

StorageWorks™ Solutions

Configuration Guide

Order Number: EK-BA350-CG. E01

This manual describes the StorageWorks shelf building block subsystem, StorageWorks products, compatible Digital systems, identifies the related products, lists the rules for configuring a system, and provides examples of the system configuration process.

**Digital Equipment Corporation
Maynard, Massachusetts**

April 1994

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

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Preface

The *StorageWorks Solutions Configuration Guide* describes the StorageWorks™ shelf building block subsystem, StorageWorks products, compatible Digital™ systems, identifies the related products, lists the rules for configuring a system, and provides examples of the system configuration process.

Note

The configurations defined in this manual are for guidance only. They are current and correct as of the date of publication but are subject to change without notice.

Intended Audience

This manual is for use by personnel responsible for designing and configuring a StorageWorks subsystem.

Structure

This manual is organized as follows:

Chapter 1 Introducing the StorageWorks Family	This chapter is an overview of the StorageWorks product line, to include SBBs, shelves, enclosures, and related products.
<hr/> Part I – StorageWorks Products <hr/>	
Chapter 2 StorageWorks Storage Devices	Describes the StorageWorks storage devices to include disks, tapes, CD-ROMs, solid state disks, and magazine tape subsystems.
Chapter 3 StorageWorks Shelves	Describes the StorageWorks shelves, their functions, and use.
Chapter 4 StorageWorks Controllers, Converters, and Adapters	Describes the StorageWorks controllers, converters, and adapters that can integrate the StorageWorks 8-bit, single-ended SCSI bus with a different host computer bus.
Chapter 5 StorageWorks Enclosures and Subsystems	Describes the StorageWorks enclosures including SW500, SW800, deskside, and desktop enclosures. Configure-to-order and factory-configured subsystems are described to include storage capacity, controllers, devices, shelves, and so forth.
Chapter 6 StorageWorks Accessories	Describes the various StorageWorks components such as shelves, upgrade kits, and so forth.

Part II – Digital StorageWorks Compatible Systems

Chapter 7 Alpha AXP System StorageWorks Configurations	Describes Alpha AXP™ StorageWorks configurations to include shelves, SCSI cables, enclosures, and SBBs.
Chapter 8 Digital VAX System StorageWorks Configurations	Describes VAX™ StorageWorks configurations to include shelves, SCSI cables, enclosures, and SBBs.
Chapter 9 DECsystem StorageWorks Configurations	Describes DEC™ StorageWorks configurations to include shelves, SCSI cables, enclosures, and SBBs.
Chapter 10 Personal Computer System StorageWorks Configurations	Describes Digital personal computer (PC) StorageWorks configurations to include shelves, SCSI cables, enclosures, and SBBs.

Part III – StorageWorks Subsystem Planning

Chapter 11 General Configuration Rules	Describes the general configuration rules for StorageWorks subsystem.
Chapter 12 StorageWorks SCSI Buses	Describes the StorageWorks SCSI bus, termination, cabling, and interconnections.
Chapter 13 StorageWorks SCSI Cables	A comprehensive description of the StorageWorks SCSI cables to include lengths, connectors, special cables, and use.
Chapter 14 StorageWorks DSSI Cables	A comprehensive description of the StorageWorks DSSI cables to include lengths, connectors, special cables, and use.
Chapter 15 Designing a StorageWorks Subsystem	Describes the procedures for designing a typical StorageWorks subsystem.
Appendix A StorageWorks Product Specifications	Describes the physical, environmental, and performance specifications of the StorageWorks subsystem components.
Glossary	Contains the definitions of StorageWorks subsystem terms.
Index	A cross-reference to major topics.

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
StorageWorks RAID Array 110 Subsystem	
<i>DEC RAID Utilities User's Guide</i>	EK-DECRA-UG
<i>HSZ10-AA Controller Site Preparation Guide</i>	EK-HSZ10-IN
<i>StorageWorks Expansion Storage Pedestal User's Guide</i>	EK-SMCPA-UG
<i>StorageWorks RAID Array 110 Subsystem User's Guide</i>	EK-SM2CA-UG
<i>StorageWorks RAID Array 110 Utility for MS-DOS User's Guide</i>	AA-Q0N5A-TE
<i>StorageWorks RAID Array 110 Utility for Novell NetWare User's Guide</i>	AA-Q0N4A-TE
<i>StorageWorks RAID Array 110 Utility for SCO UNIX User's Guide</i>	AA-Q0N6A-TE
StorageWorks Array Controller 140-Series	
<i>StorageWorks Array Controller HS Family of Array Controllers User's Guide</i>	EK-HSFAM-UG
<i>StorageWorks BA350-MA Controller Shelf User's Guide</i>	EK-350MA-UG
DECraid™+ Rackmount Storage Subsystem and HSC™ Intelligent I/O Servers	
<i>HSC Controller User's Guide</i>	AA-PFSQA-TK
<i>HSC Controller Installation Manual</i>	EK-HSCMN-IN

(continued on next page)

Table 1 (Cont.) StorageWorks Related Documentation

Document Title	Order Number
StorageWorks Enclosures	
<i>BA35X-VA Vertical Mounting Kit User's Guide</i>	EK-350SV-UG
<i>InfoServer 1000 Installation and Owner's Guide</i>	EK-INFLC-OM
<i>StorageWorks Solutions Desktop Expansion Unit User's Guide</i>	EK-BA353-UG
<i>StorageWorks Solutions SW500 and SW800 Cabinet Metric Shelf Bracket Kit Installation Guide</i>	EK-35XRD-IG
<i>StorageWorks Solutions HSR95-Series Cabinet Metric Shelf Bracket Kit Installation Guide</i>	EK-35XRC-IG
<i>StorageWorks RETMA Shelf Rail Kit Installation Guide</i>	EK-35XRB-IG
<i>StorageWorks Solutions SW500-Series Cabinet Installation and User's Guide</i>	EK-SW500-IG
<i>StorageWorks Solutions SW500-Series Cabinet Cable Distribution Unit Installation Guide</i>	EK-SW5CU-IG
<i>StorageWorks Solutions SW800-Series Data Center Cabinet Cable Distribution Unit Installation Guide</i>	EK-SWCDU-IS
<i>StorageWorks Solutions SW800-Series Data Center Cabinet Installation and User's Guide</i>	EK-SW800-IG
<i>Instructions for Installation of the Tape Bezel Kit on SF400 Series Cabinets‡</i>	EK-SFTBK-IS
Storage Devices	
<i>SCSI Signal Converter DWZZA-AA</i>	EK-DWZZA-SV
<i>SCSI Signal Converter DWZZA-MA</i>	EK-DWZZM-SV
<i>SCSI Signal Converter DWZZA-VA</i>	EK-DWZAA-SV
<i>StorageWorks Building Blocks User's Guide</i>	EK-SBB35-UG
<i>StorageWorks Solutions 3½-Inch Storage Device Installation Guide</i>	EK-MC350-IG
<i>StorageWorks Solutions 5¼-Inch Storage Device Installation Guide</i>	EK-MC525-IG
<i>TZ86-VA Cartridge Tape Drive Device Addresses</i>	EK-TZ86A-UG
<i>TZ87-VA Cartridge Tape Drive Device Addresses</i>	EK-TZ87A-DA
<i>StorageWorks Solutions TZ8x7-Series Tape Drive SCSI Bus Configuration and Installation Guide</i>	EK-TZ8X7-IG
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.	
‡ Applies also to StorageWorks cabinets.	

Introducing the StorageWorks Family

The StorageWorks family of products is a low-cost, extremely flexible mass storage solution, that permits the user to design a StorageWorks subsystem to meet system-specific needs. This chapter is an introduction to the StorageWorks product line and includes a general description of the products, components, and features.

Note

The configurations defined in this manual are for guidance only. They are current and correct as of the date of publication but are subject to change without notice.

1.1 How to Use this Guide

Use this configuration guide as the starting point for developing a StorageWorks subsystem. This guide addresses the major considerations for designing a StorageWorks subsystem. Consider the following factors when designing your subsystem:

- **Host Computer System**
The host computer system to include the operating system and revision level; the **SCSI (small computer system interface)** controller or adapter used; the SCSI bus speed (fast or slow); and the SCSI connector type (high- or low-density, single-ended or differential, 50- or 68-pin). Each of these are discussed in the detail required for planning and configuring a system. Refer to the host or controller documentation for detailed information.
- **StorageWorks Subsystem Use**
A subsystem used for expansion storage does not require as much planning as as a **RAID 5 (random array of independent disks level 5)** subsystem.
- **Storage Devices**
When selecting a storage device you must consider the media type, storage capacity, reliability, and, when using multiple media types, the media must be compatible with the SCSI controller.
- **FCC Operating Environment**
All StorageWorks components can be used in a Class A environment. Some of the components can be used in a Class B (home) environment. All the components selected for a home environment must be certified as being FCC Class B compliant.

This guide is organized into three major sections:

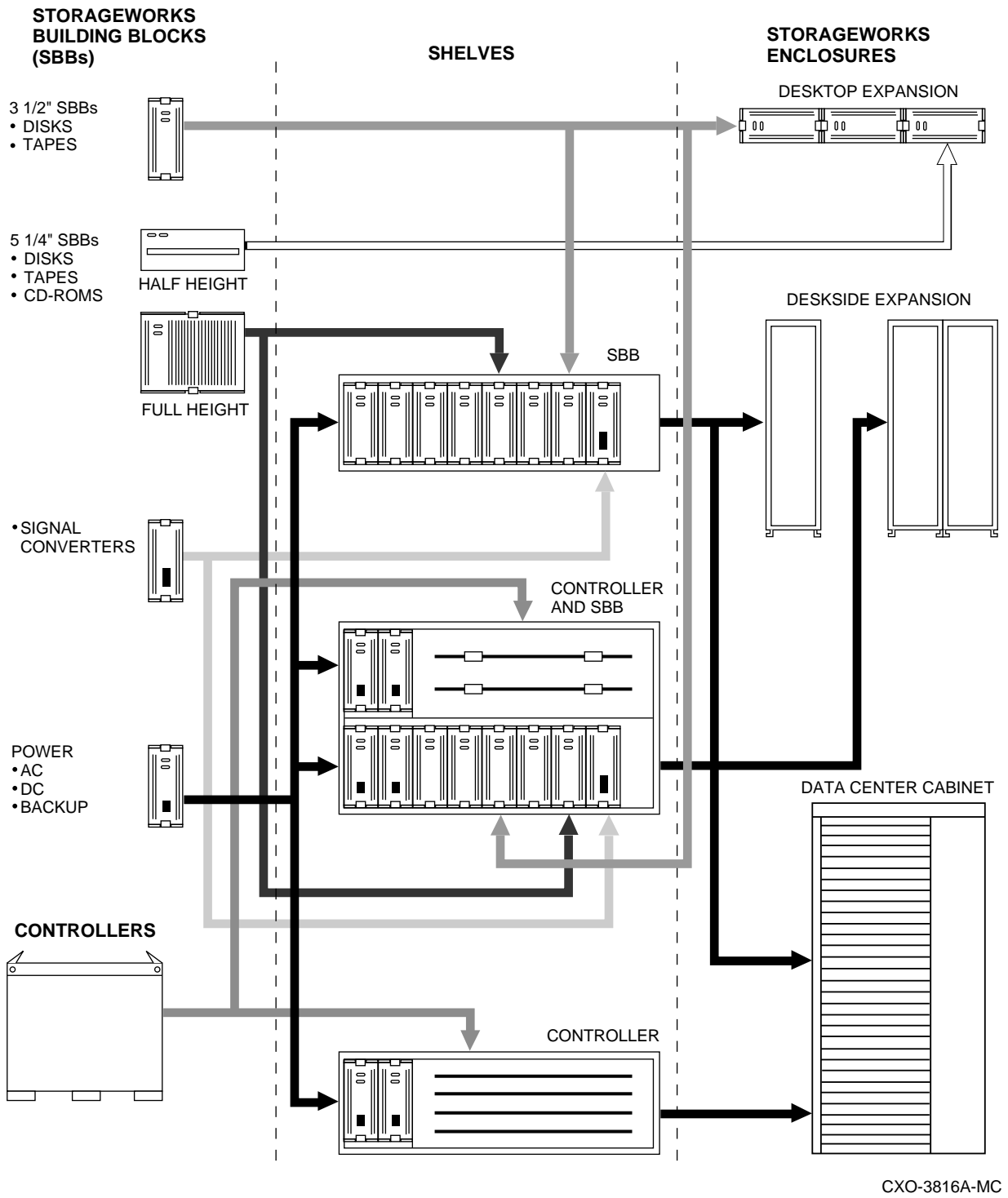
For Information About	See
StorageWorks products including storage devices, controllers, shelves, and enclosures	Part I—StorageWorks Products
Digital systems that use StorageWorks subsystems	Part II—Digital StorageWorks Compatible Systems
Considerations for designing a StorageWorks SCSI bus to include cables and the general rules for configuring a StorageWorks subsystem	Part III—StorageWorks Subsystem Planning

1.2 Product Features

The StorageWorks subsystem shown in Figure 1–1 has the following features:

- Low-cost SCSI device storage subsystems
- Snap-in devices for instant installation and removal
- The ability to mix 3½-inch and 5¼-inch storage devices
- The freedom to design your own system
- A redundant power option
- Redundant cooling
- Vertical or horizontal shelf orientation
- Locking cabinets for security of high-dollar value, portable storage devices
- Visual indication of shelf status, power supply status, storage device activity, and storage device status
- Automatic reporting of shelf status to host
- The capability to swap power supplies and storage devices without powering down the system

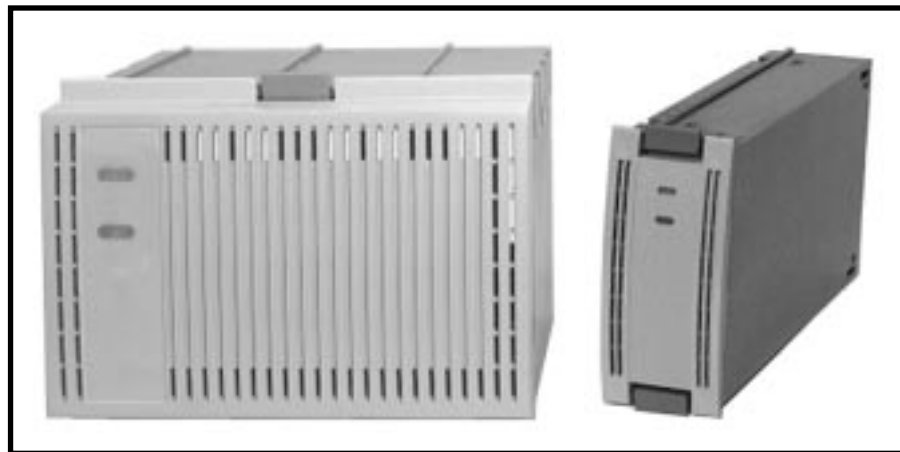
Figure 1-1 StorageWorks Subsystem Components



1.3 StorageWorks Building Blocks

The **StorageWorks building blocks (SBBs)**, shown in Figure 1–2, are the basic building blocks of the StorageWorks subsystem. They are available for both 3½-inch and 5¼-inch form factor devices. You can order SBBs with storage devices installed or you can install third-party devices in a StorageWorks **modular carrier** to create an SBB. SCSI bus converters, adapters, and power supplies can also be mounted in SBBs.

Figure 1–2 Typical 5¼-Inch and 3½-Inch SBBs



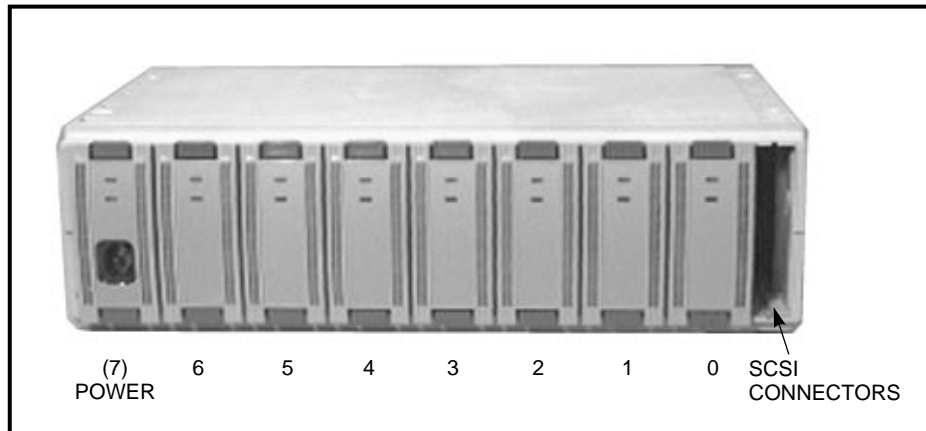
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1.4 StorageWorks Shelves

The StorageWorks shelves (refer to Figure 1–1) fit into any enclosure that can accommodate a 445 millimeter (17.5 inch) device in either the horizontal or vertical position. The mounting bracket kits permit installing a shelf in either a data center cabinet with a metric mounting hole pattern or an HSC™ controller cabinet with a Radio-Electronics-Television Manufacturer's Association (RETMA) mounting hole pattern. The shelf types include the following:

- The basic **SBB shelf**, shown in Figure 1–3, contains SBBs and power supplies.

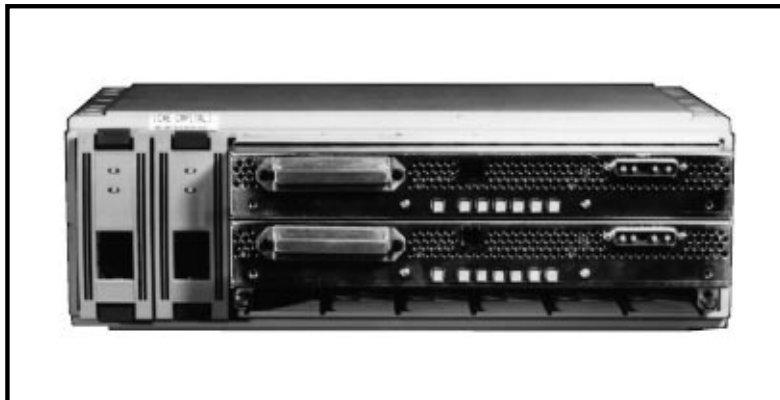
Figure 1-3 Typical SBB Shelf



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- The **controller shelf**, shown in Figure 1-4, contains SCSI bus controllers, cache memories, and power supplies.

Figure 1-4 Typical Controller Shelf



CXO-3660A-PH

- A **controller and SBB shelf** contains SCSI bus controllers, SBBs, and power supplies.

All of these shelves require either an ac or dc input power supply mounted in an SBB. The BA350-JA SBB shelf kit includes an ac power supply and the mounting hardware. See the individual shelf user's guide for a detailed description of a particular shelf.

1.5 StorageWorks Controllers

The controllers (refer to Figure 1-1) are the interface between the host computer and the SCSI-2 devices. These controllers are not interchangeable and can be used only with a specific type host.

The function and purpose of the StorageWorks controllers are model specific. The controllers are mounted in special shelves such as the one shown in Figure 1-4.

1.6 StorageWorks Enclosures

StorageWorks enclosures (SW500-series and SW800-series cabinets, and BA350–Kx deskside expansion units) are used for mounting shelves. Desktop expansion units (BA353–Ax) are used for mounting SBBs. Each enclosure has a switch-controlled ac or dc power distribution unit. SW500-series and SW800-series cabinet shelf mounting brackets are available in either the RETMA or the metric mounting hole pattern.

The following enclosures can be used for StorageWorks products:

- BA353–Ax series desktop expansion unit¹ for mounting SBBs for use with workstations and PCs as shown in Figure 1–5.

Figure 1–5 BA353–Ax Desktop Expansion Unit

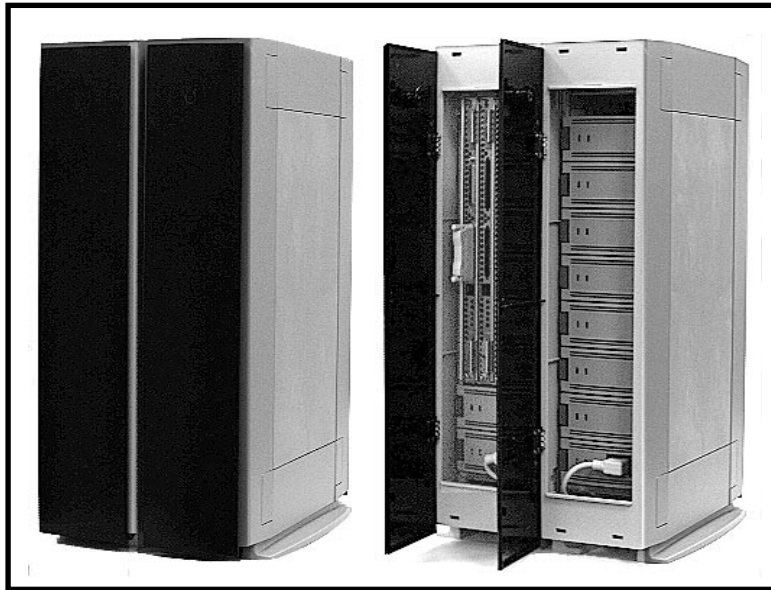


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- Deskside expansion unit for mounting shelves such as the BA350–Kx series similar to the one shown in Figure 1–6.
- Cabinets for mounting multiple SBB shelves and controller SBB shelves such as the SW500-series departmental servers and the SW800-series data center cabinets, shown in Figure 1–7.

¹ The desktop storage expansion unit includes an internal power supply and does not require an SBB power supply.

Figure 1–6 RAID Array Subsystem with Two Deskside Expansion Units



SHR-XR3000-VIF

Figure 1–7 Typical SW500-Series and SW800-Series Cabinets



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Part I

StorageWorks Products

Part I contains descriptions of the StorageWorks products organized by product type, as follows:

For information about	See
Accessories	Chapter 6, StorageWorks Accessories
Adapters	Chapter 4, StorageWorks Controllers, Converters, and Adapters
BA350–JA Shelf Kit	Chapter 3, StorageWorks Shelves
BA350–Ex/Mx/Sx Shelves	Chapter 3, StorageWorks Shelves
BA353–Ax Desktop Expansion Units	Chapter 5, StorageWorks Enclosures and Subsystems
BA35x–Kx Deskside Expansion Units	Chapter 5, StorageWorks Enclosures and Subsystems
BA655–Ax Plug-In Unit	Chapter 5, StorageWorks Enclosures and Subsystems
Cartridge Tape Drives	Chapter 2, StorageWorks Storage Devices
CD-ROMs	Chapter 2, StorageWorks Storage Devices
Controller Shelves	Chapter 3, StorageWorks Shelves
SBB Shelves	Chapter 3, StorageWorks Shelves
Controllers	Chapter 4, StorageWorks Controllers, Converters, and Adapters
Disk Drives	Chapter 2, StorageWorks Storage Devices
HSC/HSD/HSJ/HSZ-Series Controllers	Chapter 4, StorageWorks Controllers, Converters, and Adapters
InfoServer Controller	Chapter 4, StorageWorks Controllers, Converters, and Adapters
Magazine Tape Subsystems	Chapter 2, StorageWorks Storage Devices
Power Supplies and Power Cords	Chapter 3, StorageWorks Shelves
Signal Converters	Chapter 4, StorageWorks Controllers, Converters, and Adapters
Solid State Disks	Chapter 2, StorageWorks Storage Devices
SW500/SW800-Series Enclosures	Chapter 5, StorageWorks Enclosures and Subsystems
SW1000 Controller	Chapter 4, StorageWorks Controllers, Converters, and Adapters
Tape Drives	Chapter 2, StorageWorks Storage Devices

StorageWorks Storage Devices

This chapter contains descriptions of the StorageWorks storage devices. Check with your Digital account representative for availability of additional devices.

Note

No attempt has been made to define StorageWorks compatible third-party storage devices.

Devices that meet the basic criteria defined in Table 2–1 may be installed in a **modular carrier** to create an SBB (StorageWorks building block).

Table 2–1 lists the general specifications for all StorageWorks devices.

Table 2–1 StorageWorks Devices—General Description

Criteria	Definition
Interface	The StorageWorks SCSI bus is SCSI–3 compliant. However, the shelves only support single-ended SCSI–2 devices.
Device size (form factor)	3½-inch full-height or low-profile, fixed or removable media devices. 5¼-inch half-height or full-height, fixed or removable media devices.
Power	The total power requirements for the devices in one shelf cannot exceed 131 watts. To make sure this requirement is met, <i>devices must spin up sequentially at 4-second intervals.</i>
Heat dissipation	The SBB shelf blowers provide sufficient air flow to cool devices mounted in an SBB.
SBB qualification	All Digital devices have been tested in an approved StorageWorks configuration (that is, shelf, enclosure, power supply, cabling, sequential device spin-up at 4-second intervals, and so forth) and are in complete compliance with country-specific standards (for example, FCC, TUV, CSA, and so forth) and with Digital standards. Customers are responsible for testing third-party devices for compliance with country-specific standards.
FCC certification	All StorageWorks storage devices have been certified as being FCC Class A compliant. Some devices have been certified as being Class B compliant. FCC Class B installations require that all components, specifically the shelf, power supply, and storage devices, must all be Class B compliant. Use of a single Class A component in a subsystem requires that the subsystem be used only in a Class A environment. All SW500-series departmental servers and SW800-series data center cabinets can be used only in a Class A environment.

For information about a specific type device, see the following sections:

- Cartridge tape drives—Section 2.7
- CD-ROMs—Section 2.8
- Disk drives—Section 2.5
- Magazine tape subsystems—Section 2.10
- Solid-state disks—Section 2.9
- Optical disk drives—Section 2.6

Information is presented in a tabular form and is organized by form factor, either 3½-inch or 5¼-inch, with their basic specifications (for example, capacity, media, transfer rate, rotational speed, and so forth). Detailed specifications are listed in the *Digital Systems and Options Catalog*.

2.1 StorageWorks Building Blocks

The primary StorageWorks building block (SBB) is a SCSI-2 storage device mounted in either a 3½-inch or 5¼-inch carrier. The first step in designing a system is selecting storage devices with the following features:

- Compatible media
- Required storage capacity

Note

The SBB connectors are 96-pin female DIN connectors that provide positive mating with the SBB shelf male connectors. 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.

2.2 5¼-inch SBBs

The 5¼-inch SBB shown in Figure 2–1 can accommodate the following 5¼-inch form factor devices:

- Fixed media devices
- Removable media devices
- One full-height (82.6 mm [3.25 inch]) device
- Two half-height (43.2 mm [1.7 inch]) devices
- Three one-third height devices (25.4 mm [1.0 inch]) devices

Figure 2–1 Typical Full-Height 5¼-inch Storage Device SBB



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The following are the general rules for mounting half-height and one-third height devices in one 5¼-inch carrier:

- Different device types can be mounted in the same carrier, for example, a tape drive and a CD-ROM.
- The first device is normally mounted in the lower part of the carrier.¹
- The second device is normally mounted in the upper part of the carrier. Unless specifically stated otherwise, the second device can be installed by the user.

¹ The InfoServer SWDCI-AA is an exception. It is *always* mounted in the upper part of the carrier even when it is the only device in the carrier.

2.3 3½-inch SBBs

The 3½-inch SBB shown in Figure 2–2 can accommodate either a full-height (40.7 mm [1.6 inch]) or a low-profile (less than 25.4 mm [1-inch]) fixed or removable media 3½-inch form factor storage device.

Figure 2–2 Typical 3½-inch Storage Device SBB



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2.4 SCSI Device Addresses

The SBB device addresses can be assigned either automatically by the SBB shelf connectors or manually with the device address switches on the rear of the SBB. See the *StorageWorks Solutions Shelf and SBB User's Guide* for detailed information on setting SBB device addresses.

Note

Not all 3½-inch SBBs have a device address switch. In these cases, the device address is always assigned by the SBB shelf connector.

2.5 Disk Drives

Table 2–2 describes the Digital StorageWorks disk drives.

CAUTION

Do not operate 5¼-inch disk drives in the inverted position or the media may be damaged.

Table 2–2 StorageWorks Disk Drives

3½-Inch SBB					
Device	Type	Capacity	Rotational Speed	SCSI Transfer	FCC
RZ25–VA	Fixed	426.00 MB	4412 r/min	5 MB/s	Class A
RZ25L–VA†	Fixed	525.00 MB	5400 r/min	5 MB/s	Class B
RZ26–VA	Fixed	1.05 GB	5400 r/min	5 MB/s	Class A
RZ26L–VA†	Fixed	1.05 GB	5400 r/min	5 MB/s	Class B
RZ28–VA	Fixed	2.10 GB	5400 r/min	10 MB/s	Class B
RZ28B–VA	Fixed	2.10 GB	5400 r/min	10 MB/s	Class B

5¼-Inch Full-Height SBB					
Device	Type	Capacity	Rotational Speed	SCSI Transfer	FCC
RZ73–VA	Fixed	2.00 GB	3600 r/min	10 MB/s	Class A
RZ74–VA	Fixed	3.50 GB	5400 r/min	10 MB/s	Class A

† Low-profile device.

2.6 Optical Disk Drives

Table 2–3 describes the StorageWorks removable, rewritable optical disk drives.

Table 2–3 StorageWorks Optical Disk Drives

5¼-Inch Full-Height SBB					
Device	Capacity	Maximum Transfer Rates			FCC
		Read	Write	SCSI	
RWZ52–VA	1.3 GB	1.6 MB/s	0.8 MB/s	5 MB/s	Class B

2.7 Cartridge Tape Drives

Table 2–4 describes the StorageWorks cartridge tape drives.

CAUTION

Do not operate cartridge tape drives in the inverted position or the media may be damaged.

Table 2–4 StorageWorks Cartridge Tape Drives

3½-Inch SBB					
Device	Tape Type	Capacity	Data Transfer	SCSI Transfer	FCC
TLZ06–VA	4 mm DAT	4 GB	366 KB/s	4 MB/s	Class B
5 1/4-Inch SBB—Full-Height Devices					
Device	Tape Type	Capacity	Data Transfer	SCSI Transfer	FCC
TKZ09–VA	Helical scan	5 GB	500 KB/s	5 MB/s	Class A
TLZ6L–VA††	RDAT	48 GB	500 KB/s	5 MB/s	Class A
TZ86–VA	DLT	6 GB	800 KB/s	5 MB/s	Class A
TZ87–VA	DLT	20 GB	800 KB/s	5 MB/s	Class B
TZ87N–VA	DLT	20 GB	800 KB/s	5 MB/s	Class B
5 1/4-Inch SBB—Half-Height Devices					
Device	Tape Type	Capacity	Data Transfer	SCSI Transfer	FCC
SWXTE–AA	Helical Scan	10 GB	1 MB/s	5 MB/s	Class B
SWXTE–AB†	Helical Scan	10 GB	1 MB/s	5 MB/s	Class B
SWXTE–AC‡	Helical Scan	10 GB	1 MB/s	5 MB/s	Class B
TZ30–VE‡	DLT	95 MB	62.5 KB/s	5 MB/s	Class A
TZK10–VA	QIC	525 MB	200 KB/s	3 MB/s	Class A
TZK10–VU†	QIC	525 MB	200 KB/s	3 MB/s	Class A
TZK11–VA	QIC	2 GB	300 KB/s	3 MB/s	Class B
TZK11–VE‡	QIC	2 GB	300 KB/s	3 MB/s	Class A
TZK11–VU†	QIC	2 GB	300 KB/s	3 MB/s	Class A

† Second device; does not include SBB.

‡ Only used with desktop expansion unit.

†† Cartridge tape drive loader, capacity of 1–12 cartridges.

2.8 CD-ROMs

Table 2–5 describes the Digital StorageWorks CD-ROM drives.

CAUTION

Do not operate CD-ROM drives in the inverted position or the media may be damaged.

Table 2–5 StorageWorks CD-ROM Drives

5¼-Inch SBB—Half-Height Devices					
Device	Capacity	Format	Data Transfer	SCSI Transfer	FCC
RRD42–VB	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class B
RRD42–VE†	600 MB	CD-ROM standard	150 KB/s	5 MB/s	Class A
RRD42–VU†	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class A
RRD43–VA	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class B
RRD43–VC††	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class B
RRD43–VE‡	600 MB	CD-ROM standard	150 KB/s	5 MB/s	Class A
RRD43–VU†	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class B
RRD44–VA	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class B
RRD44–VE‡	600 MB	CD-ROM standard	150 KB/s	5 MB/s	Class A
RRD44–VU†	600 MB	CD-ROM standard	150 KB/s	10 MB/s	Class B

† Second device; does not include SBB.

‡ Only used with desktop expansion unit.

†† Three devices in single SBB. Only available as a factory-configured device. CANNOT be installed in the field.

2.9 Solid-State Disks

Table 2–6 describes the StorageWorks solid state disks.

Table 2–6 StorageWorks Solid State Disks (SSDs)

5¼-Inch SBB				
Device	Sectors	Capacity	SCSI Transfer	FCC
EZ51R–VA	209 k blocks	107 MB	10 MB/s	Class B
EZ54R–VA	835 k blocks	428 MB	10 MB/s	Class B
EZ58R–VA	568 k blocks	856 MB	10 MB/s	Class B

2.10 Magazine Tape Subsystems

Both **DIGITAL Linear Tape (DLT) half-rack** magazine tape subsystems and StorageWorks devices can be installed in either a StorageWorks SW500-series or a SW800-series cabinet. Table 2-7 lists the Digital magazine tape subsystems.

Table 2-7 StorageWorks DLT Magazine Tape Subsystems

Device	Number of Cartridges—Total Capacity	Number of Subsystems per Cabinet	SCSI Transfer	FCC
TZ867-VA	7—42 GB	SW500—3 SW800—4	5 MB/s	Class A
TZ877-VA	7—140 GB	SW500—3 SW800—4	5 MB/s	Class A

These devices are *always* installed in the top of the cabinet and extend the full depth of the cabinet. Installing one of these devices reduces the cabinet SBB shelf capacity by four shelves (two front; two rear). When the first device is installed, you must also modify the cabinet door for access to tapes by ordering and installing a tape loader door bezel (order number CK-SF400-TE).

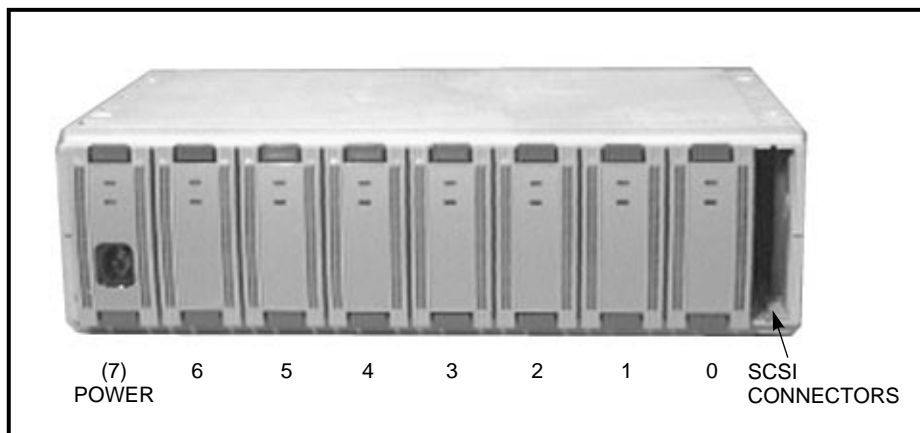
StorageWorks Shelves

The following basic StorageWorks shelf types are described in this chapter:

- The StorageWorks building block (SBB) shelf in which 3½-inch and 5¼-inch form factor storage devices, controllers, and adapters are installed
- The controller shelf in which controllers and the associated cache memory are installed
- The special purpose controller and SBB shelf in which controllers, the associated cache memory, and 3½-inch and 5¼-inch form factor storage devices, controllers, and adapters are installed¹

The BA350-SB² is the basic StorageWorks shelf. It can have a maximum of two buses—a four-device bus and a three-device bus. A single, seven-device bus can be created using the bus jumper board supplied with each SBB shelf. A dual-bus storage devices SCSI terminator board is furnished with each SBB shelf. Each SBB shelf can accommodate a maximum of eight 3½-inch SBBs as shown in Figure 3-1. *The 3½-inch SBB shelf power supply is always installed in Slot 7.* The shelf can have a combination of 3½-inch and 5¼-inch, SBBs as shown in Figure 3-2. *Remember, a 5¼-inch SBB occupies three shelf slots.* Table 3-1 lists some of the possible configurations.

Figure 3-1 Typical SBB Shelf (3½-inch SBBs)



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¹ The BA350-EA controller and SBB shelf is used only in RAID Array Subsystems.

² Direct replacement for the BA350-SA SBB shelf; it can be used in either an FCC Class A or Class B environment.

Figure 3–2 Typical SBB Shelf (3½-inch and 5¼-inch) SBBs



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Table 3–1 SBB Shelf Capacities

Power Supplies	Storage SBBs		Total Storage Devices
	3½-Inch SBBs	5¼-Inch SBBs	
1	7	0	7
1	4	1	5† or 6
1	1	2	3†, 4, 5
2	6	0	6
2	0	2	2† or 4
2	3	1	4† or 5

† No half-height 5¼-inch devices

In addition, you can connect multiple storage shelves in series (daisy-chaining) provided you do not exceed the maximum SCSI bus length or the maximum of seven devices per single bus.

3.1 Shelves and Shelf Upgrade Kits

The following lists various kit options that you may wish to add to your current configuration. See Table 3–2 for a complete description of the kits listed.

If you Wish to Add	Order
An SBB shelf to an SW500-series or SW800-series cabinet	BA350–JA
An SBB shelf to an HSC-type cabinet (RETMA mounting rails)	BA350–SB BA35X–Hx power supply BA35X–RB bracket kit
Two SBB shelves to an Alpha AXP DEC 7000 or DEC 10000	BA655–AA
A controller shelf to an SW500-series or SW800-series series cabinet	BA350–MB

Table 3–2 lists the basic StorageWorks shelves and the shelf upgrade kits. When ordering shelves you must either order mounting brackets (see Chapter 6), and power supplies, or order an upgrade kit.

Table 3–2 StorageWorks Shelves and Upgrade Kits

Order Number	Description
SBB Shelves	
BA350–SB†	This basic, single-height SBB shelf can be configured for either one or two SCSI–2 buses. Its maximum capacity is seven 3½-inch SBBs, or two 5¼-inch SBBs and one 3½-inch SBB, and one power supply. A redundant power supply (ac, dc, or BBU) can be installed in slot 6.
BA350–JA	An SW500-series and SW800-series cabinet compatible SBB shelf upgrade kit containing the following: <ul style="list-style-type: none"> 1 BA350–SB SBB shelf with the following components: <ul style="list-style-type: none"> 2 BA35X–MA blowers 1 BA35X–MB terminator board 1 BA35X–MC jumper board 1 BA35X–RD metric mounting bracket kit 1 BA35X–HA ac input power supply
BA655–AA‡	A DEC 7000 or DEC 1000 AXP compatible upgrade kit containing the following: <ul style="list-style-type: none"> 2 BA350–LA SBB shelves with the following components: <ul style="list-style-type: none"> 1 BA35X–MB terminator board 1 BA35X–MC jumper board 1 PIU mounting bracket kit 1 BA35X–HB dc input power supply (BA35X–HB)

† The BA350–SB shelf is FCC Class B certified and can be installed in either a Class A or Class B environment. It is a direct replacement for the BA350–SA SBB shelf.

‡ The BA350–LA SBB shelf does not have any blowers. The system cabinet fans provide cooling.

Controller Shelves	
BA350-MA	This special purpose, single-height shelf has a maximum capacity of two controllers, two cache memories, two power supplies, and six SCSI-2 buses. <i>Storage SBBs cannot be used in this shelf.</i>
BA350-MB	An SW500-series and SW800-series cabinet compatible controller shelf upgrade kit containing the following: <ul style="list-style-type: none"> 1 BA350-MA controller shelf with the following components: <ul style="list-style-type: none"> 2 BA35X-MA blowers 1 BA35X-MB terminator board 1 BA35X-MC jumper board 1 BA35X-RD metric mounting bracket kit 1 BA35X-HA ac input power supply
Controller and SBB Shelves	
BA350-EA	This special purpose, double-height shelf is part of the StorageWorks RAID Array Subsystem. It has a maximum capacity of two controllers, two cache memories, and two power supplies in the controller portion of the shelf. The SBB portion of the shelf has one power supply and up to seven 3½-inch SBBs which can be storage devices, signal converters, or a redundant power supply, in any combination. It has five SCSI buses or channels.
<p>† The BA350-SB shelf is FCC Class B certified and can be installed in either a Class A or Class B environment. It is a direct replacement for the BA350-SA SBB shelf.</p> <p>‡ The BA350-LA SBB shelf does not have any blowers. The system cabinet fans provide cooling.</p>	

3.2 Shelf Power Supplies

Each StorageWorks shelf requires an ac or dc input power supply. The power supply type is determined by the internal enclosure power system, either ac or dc.

Any shelf can have a redundant power supply to preclude a single power supply failure from disabling the shelf. In most cases, battery backup units (BBUs) can be combined with the shelf power supply to provide extended system data integrity. See Table 3-3 and the *StorageWorks Solutions Shelf and SBB User's Guide* for more information about the power supplies.

Table 3-3 contains the specifications for the BA35X-HA, the BA35X-HB, and the BA35X-HC StorageWorks power supplies.

Table 3-3 StorageWorks Power Supplies

Specifications	BA35X-HA	BA35X-HB	BA35X-HC
Power supply type	AC input	DC input	Battery backup
Input voltage range	90-264 V ac	36-72 V dc	N/A
Nominal input voltage	110 V ac	48 V dc	12 V dc‡
Autoranging feature	Yes	Yes	No
Output voltages	12 V dc 5 V dc	12 V dc 5 V dc	12 V dc 5 V dc

‡ Charging voltage

(continued on next page)

Table 3–3 (Cont.) StorageWorks Power Supplies

Specifications	BA35X–HA	BA35X–HB	BA35X–HC
Output power†	131 W	131 W	200 W peak power for 16, 32, or 64 seconds

† Sequential device spin-up at 4-second interval mandatory

3.3 Power Cords—Desktop and Deskside Expansion Units

The StorageWorks shelf power cords are enclosure-specific and are supplied with the StorageWorks SW500-series and SW800-series cabinets. The deskside expansion unit and desktop expansion unit are different in that you must order a country-specific 10 amp input power cord, as listed in Table 3–4.

Table 3–4 Country-Specific Power Cords

Country	Voltage	Plug	Meters (Feet)	Order No.
Australia	250 V ac	AS 3112 - 1981	2.5 (8.2)	BN19H–2E
Central Europe	250 V ac	CEE 7/7 (Schuko)	2.5 (8.2)	BN19W–2E
Denmark	250 V ac	Afsnit 107	2.5 (8.2)	BN19K–2E
Europe—Central	250 V ac	CEE 7/7 (Schuko)	2.5 (8.2)	BN19W–2E
India	250 V ac	BS 546	2.5 (8.2)	BN19S–2E
Ireland	250 V ac	BS 1363	2.5 (8.2)	BN19A–2E
Israel	250 V ac	SI 32	2.5 (8.2)	BN18L–2E
Italy	250 V ac	CEI 213–16/VII	2.5 (8.2)	BN19M–2E
Japan	125 V ac	NEMA 5–15	3.0 (9.8)	BN27S–03†
New Zealand	250 V ac	AS 3112 - 1981	2.5 (8.2)	BN19H–2E
South Africa	250 V ac	BS 546	2.5 (8.2)	BN19S–2E
Switzerland	250 V ac	SEV 1011	2.5 (8.2)	BN19E–2E
United Kingdom	250 V ac	BS 1363	2.5 (8.2)	BN19A–2E
United States	125 V ac	NEMA 5–15	3.0 (9.8)	BN27S–03†

† This power cord is rated at 15 amps.

StorageWorks Controllers, Converters, and Adapters

The StorageWorks controllers, converters, and adapters are the interface between the host computer and the StorageWorks SCSI-2 devices. The controllers, converters, and adapters are not interchangeable and can be user only with a specific type host. For general information about these devices, see the following sections in this chapter:

Model	Description	See
DWZZA-xx	A SCSI bus converter for connecting a 16-bit differential SCSI host operating in the 8-bit mode to a StorageWorks shelf operating the single-ended, 8-bit, SCSI-2 mode.	Section 4.5
HSD05™-AA	A storage array controller for connecting a DSSI (DIGITAL standard system interconnect) host to a StorageWorks shelf SCSI bus.	Section 4.3
HSJ™40-AD	A CI™ (computer interface) compatible SCSI controller that supports up to 36 SCSI-2 disks, tapes, or optical devices. This controller includes a 16 MByte read cache and supports RAID 0 (random array of independent disks, level 0).	Section 4.1
HSJ42-AD	A CI (computer interface) compatible SCSI controller with two HSJ40-AD controllers. It is used for redundant systems.	Section 4.1
HSD30™-Ax	A controller for connecting an 8-bit wide DSSI host computer to 3 SCSI-2 single-ended buses.	Section 4.4
HSS9X-Ax	The HSC controller seven device SCSI channel controller (K.scsi) for use with the HSC95 or HSR95 controller. This controller is part of the HSR95-series HSC rackmount servers.	Section 4.7
HSZ™10-Ax HSZ15-Ax	A RAID array subsystem SCSI controller that can support up to 30 SCSI-2 devices on six SCSI buses or channels. These subsystems (SZ200-Ax series) are installed in deskside expansion units.	Section 4.6
HSZ40-Ax	A controller for connecting a wide (16-bit), differential SCSI bus to narrow (8-bit), single-ended SCSI bus. This controller requires using a DWZZA-series signal converter.	Section 4.2
SWCDI-Ax	The InfoServer controller is a dedicated SCSI storage server mounted in the upper half of a 5¼-inch SBB (StorageWorks building block). It quickly and efficiently transfers data between the StorageWorks SCSI devices and remote network client systems.	Section 4.8

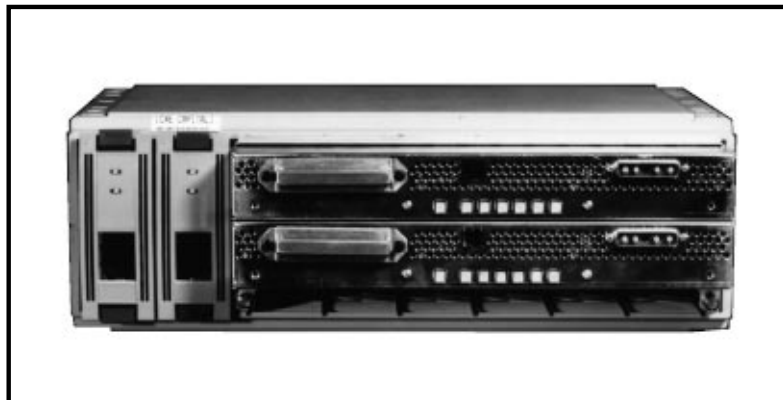
4.1 HSJ-Series Controllers

The HSJ controller series (the HSJ40 [6 SCSI ports] and HSJ30 [3 SCSI ports] controllers), shown in Figure 4–1, connect a CI bus to a SCSI bus. These controllers, their cache memories, and the power supplies are mounted in a BA350–MA controller shelf. The SBBs are mounted in SBB shelves. Both the controller and the SBB shelves can be installed in either an SW500-series or SW800-series cabinet.¹ There is no provision for installing these controllers in a desktide expansion unit.

CAUTION

Installing CD-ROM devices and other storage devices on the same HSJ-series controller SCSI bus can cause time-out problems. Do not install any other storage device on a SCSI bus with a CD-ROM when using an HSJ-series controller.

Figure 4–1 Typical HSJ-Series Controller Shelf Installation



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4.2 HSZ40-Series SCSI Controllers

The HSZ40 SCSI disk controller is a member of the Digital HSZ family of storage array controllers and is installed in BA350–Mx series controller shelf. The HSZ40 controller connects a 16-bit wide, differential host computer SCSI port to six 8-bit, single-ended SCSI device ports. A DWZZA SCSI signal converter is required.

The HSZ40 controller can be connected to a Digital host SCSI ports when the host is running Digital OSF/1® software. Support for non-Digital hosts is provided for the original equipment manufacturer (OEM) environment.

¹ SW500-series and SW800-series cabinets can be only installed in an FCC Class A environment regardless of the SBB shelf type.

4.3 HSD05 DSSI Storage Array Controller

The HSD05 array controller, shown in Figure 4–2, connects a DSSI host to a StorageWorks SCSI bus. This 3½-inch SBB connects to the DSSI bus with a 50-pin micro-ribbon cable attached to the connector on the front. Switches on the back of the SBB define the DSSI **node identification (node ID)**, the SCSI ID, and the DSSI bus termination. The DSSI tralink connector and DSSI terminator block provided with each HSD05 array controller are used to either position the controller in the mid-bus position, or to permit its removal without interrupting the bus.

The HSD05 has two connectors: a 68-pin high-density DSSI connector to which the DSSI cable is attached, and a 96-pin DIN connector that connects to the SBB shelf backplane connector. The single-ended terminators are mounted internally and the converter can be used in either the end-bus or mid-bus position with an HSD tralink connector.

Figure 4–2 HSD05 DSSI Storage Array Controller



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The HSD05 storage array controller is connected to the host with one of the DSSI cables listed in Chapter 14. The 96-pin connector connects the controller to the 8-bit wide, single-ended SBB shelf SCSI bus.

4.4 HSD30 Array Controller

The HSD30 array controller can be configured either as a single controller, or with another HSD30 in a dual-redundant configuration (**failover** support). The HSD30 has three SCSI–2 device ports.

- In the dual-redundant configuration, each port can support six devices.
- In the single controller configuration, each port can support seven devices.

4.5 SCSI Bus Signal Converters

The SBB shelf SCSI buses are 8-bit, single-ended, SCSI-2 buses. Some controllers and hosts, or their SCSI adapters, use a 16-bit, differential SCSI bus. Singled-ended and differential buses are incompatible and the SCSI protocol will disable both buses when they are connected together.

As shown in Figure 4-3, SCSI bus signal converters permit connecting single-ended and differential buses together without modifying the SCSI devices. For an SBB shelf, the DWZZA-series SCSI bus signal converters are used perform the following:

- Establish compatibility between the host SCSI bus and the SBB bus
- Extend the length of the SCSI bus

Two SCSI bus signal converters are used with StorageWorks products—the DWZZA-Ax and the DWZZA-VA. Electrically and operationally, these models are identical. The primary differences are as follow:

- The DWZZA-Ax is a desktop model with a self-contained power supply that can be connected to an SBB shelf or a DWZZA-VA converter. The DWZZA-Ax has two female cable connectors—a 68-pin, high-density and a 50-pin, low-density.
- The DWZZA-VA is always installed in slot 0 of an SBB shelf. It has a single female cable connector—a 68-pin, high-density.

Note

The DWZZA-VA input connector is a 68-pin, differential connector. There is no provision for connecting a 50-pin, single-ended connector to the DWZZA-VA.

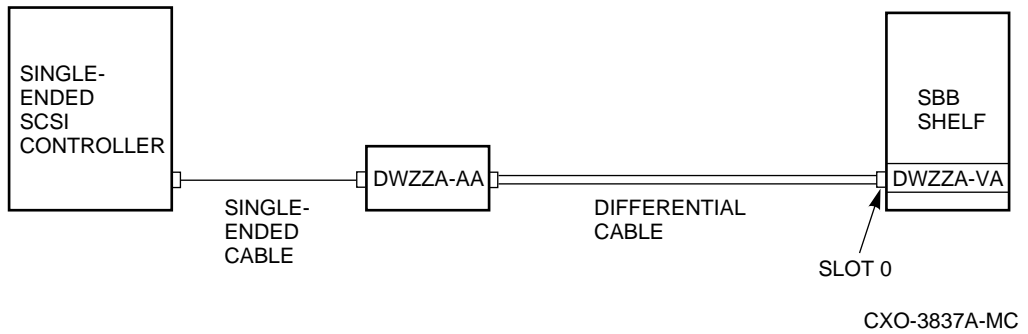
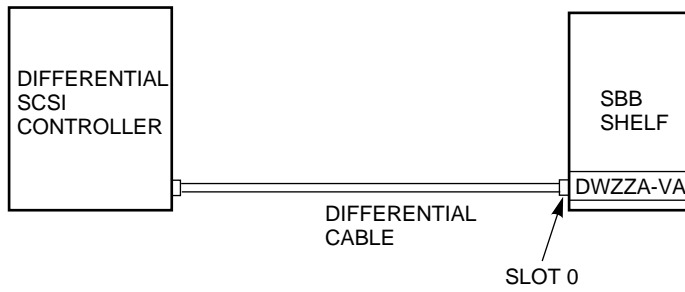
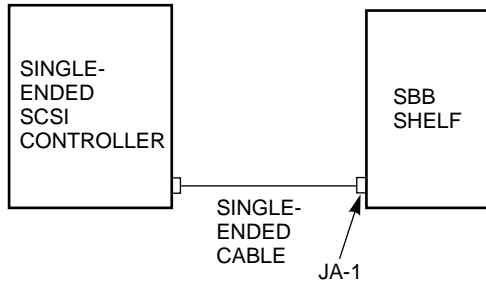
Both the DWZZA-Ax and DWZZA-VA models have internal differential SCSI and single-ended SCSI terminators. These converters can be installed in either the end-bus or the mid-bus position. The mid-bus position requires using the H885-Ax trilink connector block.

The primary differences between the -Ax and the -VA converters exist in the enclosures (the -VA is mounted in a 3½-inch SBB; the -Ax is mounted in a desktop enclosure) and the connectors. All of the cable connectors are high-density (HD). Table 4-1 describes the major differences between these converters.

Table 4-1 StorageWorks SCSI Bus Converters Description

Converter Type	Connectors			DC Power Source
	68-pin HD	50-pin HD	96-pin DIN	
DWZZA-Ax	1	1	0	Internal
DWZZA-VA	1	0	1	SBB shelf

Figure 4-3 Typical Host-SBB Shelf SCSI Bus Cabling



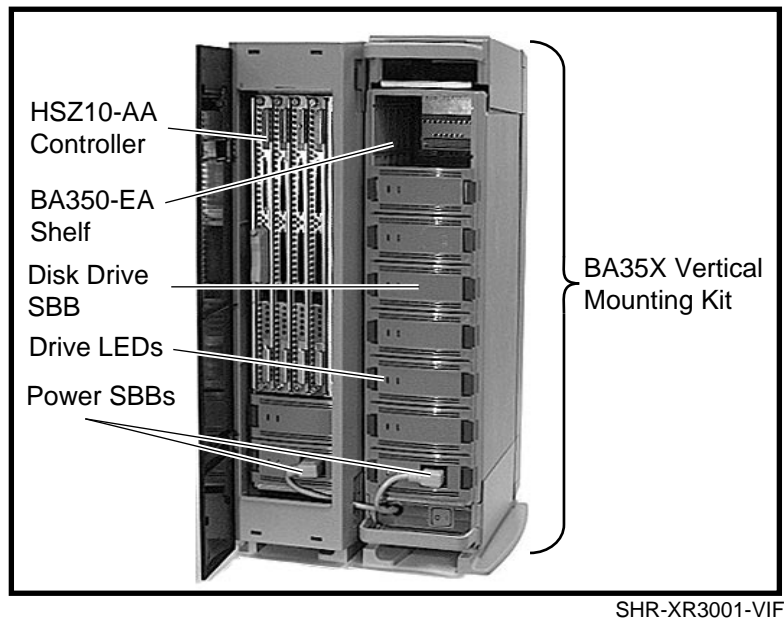
4.6 HSZ1x-Series Disk Array Controllers

The HSZ1x-series SCSI disk array controller supports RAID levels 0, 1, 3, and 5. The controller is only used with RAID array subsystems and is mounted in a controller and SBB shelf. This shelf has 5 SCSI buses, or channels, with one 3½-inch per bus (a one rank\BOLD)² bus) that can be expanded by adding SBB shelves and 3½-inch SBBs up to a maximum of 30 SBBs (5 buses of 6 SBBs each, a 5x6 configuration). All the StorageWorks RAID Array Subsystem shelves are installed in deskside expansion units. The controller and SBB shelf is mounted in two deskside expansion units, as shown in Figure 4-4.

The host SCSI channel is a synchronous/asynchronous, 10 MB/s (fast), 8-bit/16-bit differential channel, and supports the SCSI-2 protocol. The host connector is a 68-pin, high-density, female connector. The second connector is a SCSI output connector for connecting another controller or shelf in series.

There are five 8-bit, single-ended, synchronous/asynchronous, SCSI-2 channels or interfaces. The controller provides active SCSI termination and terminator power. For additional details, see the *StorageWorks RAID Array 110 Subsystem User's Guide*.

Figure 4-4 Typical StorageWorks RAID Array Subsystem Expansion Unit

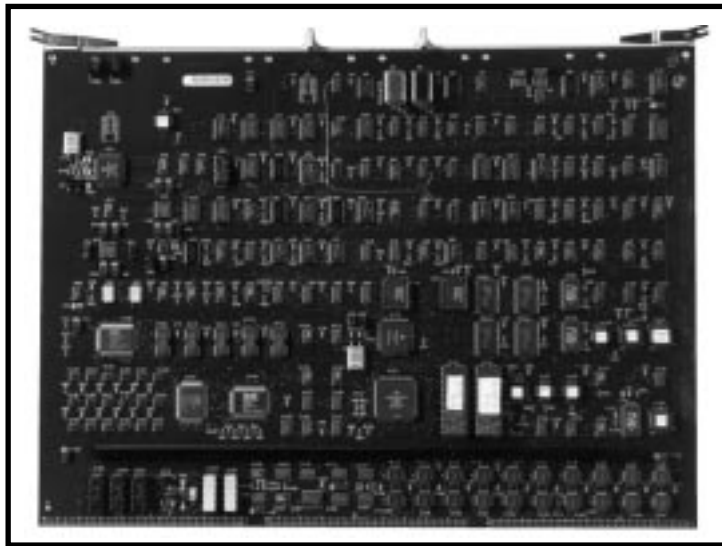


² A rank is the number of SBB devices in a RAID set.

4.7 HSC Controller SCSI Channel Card

The HSC controller SCSI channel card HSS9X-Ax, shown in Figure 4-5 (commonly referred to as “K.scsi”) expands the capabilities of the HSC-series controllers³ to include **SCSI devices**. These controllers can operate with either a single-ended host or a differential host operating in the 8-bit mode and can be installed in either an HSC controller cabinet, such as the HSC95™ or in an HSR95-series data center cabinet.

Figure 4-5 HSS9X-Ax “K.scsi” Controller Card



CXO-4202A-PH

Bus control is provided by the host adapter. The HSC-series controller uses OpenVMS preferred pathing for dual pathing so two controllers can share the SCSI bus and control a maximum of six SCSI devices. Only one adapter has access at a time. In the event of a problem that does not involve the SCSI bus, the other controller can assume control of the devices.

³ Except for the HSC50™ controller

4.8 InfoServer Controller

The InfoServer SW1000 controller SWDCI-AA, shown in Figure 4-6, is an inexpensive means of connecting a remote network client system to a StorageWorks SCSI bus. The SWDCI-AA is always installed in the upper half of a 5¼-inch SBB. The client system is connected to the SBB front panel connector with a thin-wire Ethernet cable. The SBB is always mounted in the the first three SBB shelf slots (slots 0, 1, and 2). The InfoServer SW1000 connector mates with the SBB shelf backplane connector in slot 0. The InfoServer SW1000 SBB device address switch is set to 7, the host controller address, thereby overriding the SBB backplane connector address.

A half-height storage device, such as a CD-ROM, can be mounted in the lower portion of the SBB and its connector mates with SBB shelf backplane connector in slot 2. This device also has a SCSI device address switch.

Figure 4-6 InfoServer Controller SWDCI-AA



CXO-4142A-PH

StorageWorks Enclosures and Subsystems

The following StorageWorks enclosures are described in this chapter:

- SW800-series data center cabinets and subsystems (see Section 5.1)
- SW500-series departmental servers and subsystems (see Section 5.2)
- BA350–Kx-series desktide expansion units (see Section 5.3)
- BA353–Ax-series desktop expansion units (see Section 5.4)

StorageWorks shelves can be mounted in a variety of Digital enclosures. This chapter describes the various type enclosures, the **configure-to-order** subsystems, and the **factory-configured** subsystems to include the following:

- Dimensions
- Input power
- StorageWorks shelf capacity
- Controllers provided or required
- Type and quantity of StorageWorks shelves
- AC power supplies
- AC power cords
- Storage devices
- Cable distribution units

You can configure StorageWorks enclosures and subsystems in the following ways:

Configure-to-Order Systems:

The customer-specified options are installed at the factory.

Factory-Configured Systems:

These systems are configured at the factory and shipped to the customer “*as is*.” Customer-specified options are shipped with the system for on-site installation.

Field Configured Systems

Customer-specified options are installed on-site. The options can be ordered at any time for field upgrades.

As shown in Table 5–1, the system configuration category is model dependent. Unless specifically stated otherwise, all systems can be configured at the customer site providing the proposed upgrade does not create any configuration conflicts (see Part III, StorageWorks Subsystem Planning). For detailed information about compatible upgrades and possible conflicts, contact your Digital account representative.

Table 5–1 StorageWorks Enclosure System Configurations Categories

SW500-Series Departmental Cabinets							
Configure-to-Order Systems				Factory-Configured Systems			
SW500–AC	SW510–AC	SW511–AC	SW512–AC	SW510–BC	SW510–CC	SW512–BC	SW512–CC
SW500–AD	SW510–AD	SW511–AD	SW512–AD	SW510–BD	SW510–CD	SW512–BD	SW512–CD
SW800-Series Data Center Cabinets							
Configure-to-Order Systems				Factory-Configured Systems			
SW800–AA	SW810–AA	SW811–AA	SW812–AA	SW810–BA	SW810–CA	SW812–BA	SW812–CA
SW800–AB	SW810–AB	SW811–AB	SW812–AB	SW810–BB	SW810–CB	SW812–BB	SW812–CB
Deskside Expansion Units							
Configure-to-Order Systems				Factory-Configured Systems			
BA350–KB				BA350–KC	BA350–KE		
Desktop Expansion Units							
Configure-to-Order Systems				Factory-Configured Systems			
BA353–AA	BA353–AE	BA353–AH	BA353–AP				
BA353–AD	BA353–AF	BA353–AJ					

5.1 SW800 Data Center Cabinet Subsystems

Tables 5-2 and 5-3 describe SW800 data center cabinets and subsystems configurations similar to the one shown in Figure 5-1.

Figure 5-1 Typical SW800 Data Center Cabinet



CXO-4199A-PH

Table 5–2 SW800-Series Data Center Cabinets—Configure-to-Order Subsystems

Note

The second letter in the model-suffix denotes the cabinet input ac power as follows:

- xA—60 Hz, 120/208 V ac, three-phase
- xB—50 Hz, 240/416 V ac, three-phase

Enclosure	Description
SW800-AA SW800-AB	<p>SW800 Data Center Cabinet No controller shelves or controllers No SBB shelves or storage devices</p> <p>A 1700 mm (66.9 in) high, configure-to-order SW800 cabinet available in either 60 Hz, 120/208 V ac, three-phase configuration (–AA) or 50 Hz, 240/416 V ac, three-phase configuration (–AB).</p> <p>This cabinet includes the following components:</p> <ul style="list-style-type: none"> • Outer panels • Blank doors • Power entry units • Internal power cords • Cooling systems <p>It <i>does not</i> include:</p> <ul style="list-style-type: none"> • Shelf mounting hardware • SCSI cables • StorageWorks components • Storage devices <p>It can accommodate a <i>maximum</i> of 24 StorageWorks shelves.</p>
SW810-AA SW810-AB	<p>SW810 Data Center Subsystem Controller shelf without a controller 6.3 GB disk storage</p> <p>Customer-specified options can be installed at the factory or on site.</p> <p>This configure-to-order SW800 subsystem contains the following components:</p> <ol style="list-style-type: none"> 1 BA350–MA controller shelf with: <ol style="list-style-type: none"> 1 BA35X–HA ac power supply 1 ac power cord 3 BA350–SB SBB shelves with: <ol style="list-style-type: none"> 6 RZ26L–VA 3½-inch disk drives (2 per shelf) 6 BN21H–01 SCSI cables (2 per shelf) 3 BA35X–HA ac power supplies (1 per shelf) 3 ac power cords (1 per shelf)

(continued on next page)

Table 5–2 (Cont.) SW800-Series Data Center Cabinets—Configure-to-Order Subsystems

Enclosure	Description
SW811-AA SW811-AB	<p>SW811 Data Center Subsystem Controller shelf without a controller 21 GB disk storage</p> <p>Customer-specified options can be installed at the factory or on site. This configure-to-order SW800 subsystem contains the following components:</p> <ul style="list-style-type: none">1 BA350–MA controller shelf with:<ul style="list-style-type: none">1 BA35X–HA ac power supply1 ac power cord6 BA350–SB SBB shelves with:<ul style="list-style-type: none">6 RZ74–VA 5¼-inch disk drives (1 per shelf)6 BN21H–01 SCSI cables (1 per shelf)6 BA35X–HA ac power supplies (1 per shelf)6 ac power cords (1 per shelf)
SW812-AA SW812-AB	<p>SW812 Data Center Subsystem Controller shelf without a controller 12.6 GB disk storage</p> <p>Customer-specified options can be installed at the factory or on site. This configure-to-order SW800 subsystem contains the following components:</p> <ul style="list-style-type: none">1 BA350–MA controller shelf with:<ul style="list-style-type: none">1 BA35X–HA ac power supply1 ac power cord3 BA350–SB SBB shelves with:<ul style="list-style-type: none">6 RZ28–VA 3½-inch disk drives (2 per shelf)6 BN21H–01 SCSI cables (2 per shelf)3 BA35X–HA ac power supplies (1 per shelf)3 ac power cords (1 per shelf)

Table 5–3 SW800-Series Data Center Cabinets—Factory-Configured Subsystems

Note

The second letter in the suffix denotes the cabinet or tape drive input ac power as follows:

- xA—60 Hz, 120/208 V ac, three-phase
- xB—50 Hz, 240/416 V ac, three-phase
- xE—60 Hz, 120 V ac, single-phase
- xF—50 Hz, 240 V ac, single-phase

Enclosure	Description
SW810-BA SW810-BB	<p>Data Center Subsystem HSJ42-AD Controller 18.9 GB Disk Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW800 subsystem contains the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 HSJ42-AD controller 2 BA35X-HA ac power supply 2 ac power cord 6 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 18 RZ26L-VA 3½-inch disk drives (3 per shelf) 6 BN21H-01 SCSI cables (1 per shelf) 12 BA35X-HA ac power supplies (2 per shelf) 12 ac power cord (2 per shelf) 2 cable distribution units with: <ul style="list-style-type: none"> 10 ac power cords (future expansion)
SW810-CA SW810-CB	<p>SW810 Data Center Subsystem HSJ42-AD Controller 18.9 GB Disk Storage 42 GB Tape Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW800 subsystem contains the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 HSJ42-AD controller 2 BA35X-HA ac power supply 2 ac power cord 5 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 18 RZ26L-VA 3½-inch disk drives (3 shelves: 4 drives each; 2 shelves: 3 drives each) 5 BN21H-01 SCSI cables (1 per shelf) 10 BA35X-HA ac power supplies (2 per shelf) 10 ac power cord (2 per shelf) 1 TZ867-AE/AF Tape Drive Loader with: <ul style="list-style-type: none"> 1 CK-SF400-TE Tape Drive Door Bezel Kit 1 ac power cord 2 BN21H-02 SCSI cable 2 cable distribution units with: <ul style="list-style-type: none"> 12 ac power cords (future expansion)

(continued on next page)

Table 5–3 (Cont.) SW800-Series Data Center Cabinets—Factory-Configured Subsystems

Enclosure	Description
SW812-BA SW812-BB	<p>SW812 Data Center Subsystem HSJ42-AD Controller 37.8 GB Disk Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW800 subsystem contains the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 HSJ42-AD controller 2 BA35X-HA ac power supply 2 ac power cord 6 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 18 RZ28B-VA 3½-inch disk drives (3 per shelf) 6 BN21H-01 SCSI cables (1 per shelf) 12 BA35X-HA ac power supplies (2 per shelf) 12 ac power cords (2 per shelf) 2 cable distribution units with: <ul style="list-style-type: none"> 10 ac power cords (future expansion)
SW812-CA SW812-CB	<p>SW812 Data Center Subsystem HSJ42-AD Controller 37.8 GB Disk Storage 42 GB Tape Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW800 subsystem contains the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 HSJ42-AD controller 2 BA35X-HA ac power supply 2 ac power cord 5 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 18 RZ28B-VA 3½-inch disk drives (3 shelves: 4 drives each; 2 shelves: 3 drives each) 5 BN21H-01 SCSI cables (1 per shelf) 10 BA35X-HA ac power supplies (2 per shelf) 10 ac power cords (2 per shelf) 1 TZ867-AE/AF Tape Drive Loader with: <ul style="list-style-type: none"> 1 CK-SF400-TE Tape Drive Door Bezel Kit 1 ac power cord 2 BN21H-02 SCSI cable 2 cable distribution units with: <ul style="list-style-type: none"> 10 ac power cords (future expansion)

5.2 SW500 Departmental Server Subsystems

Tables 5-4 and 5-5 describe the SW500 departmental server subsystems cabinets and subsystems similar to the one shown in Figure 5-2 configurations.

Figure 5-2 Typical SW500 Departmental Server



CXO-4200A-PH

Table 5–4 SW500-Series Departmental Cabinets—Configure-to-Order Subsystems

Note

The second letter in the model-suffix denotes the cabinet input ac power as follows:

- xA—60 Hz, 120 V ac, single-phase
- xB—50 Hz, 240 V ac, single-phase

Enclosure	Description
SW500-AC SW500-AD	<p>SW500 Departmental Server Subsystem No controller shelves or controllers No SBB shelves or storage devices</p> <p>An 1100 mm (42.1 in) high, configure-to-order SW500 cabinet available in either 60 HZ, 120 V ac, single-phase configuration (-AC) or 50 Hz, 240 V ac, single-phase configuration (-AD).</p> <p>This cabinet includes the following components:</p> <ul style="list-style-type: none"> • Outer panels • Blank doors • Power entry units • Internal power cords • Cooling systems <p>It <i>does not</i> include:</p> <ul style="list-style-type: none"> • Shelf mounting hardware • SCSI cables • StorageWorks components • Storage devices <p>It can accommodate a <i>maximum</i> of 10 StorageWorks shelves.</p>
SW510-AC SW510-AD	<p>SW500 Departmental Server Subsystem No Controller 6.3 GB Disk Storage</p> <p>Customer-specified options can be installed at the factory or on site. This configure-to-order SW500 subsystem contains the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 BA35X-HA ac power supply 1 ac power cord 3 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 6 RZ26L-VA 3½-inch disk drives (2 per shelf) 6 BN21H-01 SCSI cables (2 per shelf) 3 BA35X-HA ac power supplies (1 per shelf) 3 ac power cords (1 per shelf)

(continued on next page)

Table 5–4 (Cont.) SW500-Series Departmental Cabinets—Configure-to-Order Subsystems

Enclosure	Description
SW511-AC SW511-AD	SW500 Departmental Server Subsystem No Controller 21 GB Disk Storage Customer-specified options can be installed at the factory or on site. This configure-to-order SW500 subsystem contains the following components: <ul style="list-style-type: none">1 BA350-MA controller shelf with:<ul style="list-style-type: none">1 BA35X-HA ac power supply1 ac power cord6 BA350-SB SBB shelves with:<ul style="list-style-type: none">6 RZ74-VA 5¼-inch disk drives (1 per shelf)6 BN21H-01 SCSI cables (1 per shelf)6 BA35X-HA ac power supplies (1 per shelf)6 ac power cords (1 per shelf)
SW512-AC SW512-AD	SW500 Departmental Server Subsystem No Controller 12.6 GB Disk Storage Customer-specified options can be installed at the factory or on site. This configure-to-order SW500 subsystem contains the following components: <ul style="list-style-type: none">1 BA350-MA controller shelf with:<ul style="list-style-type: none">1 BA35X-HA ac power supply1 ac power cord3 BA350-SB SBB shelves with:<ul style="list-style-type: none">6 RZ28-VA 3½-inch disk drives (2 per shelf)6 BN21H-01 SCSI cables (2 per shelf)3 BA35X-HA ac power supplies (1 per shelf)3 ac power cords (1 per shelf)

Table 5–5 SW500-Series Departmental Cabinets—Factory-Configured Subsystems

Note

The second letter in the model-suffix denotes the cabinet input ac power as follows:

- xA—60 Hz, 120 V ac, single-phase
- xB—50 Hz, 240 V ac, single-phase

Enclosure	Description
SW510-BC SW510-BD	<p>SW500 Departmental Server Subsystem HSJ40-AD Controller 6.3 GB Disk Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW500 subsystem containing the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 HSJ40-AD controller 1 BA35X-HA ac power supply 1 ac power cord 3 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 6 RZ26L-VA 3½-inch disk drives (2 per shelf) 6 BN21H-01 SCSI cables (2 per shelf) 3 BA35X-HA ac power supplies (1 per shelf) 3 ac power cord (1 per shelf) 1 cable distribution unit with: <ul style="list-style-type: none"> 6 ac power cords (future expansion)
SW510-CC SW510-CD	<p>SW500 Departmental Server Subsystem HSJ40-AD Controller 6.3 GB Disk Storage 42 GB Tape Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW500 subsystem containing the following components:</p> <ul style="list-style-type: none"> 1 BA350-MA controller shelf with: <ul style="list-style-type: none"> 1 HSJ40-AD controller 1 BA35X-HA ac power supply 1 ac power cord 6 BA350-SB SBB shelves with: <ul style="list-style-type: none"> 6 RZ26L-VA 3½-inch disk drives (1 per shelf) 6 BN21H-01 SCSI cables (1 per shelf) 6 BA35X-HA ac power supplies (1 per shelf) 6 ac power cord (1 per shelf) 1 TZ867-AE/AF Tape Drive Loader with: <ul style="list-style-type: none"> 1 CK-SF400-TE Tape Drive Door Bezel Kit 1 ac power cord 1 BN21H-02 SCSI cable 1 cable distribution unit with: <ul style="list-style-type: none"> 2 ac power cords (future expansion)

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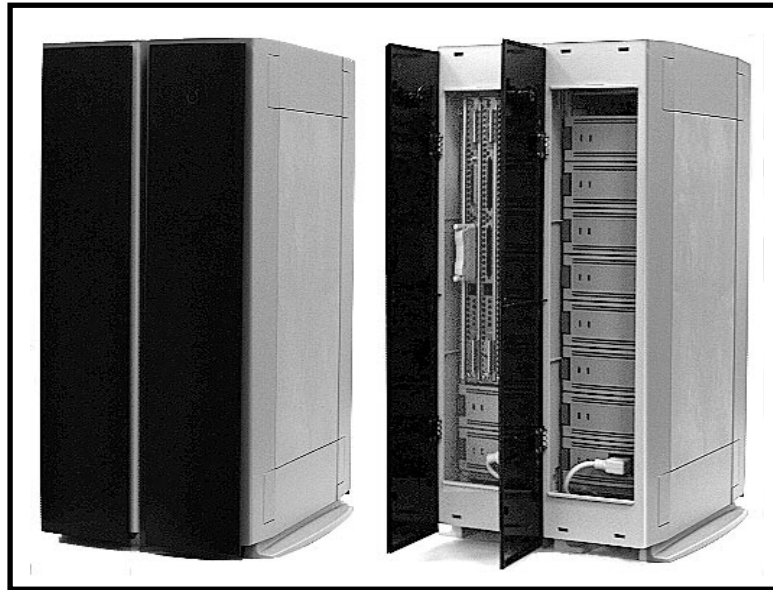
Table 5–5 (Cont.) SW500-Series Departmental Cabinets—Factory-Configured Subsystems

Enclosure	Description
SW512-BC SW512-BD	<p>SW500 Departmental Server Subsystem HSJ40-AD Controller 12.6 GB Disk Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW500 subsystem containing the following components:</p> <ul style="list-style-type: none">1 BA350-MA controller shelf with:<ul style="list-style-type: none">1 HSJ40-AD controller1 BA35X-HA ac power supply1 ac power cord6 BA350-SB SBB shelves with:<ul style="list-style-type: none">6 RZ26L-VA 3½-inch disk drives (1 per shelf)6 BN21H-01 SCSI cables (1 per shelf)6 BA35X-HA ac power supplies (1 per shelf)6 ac power cords (1 per shelf)1 cable distribution unit with:<ul style="list-style-type: none">3 ac power cords (future expansion)
SW512-CC SW512-CD	<p>SW500 Departmental Server Subsystem HSJ40-AD Controller 12.6 GB Disk Storage 42 GB Tape Storage</p> <p>This factory-configured subsystem is shipped with only the listed components installed prior to shipment. Customer-specified options are installed on site. A factory-configured SW500 subsystem containing the following components:</p> <ul style="list-style-type: none">1 BA350-MA controller shelf with:<ul style="list-style-type: none">1 HSJ40-AD controller1 BA35X-HA ac power supply1 ac power cord6 BA350-SB SBB shelves with:<ul style="list-style-type: none">6 RZ26L-VA 3½-inch disk drives (1 per shelf)6 BN21H-01 SCSI cables (1 per shelf)6 BA35X-HA ac power supplies (1 per shelf)6 ac power cords (1 per shelf)1 TZ867-AE/AF Tape Drive Loader with:<ul style="list-style-type: none">1 CK-SF400-TE Tape Drive Door Bezel Kit1 ac power cord1 BN21H-02 SCSI cable1 cable distribution unit with:<ul style="list-style-type: none">2 ac power cords (future expansion)

5.3 BA350–Kx Series Deskside Expansion Units

Table 5–6 describes the BA350–Kx series deskside expansion units and subsystems configurations similar to the one shown in Figure 5–3.

Figure 5–3 RAID Array Subsystem Dual BA350–KB Deskside Expansion Unit



SHR-XR3000-VIF

Table 5–6 Deskside Expansion Units

Enclosure	Description
BA350–KB	Deskside Expansion Unit No controller No storage devices This configure-to-order deskside expansion unit is certified for operation in an FCC Class B environment when all the installed storage devices are also Class B certified. It can also be used in an FCC Class A environment with any approved storage device installed. Customer-specified options can be installed either at the factory or on site. <ul style="list-style-type: none">1 BA35X–VA Pedestal Mounting Kit with the following components:<ul style="list-style-type: none">1 ac distribution unit2 ac power cords (internal)1 BA350–SB SBB shelf with the following components:<ul style="list-style-type: none">1 BA35X–HA ac input power supply1 ac power cord

(continued on next page)

Table 5–6 (Cont.) Deskside Expansion Units

Enclosure	Description
BA350-KC	<p data-bbox="354 331 756 411">BA350 Deskside Expansion Unit HSD05 DSSI Controller 3.15 GB Disk Storage</p> <p data-bbox="354 411 1382 516">This factory-configured deskside expansion unit is certified for operation in an FCC Class B environment when all the installed storage devices are also Class B certified. It can also be used in an FCC Class A environment with any approved storage device installed. Customer-specified options are installed on site.</p> <ul data-bbox="402 537 1170 751" style="list-style-type: none">1 BA35X-VA Pedestal Mounting Kit with the following components:<ul style="list-style-type: none">1 ac distribution unit2 ac power cords (internal)1 BA350-SB SBB shelf with the following components:<ul style="list-style-type: none">1 HSD05-AA DSSI Controller3 RZ26L-VA 3½-inch disk drives1 BA35X-HA ac input power supply1 ac power cord
BA350-KE	<p data-bbox="354 783 756 863">BA350 Deskside Expansion Unit HSD05 DSSI Controller 6.3 GB Disk Storage</p> <p data-bbox="354 863 1382 968">This factory-configured deskside expansion unit is certified for operation in an FCC Class B environment when all the installed storage devices are also Class B certified. It can also be used in an FCC Class A environment with any approved storage device installed. Customer-specified options are installed on site.</p> <ul data-bbox="402 989 1170 1203" style="list-style-type: none">1 BA35X-VA Pedestal Mounting Kit with the following components:<ul style="list-style-type: none">1 ac distribution unit2 ac power cords (internal)1 BA350-SB SBB shelf with the following components:<ul style="list-style-type: none">1 HSD05-AA DSSI Controller3 RZ28B-VA 3½-inch disk drives1 BA35X-HA ac input power supply1 ac power cord

5.4 BA353-Ax Series Desktop Expansion Unit

Table 5-7 describes the BA353-Ax desktop expansion unit and subsystem configurations similar to the one shown in Figure 5-4.

Figure 5-4 Typical BA353-Ax Deskside Expansion Unit



CXO-3679A_PH

Table 5-7 Desktop Expansion Units

Enclosure	Description
BA353-AA	Desktop Expansion Unit No storage devices A configure-to-order desktop expansion unit with the following: <ul style="list-style-type: none">1 universal ac input power supply1 internal blower1 one 5¼-inch half-height or 3½-inch SBB slot2 3½-inch SBB slots
BA353-AE	Desktop Expansion Unit 600 MB CD-ROM A factory-configured desktop expansion unit with the following: <ul style="list-style-type: none">1 universal ac input power supply1 internal blower1 RRD43-VE CD-ROM2 3½-inch SBB slots

(continued on next page)

Table 5-7 (Cont.) Desktop Expansion Units

Enclosure	Description
BA353-AF	Desktop Expansion Unit 600 MB CD-ROM A factory-configured desktop expansion unit with the following: <ul style="list-style-type: none">1 universal ac input power supply1 internal blower1 RRD42-VE CD-ROM2 3½-inch SBB slots
BA353-AH	Desktop Expansion Unit 95 MB Tape Drive A factory-configured desktop expansion unit with the following: <ul style="list-style-type: none">1 universal ac input power supply1 internal blower1 TZ30-VE cartridge tape drive2 3½-inch SBB slots
BA353-AJ	Desktop Expansion Unit 2 GB Tape Drive A factory-configured desktop expansion unit with the following: <ul style="list-style-type: none">1 universal ac input power supply1 internal blower1 TZK11-VE cartridge tape drive2 3½-inch SBB slots
BA353-AP	Desktop Expansion Unit 10 GB Tape Drive A factory-configured desktop expansion unit with the following: <ul style="list-style-type: none">1 universal ac input power supply1 internal blower1 SWXTE-VE cartridge tape drive2 3½-inch SBB slots

StorageWorks Accessories

The StorageWorks accessories listed in Table 6–1 expand the capabilities of a StorageWorks system. Most of the accessories are included in the basic StorageWorks subsystems.

Table 6–1 StorageWorks Accessories, Kits, and Components

Order No.	Description
Shelf Accessories	
BA35X-PA	Filler panel kit consisting of six 3½-inch bezels for covering blank slots.
BA35X-MA	Blower assembly for StorageWorks shelf.
BA35X-MB	An active terminator board for two 8-bit single-ended SCSI-2 buses.
BA35X-MC	A jumper board for two 8-bit single-ended SCSI-2 buses.
BA35X-RB	Radio-Electronics-Television Manufacturer's Association (RETMA) rack mounting kit for mounting StorageWorks shelves in cabinets with the RETMA mounting pattern, such as HSC controller cabinets. One kit is required for each StorageWorks shelf ordered separately.
BA35X-RC	Metric rack mounting kit for mounting StorageWorks shelves in HSR95-series cabinets. One kit is required for each StorageWorks shelf ordered separately.
BA35X-RD	Metric rack mounting kit for mounting StorageWorks shelves in an SW500-series or SW800-series cabinet. One kit is required for each StorageWorks shelf ordered separately. These brackets are part of the BA350-JA SBB shelf upgrade kit.
Cabinet Accessories	
SW8xP-AA†	60 Hz, 120/208 V ac, three-phase cable distribution unit kit. Required when more than 12 StorageWorks shelves installed in cabinet.
SW8xP-AB†	50 Hz, 240/416 V ac, three-phase cable distribution unit kit. Required when more than 12 StorageWorks shelves installed in cabinet.

† Cable distribution units are installed by Digital Multivendor Customer Services engineers.

(continued on next page)

Table 6–1 (Cont.) StorageWorks Accessories, Kits, and Components

Order No.	Description
Cabinet Accessories	
SWX01-AA	<p>This external SCSI storage kit for DEC 7000 AXP or DEC 10000 AXP systems is mounted in an SW800 cabinet. This kit contains the following items:</p> <ul style="list-style-type: none"> 1 BA350-JA SW500/SW800 data cabinet SBB shelf kit 1 DWZZA-VA SBB SCSI signal converter 1 DWZZA-AA desktop SCSI signal converter 1 BN21H-02 SCSI single-ended cable 1 BN21K-10 SCSI differential cable
HSS9X-RA	<p>This HSC-compatible external SCSI storage kit is mounted in an SW800 cabinet. This kit contains the following items:</p> <ul style="list-style-type: none"> 1 HSC9X-SX SCSI data channel card 1 BA350-JA SW500/SW800 data cabinet SBB shelf kit 1 DWZZA-VA SBB SCSI signal converter 1 BN21K-10 SCSI differential cable
SW500- and SW800-Series Cabinet Magazine Tape Door Bezel	
CK-SF400-TE	<p>TZ8x7-VA Tape Loader Door Bezel This door bezel is required to provide clearance for two TZ8xxx-VA tape drive subsystems. Order one kit for every two tape drive subsystems.</p>
Storage Device Accessories and Kits	
SWDDB-BA	<p>Twelve 1.05 GB RZ26-VA 3½-inch disk drives in a single shipping container.</p>
StorageWorks Generic Device Carrier Kits	
SWXBA-BA	<p>3½-Inch Fixed Media SBB Kit A device carrier kit for mounting <i>customer-supplied</i> 3½-inch form factor <i>fixed media</i> devices. This kit contains the following items:</p> <ul style="list-style-type: none"> • Integrated EMI/RFI/ESD shield • Universal SCSI interface and power connector • SCSI device address selection switch • Bezel mounted green device status LED • Bezel mounted amber device activity LED • Mounting hardware • Installation guide

(continued on next page)

Table 6–1 (Cont.) StorageWorks Accessories, Kits, and Components

Order No.	Description
StorageWorks Generic Device Carrier Kits	
SWXBA–BB	<p>3½-Inch Removable Media SBB Kit A device carrier kit for mounting <i>customer-supplied</i> 3½-inch form factor <i>removable media</i> devices. This kit contains the following items:</p> <ul style="list-style-type: none"> • Integrated EMI/RFI/ESD shield • Universal SCSI interface and power connector • SCSI device address selection switch • Bezel • Mounting hardware • Installation guide
SWXBB–BA	<p>5¼-Inch Fixed or Removable Media SBB Kit A device carrier kit for mounting either full-height or half-height <i>customer-supplied</i> 5¼-inch form factor fixed and removable media devices. This kit contains the following items:</p> <ul style="list-style-type: none"> • Integrated EMI/RFI/ESD shield • Universal SCSI interface and power connector • SCSI device address selection switch • Bezels for both fixed and removable media devices • Bezel mounted green device status LED—fixed media device • Bezel mounted amber device activity LED—fixed media device • Half-height device bezel panel • Half-height device mounting bracket • Mounting hardware • Bezel extraction tool • Installation guide
Differential SCSI Bus Accessories	
H885–AA	<p>A 68-pin, differential SCSI bus, tralink connector block used in conjunction with a differential terminator block to accomplish the following:</p> <ul style="list-style-type: none"> • Removing a controller or bus converter without interrupting the bus • Placing a controller or bus converter in the mid-bus position
H879–AA	<p>A 68-pin, differential SCSI, terminator block used in conjunction with the SCSI tralink connector block to permit removal of controller without interrupting the bus.</p>

Part II

Digital StorageWorks Compatible Systems

This part contains descriptions of the StorageWorks compatible Digital systems to include models, SCSI (small computer system interface) controllers/adapters, SCSI bus type, SCSI cables, and the StorageWorks enclosures, shelves, and devices. These descriptions are organized as follows:

For Information About	See
Alpha AXP Systems	Chapter 7, Alpha AXP System StorageWorks Configurations
applicationDEC™ 400xMP Systems	Chapter 10, Personal Computer System StorageWorks Configurations
DEC™ 2000 AXP Servers	Chapter 7, Alpha AXP System StorageWorks Configurations
DEC 3000 AXP Systems	Chapter 7, Alpha AXP System StorageWorks Configurations
DEC 4000 Model 600/700 AXP Distributed/Departmental Servers	Chapter 7, Alpha AXP System StorageWorks Configurations
DEC 7000 Model 600 AXP Data Center Servers	Chapter 7, Alpha AXP System StorageWorks Configurations
DEC 10000 Model 600 AXP Mainframe Class Servers	Chapter 7, Alpha AXP System StorageWorks Configurations
DECpc™ AXP 150 Deskside PC	Chapter 7, Alpha AXP System StorageWorks Configurations
DECstation™ 5000 Systems	Chapter 9, DECsystem StorageWorks Configurations
DECsystem™	Chapter 9, DECsystem StorageWorks Configurations
DECsystem 5000 Systems and Servers	Chapter 9, DECsystem StorageWorks Configurations
MicroVAX 3100™ Systems and Servers	Chapter 8, Digital VAX System StorageWorks Configurations
Personal Computers	Chapter 10, Personal Computer System StorageWorks Configurations
VAX 4000™ Systems	Chapter 8, Digital VAX System StorageWorks Configurations
VAX 4000 Systems and Servers	Chapter 8, Digital VAX System StorageWorks Configurations
VAX 7000 Systems and Servers	Chapter 8, Digital VAX System StorageWorks Configurations
VAX 10000 Systems and Servers	Chapter 8, Digital VAX System StorageWorks Configurations

Alpha AXP System StorageWorks Configurations

This chapter lists the basic data required for configuring Digital Alpha AXP computer systems for operation with StorageWorks subsystems. A supported system has been evaluated in the specified configuration (that is, the host computer and SCSI adapter, and the StorageWorks controller, shelf, enclosure, SCSI cable, and supported StorageWorks building blocks (SBBs) and complies with country-specific standards (for example, FCC, TUV, and so forth) and Digital standards.

Note

The information in this chapter is general in nature and is for guidance only. See the *Digital Systems and Options Catalog* as well as Alpha AXP system, controller, shelf, and enclosure publications for detailed information about each element of the configuration. See Part III for information about configuration rules and SCSI buses.

For Information About This System	See
DEC 2000 AXP Server	Table 7-3
DEC 3000™ AXP Desktop Workstations and Desktop Servers	Table 7-2
DEC 3000 AXP Deskside Workstations and Deskside Servers	Table 7-1
DEC 4000™ AXP Distributed/Departmental Servers	Table 7-5
DEC 7000™ AXP Data Centers Servers	Table 7-4
DEC 10000™ AXP Mainframe Class Servers	Table 7-6
DEC Personal Computer AXP	Table 7-7

These tables include the following information:

Column	Information
Host System	
Models	Self-explanatory
SCSI Adapter— Model and Speed	<p>The host SCSI adapter, or controller, used with the StorageWorks shelves and the adapter's bus speed, either fast (10 MB/s) or slow (5 MB/s). Some systems have an embedded SCSI adapter in the host that can be used both for the internal and the external SCSI-2 buses. In many cases, the external SCSI bus requires another adapter, such as the KZMSA-AB, for the SBB SCSI bus.</p> <p>The rate at which the adapter can transmit data over the SCSI-2 bus, either fast (10 MB/s) or slow (5 MB/s), is independent of the other elements in the configuration. However, the devices on the bus, such as an RZ25-VA, may not be able to process data at a fast rate. The adapter identifies the maximum rate at which individual devices can process data and uses this rate for that device.</p>

Note

When the adapter can transmit at the fast rate and there is at least one fast device on the bus, the SCSI bus *must be designed* as a fast bus (maximum length 3.0 meters [9.8 feet]). This bus cannot function as a slow bus.

StorageWorks— SCSI Cable	The SCSI cable recommended for connecting the host system to the controller, shelf, or enclosure. The cable length is a function of the physical configuration and the bus speed. SCSI cables are described in detail in Chapter 12.
StorageWorks— Component	<p>The information in this column defines the following:</p> <ul style="list-style-type: none"> • The shelves used for the controllers or the SBBs • The enclosures containing the shelves
StorageWorks— Devices	The devices that are supported in a specific configuration. Other devices may be compatible, but have not been evaluated in this configuration.

Note

Unless specifically stated otherwise, all buses are assumed to operate as a single-ended, slow SCSI bus with a transfer rate of 5 MB/s and a maximum cable length of 6.0 meters (19.7 feet).

Table 7-1 DEC 3000 AXP Deskside StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
500 AXP 500S AXP	Embedded	Slow	BC09D-06†	<ul style="list-style-type: none"> • BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06
				<ul style="list-style-type: none"> • BA353-Ax desktop expansion unit 	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B SWXTE-VE TLZ06 TZ30-VE TZK11-VE
500 AXP 500S AXP 500X AXP	PMAZ-AA PMAZ-AB	Slow Fast	BN21H	<ul style="list-style-type: none"> • BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06
				<ul style="list-style-type: none"> • BA353-Ax desktop expansion unit 	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B SWXTE-VE TLZ06 TZ30-VE TZK11-VE

† Minimum cable length.

Table 7–2 DEC 3000 AXP Desktop StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
300 AXP 300L AXP	Embedded PMAZ-AA PMAZ-AB	Slow Slow Fast	BN21H	• BA353-Ax desktop expansion unit	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE-VE TZ30-VE TZK11-VE
400 AXP 400S AXP	Embedded	Slow	BC09D-06†	• BA350-Kx deskside expansion unit (BA350-Sx SBB shelf)	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L TLZ06
				• BA353-Ax desktop expansion unit	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE-VE TZ30-VE TZK11-VE
400 AXP 400S AXP	PMAZ-AA PMAZ-AB	Slow Fast	BN21H	• BA350-Kx deskside expansion unit (BA350-Sx SBB shelf)	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06

† Minimum cable length.

(continued on next page)

Table 7–2 (Cont.) DEC 3000 AXP Desktop StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
400 AXP 400S AXP	PMAZ-AA PMAZ-AB	Slow Fast	BN21H	• BA353-Ax desktop expansion unit	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE-VE TZ30-VE TZK11-VE

† Minimum cable length.

Table 7–3 DEC 2000 AXP Server StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
300 AXP	PCTAZ-AB	Fast	BN21H	• BA350-Kx deskside expansion unit	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TZK10

Table 7–4 DEC 7000 AXP Data Center Servers StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
600	KZMSA-AB	Fast	BN21H	<ul style="list-style-type: none"> BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	EZ51R EZ54R EZ58R RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TLZ06 TZ86 TZ87
			BC10U	<ul style="list-style-type: none"> BA655-AA building block dual shelf (BA350-LA SBB shelf) 	EZ51R EZ54R EZ58R RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TKZ09 TLZ06
			BN21H-02 BN21K-10†	<ul style="list-style-type: none"> SW500 cabinet expansion unit (BA350-JA SBB shelf kit) SW800 cabinet expansion unit (BA350-JA SBB shelf kit) 	DWZZA-VA DWZZA-AA EZ51R EZ54R EZ58R RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TKZ09 TLZ06 TZ86 TZ87 TZ867 TZ877

† Components required for DWZZA SCSI signal converter operations.

Table 7-5 DEC 4000 AXP Servers StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
600	Embedded	Slow	BN21R	<ul style="list-style-type: none"> BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TLZ06 TZ86 TZ87 TZ867 TZ877 TZK10 TZL6L

Table 7–6 DEC 10000 AXP Mainframe Class Servers StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
600	KZMSA-AB	Fast	BN21H	<ul style="list-style-type: none"> BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	EZ51R EZ54R EZ58R RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TLZ06 TZ86 TZ87
			BC10U	<ul style="list-style-type: none"> BA655-AA building block dual shelf (BA350-LA SBB shelf) 	EZ51R EZ54R EZ58R RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TLZ06 TZ86 TZ87
			BN21H-02 BN21K-10†	<ul style="list-style-type: none"> SW500 cabinet expansion unit (BA350-JA SBB shelf kit) SW800 cabinet expansion unit (BA350-JA SBB shelf kit) 	DWZZA-VA DWZZA-AA EZ51R EZ54R EZ58R RRD42 RRD43 RRD44 RZ26 RZ26L RZ28 RZ28B RZ73 RZ74 TLZ06 TZ86 TZ87 TZ867 TZ877

† Components required for DWZZA SCSI signal converter operations.

Table 7-7 DEC Personal Computer AXP (DECpc™AXP) StorageWorks Configurations

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
150	—	—	BN21H	<ul style="list-style-type: none"> BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 TLZ6L TZK10 TZK11
				<ul style="list-style-type: none"> BA353-Ax desktop expansion unit 	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B SWXTE-VE TLZ06 TZ30-VE TZK11-VE

Digital VAX System StorageWorks Configurations

This chapter lists the basic data required for configuring Digital VAX computer systems for operation with StorageWorks subsystems. A supported system has been evaluated in the specified configuration (that is, the host computer and SCSI adapter, and the StorageWorks controller, shelf, enclosure, SCSI cable, and supported StorageWorks building blocks (SBBs), and complies with country-specific standards (for example, FCC, TUV, and so forth) and Digital standards.

Note

The information in this chapter is *general* in nature and is for guidance *only*. See the *Digital Systems and Options Catalog* as well as VAX system, controller, shelf, and enclosure publications for detailed information about each element of the configuration. See Part III for detailed information about configuration rules and SCSI buses.

For Information About This System	See
VAX 4000 Systems and Servers	Table 8-3
VAXstation™ 4000 Systems	Table 8-2
MicroVAX 3100™ Systems	Table 8-1

These tables include the following information:

Column	Information
Host System	
Models	Self-explanatory
SCSI Adapter— Model and Speed	<p>The host SCSI adapter, or controller, used with the StorageWorks shelves and the adapter's bus speed, either fast (10 MB/s) or slow (5 MB/s). Some systems have an embedded SCSI adapter in the host that can be used both for the internal and the external SCSI-2 buses. In many cases, the external SCSI bus requires another adapter, such as the KZMSA-AB, for the SBB SCSI bus.</p> <p>The rate at which the adapter can transmit data over the SCSI-2 bus, either fast (10 MB/s) or slow (5 MB/s), is independent of the other elements in the configuration. However, the devices on the bus, such as an RZ25-VA, may not be able to process data at a fast rate. The adapter identifies the maximum rate at which individual devices can process data and uses this rate for that device.</p>

Note

When the adapter can transmit at the fast rate and there is at least one fast device on the bus, the SCSI bus *must be designed* as a fast bus (maximum length 3.0 meters [9.8 feet]). This bus cannot function as a slow bus.

StorageWorks— SCSI Cable	The SCSI cable recommended for connecting the host system to the controller, shelf, or enclosure. The cable length is a function of the physical configuration and the bus speed. SCSI cables are described in detail in Chapter 12.
StorageWorks— Component	<p>The information in this column defines the following:</p> <ul style="list-style-type: none"> • The shelves used for the controllers or the SBBs • The enclosures containing the shelves
StorageWorks— Devices	The devices that are supported in a specific configuration. Other devices may be compatible, but have not been evaluated in this configuration.

Note

Unless specifically stated otherwise, all buses are assumed to operate as a single-ended, slow SCSI bus with a transfer rate of 5 MB/s and a maximum cable length of 6.0 meters (19.7 feet).

Table 8–1 MicroVAX 3100 Systems

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
30 40 80 90	Embedded†	Slow	BC09D–06‡	• BA350–Kx deskside expansion unit (BA350–Sx SBB shelf)	RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B RZ74 TLZ06 TLZ6L TZK10 TZK11
			BC09D–06‡ BN21L–0E††	• StorageWorks RAID array 110 subsystem (BA350–Ex controller shelf and SBB shelf)	DWZZA–VA DWZZA–AA RZ25 RZ25L RZ26 RZ26L
90‡‡	Embedded†	Slow	BN21H	• BA350–Kx deskside expansion unit (BA350–Sx SBB shelf)	RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B RZ74 TLZ06 TLZ6L TZK10 TZK11
90‡‡	Embedded†	Slow	BN21H BN21L–0E††	• StorageWorks RAID array 110 subsystem (BA350–Ex controller shelf and SBB shelf)	DWZZA–VA DWZZA–AA RZ25 RZ25L RZ26 RZ26L

† Permanently set to device address 6.
Do not insert a 3½-inch disk SBB in slot 6. Maximum of six 3½-inch disk SBBs per shelf.
Do not set any SBB device address switch to 6.
‡ Minimum length cable that can be used for this configuration.
†† Components required for DWZZA SCSI signal converter operation.
‡‡ With KZDDA–AF upgrade kit installed.

Table 8–2 VAXstation 4000 Systems

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
VLC	Embedded	Slow	BC09D–06†	• BA353–Ax desktop expansion unit	RRD42–VE RRD43–VE RRD44–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE
60 90	Embedded	Slow	BC09D–06†	• BA350–Kx deskside expansion unit (BA350–Sx SBB shelf)	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 TZK10
				• BA353–Ax desktop expansion unit	RRD42–VE RRD43–VE RRD44–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE
60 90	Embedded	Slow	BN21K‡ BN21P–0B‡ H879–AA‡	• StorageWorks RAID array 110 subsystem (BA350–Ex controller and SBB shelf)	DWZZA–VA DWZZA–AA RZ25 RZ25L RZ26 RZ26L

† Minimum length cable that can be used for this configuration.
‡ Components required for DWZZA SCSI signal converter operation.

(continued on next page)

Table 8–2 (Cont.) VAXstation 4000 Systems

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
60 90	PMAZ-AB	Slow	BN21H	<ul style="list-style-type: none"> BA350-Kx deskside expansion unit (BA350-Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 TZK10
				<ul style="list-style-type: none"> BA353-Ax desktop expansion unit 	RRD42-VE RRD43-VE RRD44-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE-VE TZ30-VE TZK11-VE
	PMAZ-AB	Slow	BN21K‡ BN21P-0B‡	<ul style="list-style-type: none"> StorageWorks RAID array 110 subsystem (BA350-Ex controller and SBB shelf) 	DWZZA-VA DWZZA-AA RZ25 RZ25L RZ26 RZ26L

† Minimum length cable that can be used for this configuration.

‡ Components required for DWZZA SCSI signal converter operation.

Table 8–3 VAX 4000 Systems

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
100 100A	Embedded	Slow	BC09D–06†	• BA350–KB deskside expansion unit (BA350–Sx SBB shelf)	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B RZ74 TLZ06L TLZ6L TZK10 TZK11

† Minimum length cable that can be used for this configuration.

DECsystem StorageWorks Configurations

This chapter lists the basic data required for configuring Digital DECsystem computer systems for operation with StorageWorks subsystems. A supported system has been evaluated in the specified configuration (that is, the host computer and SCSI adapter, and the StorageWorks controller, shelf, enclosure, SCSI cable, and supported StorageWorks building blocks (SBBs), and complies with country-specific standards (for example, FCC, TUV, and so forth) and Digital standards.

Note

The information in this chapter is general in nature and is for guidance only. See the *Digital Systems and Options Catalog* as well as DECsystem system, controller, shelf, and enclosure publications for detailed information about each element of the configuration. See Part III for detailed information about configuration rules and SCSI buses.

For Information About This System

See

PersonalDECstation 5000 Workstations
DECstation 5000 Workstations

Table 9-1
Table 9-2

These tables include the following information:

Column	Information
Host System	
Models	Self-explanatory
SCSI Adapter— Model and Speed	<p>The host SCSI adapter, or controller, used with the StorageWorks shelves and the adapter's bus speed, either fast (10 MB/s) or slow (5 MB/s). Some systems have an embedded SCSI adapter in the host that can be used both for the internal and the external SCSI-2 buses. In many cases, the external SCSI bus requires another adapter, such as the KZMSA-AB, for the SBB SCSI bus.</p> <p>The rate at which the adapter can transmit data over the SCSI-2 bus, either fast (10 MB/s) or slow (5 MB/s), is independent of the other elements in the configuration. However, the devices on the bus, such as an RZ25-VA, may not be able to process data at a fast rate. The adapter identifies the maximum rate at which individual devices can process data and uses this rate for that device.</p>

Note

When the adapter can transmit at the fast rate and there is at least one fast device on the bus, the SCSI bus *must be designed* as a fast bus (maximum length 3.0 meters [9.8 feet]). This bus cannot function as a slow bus.

StorageWorks— SCSI Cable	The SCSI cable recommended for connecting the host system to the controller, shelf, or enclosure. The cable length is a function of the physical configuration and the bus speed. SCSI cables are described in detail in Chapter 12.
StorageWorks— Component	<p>The information in this column defines the following:</p> <ul style="list-style-type: none"> • The shelves used for the controllers or the SBBs • The enclosures containing the shelves
StorageWorks— Devices	The devices that are supported in a specific configuration. Other devices may be compatible, but have not been evaluated in this configuration.

Note

Unless specifically stated otherwise, all buses are assumed to operate as a single-ended, slow SCSI bus with a transfer rate of 5 MB/s and a maximum cable length of 6.0 meters (19.7 feet).

Table 9–1 Personal DECstation 5000 Workstations – UNIX®-Based RISC

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
20 25 33	Embedded	Slow	BC09D–06†	<ul style="list-style-type: none"> • BA350–Kx deskside expansion unit (BA350–Sx SBB shelf) 	RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06
				<ul style="list-style-type: none"> • BA353–Ax desktop expansion unit 	RRD42–VE RRD43–VE RRD42–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE
20 25 33	PMAZ–AA PMAZ–AB	Slow Slow	BN21H	<ul style="list-style-type: none"> • BA350–Kx deskside expansion unit (BA350–Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06
20 25 33	PMAZ–AA PMAZ–AB	Slow Slow	BN21H	<ul style="list-style-type: none"> • BA353–Ax desktop expansion unit 	RRD42–VE RRD43–VE RRD42–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE

† Minimum length cable that can be used for this configuration.

Table 9–2 DECstation 5000 Workstations—UNIX®-Based RISC

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
125 133	Embedded	Slow	BC09D–06†	<ul style="list-style-type: none"> • BA350–Kx deskside expansion unit (BA350–Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TKZ09 TLZ06 TZK10
				<ul style="list-style-type: none"> • BA353–Ax desktop expansion unit 	RRD42–VE RRD43–VE RRD42–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE
125 133	PMAZ–AA PMAZ–AB	Slow Slow	BN21H	<ul style="list-style-type: none"> • BA350–Kx deskside expansion unit (BA350–Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TKZ09 TLZ06 TZK10

† Minimum length cable that can be used for this configuration.

(continued on next page)

Table 9–2 (Cont.) DECstation 5000 Workstations—UNIX®-Based RISC

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
				<ul style="list-style-type: none"> • BA353–Ax desktop expansion unit 	RRD42–VE RRD43–VE RRD42–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE
240	Embedded	Slow	BC09D–06†	<ul style="list-style-type: none"> • BA350–Kx deskside expansion unit (BA350–Sx SBB shelf) 	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TKZ09 TLZ06
				<ul style="list-style-type: none"> • BA353–Ax desktop expansion unit 	RRD42–VE RRD43–VE RRD42–VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE–VE TZ30–VE TZK11–VE

† Minimum length cable that can be used for this configuration.

(continued on next page)

Table 9–2 (Cont.) DECstation 5000 Workstations—UNIX®-Based RISC

Models	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
240	PMAZ-AA PMAZ-AB	Slow Slow	BN21H	• BA350-Kx deskside expansion unit (BA350-Sx SBB shelf)	RRD42 RRD43 RRD44 RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TKZ09 TLZ06 TZK10 TZK11
240	PMAZ-AA PMAZ-AB	Slow Slow	BN21H	• BA353-Ax desktop expansion unit	RRD42-VE RRD43-VE RRD42-VE RZ25 RZ25L RZ26 RZ26L RZ28 RZ28B TLZ06 SWXTE-VE TZ30-VE TZK11-VE

† Minimum length cable that can be used for this configuration.

Personal Computer System StorageWorks Configurations

This chapter lists the basic data required for configuring Digital PC (personal computer) systems for operation with StorageWorks subsystems. A supported system has been evaluated in the specified configuration (that is, the host computer and SCSI adapter, and the StorageWorks controller, shelf, enclosure, SCSI cable, and supported StorageWorks building blocks (SBBs), and complies with country-specific standards (for example, FCC, TUV, and so forth) and Digital standards.

Note

The information in this chapter is *general* in nature and is for guidance *only*. See the *Digital Systems and Options Catalog* as well as PC system, controller, shelf, and enclosure publications for detailed information about each element of the configuration. See Part III for detailed information about configuration rules and SCSI buses.

See Table 10–1 for applicationDEC 400xMP Systems configurations that support StorageWorks products.

These tables include the following information:

Column	Information
Host System	
Models	Self-explanatory
SCSI Adapter— Model and Speed	<p>The host SCSI adapter, or controller, used with the StorageWorks shelves and the adapter's bus speed, either fast (10 MB/s) or slow (5 MB/s). Some systems have an embedded SCSI adapter in the host that can be used both for the internal and the external SCSI-2 buses. In many cases, the external SCSI bus requires another adapter, such as the KZMSA-AB, for the SBB SCSI bus.</p> <p>The rate at which the adapter can transmit data over the SCSI-2 bus, either fast (10 MB/s) or slow (5 MB/s), is independent of the other elements in the configuration. However, the devices on the bus, such as an RZ25-VA, may not be able to process data at a fast rate. The adapter identifies the maximum rate at which individual devices can process data and uses this rate for that device.</p>

Note

When the adapter can transmit at the fast rate and there is at least one fast device on the bus, the SCSI bus *must be designed* as a fast bus (maximum length 3.0 meters [9.8 feet]). This bus cannot function as a slow bus.

StorageWorks— SCSI Cable	The SCSI cable recommended for connecting the host system to the controller, shelf, or enclosure. The cable length is a function of the physical configuration and the bus speed. SCSI cables are described in detail in Chapter 12.
StorageWorks— Component	The information in this column defines the following: <ul style="list-style-type: none"> • The shelves used for the controllers or the SBBs • The enclosures containing the shelves
StorageWorks— Devices	The devices that are supported in a specific configuration. Other devices may be compatible, but have not been evaluated in this configuration.

Note

Unless specifically stated otherwise, all buses are assumed to operate as a single-ended, slow SCSI bus with a transfer rate of 5 MB/s and a maximum cable length of 6.0 meters (19.7 feet).

Table 10–1 applicationDEC 400xMP Systems

Model	SCSI Adapter		StorageWorks		
	Model	Speed	Cable	Component	Devices
433MP	KZESA	Slow	BN21K BN21P-0B† H879-AA†	StorageWorks RAID array 110 subsystem (BA350-Ex controller and SBB shelf)	DWZZA-VA DWZZA-AA RZ25 RZ25L RZ26 RZ26L

† Components required for DWZZA SCSI signal converter operations.

Part III

StorageWorks Subsystem Planning

This part contains descriptions of the basic instructions and considerations for planning a StorageWorks subsystem. This information is organized as follows:

For Information About	See
Configuration rules	Chapter 11, General Configuration Rules
Designing a StorageWorks subsystem	Chapter 15, Designing a StorageWorks Subsystem
DSSI cables	Chapter 14, StorageWorks DSSI Cables
SCSI buses	Chapter 12, StorageWorks SCSI Buses
SCSI cables	Chapter 13, StorageWorks SCSI Cables

General Configuration Rules

This chapter describes the general configuration rules for StorageWorks products. These rules may appear multiple times in this chapter because some rules apply to multiple products.

There are two types of configurations rules—logical and physical.

- Logical rules describe items such as selecting a device address.
- Physical rules define capacities, cable lengths, and so forth.

The following sections are organized by general subject and include both the logical and physical configuration rules.

Note

Configuration rules for a specific StorageWorks product have precedence over the general configuration rules listed in this chapter.

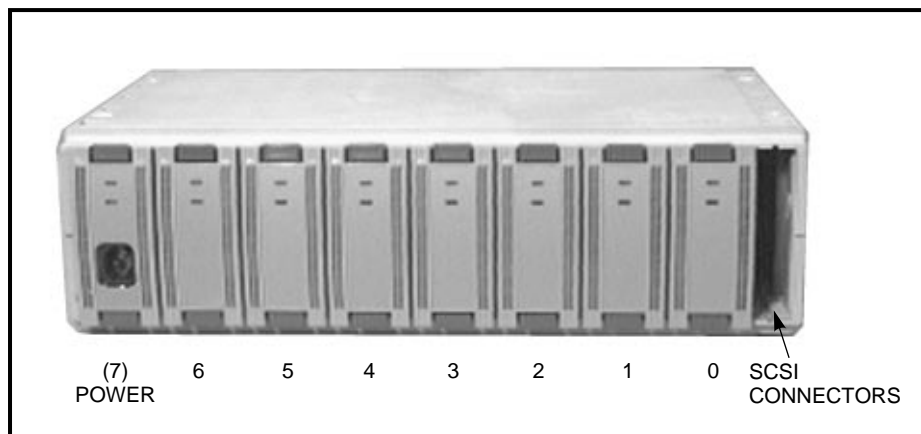
11.1 Device Addresses

The following general configuration rules apply to StorageWorks device addresses:

- Either the physical location of the storage device in the shelf or the device address switch setting determines the **SCSI device address** (small computer system interface) or ID of the following devices:
 - 3½-inch devices ¹
 - All 5¼-inch devices

The physical location device addresses are assigned from right to left as viewed from the front, as shown in Figure 11-1.

Figure 11-1 Typical SBB Shelf—Device Addresses



CXO-3617B-PH

- The available device addresses for each shelf are 0 through 6.
- The shelf slot numbers and the device addresses for 3½-inch SBBs (StorageWorks building blocks) are the same.
- The device addresses for most SBBs can be set either manually using the address switch on the rear of the SBB or automatically by the shelf connector. The default address is “automatic” to activate the shelf connector device address. (For detailed information on setting device addresses with the switches, see the *StorageWorks Solutions Shelf and SBB User's Guide*.)
- The shelf power slot is *always* slot 7 and does not have a device address.

¹ Some 3½-inch disk drives do not have a device address switch.

11.2 SBB Shelves

The following general configuration rules apply to SBB shelves:

- Shelf capacity is measured by the number of 3½-inch SBBs in the shelf (refer to Figure 11–1).
- Each 3½-inch SBB occupies one slot in a shelf.
- All shelf power supplies and battery backup units (BBUs) are mounted in 3½-inch modular carriers.
- Shelf power requirements are based on a maximum of seven 3½-inch SBBs.
- All devices in a shelf must spin up sequentially under software control at a *4-second or greater intervals*.
- A 5¼-inch SBB requires three slots for mounting, as shown in Figure 11–2.

Figure 11–2 Typical 5¼-Inch SBB Installation



CXO-3608A-PH

- The 5¼-inch SBB can hold either one full-height (FH), two half-height (HH) devices, or three one-third height devices.
 - A 5¼-inch SBB with an FH device has one connector mounted in the center position.
 - A 5¼-inch SBB with two HH or one-third height devices has two connectors. The connector in the center position is for the lower HH device; the other connector is for the HH device.
 - A 5¼-inch SBB with three one-third devices has three connectors. The connector in the center position is for the lower device; the connector on the left rear is for the upper device, and the connector on the right rear is for the middle device.

11.3 SCSI Bus

The following general configuration rules apply to StorageWorks SCSI buses:

- The maximum number of storage devices on a single SCSI-2 bus is seven.
- The total length of an 8-bit, single-ended, SCSI bus is the distance between the two bus terminators.
- The total length of an 8-bit, single-ended, SCSI bus operating at 10 MB/s cannot exceed 3.0 meters (9.8 feet).
- The total length of an 8-bit, single-ended, SCSI bus operating at 5 MB/s cannot exceed 6.0 meters (19.7 feet).
- The rate at which data is transferred over an 8-bit, single-ended, SCSI bus is primarily determined by the capabilities of the host SCSI adapter or controller. A controller is rated as either fast or slow based on the maximum rate at which it can transfer data. Prior to transferring the data, the controller determines the maximum rate at which each device can accept data. If this rate is lower than the controller's maximum rate, the controller uses the lower rate for the transfer.

This capability enables the reliable transfer of data to both slow and fast devices on the same bus, provided the bus is designed as a fast bus with a maximum bus length of 3.0 meters (9.8 feet).

Note

When the adapter can transmit at the fast rate and there is at least one fast device on the bus, the SCSI bus *must be designed* as a fast bus (maximum length 3.0 meters [9.8 feet]).

- The total length of a fast-wide, 16-bit, differential SCSI bus cannot exceed 25 meters (82 feet).
- Both a single-ended and a differential SCSI bus can be extended using SCSI signal converters. A maximum of two SCSI signal converters, including one installed in the shelf, such as a DWZZA-VA, can be used on any one bus.
- A single, fast SCSI bus cannot be used for more than two shelves.
- All SCSI buses require termination at both ends of the bus.
- The single-ended SCSI buses are terminated on the last shelf on the bus.

Note

SCSI buses must be terminated at both ends for proper operation. SBBs do not terminate a bus; a BA35X-MB terminator board must be installed on the shelf backplane.

- The rules for installing SCSI bus terminators and jumpers are shelf specific.
- Multiple SCSI buses on a shelf can be connected together using a jumper board (BA35X-MC). For example, two buses can be connected into one; three buses can be connected into two, and so on.

- The target ID addresses for hosts and controllers are normally as follow:
 - First (single) host or controller: slot 7
 - Second (dual) host or controller: slot 6

For a detailed description of the StorageWorks shelf SCSI buses, including lengths, see Chapter 12.

11.4 HSZ-Series Disk Array Controllers

The basic rules for configuring the HSZ10-AA and HSZ15-AA disk array controllers (part of the StorageWorks Redundant Array of Independent Disks [RAID] subsystem) are primarily concerned with the disk drives. These rules, listed in Table 11-1, are dependent upon the RAID level (0, 1, 3, or 5). For detailed configuration rules, see the *DEC RAID Subsystem User's Guide*.

Table 11-1 StorageWorks Raid Array Subsystem 110 Configuration Rules

RAID Level	Drives per LU ¹	Comments
0, 1, 3, 5	N/A	All drives within a RAID level must be of the same vendor type and capacity.
0	1 to 5	None
1	2 to 4	<ul style="list-style-type: none"> • Must specify an even number of drives • The mirrored pairs are created by grouping the first and second drive you enter as the first pair; the third and fourth drives as the second pair; and so forth • Mirrored pair drives cannot be on the same channel
3	3 or 5	None
5	3 to 5	Each drive must be on a separate channel

¹ An LU (logical unit) is a grouping of drives that has its own device SCSI ID and number. For most purposes, a logical unit is equivalent to an array.

11.5 HSZ40 SCSI Disk Array Controller

You must observe the following rules when configuring an HSZ40 SCSI disk array controller:

- The HSZ40 supports only disk storage devices.
- There is no provision for dual-redundant (two controller) HSZ40 configurations.
- An HSZ40 SCSI controller supports the following host adapters:

If Your System Is a	The Controller Supported Is:
DEC 3000	KZTSA
Alpha AXP DEC 7000	KSMSA†
Alpha AXP DEC 10000	KSMSA†

†Requires a SCSI bus converter DWZZA.

11.6 HSJ Array Controller Family

The hierarchical storage controller (HSC) CI configuration rules for supporting from 1 to 31 host nodes also apply to the HSJ array controller family. See the Software Product Descriptions (SPDs) and release notes for specific configuration rules for the following host adapters:

If Your System Is a	The Controller Supported Is:
SBO-based system	CI780
BI-based system	CIBCA-B
XMI-based system	CIXCD

CAUTION

Installing CD-ROM devices and other storage devices on the same HSJ-series controller SCSI bus can cause time-out problems. Do not install any other storage device on a SCSI bus with a CD-ROM when using an HSJ-series controller.

There are two types of HSJ array controllers—the HSJ40-series and the HSJ30-series. The HSJ40-series has six SCSI ports (buses) and the HSJ30-series has three SCSI ports (buses). The basic difference between these two types of controllers is the total number of devices supported. The HSJ40-series supports twice as many devices as does the the HSJ30-series.

A single controller shelf, such as the BA350-MA, can contain two controllers and cache memories. Therefore, there are two sets of configuration rules:

- Rules that apply to only the single controller configuration—see Section 11.6.1.
- Rules that apply to both configurations—see Section 11.6.2.

See the *HS Family of Array Controllers User's Guide* for detailed information about the HS family of array controllers.

11.6.1 HSJ Single Controller

The following general rules apply *only* to the single-controller configuration:

- Install the controller either in the top slot or the right-hand slot.
- A single controller port can support a *maximum* of two 5¼-inch, full-height (FH) SBBs in a single SBB shelf.
- A single controller port can support a *maximum* of four 5¼-inch, FH SBBs in two *adjacent* SBB shelves.
- A single controller port can support a *maximum* of six devices, using a combination of 3½-inch and 5¼-inch SBBs.
- A single controller port can support a maximum of seven 3½-inch storage devices.

11.6.2 HSJ Single and Dual-Redundant Controllers

The following configuration rules apply to both the single- and dual-controller configurations:

- The minimum number of power supplies per controller shelf and SBB shelf is one.
- The *preferred* number of power supplies per controller shelf and SBB shelf is two.
- The maximum number of SBBs supported by a *single* HJSJ40 controller is 42 (that is, seven devices per SCSI channel).
- The *preferred* number of devices supported by a single HSJ40 controller is 36 (that is, six devices per SCSI channel).
- The maximum number of SBBs supported by a *single* HJSJ30 controller is 21 (that is, seven devices per SCSI channel).
- The *preferred* number of devices supported by a single HSJ30 controller is 18 (that is, six devices per SCSI channel).
- CD-ROMs must be on a dedicated bus. No other storage devices, such as disks or tapes, can be on the same bus.
- A maximum of two *adjacent* SBB shelves³ can be connected to a single controller port.
- Half-rack or full-depth devices, such as the TZ867 tape drives, must have a dedicated controller port. No more than two devices can be connected to a single port.

³ The second shelf is mounted directly below the first shelf with no space between them.

11.7 HSC SCSI Controller

This section describes the general rules for configuring the HSC SCSI controller, commonly referred to as a “K.scsi controller.” For detailed configuration rules, see the *HSC Controller User's Guide*.

11.7.1 HSC Controller SBB Shelf—Single SCSI Bus

The following configuration rules apply when there is only one SBB shelf SCSI bus and a maximum of seven SBBs:

- Install the terminator board (BA35X-MB) in the backplane connector adjacent to slot 1.
- Install the jumper board (BA35X-MC) connector adjacent to slot 5.
- The SCSI bus is a slow bus with a maximum bus length of 6.0 meters (19.7 feet).
- Place the HSC controller in the end bus position for differential SCSI bus operations with a maximum bus length of 25 meters (82 feet).
- Install the DWZZA-VA SCSI signal converter in slot 0.
- Disable the DWZZA-VA SCSI signal converter, single-ended terminator when a SCSI “A” cable is connected to the upper (JA1) shelf connector.
- Disable the DWZZA-VA SCSI signal converter, differential terminators when using a trilink connector block (H885-AA).

11.7.2 HSC Controller SBB Shelf—Dual SCSI Buses

The following configuration rules apply when using both SCSI-2 buses on a shelf:

- Install the terminator board (BA35X-MB) in the backplane connector adjacent to slot 5.
- Install the jumper board (BA35X-MC) in the backplane connector adjacent to slot 1 for safekeeping. This board has no function in this configuration and installing it here does not affect the SCSI bus operations.
- The SCSI bus is a slow bus with a maximum bus length of 6.0 meters (19.7 feet).
- Place the HSC controller in the end bus position for differential SCSI bus operations with a maximum bus length of 25 meters (82 feet).
- Install the DWZZA-VA SCSI signal converter in slot 0 or slot 1.
- Disable the slot 0, DWZZA-VA SCSI signal converter, single-ended terminator when a SCSI “A” cable is connected to the upper (JA1) shelf connector.
- Disable the slot 1, DWZZA-VA SCSI signal converter, single-ended terminator when a SCSI “A” cable is connected to the lower (JB1) shelf connector.
- Disable the DWZZA-VA SCSI signal converter, differential terminators when using a trilink connector block (H885-AA).
- Only the HSC controller connected to the upper SCSI connector (JA1) can monitor the SHELF_OK signal.

11.7.3 HSC Controller Multiple SBB Shelves

Multiple SBB shelves can be used with an HSC controller, and they can be configured as either a single- or dual-bus shelf using the following rules:

- The single-bus or dual-bus configuration rules apply to each individual single- or dual-bus shelf.
- Use the following rules to configure the first shelf:
 - Connect the HSC controller to the upper connector (JA1).
 - Install the jumper board (BA35X–MC) in the backplane connector adjacent to slot 5.
 - Connect the lower connector (JB1), the output connector, to the upper connector (JA1), the input connector, of the second shelf.

Note

Installing a terminator board in the first shelf will terminate the bus. No devices in the second shelf will be on the bus.

- Configure the second shelf as either a single- or dual-bus shelf.
- Use the following rules to configure the second shelf when adding *five or more* 3½-inch SBBs:
 - Install the jumper behind slot 5.
 - Install the terminator behind slot 1.
 - Use the upper connector (JA1) as the input connector.
- Use the following rules to configure the second shelf when adding *three or fewer* 3½-inch SBBs:
 - Connect the lower connector (JB1) of the first shelf to the upper connector (JA1) of the second shelf.
 - Install the terminator board behind slot 5.
 - Install the jumper board behind slot 1 for safekeeping.
- Use the following rules to configure the second shelf when adding *four* 3½-inch SBBs:
 - Connect the lower connector (JB1) of the first shelf to lower connector (JB1) of the second shelf.
 - Install the terminator board behind slot 5.
 - Install the jumper board behind slot 1 for safekeeping.

11.8 HSD30 Array Controller

The following rules apply to the HSD30 array controller:

- Each DSSI bus supports a maximum of eight nodes.
- Disk and tape storage devices may be installed on the same DSSI controller port (SCSI) bus.
- All systems connected to a single DSSI bus must have common power and ground circuits.
- All DSSI buses must be terminated at both ends at all times.

CAUTION

Disconnecting the DSSI host port cable removes one of the bus terminations. Disconnecting the DSSI hosts port cable on an active bus (one to which power is applied) can cause data corruption.

- An HSD30 DSSI controller with V1.4 or a subsequent firmware release supports the following host adapters:

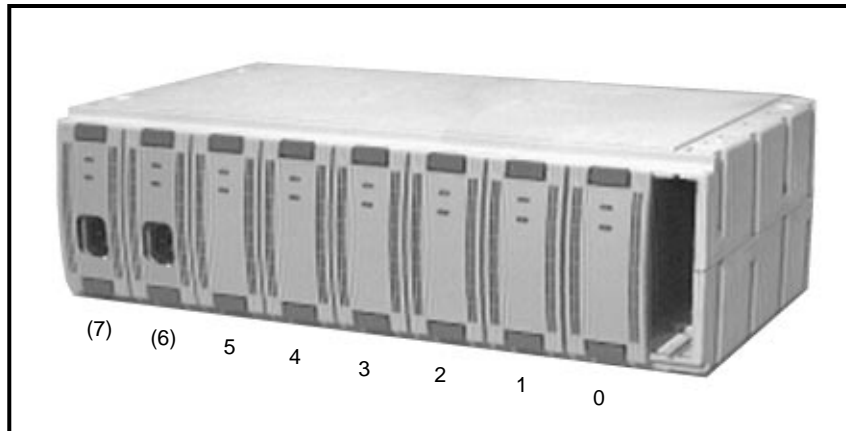
If Your System Is a	The Controller Supported Is a
DEC system	SHAC
VAX system	SHAC
DEC 4000 system	D4000
XMI-based system	KFMSA

11.9 Power Supplies

The following general configuration rules apply to StorageWorks power supplies:

- Each shelf requires either an ac or dc input primary power supply.
- Each StorageWorks enclosure usually provides switch-controlled input voltages to the shelf power supplies.
- Each power supply can support a maximum of seven 3½-inch SBBs or one 3½-inch and two 5¼-inch SBBs.
- The shelf power supply must be mounted in slot 7 (power slot) of the shelf, as shown in Figure 11–3.
- An optional redundant power supply or an optional battery backup unit (BBU) can be mounted in slot 6.

Figure 11–3 BA350–SA SBB Shelf (Redundant AC Power Supplies)



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11.10 SW800 Data Center Cabinet

The SW800 data center cabinet is the largest StorageWorks storage enclosure and has a capacity of 24 SBB shelves. The following general configuration rules apply to this cabinet:

- Capacities are measured by the number of shelves that can be installed.
- Shelves are installed in cabinets in a specific sequence to maintain stability. The installation sequence is model specific.
- Unless specifically stated otherwise, the shelf configuration rules apply to all cabinets.
- Front and rear service areas of approximately 0.9 meters (3.0 feet) are required.
- The SW800-series data center cabinets have a three-phase ac distribution unit rated for either 380–416 V ac, 50 Hz, or 120/208 V ac, 60 Hz.
- A second cable distribution unit is required when more than 12 shelves are installed.

11.11 SW500 Data Center Cabinet

The SW500 data center cabinet has a maximum capacity of 10 SBB shelves. The following general configuration rules apply to this cabinet:

- Capacities are measured by the number of shelves that can be installed.
- Shelves are installed in cabinets in a specific sequence to maintain stability. The installation sequence is model specific.
- Unless specifically stated otherwise, the shelf configuration rules apply to all cabinets.
- Front and rear service areas of approximately 0.9 meters (3.0 feet) are required.
- The SW500-series data center cabinets have a single-phase ac distribution unit rated for either 240 V ac, 50 Hz, or 120 V ac, 60 Hz.

11.12 Deskside Expansion Units

All of the deskside expansion units (BA350–Kx) use the BA35X–VA pedestal mounting kit. A single kit is used to mount an SBB shelf or a controller shelf. Two kits are used to mount a controller and SBB shelf (that is, a StorageWorks RAID array subsystem).

The following general configuration rules apply to the StorageWorks deskside expansion units:

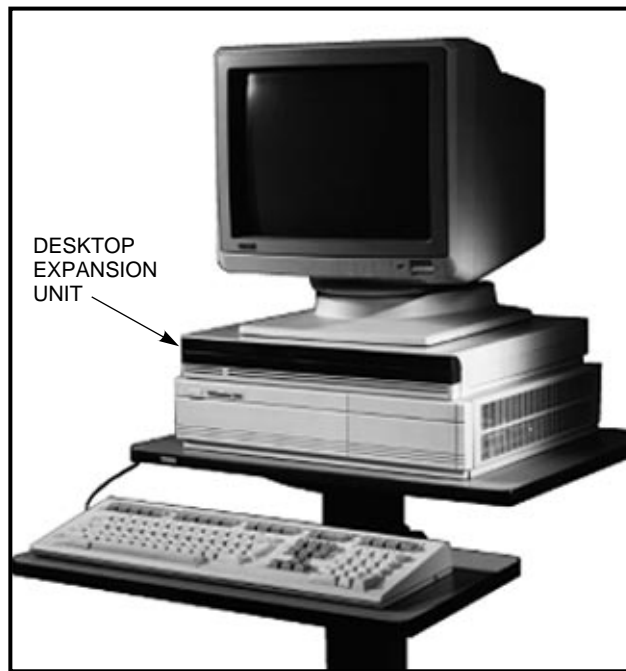
- Unless specifically stated otherwise, the shelf configuration rules apply to all deskside expansion units.
- Each unit has an ac distribution unit that provides switch-controlled input voltages to the shelf power supplies.
- Each unit has a switched ac outlet for connecting a maximum of two units to the same wall receptacle.
- Because the unit is portable, it can be installed without a front or rear service area.
- Slot 6 is normally reserved for either a redundant power supply or a BBU.

11.13 Desktop Expansion Units

Each StorageWorks desktop expansion unit contains a maximum of three 3½-inch SBBs or two 3½-inch SBBs and one 5¼-inch half-height (HH) device. An ac input power supply is integral to this unit. The following general configuration rules apply to the desktop expansion unit:

- The unit can be installed either beneath the monitor as shown in Figure 11–4 or beneath the central processor unit (CPU). It can also be installed in the vertical position on the desktop.
- No service area is required.

Figure 11–4 BA353–AA Desktop Expansion Unit



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StorageWorks SCSI Buses

This chapter describes the basic StorageWorks data bus.

12.1 StorageWorks Data Bus Description

The StorageWorks data bus is an 8-bit, single-ended, small computer system interface (SCSI). This bus has eight device addresses (0 through 7) that identify devices on the bus.

- Device address 7 is normally reserved for the host computer address.
- The remaining seven addresses (0 through 6) are used for the individual storage device addresses.

StorageWorks shelves use a SCSI bus that can transfer data either at a slow rate (5 MB/s [Megabytes per second]) or the fast rate (10 MB/s). The rate at which data is transferred is affected by many things. However, the two primary concerns are as follow:

- The maximum rate at which the controller or **initiator** can transmit data
- The maximum rate at which the target device can process data

The rate at which data is transferred over an 8-bit, single-ended, SCSI bus is primarily determined by the capabilities of the host SCSI adapter or controller. A controller is rated as either fast or slow based on the *maximum* rate at which it can transfer data. Prior to transferring the data, the controller determines the maximum rate at which each device can accept data. If this rate is lower than the controller's maximum rate, the controller uses the lower rate for the transfer.

This capability enables the reliable transfer of data to both slow and fast devices on the same bus provided the bus is *designed* as a fast bus with a maximum bus length of 3.0 meters (9.8 feet).

CAUTION

When the adapter can transmit at the fast rate and there is at least one fast device on the bus, the SCSI bus *must be designed* as a fast bus (maximum length 3.0 meters [9.8 feet]).

The *maximum* length of the fast and slow buses, including all cables and shelf buses, is shown in Table 12–1. All bus lengths are rounded off to the nearest tenth of a unit.

Table 12–1 SCSI Bus Parameters

Bus Type	Transfer Rate	Meters	Feet
8-bit, single-ended	5 MB/s	6.0	19.7
8-bit, single-ended	10 MB/s	3.0	9.8
16-bit, differential	20 MB/s	25.0	82.0

12.2 Terminating SCSI Buses

The shelf end of the SCSI bus is terminated with a terminator board mounted on the shelf backplane. See the individual controller documentation for termination options.

Note

All StorageWorks SBB shelf SCSI buses are terminated on the shelf backplane. There is no SCSI bus termination on any SBB device.

12.3 Computing SCSI Bus Lengths

Operation of an 8-bit, single-ended, SCSI bus is affected by the total bus length (that is, the total distance between the two bus terminators). Failure to accurately determine the total SCSI bus length can cause signal degradation to the point where the bus is non-operational. Practical experience, especially when dealing with a fast SCSI bus (10 MB/s transfer rate), has shown that the limitations stated in Section 12.1 are applicable for most bus operations.

Use the procedures in the following sections to determine the SCSI bus lengths for either single or multiple SBB shelves.

12.3.1 Single StorageWorks Shelf SCSI Bus Lengths

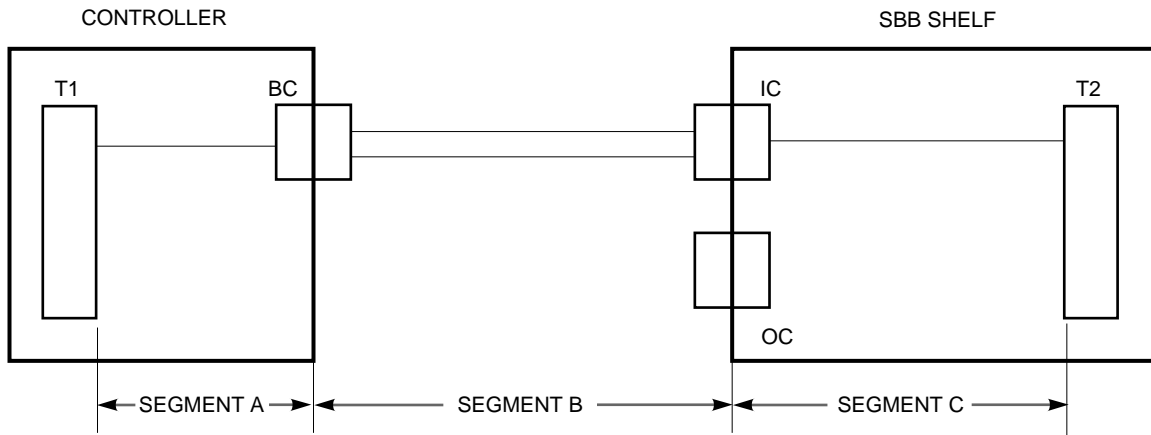
As shown in Figure 12–1, the SCSI bus for a single shelf is composed of the following segments:

- **Segment A**—The distance from the controller terminator (T1) to the SCSI bus connector (BC).
- **Segment B**—The length of the SCSI cable from the controller shelf to the SBB shelf (either 1 meter [3.3 feet] or 2 meters [6.5 feet]).
- **Segment C**—For a single SBB shelf this is the distance from the SBB shelf input connector (IC) to the shelf SCSI terminator (T2).

Use the information in Table 12–2 and the following formula to calculate the length of a SCSI bus:

$$\text{Total Bus Length} = A + B + C$$

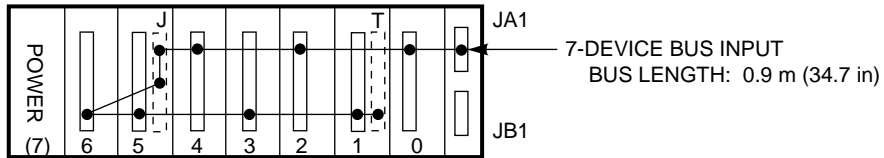
Figure 12–1 SCSI Bus Segments—Single SBB Shelf



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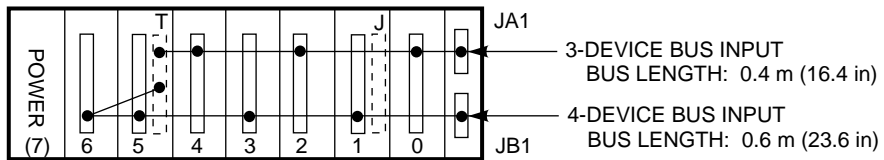
Table 12–2 Single SBB Shelf SCSI Bus Lengths

Shelf	Bus	Input	Slot 1	Slot 5	Meters	Feet
Single Shelf—Single Bus						
1	1	JA1	Terminator	Jumper	0.9	2.9



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Single Shelf—Two Buses						
1	1	JA1	Jumper †	Terminator	0.4	1.4
1	2	JB1	Jumper †	Terminator	0.6	2.0



CXO-3597B-MC

† The jumper is placed here for safekeeping and has no effect on the SCSI bus.

12.3.2 Multiple StorageWorks Shelves SCSI Bus Lengths

As shown in Figure 12-2, the SCSI bus for multiple SBB shelves on a single SCSI bus is composed of the following segments:

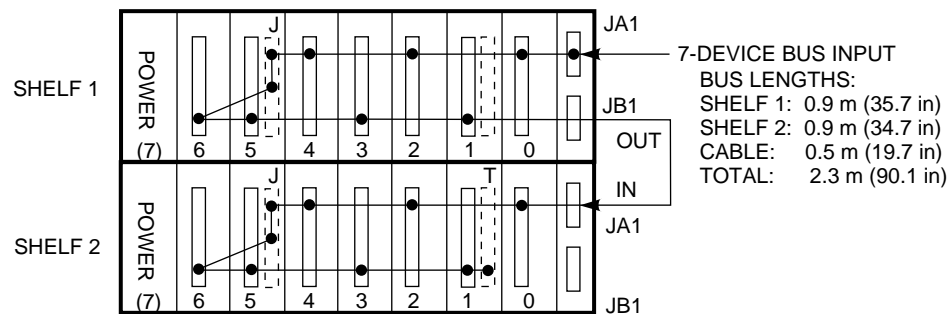
- **Segment A**—The distance from the controller terminator to the shelf backplane connector (port) and from there to the SCSI bus connector
- **Segment B**—The length of the BN21H-series cable from the controller shelf to the SBB shelf (either 1 meter [3.3 feet] or 2 meters [6.5 feet])
- **Segment C**—The distance from the first or second SBB shelf input connector through the jumper (J) to the shelf output connector
- **Segment D**—The length of the SCSI cable (0.5 meters or 1.6 feet) that connects the SBB shelves
- **Segment E**—The distance from the *last* shelf input connector to the bus terminator on the same shelf.

Use the information in Table 12-3 and the following formula to calculate the length of a SCSI bus:

$$\text{Total Bus Length} = A + B + C + D + E$$

Table 12-3 Multiple SBB Shelves SCSI Bus Lengths

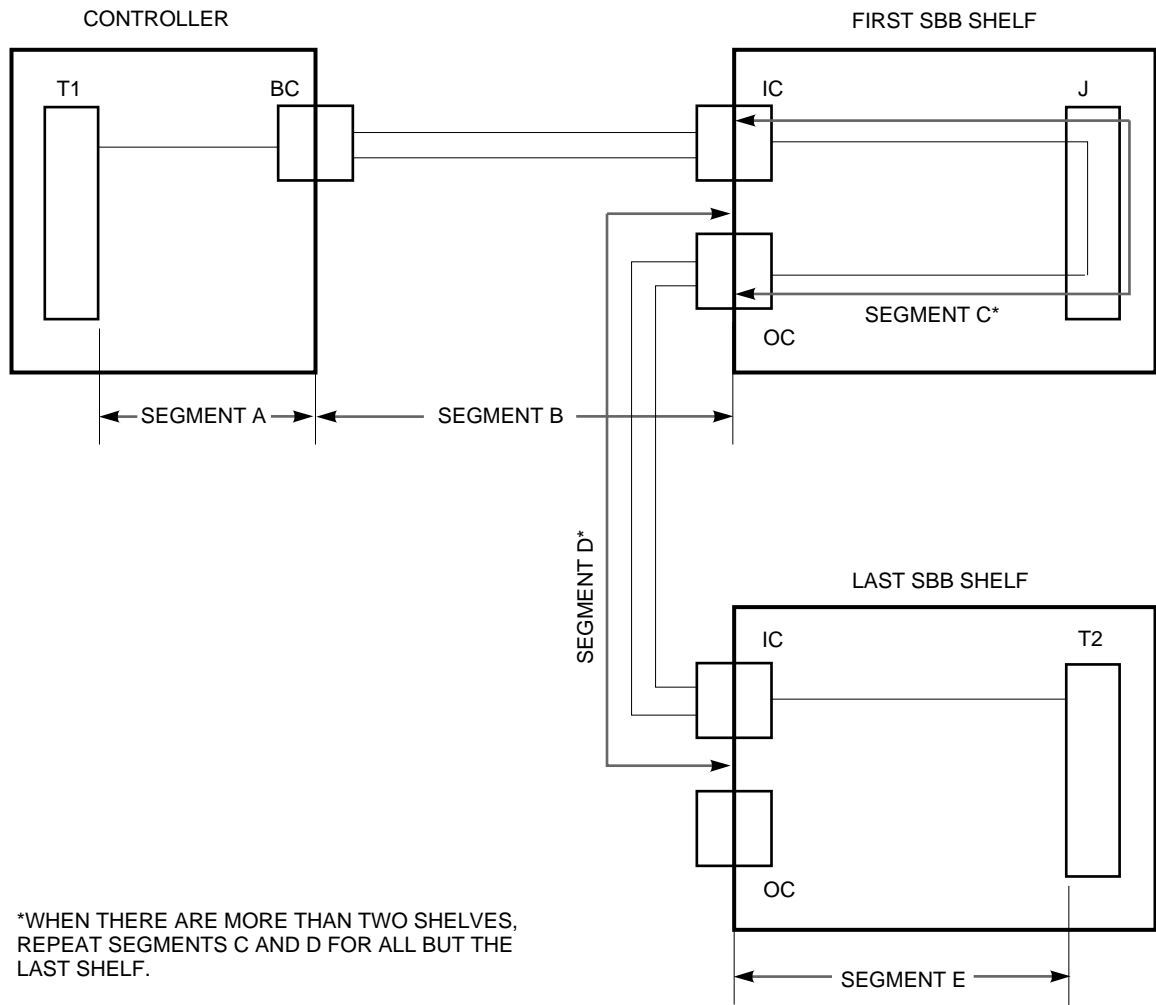
Shelf	Bus	Input	Slot 1	Slot 5	Meters	Feet
Two Adjacent Shelves—Single Bus						
1	1	JA1	None †	Jumper	0.9 ‡	2.9 ‡
2	1	JA1	Terminator	Jumper	0.9	2.9
				BN21H-0E Cable	0.5	1.6
				Total Bus Length	2.3	7.4



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† Do not install a terminator here.
‡ From input connector (JA1) to output connector (JB1)

Figure 12-2 SCSI Bus Segments—Multiple SBB Shelf



*WHEN THERE ARE MORE THAN TWO SHELVES, REPEAT SEGMENTS C AND D FOR ALL BUT THE LAST SHELF.

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StorageWorks SCSI Cables

The process for selecting SCSI cables is basically the same whether or not the host system is a Digital system. Part II lists the Digital systems StorageWorks configurations to include the compatible SCSI cables. All you have to do is determine the cable length.

For a non-Digital system, you must refer to the host system and controller documentation and determine the following:

- The SCSI adapter or controller type
- The SCSI connector pin configuration (50-pin or 68-pin)
- The connector configuration (straight, right-angle) and latching mechanism (thumb latches, thumb screws, bale locks, and so forth)
- The controller bus speed (fast [10 MB/s] or slow [5 MB/s]).

For all host systems you must then calculate the maximum SCSI bus cable length. This is the difference between the maximum SCSI bus length, which is determined by the bus speed, and the total of the following:

- The SCSI bus length between the controller terminator and the controller cable connector
- The SCSI bus length between the shelf input connector and either the shelf terminator or shelf output connector
- The special cables
- The cables connecting the SBB shelves

It is recommended that you select the shortest cable possible to connect the host to the StorageWorks subsystem.

13.1 SCSI Cable Connectors

All BA350–SB SBB shelves have two SCSI, 50-pin, high-density, female connectors. Only cables, such as the BN21H-series, with a SCSI 50-pin, high-density, male, *straight* connector can be attached to the SBB shelves. The BN-series StorageWorks SCSI cables are built to SCSI–3 specifications and operate reliably as part of either a fast or slow bus.

Controllers can have both 50-pin, high-density, female connectors and 68-pin, high density, female connectors. Only connectors with a 50-pin, high-density, male, *straight* connector or a 68-pin, high-density, *right-angle* connector can be attached to the StorageWorks controller shelves. The following sections contain a general description of the StorageWorks-compatible SCSI cables for use with the following components:

- Shelves
- Controllers
- Host computers or adapters

All of the StorageWorks BN-series SCSI cables conform to SCSI–3 standards.

13.2 StorageWorks Shelf SCSI Cables

All the StorageWorks shelves and expansion units, such as the BA350–KB desktside expansion unit and the BA353–Ax desktop expansion unit, have SCSI “A” type 50-pin, high-density, female, straight connectors. Only cables with a 50-pin, high-density, male, straight connectors, such as found on the BN21H-series cables, can be used.

The following sections contain detailed descriptions of the compatible SCSI cables, to include connectors, typical use, and lengths:

- SCSI–2, 50-conductor, single-ended “A” cables—Section 13.4
- SCSI–3, 68-conductor, differential “P” cables—Section 13.5
- SCSI–2 and SCSI–3 special purpose cables, such as “Y” cables, tralink connectors, and terminator blocks—Section 13.6

13.3 Recommendations for StorageWorks Shelves

Digital strongly recommends that the same length cables be used to connect all the SBB shelves to the controller shelves in a cabinet or desktside expansion unit. The following advantages can be realized:

- The cables between shelves will not be under any strain.
- All the SCSI–2 buses are the same length.
- The possibility of unbalancing a bus by inadvertently exceeding the maximum bus length is avoided.

13.4 SCSI “A” Cables

The SBB shelf SCSI bus is an 8-bit wide, single-ended bus with two 50-pin, high-density, female connectors (JA1 and JB1). The compatible cable for these connectors is a 50-conductor cable with a 50-pin, high-density, shielded male, straight connector with thumb latches (also known as squeeze-to-release latches). This combination of conductors and connectors is a SCSI “A” cable.

The primary difference between the “A” cables is the connectors. The following sections describe the different types of SCSI “A” cables that are compatible with the SBB shelves. Table 13–1 lists the SCSI “A” cable specifications, to include connectors, length, and cable order numbers.

Table 13–1 SCSI “A” Cable Specifications

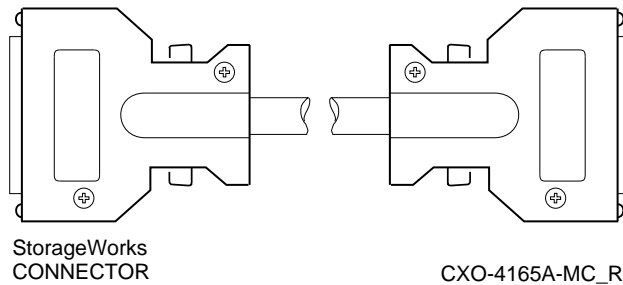
Cable Description	Meters	Feet	Cable Order No.
Standard cable, 50-conductor	0.3	1.0	BN21H-0C
• Two 50-pin, high-density, male, straight connectors	0.5	1.6	BN21H-0E
	1.0	3.3	BN21H-01
	1.5	4.8	BN21H-1E
	2.0	6.5	BN21H-02
	3.0	9.8	BN21H-03
	5.0	16.4	BN21H-05
	10.0	32.8	BN21H-10
	15.0	49.2	BN21H-15
	20.0	65.6	BN21H-20
HSC controller to HSC controller cable, 50-conductor	2.0	6.5	BN31A-02
• Two 50-pin, high-density, male, straight connectors with thumbscrews			
HSC controller to StorageWorks shelf cable, 50-conductor	2.0	6.5	BN31B-02
• One 50-pin, high-density, male, straight connector with thumb latches	3.0	9.8	BN31B-03
• One 50-pin, high-density, male, straight connector with thumb screws			
Adapter cable, 50-conductor	2.0	6.5	BN21R-02
• One 50-pin, high-density, male, straight connector	3.0	9.8	BN21R-03
• One 50-pin, low-density, male, right-angle connector	5.0	16.4	BN21R-05
Adapter cable, 50-conductor	0.9	3.0	BC09D-03
• One 50-pin, high-density, straight connector	1.8	6.0	BC09D-06
• One 50-pin, low-density, straight connector	3.7	12.0	BC09D-12
Alpha AXP DEC 7000 and DEC 1000 SCSI cable, 50-conductor	2.0	6.5	BC10U-02
	3.0	9.8	BC10U-03
• Two 50-pin, high-density, male, straight connectors	5.0	16.4	BC10U-05

13.4.1 BN21H-Series SCSI “A” Cables

The BN21H-series cables have two male, 50-pin, high-density, straight connectors with thumb latches, as shown in Figure 13–1. These cables are typically used to connect SBB shelves to the following:

- Other SBB shelves
- SCSI adapters, such as the following:
 - KZMSA, an XMI to SCSI adapter
 - PMAZ-AA and PMAZ-AB
 - K.scsi

Figure 13–1 BN21H-Series Cable



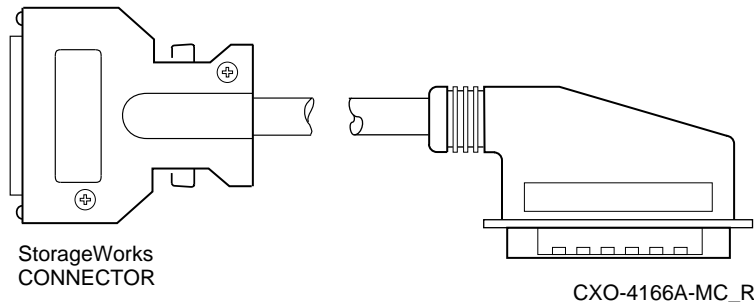
13.4.2 BN21R-Series SCSI “A” Cables

The BN21R-series “A” cable shown in Figure 13–2 has the following connectors:

- One male, 50-pin, low-density, right-angle connector
- One male, 50-pin, high-density, straight connector with thumb latches

The BN21R-series cables are typically used to connect a StorageWorks shelf to a 50-pin, low-density receptacle, such as that used by the DEC 4000 Model 610 AXP Distributed/Departmental Server.

Figure 13–2 BN21R-Series Cable



13.4.3 BC09D-Series Cables SCSI “A” Cables

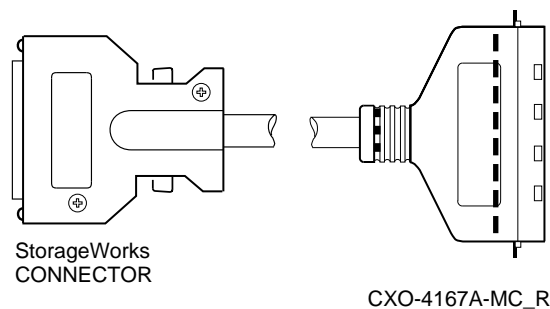
The BC09D-series cables shown in Figure 13–3 have the following connectors:

- One male, 50-pin, low-density, straight connector with bale locks
- One male, 50-pin, high-density, straight connector with thumb latches

These cables, sometimes referred to as transition cables, allow you to connect SCSI devices that have different density, 50-pin connectors. The BC09D-series cables are typically used to connect SBB shelves to the following:

- Devices with embedded SCSI adapters, such as DEC 3000 AXP servers, MicroVAX 3100 systems, and so forth
- KZESA, an EISA to SCSI adapter

Figure 13–3 BC09D-Series Cable



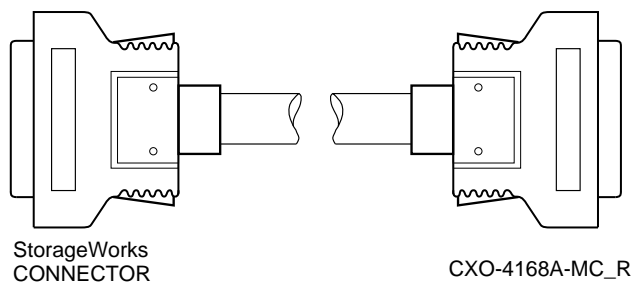
13.4.4 BC10U-Series Cables SCSI “A” Cables

The BC10U-series cables are used *only* with AXP systems with the BA655 SCSI plug-in unit (PIU). *Do not* use this SCSI cable in any other configuration.

These cables have two male, 50-pin, high-density, straight connectors with thumb latches, as shown in Figure 13–4. These cables are typically used to connect SBB shelves to the following:

- Other SBB shelves
- KZMSA, an XMI to SCSI adapter

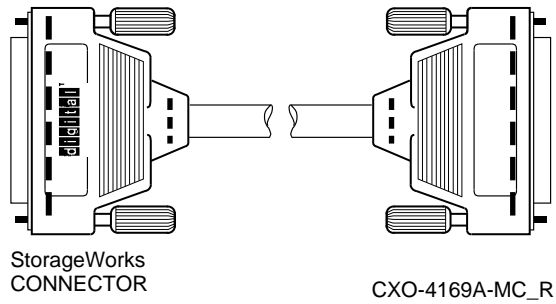
Figure 13–4 BC10U-Series Cable



13.4.5 BN31A-Series Cables HSC Controller “A” Cables

The BN31A-02 cable, shown in Figure 13-5, has two 50-pin, high-density, male connectors with thumb-screws. This cable is used with the HSC controllers.

Figure 13-5 BN31A-Series Cable

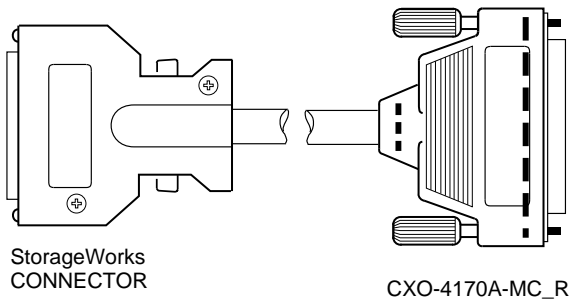


13.4.6 BN31B-Series HSC Controller “A” Cable

The BN31B-series cables shown in Figure 13-6 has the following connectors:

- One 50-pin, high-density, male, straight connector with thumb screws
- One 50-pin, high-density, male, straight connector with thumb latches

Figure 13-6 BN31B-Series 50-Pin



13.5 SCSI “P” Cables

Many host computers use the 16-bit wide, “P” SCSI bus. The controller or SCSI signal converters use a 68-conductor cable, a “P” cable.

The primary difference between the cables is the connectors. The following sections describe the different types of SCSI “P” cables. Table 13–2 lists the SCSI “P” cables, to include their connectors, length, and cable order number.

Table 13–2 SCSI “P” Cable Specifications

Cable Description	Meters	Feet	Cable Order No.
Standard cable, 68-conductor	1.0	3.3	BN21K-01
• One 68-pin, high-density, straight connector	2.0	6.5	BN21K-02
• One 68-pin, high-density, right-angle connector	3.0	9.8	BN21K-03
	5.0	16.4	BN21K-05
	8.0	26.2	BN21K-08
	10.0	32.8	BN21K-10
	15.0	49.2	BN21K-15
	20.0	65.6	BN21K-20
	23.0	75.5	BN21K-23
Standard cable, 68-conductor	0.15	0.5	BN21L-0B
• Two 68-pin, high-density, right-angle connectors	0.5	1.6	BN21L-0E
	1.0	3.3	BN21L-01
	2.0	6.5	BN21L-02
	3.0	9.8	BN21L-03
	5.0	16.4	BN21L-05
	10.0	32.8	BN21L-10
	15.0	49.2	BN21L-15
	20.0	65.6	BN21L-20

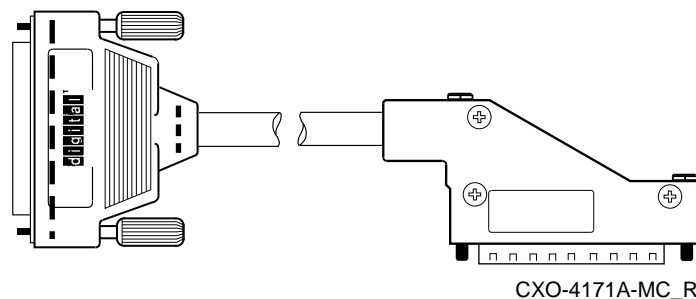
13.5.1 BN21K-Series SCSI “P” Cables

The BN21K-series cables shown in Figure 13–7 have the following connectors:

- One male, 68-pin, high-density, straight connector with jackscrew (thumbscrew) fasteners
- One male, 68-pin, high-density, right-angle connector with screw fasteners

These cables are typically used to connect a StorageWorks controller shelf to a host SCSI adapter, such as the KZTSA or a K.scsi.

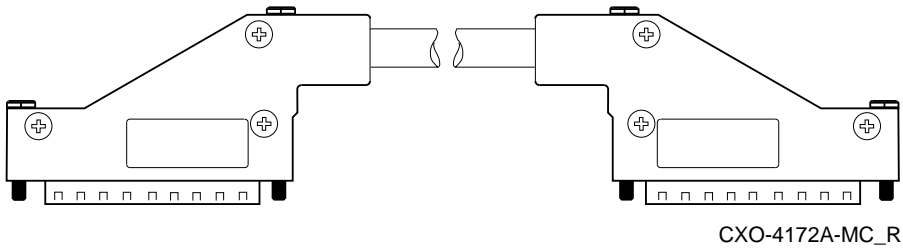
Figure 13–7 BN21K-Series Cable



13.5.2 BN21L-Series StorageWorks SCSI “P” Cables

The BN21L-series “P” cables shown in Figure 13–8 have two male, 68-pin, high-density, right-angle connectors with screw fasteners. The BN21L-series cables are typically used to connect a StorageWorks controller to another controller or a controller to a SCSI converter when there is not enough clearance to use a straight connector.

Figure 13–8 BN21L-Series Cables



13.6 Special SCSI Cables

There are many compatible SCSI devices that cannot be connected together using the standard SCSI “A” or “P” cables. In some special cases there is a requirement to connect a SCSI adapter to multiple controllers, place a device in the middle of the bus, or other special configurations. Most of these cases can be handled using a trilink connector block (a “Y” connector) or a “Y” cable.

Table 13–3 lists the StorageWorks-compatible adapter SCSI cables by *function* (listed alphabetically).

Note

The length of all “-0B” “Y” adapter cables is 0.15 meters (6 inches).

Table 13–3 Selecting a “Y” SCSI Cable

To do this	Use this cable
Connect a 16-bit bus (operating in the 8-bit mode) “P” cable to a 50-pin low-density connector.	BN21P-0B See Figure 13–10.
Connect a 16-bit bus (operating in the 8-bit mode) “P” cable connector to a 50-pin, high-density connector, such as an HSZ-series 8-bit controller connector. Use with Sun Microsystems® or Hewlett-Packard® systems.	BN21X-0B See Figure 13–13.
Connect a <i>high-availability</i> OSF™ configuration host cables, such as an ULTRIX™ system, to a StorageWorks shelf.	BN21V-0B See Figure 13–11.
Connect an OSF configuration host cables to a StorageWorks shelf.	BN21Y-0B See Figure 13–14.
Connect a second host cables to a KZTSA SCSI host adapter.	BN21W-0B See Figure 13–12.
Remove an HSZ-series controller from the end-bus position without interrupting the bus. You <i>must also</i> use a 68-pin, differential, terminator block (H879-AA).	BN21P-0B See Figure 13–10.

As shown in Figure 13–9, you can adapt a 68-pin “P” cable to a 50-pin “A” connector simply by connecting a “Y” cable, 68-pin, female connector to the male cable connector. By installing the differential terminator block in the other 68-pin “Y” cable connector, you now could disconnect the “Y” cable to the adapter without interrupting the SCSI bus because the differential terminal block in the “Y” cable now terminates the bus.

Figure 13-9 Typical "Y" Cable Connection

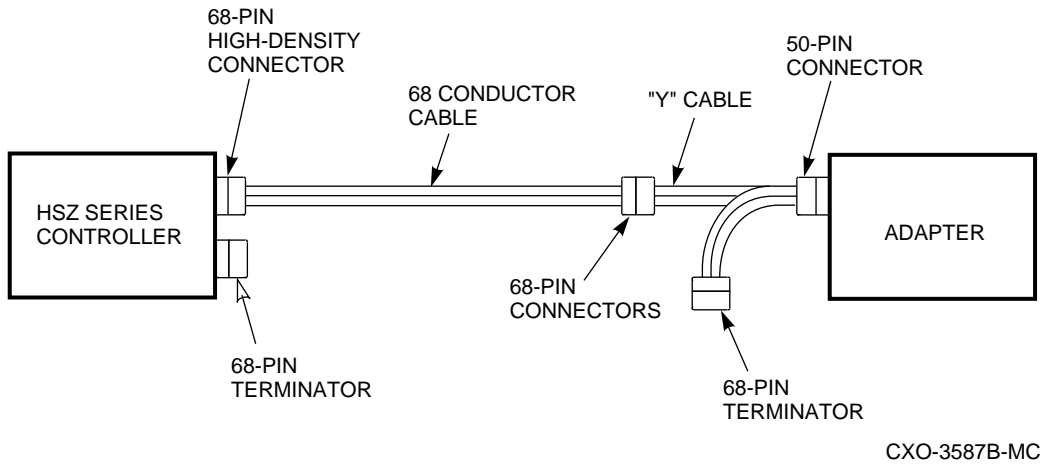


Figure 13-10 BN21P-0B "Y" Cable Configuration

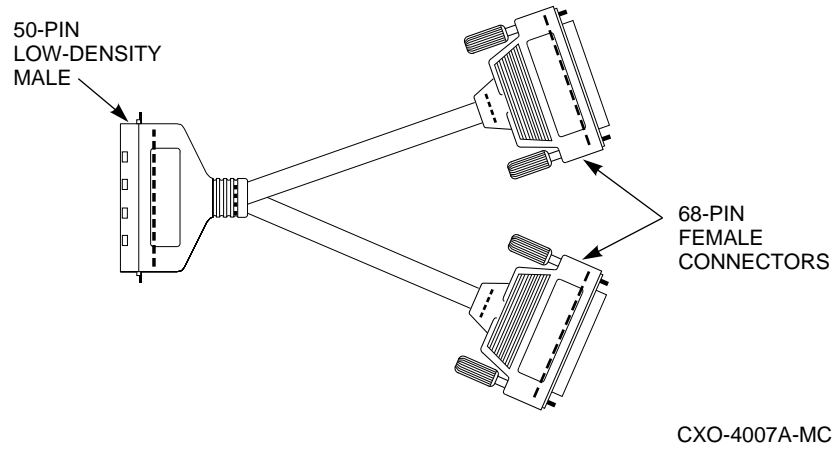


Figure 13-11 BN21V-0B “Y” Cable Configuration

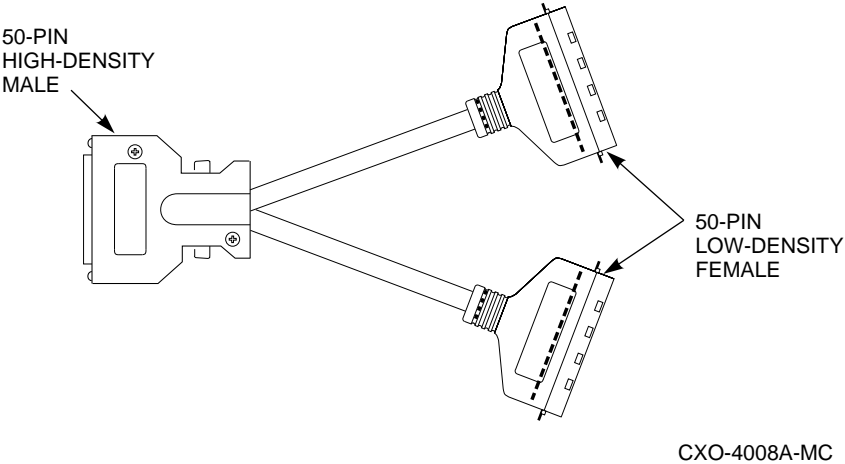


Figure 13-12 BN21W-0B “Y” Cable Configuration

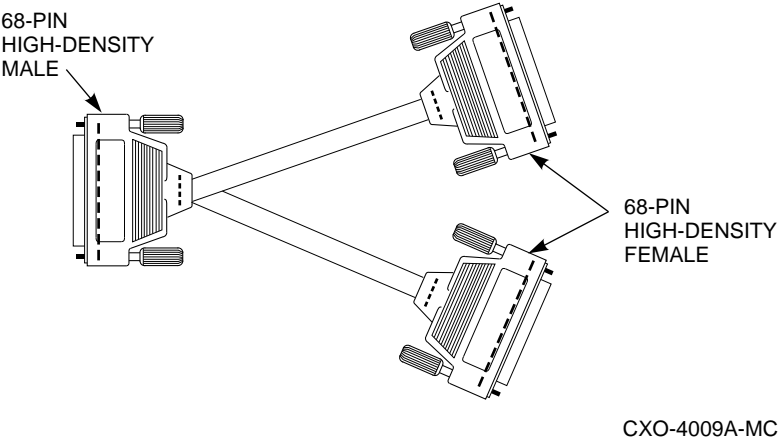


Figure 13–13 BN21X–0B “Y” Cable Configuration

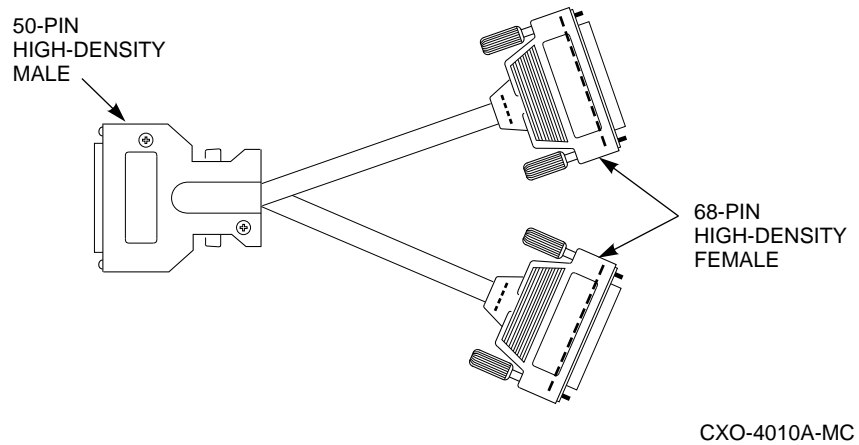
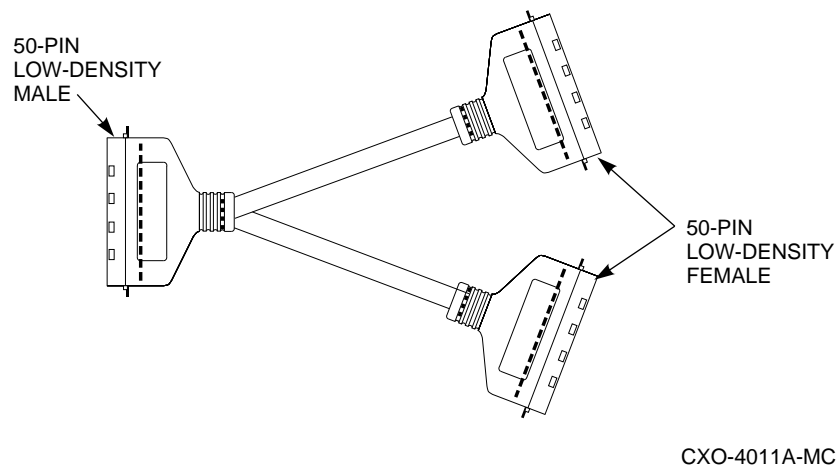


Figure 13–14 BN21Y–0B “Y” Cable Configuration



13.7 H885–AA Trilink Connector Block

Table 13–4 lists the StorageWorks-compatible trilink connectors and terminators and their uses.

Table 13–4 StorageWorks Trilink Connectors and SCSI Terminator Blocks

Order No.	Function
H879-AA	68-pin, SCSI, differential, terminator block for terminating SCSI “Y” cables, trilink connector blocks, and SCSI differential buses. Used to enable the hot-swap method for replacing a controller without interrupting the bus.

(continued on next page)

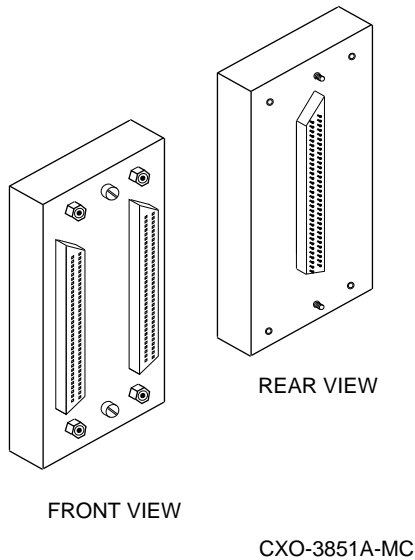
Table 13–4 (Cont.) StorageWorks Trilink Connectors and SCSI Terminator Blocks

Order No.	Function
H885-AA	Trilink connector block used with the differential terminator block to enable the hot-swap method for replacing an HSZ-series controller in either the mid-bus or end-bus position

A trilink connector as shown in Figure 13–15 can be used in conjunction with an H879-AA differential terminal block to permit replacing an HSZ-series controller without disabling the bus.

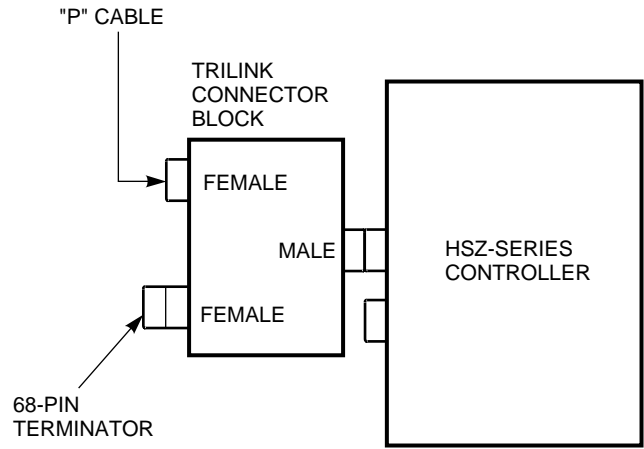
The trilink connector has three 68-pin connectors—two female and one male. The male connector is attached to the controller and the “P” cables, or a 68-pin, differential, terminator block is attached to the female connectors.

Figure 13–15 H885-A Trilink Connector



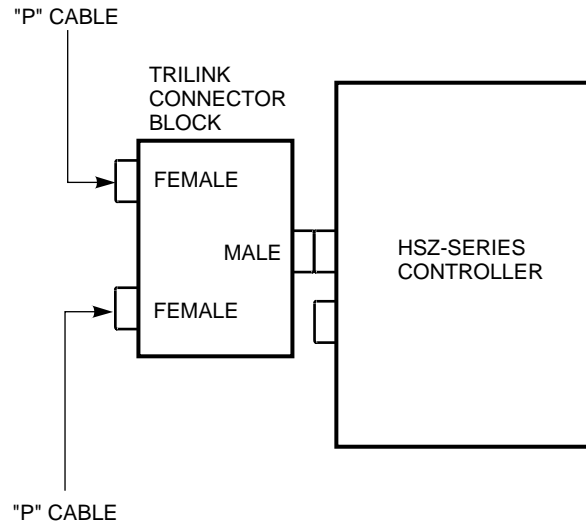
See Figure 13–16 for a typical end-bus installation using a trilink connector. See Figure 13–17 for a typical mid-bus installation.

Figure 13–16 HSZ-Series Controller—End-Bus Position



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Figure 13–17 HSZ Controller—Mid-Bus Position



CXO-3631B-MC

StorageWorks DSSI Cables

The process for selecting DSSI (DIGITAL standard system interface) cables is basically the same whether or not the host system is a Digital system. You must refer to the host system and controller documentation and determine the following:

- The DSSI adapter or controller type
- The connector configuration (straight or right-angle)

For all host systems you must then calculate the maximum DSSI bus cable length. This is the difference between the maximum DSSI bus length and the total of the following:

- The DSSI bus length between the host controller terminator and the host controller cable connector
- The DSSI bus length between the HSD-series controller cable connector and the HSD-series controller DSSI terminator

Digital recommends that you select the shortest cable possible to connect the host to the StorageWorks subsystem.

The HSD05 storage array controller SBB is connected to the host with one of the DSSI cables listed in Table 14-1. The SBB 96-pin connector connects the controller to the 8-bit wide, single-ended SBB shelf DSSI bus.

Table 14–1 Host System to StorageWorks DSSI Cables

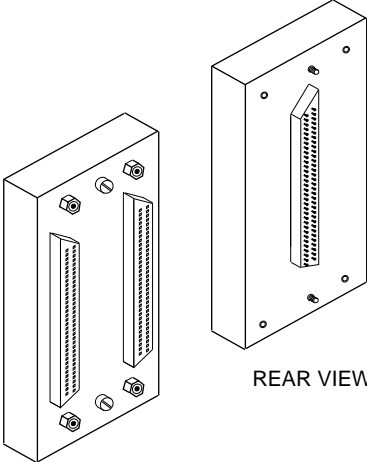
Cable Description	Feet	Meters	Order No.
Use one of the following cables to connect an HSD05 storage array controller to:			
<ul style="list-style-type: none"> • DEC 4000 AXP Model 600 Distributed/Departmental Servers • VAX 4000 Systems and Servers 			
A micro-ribbon cable with:	6	1.8	BC29R–06
• One right-angle 50-pin micro-ribbon connector	9	2.7	BC29R–09
• One straight 50-pin micro-ribbon connector	16	4.9	BC29R–16
	30	9.1	BC29R–30
	45	13.7	BC29R–45
	60	18.3	BC29R–60
Use one of the following cables to connect an HSD05 storage array controller to:			
<ul style="list-style-type: none"> • DEC 7000 AXP Model 600 Data Center Servers with a KFMSB adapter. • DEC 10000 AXP Model 600 Mainframe Class Servers with a KFMSB adapter. • VAX 6000 Systems and Servers 			
A micro-ribbon cable with:	6	1.8	BC29S–06
• One right-angle 50-pin micro-ribbon connector	9	2.7	BC29S–09
• One straight 50-pin TAB connector	16	4.9	BC29S–16
	30	9.1	BC29S–30
	45	13.7	BC29S–45
	60	18.3	BC29S–60

Table 14–2 lists the DSSI cables approved for interconnecting (“daisy chaining”) HSD05 controllers, including the connectors, length, and order number. Interconnecting HSD05 controllers requires a trilink connector (as shown in Figure 14–1) and a terminator block.

Table 14–2 HSD05 Interconnecting DSSI Cables

Cable Description	Feet	Meters	Order No.
Use the following cable to connect the HSD05 tri-link connectors when:			
<ul style="list-style-type: none">• One shelf is mounted in the front of the cabinet.• One shelf is mounted in the rear of the cabinet.• One shelf is mounted in the horizontal position.• One shelf is mounted in the vertical position.			
A micro-ribbon cable with:	3	1.0	BC29T-03
<ul style="list-style-type: none">• Two right-angle connectors	9	3.0	BC29T-09
Use the following cable to connect the HSD05 tri-link connectors when both shelves are:			
<ul style="list-style-type: none">• Mounted in the front of the cabinet.or• Mounted in the rear of the cabinet.• Mounted in the vertical position.			
A micro-ribbon cable with:	3	1.0	BC29T-03
<ul style="list-style-type: none">• Two right-angle connectors			
Use the following cable to connect the HSD05 tri-link connectors when:			
<ul style="list-style-type: none">• Both shelves are mounted in the rear of the cabinet.• One shelf is mounted in the horizontal position.• One shelf is mounted in the vertical position.			
A micro-ribbon cable with:	3	1.0	BC29T-03
<ul style="list-style-type: none">• Two right-angle connectors			
Use the following cable to connect the HSD05 tri-link connectors when both shelves are:			
<ul style="list-style-type: none">• Mounted in the front cabinet.or• Mounted in the rear cabinet.• Mounted horizontally adjacent to each other.			
A micro-ribbon cable with:	2	0.7	BC29U-02
<ul style="list-style-type: none">• Two right-angle 50-pin micro-ribbon connectors mounted facing opposite directions.			

Figure 14-1 HSD05 DSSI Trilink Connector



FRONT VIEW

REAR VIEW

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Designing a StorageWorks Subsystem

Designing a StorageWorks subsystem is a complex process that requires you to consider many factors. This chapter contains examples of the steps involved in configuring some of the more basic subsystems. To reduce the complexity of the process, the examples are limited to subsystems that use the following:

- HSZ10-AA disk array controller
- BA350-Ex controller and SBB (StorageWorks building block) shelf
- BA350-Sx SBB shelf
- BA350-Kx deskside expansion unit with an ac distribution unit
- 120 Vac 60 Hz input power

15.1 Before You Begin

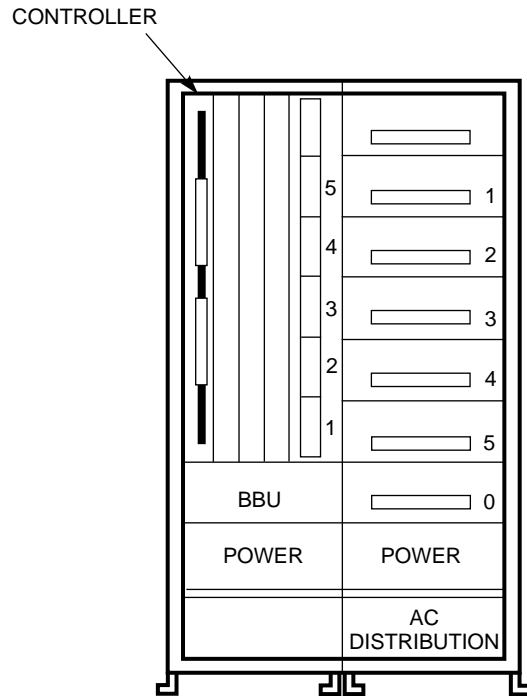
Before designing a StorageWorks subsystem, you should do the following:

1. Determine the storage requirements, to include the media, the storage capacity, and so forth.
2. Determine the bus type and the device that will control the bus.
3. Select the SBBs, controllers, shelves, and enclosures listed in Part I that meet your requirements.
4. Familiarize yourself with the configuration rules in Chapter 11 for the preferred configuration.
5. Determine which SCSI (small computer system interface) cables, listed in Chapter 12, are compatible with the preferred configuration, taking into account the shelf bus length, bus speed (fast or slow), and cable length.
6. Study the configuration examples presented in the following sections.

15.2 StorageWorks Controller and SBB Shelf

An example of a single controller and SBB shelf with one HSZ10-AA disk array controller is shown in Figure 15-1.

Figure 15-1 Typical StorageWorks Controller and SBB Shelf



CXO-3634A-MC

Assumptions: The following assumptions have been made about this configuration:

- The user wants one HSZ10-AA disk array controller.
- The HSZ10-AA disk array controller is operated from a KZESA adapter.
- The user wants a battery backup unit (BBU) to maximize data integrity.
- The user needs 4 GB of storage in a RAID 5 (Redundant Array of Independent Disks, level 5) configuration.
- The user wants the SBB shelf in deskside expansion enclosures.
- The configuration will be used in France.

Storage Capacity: This configuration uses five disk drives. Four RZ26-VA disk drives are used to meet the user's storage requirements, providing 4.20 GB of storage. Because RAID 5 configurations require $n+1$ disks, an additional (fifth) disk drive is used to meet RAID requirements.

Enclosure: Two BA350-Kx deskside expansion enclosures.

SCSI Connections: In this example, two levels of SCSI connections must be considered:

- The first is the SCSI connection from the KZESA adapter to the HSZ10-AA disk array controller.
- The second is the SCSI connection from the controller and SBB shelf to the SBBs.

The SCSI connection from the KZESA adapter to the HSZ10-AA disk array controller is accomplished with a BN21K cable and a “Y” cable (described in Chapter 12). A 68-pin terminator is also needed for this arrangement.

The controller and SBB shelf can accommodate up to six SCSI buses. Each disk drive has its own separate SCSI bus from the HSZ10-AA controller. This connection is made on the backplane.

Power Cord: A BN19W-2E power cord is used.

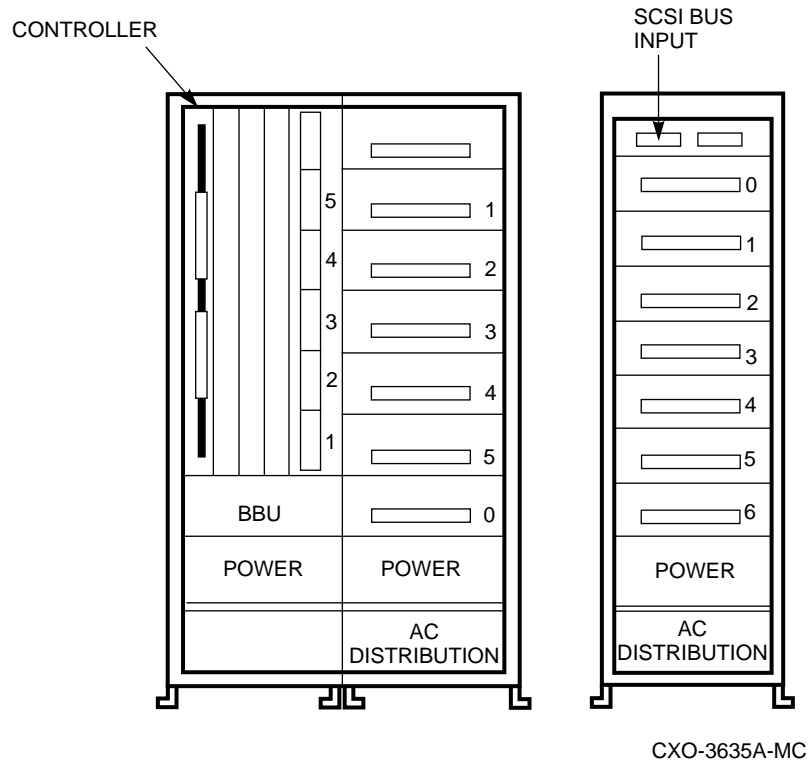
Parts Lists: The parts list for the controller and SBB configuration in this example is as follows:

- One BA350-Ex controller and SBB shelf
- Two BA350-Kx deskside expansion enclosures
- One HSZ10-AA disk array controller
- Five RZ26-VA disk drives
- Two BA350-HA ac input power supplies
- One BA350-HC BBU
- One BN21K-03 SCSI cable
- One BN21P-0B “Y” cable
- One H879-AA 68-pin terminator
- One BN19W-2E Central Europe 220 V ac power cord (France)

15.3 Combination BA350-Ex and BA350-Sx StorageWorks Subsystem

An example of a configuration that uses a controller and SBB shelf and a SBB shelf is shown in Figure 15-2.

Figure 15-2 Typical Combination BA350-Ex and BA350-Sx StorageWorks Subsystem



Assumptions: The following assumptions have been made about the configuration in this example:

- The user wants one HSZ10-AA disk array controller.
- The HSZ10-AA disk array controller is connected to a KZESA adapter.
- The user wants a BBU for the RAID controller and redundant power for the disks.
- The user needs 9 GB of storage.
- The user wants the SBB shelf in deskside expansion enclosures.
- The system will be used in France.

Storage Capacity: The configuration in this example has a total of 10 RZ26-VA disk drives, 5 in each shelf. These disks provide a total storage capacity of 10.5 GB: 9.45 GB to satisfy the user's storage requirements, plus an additional disk to satisfy the RAID 5 requirement of $n+1$ disks.

Enclosure: Three BA350-Kx deskside expansion enclosures.

SCSI Connections: In this example, two levels of SCSI connections must be considered:

- The first is the SCSI connection from the KZESA adapter to the HSZ10-AA disk array controller.
- The second is the SCSI connection from the controller and SBB shelf to the SBB shelf.

The SCSI connection from the KZESA adapter to the HSZ10-AA disk array controller is accomplished with a BN21K cable and a “Y” cable (described in Chapter 12). A 68-pin terminator is also needed for this arrangement.

The SCSI connections from the controller and SBB shelf to the SBB shelves are accomplished as follows:

- The SBBs in the controller and SBB shelf are connected to the SCSI buses internally, on the shelf backplane.
- The SBB shelf is connected to the controller and SBB shelf with a BN21H-02 SCSI cable.

Power Cord: A BN19W-2E power cord is used. Only two power cords are needed since the controller and SBB shelf can be powered from one ac distribution unit.

Parts Lists: The parts list for this combination subsystem is as follows:

- One BA350-Ex controller and SBB shelf
- One BA350-Sx SBB shelf
- Three BA350-Kx desktide expansion enclosures
- One HSZ10-AA disk array controller
- Ten RZ26-VA disk drives
- Five BA350-HA ac input power supplies
- One BA350-HC BBU
- One BN21K-03 SCSI cable (for the HSZ10-AA disk array controller)
- One BN21P-0B “Y” cable
- One H879-AA 68-pin terminator
- One BN21H-02 SCSI cable for the BA350-Sx SBB shelf
- Two BN19W-2E Central Europe 220 V ac power cords (France)

StorageWorks Product Specifications

This appendix chapter describes the physical and environmental specifications for the StorageWorks products. See the *Digital Systems and Options Catalog* for the operating specifications for storage devices, controllers, and host computers.

A.1 Power

The input power requirements for a StorageWorks enclosure is a function of the number of shelves, the enclosure power distribution units, the fans, and other features. To accurately determine the input power requirements for a specific configuration see the enclosure documentation.

Table A-1 lists the specifications for the StorageWorks power supplies.

Table A-1 StorageWorks Power Supply Specifications

Specifications	BA35X-HA	BA35X-HB	BA35X-HC
Power supply type	AC input	DC input	Battery backup
Input ac voltage range	90–264 V ac	N/A	N/A
Input dc voltage range	N/A	36–72 V dc	12 V dc†
AC input frequency range	47–63 Hz	N/A	N/A
Nominal dc voltage input	N/A	48 V dc	N/A
Auto-ranging feature	Yes	Yes	N/A
Output voltages	12 V dc 5 V dc	12 V dc 5 V dc	12 V dc 5 V dc
Output power	131 W	131 W	200 W peak for 16, 32, or 64 seconds (user-selectable)

† Charging power from shelf power bus.

A.2 Physical Specifications

Table A-2 lists the physical specifications of the cabinets, StorageWorks shelves, and StorageWorks building blocks (SBBs).

Note

The depth specifications in Table A-2 do not include the service area requirements, which are as follows:

- The SW500-series and SW800-series cabinets require both a front and a rear service areas of 762 millimeters (30 inches).
 - Deskside expansion enclosures are portable and should be positioned to provide a front or rear service area of 762 millimeters (30 inches).
 - Desktop expansion enclosures do not require a service area.
-

Table A-2 StorageWorks Products Physical Specifications

Description	Height		Width		Depth		Total Shelves
	mm	in	mm	in	mm	in	
StorageWorks Enclosures							
SW500-series data center cabinet	1070	42.1	600	23.6	875	34.5	10
SW800-series data center cabinet	1700	66.6	800	31.5	875	34.5	24
Deskside expansion enclosure	578	22.8	203	8.0	400	15.7	1
Desktop expansion enclosure	60	2.4	432	17.0	400	15.7	N/A
StorageWorks Shelves							
BA350-EA controller and SBB shelf	300	11.8	445	17.5	350	13.8	N/A
BA350-LA SBB shelf	150	5.9	445	17.5	350	13.8	N/A
BA350-SA SBB shelf	150	5.9	445	17.5	350	13.8	N/A
BA350-MA controller shelf	150	5.9	445	17.5	350	13.8	N/A
StorageWorks Building Blocks							
3½-inch SBB	121	4.8	51	2.0	216	8.5	N/A
5¼-inch SBB	121	4.8	152	6.0	267	10.5	N/A
Magnetic Tape Storage Subsystems							
TZ867-VA/TZ877-VA	265	10.4	222	8.7	647	25.5	N/A

A.3 Environmental Specifications

The StorageWorks product line environmental specifications listed in Table A-3 are the same as for other Digital storage devices.

Table A-3 StorageWorks 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 m (8000 ft)
Air quality	Maximum particle count .5 micron or larger, not to exceed 500,000 particles per cubic ft of air
Inlet air volume	.026 cubic m per second (50 cubic ft per minute)
Maximum Operating Environment (Range)	
Temperature	+10° to +40°C (+50° to +104°F) Derate 1.8°C for each 1000 m (1.0°F for each 1000 ft) 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 Environment (Range)	
Temperature	-40° to +66°C (-40° to +151°F) (During transportation and associated short-term storage)
Relative humidity Nonoperating	8% to 95% in original shipping container (noncondensing); otherwise, 50% (noncondensing)
Altitude	From -300 m (-1000 ft) to +3600 m (+12,000 ft) MSL

A.4 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–4 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 This Condition Exists

Condensation is visible on the outside of the storage device

Condensation is not visible on the outside of the storage device

Then You Must

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.

Thermally stabilize the device for the amount of time specified in Table A–4.

Table A–4 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

StorageWorks Glossary

ac distribution

The method of distributing ac power in a cabinet.

ac power supply

A power supply designed to produce dc power from an ac input.

adapter

A device that converts the protocol and hardware interface of one bus type into that of another without changing the functionality of the bus. See *signal converter*.

American National Standards Institute

See *ANSI*.

ANSI

American National Standards Institute. An organization that develops and publishes electronic and mechanical standards.

array controller

A hardware/software device that facilitates communications between a host and one or more devices organized in an array. The HSJ40 controller is an array controller.

BA350–Mx controller shelf

The StorageWorks controller shelf used for HS-family controller modules, cache modules, and shelf power units.

BA350–Sx SBB shelf

A StorageWorks shelf used for only power units and SBBs.

battery backup unit

See *BBU*

BBU

StorageWorks battery backup unit that extends power availability after the loss of primary ac power or a power supply to protect against the corruption or loss of data.

blower

An airflow device mounted in a StorageWorks shelf.

cable distribution unit

See *CDU*.

carrier

A standard, StorageWorks shelf-compatible, plastic shell into which a device can be installed. Sometimes called SBB carrier.

CDU

Cable distribution unit. The power entry device for StorageWorks center cabinets. The unit provides the connections necessary to distribute ac power to cabinet shelves and fans.

channel

The RAID Array 110 subsystem term for a SCSI bus.

CI bus

Digital's computer interconnect bus using two serial paths, each with a transfer rate of 70 Mb/s (8.75 MB/s).

cold swap

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

configure-to-order

See *CTO*.

controller

A hardware/software device that facilitates communications between a host and one or more devices.

controller shelf

A StorageWorks shelf designed to contain controller and cache memory modules.

CTO

Configure-to-order. The customer-specified options are installed at the factory.

DAT

Digital Audio Tape. A format for recording digital data on a cartridge tape.

data center cabinet

A generic reference to the large cabinets, such as the SW800 series, in which StorageWorks components can be mounted.

data channel

An HSC interface between the disk drive or tape formatters and HSC data and control memory.

deskside expansion unit

A pedestal enclosure designed to house one or two StorageWorks shelves in a vertical position.

DIGITAL Storage System Interconnect

See DSSI

DSSI

Digital's storage system interconnect bus with an 8-bit data transfer rate of 4-5 MB/s.

dual cabinet power configuration

A cabinet ac power configuration in which two ac sources and two ac power supplies are used to supply dc power to the cabinet's SBB shelves.

dual porting (or dual access)

The ability of a disk or tape drive to be accessed by two controllers. All DSA drives have a standard dual-port feature. DSA drives can be online to only one controller at a time. However, they are able to disconnect themselves from a failed controller (or be disconnected by a failing controller) and become available for continued service through the other controller.

dual-redundant configuration

A controller configuration consisting of a primary and backup controller in one controller shelf . If the primary controller fails, the backup controller assumes control over the failing controller's devices.

dual shelf power configuration

A cabinet ac power configuration in which one ac source and two ac power supplies are used to supply dc power to the cabinet's SBB shelves.

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.

factory-configured

These systems are configured at the factory and shipped to the customer "as is." Customer-specified options are shipped with the system for on-site installation.

failover

Failover is the software process that takes place when one controller fails in a dual-redundant configuration and the other controller takes over the devices of the failed controller and services them to the host until or if the failed controller comes back or is replaced.

fan

An airflow device mounted in a StorageWorks cabinet.

fast, differential SCSI

See *FD SCSI*.

fast, wide, differential SCSI

See *FWD SCSI*.

FD SCSI

The fast, differential SCSI bus with an 8-bit data transfer rate of 10 MB/s.

See also *FWD SCSI* and *SCSI*.

field configured

Customer-specified options are installed on-site. The options can be ordered at any time for field upgrades.

full-height device

A single device that occupies an entire 5.25 inch SBB carrier. StorageWorks full-height devices have an order number suffix of “-VA”.

FWD SCSI

The fast, wide, differential SCSI bus with a 16-bit data transfer rate of up to 20 MB/s.

See also *FD SCSI* and *SCSI*.

half-height device

A device that occupies half of a 5.25 inch SBB carrier. Two half-height devices can be mounted in a 5.25 inch SBB carrier. The first half-height device is normally mounted in the lower part of the carrier. The second device is normally mounted in the upper part of the carrier.

Hierarchical Storage Controller

See *HSC*.

host

The primary or controlling computer to which a storage subsystem is attached.

hot swap

A method of device replacement whereby the complete system remains on line and active during device removal and reinstallation. The device being removed or reinstalled is the only device that cannot perform operations during this process.

HSC

Hierarchical Storage Controller. An intelligent mass storage server used on the CI bus. Capable of supporting a total of eight disk and/or tape data channels, the HSC is part of the System Interconnect Architecture and Digital Storage Architecture. By performing as an I/O manager, the HSC can be classified as an I/O server, removing the burden of I/O management from the CPU.

qualified device

A device that has been fully tested in all appropriate StorageWorks hardware and software configurations, and is in complete compliance with Digital and country-specific standards (for example, FCC and TÜV).

radio frequency interference

See RFI.

RAID

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

redundant array of independent disks

See RAID.

RFI

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

SBB

StorageWorks building block. A device housed in a standard StorageWorks SBB carrier. An SBB has a standard physical and electrical interface that is compatible with those of StorageWorks shelves and enclosures.

SBB shelf

A StorageWorks shelf, such as the BA350-Sx, designed to house plug-in SBB modules.

SCSI

Small Computer System Interface. An ANSI interface defining the physical and electrical parameters of a parallel I/O bus used to connect hosts to a maximum of seven devices. The StorageWorks device interface is implemented according to the SCSI-2 standard, allowing the synchronous transfer of 8-bit data at rates of up to 10 MB/s.

shelf brackets

Sheet metal components designed to attach and position StorageWorks shelves in their associated enclosures.

signal converter

A device that converts the protocol and hardware interface of one bus type into that of another without changing the functionality of the bus. *See adapter.*

Small Computer System Interface

See SCSI.

StorageWorks

Digital's family of modular data storage products that allows customers to design and configure their own storage subsystems. Components include power, packaging, cabling, devices, controllers, and software. Customers can integrate devices and array controllers in StorageWorks enclosures to form storage subsystems.

StorageWorks building block

See *SBB*.

supported device

A device tested as functionally compatible with an approved StorageWorks hardware and software configuration.

warm swap

A controller function that allows devices to be added, removed, or replaced while the subsystem remains operational. All activity on the device's SCSI bus must normally be halted for the duration of the warm swap operation.

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 - See CD–ROM drives 5¼-inch
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