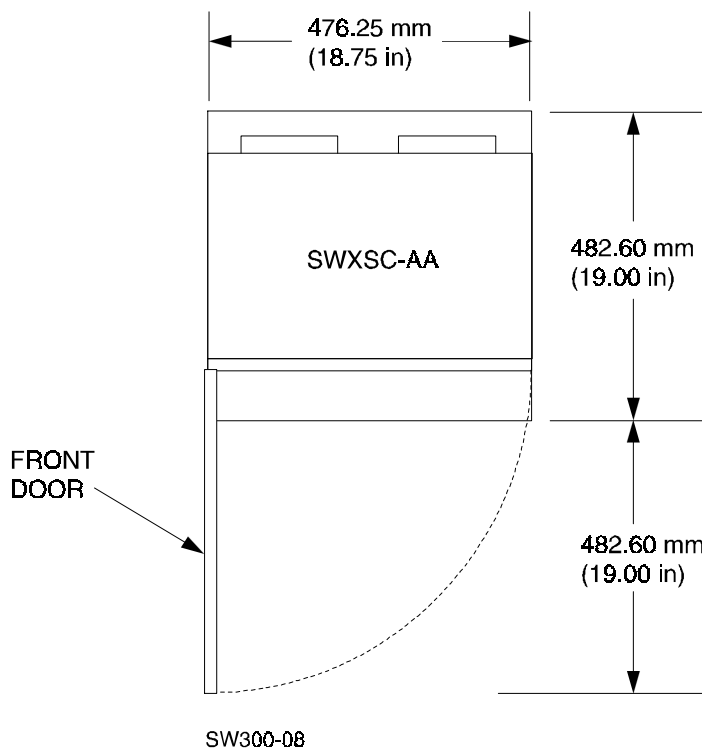
2.2   Unpacking the SWXSC-AA Enclosure

The SWXSC-AA enclosure is packed in a corrugated carton attached to a wooden shipping pallet, as shown in Figure 2–2A. Unpack the SWXSC-AA enclosure 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.

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1. Remove the shipping straps (Figure 2–2A).

2. Remove the top cover (Figure 2–2B).

3. Remove the ramp from the top of the shipping carton (Figure 2–2B) and set it aside for subsequent use in moving the SWXSC-AA enclosure off the pallet.

4. Remove the two foam cushions from the top of the SWXSC-AA container (Figure 2–2B).

5. Remove the cardboard carton surrounding the SWXSC-AA enclosure (Figure 2–2B).

6. Remove the plastic barrier bag (Figure 2–2C).

7. Once the SWXSC-AA enclosure is exposed (Figure 2–2D), examine the equipment for any apparent damage. Report any such problems immediately to your sales representative.

Figure 2–2 Unpacking the SWXSC-AA Enclosure
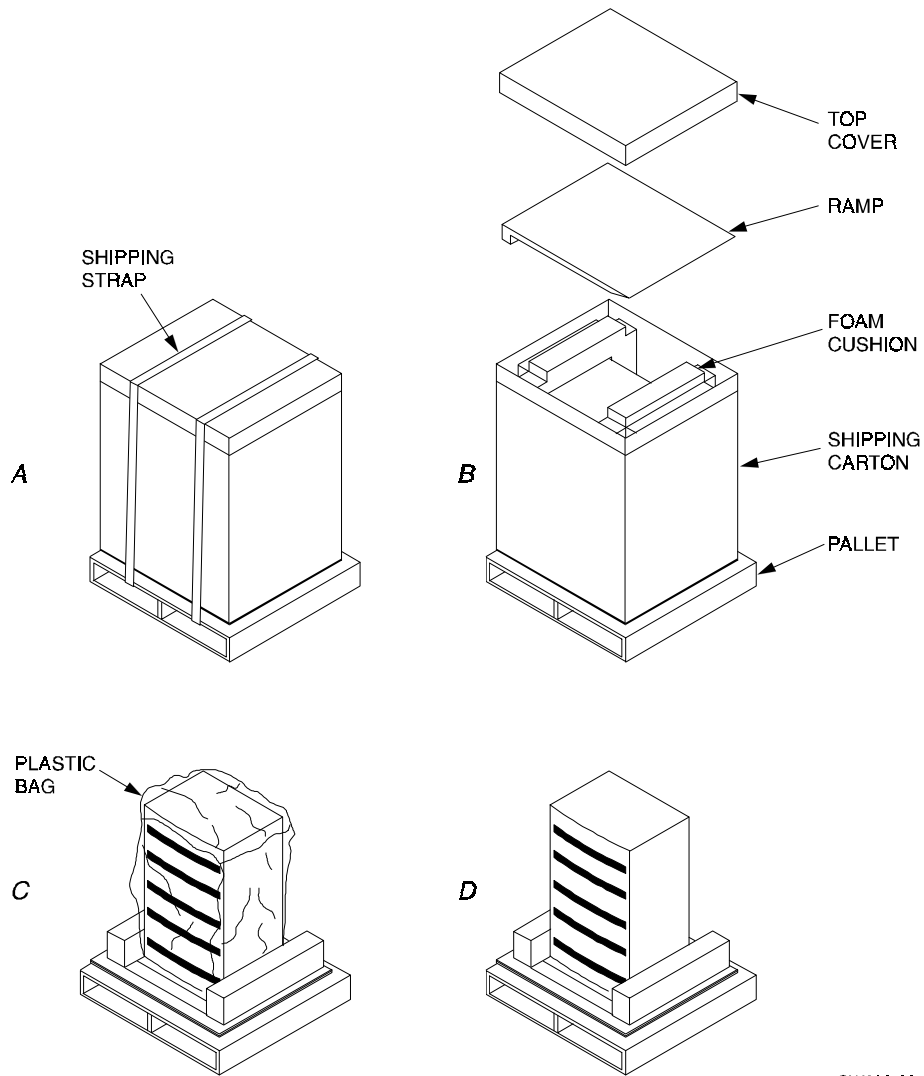
2.3   Removing the SWXSC-AA Enclosure from the Pallet

Use the following procedure to remove the SWXSC-AA enclosure 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 2–3.

Figure 2–3 Installation of Ramp on Shipping Pallet
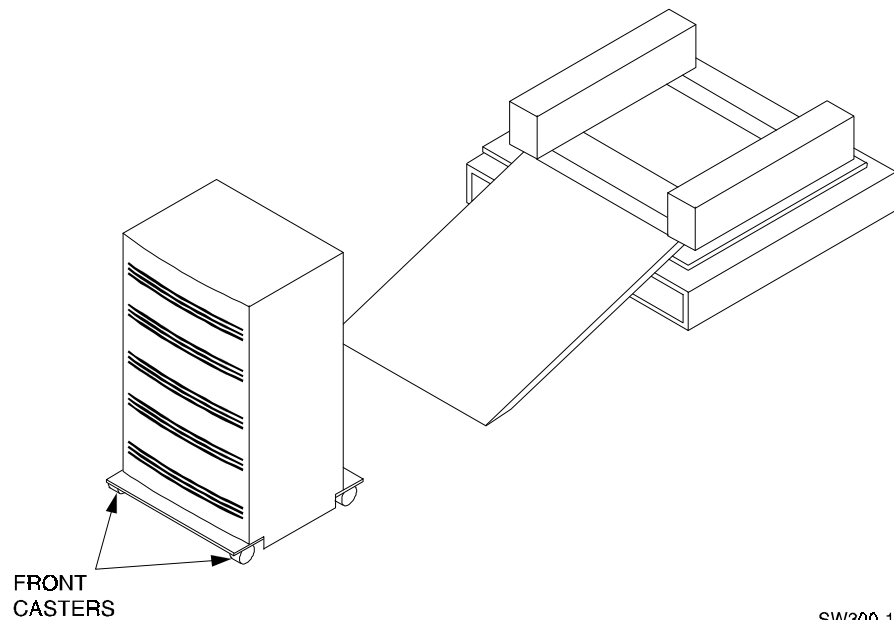
2. Lift the lock lever on each front caster to its *up* position so that the SWXSC-AA
    enclosure can be moved.

