StorageWorks™ Solutions DWZZx–Series SCSI Bus Converters

User's Guide

Order Number: EK–DWZZX–UG. A01

This publication describes the StorageWorks 8- and 16-bit SCSI Bus Converters, specifications, and replacement procedures.

Digital Equipment Corporation
Maynard, Massachusetts

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NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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 DWZZx SCSI Bus Signal Coverters* introduces the 8- and 16-Bit StorageWorks™ Building Blocks (SBB) SCSI bus converters which provide a small computer system interface between controllers, host, or their SCSI adapters. This guide also describes the components, installation, replacement procedures, and specifications.

This guide and the *StorageWorks Solutions Configuration Guide*, describes the complete subsystem and comprises the basic 8- and 16-bit StorageWorks documentation set. Other documentation for this product line is listed in the related documents section.

Intended Audience

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

Note

Shelf installation procedures are cabinet specific and are not included in this guide.

Documentation Conventions

The following conventions are used in this manual:

boldface type	Boldface type indicates the first instance of terms being defined in text, in the glossary, or both.
italic type	Italic type indicates emphasis and complete manual titles. In the glossary, italic type also is used to indicate cross–references.

Structure

This manual is organized as follows:

Chapter 1 **Introduction** Provides a product overview of the StorageWorks.SCSI bus signal converters.

Chapter 2 **DWZZA Signal Bus Converters** Describes the DWZZA StorageWorks 8-bit bus signal converters.

Chapter 3 **DWZZB Signal Bus Converters** Describes the DWZZB StorageWorks 16- bit bus signal converters.

Glossary

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Related Documents

Listed below are the StorageWorks-related user documents organized by use, system, or product.

StorageWorks Related Documentation

Document Title	Order Number
StorageWorks Primary Publications	
StorageWorks Solutions Configuration Guide	EK–BA350–CG
StorageWorks Solutions Shelf and SBB User's Guide	EK–BA350–UG
StorageWorks Solutions BA356–SB 16-Bit Shelf User's Guide	EK–BA356–UG
StorageWorks RAID Array 110 Subsystem	
DEC RAID Utilities User's Guide	EK–DECRA–UG
HSZ10–AA Controller Site Preparation Guide	EK–HSZ10–IN
StorageWorks Expansion Storage Pedestal User's Guide	EK–SMCPA–UG
StorageWorks RAID Array 110 Subsystem User's Guide	EK–SM2CA–UG
StorageWorks RAID Array 110 Utility for MS–DOS User's Guide	AA–Q0N5A–TE
StorageWorks RAID Array 110 Utility for Novell NetWare User's Guide	AA–Q0N4A–TE
StorageWorks RAID Array 110 Utility for SCO UNIX User's Guide	AA–Q0N6A–TE
StorageWorks Array Controller 140–Series	
StorageWorks Array Controller HS Family of Array Controllers User's Guide	EK–HSFAM–UG
StorageWorks BA350–MA Controller Shelf User's Guide	EK–350MA–UG
Rackmount StorageSubsystem and HSC™ Intelligent I/O Servers	
HSC Controller User's Guide	AA–PFSQA–TK
HSC Controller Installation Manual	EK–HSCMN–IN
StorageWorks Enclosures	
BA35X–VA Vertical Mounting Kit User's Guide	EK–350SV–UG
BA35X–KB Deskside Expansion Unit User's Guide	EK–350KB–UG
InfoServer 1000 Installation and Owner's Guide	EK–INFLC–OM
StorageWorks Solutions Desktop Expansion Unit User's Guide	EK–BA353–UG
StorageWorks Solutions SW500 and SW800 Cabinet Metric Shelf Bracket Kit Installation Guide	EK–35XRD–IG
StorageWorks Solutions HSR95-Series Cabinet Metric Shelf Bracket Kit	EK–35XRC–IG

Document Title	Order Number
Installation Guide	
StorageWorks RETMA Shelf Rail Kit Installation Guide	EK–35XRB–IG
StorageWorks Solutions SW500-Series Cabinet Installation and User's Guide	EK–SW500–IG
StorageWorks Solutions SW500-Series Cabinet Cable Distribution Unit Installation Guide	EK–SW5CU–IG
StorageWorks Solutions SW800-Series Data Center Cabinet Cable Distribution Unit Installation Guide	EK–SWCDU–IS
StorageWorks Solutions SW800-Series Data Center Cabinet Installation and User's Guide	EK–SW800–IG
*Instructions for Installation of the Tape Bezel Kit on SF400 Series Cabinets**	
Storage Devices	
StorageWorks Solutions 3½-Inch Storage Device Installation Guide	EK–MC350–IG
StorageWorks Solutions 5¼-Inch Storage Device Installation Guide	EK–MC525–IG
TZ86–VA Cartridge Tape Drive Device Addresses	EK–TZ86A–UG
TZ87–VA Cartridge Tape Drive Device Addresses	EK–TZ87A–DA
StorageWorks Solutions TZ8x7–Series Tape Drive SCSI Bus Configuration and Installation Guide	EK–TZ8X7–IG
General Reference Publications	
Digital Systems and Options Catalog	†
Small Computer System Interface, An Overview	EK–SCSIS–OV
Small Computer System Interface, A Developer's Guide†	EK–SCSIS–DK

* Applies also to StorageWorks cabinets.

† Available from your Digital account representative.

1

Introduction

The *StorageWorks Solutions DWZZx 8-and 16-Bit Bus Converter User's Guide* is part of the basic StorageWorks documentation set. This guide provides information to install, configure and operate DWZZx bus converters. The information contained in this document is supplemented by the system and shelf documentation listed in the Related Documents section of the Preface.

1.1 StorageWorks DWZZx Components

See the *StorageWorks Solutions Configuration Guide* for a complete listing of the StorageWorks family products.

The scope of this guide is limited to providing information about the following:

- Installation
- Terminators
- Shelf compatibility
- Cable requirements

1.2 DWZZx Bus Signal Converter Description

The **SCSI** buses presented in this guide are of the following types:

- A **differential** physical bus
- A **single-ended** physical bus
- A **logical** bus is a single-ended physical bus connected to a differential physical bus by a SCSI bus signal converter.

The BA350 is an 8-bit SBB shelf and the BA356 is a 16-bit SBB shelf. Both are single-ended, SCSI-2 buses. Some controllers and hosts, or their SCSI adapters, use a differential SCSI bus. Singled-ended and differential buses are incompatible. The SCSI protocol disables these buses when they are connected together.

