DIGITAL StorageWorks
UltraSCSI SBB Shelf
(DS–BA356 Series)

User's Guide

Part Number: EK–BU356–UG. A01

November 1997

This publication describes the UltraSCSI SBB shelf features, configurations, operating procedures, power distribution, storage devices, and specifications.
November 1997

Digital Equipment Corporation makes no representations that the use of its products in the manner described in this publication will not infringe on existing or future patent rights, nor do the descriptions contained in this publication imply the granting of licenses to make, use, or sell equipment or software in accordance with the description.

Possession, use, or copying of the software described in this publication is authorized only pursuant to a valid written license from Digital or an authorized sublicensor.

© Digital Equipment Corporation 1997. All rights reserved.

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.

DIGITAL, StorageWorks, and the DIGITAL logo are trademarks of Digital Equipment Corporation.
## Table of Contents

**Preface**
- Intended Audience .............................................................................................................. ix
- Structure ........................................................................................................................... ix
- Related Documents ........................................................................................................... x
- Documentation Conventions ............................................................................................ xi

**Manufacturer’s Declaration**
- Electromagnetic Compatibility ......................................................................................... xiii
- Acoustic Noise Declarations .............................................................................................. xiv

**1 Introducing the UltraSCSI SBB Shelf**
- Product Description ........................................................................................................... 1–2
- Shelf Status Displays ........................................................................................................... 1–3
- SBB Shelf and Pedestal Configurations ............................................................................ 1–4
  - Single-Ended, UltraSCSI, Bus Configurations ............................................................... 1–4
  - Differential, UltraSCSI, Bus Configurations ................................................................. 1–7
  - Configure-to-Order (CTO) Shelf (DS–BA356–SG) ......................................................... 1–8

**2 Configuration Rules**
- Buses ................................................................................................................................. 2–1
- Storage Nodes .................................................................................................................... 2–2
- UltraSCSI I/O Modules ...................................................................................................... 2–3
- SBB Shelves ....................................................................................................................... 2–3
- Trilink Connectors .............................................................................................................. 2–3
- Bus Expanders .................................................................................................................... 2–4
# Table of Contents

## 3 Operating an UltraSCSI SBB Shelf

- Shelf Status ....................................................................................................................... 3–1
- SHELF Status Distribution ................................................................................................. 3–2
- Blower Failure ................................................................................................................... 3–3
- Power Supply Failure ......................................................................................................... 3–5
- Device SBB Faults ............................................................................................................... 3–7
- Configuring the SBB Shelf I/O Module .............................................................................. 3–8
- External SCSI Bus Termination Settings .......................................................................... 3–10
- Setting the SCSI Bus IDs ................................................................................................. 3–12
  - Single Shelf Default Configurations .............................................................................. 3–12
  - Dual Shelf Configurations ............................................................................................ 3–13
- DIGITAL Supported Shelf Configurations ...................................................................... 3–14
  - Single-Channel Configurations .................................................................................... 3–15
  - Dual Channel, Single Shelf Configuration ................................................................... 3–20

## 4 Power Distribution

- Power Supply Description .................................................................................................. 4–2
- Power Supply Status Display .......................................................................................... 4–4

## 5 Storage Devices

- Handling SBBs .................................................................................................................... 5–2
- SBB SCSI Bus IDs ............................................................................................................... 5–3
- SBB Status Reporting ....................................................................................................... 5–4
- Identifying a Storage Device ............................................................................................ 5–6
- Replacing SBBs .................................................................................................................. 5–8
  - The SBB Connector ......................................................................................................... 5–8
- SBB Replacement Methods ............................................................................................. 5–8
  - Hot Swap ......................................................................................................................... 5–9
  - Warm Swap .................................................................................................................... 5–9
  - Cold Swap ...................................................................................................................... 5–9

## 6 Replacing Components

- Replacing a Storage SBB .................................................................................................... 6–2
- Replacing a Shelf Power Supply ....................................................................................... 6–4
- Replacing a Blower Assembly .......................................................................................... 6–6
- Replacing an I/O Module ................................................................................................... 6–8
Table of Contents

A SBB Shelf Specifications

Physical Specifications ........................................................................................................ A–1
Electrical Specifications ...................................................................................................... A–2
Operating Environments ................................................................................................... A–3
SBB Thermal Stabilization .............................................................................................. A–4

B Connecting an UltraSCSI Subsystem

Components..................................................................................................................... B–2
Selecting Components .................................................................................................... B–3
BN37A Series UltraSCSI Cables...................................................................................... B–4
BN37B Series UltraSCSI Adapter Cables ................................................................. B–4
BN37C Series UltraSCSI “Y” Adapter Cables ........................................................... B–5
BN38A Series UltraSCSI Adapter Cables ................................................................. B–5
BN38B Series UltraSCSI Adapter Cables ................................................................. B–6
BN38E Series UltraSCSI Adapter Cables ................................................................. B–6
SCSI VHDCI Trilink Connector ................................................................................... B–7
VHDCI Terminator Blocks ....................................................................................... B–8

Glossary
Table of Contents

**Figures**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1–1</td>
<td>Typical DS–BA356 UltraSCSI SBB Shelf</td>
<td>1–1</td>
</tr>
<tr>
<td>Figure 3–1</td>
<td>Shelf Status Jumper</td>
<td>3–3</td>
</tr>
<tr>
<td>Figure 3–2</td>
<td>Blower Status LEDs</td>
<td>3–4</td>
</tr>
<tr>
<td>Figure 3–3</td>
<td>Power Supply Status LEDs</td>
<td>3–6</td>
</tr>
<tr>
<td>Figure 3–4</td>
<td>SBB Status LEDs</td>
<td>3–7</td>
</tr>
<tr>
<td>Figure 3–5</td>
<td>Single-Ended UltraSCSI I/O Module</td>
<td>3–8</td>
</tr>
<tr>
<td>Figure 3–6</td>
<td>External Termination Switches</td>
<td>3–10</td>
</tr>
<tr>
<td>Figure 3–7</td>
<td>Single Shelf Switch Settings</td>
<td>3–12</td>
</tr>
<tr>
<td>Figure 3–8</td>
<td>Dual Shelf Switch Settings</td>
<td>3–13</td>
</tr>
<tr>
<td>Figure 4–1</td>
<td>Power Supply</td>
<td>4–1</td>
</tr>
<tr>
<td>Figure 4–2</td>
<td>Power Supply Status LEDs</td>
<td>4–4</td>
</tr>
<tr>
<td>Figure 5–1</td>
<td>SBB Handling</td>
<td>5–2</td>
</tr>
<tr>
<td>Figure 5–2</td>
<td>SBB Shelf Layout</td>
<td>5–3</td>
</tr>
<tr>
<td>Figure 5–3</td>
<td>SBB Status LEDs</td>
<td>5–4</td>
</tr>
<tr>
<td>Figure 5–4</td>
<td>Typical Regulatory Label</td>
<td>5–6</td>
</tr>
<tr>
<td>Figure 5–5</td>
<td>Typical SBB Bezel Label</td>
<td>5–7</td>
</tr>
</tbody>
</table>
## Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1-1</td>
<td>Single-Ended SBB Shelves—Metric Cabinet (DS–BA356–J Series)</td>
<td>1–5</td>
</tr>
<tr>
<td>Table 1-2</td>
<td>Single-Ended SBB Shelves—RETMA Cabinet (DS–BA356–R Series)</td>
<td>1–5</td>
</tr>
<tr>
<td>Table 1-3</td>
<td>Single-Ended SBB Shelves (DS–BA356–S Series)</td>
<td>1–6</td>
</tr>
<tr>
<td>Table 1-4</td>
<td>Single-Ended SBB Pedestals (DS–BA356–K Series)</td>
<td>1–6</td>
</tr>
<tr>
<td>Table 1-5</td>
<td>Differential SBB Shelf (DS–BA356–JF)</td>
<td>1–7</td>
</tr>
<tr>
<td>Table 1-6</td>
<td>Differential UltraSCSI SBB Shelf (DS–BA356–SF)</td>
<td>1–7</td>
</tr>
<tr>
<td>Table 1-7</td>
<td>Differential UltraSCSI Pedestals (DS–BA356–KH)</td>
<td>1–8</td>
</tr>
<tr>
<td>Table 1-8</td>
<td>Configure to Order SBB Shelf (DS–BA356–SG)</td>
<td>1–8</td>
</tr>
<tr>
<td>Table 3-1</td>
<td>Single Power Supply Status Displays</td>
<td>3–4</td>
</tr>
<tr>
<td>Table 3-2</td>
<td>Dual Power Supply Status Displays</td>
<td>3–6</td>
</tr>
<tr>
<td>Table 3-3</td>
<td>SBB Status Displays</td>
<td>3–7</td>
</tr>
<tr>
<td>Table 3-4</td>
<td>Setting Bus Termination and Device Addresses</td>
<td>3–9</td>
</tr>
<tr>
<td>Table 3-5</td>
<td>Termination Switch Settings</td>
<td>3–11</td>
</tr>
<tr>
<td>Table 3-6</td>
<td>Single-Channel, Single Shelf Configuration</td>
<td>3–15</td>
</tr>
<tr>
<td>Table 3-7</td>
<td>Single-Channel, Dual Shelf Configuration</td>
<td>3–17</td>
</tr>
<tr>
<td>Table 3-8</td>
<td>Dual-Channel, Single Shelf Configuration</td>
<td>3–20</td>
</tr>
<tr>
<td>Table 4-1</td>
<td>Power Supply Specifications</td>
<td>4–2</td>
</tr>
<tr>
<td>Table 4-2</td>
<td>DIGITAL-Supported Power Configurations</td>
<td>4–3</td>
</tr>
<tr>
<td>Table 4-3</td>
<td>Single Power Supply Status Displays</td>
<td>4–4</td>
</tr>
<tr>
<td>Table 4-4</td>
<td>Dual Power Supply Status Displays</td>
<td>4–5</td>
</tr>
<tr>
<td>Table 5-1</td>
<td>SBB Status LEDs</td>
<td>5–5</td>
</tr>
<tr>
<td>Table 6-1</td>
<td>SBB Replacement</td>
<td>6–3</td>
</tr>
<tr>
<td>Table 6-2</td>
<td>Power Supply Replacement</td>
<td>6–5</td>
</tr>
<tr>
<td>Table 6-3</td>
<td>Blower Replacement</td>
<td>6–7</td>
</tr>
<tr>
<td>Table 6-4</td>
<td>I/O Module Replacement</td>
<td>6–9</td>
</tr>
</tbody>
</table>
Preface