WARNING

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

CAUTION

Do not drop the SWXSC-AA enclosure from a height of more than
two inches, as serious structural damage can result.

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3. Grasping the sheet metal base assembly, carefully lift the rear of the SWXSC-AA
    enclosure over the "hump" in the center of the pallet and then roll the SWXSC-AA
    enclosure off the pallet and down the ramp to the floor. If any further lifting of the
    SWXSC-AA enclosure is required, grasp the sheet metal base assembly on the side and
    lift it carefully.

4. Retain the shipping container and all packing materials.

2.4   Placing the SWXSC-AA Enclosure

Use the following procedure to move the SWXSC-AA enclosure to its designated site:

> **WARNING**
>
> To prevent damage to the SWXSC-AA enclosure and injury to personnel, make sure to provide a clear path for the casters.

1. Roll the SWXSC-AA enclosure to the desired location.

2. If required, engage the lock on each front caster to prevent the enclosure from moving.

3

Configuration Rules and Restrictions

This chapter describes configuration rules and restrictions for the SWXSC-AA RAID Office Expansion Enclosure. When specific rules and restrictions are not provided, references are given to the proper StorageWorks documentation.

3.1 System Configurations

Table 3–1 lists the operating configurations for the SWXSC-AA enclosure.

Table 3–1 Operating Configurations

Field Replaceable Unit	Minimum	Maximum
StorageWorks Building Block (SBB) Shelf Power Supplies (SWXBP-SB)	4	8
3½-Inch Storage SBBs	1	24
RAID Controllers with cache memory	1	2
Environmental Monitor Units (EMUs) (SWXBE-AA)	1	2
AC Power Entry Controllers (SWXBP-AA)	1	2
Dual Speed Blowers (BA35X-MD)	8	8

3.2 Input Power Cord Routing and System Redundancy

You can configure the SWXSC-AA enclosure with redundant ac power. The optional dual power redundancy configuration consists of both ac power cords from the ac power entry controllers being plugged into a primary ac power source (wall outlet) and an auxiliary ac power source (the same or another wall outlet).

For complete power redundancy, you have the option to provide independent, external power sources for the ac power entry controllers. Thus, one ac power entry controller would receive ac input power from one circuit, while the second ac power entry controller received it from a different circuit.

3.3 Power Configurations

Table 3–2 lists the power configurations for the SWXSC-AA enclosure.

Table 3–2 Power Configurations

	Power Cords		
	Input[1]	Black[2]	White[3]
Single AC Input Assembly (Power Supply Bus A)			
Basic (SBB shelf power supplies in Slot A of each shelf)	1	4	0
Redundant (n+1) (SBB shelf power supplies in Slot A of each shelf and Slot B, top shelf)	1	5	0
Dual AC Power Entry Controller (Power Supply Buses A and B)			
SBB shelf power supplies in Slots A and B of each shelf	2	4	4

[1]From the wall outlet to the SWXSC-AA enclosure.
[2]Black ac power cords are connected to ac power entry controller A.
[3]White ac power cords are connected to ac power entry controller B.

3.4 SWXSC-AA SCSI Buses

The six fast single-ended SCSI-2 buses run vertically and attach to four devices per SCSI bus (Ids 0 through 3). The two RAID controller SCSI initiator Ids are either 6 or 7 and are determined by the slot numbers as shown in Figure 3–1.

Figure 3–1 SWXSC-AA SCSI Buses
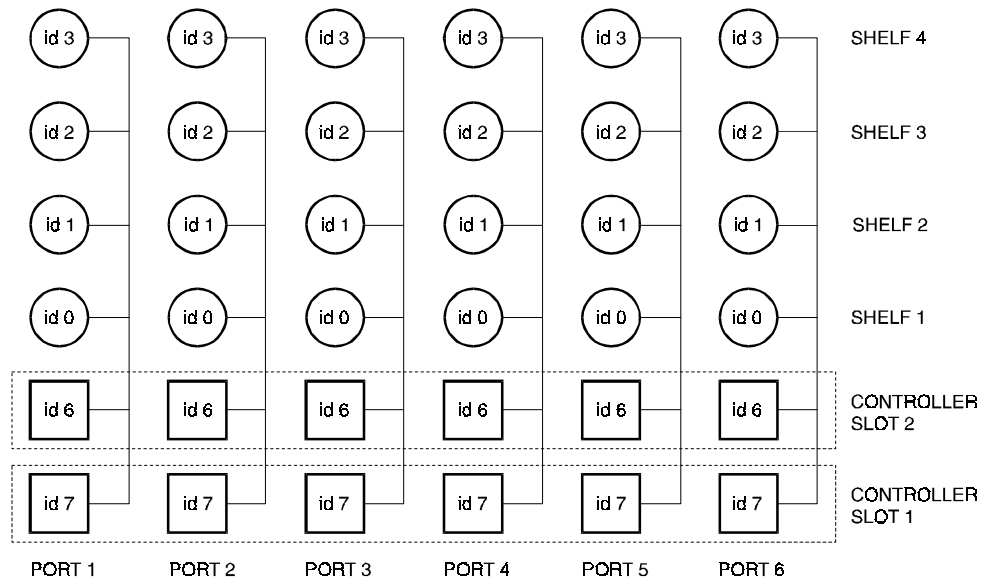
3.5   Recommended Loading Sequence

The recommended loading sequence for the SWXSC-AA enclosure is as follows:

1. Install a controller and cache module in slot 1.

2. Install a controller and cache module in slot 2 (optional).

3. We recommend you install the storage device SBBs left to right, bottom to top. (The first storage device SBB therefore should be installed in Port 1, ID 0, on Shelf 1, as shown in Figure 3–1. The second storage device SBB should be installed in Port 2, ID 0, in Shelf 1, and so on, with the last SBB being installed in Port 6, ID3, in Shelf 4.)

3.6   RAID Controller Configurations

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

3.7   Applying Power

Use the following procedure to apply power:

1. Verify that the on/off switch on each ac power entry controller is set to the *off* (0) position.

2. Verify that all power cables are attached to the appropriate power supply StorageWorks building blocks (SBBs).

3. Verify that, in a single-controller configuration, the controller and the cache module are installed in the bottom slot of the enclosure.

