Desktop Expansion Unit

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. This publication supports the StorageWorks Desktop Expansion Unit.

Revision Level	Date	Summary of Changes
EK-SMCPB-UG. A01	December 1993	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 Desktop Expansion Unit User's Guide

This guide provides installation and maintenance information for the StorageWorks Desktop Expansion Unit.

Intended Audience

This guide is intended for people who will install, operate, and maintain StorageWorks Desktop Expansion Units.

NOTE

Installing the StorageWorks Desktop Expansion Unit requires a general understanding of SCSI devices and basic hardware installation procedures. It is recommended that you review Chapter 1 before proceeding with the installation of your expansion unit.

Document Structure

This guide contains the following chapters:

Chapter 1: Introduction

Introduction gives an overview of the StorageWorks Desktop Expansion Unit, describes its components, and discusses the expansion unit features.

Chapter 2: Installation

Installation describes unpacking, SCSI cables and connectors, the SCSI cable connection between the expansion unit and the host system, device addressing, termination on the SCSI bus, the power cable connection, and how to install the storage devices in the expansion unit. The chapter also discusses the expansion unit power on test.

Chapter 3 Maintenance

Maintenance discusses the expansion unit LED indicators and how to replace a storage SBB. The chapter also discusses expansion unit cooling, troubleshooting, and field replaceable parts.

Appendix A: Expansion Unit Specifications

Expansion Unit Specifications list the physical, electrical, cooling, environmental, and environmental stabilization specifications for the expansion unit.

Conventions

This guide uses the following conventions:

Documentation Conventions

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

1

Introduction

This chapter provides an overview of the Desktop Expansion Unit, outlines its features, and describes the system components and options available to the user.

1.1   Product Description

The StorageWorks Desktop Expansion Unit (shown in Figure 1-1 and hereafter referred to as the "expansion unit") is a low-profile, SCSI-based unit with self-contained power and cooling. The expansion unit supports up to three SCSI devices and serves as an integral part of a workstation or any CPU-based host to expand the storage capacity of the system.The optional modular components available for the expansion unit are referred to as StorageWorks Building Blocks (SBBs) which are packaged in 3.5 and 5.25-inch industry standard form factors containing devices such as disk, tape, and optical drives.

The footprint of the expansion unit is no larger than a typical Central Processing Unit (CPU). It can support up to 45 kg (99 lbs.) and can be placed either on top of or under the CPU with the monitor on top. The preferred configuration is in the horizontal position on top of the CPU and under the monitor (Figure 1-2).

Figure 1-1 StorageWorks Desktop Expansion Unit
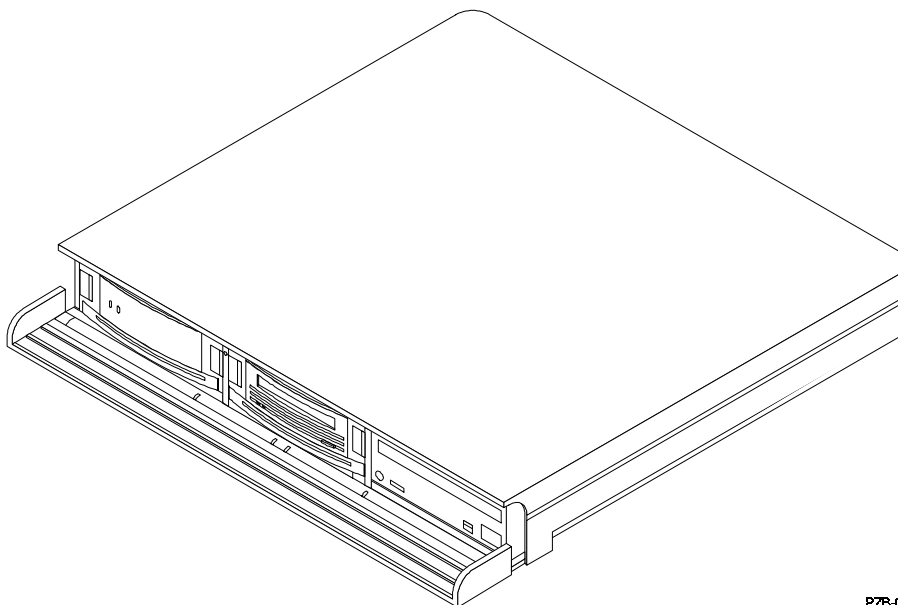
PZB-01

Figure 1-2 Typical Expansion Unit Installation
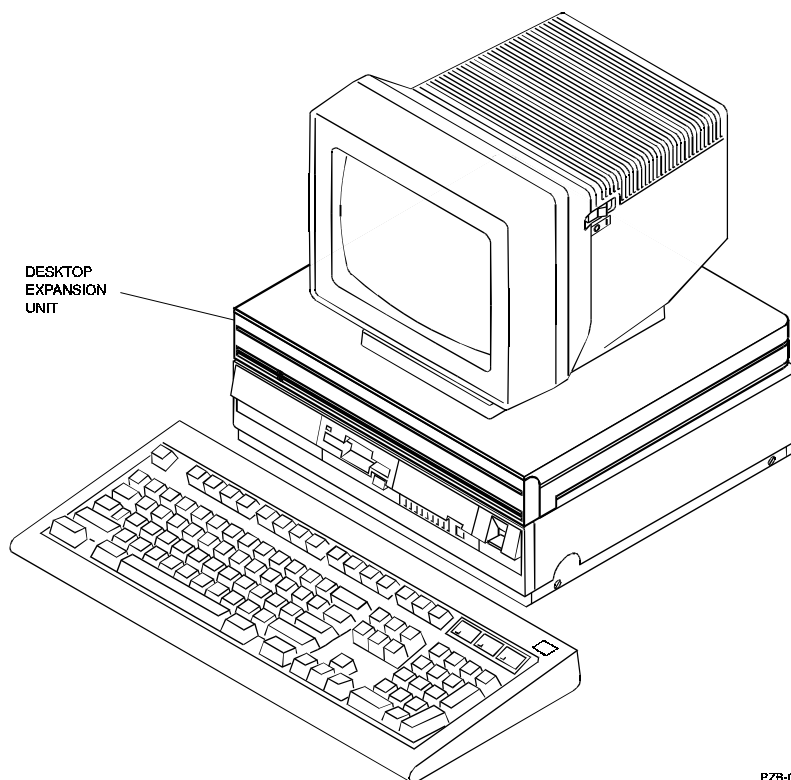
The expansion unit provides add-on storage for systems supporting SCSI devices. The capabilities of the system SCSI bus controller determine the following:

- The SCSI bus transfer rate (either 5 MB/s or 10 MB/s)

- The valid SCSI device addresses (target IDs)

- The operation of SBB status light emitting diodes (LEDs)

- The valid SBB replacement procedures (warm-swap or cold-swap)

CAUTION

Tape drives and CD-ROMs operate reliably in the horizontal plane as shown in Figure 1-2. If you wish to mount the expansion unit in the vertical plane, please check the user documentation for each SCSI device to ensure they can be mounted in this fashion.

The expansion unit is equipped with LED indicators to enable the operator to monitor the status of the storage subsystem and the activity on the drives. Each drive SBB has two LEDs that indicate the SCSI device activity and status. The expansion unit status LED, mounted between the left and center slots, is on when the system blower is operating and both the +5 Vdc and +12 Vdc power supply outputs are present. When any of conditions are not met, the expansion unit status LED is off and power is removed from the SBBs and devices.

There are no user-serviceable parts in the expansion unit; it is basically a "Go" or "No Go" unit. If the power supply or the blower fails, return it to your vendor for repair or replacement.

The expansion unit contains active termination for the SCSI bus. No external termination is required. Connecting a second expansion unit to the output of the SCSI connector automatically disables the termination in the first unit. Connecting a third unit automatically disables the termination in the second unit. This feature ensures that there is never more than one termination on the SCSI bus when connecting multiple StorageWorks desktop expansion units. Section 2.4 describes the expansion unit SCSI bus.

The combination of input and output SCSI bus connectors, plus individual SCSI address switches, enables you to quickly configure the bus to meet your system needs.

1.2   Product Features

The StorageWorks expansion unit offers the following features:

- Low-cost Small Computer System Interface (SCSI) device storage subsystems

- Snap-in devices for easy installation and removal

- Visual fault indicators

- The ability to hot swap SBBs without powering down the expansion unit

- Active SCSI bus termination provided

- Expansion units that can be "daisy chained" together

1.3   Configurations

All expansion units contain the following:

- A universal ac power supply

- A cooling fan

The standard expansion unit configuration does not include any SBBs. These optional devices are ordered separately.