The DIGITAL StorageWorks UltraSCSI SBB Shelf (DS–BA356 Series) User's Guide describes the purpose, function, installation, and use of the storage shelf including the configuration rules and procedures, power distribution, StorageWorks building blocks (SBBs), and specifications.

Intended Audience

This publication is for use by DIGITAL customers and employees who are responsible for configuring, installing, and maintaining UltraSCSI SBB shelves.

Structure

This manual is organized as follows:

Chapter 1
Describes SBB shelves including functions, uses, components, and features.

Chapter 2
Describes the rules for configuring buses, nodes, I/O modules, SBB shelves, trilink connectors, and bus expanders.

Chapter 3
Describes the operation, functions, uses, and configuration procedures for an SBB shelf.

Chapter 4
Describes SBB shelf power distribution, monitoring, and status reporting.

Chapter 5
Describes the SBB handling, monitoring, and status reporting.
Preface

Chapter 6
Describes the procedures for replacing shelf components.

Appendix A
Describes the SBB shelf physical, electrical, and environmental specifications.

Appendix B
Describes the interconnection of components required in various configurations of UltraSCSI subsystems.

Glossary
Contains definitions of StorageWorks and SCSI terminology.

Related Documents
The following publications contain additional information about UltraSCSI shelf products.

<table>
<thead>
<tr>
<th>Publication Title</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Shelf Departmental Server User’s Guide</td>
<td>EK–SW500–UG</td>
</tr>
<tr>
<td>24-Shelf Data Center Cabinet (SW800 Series) User’s Guide</td>
<td>EK–SW800–UG</td>
</tr>
<tr>
<td>RETMA Shelf Rail Kit Installation Guide</td>
<td>EK–35XRB–IG</td>
</tr>
<tr>
<td>SBB Shelf I/O Module User’s Guide</td>
<td>EK–SBBIO–UG</td>
</tr>
<tr>
<td>SW500 and SW800 Cabinet Metric Shelf Bracket Kit Installation Guide</td>
<td>EK–35XRD–IG</td>
</tr>
</tbody>
</table>
## Documentation Conventions

The documentation conventions used in this publication are as follows:

<table>
<thead>
<tr>
<th><strong>boldface type</strong></th>
<th><strong>Italic type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldface type indicates the first instance of terms being defined in the text, the glossary, or both.</td>
<td>Italic type indicates emphasis and publication titles. Italic type in the glossary indicates a cross reference.</td>
</tr>
<tr>
<td><strong>A/R</strong></td>
<td>As required</td>
</tr>
<tr>
<td>The LED is <strong>OFF</strong> or blinking slowly.</td>
<td></td>
</tr>
<tr>
<td>The LED is <strong>ON</strong>.</td>
<td></td>
</tr>
<tr>
<td>The LED is <strong>FLASHING</strong> (blinking rapidly).</td>
<td></td>
</tr>
</tbody>
</table>

### Warning

The information is essential to the safety of personnel.

### Caution

The information is essential in order to avoid damaging the software or hardware.

### Note

Notes contain information which might be of special importance to the user.

- Single-ended SCSI bus
- Differential SCSI bus
Based on product testing in accordance with country-specific standards, DIGITAL declares that this product is in compliance with the following standards.

**Electromagnetic Compatibility**

You can install this **CE-Mark, Class B certified device** in commercial, office, and home environments.
**Acoustic Noise Declarations**

DIGITAL declares that the DS–BA356 series, UltraSCSI SBB shelf has the same acoustic values as the StorageWorks BA356–JC SBB shelf:

<table>
<thead>
<tr>
<th>Product</th>
<th>Sound Power Level $L_{WAd,B}$</th>
<th>Sound Pressure Level $L_{pAm,dBA}$ (bystander positions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA356–JC SBB Shelf</td>
<td>5.6</td>
<td>37</td>
</tr>
<tr>
<td>BA356–JC SBB Shelf with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 ea. RZ29B–VA Disk Drives</td>
<td>5.8</td>
<td>40</td>
</tr>
</tbody>
</table>

**Note**

Current values for sound power levels are available from DIGITAL representatives.

1 Bel = 10 dBA.

**Schallemissionswerte — Werteangaben nach ISO 9296 und ISO 7779/DIN EN27779:**

<table>
<thead>
<tr>
<th>Gerät</th>
<th>Schalleistungspegel $L_{WAd,B}$</th>
<th>Schalldruckpegel $L_{pAm,dBA}$ (Zuschauerpositionen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA356–JC</td>
<td>5.6</td>
<td>37</td>
</tr>
<tr>
<td>BA356–JC with:</td>
<td>5.8</td>
<td>40</td>
</tr>
<tr>
<td>7 ea. RZ29B–VA Disk Drives</td>
<td>5.9</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

Aktuelle Werter für spezielle Austüstitungsstufen sind über die Digital Equipment Vertretungen erhältlich. 1 Bel = 10 dBA.
Introducing the UltraSCSI SBB Shelf

The StorageWorks™ UltraSCSI SBB shelf (SBB Shelf), DS–BA356 series (see Figure 1–1) is a basic component of an UltraSCSI subsystem. This shelf can be installed in either a data center cabinet, a departmental server cabinet, or a pedestal.

Note

The DS– model number prefix indicates new DIGITAL storage products and may be similar, but not interchangeable, to existing model numbers. Examples of these are the DS–BA356 series UltraSCSI SBB shelves and BA356 series SBB shelves.

Figure 1–1 Typical DS–BA356 UltraSCSI SBB Shelf

™ StorageWorks is a trademark of Digital Equipment Corporation.
Introducing the UltraSCSI SBB Shelf

Product Description

The SBB shelves are factory configured for one of the following storage applications:

- A single-ended bus with a single channel
- A single-ended bus with dual channels
- A differential bus with a single channel

The characteristics of SBB shelves are:

- Each shelf is 150 mm (5.9 in) high, 445 mm (17.5 in) wide, and 350 mm (13.8 in) deep.
- Each shelf can accommodate a maximum of eight 3.5–inch StorageWorks building blocks (SBBs) configured as follows:
  - Seven storage devices and one power supply.
  - or
  - Six storage devices and two power supplies.
  - A 5.25-inch SBB uses three SBB slots. Therefore, only a total of two 5.25-inch SBBs can be installed in one shelf.
- The shelf SBB guide slots are designed so that the SBBs automatically align with the backplane connectors.
- The slots are numbered from right to left, 0 through 7.
  - The SBB shelf I/O module, located at the right end of the shelf, assigns SCSI bus IDs to the backplane connectors. The default is SCSI bus IDs 0—6. This module provides termination for both the internal shelf bus and the external bus. The termination bus width and implementation are switch selectable by the user.
  - Storage devices mount in Slots 0 through 6.
  - Slots 0 through 5 each have one storage device backplane connector.
  - Slot 6 has two backplane connectors—one for a storage device connector and one for a power supply.
  - Slot 7 has only a power supply backplane connector.
Introducing the UltraSCSI SBB Shelf

— The primary power supply (DS–BA35X–HH) *ALWAYS* mounts in Slot 7.