4. Verify that all external cables are attached to the controller.

5. Make sure that all SBBs are seated firmly in their shelves.

6. Connect the power cord to each ac power entry controller.

7. Connect each power cord plug to a wall outlet receptacle.

8. Apply power to the enclosure by setting the on/off switch on each ac power entry controller to the *on* (1) position.

9. Verify that the power is on by checking the light emitting diodes (LEDs) on the power supply SBBs, environmental monitor unit (EMU), and controllers. These LEDs should appear as follows:

    a. Power supply SBBs—both LEDs (green) are *on* (Figure 1–5).

    b. EMU—SYSTEM OK LED (green) is *on* (Figure 4–2).

    c. Controller—reset LED (green) is *flashing* (Figure 4–3).

    d. SWXSC-AA enclosure cabinet—System OK LED (green) is *on* and the FAULT LED (amber) is *off* (Figure 4–1).

For further information on SBB LEDs, refer to Chapter 4.

4

Troubleshooting

This chapter describes the errors, faults and significant events that can occur during the SWXSC-AA enclosure's initialization and normal operation. The chapter provides a description of the events and how to respond. The error and event descriptions isolate failures to the field replaceable unit (FRU).

4.1 SWXSC-AA Front Panel Fault Notification

Figure 4–1 depicts the two light emitting diodes (LEDs) on the SWXSC-AA cabinet. Refer to Table 4–1 to determine the error codes on the SWXSC-AA cabinet front panel.

Figure 4–1 SWXSC-AA Light Emitting Diodes (LEDs)
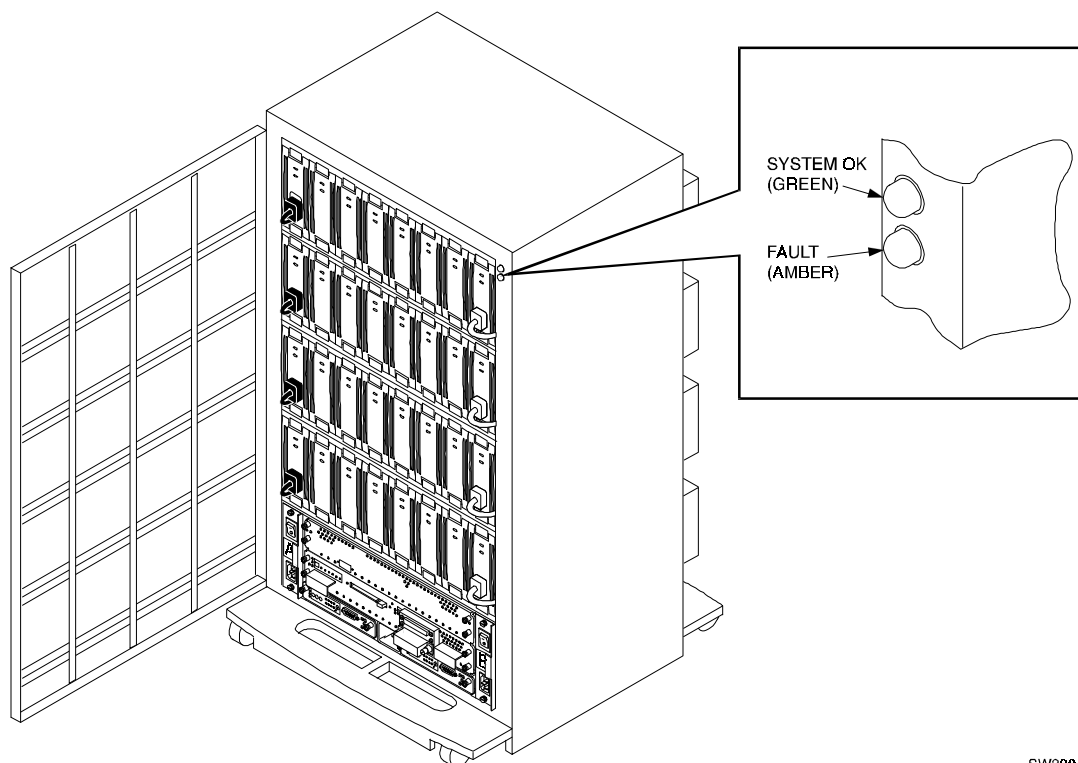
Table 4–1 SWXSC-AA Front Panel Fault Notification LEDs

When the . . .	Is . . .	The subsystem . . .
System OK (green) LED Fault (amber) LED	ON OFF	Is in the normal operating state.
System OK (green) LED	OFF	The subsystem does not have power applied or is in a reset state. 1. Check that ac power is applied. 2. Check the EMU control panel LEDs to determine which FRU has failed. 3. Check that the system has at least four operational power supply SBBs. 4. Check for error messages on the terminal (if one is attached).
Fault (amber) LED	ON	Has a failed FRU. Check the EMU control panel LEDs to determine which FRU has failed.

4.2 Environmental Monitor Unit (EMU) Functions

The EMU provides increased protection against catastrophic subsystem faults. As an option, The SWXSC-AA offers two EMUs to provide complete system redundancy. If one EMU should fail, the other will continue to monitor all system functions. The EMU works with the controller to warn the user of various types of existing or impending subsystem failures. The controller responds to such conditions by displaying error messages to the operator via the maintenance terminal and host interfaces. At the same time, it controls the warning light emitting diodes (LEDs) on the HS controller operator control panel (OCP) and the storage devices. The EMU reports faults by turning on status LEDs on the SWXSC-AA front panel.

The EMU has a selectable audible alarm switch on the front panel:

- In the up (enable) position, the alarm is activated and produces an audible signal whenever a fault condition occurs.

- In the down (disable) position, the alarm is deactivated

The EMU performs the following specific functions:

1. **Monitors and controls the cabinet blowers.** The EMU monitors the FAN_OK signals coming from each of the eight blowers. If any blower malfunctions (that is, if its speed goes below a set point), the EMU turns all of the other blowers up to high speed. This condition also generates a fault signal, as follows:

   a. Turns on the Fault (amber) LED located on the front of the SWXSC-AA, in the upper right corner.

   b. Turns on an LED on the EMU to identify the defective blower.

   c. Turns off the SHELF_OK signal.

   d. Activates the audible alarm (if enabled).

2. **Monitors the FAN_INPLACE signals** originating from each bank of four blowers and detects if a blower is not installed or connected. If a blower is not installed or connected, the EMU turns all of the other blowers up to high speed. This condition also generates a fault signal, as follows:

   a. Turns on the Fault (amber) LED located on the front of the SWXSC-AA, in the upper right corner.

   b. Turns on a bank of LEDs on the EMU to identify the bank with the missing blower.

   c. Turns off the SHELF_OK signal.

   d. Activates the audible alarm (if enabled).

3. **Monitors the power supplies**. The EMU monitors the POWER_OK signals originating from all power supply SBBs. If any power supply SBB fails, but there are still four or more power supply SBBs functioning, the EMU generates a fault condition and performs the following actions:

   a. Turns on the Shelf Fault (amber) LED on the front of the EMU.

   b. Turns on the Fault (amber) LED located on the front of the SWXSC-AA, in the upper right corner.

   c. Activates the audible alarm (if enabled).

4. If the monitoring of the POWER_OK signals originating from all power supply SBBs determines that less than four power supply SBBs are functioning properly, the EMU performs the following actions:

   a. Turns off the SYSTEM_POWER_OK signal going from the EMU.

   b. Turns off the System OK (green) LED on the front of the EMU.

   c. Turns on the Shelf Fault (amber) LED on the front of the EMU.

   d. Turns off the System OK (green) LED located on the front of the SWXSC-AA, in the upper right corner.

   e. Turns on the Fault (amber) LED located on the front of the SWXSC-AA, in the upper right corner.

   f. Turns off the SHELF_OK signal.

   g. Activates the audible alarm (if enabled).

   h. Resets the host controller(s).

5. **Senses cabinet temperature**. The EMU senses two different temperatures: warning and reset state. Warnings take place when the temperature is above 35ºC (95ºF). The EMU generates a fault condition and performs the following actions:

   a. Turns on the Temperature (amber) LED on the front of the EMU.

   b. Turns on the Fault (amber) LED located on the front of the SWXSC-AA, in the upper right corner.

   c. Turns the dual-speed blowers up to high speed.

6. If the continuing temperature measurement determines that temperature is above +50ºC (+122ºF), the EMU performs the following actions to hold the SWXSC-AA in a reset state:

   a. Turns off the System OK (green) LED located on the front of the SWXSC-AA, in the upper right corner.

   b. Turns off the System OK (green) LED on the front of the EMU.

   c. Fault (amber) LED on the front of the EMU remains on.

   d. Temperature (amber) LED on the front of the EMU remains on.

   e. Turns off the SYSTEM_POWER_OK signal from the EMU. Turns off the SYSTEM_POWER_OK signal from the EMU.

   f. Activates the audible alarm (if enabled).

7. **Monitors the power supply voltage**. The EMU monitors the +12V dc and the +5V dc cabinet power supplies. If the +12V power drops below +9.2V dc or if the +5V power drops below +3.9V dc, the EMU performs the following actions:

   a. Turns off the System OK (green) LED located on the front of the SWXSC-AA, in the upper right corner.

   b. Turns off the System OK (green) LED on the front of the EMU.

   c. Turns off the SYSTEM_POWER_OK signal from the EMU.

   d. Activates the audible alarm (if enabled).

4.3   EMU Control Panel LEDs and Fault Notifications

The control panel LEDs (Figure 4–2) display information when the SWXSC-AA enclosure is powered up or encounters a problem. Table 4–2 lists the EMU control panel buttons and LEDs, their functions, and error code meanings.

Figure 4–2 EMU Control Panel LEDs and Alarm Switch
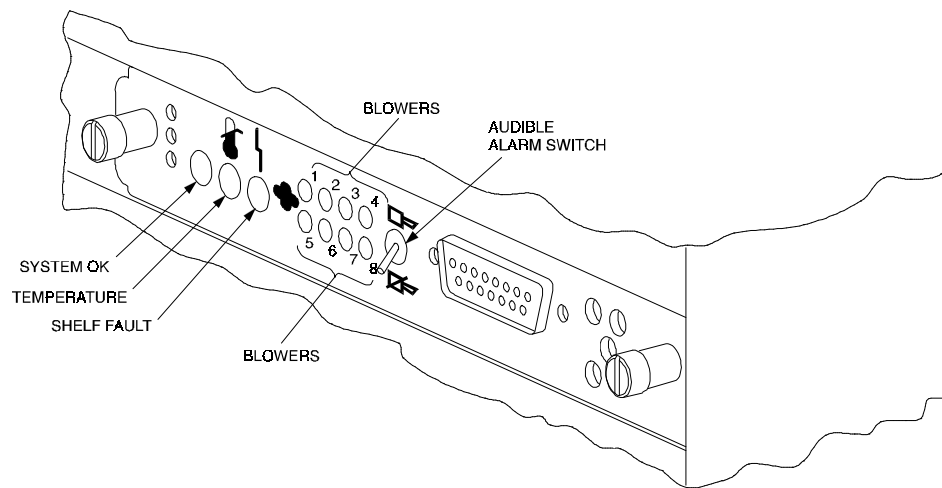
Table 4–2 EMU Control Panel LEDs/Alarm Switch and Description of Errors

When the . . .	Is . . .	The subsystem . . .
System OK (green) LED Shelf Fault (amber) LED Blower 1 through 8 (amber) LEDs Temperature (amber) LED Audible Alarm	ON OFF OFF OFF OFF	Is in the normal operating state.
Audible Alarm	ON	Has a failed FRU. Check the EMU control panel LEDs to determine which FRU has failed.
System OK (green) LED	OFF	Has a failed FRU and one or more of the following error conditions exists: • The temperature is above the maximum safe operating level. • The + 12 V dc power supply output is out of regulation. • The + 5 V dc power supply output is out of regulation. • Fewer than four power supply SBBs are operational.
Any blower LED	ON	Has an individual blower failure.
Blower 1, 2, 3, 4 (amber) LEDs	ON	Has one of the four blowers either not installed or not connected.
Blower 5, 6, 7, 8 (amber) LEDs	ON	Has one of the four blowers either not installed or not connected.
Temperature (amber) LED	ON	Operating temperature is too high. The blowers will operate at high speed to reduce the temperature.
Shelf Fault (amber) LED	ON	Has one or more of the following faults: • A power supply SBB has failed (verify if any individual power supply SBB LEDs are off to confirm). • Fewer than four power supply SBBs are operational. • Controller failure. Refer to *StorageWorks SWXRC-04 RAID Controller User's Guide*.

4.4   RAID Controller LEDs and Fault Notification

The following sections discuss the operator control panel (OCP) normal operation and fault notification using a typical controller for reference.

4.4.1   RAID Controller Operator Control Panel

The RAID controller OCP contains the following:

•   One reset button (//) with an embedded green LED

•   One button per SCSI port

•   Six amber LEDs

Figure 4–3 shows the RAID controller OCP. Push buttons and LEDs serve different functions with respect to controlling the SCSI ports and/or reporting fault and normal conditions. Push button and LED functions are discussed in the following sections.

Figure 4–3 RAID Controller Operator Control Panel
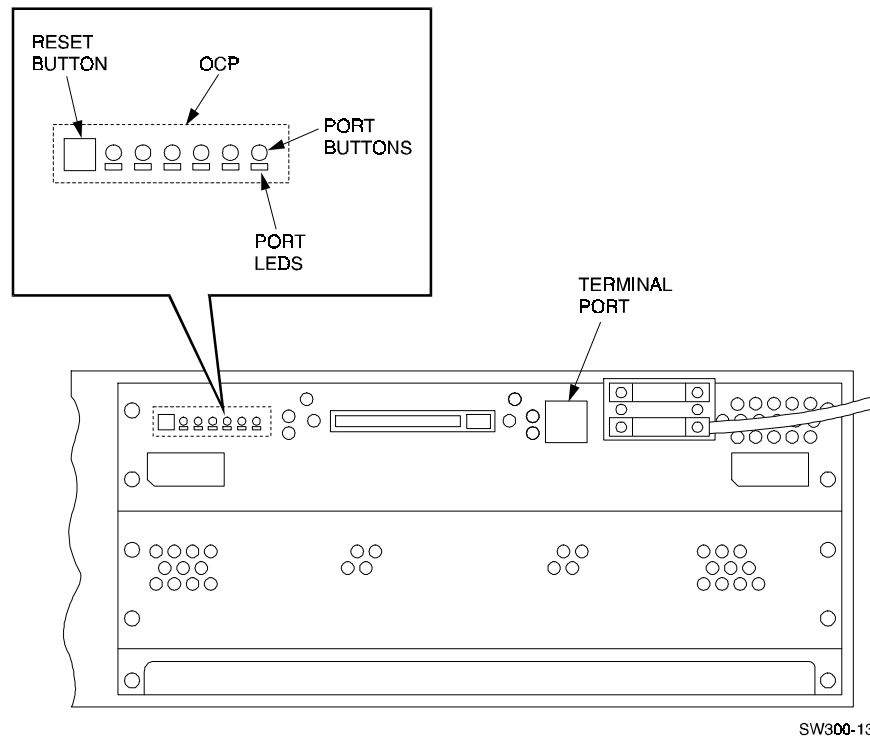
4.4.2 RAID Controller Normal Operation

The reset (green) LED (//) reflects the state of the controller and the host interface. Once controller initialization completes and its firmware is functioning, the green push button constantly *flashes*. Pressing this push button during normal operation resets the controller. Under normal operation, the amber LEDs indicate the state of the respective SCSI-2 buses. When the devices on the buses are operating correctly, the amber LEDs are *off* or *flashing*.

Pressing one of the push buttons at this time will light its corresponding amber LED and **quiesce** its SCSI-2 port. A port must be quiesced to remove or warm swap a device on the SCSI-2 bus for that port. For further information regarding StorageWorks building block (SBB) warm swaps, see the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

4.4.3 RAID Controller Fault Notification

The OCP LEDs display information when the RAID controller encounters a problem with a device configuration, a device, or the controller itself.

For definitions of error codes, see the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

4.5 Storage Device SBB LEDs and Fault Notification

The storage device is an industry standard 3½-inch SBB as shown in Figure 4–4. The storage SBB has two LEDs that display the SBB's status. These LEDs have three states: *on*, *off*, and *flashing*:

- The left (green) LED is the "Device Activity LED" and is *on* or *flashing* when the SBB is active

- The right (amber) LED is the "Device Fault LED" and indicates an error condition or configuration problem when it is either *on* or *flashing*

CAUTION

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

Figure 4–4 3½-Inch Storage SBB
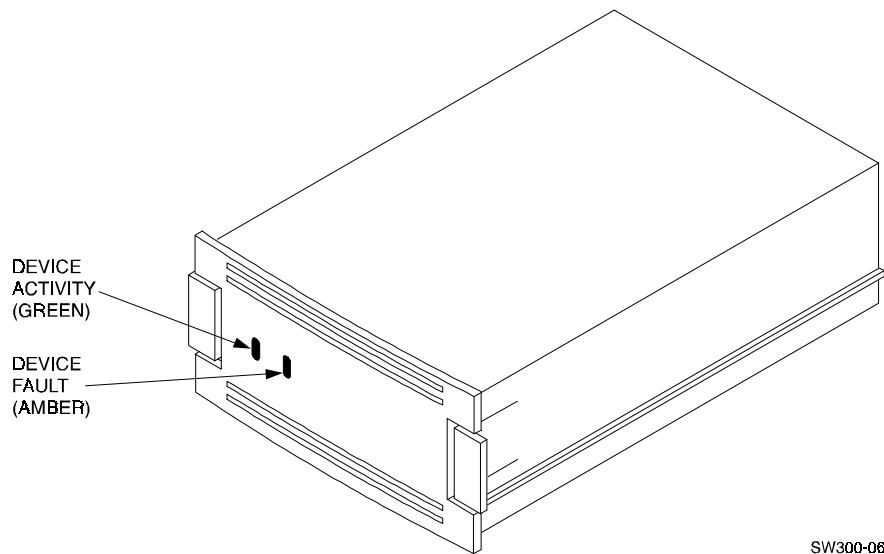
4.6 Power Supply SBB LEDs and Fault Notification

Each power supply SBB has two LEDs that display the power supply status, as shown in Figure 4–5. The left (green) LED is the "Common Power Supply Status" LED. The right (green) LED is the "Power Supply Status" LED.

- When the left LED is *on*, all the power supplies on its power bus are functioning properly

- When the left LED is *off*, at least one of the power supply SBBs on its power bus is not functioning properly

- When the right LED is *off*, either there is an input power problem or the power supply is not functioning

Figure 4–5 3½-Inch Power Supply SBB
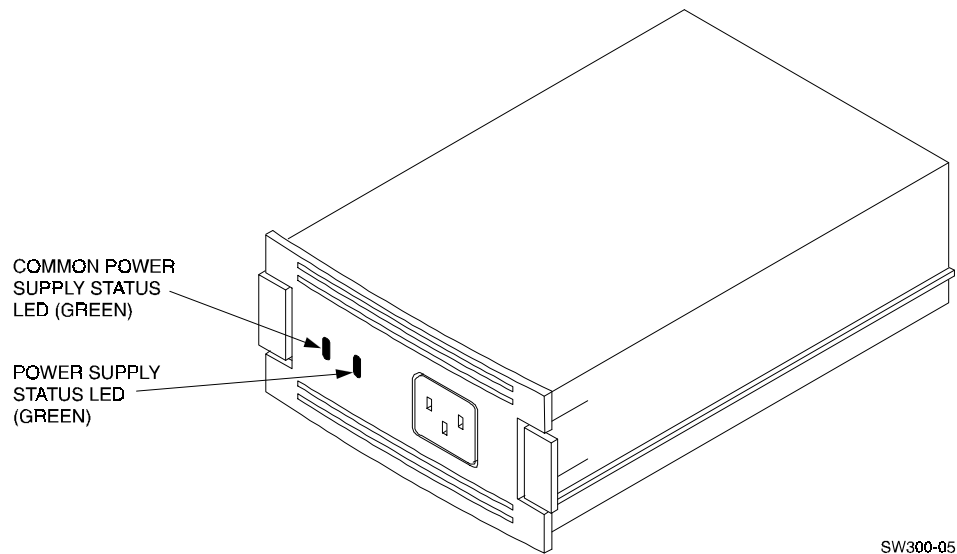
4.7 Dual-Speed Blower Fault Notification

The SWXSC-AA has eight rear-mounted blowers that cool the controllers and storage devices. Connectors on the backplane provide the +12 V dc power to operate the blowers. When a blower fails, the appropriate blower LED is lit on the EMU to identify which blower has malfunctioned. Also, if a blower is not installed or connected, its corresponding blower LED bank will light on the EMU.

5

Removal and Installation Procedures

This chapter describes the procedures to remove and install the field replaceable units (FRUs) in the SWXSC-AA Office Expansion RAID Enclosure. The FRUs are: power supply or storage device SBBs, environmental monitor unit (EMU), controller and cache module, dual-speed blower, and ac power entry controller.

5.1   Removing a Power Supply SBB

There are two methods for replacing power supply SBBs: the *hot-swap* method and the *cold-swap* method. You must determine the appropriate replacement method prior to replacing a power supply SBB.

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

- For power supply SBBs, the *hot-swap* method can be used to replaced a failed power supply SBB (both LEDs are *off*)

- The *cold-swap* method is normally used during initial installation. The power is removed from the enclosure assembly and all devices are inactive. No device is operational until the power is restored

---

CAUTION

The power supply SBB can be damaged if dropped. When removing or replacing a power supply SBB, always use both hands to support its weight. Also, to prevent electrostatic discharge (ESD) damage to an SBB, do not touch the SBB connector.