1.4   Expansion Unit Components

The components of the expansion unit include the following:

- StorageWorks Building Blocks

    - 3.5-inch disk drives

    - Tape and optical drives

Figure 1-3 identifies the slots in the expansion unit and shows a typical installation configured with a disk drive (left slot), a tape drive (center slot), and a 5.25-inch half height CD ROM (right slot).

Figure 1-3 Expansion Unit Slot Locations
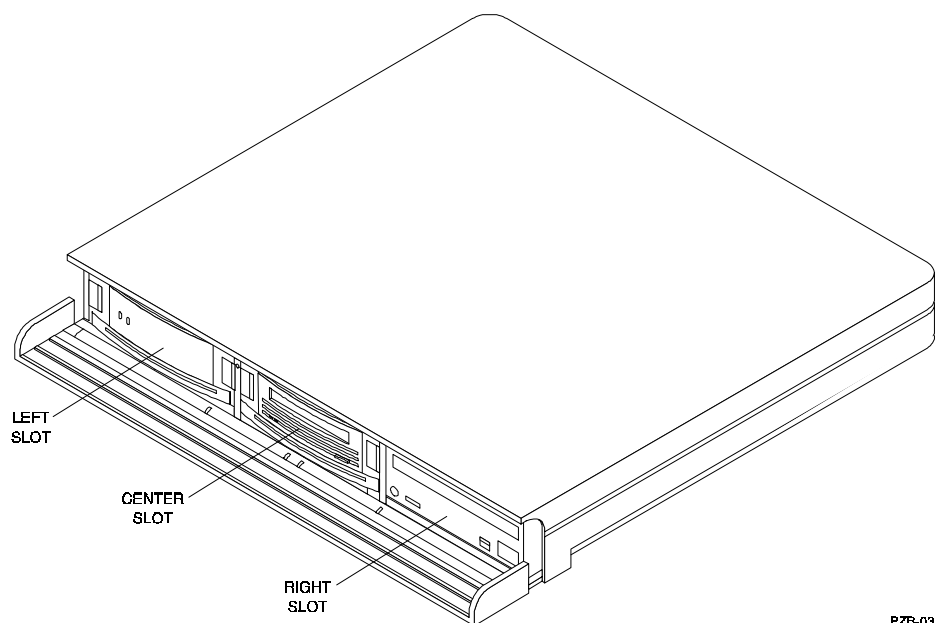
1.4.1 StorageWorks Building Blocks (SBBs)

All storage devices are mounted inside modular carriers which plug into slots in the expansion unit. Each SBB can be removed and replaced without powering down the expansion unit. In addition, each SBB has visual status indicator LEDs which are used to determine whether devices are functioning properly.

The 3.5-inch SBB has guides to ensure that the SBB connector properly mates with the expansion unit connector. When the SBB is fully inserted into the unit, the side mounted tabs expand and engage the expansion unit to securely mount the SBB. To remove the SBB, you press and hold the two mounting tabs and slide the device out of the expansion unit.

1.4.2 5.25-Inch Half Height SCSI Devices

The expansion unit is pre-configured at the factory for three 3.5-inch SBBs. However, the right slot of the expansion unit can be reconfigured to accept a 5.25-inch half height device if desired. Section 2.5.4 describes in detail how to convert the right-hand slot of the expansion unit from a 3.5-inch SBB to a 5.25-inch half height storage device.

1.5   SCSI Cable Requirements

SCSI cables must be ordered separately. The expansion unit has two 50-pin, high-density, female, SCSI connectors. It requires a cable with 50-pin, high-density, male connector. The host or controller SCSI connector determines the other cable connector type.

1.6   Power Cable Requirements

The expansion unit provides switched-controlled ac power to the expansion unit power supply. In addition, the rear panel contains a switched-controlled ac outlet which can be used to power a second expansion unit or a second device such as a monitor. To power the expansion unit and the ac outlet, you must install an ac line cord between the rear panel and a 125 or 250 volt ac power source (see Table A.3, Appendix A, for electrical specifications). Table 1-1 lists the power cords available for the expansion unit. These power cords are country specific. Ensure that your power cord matches those listed in Table 1-1.

In general, the power cords listed in Table 1-1 have the following characteristics:

- Rated at 10 amps at the specified operating voltage
- 2.5 meters (8.2 feet) in length
- Have a country-specific plug
- Have an IEC 320 C-14 compatible connector

The only exception is the BN27S-03 power cord used in Japan and the United States; it is rated at 15 amps and is three meters (9.8 feet) long.

Table 1-1 Country-Specific Power Cords

Country	Voltage	Plug	Length meters (ft.)	Part No,
Australia	250 Vac	AS 3112 - 1981	2.5 (8.2)	BN19H-2E
Central Europe	250 Vac	CEE 7/7 (Schuko)	2.5 (8.2)	BN19C-2E
Denmark	250 Vac	Afsnit	2.5 (8.2)	BN19K-2E
India	250 Vac	BS 546	2.5 (8.2)	BN19S-2E
Ireland	250 Vac	BS 1363	2.5 (8.2)	BN19A-2E
Israel	250 Vac	SI 32	2.5 (8.2)	BN18L-2E
Italy	250 Vac	CEI 213-16/VII	2.5 (8.2)	BN19M-2E
Japan	125 Vac	NEMA 5-15	3.0 (9.8)	BN27S-03[1]
New Zealand	250 Vac	AS 3112 - 1981	2.5 (8.2)	BN19H-2E
South Africa	250 Vac	BS 546	2.5 (8.2)	BN19S-2E
Switzerland	250 Vac	SEV 1011	2.5 (8.2)	BN19E-2E
United Kingdom	250 Vac	BS 1363	2.5 (8.2)	BN19A-2E
United States	125 Vac	NEMA 5-15	3 (9.8)	BN27S-03[1]

[1] This power cord is rated at 15 amps.

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Installation

This chapter describes the installation procedures required to connect the desktop expansion unit to the host, identifies the SCSI cables and connectors, and contains a power on test to ensure the expansion unit is functioning properly.

2.1 Introduction

The information in this chapter is divided into the following sections:

- Unpacking
- SCSI cables and connectors
- The SCSI bus and device addressing
- Connecting the expansion unit to the host system
- Power and cooling
- Power on test

2.2 Unpacking

Before unpacking the expansion unit or its components, check all packing slips to ensure the correct equipment has been shipped. Also, inspect the shipping containers for damage (crushed corners, punctures, and so forth). All boxes and packing material should be retained at the installation site for reshipment. The shipment should contain the following items:

- Expansion unit assembly
- Power cord (see Table 1-1)
- This guide
- StorageWorks SBB user's guide (EK-SBB35-UG)

2.3 SCSI Cables and Connectors

SCSI connectors are used on the ends of SCSI cables and on the equipment to which these cables connect. This section discusses the following SCSI connector topics:

- Low-density and high-density SCSI connectors
- SCSI connector securing mechanisms
- Expansion unit SCSI connectors

2.3.1 Low-Density and High-Density SCSI Connectors

There are two types of SCSI cable connectors used at the host end of the SCSI "A" cable which connects the expansion unit to the host system. The first version of the cable is a 50-pin, low-density connector as shown in Figure 2-1. The second is a smaller 50-pin high-density connector as shown in Figure 2-2. Always determine which type of connector your host system uses before ordering your SCSI cable.

Figure 2-1 50-Pin Low-Density Connector
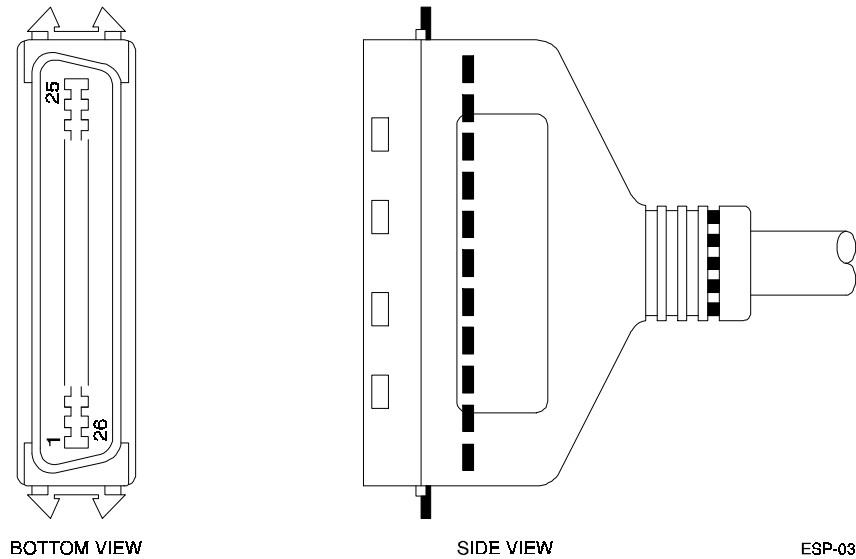
Figure 2-2 50-Pin High-Density Connector
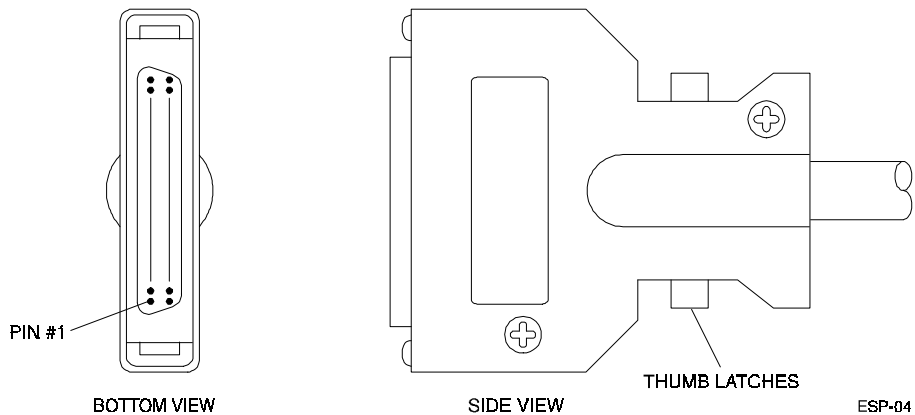
2.3.2 SCSI Connector Securing Mechanisms