— The redundant power supply *ALWAYS* mounts in Slot 6. Using a **redundant power configuration** reduces the total number of 3.5-inch storage devices in a shelf to six.

• The shelves can be mounted in DIGITAL™ SW500– and SW800 series cabinets, either horizontally or vertically, using a **metric shelf mounting kit** (BA35X–RD).

• The shelves can be mounted either horizontally or vertically in a cabinet with RETMA mounting rails, using a **RETMA mounting kit** (DS–BA35X–RK). This kit is used with the DS–BA356–R series shelves.

• The shelf can be mounted in a pedestal using the DS–BA35X–VB pedestal kit.

**Shelf Status Displays**

The only conditions that can affect the entire shelf are power and cooling. The power supply status LEDs display the status of the shelf power supplies and the **blower assemblies**.

---

™ DIGITAL is a trademark of Digital Equipment Corporation.
SBB Shelf and Pedestal Configurations

DIGITAL has developed a series of shelf and SBB configurations for specific UltraSCSI subsystem requirements. These configurations may be modified to meet specific system requirements.

The primary consideration in developing these configurations is the external SCSI bus configuration, either single-ended or differential.

Single-Ended, UltraSCSI, Bus Configurations

Tables 1–1 through 1–4 list the shelves and pedestals (DS–BA356 series) that are used with single-ended UltraSCSI buses.

- **–J series** are the SBB shelves with an I/O module and power supply with a metric mounting kit.

- **–K series** are SBB shelves with an I/O module and a power supply mounted in a pedestal kit.

- **–R series** are the SBB shelves with an I/O module and power supply with a RETMA mounting kit.

- **–S series** are SBB shelves with an I/O module, but without mounting hardware or power supplies.
Introducing the UltraSCSI SBB Shelf

### Table 1-1  Single-Ended SBB Shelves—Metric Cabinet (DS–BA356–J Series)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual-Channel, Single-Ended, I/O Module</td>
<td>DS–BA35X–FB</td>
<td>–JD 0, –JE 1</td>
</tr>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>–JD 1, –JE 1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Jumper Board</td>
<td>BA35X–MF</td>
<td>–JD 1, –JE 0</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Terminator Board</td>
<td>BA35X–ME</td>
<td>–JD 0, –JE 1</td>
</tr>
<tr>
<td>Shelf Mounting Kit Brackets—Metric</td>
<td>BA35X–RD</td>
<td>–JD 1, –JE 1</td>
</tr>
</tbody>
</table>

#### User-Ordered Components


### Table 1-2  Single-Ended SBB Shelves—RETMA Cabinet (DS–BA356–R Series)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>–RC 1, –RD 1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Jumper Board</td>
<td>BA35X–MF</td>
<td>–RC 1, –RD 0</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Terminator Board</td>
<td>BA35X–ME</td>
<td>–RC 0, –RD 1</td>
</tr>
<tr>
<td>Shelf Mounting Kit Brackets—RETMA</td>
<td>BA35X–RK</td>
<td>–RC 1, –RD 1</td>
</tr>
</tbody>
</table>

#### User-Ordered Components

Introducing the UltraSCSI SBB Shelf

### Table 1-3  Single-Ended SBB Shelves (DS–BA356–S Series)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-SD</td>
<td>-SE</td>
</tr>
<tr>
<td>Single-Channel, Single-Ended, I/O Module</td>
<td>DS–BA35X–FA</td>
<td>1</td>
</tr>
<tr>
<td>Dual-Channel, Single-Ended, I/O Module</td>
<td>DS–BA35X–FB</td>
<td>0</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Jumper Board</td>
<td>BA35X–MF</td>
<td>1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Terminator Board</td>
<td>BA35X–ME</td>
<td>0</td>
</tr>
</tbody>
</table>

**User-Ordered Components**

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1</td>
</tr>
<tr>
<td>Shelf Mounting Kit Brackets—RETMA</td>
<td>BA35X–RK</td>
<td>1</td>
</tr>
<tr>
<td>Shelf Mounting Kit Brackets—RETMA</td>
<td>BA35X–RK</td>
<td>1</td>
</tr>
<tr>
<td>Pedestal Kit</td>
<td>DS–BA35X–VB</td>
<td>A/R</td>
</tr>
</tbody>
</table>

### Table 1-4  Single-Ended SBB Pedestals (DS–BA356–K Series)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-KF</td>
<td>-KG</td>
</tr>
<tr>
<td>Single-Channel, Single-Ended, I/O Module</td>
<td>DS–BA35X–FA</td>
<td>1</td>
</tr>
<tr>
<td>Dual-Channel, Single-Ended, I/O Module</td>
<td>DS–BA35X–FB</td>
<td>0</td>
</tr>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Jumper Board</td>
<td>BA35X–MF</td>
<td>1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Terminator Board</td>
<td>BA35X–ME</td>
<td>0</td>
</tr>
<tr>
<td>Pedestal Kit</td>
<td>DS–BA35X–VB</td>
<td>1</td>
</tr>
</tbody>
</table>

**User-Ordered Components**

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per</th>
</tr>
</thead>
</table>
Introducing the UltraSCSI SBB Shelf

Differential, UltraSCSI, Bus Configurations

Tables 1–5 through 1–7 identify the differential UltraSCSI shelves and pedestals (DS–BA356 series).

Table 1-5  Differential SBB Shelf (DS–BA356–JF)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Shelf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Channel, Differential, I/O Module</td>
<td>DS–BA35X–DA</td>
<td>1</td>
</tr>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf Jumper Board</td>
<td>BA35X–MF</td>
<td>1</td>
</tr>
<tr>
<td>Shelf Mounting Kit—Metric</td>
<td>BA35X–RD</td>
<td>1</td>
</tr>
</tbody>
</table>

User-Ordered Components

Redundant, 180 W, Power Supply DS–BA35X–HH A/R

Table 1-6  Differential UltraSCSI SBB Shelf (DS–BA356–SF)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Shelf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Channel, Differential, I/O Module</td>
<td>DS–BA35X–DA</td>
<td>1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf Jumper Board</td>
<td>BA35X–MF</td>
<td>1</td>
</tr>
</tbody>
</table>

User-Ordered Components

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Shelf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1</td>
</tr>
<tr>
<td>Redundant, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>A/R</td>
</tr>
<tr>
<td>Shelf Mounting Kit—Metric</td>
<td>BA35X–RD</td>
<td>A/R</td>
</tr>
<tr>
<td>Shelf Mounting Kit—RETMA</td>
<td>BA35X–RB</td>
<td>A/R</td>
</tr>
</tbody>
</table>
Introducing the UltraSCSI SBB Shelf

Table 1-7 Differential UltraSCSI Pedestals (DS–BA356–KH)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Pedestal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Channel, Differential, I/O Module</td>
<td>DS–BA35X–DA</td>
<td>1</td>
</tr>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf Jumper Board</td>
<td>BA35X–MF</td>
<td>1</td>
</tr>
<tr>
<td>Pedestal Kit</td>
<td>DS–BA35X–VB</td>
<td>1</td>
</tr>
</tbody>
</table>

User-Ordered Components

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Shelf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundant, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>A/R</td>
</tr>
</tbody>
</table>

Configure-to-order (CTO) Shelf (DS–BA356–SG)

The DS–BA356–SG UltraSCSI SBB shelf is an “empty” shelf with a 16-bit jumper board. The user is responsible ordering the components to create an operational shelf. This includes power supplies, I/O modules, mounting kits (shelf or pedestal), terminator boards, and storage SBBs.

Table 1-8 Configure to Order SBB Shelf (DS–BA356–SG)

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Shelf</th>
</tr>
</thead>
<tbody>
<tr>
<td>16–Bit, SBB Shelf, Jumper Board</td>
<td>BA35X–MF</td>
<td>1</td>
</tr>
</tbody>
</table>

User-Ordered Components

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Model No.</th>
<th>Quantity per Shelf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1</td>
</tr>
<tr>
<td>Redundant, 180 W, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>A/R</td>
</tr>
<tr>
<td>Shelf Mounting Kit—Metric</td>
<td>BA35X–RD</td>
<td>A/R</td>
</tr>
<tr>
<td>Shelf Mounting Kit—RETMA</td>
<td>BA35X–RB</td>
<td>A/R</td>
</tr>
<tr>
<td>Pedestal Kit</td>
<td>DS–BA35X–VB</td>
<td>A/R</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Terminator Board</td>
<td>BA35X–ME</td>
<td>A/R</td>
</tr>
<tr>
<td>8-bit I/O Module (FAST 10 Only)</td>
<td>BA35X–MG</td>
<td>A/R</td>
</tr>
<tr>
<td>16-bit I/O Module (FAST 10 Only)</td>
<td>BA35X–MH</td>
<td>A/R</td>
</tr>
</tbody>
</table>
The configuration rules contained in this chapter—when applied to UltraSCSI components—reduce possible conflicts and improve subsystem operations.

_____________________ Note __________________

The use of the terms “device” and “node” interchangeably can cause possible conflicts. In this chapter, the term “node” refers to a SCSI bus device that uses a SCSI bus address.

_____________________________________________________________________

Buses

The following rules apply to the buses:

1. The following SCSI bus devices use a SCSI bus address and are SCSI bus nodes:
   - Adapters
   - Controllers
   - Storage devices

2. The following devices do not use a SCSI bus address and are not SCSI bus “nodes:”
   - SCSI bus expanders (DS–DWZZC series)
   - I/O modules (DS–BA35X–D or DS–BA35X–F series)
   - Shelf power supplies

3. Every node on a bus must have an unique SCSI ID.
Configuration Rules

4. The SCSI ID for the primary controller is always 7. This ID cannot be used for any other node.

5. When there is a redundant controller, it uses SCSI bus ID 6. *You may use SCSI bus ID 6 for a storage device only when there is no redundant controller.*

6. There are slots for seven 3.5-inch SBB nodes in a shelf. The I/O module address switch determines the SCSI bus IDs. The default IDs are 0 through 6.

   When there is a redundant controller, SCSI bus ID 6 cannot be used.

7. There is a maximum of 14 valid SCSI IDs—0 through 6 and 8 through 14. Although a redundant power supply does not use a SCSI bus ID, when it is installed SCSI bus IDs 6 and 14 are no longer available.

8. With all UltraSCSI devices, the maximum transfer rate of an UltraSCSI bus is 40 MB/sec.

9. If a FAST 10 device is added to an UltraSCSI system, the UltraSCSI system performance can be degraded.

10. Narrow devices can only use SCSI IDs 0 through 6.

11. A narrow (–VA suffix), FAST 10 device in an UltraSCSI shelf has a maximum transfer rate of 10 MB/sec.

12. A wide (–VW suffix), FAST 10 device has a 20 MB/sec transfer rate.

Storage Nodes

The following rules apply to SCSI storage nodes, such as disks, tapes, and so forth:

1. A storage node cannot use SCSI bus ID 7.

2. A storage node *cannot* use SCSI bus ID 6 when there is a redundant controller.
UltraSCSI I/O Modules

The following rules apply to I/O modules in SCSI SBB shelves:

1. The only SBB shelf compatible, I/O modules are the DS–BA35X–DA (differential) and the DS–BA35X–F (single-ended) series.
2. Connecting a trilink connector requires that the external bus termination on the associated I/O module port be disabled.
3. Neither the BA35X–MG (narrow) nor the BA35X–MH (wide), I/O modules are UltraSCSI bus compatible. Installing these I/O modules restricts the shelf to FAST 10 operation.

SBB Shelves

The following rules apply to the UltraSCSI, SBB shelves:

1. Shelves (DS–BA356 series) are not compatible with the UltraSCSI enclosure (DS–BA370). Expanding an enclosure bus with these shelves is not possible.
2. Shelves require 180 W power supplies.
3. Shelves support the following SCSI buses:
   - UltraSCSI (FAST 20) with SCSI bus IDs 0 through 6 or 8 through 14 at a maximum transfer rate of 40 MB/sec.
   - Wide, FAST 10, SCSI devices (–VW suffix), SCSI bus IDs 0 through 6 and 8 through 14 at a maximum transfer rate of 20 MB/sec.
   - Narrow, FAST 10, SCSI devices (–VA suffix), SCSI bus IDs 0 through 6 at a maximum transfer rate of 10 MB/sec.

Trilink Connectors

An UltraSCSI trilink connector requires that the external bus termination on the I/O module port be disabled.
Bus Expanders

The following rules apply to the use of bus expanders with an UltraSCSI, SBB shelf:

1. The only UltraSCSI, SBB shelf, compatible expanders are the table-top DS–DWZZC– series.
2. The DWZZA series expanders are not UltraSCSI bus compatible.
3. The DWZZB series expanders are not UltraSCSI bus compatible.
Operating an UltraSCSI SBB Shelf

This chapter describes the procedures for configuring:

- The StorageWorks fault bus
- Shelf status reporting
- I/O modules
- Specific shelf configurations

**Shelf Status**

The **shelf power supply** provides dc power, and the blowers cool the components:

- Failure of a shelf blower can result in devices overheating and failing. Internal shelf circuitry ensures that whenever a blower is nonoperational or rotating too slowly, the other blower automatically switches to high speed to increase air flow through the shelf.

The I/O module circuitry monitors the air flowing through the module. Should the air temperature exceed 32°C ± 2°C (90°F ± 3°F), this circuitry automatically switches both blowers to high speed.
Operating an UltraSCSI SBB Shelf

**Caution**

The only compatible SBB shelf blower is model DS–BA35X–MQ, a dual-speed device. *Do not install any other model.*

Removing a blower while the shelf is operating significantly changes the air flow pattern. *Operating a system with a blower removed for more than 60 seconds can result in damaged storage devices.* It is recommended that a replacement blower be available.

- When there is only *one* power supply on a shelf, the failure of that supply causes the storage devices to fail.
- When there are *two* power supplies on a shelf, the failure of *both* supply causes the storage devices to fail.

Each SCSI bus has the status signal, SHELF_OK. This signal is the result of logically “anding” a signal based on the speed of the blowers and the “power good” signals for all power supplies on the shelf.

**SHELF Status Distribution**

The controller can process the SHELF_OK signal only when you configure the shelf to distribute this signal to the controller. The backplane, jumper W1 controls distribution of the SHELF_OK signal.

**Caution**

Not all adapters and controllers can process the SHELF_OK signal. *Before* installing the SHELF_OK jumper, read the controller documentation to determine if the controller can process the SHELF_OK signal.

If the controller or adapter does NOT support the signal, do NOT install the SHELF_OK jumper. If the jumper is installed, an incorrect display can be generated.

The SHELF_OK connector ① is located adjacent to connector J12, which is behind the left-hand blower.
Operating an UltraSCSI SBB Shelf

**Figure 3–1  Shelf Status Jumper**

When the controller or adapter can process the SHELF_OK signal, install jumper W1 to route the signal to the I/O module.

**Blower Failure**

When a blower malfunctions, the SHELF_OK signal changes state and initiates the following actions:

- Turns OFF the SHELF_OK LED on all the shelf power supplies.
- Notifies the adapter or controller that there is a problem (if the adapter or controller support the SHELF_OK signal).
- When a blower malfunctions, the other blower shifts to high speed which provides adequate cooling for up to 100 hours. Continued operation with a malfunctioning blower can adversely affect the SBB.

Removing a defective blower can cause the remaining blower to revert to the low-speed mode of operation. Even if the remaining blower operates at high speed, the change in the shelf air flow pattern can result in devices overheating within 60 seconds.
Operating an UltraSCSI SBB Shelf

---

**Caution**

To prevent overheating, *do not operate* an SBB shelf with a blower removed for more than 1 minute.

---

**Figure 3–2  Blower Status LEDs**

![Blower Status LEDs](CXO6064A)

**Table 3-1  Single Power Supply Status Displays**

<table>
<thead>
<tr>
<th>If the LED display is...</th>
<th>the Blower status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑️</td>
<td>The shelf blowers and power supply are functioning properly.</td>
</tr>
<tr>
<td>☑️</td>
<td>One or more shelf blowers have failed. There is no power supply problem.</td>
</tr>
<tr>
<td>☑️</td>
<td>Identify and replace the defective shelf blower.</td>
</tr>
</tbody>
</table>
Caution
The only compatible SBB shelf blower model is the DS–BA35X–MQ, a dual-speed blower. Do not install any other model.

Note
The power supply LEDs display blower error conditions. However, they do not identify the defective blower.

Power Supply Failure
All SBB shelves can accommodate either one or two power supplies. The failure of either power supply causes the SHELF_OK signal to change. DIGITAL recommends replacing the defective power as soon as possible to restore the subsystem to full operational status.

Caution
The SBB shelf requires power supplies rated for a minimum of 180 W. Do not use any shelf power supply with a lower rating.

When a power supply malfunctions, the SHELF_OK signal changes state and initiates the following actions:

- Turns Off the green SHELF_OK LED (upper) on all the shelf power supplies
- Turns Off the green POWER_OK LED (lower) on the malfunctioning shelf power supply
Operating an UltraSCSI SBB Shelf

**Figure 3–3  Power Supply Status LEDs**

<table>
<thead>
<tr>
<th>LED Displays</th>
<th>The power supply status is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot 7:  [] Slot 6:  []</td>
<td>The Slot 7 shelf power supply is functioning properly.</td>
</tr>
<tr>
<td></td>
<td>The Slot 6 shelf power supply is nonoperational.</td>
</tr>
<tr>
<td></td>
<td>Replace the Slot 6 shelf power supply.</td>
</tr>
<tr>
<td>Slot 7:  [] Slot 6:  []</td>
<td>The Slot 6 shelf power supply is functioning properly.</td>
</tr>
<tr>
<td></td>
<td>The Slot 7 shelf power supply is nonoperational.</td>
</tr>
<tr>
<td></td>
<td>Replace the Slot 7 shelf power supply.</td>
</tr>
<tr>
<td>One of the following conditions exists:</td>
<td></td>
</tr>
<tr>
<td>1. Both power supplies are nonoperational.</td>
<td></td>
</tr>
<tr>
<td>2. There is no ac power.</td>
<td></td>
</tr>
</tbody>
</table>
Operating an UltraSCSI SBB Shelf

Device SBB Faults

These faults are for SBBs that are attached to adapters or controllers that support fault bus protocol. The controller uses the combination of the SBB shelf status signals to control the amber device fault LED.

Figure 3–4  SBB Status LEDs

Table 3-3  SBB Status Displays

<table>
<thead>
<tr>
<th>If the LED display is...</th>
<th>the Blower status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED is ON.</td>
<td>The SBB is probably not responding to control signals. DIGITAL recommends that you replace the SBB.</td>
</tr>
<tr>
<td>LED is OFF</td>
<td>The SBB is active and is spinning down due to the fault. DIGITAL recommends replacing the SBB after the device has spun down.</td>
</tr>
<tr>
<td>LED is FLASHING</td>
<td>In response to a fault bus message, the controller is spinning down the device. DIGITAL recommends replacing the SBB after the device has spun down.</td>
</tr>
<tr>
<td></td>
<td>The SBB is inactive and spun down. Replace the SBB.</td>
</tr>
</tbody>
</table>
Configuring the SBB Shelf I/O Module

This section is an overview of the procedures for configuring either a single-ended or differential, UltraSCSI shelf, I/O module. These procedures set both the SCSI bus terminator and the storage device SCSI bus IDs. For detailed information about the I/O modules, see the Digital StorageWorks SBB Shelf I/O Modules User’s Guide.

Figure 3–5   Single-Ended UltraSCSI I/O Module
Complete the procedure in Table 3-4 to set the bus termination and SBB device addresses.

**Table 3-4 Setting Bus Termination and Device Addresses**

1. Use switch S4 to set the SCSI bus termination per Table 3-5.

2. Use switch S3 to set the shelf device address per either Figure 3–5 or Figure 3–6.
External SCSI Bus Termination Settings
Switch S4 (see Figure 3–6) determines the external SCSI bus terminations.

Figure 3–6  External Termination Switches

1. The top two switches (S4–1 and S4–2) control termination for channel A on both single-channel and dual-channel I/O modules.
2. The bottom two switches (S4–3 and S4–4) control termination for channel B on dual-channel I/O modules.
### Table 3-5 Termination Switch Settings

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Channel A</th>
<th>Channel B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>16–Bit External Bus Termination</strong></td>
<td><img src="CX05718A" alt="Diagram" /></td>
<td><img src="CX05721A" alt="Diagram" /></td>
</tr>
<tr>
<td>This configuration terminates all SCSI bus bits (full termination). Use this configuration when the shelf is the end point in a SCSI bus. As long as Switch–1 is on in Channel A and Switch–3 is on in Channel B, the rest of the switch settings in both channels have no significance.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Channel A</th>
<th>Channel B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8-Bit External Bus Termination</strong></td>
<td><img src="CX05719A" alt="Diagram" /></td>
<td><img src="CX05722A" alt="Diagram" /></td>
</tr>
<tr>
<td>This configuration terminates only the upper 8 data bits. Use this configuration when the input bus is a wide (16–bit) bus—it continues as a narrow (8-bit) bus. Use this configuration to extend the bus to a narrow device using a trilink. As long as Switches–1 and –2 are on in Channel A, and Switches–3 and –4 are on in Channel B, the rest of the switch settings in both channels have no significance.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Channel A</th>
<th>Channel B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Bus Expansion</strong></td>
<td><img src="CX05720A" alt="Diagram" /></td>
<td><img src="CX05723A" alt="Diagram" /></td>
</tr>
<tr>
<td>There is no termination on the shelf in this configuration. Use this configuration when the shelf is not an end point of a SCSI bus segment. As long as Switches–1 and –2 are on in Channel A and Switches–3 and –4 are on in Channel B, the rest of the switch settings in both channels have no significance.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Note**

Switches S4–3 and S4–4 have no function on any single-channel I/O module.
Setting the SCSI Bus IDs

A SCSI bus has 16 SCSI bus IDs, 0 through 15. Each SBB shelf can have a maximum of seven 3.5-inch SBBs. Therefore, 14 devices is the physical limit for two SBB shelves in a single bus configuration.

Single Shelf Default Configurations

The rules for single shelf configurations (see Figure 3–7) are as follows:

- If a second power supply is added, it goes in slot 6.
- When there is a redundant controller, it uses SCSI bus ID 6. This limits the SCSI IDs to six (0 through 5).
- Shelf bus address 0 sets SCSI bus IDs 0 through 6.

DIGITAL supports the following single shelf configurations:

- One power supply and one controller—SCSI IDs 0 through 6
- Two power supplies and one controller—SCSI IDs 0 through 5
- One power supply and dual controllers—SCSI IDs 0 through 5
- Two power supplies and dual controllers—SCSI IDs 0 through 5
Dual Shelf Configurations
The rules for dual shelf configurations (see Figure 3–8) are as follows:

Figure 3–8   Dual Shelf Switch Settings

- Using two power supplies on both SBB shelves reduce the total number of 3.5-inch devices on a single bus to 12 (SCSI bus IDs 0 through 5, and 8 through 13).
- When shelf bus address switches on shelf one are all set to OFF, then the SCSI bus IDs are 0 through 6 on the first shelf.
- When shelf bus address switches 1, 2, 3, 5, and 6 on shelf 2 are set to ON and 4 and 7 are set to OFF, then SCSI bus IDs are 8 through 14.
- Without a redundant controller, the valid SCSI, storage device IDs are 0 through 6 and 8 through 14—a total of 14 devices.
- When there is a redundant controller (using SCSI ID 6), the valid SCSI storage device IDs are 0 through 5 and 8 through 14—a total of 13 devices.
DIGITAL Supported Shelf Configurations

There are many possible SBB shelf configurations. However, to ensure optimum operation, DIGITAL recommends using only the following configurations:

- A single-ended bus, single-channel configuration for:
  - Creating a single shelf, 7- or 6–device configuration with SCSI bus IDs 0 through 6 or 0 through 5 (default configuration)
  - Daisy chaining two shelves with a trilink connector to enable a single host or controller to control a maximum of 14 devices

- A single-ended bus, dual-channel configuration for connecting two hosts to a single dual-bus mode shelf:
  - Channel A, 4 device address—0, 2, 4, 6
  - Channel B, 3 device address—1, 3, 5

- A differential bus, single-channel configuration for:
  - Creating a single shelf, 7- or 6–device configuration with SCSI bus IDs 0 through 6 or 0 through 5
  - Creating a single shelf, 7- or 6–device configuration with SCSI bus IDs 8 through 14 or 8 through 13
  - Daisy chaining two shelves with a trilink connector to enable a single host or controller to control a maximum of 14 devices

As described in Chapter 1 and Appendix B, each configuration has standard components furnished with all shelves:

- User-ordered components that are required for proper operation, such as cables, power supplies, and so forth
- Optional components to create special configurations
Single-Channel Configurations

You can configure single-channel, I/O modules to function in either:

1. A single-channel, single shelf, 6– or 7-SBB configuration (see Table 3–2).

2. A single-channel, dual shelf, 14-SBB configuration (see Table 3–3).

Table 3-6 Single-Channel, Single Shelf Configuration

<table>
<thead>
<tr>
<th>SBB Shelf Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 16–Bit Terminator Board (BA35X–ME)</td>
</tr>
<tr>
<td>2. EMI Shield</td>
</tr>
</tbody>
</table>
Table 3–6  Single-Channel, Single Shelf Configuration (Continued)

### Cabling

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Adapter or controller
2. Optional adapter cable (BN38x series)
3. 68 conductor VHDCI cable (BN37A series)
4. A single channel shelf or pedestal

______________________Note __________________

The maximum combined length of cables 2 and 3 is 20 m (65.6 ft)

______________________Termination and Address Switch Settings __________________

1. The I/O module terminates the external bus
2. The terminator board (BA35X–ME) terminates the internal bus.
3. SCSI address 0 sets SBB SCSI IDs 0 through 6
Table 3-7  Single-Channel, Dual Shelf Configuration

<table>
<thead>
<tr>
<th>First SBB Shelf Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 16–Bit Jumper (BA35X–MF)</td>
</tr>
<tr>
<td>2. EMI Shield</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second SBB Shelf Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 16–Bit Terminator Board (BA35X–ME)</td>
</tr>
<tr>
<td>2. EMI Shield</td>
</tr>
</tbody>
</table>
Operating an UltraSCSI SBB Shelf

Table 3–7  Single-Channel, Dual Shelf Configuration (Continued)

<table>
<thead>
<tr>
<th>Cabling</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="CXOS844A" alt="Diagram" /></td>
</tr>
</tbody>
</table>

1. Adapter or controller
2. Optional adapter cable (BN38x series)
3. 68 conductor VHDCI cable (BN37A series)
4. Single ended trilink connector (H8861–AA)
5. Two single-channel shelf or pedestal

---

**Note**

*The maximum combined length of cables 2 and 3 is 4 m (13.1 ft).*
### Table 3–7  Single-Channel, Dual Shelf Configuration (Continued)

<table>
<thead>
<tr>
<th>Termination and Address Switch Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="CX05662B" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**First SBB Shelf**
1. The I/O module terminates the internal bus.
2. SCSI address 0 sets SBB SCSI IDs 0 through 6.

**Second SBB Shelf**
1. The I/O module terminates the external and the internal buses.
2. The SCSI bus address 55 sets SBB SCSI IDs 8 through 14.
Operating an UltraSCSI SBB Shelf

**Dual Channel, Single Shelf Configuration**

The following table (Table 3–4) shows a dual-channel, single shelf configuration.

**Table 3-8 Dual-Channel, Single Shelf Configuration**

<table>
<thead>
<tr>
<th>SBB Shelf Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 16–Bit Terminator Board (BA35X–ME)</td>
</tr>
<tr>
<td>2. EMI Shield</td>
</tr>
</tbody>
</table>

**Cabling**

1. Adapter or controller
2. Optional adapter cable (BN38x series)
3. 68 conductor VHDCI cable (BN37A series)
4. A single channel shelf or pedestal
### Table 3–8  Dual-Channel, Single Shelf Configuration (Continued)

<table>
<thead>
<tr>
<th>Termination and Address Switch Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
</tr>
<tr>
<td>ID 5</td>
</tr>
<tr>
<td>ID 3</td>
</tr>
<tr>
<td>ID 1</td>
</tr>
<tr>
<td><strong>Termination</strong></td>
</tr>
<tr>
<td>ON</td>
</tr>
<tr>
<td>ID 4</td>
</tr>
<tr>
<td>ID 2</td>
</tr>
<tr>
<td>ID 0</td>
</tr>
<tr>
<td><strong>Bus address switches</strong></td>
</tr>
<tr>
<td>Slot 7</td>
</tr>
<tr>
<td>Slot 6</td>
</tr>
<tr>
<td>Slot 5</td>
</tr>
<tr>
<td>Slot 4</td>
</tr>
<tr>
<td>Slot 3</td>
</tr>
<tr>
<td>Slot 2</td>
</tr>
<tr>
<td>Slot 1</td>
</tr>
<tr>
<td>Slot 0</td>
</tr>
</tbody>
</table>

1. The I/O module terminates the external bus.
2. The terminator board (BA35X–ME) terminates the internal bus.
3. SCSI address 0 sets SBB SCSI IDs 0 through 6

---

**Note**

The maximum combined length of cables 2 and 3 is 20 m (65.6 ft)
This chapter describes the UltraSCSI, SBB shelf power distribution which includes:

- The SBB shelf power system components and configurations
- The error detection and reporting processes

The primary power supply is installed in Slot 7. The redundant power supply can only be installed in Slot 6.

Figure 4–1   Power Supply
Power Supply Description

The SBB shelf has only one power component, the 180 W power supply, model DS–BA35X–HH.

The universal power supply for the input shelf converts ac to +5 V dc and +12 V dc and distributes the dc voltages to all the components through the SBB shelf, backplane connectors.

See Table 4-1 for the power supply specifications

<table>
<thead>
<tr>
<th>Table 4-1  Power Supply Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>Input Line Voltage</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>DC Output Voltage</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Maximum Load</td>
</tr>
</tbody>
</table>
### Table 4-2  DIGITAL-Supported Power Configurations

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Description</th>
</tr>
</thead>
</table>
| Redundant Configuration| The DIGITAL recommended redundant power configuration provides the maximum shelf power redundancy. The shelf becomes nonoperational should any one of the following events occur:  
  - Both power supplies fail  
  - Both power sources fail |
| Standard Configuration | The standard, single power supply configuration provides no redundancy. The shelf becomes nonoperational should any one of the following events occur:  
  - The power supply fails  
  - The power source fails |
Power Distribution

Power Supply Status Display

Each shelf power supply has two green LEDs (see Figure 4–2) that display the status of the power supply and blower.

Figure 4–2  Power Supply Status LEDs

![Power Supply Status LEDs](CX0604A)

Table 4-3  Single Power Supply Status Displays

<table>
<thead>
<tr>
<th>If the LED display is...</th>
<th>the Blower and Power Supply status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED is On.</td>
<td>The shelf blowers and power supply are functioning properly.</td>
</tr>
<tr>
<td>LED is Off.</td>
<td>One or more shelf blowers have failed. There is no power supply problem. Identify and replace the defective shelf blower.</td>
</tr>
<tr>
<td>LED is Flashing</td>
<td>One or more of the following conditions exists: 1. There is no ac power. Check the ac power source. 2. The shelf power is non operational. Replace the shelf power supply.</td>
</tr>
</tbody>
</table>
### Table 4-4 Dual Power Supply Status Displays

<table>
<thead>
<tr>
<th>If the LED displays are...</th>
<th>The power supply status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot 7</td>
<td>Slot 6</td>
</tr>
<tr>
<td>LED is On.</td>
<td>LED is Off</td>
</tr>
<tr>
<td>LED is Off</td>
<td>LED is On.</td>
</tr>
</tbody>
</table>
| LED is Flashing | LED is Flashing | One of the following conditions exists:  
1. Both power supplies are nonoperational.  
2. There is no ac power. |

___________________________ Note _____________________________

A single shelf can operate correctly with only one working power supply.
This chapter describes the procedures for handling, addressing, and identifying StorageWorks building block (SBB) disk drives. It also describes error conditions and the SBB LED displays statuses.
Handling SBBs

Handling SBBs properly (see Figure 5–1) reduces the risk of damaging the storage devices.

Figure 5–1 SBB Handling

- Set the SBB on its side.
- Set the SBBs side by side.
- Set the SBB down gently.
- Push the SBB into the shelf gently, but firmly.

- Do NOT set the SBB on its edge.
- Do NOT stack SBBs.
- Do NOT drop the SBB.
- Do NOT force the SBB into the shelf.
SBB SCSI Bus IDs

Each storage SBB is a node on the SCSI bus, and, as such, uses a SCSI bus ID (address). The sequential SBB shelf slot numbering and SCSI bus ID numbering begins with Slot 0 on the right through Slot 6 on the left (see Figure 5–2). The SCSI bus address switch on the UltraSCSI, I/O module determines the SCSI ID assigned to the SBBs installed in slots 0 through 6. Slot 6 may contain either an SBB or the redundant power supply. When there is a power supply in Slot 6, SBBs can be installed in slots 0 through 5.

Slot 7 always contains the primary power supply and does not have a SCSI bus ID.

Chapter 3 contains detailed information about configuring the shelves.

Figure 5–2 SBB Shelf Layout

![SBB Shelf Layout Diagram]

Caution

The primary controller always uses SCSI bus ID 7 which is the highest priority address. An SBB cannot use this SCSI bus ID.

Installing an optional, redundant controller precludes using SCSI bus ID 6 for an SBB.
SBB Status Reporting

Each storage SBB has two LED indicators which display the status of the SBBs. These LEDs have three states: ON, OFF, and FLASHING.

Figure 5–3 SBB Status LEDs

The upper LED (green) is the device activity LED, and is ON or FLASHING when the SBB is active. This is driven directly by the SBB storage device.

Caution

Do not remove a storage SBB when the upper LED is ON or FLASHING. Doing so can cause the loss or corruption of data.

The lower LED (amber) is the storage SBB fault status LED. It indicates an error condition when it is either ON or FLASHING, or it indicates a locate command when it is FLASHING. The controller controls this LED via the fault bus. The host adapter or host controller documentation describes how these devices support operation of this LED. Not all adapters or controllers support fault bus protocol.

See Table 5-1 for SBB status displays.


Table 5-1  SBB Status LEDs

<table>
<thead>
<tr>
<th>If the LED display is…</th>
<th>The SBB Status is…</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED is On.</td>
<td>The SBB is probably not responding to control signals. DIGITAL recommends that you replace the SBB.</td>
</tr>
<tr>
<td>LED is Off</td>
<td>1. The SBB is active and is spinning down due to the fault. DIGITAL recommends that you replace the SBB after the device has spun down. or 2. The locate command has been issued by the controller. There is no error condition.</td>
</tr>
<tr>
<td>LED is Flashing</td>
<td>1. In response to a fault bus message, the controller is spinning down the device. DIGITAL recommends that you replace the SBB after the device has spun down. or 2. The locate command has been issued by the controller. There is no error condition.</td>
</tr>
</tbody>
</table>

The SBB is inactive and spun down. Replace the SBB.
Identifying a Storage Device

To determine the model number of a device, see the regulatory label (see Figure 5–4) on the side of the SBB or the SBB bezel label (see Figure 5–5).

![Figure 5–4  Typical Regulatory Label](image)

The SBB bezel label (see Figure 5–5) identifies the device, the SCSI bus type, and lists user-assigned information.
Figure 5–5 Typical SBB Bezel Label

1. The device model number
2. The total amount of data the device stores (capacity)
3. The user-assigned, SCSI logical unit number (LUN)
4. The user-assigned, SCSI identification number (target ID)
5. The user-assigned, array controller channel number (the array controller port or SCSI bus)
6. The device SCSI bus width (wide or narrow) where:
   • N is an 8-bit device
   • W is a 16-bit device
7. The StorageWorks shelves in which you can install the device where:
   • N is a device compatible with an 8-bit shelf
   • W is a device compatible with a 16-bit shelf
   • N/W is a device compatible with both 8-bit and 16-bit shelves
8. The bus speed expressed in megabits (Mb) per second and is identified as follows:
   • S is a slow device. For example, S5 = 5 Mb/sec.
   • F is a fast device. For example, F10 = 10 Mb/sec, F20 = 20 Mb/sec
9. The rate at which a device can transfer data in megabytes per second (MB/sec).
Replacing SBBs

This section describes the considerations and procedures for replacing SBBs.

The SBB Connector

The StorageWorks SBB connectors ensure that the SBBs operate reliably even when replaced many times.

The SBB, 96-pin, female, DIN connector provides positive mating with the SBB shelf, male, backplane connectors. The connector design ensures that \textit{dc power is present until after the SCSI bus connection} is broken and that \textit{dc power is applied before the SCSI bus connection} is made. This feature protects the integrity of the SCSI data bus. This avoids introducing noise on the bus which 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. A replacement cycle consists of removing and replacing an SBB. Over the active product life of 5 years, this is the equivalent of 40 replacement cycles per year, or approximately 1 cycle every 9 days. The replacement cycle limit applies equally to shelf connectors and device connectors.

If the SBB is replaced more often than the recommended cycle, the gold contact coating wears away and the integrity of the connection is destroyed. Environments which require a greater number of replacement cycles are not supported by this product and are considered to be improperly treating or misusing the devices (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.

SBB Replacement Methods

There are three methods for replacing StorageWorks storage SBBs: \textbf{hot swap}, \textbf{warm swap}, and \textbf{cold swap}. You must determine the appropriate replacement method based on the capabilities of the bus controller before replacing a device.
Hot Swap

___________________ Caution _________________

If you are not positive that your SCSI controller supports hot swap, DIGITAL recommends using a warm swap to protect the integrity of your data.

Read the controller documentation to determine the controller-supported swap method to use.

When you perform a hot swap, power and data are present on the SBB shelf connector. When the controller does not support hot swap, replacing an SBB using this method results in the corruption or loss of data.

You can use a hot swap to remove and replace SBBs from a system which is on line and active.

Warm Swap

___________________ Caution _________________

You can perform a warm swap only when the green device activity LED is OFF.

When you perform a warm swap, power is present on the SBB shelf connector, and there is no data on the bus. Before you perform a warm swap, you must quiesce the bus at the controller, and observe the green device activity LED on the SBB, and ensure that it is not FLASHING.

Cold Swap

When you perform a cold swap, neither power nor data is present on the SBB shelf connector. This requires turning OFF the shelf power in all the UltraSCSI subsystem shelves within a single cabinet.
Replacing Components

This chapter describes the procedures for replacing the following SBB shelf components:

- Storage SBBs
- Power supplies
- Blowers
- I/O modules
Replacing Components

Replacing a Storage SBB

Replacing an SBB is a relatively simple procedure. However, you must consider the following:

- Before replacing an SBB, you must know the device type or model number.
- You can use the SBB bezel label to identify the device model, logical unit number (LUN), SCSI bus ID, and other device characteristics.

____________________ Caution _________________

Be sure that the replacement device is the same model as the one you are replacing.

Properly ground yourself before you touch the SBB backplane connector. This prevents an electrostatic discharge (ESD) from damaging the device.

______________________________

Complete the procedure in Table 6-1 to replace a storage SBB.
Replacing Components

Table 6-1  SBB Replacement

1. Unpack the replacement SBB and verify that it is the proper model.
2. If the controller supports hot swap, go to Step 5.
3. If the controller does not support hot swap, *quiesce* the bus and go to Step 5.
4. If you cannot quiesce the bus, turn off the controller and remove power from the shelf.
5. Press the bezel tabs together to release the SBB.
6. Use both hands and pull the SBB out of the shelf.

7. Insert the replacement SBB into the guide slots and push it in until it seats fully and the bezel tabs engage the shelf.
8. After power is applied, the green device activity LED is either ON, FLASHING, or OFF.
Replacing a Shelf Power Supply

In a redundant power supply shelf, you can remove and replace a failed power supply without removing power from the other power supply.

Caution

The SBB shelf compatible power supply is model DS–BA35X–HH. You cannot use any other shelf power supply or battery backup unit.

To prevent electrostatic discharge (ESD) damage, do not touch the power supply backplane connector.

Complete the procedure in Table 6-2 to replace a power supply.
Table 6-2  Power Supply Replacement

1. Unpack the power supply and verify that it is model DS–BA35X–HH.
2. Disconnect the power cord from the defective shelf power supply.
3. Press the bezel tabs together to release the power supply from the shelf.
4. Remove the power supply.
5. Insert the replacement supply in the shelf guide slots. Push it in until the bezel tabs engage the shelf.
6. Connect the power cord.
7. The lower LED is ON when the supply is functioning properly.
Replacing Components

Replacing a Blower Assembly

Each SBB shelf has two blowers mounted on the rear. Connectors on the backplane provide the +12 V dc power to operate the blowers. When there is a blower failure, the second blower switches to high speed, and the upper power supply LED is Off.

---

**Caution**

Removing a blower while the shelf is operating significantly changes the air flow pattern. Operating a system with a blower removed for more than 60 seconds can damage the storage devices.

The only compatible SBB shelf blower is model DS–BA35X–MQ, a dual-speed blower. Do not install any other model.

---

Complete the procedure in Table 6-3 to replace a blower.
Replacing Components

Table 6-3  Blower Replacement

1. To determine the defective blower, place your hand adjacent to the blower exhaust. If there is NO air flow, the blower is defective.
2. Unpack the replacement blower and verify that it is model DS–BA35X–MQ.
3. Use a Phillips screwdriver to remove the safety screw.
4. Press the upper and lower blower mounting tabs together to release the blower.
5. Pull the blower straight out to disconnect it from the shelf power connector.
6. Align the replacement blower connector and push the blower straight in, making sure that both mounting tabs lock in place.
7. Reinstall the safety screw.
8. Both power supply LEDs should be ON.
Replacing an I/O Module

Caution

The only UltraSCSI compatible SBB shelf I/O modules are models DS–BA35X–DA (differential) and DS–BA35X–F series (single-ended).

Installing a FAST 10 I/O module (BA35X–MG or BA35X–MH) precludes UltraSCSI (FAST 20) shelf operations.

Caution

Replacing an I/O module requires you to quiesce the bus to perform a warm swap. If you cannot quiesce the bus, you must remove power from the adapter or controller and the SBB shelf, and perform a cold swap. Failure to implement these procedures can corrupt or cause the loss of data.

Complete the procedure in Table 6-4 to replace an I/O module.

Note

The procedure for replacing either a single-ended or differential UltraSCSI I/O module is the same.
### Table 6-4  I/O Module Replacement

1. Either quiesce the SCSI buses or remove power from all adapters or controllers and the SBB shelf.
2. Press the upper and lower mounting tabs together to release the module.
3. Pull the module out of the shelf.
4. Remove all external connectors (cables, trilinks) and label them.
Replacing Components

Table 6–4  I/O Module Replacement (Continued)

7. On the defective I/O module, note the settings of the SCSI bus address (S3) and the SCSI bus termination (S4) switches.

8. Set the switches on the replacement module to the identical settings.
9. Attach the external connectors (cables, trilinks).
10. Insert the replacement module into the shelf and slide it into place until it is fully seated and the mounting tabs lock in place.
11. Activate the SCSI bus and verify that the shelf is functioning properly.
This appendix defines the physical, electrical, and environmental specifications for the DIGITAL StorageWorks UltraSCSI SBB shelf (DS–BA356 series).

### Physical Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS–BA356 series UltraSCSI SBB shelf</td>
<td>150 mm (5.9 in)</td>
<td>445 mm (17.5 in)</td>
<td>350 mm (13.8 in)</td>
<td>4.45 kg (10.0 lb)(^1)</td>
</tr>
<tr>
<td>180 W SBB shelf power supply (DS–BA35X–HH)</td>
<td>121 mm (4.8 in)</td>
<td>51 mm (2.0 in)</td>
<td>216 mm (8.5 in)</td>
<td>1 kg (2.2 lb)</td>
</tr>
</tbody>
</table>

\(^1\) With I/O module; without power supply and SBBs.
SBB Shelf Specifications

Electrical Specifications

The following are the electrical specifications of the DS–BA356 SBB shelf:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Line Voltage</td>
<td>90 Vrms—264 Vrms</td>
</tr>
<tr>
<td></td>
<td>(100—240 V ac ±10%)</td>
</tr>
<tr>
<td></td>
<td>47—63 Hz (50—60 Hz ±10%)</td>
</tr>
<tr>
<td></td>
<td>2.5 A @ 220–240 V ac</td>
</tr>
<tr>
<td></td>
<td>5 A @ 100—120 V ac</td>
</tr>
<tr>
<td>DC Output Voltage</td>
<td>+12 V dc</td>
</tr>
<tr>
<td></td>
<td>10 A maximum continuous</td>
</tr>
<tr>
<td></td>
<td>+5 V dc</td>
</tr>
<tr>
<td></td>
<td>12 A maximum continuous</td>
</tr>
<tr>
<td>Maximum Load</td>
<td>180 W total</td>
</tr>
</tbody>
</table>
Connecting an UltraSCSI Subsystem

Operating Environments

DIGITAL recommends maintaining the following environments to ensure proper operation of this product.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optimum Operating Environment</strong>&lt;br&gt;(Suggested for optimum operation)</td>
<td><strong>Ambient temperature</strong> 18°C to +24°C (+64°F to +75°F) with an average rate of change of 3°C/hour maximum and a step change of 3°C or less&lt;br&gt;&lt;br&gt;<strong>Relative humidity</strong> 40% to 60% (noncondensing) with a step change of 10% or less (noncondensing)&lt;br&gt;&lt;br&gt;<strong>Altitude</strong> Up to 2400 m (8000 ft)&lt;br&gt;&lt;br&gt;<strong>Air quality</strong> Not to exceed a maximum of 500,000 particles, 0.5 micron or larger, per cubic foot of air.</td>
</tr>
<tr>
<td><strong>Minimum Operating Environment</strong>&lt;br&gt;(Required for proper operation)</td>
<td><strong>Ambient temperature</strong> +10°C to +35°C (+50°F to +104°F)&lt;br&gt;Reduce rating by 1.8°C for each 1000 m altitude (1.0°F for each 1000 ft altitude)&lt;br&gt;&lt;br&gt;<strong>Relative humidity</strong> 10 to 85% at maximum wet bulb temperature of +32°C (+90°F) and a minimum dew point of +2°C (+36°F)&lt;br&gt;&lt;br&gt;<strong>Altitude</strong> Up to 2400 m (8000 ft)&lt;br&gt;&lt;br&gt;<strong>Air quality</strong> Not to exceed a maximum of 500,000 particles, 0.5 micron or larger, per cubic foot of air.</td>
</tr>
<tr>
<td><strong>Nonoperational Operating Environment</strong>&lt;br&gt;(Shipping or short term storage)</td>
<td><strong>Ambient temperature</strong> –40°C to +66°C (–40°F to +150°F)&lt;br&gt;&lt;br&gt;<strong>Relative humidity</strong> 10% to 80% noncondensing&lt;br&gt;&lt;br&gt;<strong>Altitude</strong> 4900 m (16,000 ft)</td>
</tr>
</tbody>
</table>
SBB Shelf Specifications

SBB Thermal Stabilization

For proper operation upon initial power application, the DIGITAL SBB temperature should be within the range of 18–29°C (65–85°F).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Then You Must …</th>
</tr>
</thead>
<tbody>
<tr>
<td>When there <em>is condensation</em> on the outside of the SBB,</td>
<td>Stabilize the SBB in the operating environment for 6 hours or until the condensation is no longer visible, whichever is longer. Do not insert the SBB into the shelf until it is fully stabilized.</td>
</tr>
<tr>
<td>When there <em>is no condensation</em> on the outside of the SBB,</td>
<td>Thermally stabilize the SBB for the time specified.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage Temperature Range</th>
<th>Stabilize for</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 to 66 °C</td>
<td>140 to 151 °F</td>
</tr>
<tr>
<td>50 to 59 °C</td>
<td>122 to 138 °F</td>
</tr>
<tr>
<td>40 to 49 °C</td>
<td>104 to 120 °F</td>
</tr>
<tr>
<td>30 to 39 °C</td>
<td>86 to 102 °F</td>
</tr>
<tr>
<td>18 to 29 °C</td>
<td>64 to 84 °F</td>
</tr>
<tr>
<td>10 to 17 °C</td>
<td>50 to 63 °F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage Temperature Range</th>
<th>Stabilize for</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9 °C</td>
<td>32 to 48 °F</td>
</tr>
<tr>
<td>–10 to –1 °C</td>
<td>14 to 30 °F</td>
</tr>
<tr>
<td>–20 to –11 °C</td>
<td>–4 to 12 °F</td>
</tr>
<tr>
<td>–30 to –21 °C</td>
<td>–22 to –6 °F</td>
</tr>
<tr>
<td>–40 to –31 °C</td>
<td>–40 to –24 °F</td>
</tr>
</tbody>
</table>
Connecting an UltraSCSI Subsystem

Connecting an UltraSCSI subsystem usually involves the use of 68-conductor, VHDCI (very high-density, connector interface) cables, such as the BN37A series. However, interfacing to adapters or controllers with other type connectors, such as 50- or 68-pin, high-density connectors, requires using special adapter cables. