StorageWorks™ Solutions

24 SBB RAID Subsystem Deskside Expansion Unit (SW300-Series)

User's Guide

Order Number: EK–SW300–UG. B01

This guide describes the procedures for using a 24 SBB RAID subsystem deskside expansion unit (SW300 Series).

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Maynard, Massachusetts

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Any changes or modifications made to this equipment may void the users authority to operate this equipment. Operation of this equipment in a residential area may cause interference in which case the user at his own expense, will be required to take whatever measures may be required to correct the interference.

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Preface

The StorageWorks Solutions, 24 SBB RAID (redundant array of independent disks) Subsystem Deskside Expansion Unit User's Guide describes the purpose, function, operation, and use of the RAID subsystem including the associated power entry controllers, power supplies, environmental monitor units (EMUs), and StorageWorks building blocks (SBBs).

Intended Audience

This publication is for use by customers and Digital™ employees responsible for configuring, installing, and maintaining the StorageWorks™ subsystem and its components.

Structure

This manual is organized as follows:

Chapter 1

Describes the RAID subsystem including physical characteristics, layout, specifications, components, StorageWorks SBBs and general information.

Chapter 2

Describes the how to configure the RAID subsystem power and SCSI buses.

Chapter 3

Describes how the RAID subsystem and the device status are monitored and reported. This chapter includes recommended corrective action for fault conditions.

Chapter 4

Describes the procedures replacing SBB power supplies, SBB storage devices, environmental monitor unit (EMU), controllers, blowers, and power entry controllers.

Glossary

Documentation Conventions

The following conventions are used in this manual:

boldface type

Boldface type indicates the first instance of terms being defined in text, in the glossary, or both.

italic type

Italic type indicates emphasis and complete manual titles. In the glossary, italic type also is used to indicate cross–references.

1

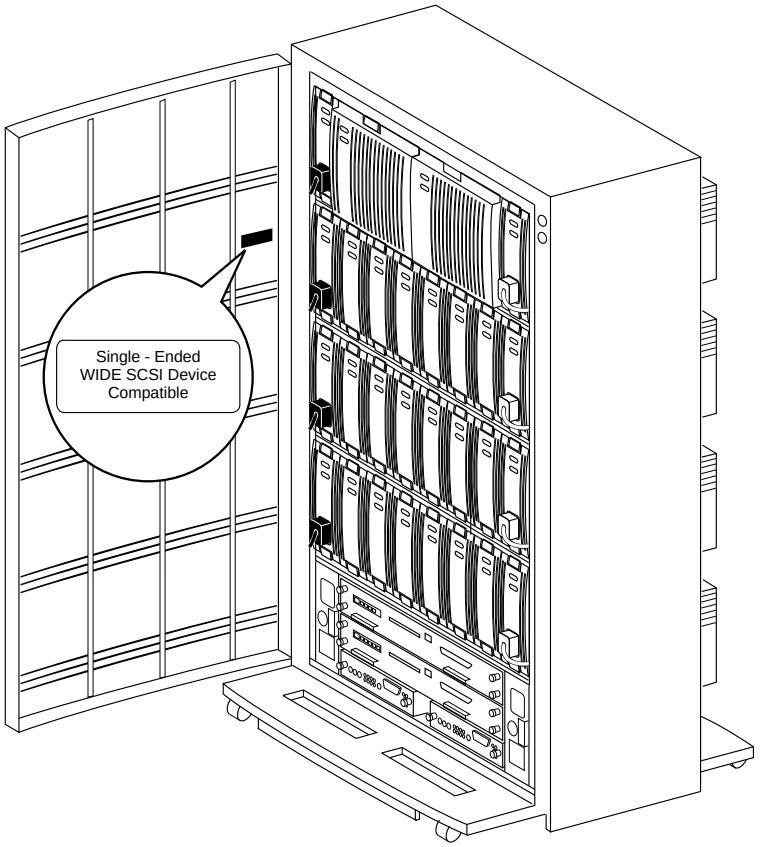
Introducing the RAID Subsystem

*This chapter describes the **RAID** (redundant array of independent disks) subsystem 8-bit and 16-bit device compatible deskside expansion units. As shown in Figure 1-1 the 16-bit device compatible units have a label mounted inside the door. This description includes features, unit layout, Small Computer System Interface (**SCSI**) bus, power, cabling, StorageWorks building blocks (**SBB**s), and general user information.*

Note

Even though you can install 16-bit storage device SBBs in the RAID subsystem shown in Figure 1-1 you can only use 8-bit device addresses, addresses 0—7.

Figure 1-1 Typical 24 SBB RAID Subsystem



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1.1 Product Overview

The RAID subsystem, a member of the Digital StorageWorks family of modular enclosures that contain StorageWorks storage devices, power supplies, and **controllers**, has the following major features:

- The capability for redundant power distribution to eliminate single points of failure.
- Six, single-ended, 8-bit/16-bit SBB device compatible configured and terminated *internal* SCSI buses which eliminate the requirement for *internal* SCSI cables to connect controllers to devices
- Compatibility with **CI**™ (Digital Computer Interconnect), **DSSI**™ (Digital Standard System Interface), or SCSI host computers using Digital HS-series **array controllers**

Note

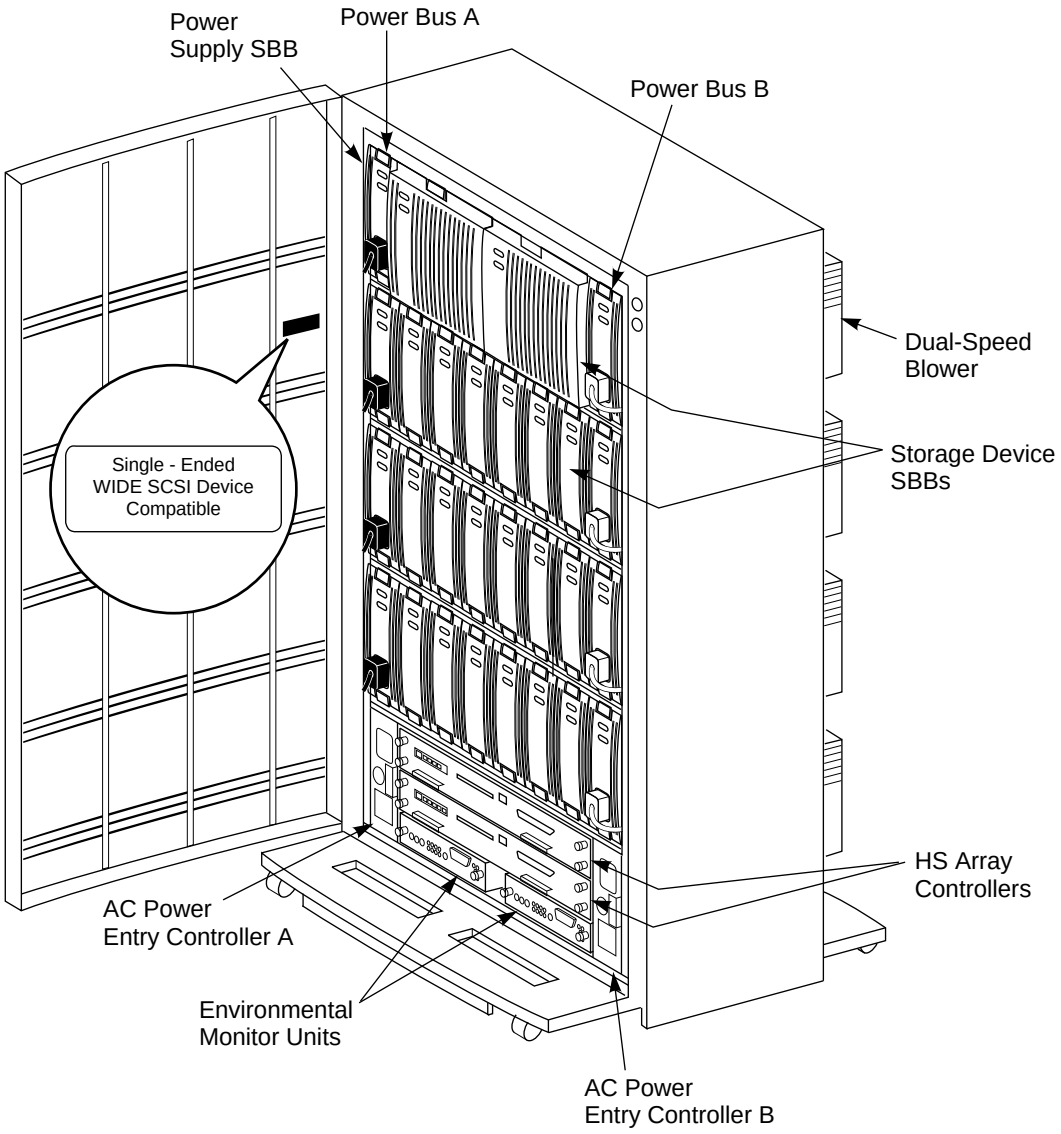
The RAID subsystem requires at least one HS-series array **controller** for proper operation. The operation of these controllers is not within the scope of this publication. For detailed descriptions of the individual controllers, use, configuration, operation, storage device compatibility, SCSI bus, and diagnostics, refer to the specific controller documentation.

- All major components, *except* the **cache memory** modules, can be replaced using either the **hot swap** or **warm swap** methods as described in Chapter 4.
- Extensive fault monitoring and reporting capability for the following error conditions:
  - Incorrect voltage
  - Shelf blower failure
  - Power supply failure
  - Operating temperature too high
  - Storage device not operating properly
  - Storage device removal
  - Storage device installation
- Automatic initiation of system protection actions

As shown in Figure 1-2, a fully configured subsystem consists of a 24 SBB RAID shelf (BA355-series) mounted in a deskside expansion unit (SW300-series) with the following components:

- 8 — SBB power supplies (5 are standard)
- 2 — ac input power controllers (1 is standard)
- 2 — Environmental units (1 is standard)
- 2 — HS-series controllers (0 is standard)
- 18 — 3.5–inch SBBs (0 is standard)
- 2 — 5.25–inch SBBs (0 is standard)
- 8 — Dual speed blowers (standard)

Figure 1-2 RAID Subsystem Major Components



Note

The 24 SBB RAID subsystem deskside expansion unit is only certified for use in an office or a commercial environment.

1.2 Power Distribution

There are two primary RAID subsystem power configurations:

- Standard—One ac power controller and five power supply SBBs on power bus A (four standard plus one redundant power supply SBB), a 4 + 1 power configuration.
- Redundant—One ac power controller and four power supply SBBs on power bus A and power bus "B," a 4 + 4 power configuration.

When there are less than four operational power supplies, the RAID subsystem will cease operating to preserve and protect the data. The following sections describe the RAID subsystem power components (see Table 1-1), functions, and configurations.

CAUTION

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

- 2 – EMUs
- 2 – HS-series Controllers
- 24 – 3.5–inch SBBs
- 2 – Cache Memories

Table 1-1 RAID Subsystem Major Power Components

Component	Order No.	Power Configurations	
		Standard	Redundant
ac Power entry controller	BA35X–HE	1	2
Shelf power supply SBB (150W)	BA35X–HF	5	8

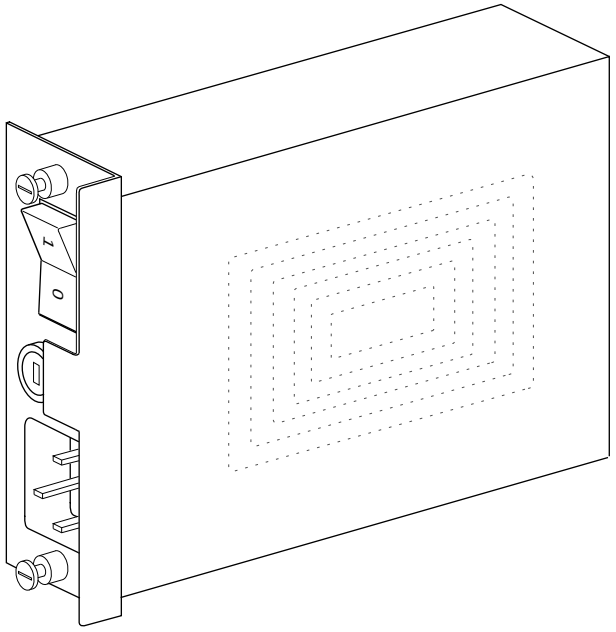
1.2.1 AC Power Entry Controllers

The ac input power is routed from the wall outlet to a power entry controller (see Figure 1-3). These power controllers 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

The two ac power entry controllers have a system ON/OFF switch and distribute ac power to all power supply SBBs.

Figure 1-3 ac Power Entry Controller (Power Bus A)



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1.2.2 Power Supply SBBs

CAUTION

The RAID subsystem requires power supply SBBs rated for at least 150 W such as the BA35X–HF. Lower rated supplies, such as the 131 W BA35X–HA or the 145 W BA35X–HD, cannot be used.

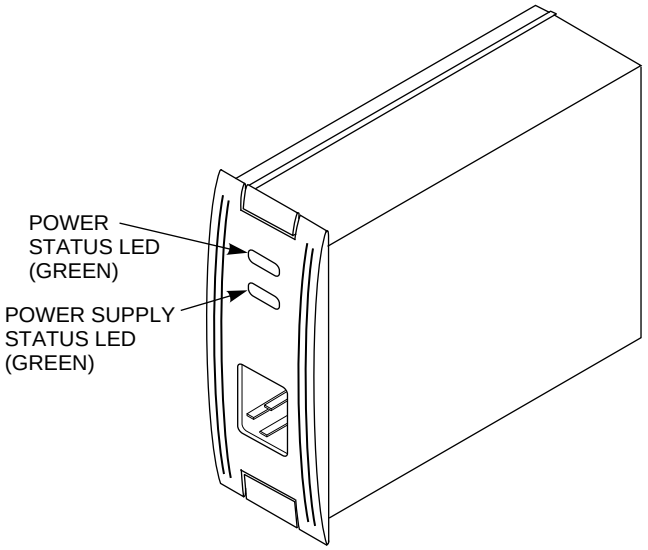
The power supply SBB shown in Figure 1-4 converts the ac voltage from the power controller to +5 V dc and +12 V dc for distribution throughout the RAID subsystem. The maximum capacity of the RAID subsystem is eight power supplies.

The 4 + 1 configuration provides five supplies connected to power bus A by the black power cords. As long as any four of these supplies are operational, the RAID subsystem is operational. The failure of a second supply places the RAID subsystem controller in a reset state. This precludes further data processing and prevents the corruption or loss of the stored data.

With the 4 + 4 full redundant power option, the RAID subsystem can survive multiple power supply faults. To fully realize the benefits of the 4 + 4 configuration, connect the power controllers to different ac distribution circuits ("legs").

The four RAID subsystem power supply SBBs on the left end of the shelf are connected to power controller A. The four RAID subsystem power supply SBBs on the right end of the shelf are connected to power controller B.

Figure 1-4 Typical Shelf Power Supply SBB



1.2.3 Standard (4 + 1) Power Configuration

Note

The black power cord at the upper right corner of the RAID subsystem is used *only* for the standard (4 + 1) configuration. It is not used for the redundant (4 + 4) configuration.

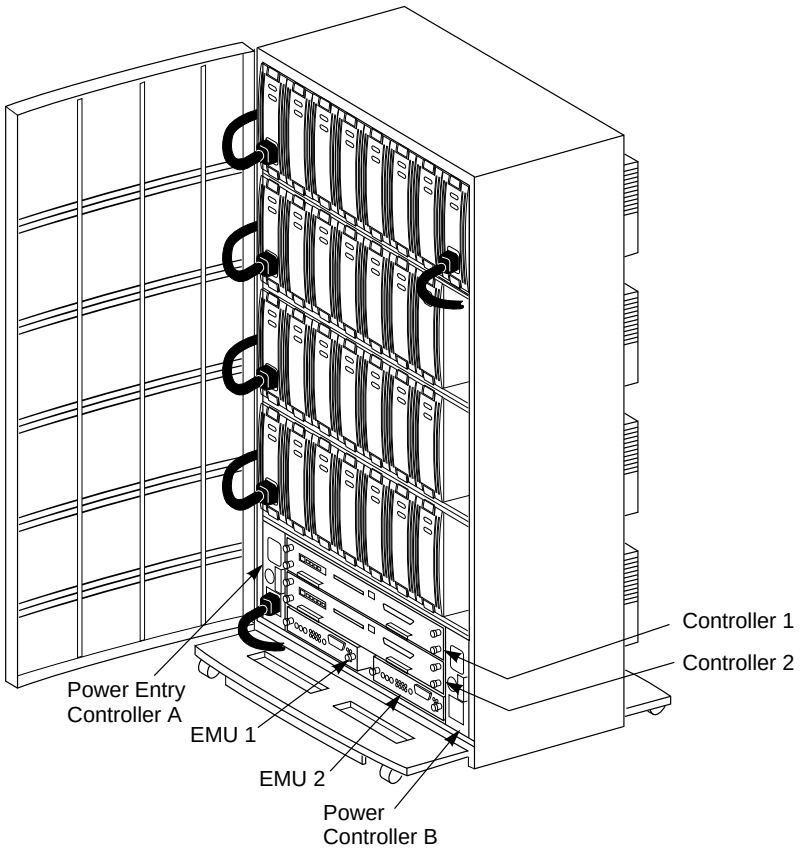
This standard power configuration (see Figure 1-5) *is recommended* by Digital. If a power supply SBB fails you would be able to replace it before a second power supply SBB fails. The standard power configuration has the following components:

5 — power supply SBBs
1 — ac power controller

Any one of the following error conditions *will* cause the RAID subsystem to cease operation and may cause loss or corruption of data:

- Failure of *two* power supply SBBs
- Power controller failure

Figure 1-5 Standard Power Configuration (4 + 1)



1.2.4 Redundant (4 + 4) Power Configuration

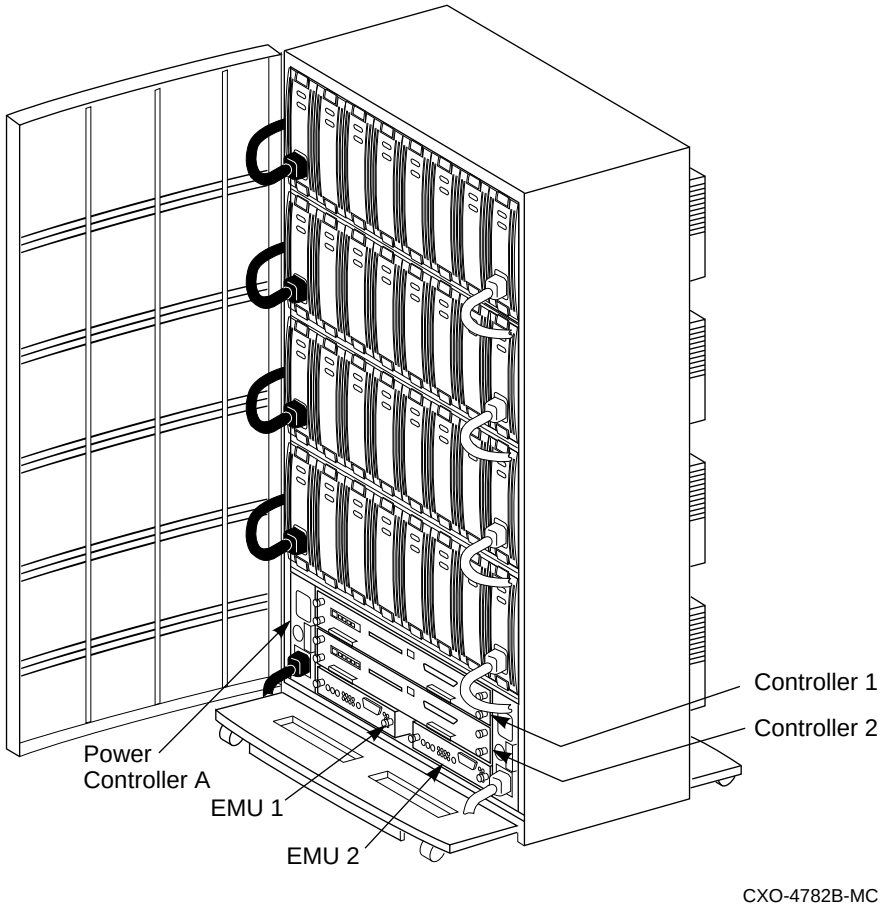
Digital *recommends* this configuration to provide complete power system redundancy thereby ensuring complete data protection. Loss or corruption of data may occur *only* when one of the following *multiple error conditions* occurs before you take corrective action:

- Failure of *five* power supply SBBs
- Failure of *both* power controllers

Two separate ac power sources and two ac power controllers are required for full redundant power operation.

- The first ac source provides power to controller A**,** which distributes the ac power through the four *black* power cords to the four power supply SBBs on the *left* end of the each shelf.
- The second ac source provides power to controller B. The four power supply SBBs on the *right* end of each shelf are connected to power bus B with the four *gray* power cords.

Figure 1-6 Redundant Power Configuration



1.3 Error Detection and Reporting

The RAID subsystem error detection and reporting function has two major elements—the fault bus and EMU (environmental monitor unit). For a detailed discussion of error detection, fault reporting, and correction see Chapter 3.

1.3.1 Fault Bus

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

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

The fault bus consists of three subsystem backplane signals routed to the array controller port connectors:

- Shelf Status Signal
  The SHELF_OK status signal indicates the state of the RAID subsystem 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 subsystem.
- 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, 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.

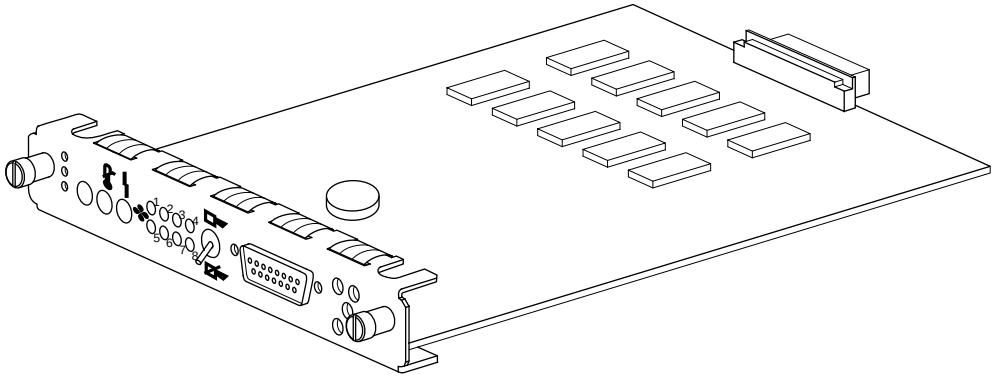
1.3.2 Environmental Monitor Unit (EMU)

The EMU (see Figure 1-7) provides protection against catastrophic RAID subsystem faults and with the controller warn you of existing or impending failures using one or more of the following error reporting systems:

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

In some instances, such as a blower failure, the EMU automatically initiates corrective actions.

Figure 1-7 Environmental Monitor Unit (EMU)



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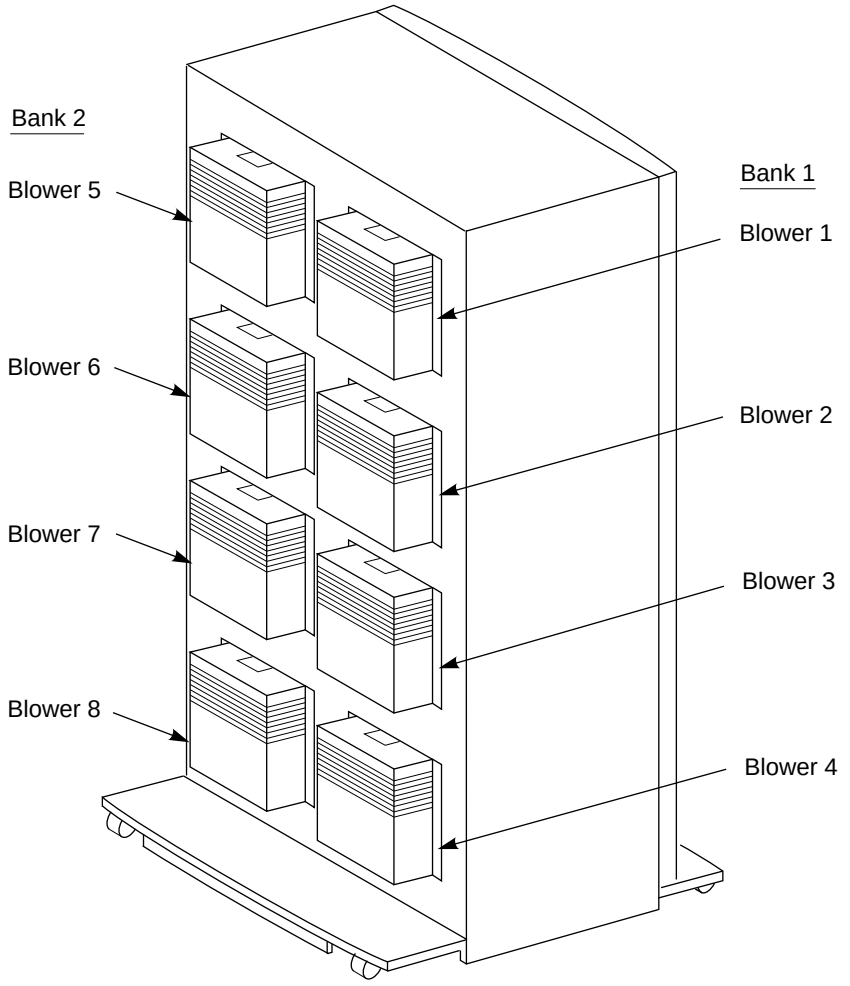
1.4 Subsystem Cooling

As shown in Figure 1-8, the RAID subsystem has eight *dual-speed* blowers. These blowers, normally operating at low-speed, pull air in from the front of the cabinet; through the SBBs, controllers, and EMUs; and exhaust it out the rear. Backplane connectors provide +12 V dc to operate the blowers and route the blower status signals to the shelf backplane and the EMU. All operational blowers automatically switch from low-speed to high-speed when one or more of the following conditions occur:

- When a blower is removed.
- When a blower malfunctions.
- When a blower is not rotating at the correct speed.
- When the EMU detects an overtemperature condition.

Figure 1-8 Dual Speed Blowers Locations



1.5 HS-Series Array Controllers

The HS-series array controllers connect a host system to the RAID subsystem. Installing two HS-series controllers with cache memories provides complete controller redundancy as described in the controller user's guide. The controller documentation describes the procedures for:

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

The RAID subsystem can use the following Digital array controllers:

- An HSD™-series array controller with a Digital Standard System (DSSI™) host.
- An HSJ™-series array controller with a Computer Interface (CI™) host.
- An HSZ™-series array controller with a SCSI host.

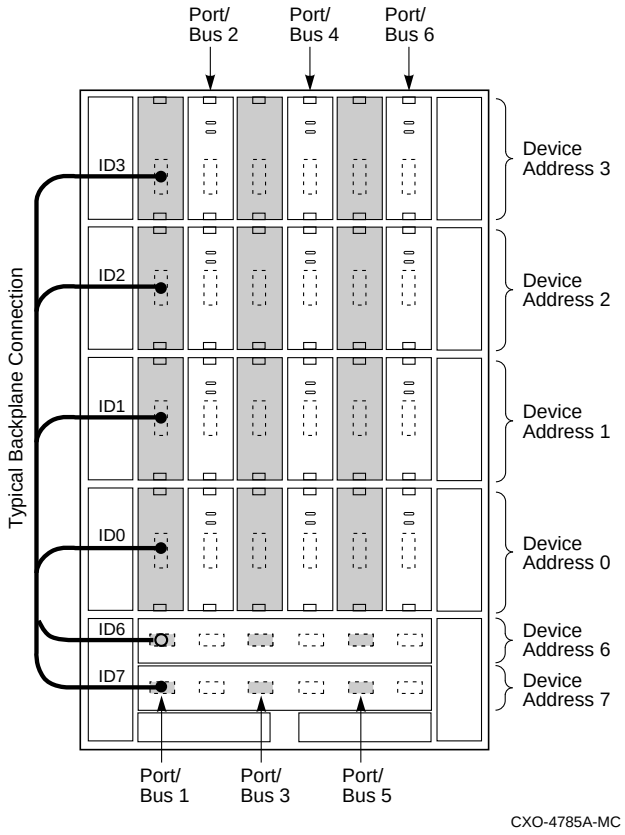
The controller firmware revision level determines the devices supported by each controller. See the controller firmware release-specific *StorageWorks Array Controller Operating Firmware Release Notes* for a list of supported storage devices.

The *24 SBB RAID Subsystem Expansion Units and Shelves Product Compatibility and Certification Guide* list compatible devices and their FCC and CE-Mark certification.

1.6 SCSI Buses

The six 8-bit SCSI buses and the associated ports and device addresses are shown in Figure 1-9.

Figure 1-9 SCSI Buses



The RAID subsystem enclosure supports 16-bit storage devices operating in the 8-bit mode. The configuration rules for these 8-bit single-ended SCSI buses are as follows:

- You may install controller-compatible 8-bit (–VA suffix) and 16-bit (–VW suffix) storage SBBs.
- You must use 8-bit device addresses for both the 8- and 16-bit devices
- All devices and ports in the same column are on the same SCSI bus or port.
- All the devices in the same row (device shelf) have the same device address.
- Device addresses are determined by the backplane connector into which the device is inserted.
- Device addresses 4 and 5 are only used when the SBB has a device address switch.

1.7 Storage Device SBBs

The RAID subsystem accommodates both the 3.5–inch and 5.25–inch storage device SBBs (see Figure 1-10). The subsystem capacities are as follows:

- 24 — 3.5–inch SBBs, each occupying one slot (six SBBs per row)
  or
- 8 — 5.25–inch SBBs, each occupying three slots (two SBBs per row)
  or
- a combination of both (a maximum of one 5.25–inch SBB and three 3.5–inch SBBs per row)

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 the 5.25–inch SBBs and tape storage device 3.5–inch SBBs.

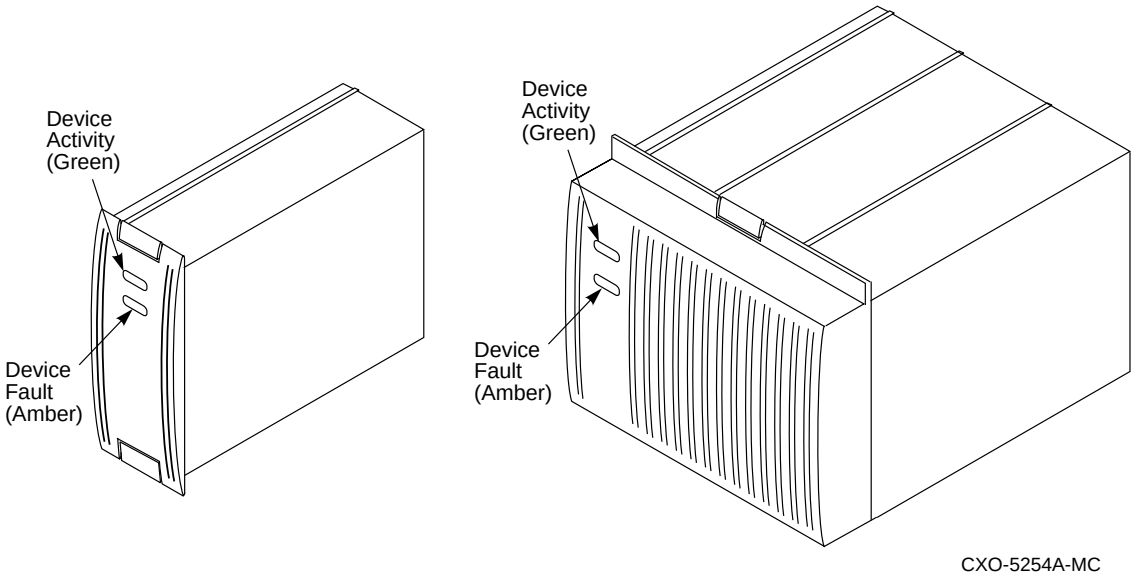
CAUTION

The HS-series controllers do not support 16-bit addresses. Therefore, all 16-bit devices use only the lower eight address bits, addresses 0 through 7.

- For a list of all the RAID subsystem compatible devices including storage devices, power, and SCSI bus controllers refer to *StorageWorks Solutions 24 SBB RAID Subsystem Expansion Units and Shelves Product Compatibility and Certification Guide*.
- For detailed information about SCSI device addressing refer to the *StorageWorks Solutions SBB User's Guide.*

The HS-series array controller software product descriptions list the SBBs compatible with a RAID subsystem.

Figure 1-10 Typical 3.5–Inch and 5.25–inch SBBs



2

Configuring the RAID Subsystem

This chapter describes the basic rules for configuring a RAID subsystem. Table 2-1 lists the components provided with a RAID subsystem and those required to create operational subsystems.

- *The "Basic Components" column lists the items provided with a RAID subsystem. These items **do not** create an operational subsystem.*
- *The "Operational Subsystem" column lists the components **you must order** to create a basic, operational RAID subsystem with redundant power.*

Note

The shaded items are supplied with each RAID subsystem.

- *For complete power and controller redundancy you must order the additional components listed in the "Redundant Subsystem" column.*

Table 2-1 RAID Subsystem Components

Item	Basic Components	Operational Subsystem	Redundant Subsystem
Dual speed blowers	8		
Environmental monitor unit (EMU)	1		1
Power entry controller	1		1
Power entry controller ac power cords	1		1
Power supply SBBs	0	5	3
ac power cord shelf power supply—black	5		
ac power cord shelf power supply—gray	4		
3.5–inch storage SBBs	0	6	18
5.25–inch storage SBBs	0		1—8
68-pin tri-Link connector	0	1	1
Connector guide	0	1	1
Controller to host bus cables	0	1	1
HS-series array controller	0	1	1
HS-series array controller cache memory	0	1	1

2.1 Power Configurations

The standard RAID subsystem is configured for a *single power bus*, power bus A, with one ac power controller and five SBB power supplies. This configuration, a 4 + 1, provides *minimum* power redundancy.
The *optimum* power configuration has both power bus A and power bus B. Each power bus has an ac power controller and four SBB power supplies, a 4 + 4 configuration. Using this configuration *with separate ac sources* for each bus provides the maximum protection for your data.
Table 2-2 lists the RAID subsystem 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.

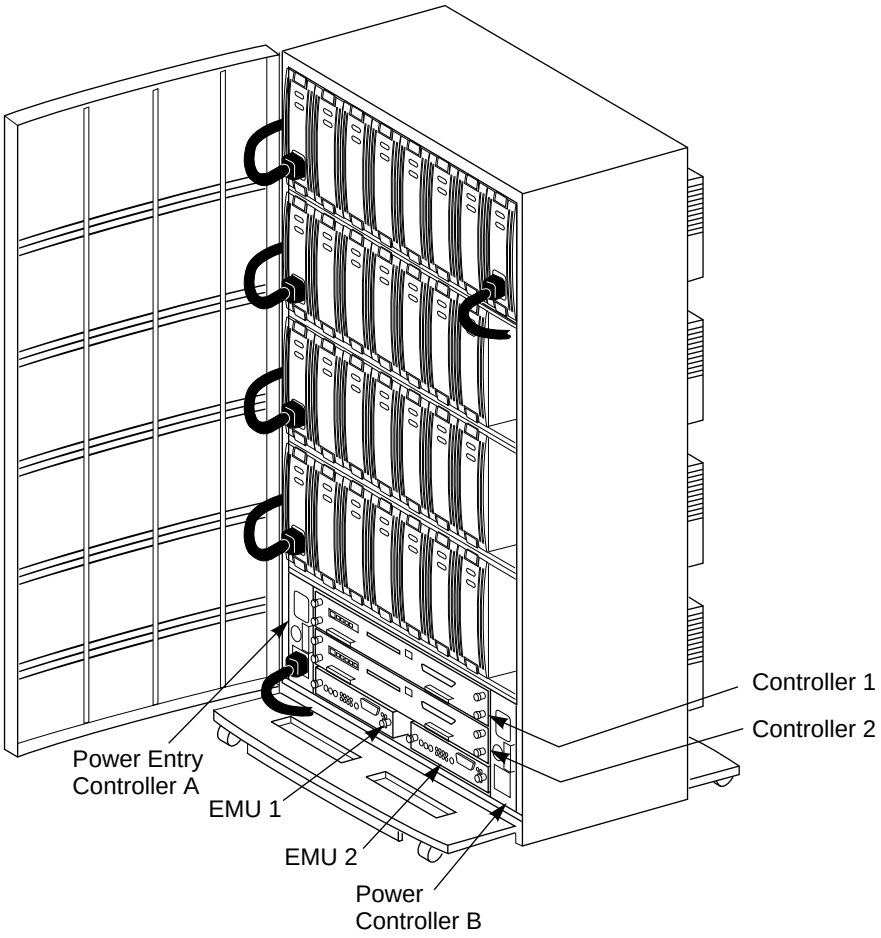
Table 2-2 Power Configurations

Bus Type	Power Supply Locations	Power Cords	
		Bus A (Black)	Bus B (Gray)
Power Supply Bus A (Single Power Controller)			
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)			
Optional (4 + 4)	SBB power supplies in Slots A on each shelf. SBB power supplies in Slots A on each shelf.	4	4

2.1.1 Power Bus A

Power controller A, located in the lower left corner of the RAID subsystem, provides power for both power configurations. *Only* the black power cords are connected to power bus A**.**
Figure 2-1 shows the *standard* (4 + 1) power configuration for power bus A**.** In this configuration, the fifth or redundant power supply is installed at the right end of the top row. It is connected to the power bus A using the black power cord. Digital *recommends* this configuration to provide basic power redundancy.

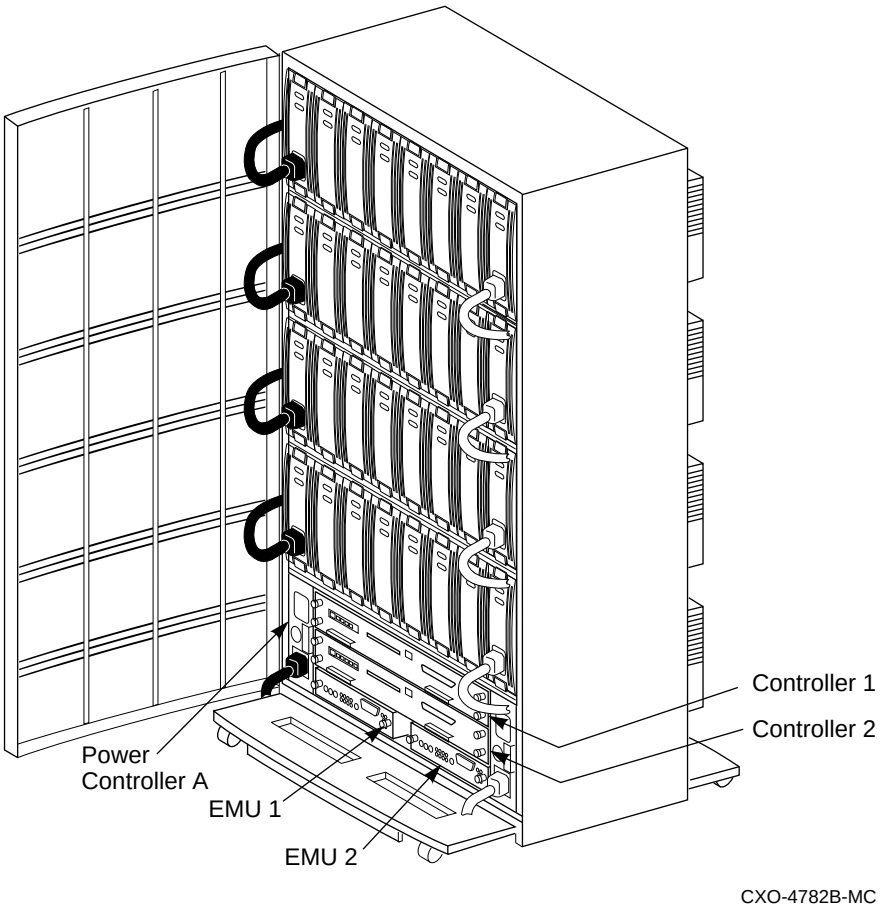
Figure 2-1 Standard (4 + 1) Power Configuration



2.1.2 Power Bus B

Power bus B is only used in the *redundant* (4 + 4) power configuration (see Figure 2-2). Power controller B provides power to four power supply SBBs at the right end of the RAID subsystem (gray power cords).

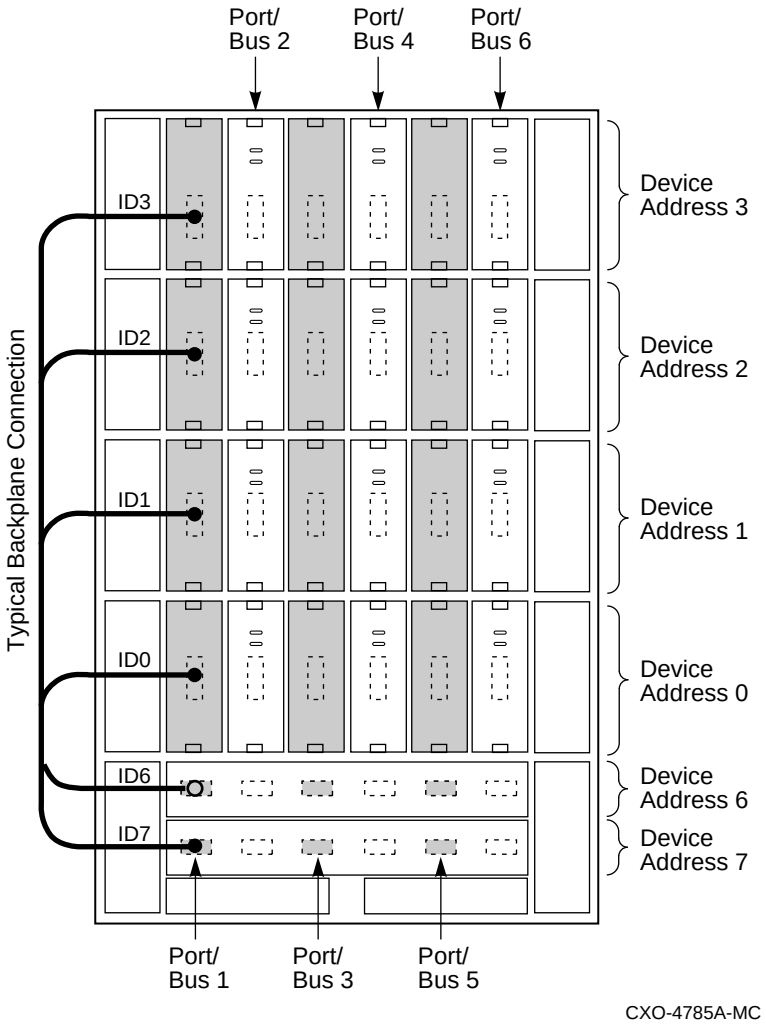
Figure 2-2 Redundant (4 + 4) Power Configuration



2.2 SCSI Bus Configurations

The six single-ended, SCSI buses are oriented vertically on the RAID subsystem backplane. Each bus connects a HS-series controller to one device in each device row for a total of four devices per SCSI bus (device addresses 0 through 3). The two HS-series array controllers SCSI initiator device addresses are preset by slot location to device addresses 6 and 7 (see Figure 2-3).

Figure 2-3 RAID Subsystem SCSI Buses



2.3 HS-Series Array Controller Configurations

For information about RAID and controller configurations, see the HS-series array controller user's guide, service manual, release notes, and software product description.

2.4 Installing Controllers and Devices

For the most effective RAID subsystem operation install the controllers, the cache memories, and the SBBs in the following sequence (see Figure 2-4):

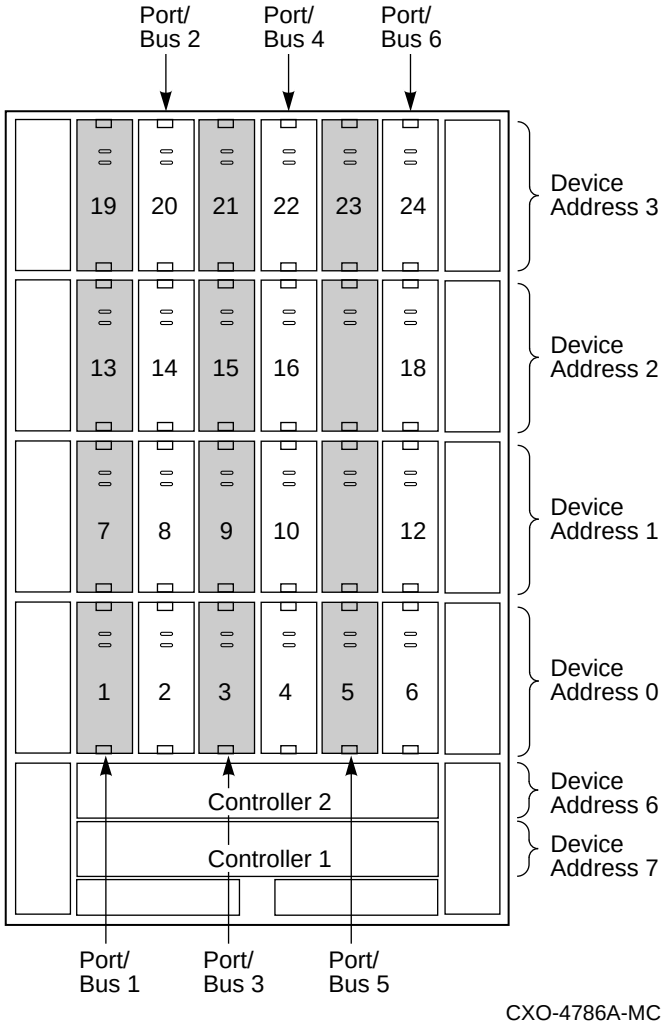
1. Install the *first* HS-series controller and cache memory in the bottom controller slot (Device Address 7).
2. Install the *second* HS-series controller and cache memory in the top controller slot (Device Address 6).

Note

The SBB device address is dependent upon the SBB form factor (3.5–inch or 5.25–inch) and the mating backplane connector.

3. Install the *first* storage device SBB at the left end of the bottom row. Completely fill the bottom row from left to right.
4. Once the bottom row is full, install the next SBB at the left end of the second. Completely fill the second row from left to right.
5. Once the second row is full, install the next SBB at the left end of the third. Completely fill the third row from left to right.
6. Once the third row is full, install the next SBB at the left end of the top. Completely fill the third row from left to right.

Figure 2-4 HS-series Controller and SBB Installation Sequence



2.5 Connecting a Typical HS-Series Controller

Note

The following procedure is an *example* of connecting an HSD-series controller to a host computer. The procedures for connecting other controllers may be significantly different.

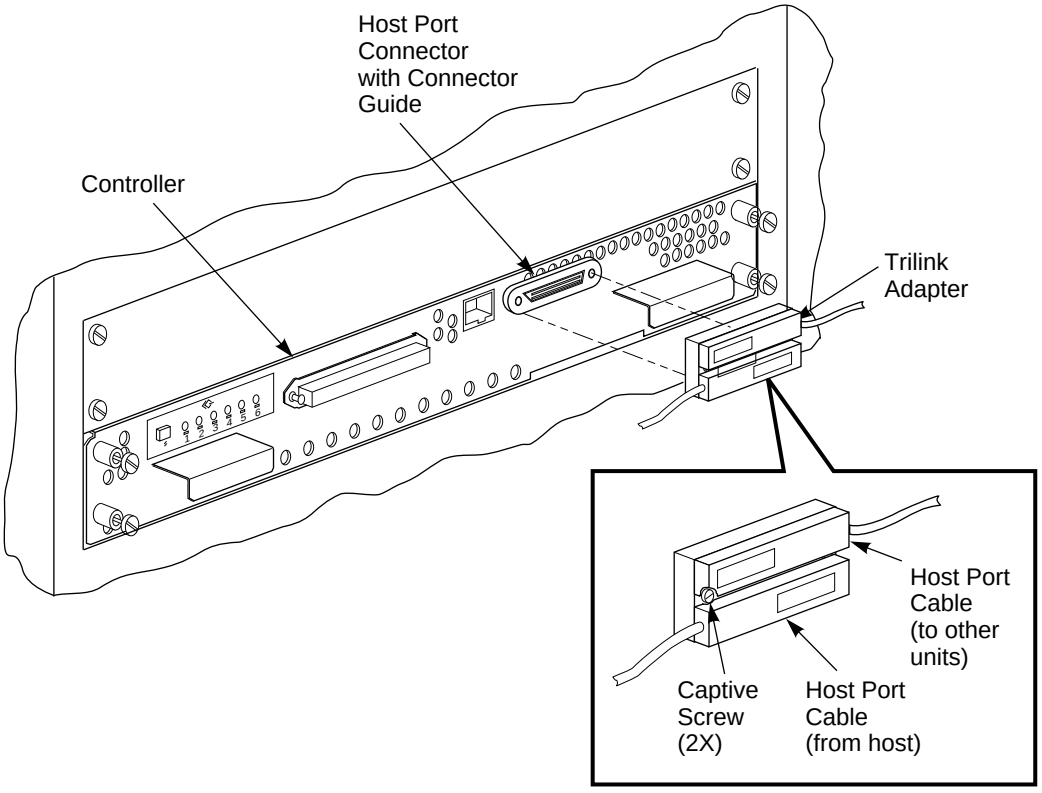
Connecting any controller to a host involves basically the same procedure. The cable types may vary based upon the controller, the host, or the adapter. For detailed information about a particular controller please refer to the controller user's guide, service manual, release notes, and software product description.

CAUTION

All DSSI buses must be terminated whenever power is applied. Disconnecting a DSSI bus cable when the power is applied removes termination from the bus and can generate erroneous signals and cause the bus to *hang*. To avoid this condition never connect or disconnect a DSSI cable with power applied to either the host or the controller.

Complete the following procedure to connect the DSSI cable to the HS-series controller:

1. Install the connector guide over the 68-pin DSSI controller connector.
2. Connect the DSSI cables to the tri-link connector.
3. Install the tri-link connector on the 68-pin DSSI controller connector.



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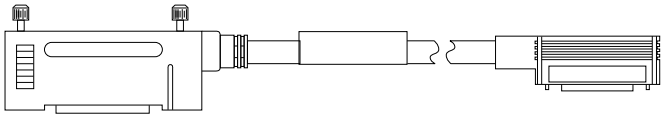
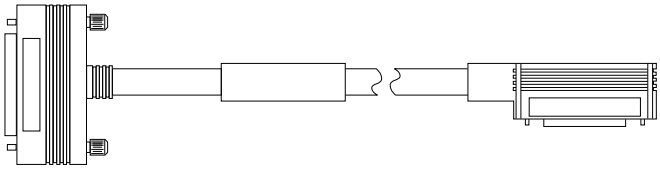
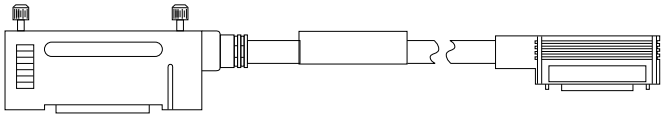
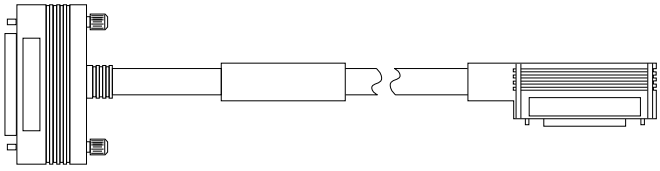
The DSSI bus cable you use is dependent upon the following:

- The computer **host**.
- The adapter type.

See Table 2-3 to determine the compatible DSSI cable series for connecting the pedestal to a host adapter. For detailed information about these cables see the Controller Release Notes.

Table 2-3 DSSI RAID Subsystem Compatible Cables

If the host and adapter are…	the cable to use is …
Alpha Server 2000™ KFESA	**BC29R**  CXO-5224A-MC
Alpha Server 2000™ KFESB KFPSA	**BC29S**  CXO-5192A-MC
Alpha Server 2100™ KFESA	**BC29R**  CXO-5224A-MC
Alpha Server 2100™ KFESB KFPSA	**BC29S**  CXO-5192A-MC

3

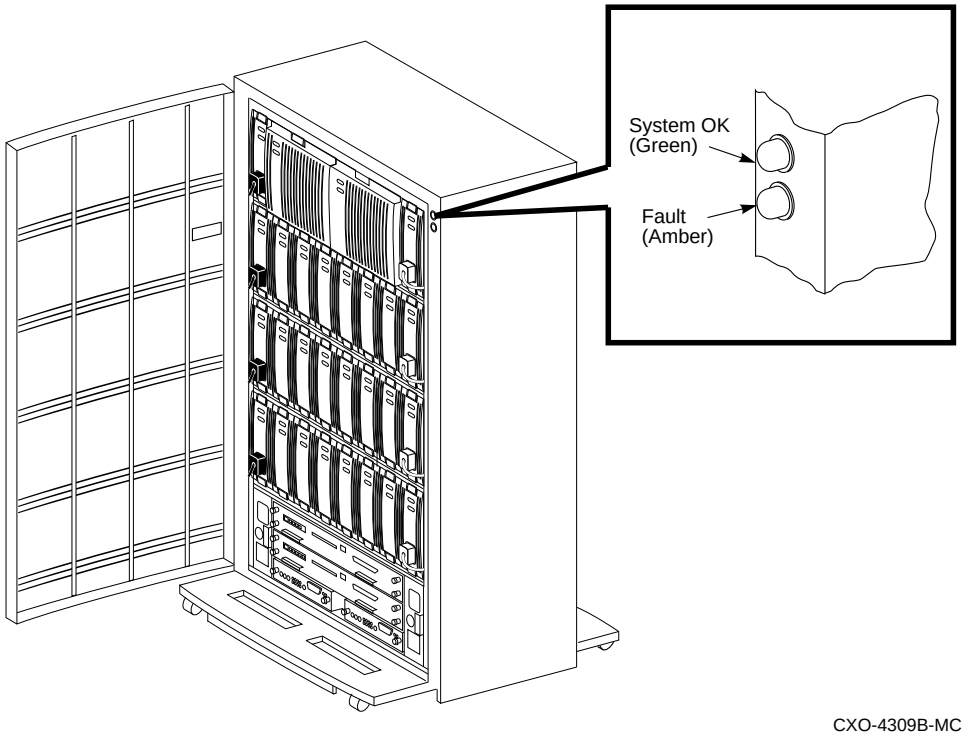
Error Analysis and Fault Isolation

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

3.1 RAID Subsystem Error Reporting

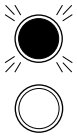
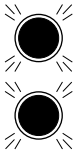
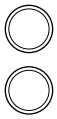
There are multiple light emitting diodes (LEDs) that display error conditions. The two most easily observed are the RAID subsystem front panel (see Figure 3-1). You then use the EMU front panel (see Figure 3-2), the power supply SBB LEDs, the storage SBB LEDs, and the controller LEDs to isolate the error condition to a component. The front panel LEDs are simple "go—no go" indicators. The green LED is the System OK LED; the amber LED is the Fault LED. When the Fault LED is on you must check all the other status LEDs to determine the cause of the error.

Figure 3-1 RAID Subsystem Status LEDs



CXO-4309B-MC

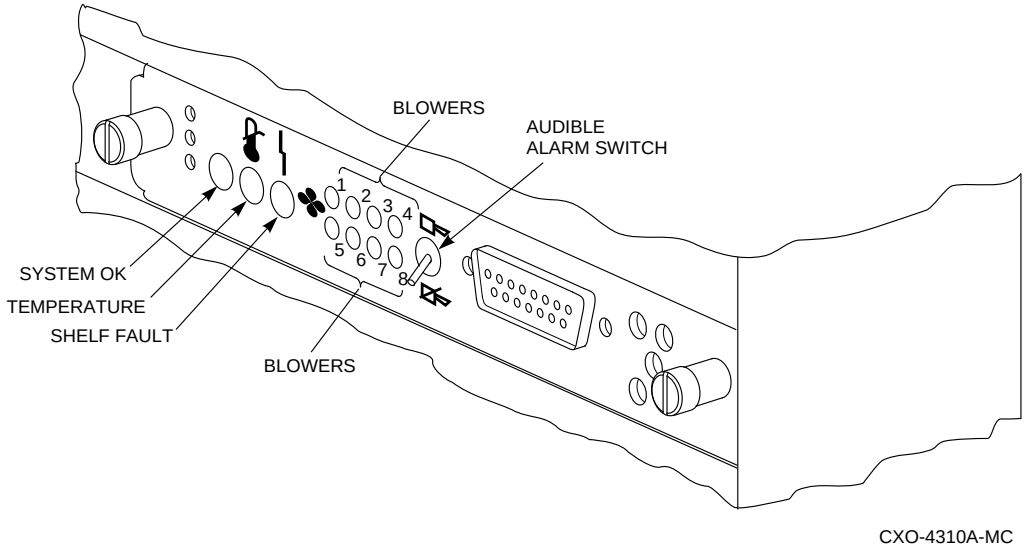
Table 3-1 RAID Subsystem Status LEDs

When RAID Subsystem LEDs are…	The subsystem status is…
	Operating normally; there are no error conditions
	There is a failed RAID subsystem component. **Recommended Corrective Actions:** 1. Check the EMU control panel LEDs to determine which component has failed. 2. Replace the failed component.
	The subsystem does not have power applied or is in a RESET state. **Recommended Corrective Actions:** 1. Check that ac power is applied. 2. Check that there are at least four operational SBB power supplies. 3. Check the system terminal for error messages.

3.2 EMU Error Indications

The front panel LEDs display RAID subsystem enclosure status information (see Figure 3-2). Any error condition can cause the audible alarm to sound *providing* the Audible Alarm switch is in the ON (up) position.

Figure 3-2 EMU Front Panel



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

- Shelf temperature sensing.

- Power supply operation and voltage monitoring.
- Blower monitoring and control.

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

- Enables the audible alarm.

Note

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

- Turns on the amber shelf fault LED.
- Turns on one or more EMU panel LEDs.

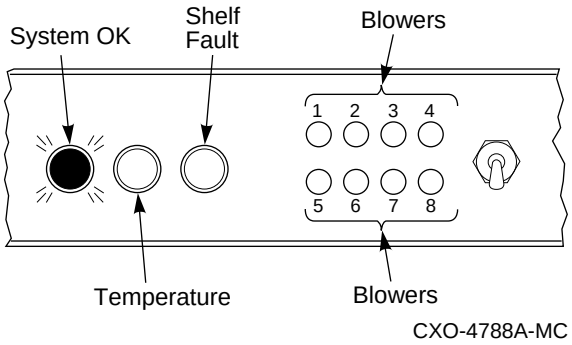
3.2.1 EMU Automatic Corrective Actions

When the EMU detects an overtemperature condition it automatically sets all blower to operate at high-speed.

3.2.2 EMU Front Panel Display

The EMU front panel LEDs (see Figure 3-3) display the status of the RAID subsystem enclosure (system OK), the temperature, error conditions (shelf fault), and the status of the individual blowers and banks of blowers (blowers). When the RAID subsystem is functioning properly, only the system OK LED is ON.

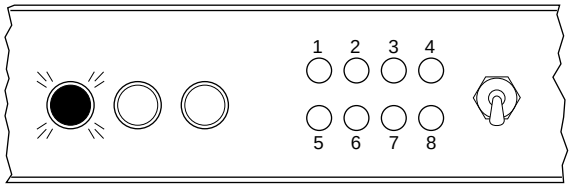
Figure 3-3 EMU LED Indicators

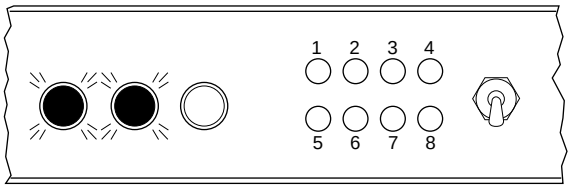
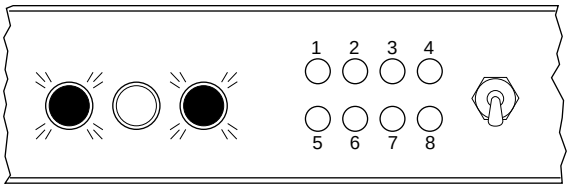
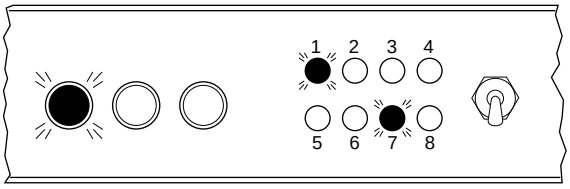
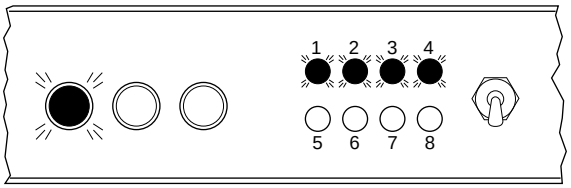


3.2.3 Decoding EMU Front Panel LED Displays

Table 3-2 summarizes the EMU LED displays, defines the RAID subsystem status, and lists the recommended corrective actions.

Table 3-2 EMU Status Indications

When the EMU LED display is…	The RAID subsystem status is…
	The RAID shelf is fully operational.

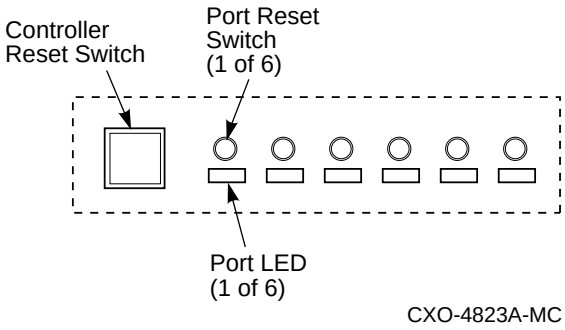
 CXO-4790A-MC	The RAID subsystem temperature is above 35°C (95°F). 1. All blowers are operating at high speed. 2. When the temperature exceeds 50°C (122°F) the EMU places the HS-series array controller in the RESET state. This will halt all data transfers thereby preventing the loss or corruption of data. **Corrective Action:** Determine and correct the cause of this condition as quickly as possible.
 CXO-4791A-MC	There is a RAID subsystem power problem **Corrective Action:** Observe the power supply LEDs to determine the defective supply and replace it.
 CXO-4792A-MC	One or more blowers are non-operational. **Corrective Action:** In this example Blowers 1 and 7 are non-operational and must be replaced.
 CXO-4793A-MC	Either a blower is not installed or it is installed incorrectly. In this example, the error condition is caused by a Bank 1 blower. **Corrective Action:** Check Blowers 1, 2, 3, and 4 to isolate the blower causing the problem and install it properly.

3.3 Controller Error Conditions

The HS-series operator control panel (OCP) (see Figure 3-4), 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 3-4 HS-series OCP



The green controller reset LED indicates controller 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 turn on the amber LED. Depending on the controller you may have to quiesce a bus to replace a storage device. For further information about requirements for quiescing the bus, see the controller user's guide.

3.4 Storage Device Fault Notification

The storage device SBBs are available in both a 3.5–inch and a 5.25–inch form factor (see Figure 3-5). The front panel LEDs display the SBB status using one of three states (ON, OFF, and FLASHING).

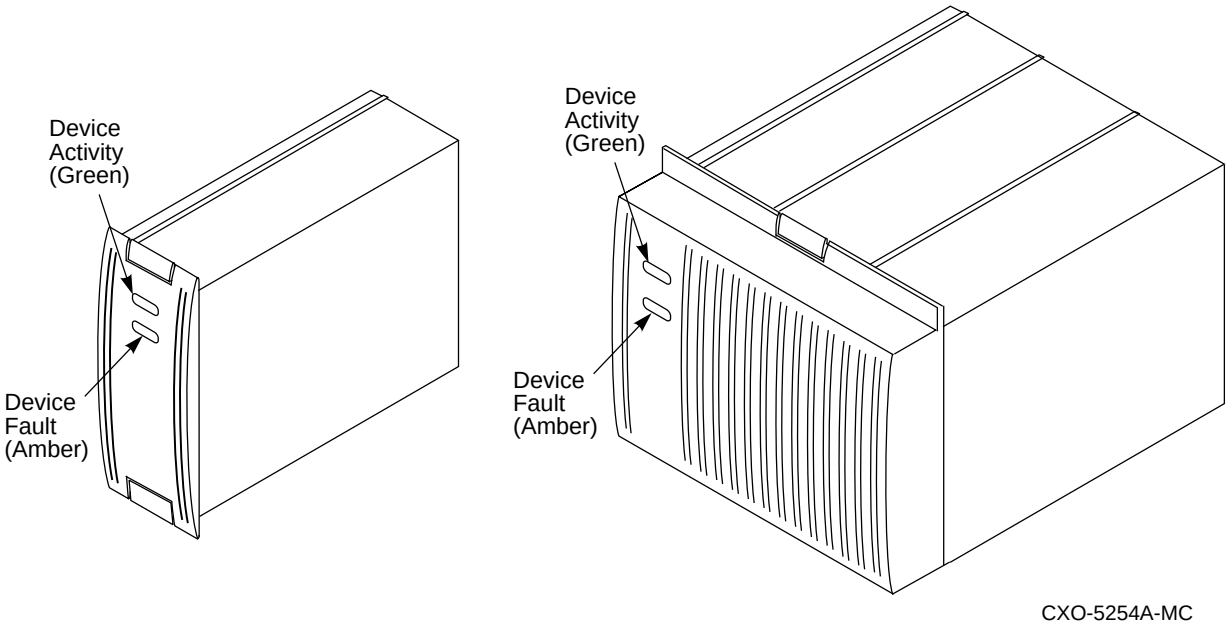
- The green LED is the device activity LED and is ON or FLASHING when the SBB is active.

Note

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 3-5 Typical 3.5–Inch and 5.25–Inch SBBs



3.5 Power Supply Fault Notification

As shown in Figure 3-6 each power supply SBB has two green LEDs that display the power supply status. Table 3-3 describes the state of these LEDs, the status being reported, and the recommended corrective action.

Figure 3-6 3.5 Inch Power Supply SBB

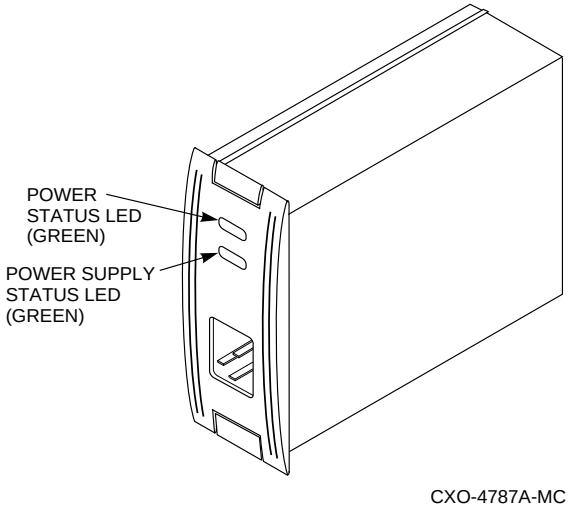
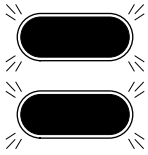
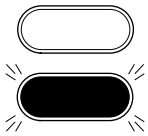
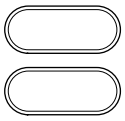


Table 3-3 Power Supply Status LED Displays

When the LED display is…	The SBB power supply status is…
	All the power supply SBBs on the *associated* power bus (either power bus A or power bus B) are functioning properly.
	At *least one* power supply SBB on the associated power bus has malfunctioned. This power supply SBB is functioning properly **Corrective Action:** Identify and replace the defective power supply SBB.
	Either there is no ac power, the ac power entry controller has failed, or this power supply SBB has failed. **Corrective Action:** 1. Check that ac power is applied. 2. Check the associated ac power entry controller for proper operation. Replace if necessary. 3. This power supply has failed and must be replaced.

4

Replacing Components

This chapter describes the procedures to remove and install the following components in the RAID subsystem:

- *SBB storage device*
- *Dual speed blower*
- *Power supply SBBs*
- *Power entry controller*
- *EMU*
-

4.1 Replacing a Controller or a Cache Module

Replacing the HS-series array controllers and cache memories are complex procedures and are not within the scope of this publication. The controller user's guides contain the complete procedures for replacing these devices.

4.2 Replacing an SBB Storage Device

"Swapping" a storage device is the process of replacing one device with an *identical* device. The *StorageWorks Solutions SBB User's Guide* describes how to determine the device model number. This replacement is normally required only when a device fails. Usually the controller determines that a device requires replacement when it cannot address the device, receives no response from the device, or detects excessive device errors.
You may decide to replace a device based on controller operator control panel (OCP) codes, the SBB LEDs, system messages, or system error log information.

4.2.1 Replacement Methods

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.

Replacing an SBB involves quickly removing and replacing a storage device SBB 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:

CAUTION

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

hot swap—A method of device replacement whereby the complete system remains on-line 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 on-line during device removal or insertion. A single SCSI 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.

4.2.2 Before You Replace a Storage SBB

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

- Installing a different model device requires you to reconfigure the subsystem.
- You cannot replace a device that is active (the green device activity LED is FLASHING) without losing or corrupting data.
- 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.

4.2.3 SBB Replacement

The procedures for replacing a storage SBB accomplish the following:

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

Removing or inserting a storage SBB generates the `C_SWAP` 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	No controller response expected.
Removing a storage device during a data transfer operation	Reduced operation.
Installing a storage device	The controller begins to reconstruct the data on the disk.

In general, the procedure for replacing an SBB is the same for most controllers. However, there may be significant operating system or firmware differences. Therefore, the following procedure is *only an example*. There may be significant differences between the procedures for different controllers. Refer to the controller user documentation for the detailed procedure that you *must* use.

Complete the following procedure to replace an SBB:

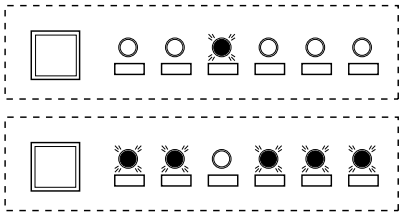
1. Dismount the device.
2. **Quiesce** the SCSI bus (port). The controller OCP LEDs display indicates the bus status and when you can remove or insert an SBB.

   Note

   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 any bus.
   - Removing or installing an SBB will not cause the data loss or corruption.

The reset light blinks at a normal rate, while the port LEDs indicate the 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:

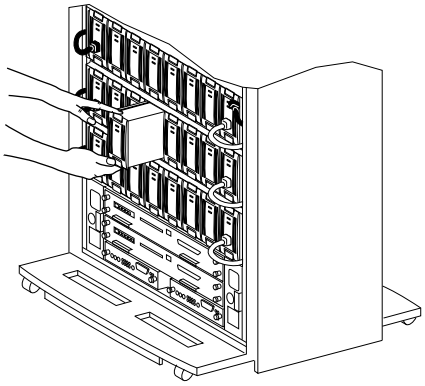


CXO-4824A-MC

CAUTION

To prevent dropping an SBB, always use both hands to remove or install it.

4. Remove the SBB by pressing the two mounting tabs together to release it from the shelf, and pull it out using both hands.



CXO-5338A-MC

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.

The controller should automatically configure the replacement SBB.
For additional information on storage device replacement, see the *StorageWorks Solutions SBB User's Guide.*

4.3 Replacing RAID Subsystem Blowers

You can install a dual speed 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.

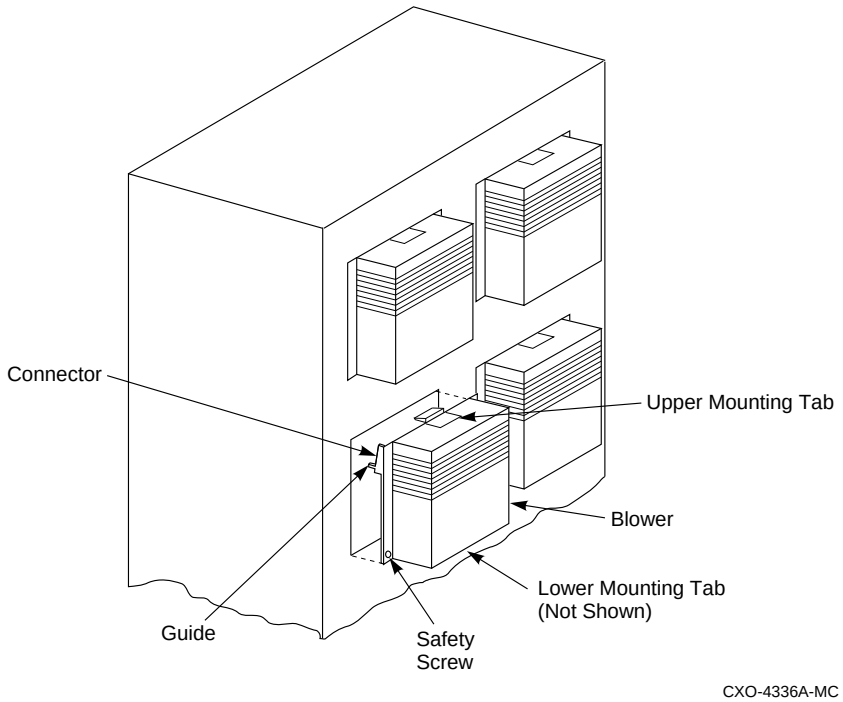
CAUTION

Operating a RAID subsystem with a blower removed significantly changes the air flow pattern and reduces air flow through the shelf and devices, This causes an overtemperature condition. *Do not* remove a blower unless you replace it within 1 minute.

To remove a blower, refer to Figure 4-1 and complete the following procedure:

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

Figure 4-1 Dual Speed Blower Replacement



To replace a blower, refer to Figure 4-1 and complete the following procedure:

1. Orient the replacement blower so the connector and guide pin align 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 Power Supply SBB

Power supply SBBs normally are replaced while power is applied to the unit and the other power supply SBBs. Use the following procedure to replace a power supply SBB:

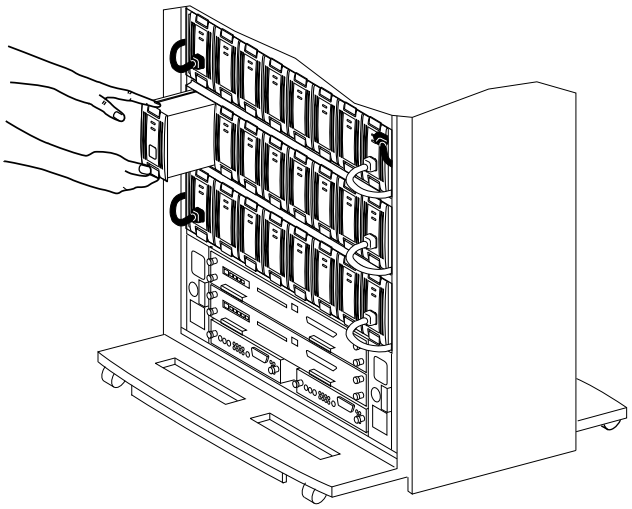
CAUTION

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

1. Disconnect the power cord from the front of the SBB.
2. Press the two mounting tabs together to release the power supply SBB from the shelf.
3. Use both hands and pull the power supply SBB out of the shelf.

CAUTION

To prevent dropping an SBB, always use both hands to remove or install it.



CXO-4314A-MC

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).

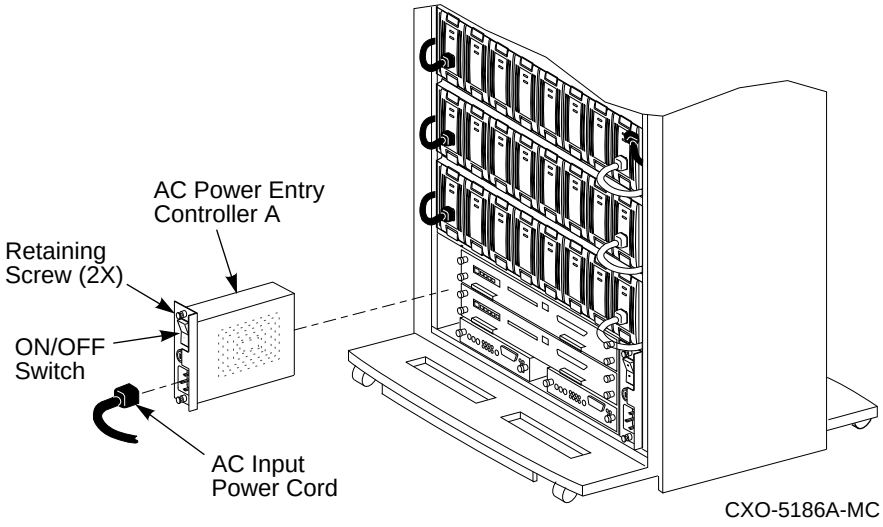
4.5 Replacing a Power Entry Controller

CAUTION

Removing and installing a power entry controller can be performed only by qualified service personnel.

Use the following procedure to remove a power entry controller:

1. Press **0** on the ON/OFF switch to turn the power controller to OFF.
2. Disconnect the ac input power cord.
3. Loosen the two retaining screws.
4. Pull the power controller from the RAID subsystem.



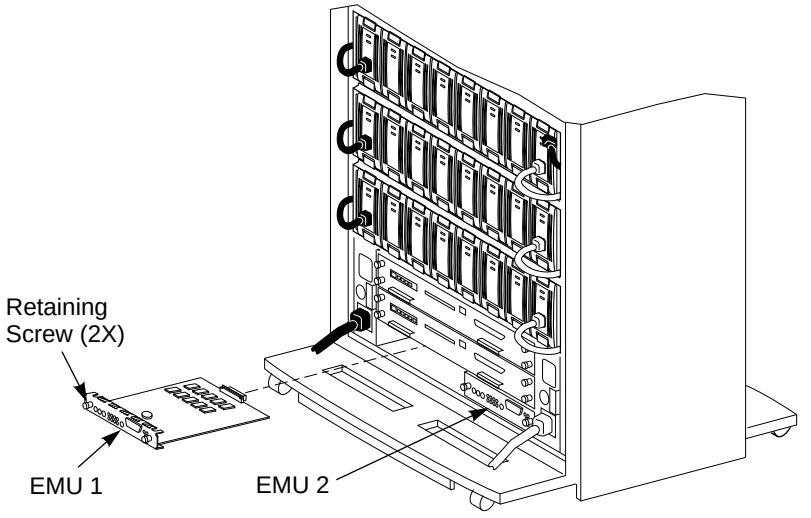
Use the following procedure to install a power entry controller:

1. Press **0** on the ON/OFF switch to turn the replacement power controller to OFF.
2. Insert the replacement power controller into the RAID subsystem.
3. Tighten retaining screws.
4. Connect the ac input power cord.
5. Press **|** on the ON/OFF switch to turn the power controller to ON.

4.6 Replacing an EMU

Use the following procedure to remove or install an EMU without turning off the RAID subsystem:

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.



CXO-5185A-MC

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 on the EMU until it is fully seated.
3. Tighten the two retaining screws.

Glossary

array controller
A device that exercises control over a storage array SCSI bus, for example, an HS-series disk array controller.

cache memory
A fast storage buffer.

CI
A Digital trademark for the Digital computer interconnect bus.

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

DSSI
A Digital trademark for the Digital standard system interconnect bus.

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 on-line 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 **warm swap**.

quiesce
To make a bus inactive or dormant. For example, you must quiesce SCSI bus operations, such as warm swapping an SBB.

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.

warm swap
A method of device replacement whereby the complete system remains on-line 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 **hot swap**.

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