Table 2-1 describes the various securing mechanisms used with the StorageWorks expansion unit SCSI connectors.

Table 2-1 SCSI Connector Securing Mechanisms

Connector Type	Straight Connector	Right Angle Connector
50-pin, low-density	Bail locks	Not applicable
50-pin, high density	Thumb Latches	Screw fasteners

2.3.3 Expansion Unit SCSI Connectors

The expansion unit has a SCSI bus in its backplane that supports the SCSI devices that plug into the slots. Two SCSI connectors are located at the rear of the unit (shown in Figure 2-3). One is used to connect the expansion unit to the host system SCSI bus; the other is used when extending a SCSI bus from one expansion unit to another or to another SCSI device.

Figure 2-3 Expansion Unit, Rear View
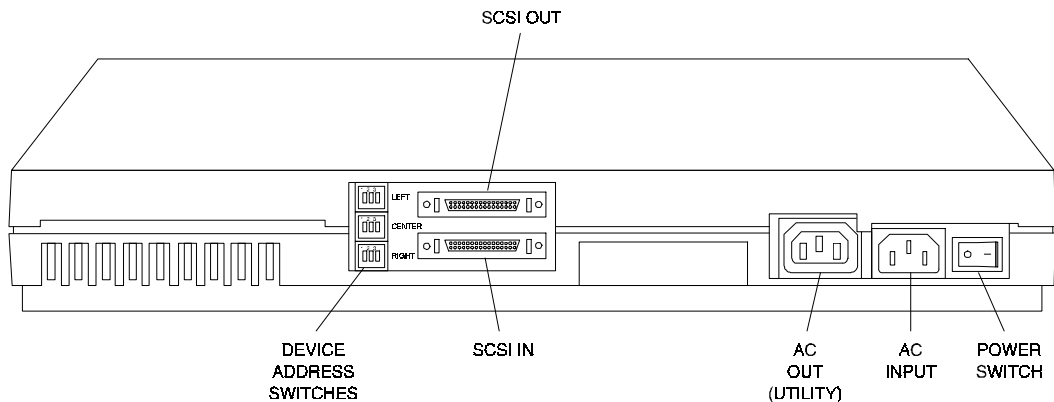
2.3.4 SCSI "A" Cable

The SCSI "A" cable is designed for 8-bit, single-ended communications. Eight-bit refers to the 8-bit wide data bus; single-ended refers to a single-wire-driven signal on the cable as opposed to a differential wire-pair-driven signal. Table 2-2 describes the three types of SCSI "A" cables used with the expansion unit.

Table 2-2 SCSI "A" Cables

Cable	Host Connector	Expansion unit Connector
BN21H	50-pin, high-density, male, straight thumb latches.	50-pin, high-density, male, straight thumb latches.
BN21J	50-pin, high-density, male, right angle 2-56 jackscrews.	50-pin, high-density, male, straight thumb latches.
BC09D	50-pin, low-density, male, bail locks.	50-pin, high-density, male, straight thumb latches.

2.4   The SCSI Bus

The expansion unit uses a single-ended SCSI bus. Bus termination is provided by an internal active terminator. Therefore, there is no requirement for any other termination either on the bus or on the devices. The internal SCSI bus is 0.9 meters (3.0 feet) long. When selecting cables or determining maximum bus operating speed, this dimension must be included in your computations. Table 2-3 lists the SCSI bus lengths and the corresponding bus operating speed.

Table 2-3 Single-Ended SCSI Bus Length vs. Speed

SCSI Bus Length	Data Transfer Rate (Maximum)
3 meters (9.9 feet)	10 MB/s
6 meters (19.7 feet)	5 MB/s

CAUTION

The SCSI bus is only terminated at the controller and at the last device on the bus. When the expansion unit is installed at the end of the bus, it terminates the bus automatically. *External termination of the SCSI bus is not required.*

2.4.1 Device Addressing

You can assign a unique device address of 0 through 7 to each device on the SCSI bus. Use the device address switches at the rear of the unit (Figure 2-4) to assign an unused SCSI device address to each storage device. For example, the left switch shown in Figure 2-4 is set to an address of 2, the center switch to 0, and the right switch to 1.

CAUTION

Some system SCSI controllers have a preset SCSI device address, usually 6 or 7. A SCSI bus cannot operate when two devices have the same address. Check the SCSI controller documentation to determine the controller SCSI address.

The function of each of the three address switches is as follows:

- The top switch sets the left slot device address
- The middle switch sets the center slot device address
- The bottom switch sets the right slot device address

Use the expansion unit device address switch (Figure 2-4) to set the individual device address in accordance with the codes listed in Table 2-3.

Table 2-4 Expansion Unit Device Addresses

Address	Switch 1	Switch 2	Switch 3
0	Off	Off	Off
1	On	Off	Off
2	Off	On	Off
3	On	On	Off
4	Off	Off	On
5	On	Off	On
6	Off	On	On
7	On	On	On

Figure 2-4 Typical Device Address Switch
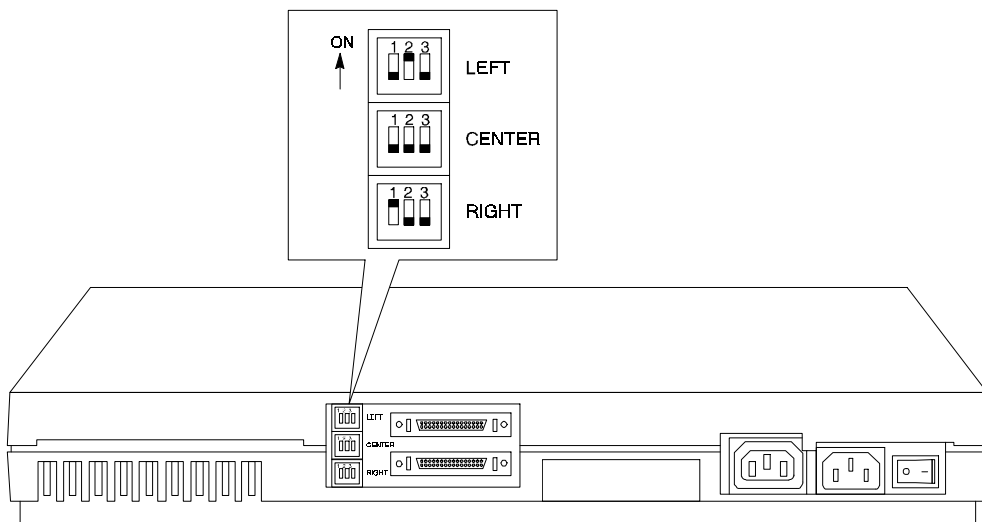
2.5 Expansion Unit Installation

Typically, the expansion unit is installed on top of the CPU with the monitor mounted on top. This configuration ensures that you can view all the status and activity LEDs. It also prevents the keyboard from blocking access to the dustcover door at the front of the expansion unit.

Connecting the expansion unit to the workstation consists of installing the SCSI "A" cable between the expansion unit SCSI connector and the SCSI connector on the host system, making the power cable connections, and then powering on and observing the expansion unit status and SBB LED indicators to ensure the interface

between the expansion unit and the CPU is functioning properly. The information in this section is divided as follows:

- SCSI "A" cable connection
- Power cable connections
- Installing a 3.5-inch SBB
- Installing a 5.25-inch half height SBB device in the right-hand slot

2.5.1 SCSI Cable Connection

Connecting the expansion unit to a host system requires the use of one of the SCSI "A" cables listed in Table 2-2. Figure 2-5 is a connection diagram showing the SCSI "A" cable connection between the expansion unit and the host system.

Figure 2-5 Expansion Unit-to-Host Connection Diagram
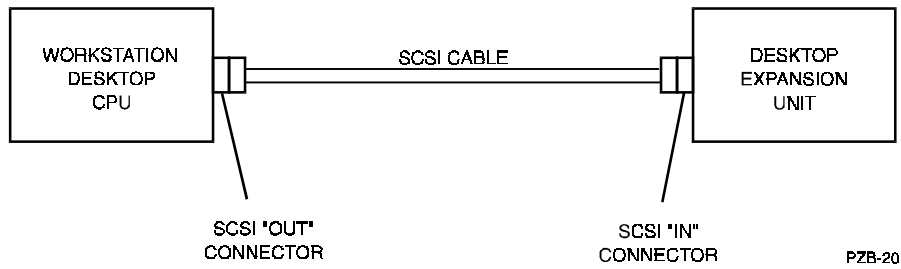
2.5.2 Power Cable Connections

The ac power cable routing for the recommended configuration shown in Figure 2-6. To make the ac power connections between the expansion unit and the workstation, proceed as follows:

1. After configuring the installation as shown in Figure 2-5, connect the workstation ac output connector to the expansion unit ac input connector.

2. Connect the expansion unit ac output to the monitor ac input connector.

Figure 2-6 Power Cable Connections
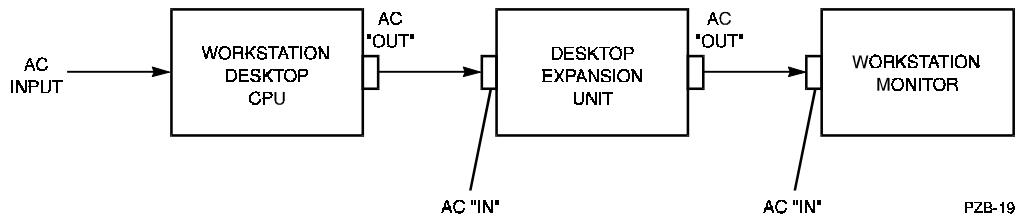
2.5.3 Installing a 3.5-inch SBB

An SBB can be installed with the expansion unit power on (hot installation) or off. To install an SBB, complete the following procedure (Figure 2-7):

CAUTION

Installing or removing an SBB with the expansion unit powered on could result in the loss or corruption of data. Consult the operating system documentation before installing or removing an SBB with the power on.

CAUTION

Ensure the SCSI ID address of the device being installed does not conflict with any other devices on the bus. Refer to Section 2.4.1 to set the SCSI addresses of the SBBs in the three slots of the expansion unit. Also, If the SBB contains an address switch on the back of the device, ensure it is set to automatic before installing the SBB into the expansion unit.

NOTE

The left and center slots in the expansion unit are always used for 3.5-inch SBBs. The right slot is preconfigured to accept a 3.5-inch SBB, but can be reconfigured to install a half-height 5.25-inch storage device at your option (see Section 2.5.4).

Figure 2-7 Installing Storage Devices
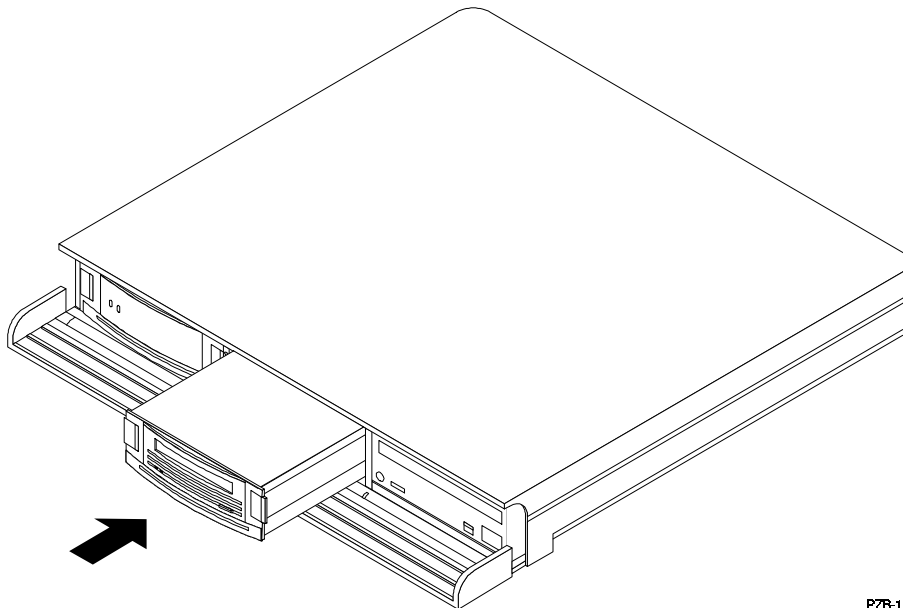
PZB-14

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1. Remove the filler panel(s) from the desired slot(s) by squeezing the side mounting tabs.

2. Insert the SBB into the guide grooves and push it in until the tabs lock into place.

3. If the optional security screws are to be installed, proceed to Section 2.5.3.1 below.

4. Observe the LEDs on the SBB to ensure the unit is operating properly (refer to power on test in Section 2.7 below).

2.5.3.1 Installing Device Security Screws

Security screws are provided with each expansion unit. They are installed through the bottom of the expansion unit into the devices in each slot as shown in Figure 2-8. These screws are used to discourage unauthorized removal of the device. Although these screws would not deter a determined individual from removing the device, they would require the proper tools and access to the bottom of the unit. All three slots have security screws.

Figure 2-8 Device Security Screws
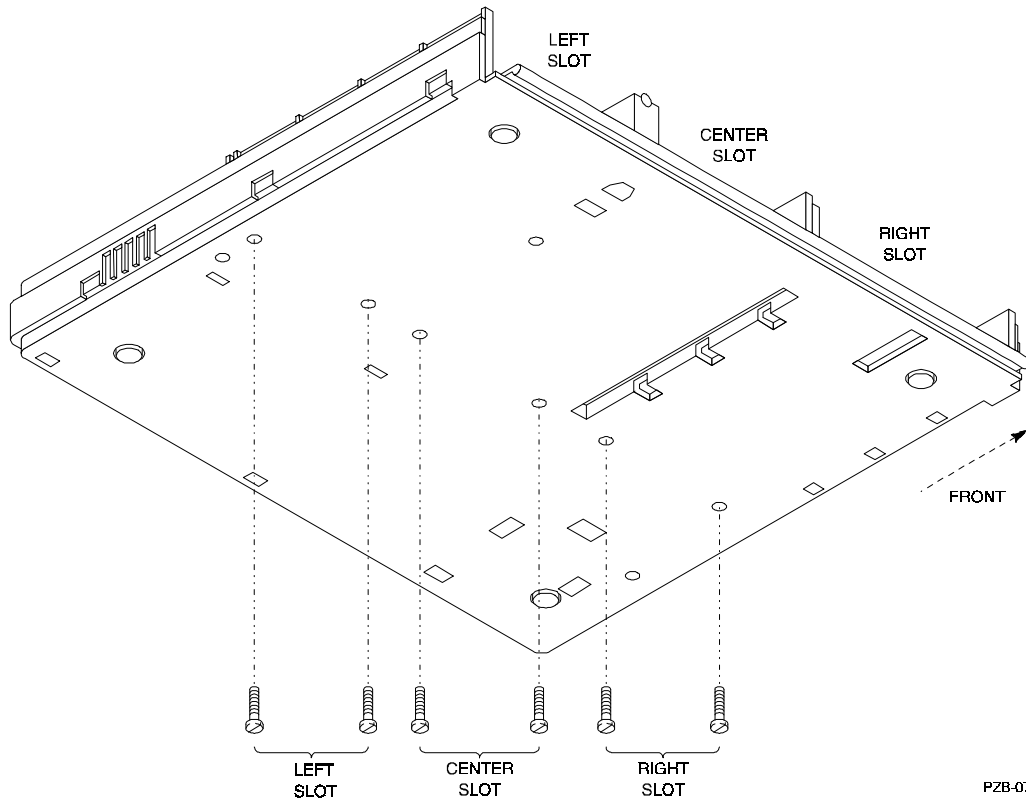
2.5.3.2 SBB SCSI Connector Life Cycle

The SBB connector is a 96-pin female connector that provides positive mating with the SBB slot male connector. The connector design ensures that dc power is present until after the SCSI bus connection is broken and that dc power is applied before the SCSI bus connection is made. This feature protects the integrity of the SCSI data bus and avoids introducing noise on the bus that could either distort data or cause the bus to "hang".

The SBB connector is a simple highly reliable mechanism that supports 200 replacement cycles (removing and replacing an SBB constitutes one replacement cycle). Over the projected StorageWorks product life of 5 years, this equates to 40 replacement cycles per year, or one cycle every nine days. Excessive replacement cycles wear away the gold contact coating and thus destroy the integrity of the connection. The replacement cycle limit applies to both shelf and device connectors.

Installations requiring a greater number of replacement cycles are not supported and are considered as improper treatment. Products or connectors damaged because of a higher number of replacement cycles are not eligible for return under warranty and standard service plans.

Digital Equipment Corporation markets a distinct family of removable storage elements for higher replacement cycle installations.

2.5.4 Installing a 5.25-Inch HH Device in Right-Hand Slot

The right slot in the expansion unit is preconfigured at the factory to accept a 3.5-inch SBB. The right slot is easily converted to accept a 5.25-inch half height device (CD-ROM for example) by removing the top cover from the expansion unit, removing the SBB rails, and repositioning the SCSI backplane connector at the rear of the slot. To reconfigure the right slot for a 5.25-inch device, proceed as follows:

CAUTION

Do not attempt the following procedure unless you have taken proper precautions against electrostatic discharge (ESD). Ensure you wear an ESD grounded wrist strap before removing the cover from any enclosure or device.

---

1. Set the power switch on the rear panel to off and disconnect the SCSI and power cables.

2. *If installed*, remove the right slot security screws from the bottom of the expansion unit (Figure 2-8).

3. Open the front panel dust cover and remove the drive (or filler panel) from the right slot of the expansion unit.

4. Place the expansion unit on a flat surface with the bottom side up and release the cover latch by inserting a flat-blade screwdriver into the hole behind the fan and pushing gently on the screwdriver until the latch releases (Figure 2-9).

5. To remove the cover, reposition the expansion unit right side up and use a flat-tip screwdriver to press the three cover tabs on the left side of the unit (Figure 2-10) and remove cover.

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6. Squeeze the side rail locking tabs on the backside of the backplane to separate the rails from the backplane (Figure 2-11).

Figure 2-9 Cover Latch Release
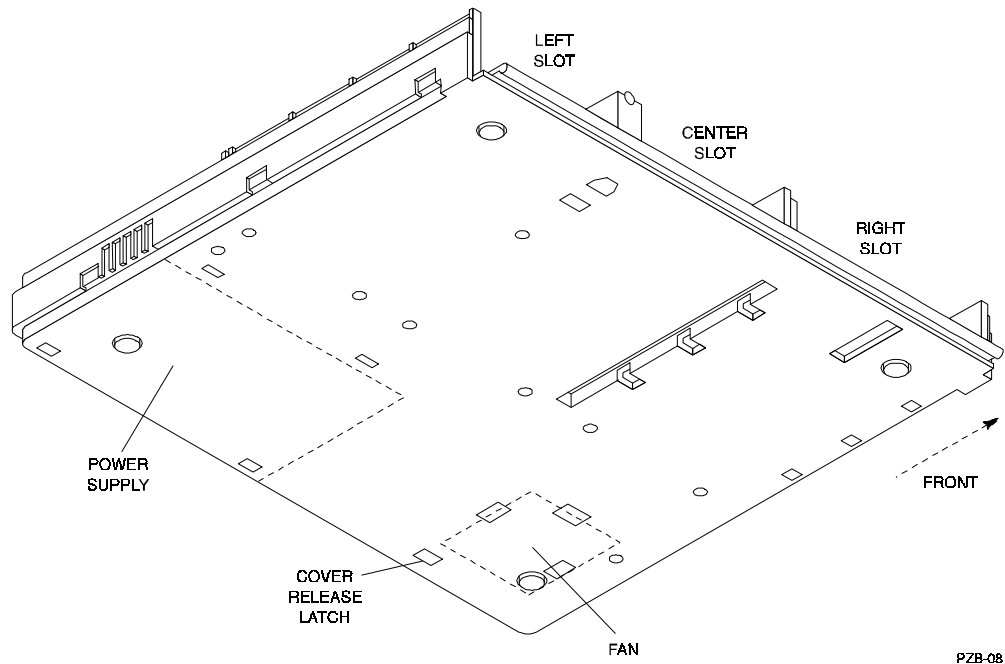
Figure 2-10 Expansion Unit Cover Tabs
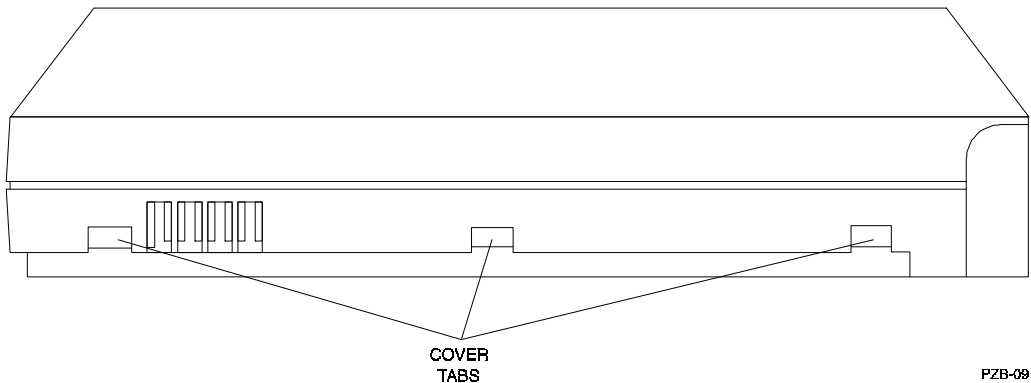
7. Pull the two side rails forward in the right slot to disengage the rail locking tabs and remove both rails (Figure 2-12).

8. Lift the backplane up and place it into the holders at the rear of the slot (Figure 2-13).

NOTE

If you have difficulty installing the cover in the following step, insert your hand into the right storage slot (ensure power is

---

off) and wiggle the backplane until it aligns with the channels in the cover.

9. Replace the cover on the expansion unit.

Figure 2-11 Separating Rails from Backplane.

PZB-15

Figure 2-12 Removing SBB Rails.

SIDE RAILS

PZB-16

Figure 2-13 Repositioning Backplane in Right Slot.

Figure 2-14 Installing 5.25-inch Device.

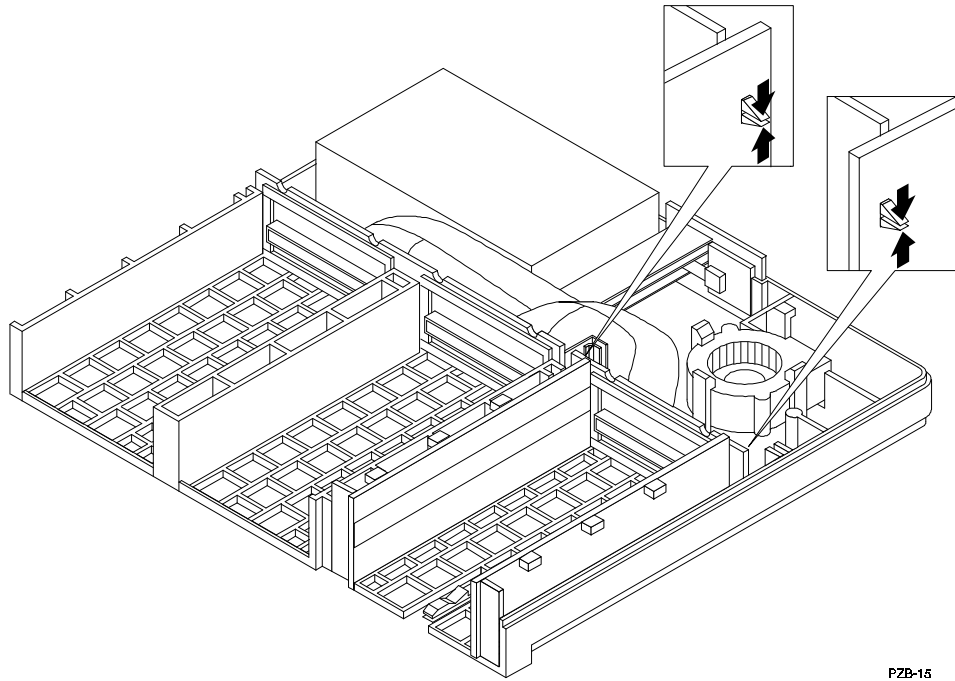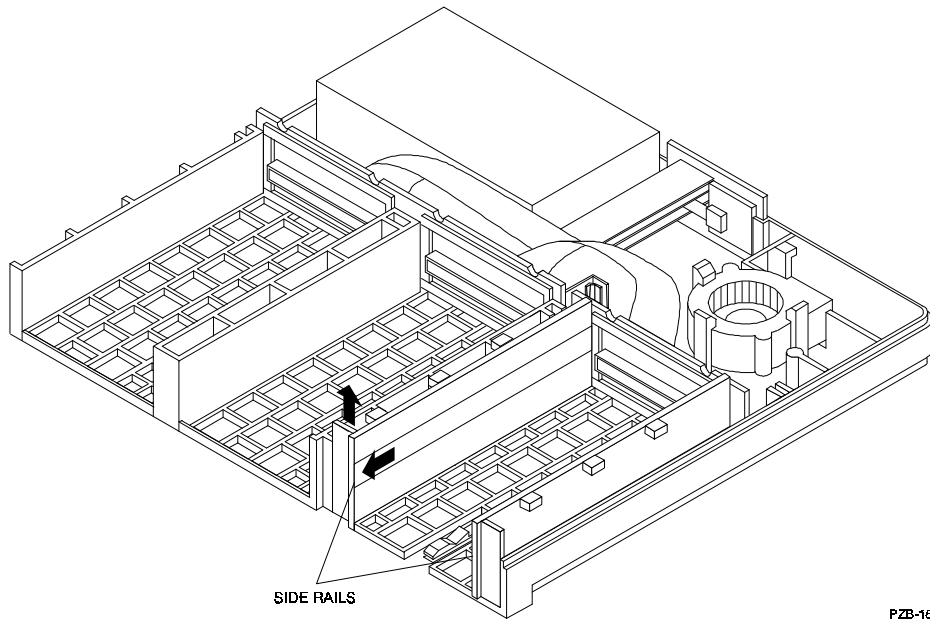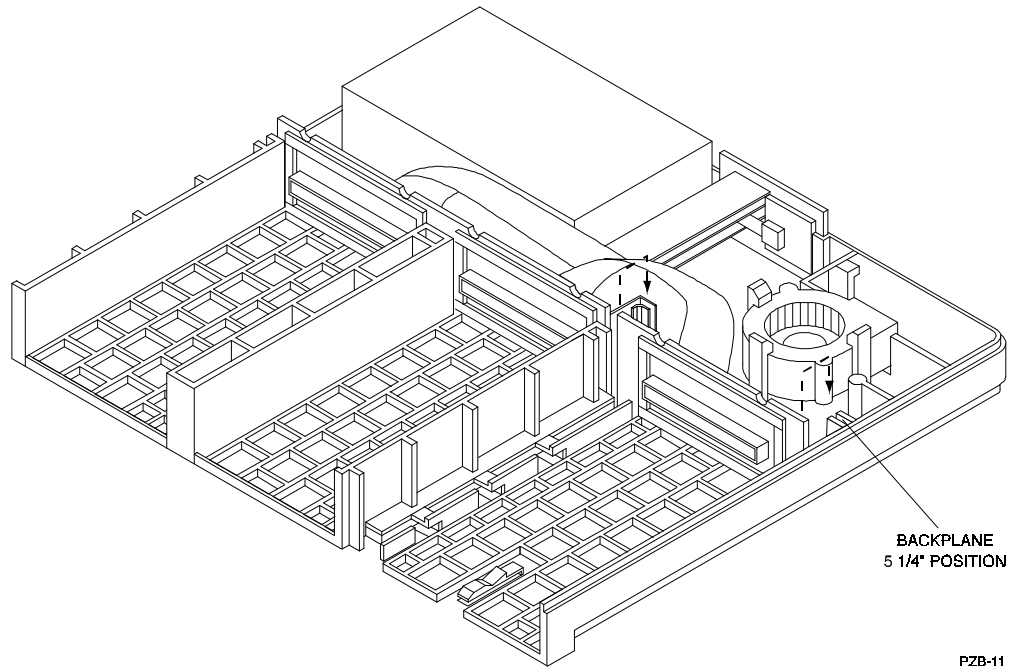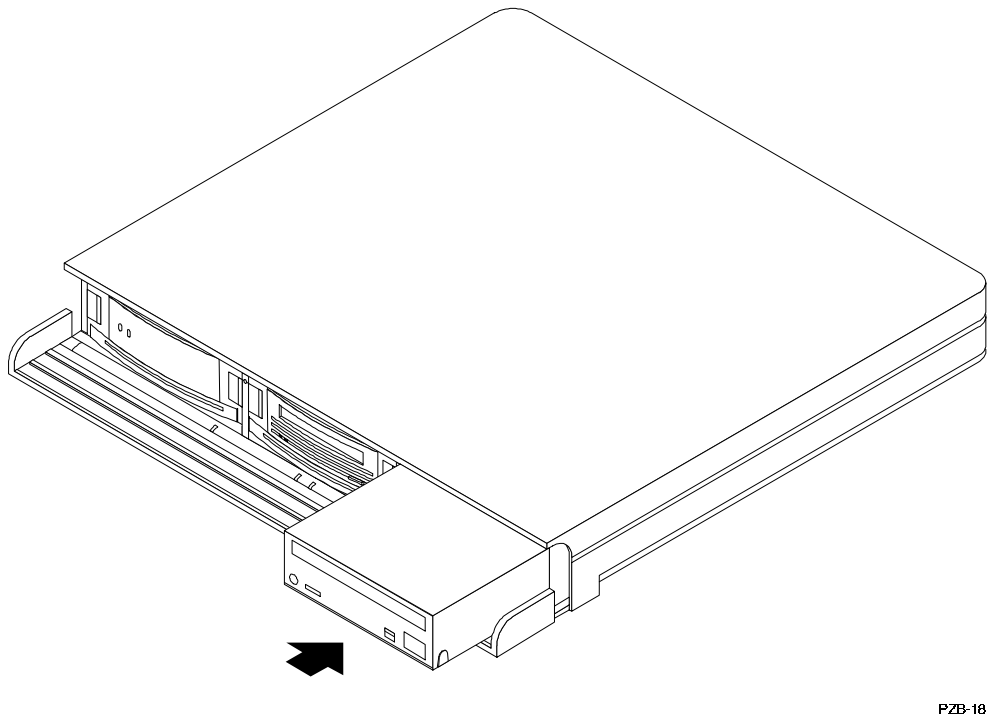10. Install the 5.25-inch device into the right slot by aligning the device into the rails and pushing it back until the SCSI connection is firmly seated (Figure 2-14).

11. If removed in step 2, replace the security screws in the right slot of the expansion unit.

12. Reconnect the SCSI and power cables, set the power switch to on, and ensure the status indicator lights and remains on.

2.5.5 Removing a 5.25-inch HH Device

The 5.25-inch half-height drive is equipped with a retractable handle at the bottom to remove the device if desired. To remove the drive, extend the handle until it stops. Grasp the opening in the handle and continue to pull until the backplane connection is disconnected and remove the drive (Figure 2-15*).*

Figure 2-15 Removing 5.25-inch Device
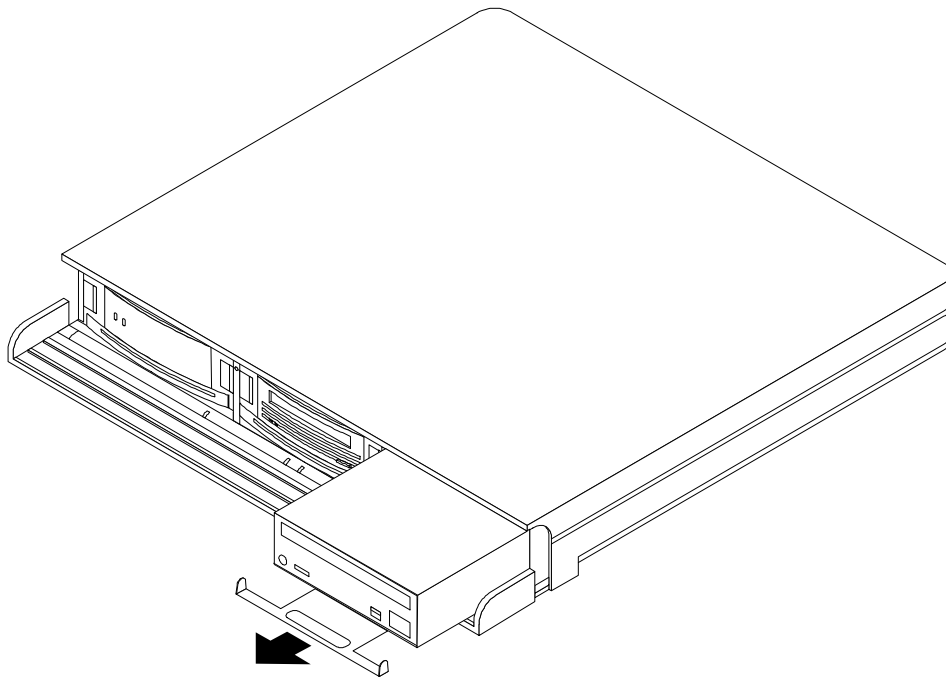
2.6   Power and Cooling

The internal power supply, located in the left rear corner of the expansion unit, is a universal ac input power supply that can operate on either 50 Hz or 60 Hz. It provides +5 Vdc and +12 Vdc for storage device operation.

The +12 Vdc output also powers the internal blower that cools the expansion unit with a front-to-rear air flow at a rate of six cubic feet per minute per slot.

The ac power switch, shown in Figure 2-3, controls the ac input to the dc power supply. The ac voltage to the ac output connector is independent of this switch. Digital recommends that the ac input power be switched controlled, preferably by

the associated workstation or personal computer (PC). Country-specific input ac power cords are listed in Table 1-1.

CAUTION

To prevent overheating, the following conditions must be met:

- Left and center slots must have either an SBB or a blank bezel installed.

- To ensure proper air flow, all slots must have either an SBB or a filler panel installed

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2.7   Power on Test

CAUTION

Care must be taken not to exceed the current capacity of the power supply. It is recommended that you review the electrical specifications of each storage device before the expansion unit is powered on.

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1. Verify that the ac power switch on the expansion unit is in the off position.
2. Verify that the ac input power and the SCSI cable connections between the expansion unit and the host are firmly seated and secure.
3. Turn on the ac power switch and verify that the expansion unit system status LED (Figure 2-16) lights and remains on.
4. Refer to the guides that support your specific storage devices to verify the normal operating functions of the LED indicators on each device.

NOTE

If the drive SBB fault LEDs remain on, this may not necessarily represent a fault condition. It may be necessary to wait until the SBBs have been initialized by the host software.

Figure 2-16 Expansion Unit Status LED

STATUS
LED

PZB-22

3
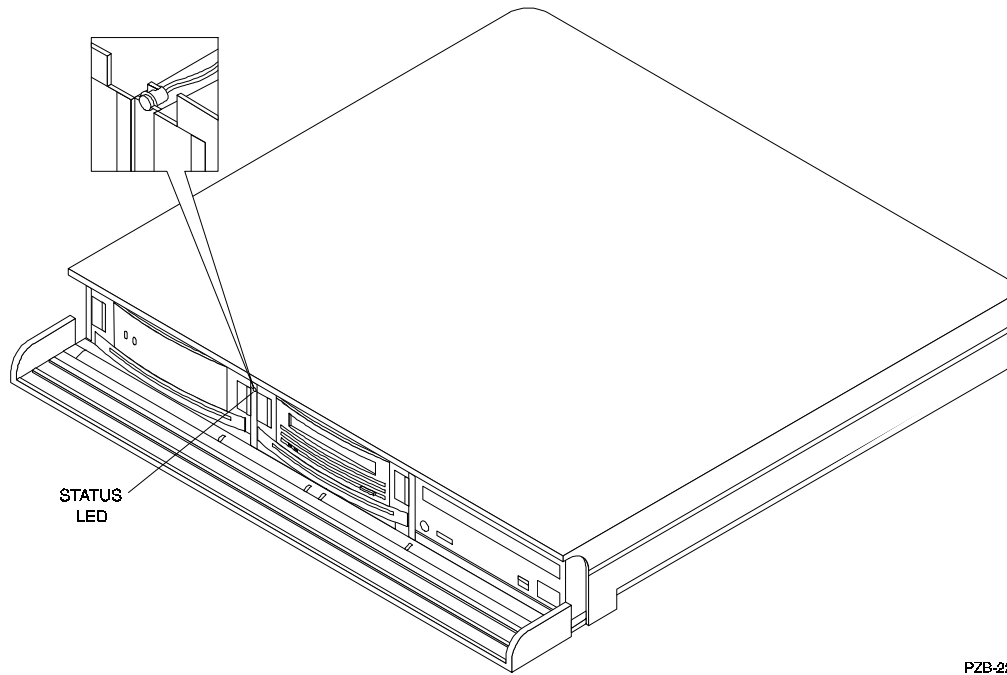
Maintenance

This chapter describes the status of the expansion unit status and SBB LED indicators and how to replace an SBB.

3.1 Expansion Unit Indicators

The expansion unit detects failures caused by an SBB, fan, or power supply. This status is displayed by the expansion unit *status* and storage device light emitting diodes (LEDs). The following sections describe these conditions or failures (their states and functions) and how to interpret the LED displays.

3.1.1 Status LED

The power supply and fan status are displayed on the green LED on the front of the expansion unit (Figure 3-1). The LED indicates a fault when one of the following conditions occur:

- A power supply fault

- A cooling problem

When the dc power supply is functioning properly and the unit fan is at the correct operating speed, the green status LED on the front of the expansion unit is on. When either dc voltage (+5 Vdc or +12 Vdc) is missing or the fan is not operating properly, this LED is off.

3.1.2 SBB Status LEDs

The status of the SBBs in the expansion unit is displayed by the LEDs on the front of the storage devices. The status of the individual SBBs is described in detail in the user's guide supplied with each device. Refer to the applicable guide to verify the operation of the LEDs for the devices in your expansion unit installation.

Figure 3-1 Expansion Unit Status LED
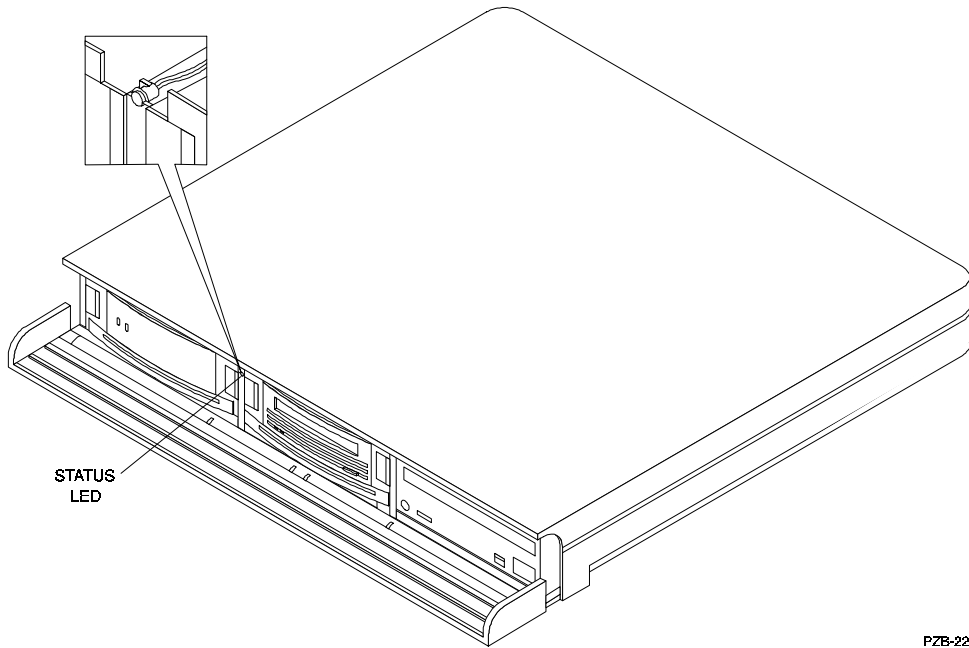
3.2   Replacing a Storage SBB

CAUTION

Once a device has been recognized on the SCSI bus by the host, moving the device to another bus or changing the device address can cause serious problems on the host.

When the *hot-swap* method of device replacement is used, the complete system remains on line and active during device removal and insertion. The device being removed or inserted is the only device that cannot perform operations during this process. However, you should review your storage subsystem documentation to ensure it supports the *hot-swap* method before replacing a device.

When two or more expansion units are connected in series, power can be removed from one unit without disrupting the SCSI bus.

CAUTION

Do not hot-swap a device unless this procedure is supported in your system environment.


CAUTION

Ensure the replacement SBB is the same type as the one being replaced. Also, always use both hands when handling a device and be careful not to touch the device connector to prevent electrostatic discharge damage.

Normally, a storage device is replaced when the device fault indicator is on. To remove or replace a storage device, perform the following procedure.

1. Remove the two security screws shown in Figure 3-3 (*optional*).

2. Press the two SBB mounting tabs in to release the SBB.

3. Suppport the SBB with both hands as you pull it from the expansion unit.

4. Insert the replacement SBB into the guide slots and push it in until it is fully seated and the mounting tabs engage the expansion unit.

5. Install the two device security screws (*optional*).

6. After power is applied, refer to the user's guide for the device and verify that the device status LEDs are operating properly.

Figure 3-2 Device Security Screws
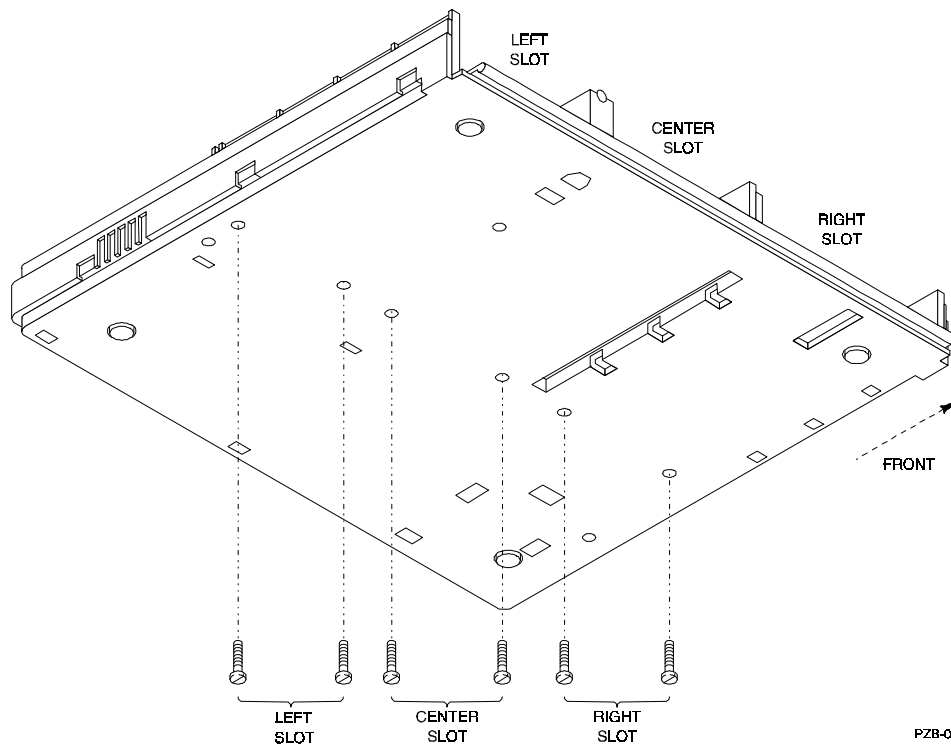
3.3 Maintaining Proper Air Flow

You must maintain sufficient air flow to ensure proper operation of the expansion unit. Removing a defective device may correct an error condition, but can cause a serious cooling problem. To maintain proper air flow, ensure all slots have either an SBB or a filler panel installed.

3.4 Troubleshooting the Expansion Unit

The primary troubleshooting tool in analyzing problems in the expansion unit is the status of the SBB LED indicators or the unit status LED on the front panel. If the expansion unit status LED indicator is off, the power supply or fan is probably at fault. Also, unmount a faulty device and try reseating the unit to ensure a proper connection with the expansion unit slot connector.

3.5 Field Replaceable Parts

The only field replaceable parts in the expansion unit are the three storage devices. If a device is faulty, contact your vendor for a replacement.

A

Specifications

This appendix describes the physical, electrical, cooling, thermal stabilization, and environmental specifications for the StorageWorks Desktop Expansion Unit.

Table A.1 Physical Specifications

Description	Height mm (in)	Width mm (in)	Depth mm (in)	Weight kg (lb)
Desktop Expansion Unit	60 (2.4)	431.8 (17.0)	400 (15.75)	3.5 (7.7)
3.5-inch SBB	121 (4.8)	51 (2.0)	216 (8.5)	1.0 (2.2)

Table A.2 Environmental Specifications

Condition	Specification
Optimum Operating Environment	

Temperature
  Rate of change
  Step change
	+18° to +24° C (+65° to +75° F)
	3° C (5.4° F)
	3° C (5.4° F)

Relative humidity	40% to 60% (non condensing) with a step change of 10% or less (non condensing)
Altitude	From sea level to 2400 m (8000 ft)
Air quality	Maximum particle count 0.5 micron or larger, not to exceed 500 ,000 particles per cubic ft of air
Inlet air volume	0.026 cubic m per second (50 cubic ft per minute)
Maximum Operating Environment (Range)	
Temperature	+10° to +35° C (+50° to +95° F) Derate 1.8° C for each 1000 m (1.0° F for each 1000 ft) of altitude Maximum temperature gradient 11° C/hr (20° F/hr) ±2° C/hr (4° F/hr)
Relative humidity	10% to 90% (non condensing) Maximum wet bulb temperature: 28° C (82° F) Minimum dew point: 2° C (36° F)
Maximum Nonoperating or Storage Environment (Range)	

Temperature
  Non operating
  Storage
	+18° to +29° C (+65° to +85° F)
	-40° to +66° C (-40° to +151° F)

Altitude	From -300 m (-1000 ft) to +3600 m (+12,000 ft) MSL

Table A.3 Electrical Specifications

Item	Specification

AC power supply
  Input
  Output
	100-120/220-240 Vac (auto ranging) 1.4/0.75 A, 46 - 63 Hz
	78 W
	+5 Vdc +/- 5%, 6.0 A
	+12 Vdc +/- 5%, 4.0 A (6 A, peak)

Slot power requirements	+5 Vdc +/- 5%, 2.0 A +12 Vdc +/- 5%, 1.3 A
Fan power requirements	+12 Vdc +/- 5%, 0.2 A
Auxiliary ac output	100 - 120/220 - 240 Vac, 8.0 A, 46 - 63 Hz

Table A.4 Cooling Specifications

Item	Specification
Expansion unit fan	Front-to-rear air flow, 6 CFM per slot

A.1 Environmental Stabilization

To ensure proper operation of Digital storage devices, the SBB temperature must be within 18–29° C (65-85° F). Table A.5 specifies the time required to thermally stabilize SBBs based on the ambient shipping temperature.

CAUTION

Always stabilize storage devices in the operating environment prior to installation or operation. Otherwise, the media or associated electronics may be damaged when power is applied to the unit.

If condensation is visible on the outside of the storage device:

Stabilize the device and the SBB in the operating environment for 6 hours or until the condensation is no longer visible, whichever is longer. Do not insert the storage device into the shelf until it is fully stabilized.

If condensation is not visible on the outside of the storage device:

Thermally stabilize the device for the amount of time specified in Table A.5.

Table A.5 Thermal Stabilization Specifications

Ambient Temp. Range ° C	Ambient Temp. Range ° F	Minimum Stabilization Time
60 to 66	140 to 151	3 hours
50 to 59	122 to 139	2 hours
40 to 49	104 to 121	1 hour
30 to 39	86 to 103	30 minutes
18 to 29	65 to 85	None
10 to 17	50 to 64	30 minutes
0 to 9	32 to 49	1 hour
-10 to -1	14 to 31	2 hours
-20 to -11	-4 to 13	3 hours
-30 to -21	-22 to -5	4 hours
-40 to -31	-40 to -21	5 hours

Glossary

This Glossary provides definitions of commonly used terms in this guide.

controller

A hardware/firmware device that manages communications on behalf of host systems over the SCSI bus to devices. Controllers typically differ by the type of interface to the host and provide functions beyond what the devices support.

desktop expansion unit

A low-profile, SCSI-based unit with self-contained power and cooling that can accommodate three 3.5-inch SBBs. This unit is used with workstations and PCs and can be positioned either adjacent to or beneath the CPU or monitor.

disk

A storage device supporting random access to fixed sized blocks of data.

host

The primary or controlling computer or any such (in a multiple computer network) to which storage is attached.

hot-swap

A method of device replacement whereby the complete system remains on-line during device removal or insertion. Activity may be suspended or paused for a brief period of time during device insertion or removal. Although the hardware is capable of supporting hot-swap, you should consult the operating system documentation before hot-swapping a storage device.

SBB

StorageWorks building block. The basic building block of the StorageWorks product line. Any device conforming to pedestal mechanical and electrical standards installed in either a 3.5-inch or 5.25-inch carrier, is considered to be an SBB, whether it is to be a storage device, a power supply, a CPU, or other device.

SCSI

Small Computer System Interface. This ANSI interface defines the physical and electrical parameters of a parallel I/O bus used to connect computers and devices. The StorageWorks pedestal implementation uses SCSI-2 for the synchronous transfer of 8-bit data at rates of up to 10 MB/s.

single-ended SCSI bus

Each signal's logic level is determined by the voltage of a single wire in relation to ground.

Small Computer System Interface
See *SCSI.*

storage array
An integrated set of storage devices.

supported device
(1) A device that has been fully evaluated in an approved StorageWorks configuration, (pedestal, power supply, cabling, etc.) and is in complete compliance with country-specific standards (for example, FCC, TUV, etc.) and with all Digital standards. (2) A device supported by a controller or host operating system.

tape
A storage device supporting sequential access to variable sized data records.

target
A SCSI device that performs an operation requested by an initiator.

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