

StorageWorks™ Solutions

BA353–Ax Desktop Expansion Unit User's Guide

Order Number: EK–BA353–UG. C01

Part I of this manual describes the BA353–Ax StorageWorks desktop expansion unit product line features, configurations, operations, and installation.

Part II describes the procedures to be performed by trained personnel to exchange 5¼-inch, half-height devices, and 3½-inch StorageWorks building blocks (SBBs).

April 1994

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Preface

This manual describes the BA353–Ax StorageWorks™ expansion unit product line features, configurations, operations, and installation. This manual also describes the procedures to be performed by trained personnel to exchange 5¼-inch, half-height devices and 3½-inch StorageWorks building blocks (SBBs).

Intended Audience

This manual is intended for use by personnel who are responsible for operating, maintaining, and installing the StorageWorks desktop expansion unit.

Structure

This manual is organized as follows:

Part I Desktop Expansion Unit User's Guide

Chapter 1	Describes the desktop expansion unit features, configurations, and cable requirements.
Chapter 2	Describes the operation and status indicators for the desktop expansion unit.
Chapter 3	Describes the installation of the desktop expansion unit and the removal and installation of storage device SBBs.

Part II Desktop Expansion Unit Service Guide

Chapter 4	Describes the procedures for modifying slot 3 from a 5¼-inch, half-height (HH) storage device to accept a 3½-inch SBBs.
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Appendix

Appendix A	Describes the physical, electrical, and environmental specifications, and the procedures for stabilizing storage devices.
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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.
<i>italic type</i>	Italic type indicates emphasis and complete manual titles. In the glossary, italic type is also used to indicate cross-references.

Related Documents

Table 1 lists the StorageWorks related user documents organized by use, system, or product.

Table 1 StorageWorks Related Documentation

Document Title	Order Number
StorageWorks Primary Publications†	
<i>StorageWorks Solutions Configuration Guide</i>	EK-BA350-CG
<i>StorageWorks Solutions Shelf and SBB User's Guide</i>	EK-BA350-UG
<i>StorageWorks Family 3½-inch Half-Height Device Installation Guide</i>	EK-MC350-IG
<i>RRD42 Disk Drive Owner's Manual</i>	EK-RRD42-OM
<i>RRD43 CD-ROM User's Guide</i>	EK-RRD43-IN
<i>RRD44 CD-ROM User's Guide</i>	EK-RRD44-IN
<i>SWXTE StorageWorks 8505 8mm Cartridge Tape Subsystem User's Guide</i>	EK-STWCT-UG
<i>TZ30 Cartridge Tape Drive Operator's Manual</i>	EK-OTZ30-OM
<i>TZ30 Cartridge Tape Drive Reference Card</i>	EK-OTZ30-RC
<i>TZ30 Cartridge Tape Drive Technical Manual</i>	EK-OTZ30-TM
<i>TZK11 Tape Backup System User Guide</i>	EK-TZK11-UG
General Reference Publications	
<i>Digital Systems and Options Catalog</i>	†
<i>Small Computer System Interface, An Overview</i>	EK-SCSIS-OV
<i>Small Computer System Interface, A Developer's Guide</i>	EK-SCSIS-DK

† Available from your Digital account representative.

Manufacturer's Declarations

The equipment described in this manual is listed by Underwriter Laboratories Inc. and bears the UL listing mark. The unit is also certified by the Canadian Standard Association and the TUEV Product Service GmbH and bears the Canadian Certification Mark and the TUEV GS mark.

CAUTION

This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

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Part I

Desktop Expansion Unit User's Guide

Part I introduces the BA353–Ax StorageWorks desktop expansion unit and describes how to configure, operate, and install the unit.

Desktop Expansion Unit Overview

This chapter describes the StorageWorks BA353–Ax **desktop expansion unit** configurations, **Small Computer System Interface (SCSI)** and power cable requirements, and storage device variants.

The StorageWorks BA353–Ax desktop expansion unit (shown in Figure 1–1) is a low-profile, SCSI-based unit with self-contained power and cooling. It can accommodate either two 3½-inch **StorageWorks building blocks (SBBs)** and one 5¼-inch, **half-height** storage device¹, or three 3½-inch SBBs.

Figure 1–1 BA353–Ax Desktop Expansion Unit



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The footprint of the desktop expansion unit is no larger than a typical central processing unit (CPU). It can support up to 45 kg (99 lb) 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, as shown in Figure 1–2. An advantage of using this configuration is that you can see the status of the SBB light emitting diodes (LEDs) and the desktop expansion unit LED.

¹ The 5¼-inch storage device is not mounted in an SBB.

Figure 1–2 Typical Desktop Expansion Unit Installation



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1.1 Configurations

All desktop expansion units include the following:

- A universal ac input power supply²
- A cooling fan

The standard desktop expansion unit configurations, shown in Table 1–1, do not include any 3½-inch SBBs. These optional storage devices are ordered separately.

Table 1–1 Desktop Expansion Unit Configurations

Model No.	Included Storage Devices
BA353-AA	N/A
BA353-AD	RRD44-VE CD-ROM
BA353-AE	RRD43-VE CD-ROM
BA353-AF	RRD42-VE CD-ROM
BA353-AH	TZ30-VE cartridge tape drive
BA353-AJ	TZK11-VE cartridge tape drive
BA353-AP	SWXTE-AC cartridge tape drive

² Requires a country-specific ac power cord.

Table 1–2 lists the specifications for the devices included as variants for use with the desktop expansion unit. For additional information concerning other storage devices, SCSI cables, and compatible systems, refer to the following manuals:

- *StorageWorks Solution Configuration Guide*
- *StorageWorks Solution Shelf and SBB User's Guide*
- *Digital Systems and Options Catalog*

Table 1–2 Desktop Expansion Unit Included Storage Device Specifications

Device Type	Capacity	Transfer Rate	Maximum SCSI Transfer Rate
RRD42–VE CD–ROM	600 MB	150 KB/s	5 MB
RRD43–VE CD–ROM	600 MB	150/300 KB/s	5 MB
RRD44–VE CD–ROM	600 MB	150/330 KB/s	5 MB
SWXTE–AC cartridge tape drive	10 GB	1 MB	5 MB
TZ30–VE cartridge tape drive	95 MB	62.5 KB/s	5 MB
TZK11–VE cartridge tape drive	62.5 GB	300 KB/s	3 MB

1.2 Configuration Rules

There are no unique configuration rules for the desktop expansion unit. Refer to the *StorageWorks Solutions Configuration Guide* for the general StorageWorks configuration rules.

1.3 Power Cord Requirements

Power cords must be ordered separately. The internal power supply, located at the left rear corner of the desktop expansion unit, is a universal ac input supply that can operate on input power of 100–120 V ac or 220–240 V ac auto ranging, 43 to 63 Hz. Country-specific input ac power cords are listed in Table 1–3. For a complete description of the country-specific power cord requirements, refer to the *StorageWorks Solutions Configuration Guide*.

Table 1–3 Country-Specific Power Cords

Country	Voltage	Plug	Length	Order No.
Australia	250 V ac	AS 3112 - 1981	2.5 m (8.2 ft)	BN19H–2E
Central Europe	250 V ac	CEE 7/7 (Schuko)	2.5 m (8.2 ft)	BN19W–2E
Denmark	250 V ac	Afsnit 107	2.5 m (8.2 ft)	BN19K–2E
Europe—Central	250 V ac	CEE 7/7 (Schuko)	2.5 m (8.2 ft)	BN19W–2E
India	250 V ac	BS 546	2.5 m (8.2 ft)	BN19S–2E
Ireland	250 V ac	BS 1363	2.5 m (8.2 ft)	BN19A–2E
Israel	250 V ac	SI 32	2.5 m (8.2 ft)	BN18L–2E
Italy	250 V ac	CEI 213–16/VII	2.5 m (8.2 ft)	BN19M–2E
Japan	125 V ac	NEMA 5–15	3.0 m (9.8 ft)	BN27S–03†

† This power cord is rated at 15 amps.

(continued on next page)

Table 1–3 (Cont.) Country-Specific Power Cords

Country	Voltage	Plug	Length	Order No.
New Zealand	250 V ac	AS 3112 - 1981	2.5 m (8.2 ft)	BN19H–2E
South Africa	250 V ac	BS 546	2.5 m (8.2 ft)	BN19S–2E
Switzerland	250 V ac	SEV 1011	2.5 m (8.2 ft)	BN19E–2E
United Kingdom	250 V ac	BS 1363	2.5 m (8.2 ft)	BN19A–2E
United States	125 V ac	NEMA 5–15	3.0 m (9.8 ft)	BN27S–03 †

† This power cord is rated at 15 amps.

1.4 SCSI Cable Requirements

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

To select the correct SCSI cables for a desktop system, complete the following steps:

1. Identify the host computer system.
2. Identify the host computer SCSI adapter.
3. Determine the maximum SCSI bus length based upon bus speed (that is, either fast [10 MB/s] or slow [5 MB/s]).
4. Determine the total SCSI bus length for all the desktop expansion units.
5. Determine the maximum SCSI cable length.
6. Select the SCSI cables. See Table 1–4 for the cable lengths and the order numbers. The SCSI cable connectors are shown in Figures 1–3 through 1–6.

Table 1–4 SCSI “A” Cable Specifications

Cable Description	Length	Cable Order No.
Standard cable, 50-conductor	0.3 m (1.0 ft)	BN21H–0C
• Two 50-pin, high-density, male, straight connectors	0.5 m (1.6 ft)	BN21H–0E
	1.0 m (3.3 ft)	BN21H–01
	1.5 m (4.8 ft)	BN21H–1E
	2.0 m (6.5 ft)	BN21H–02
	3.0 m (9.8 ft)	BN21H–03
	5.0 m (16.4 ft)	BN21H–05
	10.0 m (32.8 ft)	BN21H–10
	15.0 m (49.2 ft)	BN21H–15
	20.0 m (65.6 ft)	BN21H–20

(continued on next page)

Table 1–4 (Cont.) SCSI “A” Cable Specifications

Cable Description	Length	Cable Order No.
HSC™ controller to StorageWorks shelf cable, 50-conductor	2.0 m (6.5 ft)	BN31B-02
• One 50-pin, high-density, male, straight connector with thumb latches	3.0 m (9.8 ft)	BN31B-03
• One 50-pin, high-density, male, straight connector with thumb screws		
Adapter cable, 50-conductor	2.0 m (6.5 ft)	BN21R-02
• One 50-pin, high-density, male, straight connector	3.0 m (9.8 ft)	BN21R-03
• One 50-pin, low-density, male, right-angle connector	5.0 m (16.4 ft)	BN21R-05
Adapter cable, 50-conductor	0.9 m (3.0 ft)	BC09D-03
• One 50-pin, high-density, male, straight connector	1.8 m (6.0 ft)	BC09D-06
• One 50-pin, low-density, male, straight connector	3.7 m (12.0 ft)	BC09D-12

The *StorageWorks Solutions Configuration Guide* describes the SCSI cables and also lists the cables required to connect specific hosts and controllers to StorageWorks products.

You can connect two or more desktop expansion units in series provided the following conditions are met:

NOTE

The internal 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

- The total length of a SCSI bus transferring data at 10 MB/s is a maximum of 3.0 m (9.8 ft).
- The total length of a SCSI bus transferring data at 5 MB/s is a maximum of 6.0 m (19.7 ft).
- There are seven or fewer devices on the bus.
- No two devices on the SCSI bus have the same SCSI ID.

Figure 1-3 50-Conductor Standard Cable BN21H

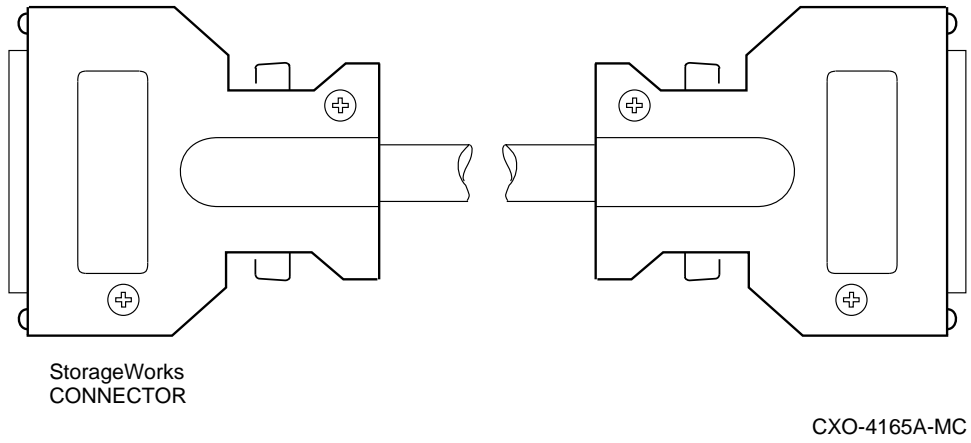


Figure 1-4 50-Conductor Adapter Cable BN31B

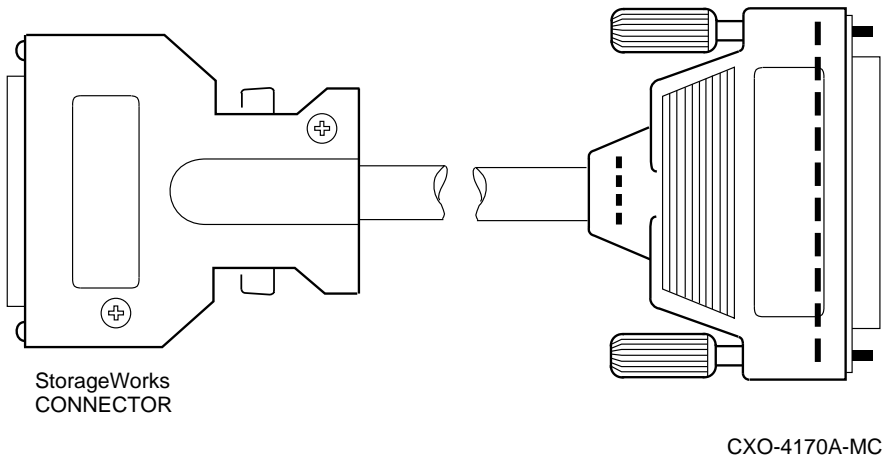


Figure 1-5 50-Conductor Adapter Cable BN21R

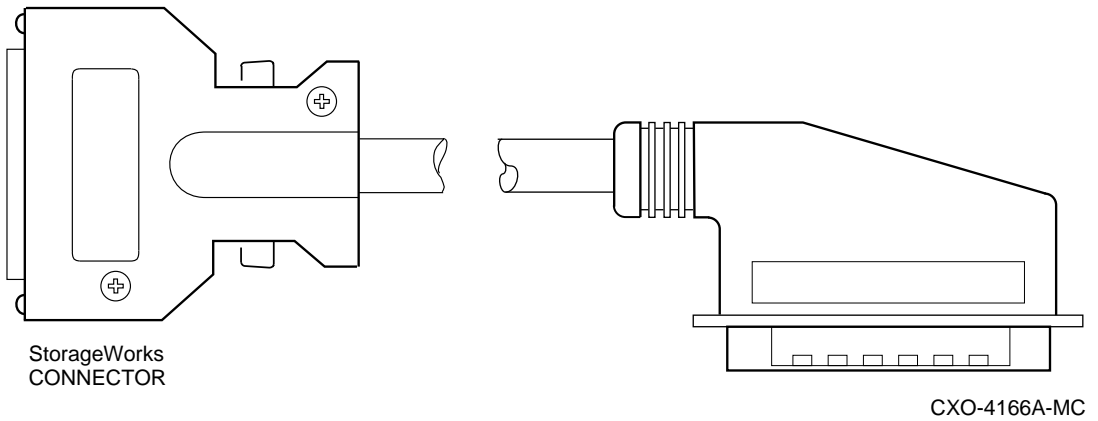
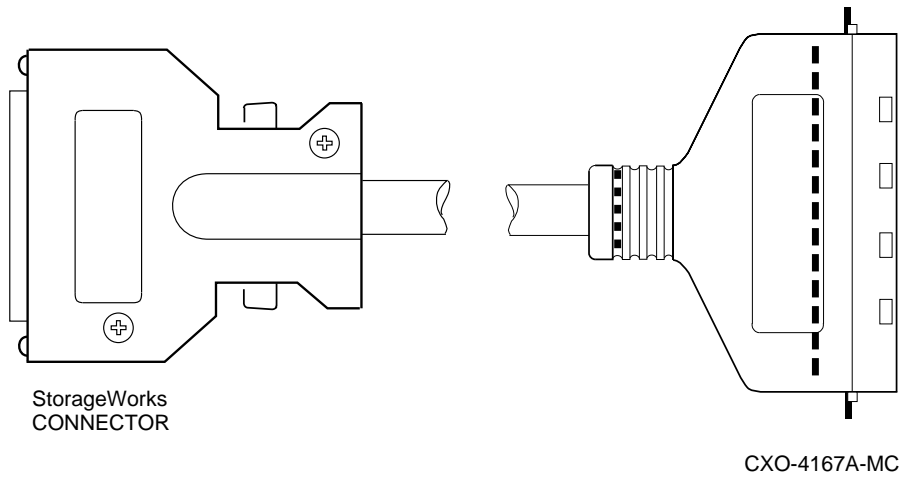


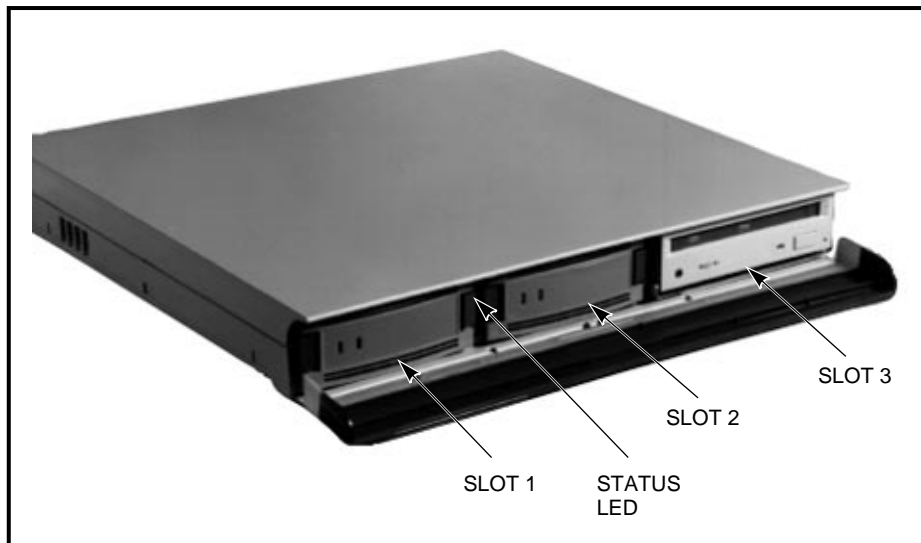
Figure 1-6 50-Conductor Adapter Cable BC09D



1.5 Storage Device Requirements

Any StorageWorks 3½-inch SBB or 5¼-inch, half-height storage device can be installed in the desktop expansion unit. The SBBs can be installed in any slot. As shown in Figure 1-7, the last slot on the right (slot 3) can accommodate either a 3½-inch SBB or a 5¼-inch, half-height storage device. Trained personnel (for example, Digital Multivendor Customer Services representatives) can convert this slot to use a different form factor device.

Figure 1-7 Typical Desktop Expansion Unit Devices Installation



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Desktop Expansion Unit Operations

This chapter describes the basic StorageWorks desktop expansion unit operations.

- Section 2.1 describes the desktop expansion unit ac power requirements, dc power supply, and cooling.
- Section 2.2 describes the desktop expansion unit status indicators.
- Section 2.3 describes the desktop expansion unit's Small Computer System Interface (SCSI) bus, device addressing, and SCSI bus termination.

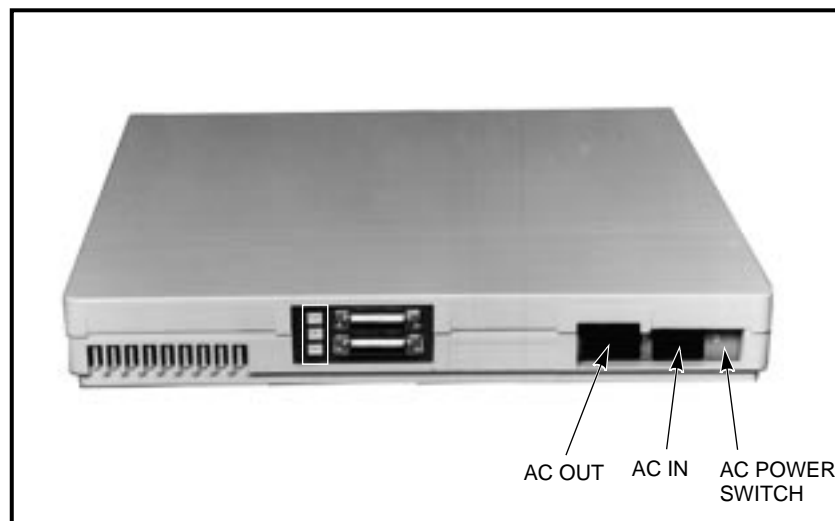
2.1 Enclosure Power and Cooling Status Display

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

The +12 V dc also powers the internal blower that cools the desktop expansion unit with a front to rear air flow at a rate of three cubic feet per minute per slot.

The ac power switch, as shown in Figure 2–1, 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 switch controlled, preferably by the associated workstation or personal computer (PC).

Figure 2–1 Desktop Expansion Unit AC Power Components

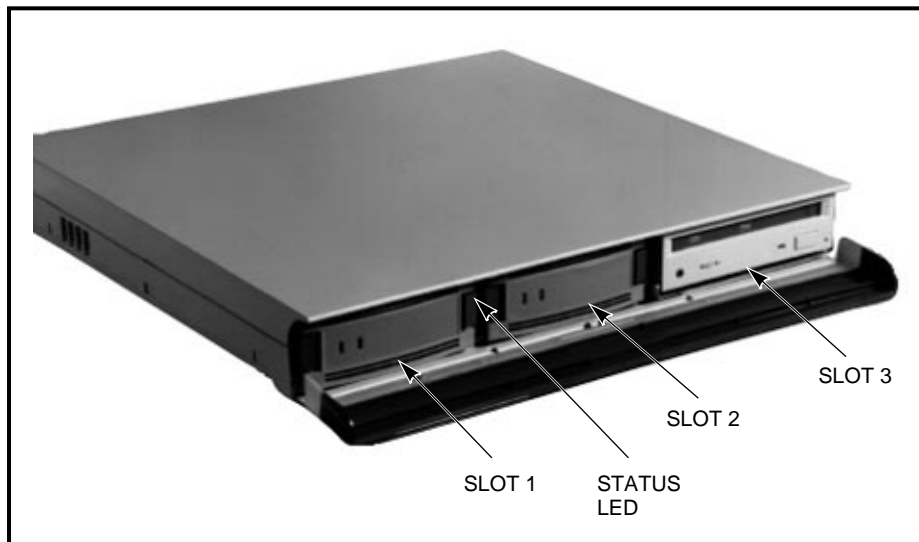


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The desktop expansion unit status light emitting diode (LED), mounted between the leftmost StorageWorks building blocks (SBBs) (slots 1 and 2) (see Figure 2–2), is on when the system blower is operating and both the +5 V dc and +12 V dc power supply outputs are present. When any of these conditions are not met, the desktop expansion unit status LED is off and power is removed from the SBBs and devices.

There are no diagnostics for the desktop expansion unit; it is basically a “Go” or “No Go” unit. Neither the power supply or the fan within the desktop expansion unit are field replaceable units (FRUs). Should either of these devices fail, contact Digital Multivendor Customer Services.

Figure 2–2 Desktop Expansion Unit—Status LED



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2.2 SBB and Device Status Indicators

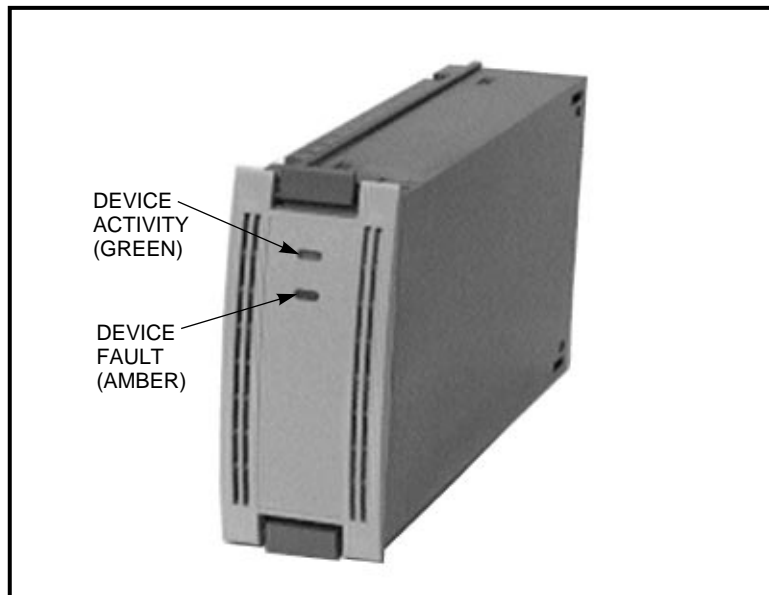
The storage device status is displayed on the fronts of the 5¼-inch, half-height storage device and 3½-inch SBBs. The status display for each of the 5¼-inch, half-height storage devices is device specific and is described in the specific device’s user’s guide.

Each 3½-inch SBB has two LEDs that indicate the SCSI device activity and the SCSI device status. As shown in Figure 2–3, each 3½-inch SBB has a device activity LED (green) and a device fault LED (amber) that display the disk drive status. These two LEDs have three states: on, off, and flashing.

NOTE

Other devices, such as the TLZ06–VA tape drive, have device-specific displays. See the device’s user’s guide for a description of these status displays.

Figure 2–3 Storage SBB Activity and Device Fault LEDs



CXO-3671A-PH

Device status can be determined by the activity and device fault LEDs as follows:

- When the green device activity LED is on or flashing, the device is active. This LED is controlled by the device.

CAUTION

Removing a storage device while data is being transferred (the green LED is on or flashing) can corrupt or lose the data.

- When the amber device fault LED is on steadily, an error condition exists.
- When the amber device fault LED is flashing, one of the following conditions may exist:
 - The device is spinning up.
 - The device is spinning down.
 - The controller is checking the device address.

NOTE

Not all SCSI controllers can control the device fault LED. Check the controller documentation to determine if this function is available.

When a fault occurs, the controller reports the fault type and the SBB device address (SCSI target ID) to the host.

2.3 The SCSI Bus

The desktop 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) and therefore, the maximum SCSI bus length
- The valid **SCSI device** addresses (**target IDs**)
- The operation of SBB status LEDs
- The valid SBB replacement methods—**hot-swap**, **warm-swap**, or **cold-swap** (See Section 3.3 for more information on these methods.)

2.3.1 Terminating SCSI Buses

The desktop expansion unit uses a single-ended SCSI-2 bus. Bus termination is supplied by an internal, active terminator. 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.

All SCSI buses are terminated at both ends to provide reliable operation. The last desktop expansion unit on the bus always terminates the bus.

Connecting a second desktop expansion unit to the output 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.

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

Note

SCSI buses are terminated only at the controller and within the desktop expansion unit. The SCSI bus is always terminated by the last desktop expansion unit on the bus. External termination of the SCSI bus is not required.

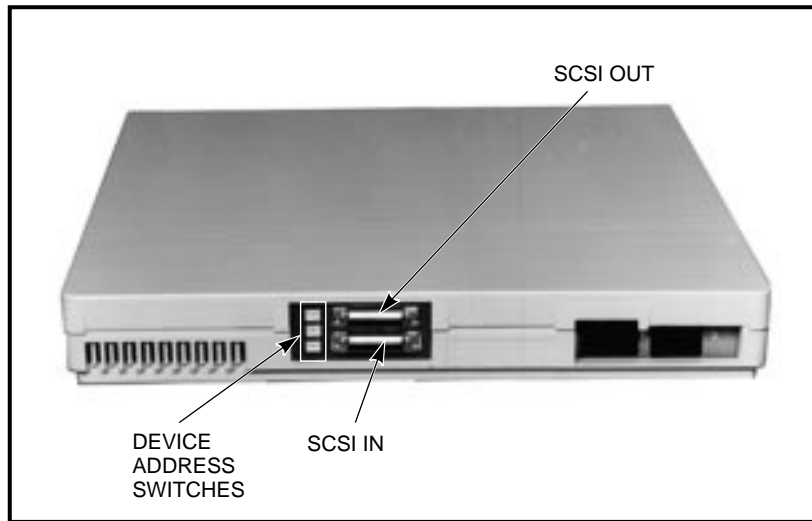
2.3.2 Device Addressing

You can assign a unique device address of 0 through 7 to each device on the SCSI bus. Use the three device address switches on the rear of the unit, as shown in Figure 2-4, to assign an unused SCSI device address to each storage device.

Note

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.

Figure 2-4 Desktop Expansion Unit SCSI Bus Components



CXO-3928A-PH

Figure 2-5 shows a typical device address switch. Use Table 2-1 to set the device address switch positions.

Figure 2-5 Typical Device Address Switch



CXO-3804-MC

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

- The top switch (left) sets the slot 1 device address.
- The middle switch (center) sets the slot 2 device address.
- The bottom switch (right) sets the slot 3 device address.

Table 2–1 Desktop Expansion Unit Device Addresses

Address	Switch		
	1	2	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

2.3.3 TZ30–VE 5¼-Inch Cartridge Tape Drive

The TZ30–VE cartridge tape drive does not support remote device addressing. Only the local TZ30–VE device address switches (accessible through a hole on the right side of the unit) are used to set the device address.

NOTE

Refer to the *TZ30 Cartridge Tape Technical Manual* for a complete description of the TZ30 switches.

Use the following procedure to set the device address:

Note

Switch 1 (the top switch) has no SCSI ID function and does not need to be set.

Switches 2, 3, and 4 (the bottom three switches) set the device address. Switch 4 is the least significant bit (LSB) and switch 2 is the most significant bit (MSB).

1. Set the switch to the right (rear) to 0.
2. Set the switch to the left (front) to 1.

The desktop expansion unit slot 3 (right) device address switch is not used for the TZ30–VE but may be set to the TZ30–VE address for convenience.

Desktop Expansion Unit Installation

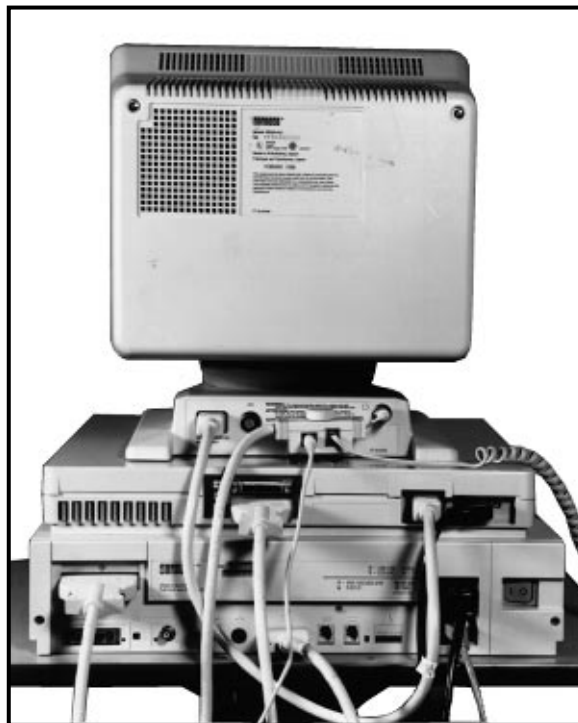
This chapter describes the preferred desktop expansion unit installation and the procedures for installing, removing, and exchanging 5¼-inch, half-height storage devices, and 3½-inch StorageWorks building blocks (SBBs).

3.1 Desktop Expansion Unit Installation

Typically, the desktop expansion unit is installed on top of the CPU with the monitor mounted on top. This configuration allows you to view all the status LEDs on the CPU and desktop expansion unit.

The following procedures explain how to cable a preferred system installation as shown in Figure 3-1.

Figure 3-1 Typical Workstation Installation—Rear View



CXO-3694A_PH

Connect the ac power cord as follows:

1. Connect the desktop expansion unit ac power cord to the workstation ac output connector and then to the desktop expansion unit ac input connector.

2. Connect the monitor ac power cord to the desktop expansion unit ac output connector and then to the monitor ac input connector if required.

Connect the SCSI cable as follows:

1. Connect the 50-pin, high-density cable connector to the SCSI INPUT connector on the rear of the desktop expansion unit. Connect the other end of the cable to the host or controller SCSI connector. Refer to Section 1.4 for information on selecting a SCSI cable.
2. If additional desktop expansion units are connected, connect a 50-pin, high-density SCSI cable from the SCSI OUTPUT connector of the first desktop expansion to the SCSI INPUT connector on the rear of the second desktop expansion unit. Refer to Section 1.4 for information on configuring two or more desktop expansion units.

Using this configuration permits you to sequentially apply power to the workstation, and then to the desktop expansion unit and monitor.

3.2 Installing a 3½-Inch SBB

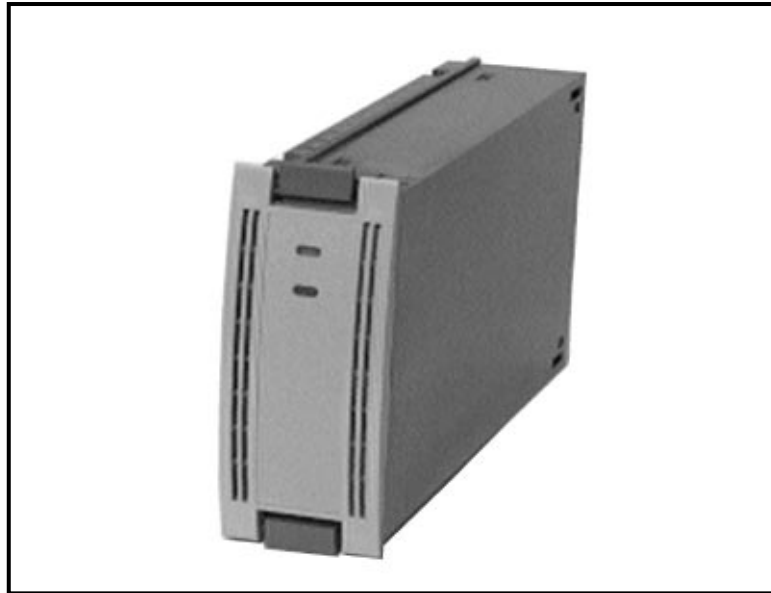
A 3½-inch SBB, as shown in Figure 3–2, is the same as the 3½-inch SBBs used with other StorageWorks products. The 3½-inch SBB is mounted horizontally with the status LEDs to the left. This has no effect on the operation of the storage device.

Note

Slots 1 and 2 are always used for 3½-inch SBBs. Slot 3 can be used for either a 5¼-inch, half-height storage device or a 3½-inch SBB. See Chapter 4 for the backplane connector positioning procedure.

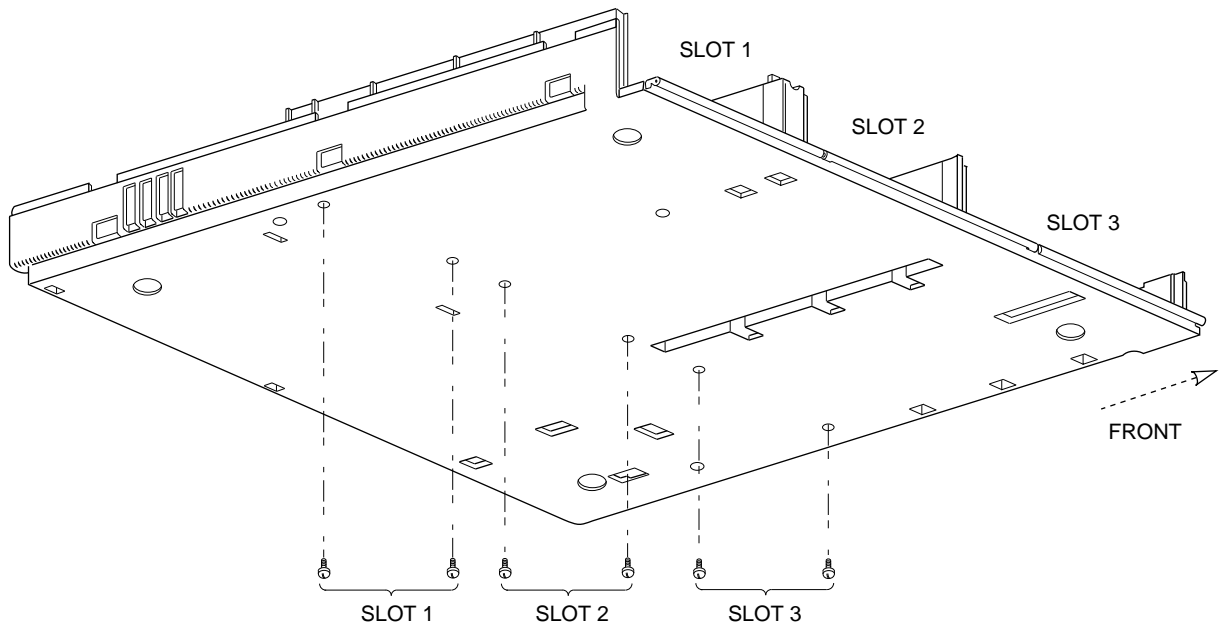
Security screws are provided with each desktop expansion unit. They can be installed through the bottom of the expansion unit into the storage devices in each slot, as shown in Figure 3–3. These screws are used to prevent unauthorized access and removal of devices. Although these screws would not deter a determined person from opening the desktop expansion unit, the person would need the proper tools to access the bottom of the unit. Security screws can be inserted for all three slots.

Figure 3–2 Typical 3½-Inch SBB



CXO-3614A-PH

Figure 3–3 Storage Device Security Screws



CXO-3849A-MC

Note

The SBB connector is a 96-pin female connector that provides positive mating with the SBB shelf 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 can support 200 SBB replacement cycles. (Removing and replacing an SBB constitutes one replacement cycle.) Over the projected StorageWorks active product life of 5 years, this equates to 40 replacement cycles per year, or approximately 1 cycle every 9 days. Excessive replacement cycles wear away the gold contact coating and thus destroys the integrity of the connection. The replacement cycle limit applies equally to shelf connectors and device connectors.

Environments requiring a greater number of replacement cycles are not supported and are considered as improper treatment or use (paragraph 9.4b of U.S. Standard Terms and Conditions). 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 environments. Contact your Digital Account Representative for more information.

3.3 Replacing a 3½-Inch SBB

There are three methods for replacing 3½-inch SBBs in desktop expansion units: hot swap, warm swap, and cold-swap.

- For single desktop expansion units:
 - The cold-swap method is normally used during initial installation or when power is removed from the desktop expansion unit. None of the storage devices are operational until the power is restored.
 - If the SCSI controller supports the hot-swap method, you can replace a storage device using this method provided that the storage device is not active (that is, the green device activity LED is off).

CAUTION

Do not use the hot-swap method unless you are positive that this method is fully supported by the SCSI controller.

- For multiple desktop expansion units:

The warm-swap method is used when two or more desktop expansion units are connected in series. Power can be removed from one unit without disrupting the SCSI bus.

The replacement methods are defined as follows:

- **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. User applications that are not dependent upon the device being swapped are not impacted.
- **Warm-swap**—A method of device replacement used when there are multiple expansion units, 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. No booting or loading of code is permitted except on the device being inserted. User applications that are not dependent upon the devices on the affected SCSI bus are not noticeably impacted.
- **Cold-swap**—A method of device replacement that requires that power be removed from one or more shelves or expansion units thereby affecting other devices therein. User applications that are not dependent upon the devices being swapped are impacted as a result. This method is used when conditions preclude the use of a warm-swap or hot-swap method. Normally, this method is only used when installing or upgrading a StorageWorks subsystem.

Refer to the *StorageWorks Solutions Shelf and SBB User's Guide* for a detailed description of the procedures for exchanging (swapping) devices.

Use the following procedure to remove or replace a 3½-inch SBB:

CAUTION

The 3½-inch SBB is heavy and can be damaged if dropped. Therefore, always use both hands to fully support the 3½-inch SBB during removal or installation.

1. *Optional*—Remove the two security screws from the enclosure. Refer to Figure 3-3.
2. Press the two SBB mounting tabs in to release the 3½-inch SBB.

CAUTION

To prevent electrostatic discharge (ESD) damage to a 3½-inch SBB, do not touch the SBB interface connector.

3. Support the 3½-inch SBB with both hands as you pull it from the desktop expansion unit.
4. Insert the replacement 3½-inch SBB into the guide slots and push it in until it is fully seated and the mounting tabs engage the desktop expansion unit.
5. *Optional*—Install the two security screws.

CAUTION

To prevent overheating, the following conditions must be met:

- Slots 1 and 2 must have either a 3½-inch SBB or a blank bezel (BA35X-Px) installed.
 - Slot 3 must have either a 5¼-inch, half-height storage device or be configured for a 3½-inch SBB and have either a 3½-inch SBB or a blank bezel (BA35X-Px) installed.
-

6. After power is applied, observe the status LEDs and verify that the green device activity LED is either on, flashing, or off, and that the amber device fault LED is off.

Note

The green device activity LED remains on when the SCSI cable is disconnected.

3.4 Replacing a 5¼-Inch, Half-Height Storage Device

The status displays for 5¼-inch, half-height storage devices are storage device specific. See the specific storage device documentation to determine if the storage device may be replaced using the hot-swap method or whether you must use the cold-swap method.

Use the following procedure to replace a 5¼-inch, half-height storage device in slot 3:

CAUTION

The storage device is heavy and can be damaged if dropped. Therefore, always use both hands to fully support the storage device during removal or installation.

1. *Optional*—Remove the two security screws from the enclosure. Refer to Figure 3-3.
2. Slide out the mounting handle, using the tabs to expose the hand grip.
3. Firmly grasp the hand grip and pull it out to release the storage device.

CAUTION

To prevent electrostatic discharge (ESD) damage to a storage device, do not touch the SCSI interface connector.

4. Use both hands and pull the storage device out of the desktop expansion unit.
5. Insert the replacement storage device into the guide slots and push it in.
6. Push the hand grip in until the storage device is firmly seated.
7. Push in on the mounting handle tabs.

8. *Optional*—Install the two security screws.

CAUTION

To prevent overheating, the following conditions must be met:

- Slots 1 and 2 must have either a 3½-inch SBB or a blank bezel (BA35X-Px) installed.
 - Slot 3 must have either a 5¼-inch, half-height storage device, or be configured for a 3½-inch SBB and have either a 3½-inch SBB or a blank bezel (BA35X-Px) installed.
-

9. After power is applied, observe the storage device status LEDs and verify that the device is functioning properly.

Part II

Desktop Expansion Unit Service Guide

Part II describes the procedures for exchanging a 5¼-inch, half-height storage device in slot 3 of the desktop expansion unit with a 3½-inch StorageWorks building block (SBB).

Note

Only qualified personnel, for example Digital Multivendor Customer Services, are authorized to complete the procedures described in this part.

Exchanging Devices and SBBs

This chapter describes the procedures for exchanging 3½-inch StorageWorks building blocks (SBBs) and 5¼-inch, half-height storage devices.

Either a 3½-inch SBB or a 5¼-inch, half-height storage device can be installed in slot 3 of the desktop expansion unit. The 3½-inch SBB and the 5¼-inch, half-height storage device are not the same size nor do they mount in the same manner. These differences are compensated for by the following:

- A movable backplane connector, which compensates for the different lengths
- 3½-inch side rails, which compensate for the difference in width and serve as SBB guide slots

Use the following procedure to convert slot 3 from a 5¼-inch, half-height storage device to a 3½-inch SBB ¹:

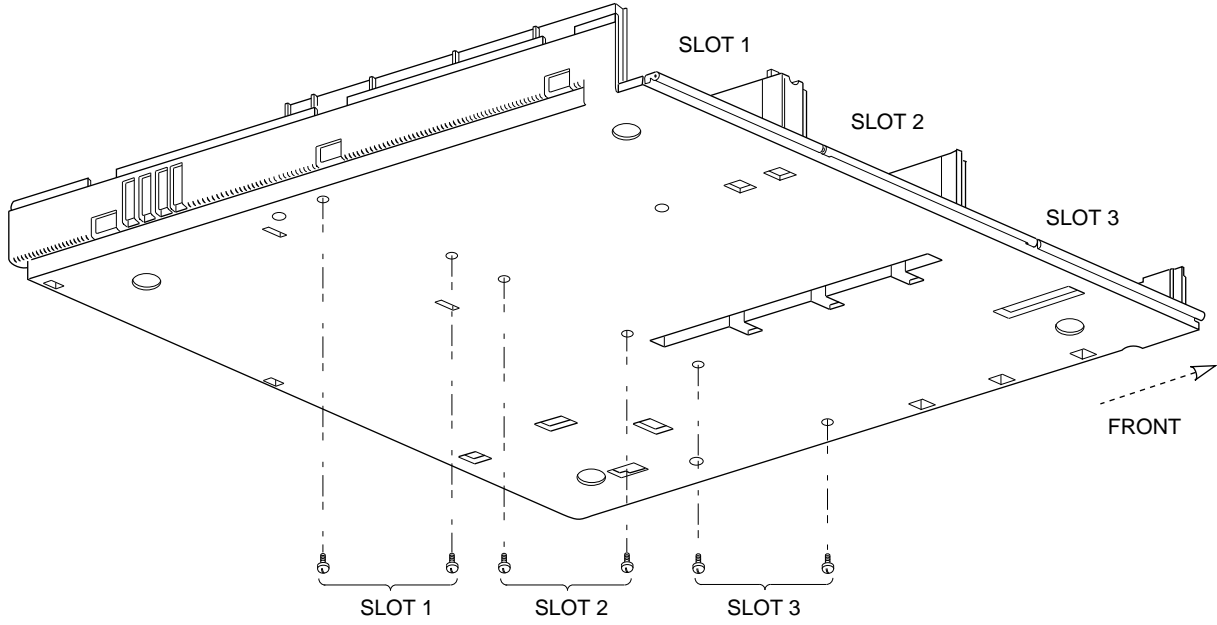
CAUTION

Do not attempt the following procedure unless you have taken proper precautions against electrostatic discharge (ESD). When you remove the cover from any enclosure or device, wear an ESD grounding wrist strap.

1. Turn off the desktop expansion unit.
2. Disconnect the SCSI cables.
3. Disconnect the power cables.
4. If installed, remove the two security screws from slot 3, located on the bottom of the desktop expansion unit as shown in Figure 4-1.
5. Remove the 5¼-inch, half-height storage device from slot 3.
6. Place the desktop expansion unit on a flat surface with the bottom side up.
7. To release the cover latch, insert a flat-tip screwdriver in the hole at the rear as shown in Figure 4-2.
8. To remove the cover, use a flat-tip screwdriver to press in the three cover tabs on the left side of expansion unit, as shown in Figure 4-3, while lifting up on the cover. Remove the cover.

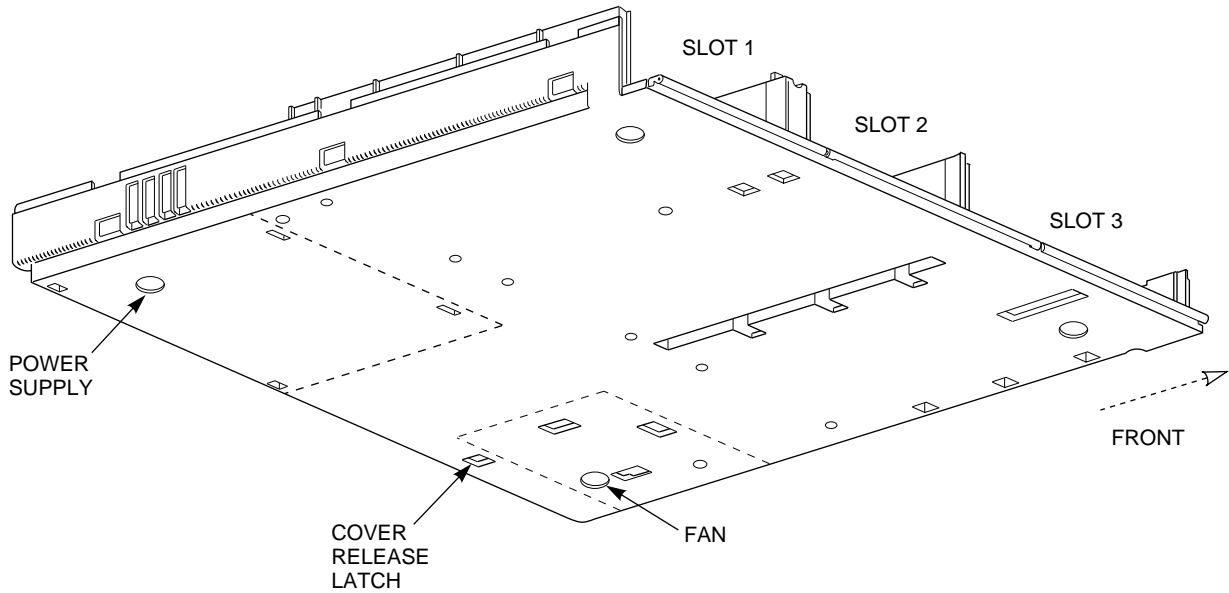
¹ You can also refer to this procedure to convert slot 3 from a 3½-inch SBB configuration to an 5¼-inch, half-height storage device configuration.

Figure 4-1 Desktop Expansion Enclosure—Bottom View



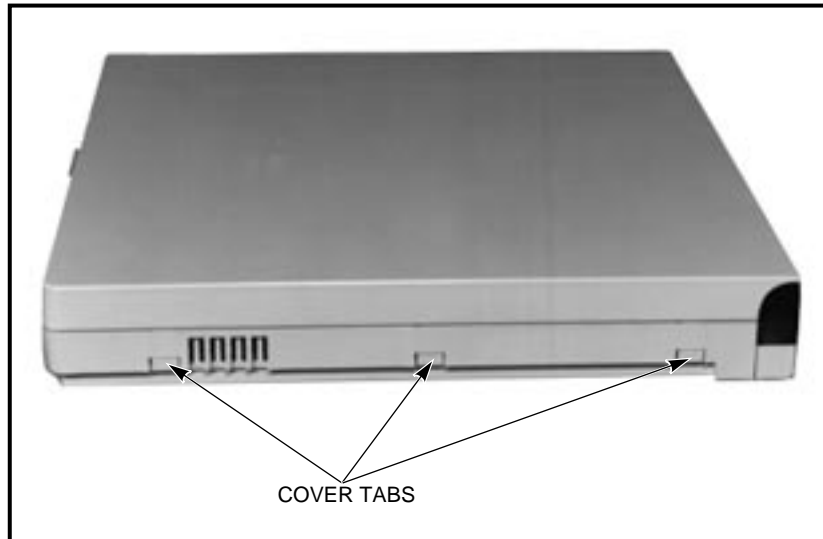
CXO-3849A-MC

Figure 4-2 Desktop Expansion Enclosure—Cover Latch



CXO-3848A-MC

Figure 4-3 Desktop Expansion Enclosure—Cover Tabs



CXO-3682A_PH

9. Note the position of the 5¼-inch backplane connector in slot 3, as shown in Figure 4-4.

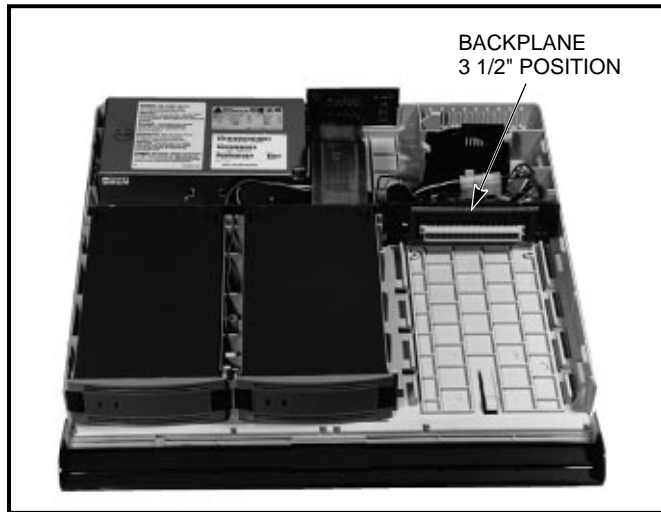
Figure 4-4 Backplane In 5¼-Inch Position



CXO-3685A-PH

10. Remove the backplane connector from the rear (5¼-inch) position and move it to the front 3½-inch position, as shown in Figure 4-5.

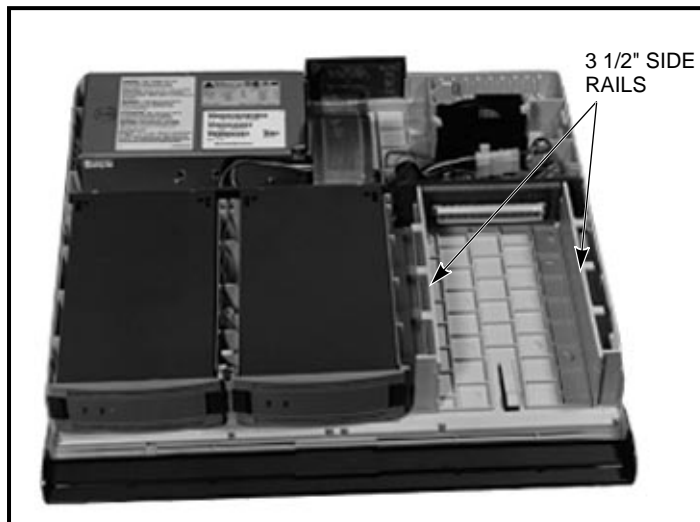
Figure 4-5 Backplane In 3½-Inch Position



CXO-3686A_PH

11. Insert the 3½-inch side rails into the channels, as shown in Figure 4-6. Push each rail downward and towards the rear of the enclosure to engage the rail and backplane connector.

Figure 4-6 3½-Inch Side Rails Installed



CXO-3687A_PH

12. Replace the cover. Make sure that the front and rear latches and the cover tabs are properly engaged.
13. Insert a 3½-inch SBB.
14. *Optional*—Install the two slot 3 security screws (refer to Figure 4-1).

15. Connect the power cables.
16. Connect the SCSI cables.
17. Turn on power and check that the desktop expansion unit status LED and the SBB device activity and fault status LEDs are functioning properly.

Specifications

This appendix describes the physical, electrical, cooling, thermal stabilization, and environmental specifications of the BA353–Ax desktop expansion unit product line.

Table A–1 Physical Specifications

Description	Height mm (in)	Width mm (in)	Depth mm (in)
BA353–Ax desktop expansion unit	60 (2.4)	431.8 (17.0)	400 (15.7)
3½-inch SBB	121 (4.8)	51 (2)	216 (8.5)

Table A–2 Electrical Specifications

Item	Specification
AC power supply	
Input	100–120/220–240 V ac (auto ranging), 1.1/0.7 A, 46–63 Hz
Output	61.1 W +5 V dc ±5%, 6.0 A +12 V dc ±5%, 4.0 A (6 A peak)
Slot power requirements	+5 V dc ±5%, 1.0 A +12 V dc ±5%, 1.2 A
Blower power requirements	+12 V dc ±5%, 0.2 A
Auxiliary ac output	100–120/220–240 V ac, 8.0 A, 46–63 Hz

Table A–3 Cooling

Item	Specification
System blower	Front to rear air flow, 3 CFM per slot

A.1 Environmental Specifications

The StorageWorks product line environmental specifications listed in Table A–4 are the same as for other Digital storage devices.

Table A–4 Environmental Specifications

Condition	Specification
Optimum Operating Environment	
Temperature	+18° to +24°C (+65° to +75°F)
Rate of change	3°C (5.4°F)
Step change	3°C (5.4°F)
Relative humidity	40% to 60% (noncondensing) with a step change of 10% or less (noncondensing)
Altitude	From sea level to 2400 meters (8000 feet)
Air quality	Maximum particle count .5 micron or larger, not to exceed 500,000 particles per cubic feet of air
Inlet air volume	.009 cubic meters per second (18 cubic feet per minute)
Maximum Operating Environment (Range)	
Temperature	+10° to +35°C (+50° to +95°F) Derate 1.8°C for each 1000 meters (1.0°F for each 1000 feet) of altitude Maximum temperature gradient 11°C/hr (52°F/hr) ±2°C/hr (36°F/hr)
Relative humidity	10% to 90% (noncondensing) Maximum wet bulb temperature: 28°C (82°F) Minimum dew point: 2°C (36°F)
Maximum Nonoperating or Storage Environment (Range)	
Temperature	
Nonoperating	+18° to +29°C (+65° to +85°F)
Storage	-40° to +66°C (-40° to +151°F)
Relative humidity	
Nonoperating	10% to 90% (noncondensing)
Storage	8% to 95% in original shipping container (noncondensing); otherwise, 50% (noncondensing)
Altitude	From -300 meters (-1000 feet) to +3600 meters (+12,000 ft) MSL

A.2 Environmental Stabilization

To make sure of the 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 Temperature Range °C	Ambient Temperature Range °F	Minimum Stabilization Time
60 to 66	140 to 151	3 hours
50 to 59	122 to 138	2 hours
40 to 49	104 to 120	1 hour
30 to 39	86 to 102	30 minutes
18 to 29	64 to 84	None
10 to 17	50 to 63	30 minutes
0 to 9	32 to 48	1 hour
–10 to –1	14 to 30	2 hours
–20 to –11	–4 to 12	3 hours
–30 to –21	–22 to –6	4 hours
–40 to –31	–40 to –24	5 hours

Glossary

ac distribution

The method of distributing ac power in a cabinet.

adapter

See *SCSI signal bus converter*.

ANSI

American National Standards Institute

building block shelf

See *SBB*.

cold-swap

A method of device replacement that requires that power be removed from one or more shelves thereby affecting other devices therein. User applications that are not dependent upon the devices being swapped are impacted as a result. This method is used when conditions preclude the use of a warm-swap or hot-swap method. Normally, this method is only used when installing or upgrading a StorageWorks subsystem.

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

controller

A hardware/firmware device that manages communications on behalf of host systems over the SCSI bus to devices, such as the HSC-series, HSJ-series, and HSZ-series controllers. Controllers typically differ by the type of interface to the host and provide functions beyond what the devices support.

DAT

Digital Audio Tape. A method of recording data on a cartridge tape.

desktop expansion unit

A low-profile, SCSI based unit with self-contained power and cooling that can accommodate either three 3½-inch SBBs or two 3½-inch SBBs and one, half-height 5¼-inch storage device. This unit is used with workstations and PCs and can be positioned either adjacent to or beneath the CPU or monitor.

differential SCSI bus

A signal's level is determined by the potential difference between two wires. A differential bus is more robust and less subject to electrical noise than is a single-ended bus.

digital audio tape

See *DAT*.

disk

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

disk array controller

See *controller*.

DWZZA

The StorageWorks compatible SCSI bus signal converter.

See *SCSI bus signal converter*.

electromagnetic interference

See *EMI*.

electrostatic discharge

See *ESD*.

EMI

Electromagnetic interference. The impairment of a signal by an electromagnetic disturbance.

ESD

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

FRU

Field replaceable unit

half-height

(1) In the storage industry, a device of conventional dimensions, except for height.
(2) A device that occupies only one-half of a 5¼-inch SBB. The first half-height device is always mounted in the lower (bottom) part of the SBB. The second device in an SBB is mounted in the upper (top) part of the SBB.

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 and active during device removal or insertion. The device being removed or inserted is the only device that cannot perform operations during this process. User applications that are not dependent upon the device being swapped are not impacted.

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

QIC

Quarter-inch cartridge. A standard tape media.

RAID

Redundant Array of Independent Disks

rank

The number of devices in a RAID set.

RFI

Radio frequency interference. The impairment of a signal by an unwanted radio signal or radio disturbance.

SBB

StorageWorks building block. The basic building block of the StorageWorks product line. Any device conforming to shelf mechanical and electrical standards installed in either a 3½-inch or 5¼-inch carrier is considered to be an SBB, whether it be a storage device, a power supply, or other device.

SBB shelf

The common name for any StorageWorks shelf that contains only power supply and storage SBBs.

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 a maximum of seven devices. The StorageWorks subsystem implementation uses SCSI-2, for the synchronous transfer of 8-bit data at rates of up to 10 MB/s.

SCSI device

A host computer adapter, a peripheral controller, or an intelligent peripheral that can be attached to the SCSI bus.

SCSI device ID

The bit-significant representation of the SCSI addressing referring to one of the signal lines numbered 0 through 7. Also referred to as *target ID*.

SCSI-A cable

A 50-conductor (25 twisted pair) cable used for single-ended, SCSI-2 bus connections.

SCSI-P cable

A 68-conductor (34 twisted pairs) cable used for differential bus connections.

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.

StorageWorks

The Digital set of enclosure products that allows customers to design and configure their own storage subsystem. Components include power, packaging, and interconnections in a StorageWorks shelf. SBBs and array controllers are integrated therein to form storage subsystems. System-level enclosures to house the shelves and standard mounting devices for SBBs are also included.

StorageWorks building block

See *SBB*.

supported device

(1) A device that has been fully evaluated in an *approved* StorageWorks configuration (that is, shelf, cabinet, power supply, cabling, and so forth) and is in complete compliance with country-specific standards (for example, FCC, TUV, and so forth) 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.

tape controller

See *controller*.

target

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

target ID

See *SCSI device ID*.

warm-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. No booting or loading of code is permitted except on the device being inserted. User applications that are not dependent upon the devices on the *affected SCSI bus* are not noticeably impacted.

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

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