The StorageWorks DWZZx SCSI bus signal converter (see Figure) is a differential SCSI to SCSI adapter, that permits connecting these buses together *without* modifying the SCSI devices. The DWZZx-series SCSI bus signal converter establishs compatibility between the host SCSI bus and the BA350 or BA356 SBB shelf SCSI bus, thereby extending the length of the SCSI bus

Figure 1–1 DWZZx SCSI Bus Signal Converter SBB (Front)

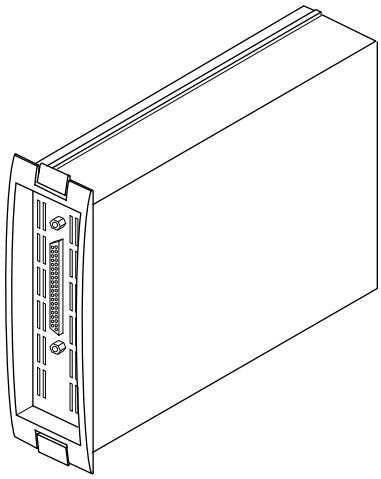

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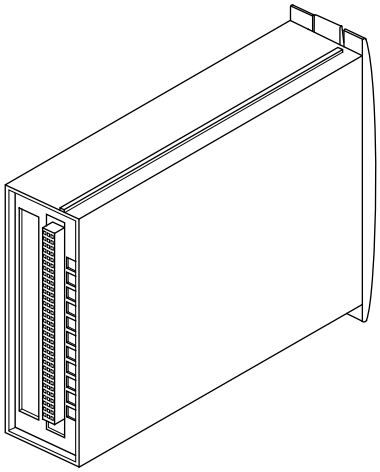
Figure 1–2 DWZZx SCSI Bus Signal Converter SBB (Rear)



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2

DWZZA SCSI Bus Signal Converters

This chapter discusses the DWZZA-series small computer system interface (SCSI) bus signal converters.

Note

The discussion of the **DWZZA-series SCSI bus signal converters** in this chapter is limited to the models, applications, cables, and configurations applicable to the StorageWorks building block (SBB) BA350 shelves. The capabilities and use of these converters in other environments or with other SCSI systems are not within the scope of this chapter.

2.1 DWZZA Description

The BA350 shelf SCSI bus is an 8-bit, single-ended, SCSI-2 bus. Some controllers and hosts, or their SCSI adapters, use a 16-bit, differential SCSI bus. Singled-ended and differential buses are incompatible. The SCSI protocol disables these buses when connected together.

The DWZZA SCSI bus signal converter permits the connection of these buses *without* modifying the SCSI devices. The DWZZA SCSI bus signal converter establishes compatibility between the host SCSI bus and the BA350 shelf SCSI bus.

There are two SCSI bus signal converters used with StorageWorks BA350 shelf, the DWZZA–AA and the DWZZA–VA. Electrically and operationally, these models are identical. The primary differences are as follows:

- The DWZZA–AA is a desktop model with a self-contained power supply that is connected to either a BA350 shelf or a DWZZA–VA converter. The DWZZA–AA has two female cable connectors, a 68-pin, high-density and a 50-pin, low-density.
- The DWZZA–VA is installed in slot 0 of a BA350 shelf.
- It has a single 68-pin, high-density female cable connector.

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.

The following is a list of the SCSI buses as presented in this chapter:

- A differential physical bus
- A single-ended physical bus
- A logical bus is a single-ended physical bus connected to a differential physical bus by a SCSI bus signal converter

2.2 DWZZA Features and Functions

The following is a list of the features and functions of the DWZZA SCSI bus signal converter:

- The DWZZA SCSI bus signal converter converts two physical buses (a single-ended bus and a differential bus) into a single logical bus.

Note

The 16-bit differential host or controller bus is operated in the 8-bit mode.

- The length of the logical bus is equal to the length of the two physical buses.
- The logical bus has a total of eight device addresses (0 through 7).
- The converter does not use a SCSI device address.
- The DWZZA SCSI bus signal converter establishes a physical connection between a 16-bit, differential bus operating in the 8-bit mode and an 8-bit, single-ended SCSI device (communication between the host and the BA350 is in 8-bit mode).
- Supports data transfers at rates of up to 10 million transfers per seconds (10 MB/s[1]).
- The converter operation is transparent to both buses.

2.3 Installing DWZZA SCSI Bus Signal Converters

The manner in which SCSI bus signal converters are installed is primarily based upon the SCSI host.

Note

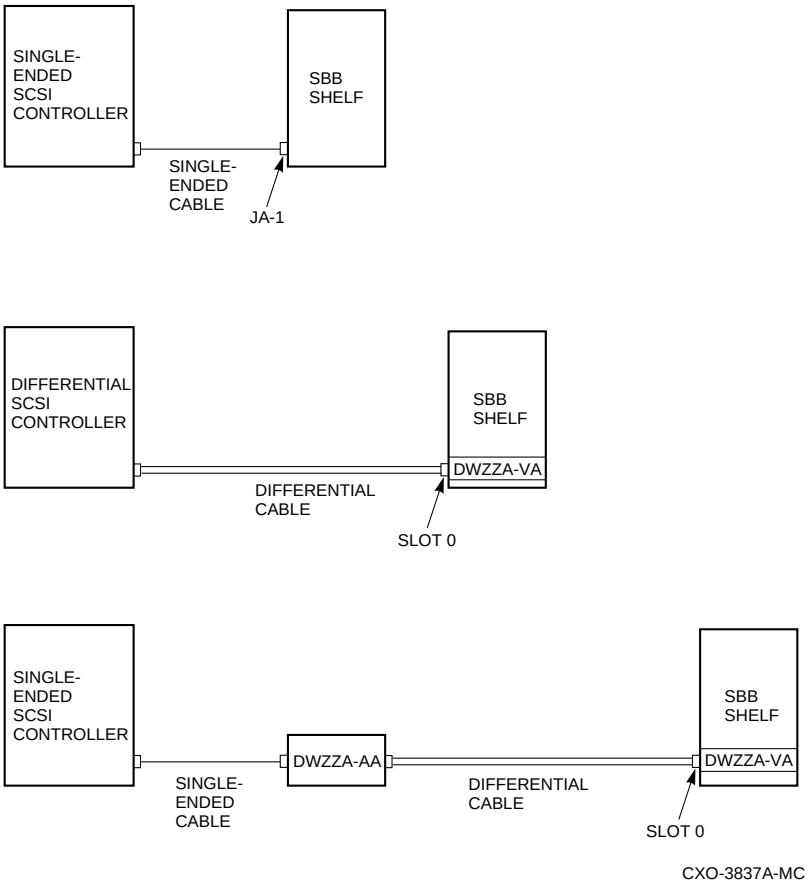
Unless otherwise stated, the DWZZA signal converters are installed in the end-bus position. This requires that both the differential bus and the single-ended bus be terminated within the DWZZA SCSI bus signal converter.