To *cold-swap* a power supply SBB, perform steps 1 through 5 of the following procedure. To *hot-swap* a power supply, perform steps 3 through 5:

1. Ensure the SWXSC-AA power switch is *off* (0).

2. Disconnect the power cord from the front of the power supply SBB.

3. Make sure that both LEDs on the power supply SBB are off.

4. Press the mounting tabs together to release the SBB from the shelf (Figure 5–1).

5. Use both hands and pull the power supply SBB out of the shelf.

Figure 5–1 Removing a Power Supply SBB (Cabinets Removed for Clarity)

SW300-14
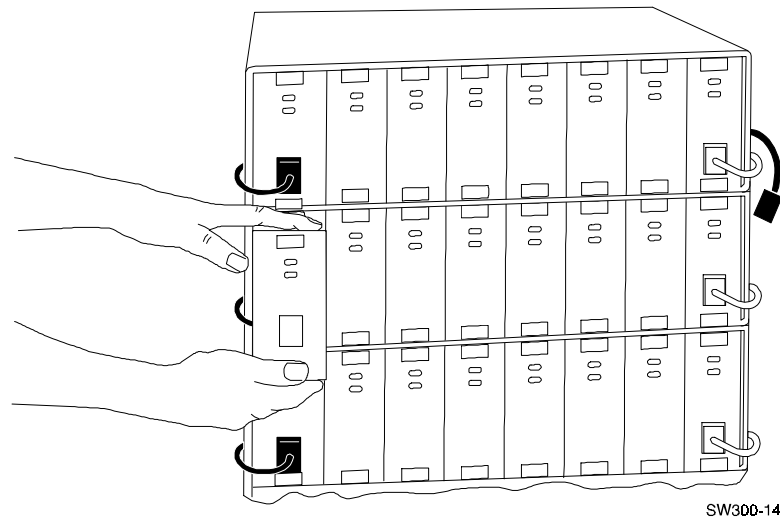
5.2   Installing a Power Supply SBB

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 on the front of the supply should be *on*.

5.3   Storage Device SBB Warm Swap

An SBB *warm swap* involves removing and replacing a disk drive SBB. SBBs can be removed safely without taking the system or controller off-line or adversely affecting activity on the rest of the system. Using *warm swap* also preserves data integrity. However, before removing a device, either the controller or the operator must determine that the swap is necessary. The SBB *warm-swap* procedure also can be used to add a device to an empty shelf slot.

*   The controller determines that a device is bad by trying to access the device, receiving no response from the device, or detecting excessive errors from the device

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

5.4 Removing a Storage Device SBB

<table>
<tr><td align="center">

CAUTION

Warm swap supports removing and replacing only one SBB at a time. Should another SBB need to be swapped, the entire warm-swap procedure must be repeated. The steps in this section must be followed in their exact order to ensure the following:

- Preserve data integrity

- Reduce chances of making a port unusable for a long period, which can render several devices inaccessible

- Prevent the controller from performing unpredictably

</td></tr>
</table>

Removing or replacing a storage SBB is reported to the controller or host by the C_SWAP signal. The transition of this normally high signal to a low signal indicates that a storage SBB has been removed or inserted. Upon receipt of this signal, the controller can respond as described in Table 5–1.

Table 5–1 Controller Response to the C_SWAP Signal

Replacement Action	Controller Response
Removing a storage device when data is not being transferred.	None
Removing a storage device during a data transfer operation.	Verify data validity.
Installing a storage device.	Begin the storage device configuration process.

<table>
<tr><td align="center">

CAUTIONS

Ensure that the replacement device is the same model as the one being replaced unless the system is reconfigured. Also, ensure he Device Activity (green) LED on the SBB is out. Removing a storage SBB when the upper LED is *on* or *flashing* can cause the loss or corruption of data.

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

</td></tr>
</table>

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NOTE

Only one port can be quiesced at any time. If the button is not held long enough, or multiple buttons are pushed in quick succession, all buttons are ignored (no ports are quiesced). The button must be pressed and held again to quiesce the port.

</td></tr>
</table>

Use the following procedure to replace a storage device SBB:

NOTES

- Is not necessary to *unmount* the device if removing a single SBB from a RAID-5 storageset in the following procedure.

- Also, replace the SBB as soon as possible to restore RAID-5 data protection.

---

1. The device must be unmounted from the host before proceeding. See the operating system documentation for procedures necessary for unmounting a device.

2. Quiesce the SBBs port by pressing and holding the controller port button for the SBB. Continue holding the button until all controller amber OCP LEDs light.

3. Wait until the chosen controller port LED flashes alternately with the other port LEDs (this indicates I/O has stopped). The alternating pattern flashes for approximately 30 seconds, during which time the SBB can be removed.

    If the pattern does not appear after a minute or two, another shelf is asserting a fault signal that prevents any quiesce function on this controller. To correct the problem. the suspect shelf must be located and all devices must be removed.

4. To remove the SBB, press its two mounting tabs together to release it from the shelf, and pull it out using both hands (Figure 5–2). While the controller OCP LEDs are *flashing*, any remaining SBBs on the quiesced port will *flash* their status LEDs.

Figure 5–2 Remove a Storage Device SBB (Cabinet Removed for Clarity)

SW300-15
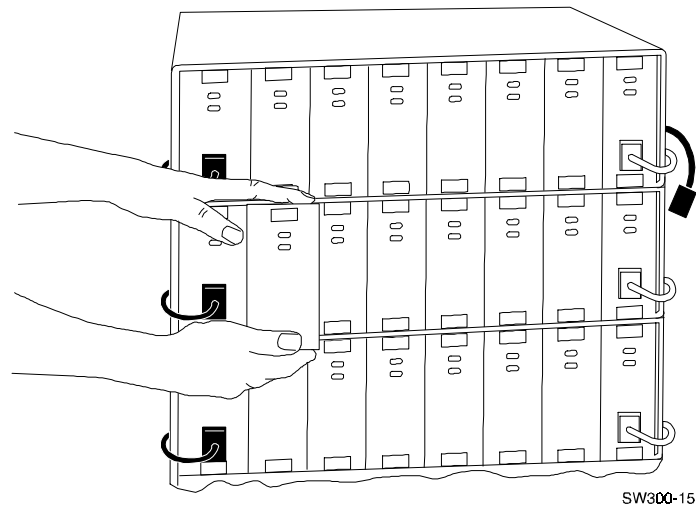
NOTE

The length of time required for I/O to stop can vary from zero seconds to several minutes, depending on load, device type, and cache status.

When the SBB is removed, the LED pattern on the controller OCP changes to solid amber, and normal operation on the ports resume. At this time, the removed SBB's port LED on the controller OCP turns *on*. The LED stays *on* until the SBB is returned to its slot, or until another SBB is inserted in the slot. The remaining port LEDs on the controller OCP turns *off*.

5.5   Installing a Storage Device SBB

Use the following procedure to install a storage device SBB.

CAUTION

Use a replacement SBB of the same type as the removed device.

1. Quiesce the SBB's port by pressing and holding the port button on the controller. Continue holding the button until all controller amber OCP LEDs are *on*.

NOTE

Only one port can be quiesced at a time. If the button is not held long enough, or multiple buttons are pushed in quick succession, all buttons are ignored (no ports are quiesced). The button must be pressed and held again to quiesce the port.

2. Wait until the chosen controller port LED *flashes* alternately with the other port LEDs (this indicates I/O has stopped). The alternating pattern *flashes* for approximately 30 seconds, during which time the SBB can be installed.

    If the pattern does appear after a minute or two, another shelf is asserting a fault signal that prevents any quiesce function on this controller. To correct the problem, the suspect shelf must be located and all devices must be removed. When the controller OCP LEDS are *flashing*, any SBBs on the quiesced port will *flash* their status LEDs.

NOTE

The of length of time for I/O to stop can vary from zero seconds to several minutes, depending on load, device type, and cache status.

---

3. Holding the SBB in both hands, insert it into the guide slots and firmly push it into the shelf until the mounting tabs snap into place.

4. Observe the status LEDs for the following the indications:

    • The Device Activity (green) LED is either *on*, *flashing*, or *off*

    • The Device Fault (amber) LED is *off*

5. If necessary, restore the device to the configuration. See the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

For additional information on storage device replacement, see the *StorageWorks UNIX Systems and PC Networks Configuration Guide.*

5.6 Removing an Environmental Monitor Unit (EMU)

Use the following procedure to remove an EMU:

NOTE

This component can be removed and installed while power is on. If the system contains a redundant EMU, then one EMU can be hot swapped without affecting system operation.

---

1. Loosen the two captive screws with a flat-blade screwdriver.

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.

5.7   Installing an Environmental Monitor Unit (EMU)

Use the following procedure to install an EMU.

NOTE

This component can be removed and installed while power is on.

---

1. Insert the replacement EMU into the guide slots and push it in until it is seated.
2. Use a gentle back-and-forth rocking motion to help seat the EMU into the backplane. Press firmly on the EMU until it is fully seated.
3. Tighten the two captive retaining screws with a flat-blade screwdriver.

5.8   Removing a Controller

Use the following procedure to remove a controller.

NOTE

In a redundant controller configuration, this component can be removed and installed while the power is on if desired.

---

1. Perform the necessary procedures to shut down the controller and remove any attached cables. See the *StorageWorks SWXRC-04 RAID Controller User's Guide.*
2. Loosen the four captive screws with a flat-blade screwdriver.
3. Use a gentle up-and-down rocking motion to loosen the controller from the backplane.
4. Pull the controller straight out to disconnect it from the backplane and place it on an approved ESD work surface or mat.

5.9   Installing a Controller

Use the following procedure to install a controller:

NOTE

In a redundant controller configuration, this component can be removed and installed while the power is on if desired.

---

1. Slide the controller into the slot using its slot's rightmost rails as guides.
2. Use a gentle up-and-down rocking motion to help seat the controller into the backplane.
3. Press firmly on the controller until it is seated.
4. Tighten the four captive retaining screws on the front bezel with a flat-blade screwdriver.
5. Perform the necessary procedures to start up the controller and install accessory components. See the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

5.10   Removing a Cache Module

Use the following procedure to remove a cache module.

> **NOTE**
>
> In a redundant controller configuration, this component can be removed and installed while the power is on if desired.

1. Perform the necessary procedures to shut down the controller and remove accessory components. See the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

2. Loosen the four captive screws with a flat-blade screwdriver.

3. Pull the controller straight out to disconnect it from the backplane and place it on an approved ESD work surface or mat.

4. Use a gentle up-and-down rocking motion to loosen the cache module from the backplane.

5. Pull the cache module straight out to disconnect it from the backplane and place it on an approved ESD work surface or mat.

5.11   Installing a Cache Module

Use the following procedure to install a cache module:

> **NOTE**
>
> In a redundant controller configuration, this component can be removed and installed while the power is on if desired.

1. Slide the cache module into the top guide rails of the controller slot.

2. Use a gentle up-and-down rocking motion to help seat the cache module into the backplane.

3. Press firmly on the front edge of the module until it is seated.

4. Slide the controller into the bottom guide rails of the controller slot and gently rock the handles on the front of the controller until it is seated into place.

5. Tighten the four captive retaining screws on the front bezel with a flat-blade screwdriver.

6. Perform the necessary procedures to start up the controller and install accessory components. See the *StorageWorks SWXRC-04 RAID Controller User's Guide.*

5.12   Removing a Dual-Speed Blower

> **CAUTION**
>
> Do not remove a failed blower until a replacement is available. Removing a defective blower without a replacement causes cooling air to vent through blower mounting space.

Use the following procedure to remove a dual-speed blower (Figure 5–3).

NOTE

This component can be removed and installed while power is on.

---

1. Press the upper and lower blower mounting tabs together to release the blower.

2. Pull the blower straight out.

Figure 5–3 Removing a Dual-Speed Blower
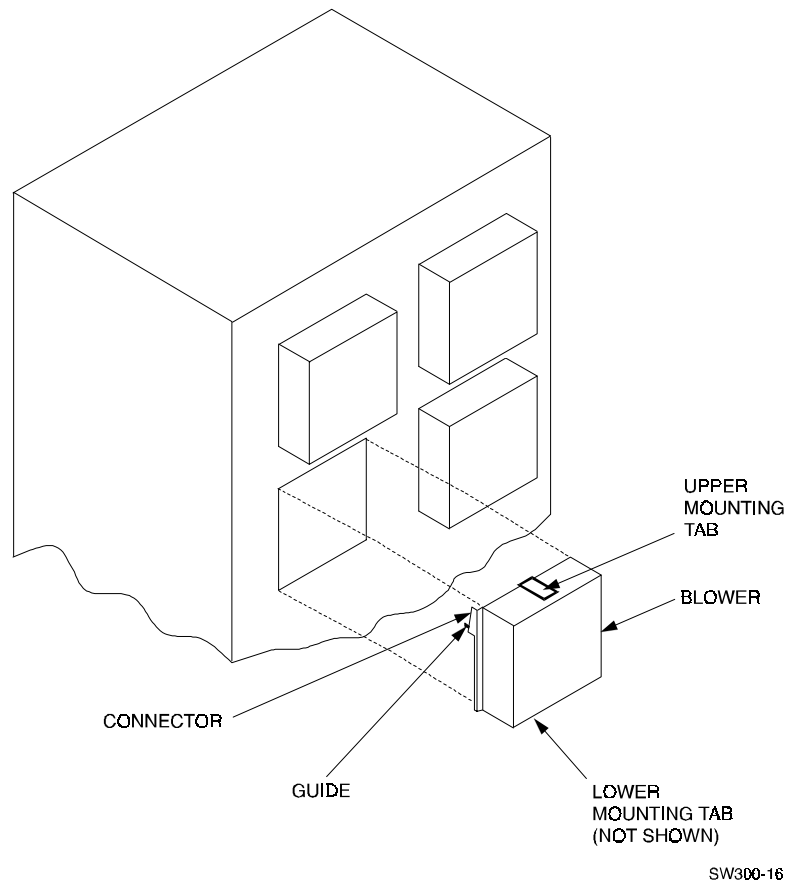
5.13   Installing a Dual-Speed Blower

Use the following procedure to install a dual-speed blower.

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 into place.

5.14   Removing an AC Power Entry Controller

WARNING

The following procedure is to be performed only by qualified service personnel. Failure to comply may result in personnel injury or death as a result of electric shock.

Use the following procedure to remove an ac power entry controller:

1. Press the on/off switch on the ac power entry controller to the *off* (0) position.

2. Disconnect the ac input power cord.

3. Unscrew the two captive retaining screws securing the ac power entry controller to the SWXSC-AA enclosure.

4. Pull the ac power entry controller from the SWXSC-AA enclosure.

5.15   Installing an AC Power Entry Controller

WARNING

The following procedure is to be performed only by qualified service personnel. Failure to comply may result in personnel injury or death as a result of electric shock.

Use the following procedure to install an ac power entry controller:

1. Verify the on/off switch on the replacement ac power entry controller is in the *off* (0) position.

2. Insert the replacement ac power entry controller into the SWXSC-AA enclosure and secure with the two captive retaining screws.

3. Connect the ac input power cord.

4. Press the on/off switch on the ac power entry controller to the *on* (1) position.

5.16   FRU Parts List

The Field Replaceable Parts in the SWXSC-AA office expansion RAID enclosure is shown in the exploded view of Figure 5–4. Refer to Figure 5–4 to identify the FRU, and then to Table 5–2 to obtain the description of the FRU and its corresponding part number.

Figure 5–4 SWXSC-AA Field Replaceable Parts
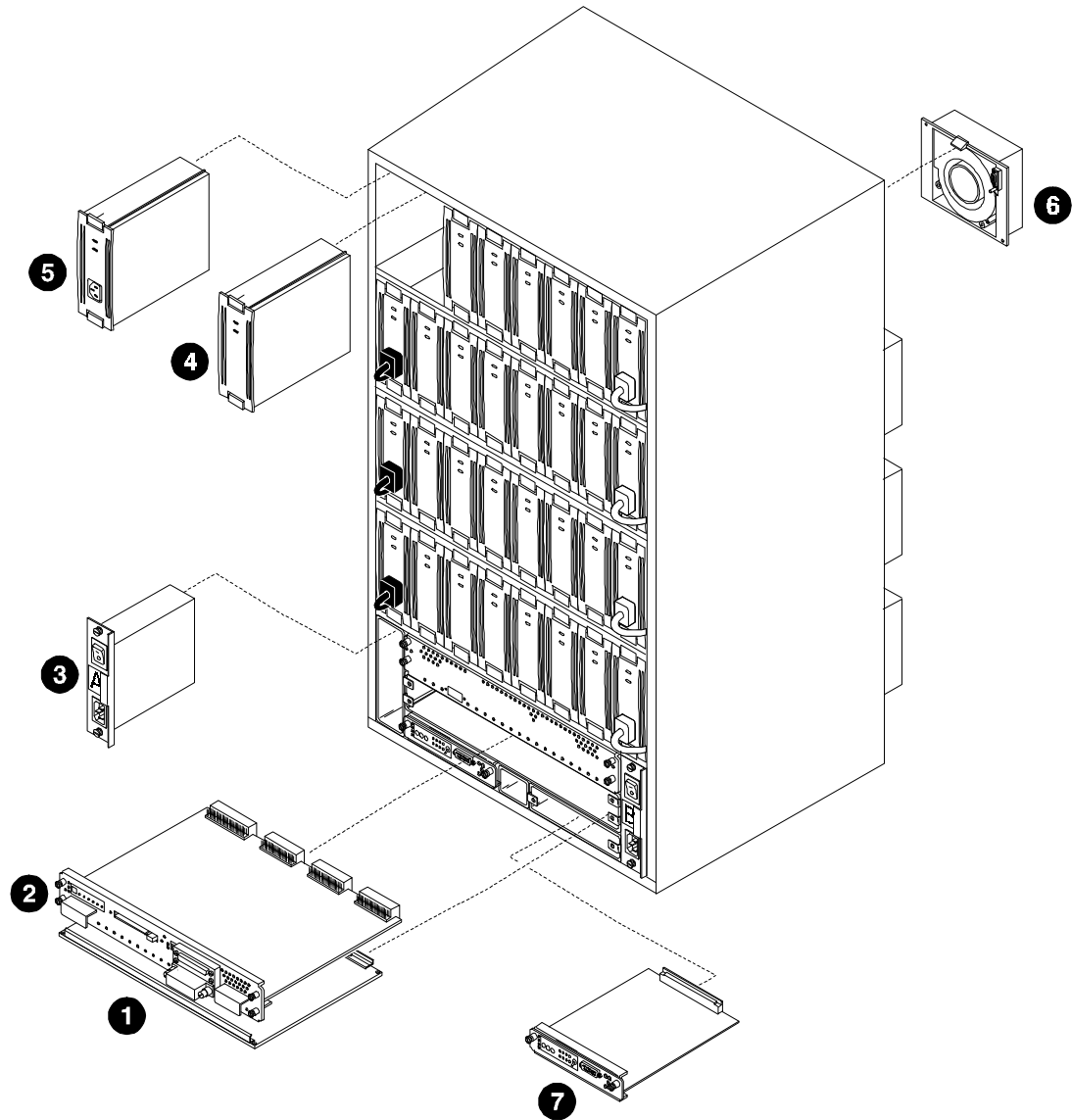
SW300-17

Table 5–2 SWXSC-AA Field Replaceable Parts

Item	Description	Part Number
1	Controller Cache Module Cache Battery Backup Kit	SWXRM-CD SWXRP-CA
2	RAID Array Controller	SWXRC-04
3	AC Power Entry Controller	SWXBP-AA
4	3½-Inch Storage Device SBB	SWXD3-SB/SC
5	AC Power Supply SBB	SWXBP-SB
6	Dual-Speed Blower	BA35X-MD
7	Environmental Monitor Unit	SWXBE–AA

	(EMU)	

A

Specifications

This appendix describes the physical, electrical, and environmental specifications for the SWXSC-AA Office Expansion RAID Enclosure.

Table A–1 SWXSC-AA Specifications

Characteristic	Specification
Dimensions (nominal)	838.20 mm (33.00 in) height 476.25 mm (18.75 in) width 482.60 mm (19.00 in) depth
Weight	
Cabinet with shipping packaging	106.65 kg (242.00 lb)
Maximum configuration	77.85 kb (178.00 lb)
Agency compliance	FCC, UL, CSA, TUV, and CE-mark
Electrical rating	100-120/220-240 V ac, 50/60 Hz, single-phase, 12/6 amperes
Operating environment	
Temperature	+10° C to +40° C (+50° F to +95° F). [Derate 1.8° C for each 1000 m altitude (1.0° F for each 1000 ft altitude).]
Relative Humidity	10% to 90% (noncondensing) at maximum wet bulb temperature of +28° C (+82° F) and minimum dew point of +2° C (+36° F)
Altitude	From sea level to 2400 m (8000 ft)
Air quality (maximum particle count)	Not to exceed 500,000 particles per cubic foot of air at a size of 0.5 micron or larger
Non-operating environment	
Temperature	-40° C to +66° C (-40° F to +151° F)
Relative humidity	8% to 95% in original shipping container (non-condensing); otherwise, 50% (non-condensing)
Altitude	3600 m (12,000 ft)

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.

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.

RAID controller

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

SBB

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

SCSI

Small Computer System Interface. This inteface defines the physical and electrical parameters of a parallel I/O bus used to connect computers and a maximum of seven SBBs. The StorageWorks modular storage system implementation uses SCSI-2, which permits the synchronous transfer of 8-bit data at rates of up to 10 Mbytes/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–SMCPD–UG.
A01_____

SWXSC-AA Office Expansion RAID Enclosure User's Guide

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Manual Rating	Excellent	Good	Fair	Poor
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