See below and Figure , for three host to BA350 shelf connections:

1. A DWZZA SCSI bus signal converter is not required when using a single-ended host. Connect the host SCSI controller or adapter directly to the BA350 shelf with a single ended cable.
2. Connect a differential host operating in the 8-bit mode, directly to the DWZZA–VA SCSI bus signal converter.
3. To create a logical bus longer than the single-ended physical bus, install two DWZZA SCSI bus signal converters: DWZZA–AA, and DWZZA–VA.
   - The desktop model, DWZZA–AA, connects to the host with a 50-conductor, single-ended (**SCSI-A**) cable (BN23G or BN21H).
   - The desktop model connects to the DWZZA–VA with a 68-conductor, differential (**SCSI-P**) cable, such as a BN21K or BN21L.

[1] This rate is supported only when at least one drive supports the 10 MB/s transfer rate and the bus has been designed as a fast bus.

Figure 2–1 Typical SCSI Bus Signal Converter End-Bus Cabling



The DWZZA SCSI bus signal converter extends the maximum length of the SCSI bus. This length is measured from the terminator on the SCSI host, to the terminator on the BA350 shelf, and includes the following:

- The length of all cables
- The distance from the host terminator to the host SCSI cable connector
- The distance from the BA350 shelf input connector or the DWZZA–VA connector to the shelf terminator

Table 2–1 lists the maximum bus lengths using the end-bus configuration for all DWZZAs.

Note

The maximum SCSI bus length is not the same as maximum cable length. The longest StorageWorks BN21K or BN21L SCSI-P cable is 23 meters. Do not use a longer SCSI-P cable.

Table 2–1 StorageWorks SCSI Buses

SCSI Bus		DWZZAs		SCSI Bus Length			Cable	
Type	MB/s	-VA	-AA	Shelf*	Cable-Host†	Maximum‡	Type	Order No.
No SCSI Bus Signal_Converters								
Fast	10	0	0	0.9 m (3.0 ft)	2.1 m (6.9 ft)	3 m (9.8 ft)	SE§	BN21H
Slow	5	0	0	0.9 m (3.0 ft)	5.1 m (16.7 ft)	6 m (19.7 ft)	SE	BN21H
Differential SCSI Host								
One SCSI Bus Signal Converter								
Fast	10	1	0	3 m (9.8 ft)	23 (75.5 ft)	26 m (85.3 ft)	DF#	BN21K, BN21L
Slow	5	1	0	6 m (19.7 ft)	23 (75.5 ft)	29 m (95.1 ft)	DF	BN21K, BN21L
Single-Ended SCSI Host								
Two SCSI Bus Signal Converters								
Fast	10	1	1	3 m (9.8 ft)	26 m (85.3 ft)	29 m (95.1 ft)	SE DF	BN23G, BN21H BN21K, BN21L
Slow	5	1	1	6 m (19.7 ft)	29 m (95.1 ft)	35 m (114.8 ft)	SE DF	BN23G, BN21H BN21K, BN21L

* First shelf input connector to last shelf terminator.
† Host terminator to shelf input connector or shelf DWZZA–A input connector.
‡ Host terminator to shelf terminator.
§ SE–SCSI–A SCSI cable, 50-pin connector.
# DF–SCSI–A SCSI cable, 68-pin connector.

The end-bus configuration terminates all cables in the converter, the BA350 shelf and in the host.

Note

This configuration effectively starts a new bus at each connection

For example, when using a single-ended bus and no converters, the maximum length of the single-ended SCSI bus from the host terminator to the BA350 shelf terminator is 6 meters (19.7 ft). By using two converters, the maximum distance from the host terminator to the BA350 shelf terminator is theoretically 37 meters (121.4 feet). The actual maximum length with approved cables is as shown in Table 2–1.

- The maximum bus length from the host terminator to the desktop converter 50-pin connector is either 3 meters (9.8 ft) or 6 meters (19.7 ft) depending upon the bus speed.
- The maximum cable length from desktop converter 68-pin connector to the BA350 shelf converter 68-pin connector is 23 meters (75.5 ft).

- The maximum bus length from the BA350 shelf converter backplane connector, to the shelf terminator is either 3 meters (9.8 ft) or 6 meters (19.7 ft) depending upon the bus speed.

2.4 SCSI Cables

The *StorageWorks Solutions Configuration Guide* describes SCSI cables in detail. The particular cable used with a SCSI bus signal converter depends upon the following:

1. The bus type:
   - A DWZZA–AA has a 68-pin, high-density, differential connector and a 50-pin, low-density, single-ended connector.
   - A DWZZA–VA has one 68-pin, high-density, cable connector, a, differential connector for connecting to a host or controller. The DWZZA–VA single-ended SCSI bus is routed to the BA350 shelf through the 96-pin connector on the rear of the DWZZA–VA SCSI bus signal converter.
2. The maximum allowable bus length.
3. The cable connector clearance. In some cases you must use a right-angle connector because there is not enough clearance to use a straight connector.

DWZZA compatible cable types are listed in Table 2–2.

Table 2–2 SCSI Cable Types

Bus Connector	Cable Type	Connectors
DWZZA-VA SBB SCSI Bus Signal Converter Compatible Cables		
Single-ended	N/A	The single-ended connector is a 96-pin, high-density, connector that mates with the SBB shelf connector.
Differential	BN21K-23	One 68-pin, high-density, straight, connector and one 68-pin, high-density, right-angle connector
Differential	BN21L-23	Two 68-pin, high-density, right-angle connectors
DWZZA-AA Desktop SCSI Bus Signal Converter Compatible Cables		
Single-ended (low-density host)	BC06P	Two 50-pin, low-density, straight connectors with bale locks.
Single-ended (low-density host)	BN23G	50-pin, high-density, straight connector and 50-pin, low-density, straight connector.
Differential	BN21K-23	One 68-pin, high-density, straight connector and one 68-pin, high- density, right-angle connector.
Differential	BN21L-23	Two 68-pin, high-density, right-angle connectors

2.5 Terminating SCSI Buses

All SCSI buses are terminated at the physical ends of the bus or cable. This is true even when using a DWZZA SCSI bus signal converter. Both DWZZA SCSI bus signal converters supply terminator power (TERMPOWER) to the SCSI terminators **TERMPOWER** is electrical current that is limited by self-resetting fuses.

The following sections describe the procedures for configuring a DWZZA SCSI bus signal converter for either end-bus (refer to Section 2.5.1) or mid-bus (refer to Section 2.5.2) operation.

CAUTION

To prevent SCSI bus malfunction, *do not* remove the DWZZA SCSI bus signal converter or disconnect the SCSI cable when power is on.

2.5.1 End-Bus SCSI Bus Signal Converter Terminators

Use the following procedure to install the single-ended and differential terminators when the DWZZA-series SCSI bus signal converter is installed in the end-bus position:

CAUTION

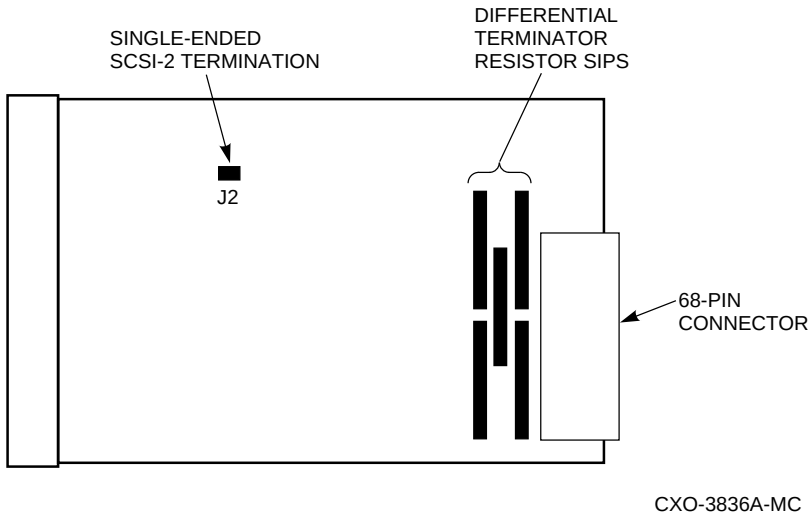
To prevent damage, remove the SBB bezel only as required and use *minimal* pressure when pushing down on the mounting tabs.

CAUTION

Do not attempt the following procedure without proper precautions against electrostatic discharge (ESD). When you remove the cover from any enclosure or device, wear an ESD grounding wrist strap.

1. Turn off the power and remove the input power cable.
2. Disconnect the SCSI cables.
3. Remove either the SBB bezel and cover, or the desktop cover.
4. Install jumper J2 (see Figure), the single-ended SCSI-2 bus termination, to terminate the single-ended bus.
5. Install the five resistor single-inline-packages (SIPs) to terminate the SCSI-P cable.
6. Replace the SBB cover and bezel, or replace the desktop cover.
7. Label the SBB bezel or the desktop cover with the status of both the differential terminator and the single-ended terminator, as either *IN* or *OUT*.
8. Install the SBB in the shelf.
9. Connect the SCSI cable.

Figure 2–2 End-Bus DWZZA Bus Terminators

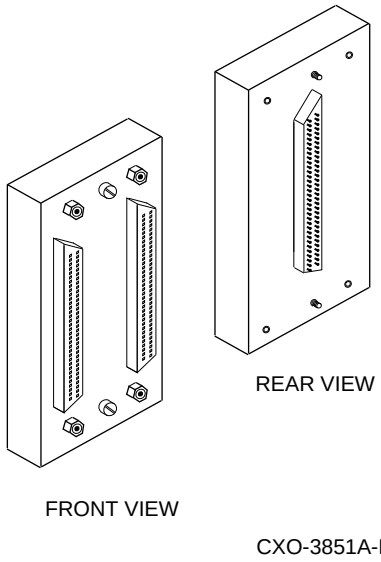


10. Connect the input power cable and apply power.
11. Observe the system to determine if the SCSI bus and devices are functioning properly.

2.5.2 Mid-Bus SCSI Bus Signal Converter Terminators

Use an H885–AA trilink connector (see Figure), to place the BA350 shelf DWZZA SCSI bus signal converter in the mid-bus position. Use the following procedure to configure the differential connector for mid-bus operation:

Figure 2–3 H885–A Trilink Connector



Note

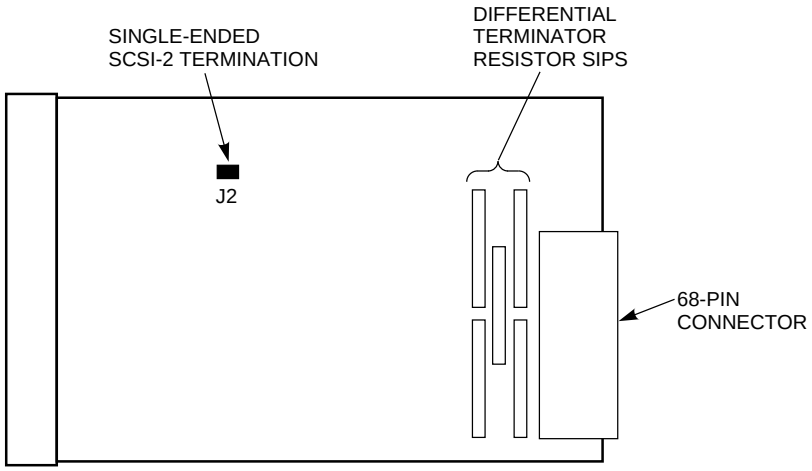
Normally, this procedure is completed only during initial installation of the SCSI bus signal converter.

CAUTION

Do not attempt the following procedure without proper precautions against electrostatic discharge (ESD). When you remove the cover from any enclosure or device, wear an ESD grounding wrist strap.

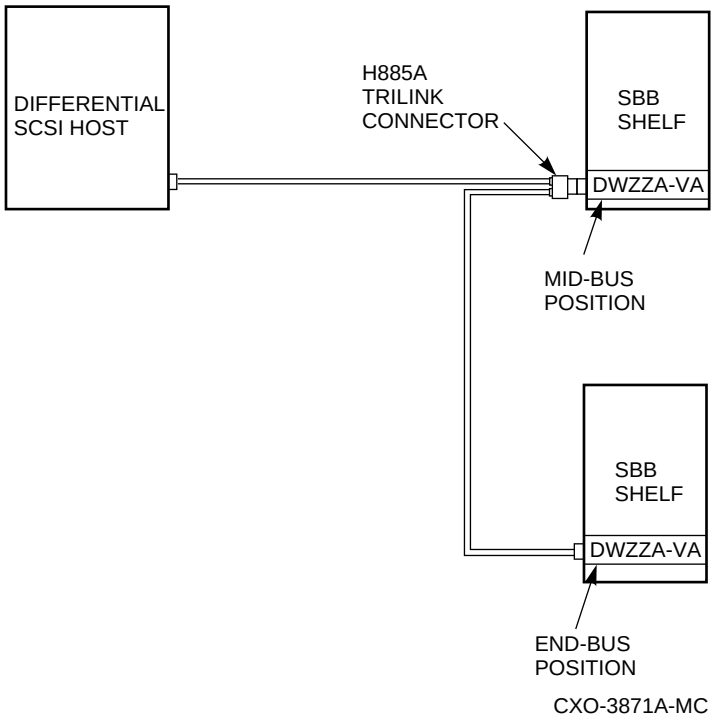
1. Turn off the power and remove the input power cable.
2. Disconnect the SCSI cables.
3. Remove either the SBB bezel and cover, or the desktop cover.
4. Install jumper J2 (see Figure), the single-ended SCSI-2 bus terminator, to terminate the single-ended bus.
5. Remove the five differential bus resistor SIPs.

Figure 2–4 Mid-Bus DWZZA Bus Terminators



6. Replace the SBB cover and bezel, or the desktop cover.
7. Install the H885–AA trilink connector in the differential connector (see Figure).
8 Connect the input SCSI-P cable from the host or the desktop converter to the trilink connector.

Figure 2–5 Mid-Bus DWZZA Cabling



9. Connect a SCSI-P cable from the trilink connector to the input connector on the second DWZZA–VA.
10. Make sure that the differential bus is terminated on the last DWZZA on the bus (refer to Section 2.5.1).
11. Label the SBB bezels with the status of both the differential terminator and the single-ended terminator, as either *IN* or *OUT*.
12. Install the SBB DWZZA signal converter.
13. Connect the SCSI cable.
14. Connect the input power cable and apply power to the shelf.
15. Observe the system to determine if the SCSI bus and devices are functioning properly.

3

DWZZB SCSI Bus Signal Converters

This chapter discusses the DWZZB-series small computer system interface (SCSI) bus signal converters.

Note

The discussion of the **DWZZB-series SCSI bus signal converters** in this chapter is limited to the models, applications, cables, and configurations applicable to the StorageWorks building block (SBB) BA356 shelf. The capabilities and use of these converters in other environments or with other SCSI systems are not within the scope of this chapter.

3.1 DWZZB Description

The BA356 shelf SCSI bus is a 16-bit, single-ended, SCSI-2 bus. Some controllers and hosts, or their SCSI adapters, use a 16-bit, differential SCSI bus. Singled-ended and differential buses are incompatible. The SCSI protocol disables these buses when connected together.

The DWZZB SCSI bus signal converter permits the connection of these buses *without* modifying the SCSI devices. The DWZZB SCSI bus signal converter establishes compatibility between the host SCSI bus and the BA356 shelf bus.

There are two DWZZB SCSI bus signal converters used with StorageWorks BA356 shelf, the DWZZB–AA and the DWZZB–VW. Electrically and operationally, these models are identical. The primary differences are as follow:

- The DWZZB–AA is a desktop model with a self-contained power supply that is connected to either an BA356 shelf or a DWZZB–VW converter. The DWZZB–AA has two female, 68-pin, high-density, cable connectors.
- The DWZZB–VW is installed in slot 0 of a BA356 shelf.
- It has a single 68-pin, high-density female cable connector.

Note

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

The following is list of the SCSI buses presented in this chapter:

- A differential physical busA single-ended physical bus
- A single-ended physical bus connected to a differential physical bus by a DWZZB SCSI bus signal converter forms a logical bus

3.2 DWZZB Features and Functions

The following is a list of the features and functions of the DWZZB SCSI bus signal converter:

- The DWZZB SCSI bus signal converter changes two physical buses (a single-ended bus and a differential bus) into a single logical bus.

Note

The 16-bit differential host or controller bus is operated in either a 8-bit mode, or a 16-bit mode.

- The length of the logical bus is equal to the length of the two physical buses.
- The logical bus has a total of sixteen device addresses (0 through 15).
- The converter does not use a SCSI device address.
- The DWZZB SCSI bus signal converter establishes a physical connection between a 16-bit, differential bus operating in either an 8-bit mode, or a 16-bit mode, and an 16-bit, single-ended SCSI device (communication between the host and the BA356 is in 16-bit mode).
- Data transfers at rates of up to 20 Bytes or 10 million transfers per seconds (20 MB/s[2]) are supported.
- The converter operation is transparent to both buses.

3.3 Installing DWZZB SCSI Bus Signal Converters

The manner in which SCSI bus signal converters are installed is primarily based upon the SCSI host.

Note

Unless otherwise stated, the DWZZB signal converters are installed in the end-bus position. This requires that both the differential bus and the single-ended bus be terminated within the DWZZB SCSI bus signal converter.

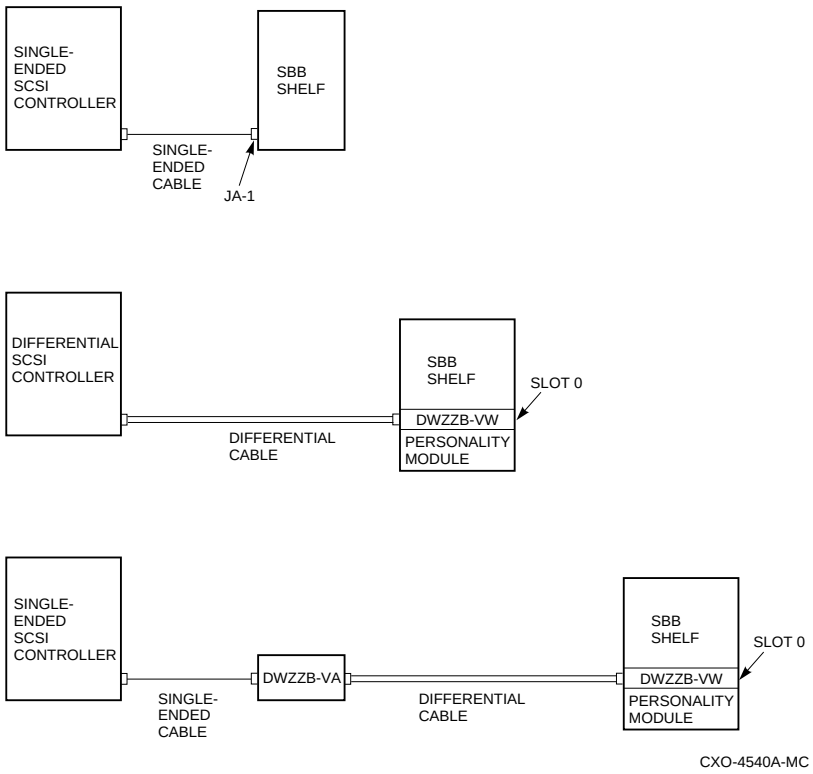
See below and Figure , for three host to BA356 shelf connections:

1. A DWZZB SCSI bus signal converter is not required, when using a single-ended host. Connect the host SCSI controller or adapter directly to the BA356 shelf with a single-ended cable.
2. Connect a differential host operating in either the 8-bit mode, or 16-bit mode directly to the DWZZB SCSI bus signal converter.
3. To create a logical bus longer than the single-ended physical bus, install two DWZZB SCSI bus signal converters: DWZZB–AA, and DWZZB–VW.
   - The desktop model, DWZZB-AA, connects to the host with a 68-conductor, single-ended (SCSI-P) cable. The cable type is dependent on the host system used.

[2] This rate is supported only when at least one drive supports the 20 MB/s transfer rate and the bus has been designed as a fast bus.

- The desktop model connects to the DWZZB-VW with a 68-conductor, differential (SCSI-P) cable, such as a BN21K or BN21L.

Figure 3–1 Typical SCSI Bus Signal Converter End-Bus Cabling



The DWZZB SCSI bus signal converter extends the maximum length of the SCSI bus. This length is measured from the terminator on the SCSI host, to the terminator on the BA356 shelf, and includes the following:

- The length of all cables
- The distance from the host terminator to the host SCSI cable connector
- The distance from the BA356 shelf input connector or the DWZZB-VW connector to the shelf terminator

Table 3-1 lists the maximum bus lengths using the end-bus configuration for all DWZZBs.

Note

Maximum SCSI bus length is not the same as maximum cable length. The longest StorageWorks BN21K or BN21L SCSI-P cable is 23 meters. Do not use a longer SCSI-P cable.

Table 3-1 StorageWorks SCSI Buses

SCSI Bus		DWZZBs		SCSI Bus Length			Cable	
Type	MB/s	-VW	-AA	Shelf*	Cable-Host†	Maximum‡	Type	Order No.
No SCSI Bus Signal_Converters								
Fast	20	0	0	0.9 m (3.0 ft)	2.1 m (6.9 ft)	3 m (9.8 ft)	SE§	BN21K, BN21L
Slow	5	0	0	0.9 m (3.0 ft)	5.1 m (16.7 ft)	6 m (19.7 ft)	SE	BN21K, BN21L
Differential SCSI Host								
One SCSI Bus Signal Converter								
Fast	20	1	0	3 m (9.8 ft)	23m(75.5 ft)	26 m (85.3 ft)	DF#	BN21K, BN21L
Slow	5	1	0	6 m (19.7 ft)	23m(75.5 ft)	29 m (95.1 ft)	DF	BN21K, BN21L
Single-Ended SCSI Host								
Two SCSI Bus Signal Converters								
Fast	20	1	1	3 m (9.8 ft)	26 m (85.3 ft)	29 m (95.1 ft)	SE DF	BN21M BN21K, BN21L
Slow	5	1	1	6 m (19.7 ft)	29 m (95.1 ft)	35 m (114.8 ft)	SE DF	BN21M BN21K, BN21L

* First shelf input connector to last shelf terminator.
† Host terminator to shelf input connector or shelf DWZZB–A input connector.
‡ Host terminator to shelf terminator.
§ SE–SCSI–A SCSI cable, 68-pin connector.
# DF–SCSI–A SCSI cxable, 68-pin connector.

The end-bus configuration terminates all cables in the converter, the BA356 shelf and in the host.

Note

This configuration effectively starts a new bus at each connection

For example, when using a single-ended bus and no DWZZB converters, the maximum length of the single-ended SCSI bus from the host terminator to the BA356 shelf terminator is 6 meters (19.7 ft). By using two DWZZB converters, the maximum distance from the host terminator to the BA356 shelf terminator would theoretically be 37 meters (121.4 feet). However, the actual maximum length when using approved cables is as shown in Table 3-1.

- The maximum bus length from the host terminator to the desktop DWZZB converter 68-pin connector is either 3 meters (9.8 ft) or 6 meters (19.7 ft) depending upon the bus speed.
- The maximum cable length from desktop converter 68-pin connector to the BA356 shelf converter 68-pin connector is 23 meters (75.5 ft).

- The maximum bus length from the BA356 shelf converter backplane connector to the shelf terminator can be either 3 meters (9.8 ft) or 6 meters (19.7 ft) depending upon the bus speed.

3.4 SCSI Cables

The *StorageWorks Solutions Configuration Guide* describes SCSI cables in detail. The particular cable used with a DWZZB SCSI bus signal converter depends upon the following:

1. The bus type:
   - A DWZZB–AA has two (2) 68-pin, high-density connectors, one at the single ended end and the other at the differential end.
   - A DWZZB–VW has one 68-pin, high-density, differential cable connector, for connecting to a host or controller. The DWZZB–VW single-ended SCSI bus is routed to the BA356 shelf through the 96-pin connector on the rear of the DWZZB–VW SCSI bus signal converter.
2. The maximum allowable bus length.
3. The cable connector clearance. In some cases you must use a right-angle connector because there is not enough clearance to use a straight connector.

DWZZB compatible cable types are listed in Table 3-2.

Table 3-2 SCSI Cable Types

Bus Connector	Cable Type	Connectors
DWZZB-VW BA356 SCSI Bus Signal Converter Compatible Cables		
Single-ended	N/A	The single-ended connector is a 96-pin, high-density connector that mates with the BA356 shelf connector.
Differential	BN21K-23	One 68-pin, high-density, straight, connector and one 68-pin, high-density, right-angle connector
Differential	BN21L-23	Two 68-pin, high-density, right-angle connectors
DWZZB-AA Desktop SCSI Bus Signal Converter Compatible Cables		
Differential	BN21K-23	One 68-pin, high-density, straight connector and one 68-pin, high- density, right-angle connector.
Differential	BN21L-23	Two 68-pin, high-density, right-angle connectors

3.5 Terminating SCSI Buses

All SCSI buses are terminated at the physical ends of the bus or cable. This is true even when using a DWZZB SCSI bus signal converter. Both DWZZB SCSI bus signal converters supply terminator power (TERMPOWER) to the SCSI terminators. TERMPOWER is electrical current that is limited by self-resetting fuses.

The following sections describe the procedures for configuring a DWZZB SCSI bus signal converterfor either end-bus (refer to Section 3.5.1) or mid-bus (refer to Section 3.5.2) operation.

CAUTION

To prevent SCSI bus malfunction, *do not* remove the DWZZB SCSI bus signal converter or disconnect the SCSI cable when power is on.

3.5.1 End-Bus SCSI Bus Signal Converter Terminators

Use the following procedure to install the single-ended and differential terminators when the DWZZB-series SCSI bus signal converter is installed in the end-bus position:

CAUTION

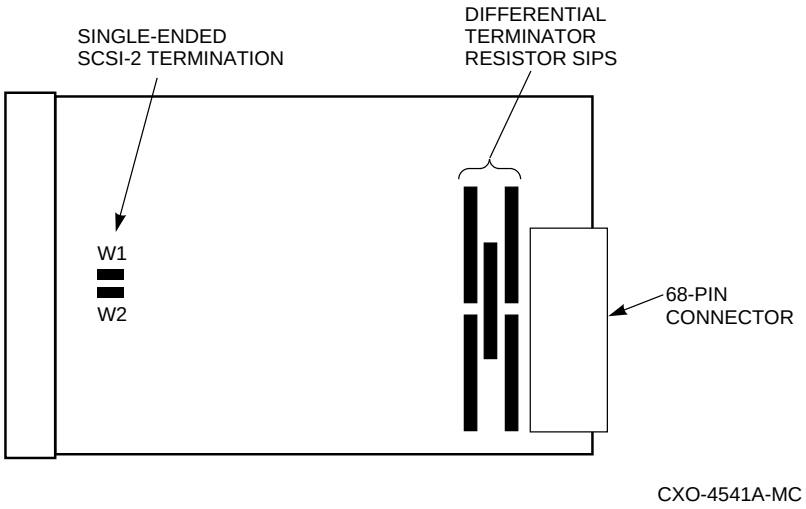
To prevent damage, remove the SBB bezel only as required and use *minimal* pressure used when pushing down on the mounting tabs.

CAUTION

Do not attempt the following procedure without proper precautions against electrostatic discharge (ESD). When you remove the cover from any enclosure or device, wear an ESD grounding wrist strap.

1. Turn off the power and remove the input power cable.
2. Disconnect the SCSI cables.
3. Remove either the SBB bezel and cover, or the desktop cover.
4. Install jumpers W1 and W2 (see Figure), the single-ended SCSI-2 bus termination, to terminate the single-ended bus.
5. Install the five resistor single-inline-packages (SIPs) to terminate the differential.
6. Replace the SBB cover and bezel, or replace the desktop cover.
7. Label the SBB bezel or the desktop cover with the status of both the differential terminator and the single-ended terminator, as either *IN* or *OUT*.
8. Install the SBB in the shelf.
9. Connect the SCSI cable.

Figure 3–2 End-Bus DWZZB Bus Terminators

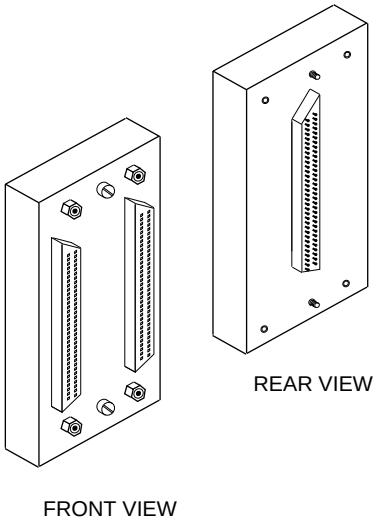


10. Connect the input power cable and apply power.
11. Observe the system to determine if the SCSI bus and devices are functioning properly.

3.5.2 Mid-Bus SCSI Bus Signal Converter

Use an H885-AA trilink connector (see Figure), to place the BA356 shelf DWZZB SCSI bus signal converter in the mid-bus position. Use the following procedure to configure the differential connector for mid-bus operation:

Figure 3–3 H885–A Trilink Connector



Note

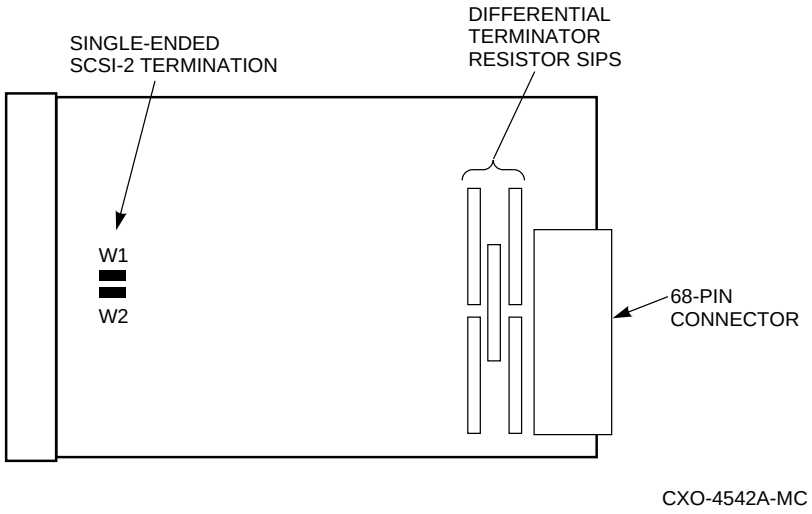
Normally, this procedure is only completed during initial installation of the SCSI bus signal converter.

CAUTION

Do not attempt the following procedure without proper precautions against electrostatic discharge (ESD). When you remove the cover from any enclosure or device, wear an ESD grounding wrist strap.

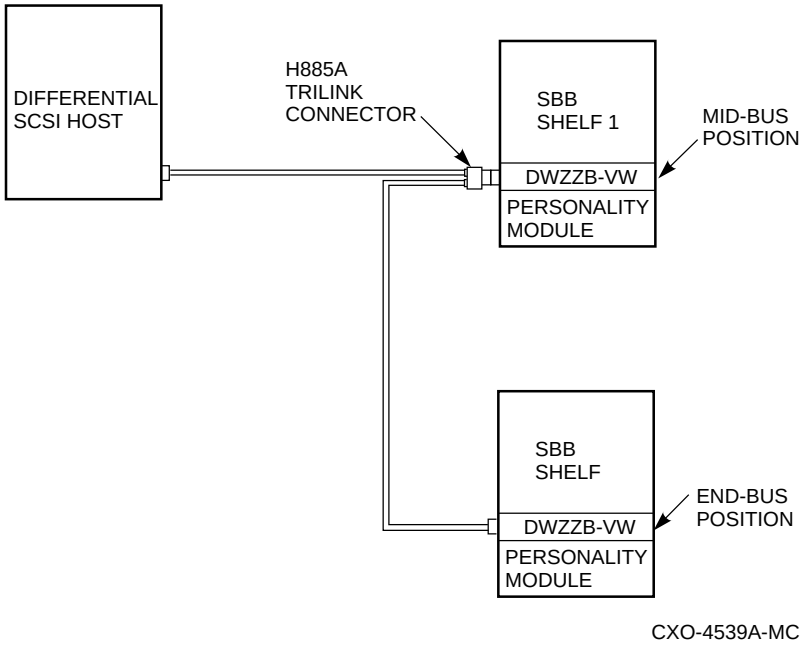
1. Turn off the power and remove the input power cable.
2. Disconnect the SCSI cables.
3. Remove either the SBB bezel and cover, or the desktop cover.
4. Install jumpers W1 and W2 (see Figure), the single-ended SCSI-2 bus terminator, to terminate the single-ended bus.
5. Remove the five differential bus resistor SIPs.

Figure 3–4 Mid-Bus DWZZB Bus Terminators



6. Replace the SBB cover and bezel, or the desktop cover.
7. Install the H885–AA trilink connector in the differential connector (see Figure).
8 Connect the input SCSI-P cable from the host or the desktop converter to the trilink connector.

Figure 3–5 Mid-Bus DWZZB Cabling



9. Connect a SCSI-P cable from the trilink connector to the input connector on the second DWZZB-VW.
10. Make sure that the differential bus is terminated on the last DWZZB on the bus (refer to Section 3.5.1).
11. Label the SBB bezels with the status of both the differential terminator and the single-ended terminator,as either *IN* or *OUT*.
12. Install the SBB DWZZB signal converter.
13. Connect the SCSI cable.
14. Connect the input power cable and apply power to the shelf.
15. Observe the system to determine if the SCSI bus and devices are functioning properly.

Glossary

adapter

See **SCSI bus signal converter**.

Battery backup unit

See **BBU.**

BBU

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

Note

The BBU does not provide power for the operation of a storage device. It provides power only for protecting data.

building block shelf

See **SBB.**

cold swap

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

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

controller

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

controller and SBB shelf

A generic reference to a StorageWorks shelf that can contain both controller SBBs and storage SBBs (for example, a BA350–EA shelf).

controller shelf

Any StorageWorks shelf that contains only controllers and cache memories (for example, a BA350–MA shelf).

daisy chain

Two or more StorageWorks shelves that are connected.

deskside expansion unit

The StorageWorks floor mounted stand that encloses a BA356–SB SBB shelf.

differential SCSI bus

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

disk

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

DWZZA

A StorageWorks compatible 8-bit SCSI bus signal converter.

See **SCSI bus signal converter.**

DWZZB

A StorageWorks compatible 16-bit SCSI bus signal converter.

See **SCSI bus signal converter.**

electrostatic discharge

See **ESD**.

ESD

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

full-height

(1) In the storage industry, a device of conventional dimensions. (2) A single device mounted in an 5¼-inch SBB.

half-height

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

host

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

hot swap

A method of device replacement whereby the complete system remains on line and active during device removal or insertion. The device being removed or inserted is the only device that cannot perform operations during this process. User applications that are not dependent upon the device being swapped are not impacted.

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

logical bus

A single-ended, physical bus connected to a differential, physical bus by a SCSI bus signal converter.

personality module

The BA356 module that interfaces the single-ended SCSI-bus to the BA356 shelf.

physical bus

Two SCSI terminators separated by cables, connectors, and/or the backplane circuitry.

RAID

Redundant Array of Independent Disks. A set of storage techniques that increases the performance and availability of a storage subsystem.

SBB

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

SBB shelf

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

SCSI

Small computer system interface. This ANSI interface defines the physical and electrical parameters of a parallel I/O bus used to connect computers and devices. The StorageWorks subsystem implementation uses SCSI–2 for the transfer of data.

SCSI bus signal converter

Sometimes referred to as an adapter. (1) A connecting device that permits the attachment of accessories or provides the capability to mount or link units. (2) The device that connects a differential SCSI bus to a single-ended SCSI bus.

SCSI device

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

SCSI device ID

The bit-significant representation of the SCSI addressing referring to one of the signal lines numbered 0 through 15. Also referred to as target ID.

SCSI mid-bus

The physical location of a controller or a device that the SCSI bus passes through enroute to the controller or device that contains the SCSI bus termination.

SCSI–A cable

A 68-conductor (34 twisted pair) cable used for single-ended, SCSI–3 bus connections.

SCSI–P cable

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

single-ended SCSI bus

A bus in which each signal's logic level is determined by the voltage of a single wire in relation to ground.

Small Computer System Interface

See **SCSI.**

StorageWorks

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

StorageWorks building block

See **SBB**.

tape controller

See **controlle***r*.

target

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

target ID

See **SCSI device ID**.

termpower

Is an electrical current that is limited by self-resetting fuses.

third-height

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

warm swap

A method of device replacement whereby the complete system remains on line during device removal or insertion. Activity can be suspended or paused for a brief period of time during device insertion or removal. No booting or loading of code is permitted except on the device being inserted. User applications that are not dependent upon the devices on the affected SCSI bus are not noticeably impacted.

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

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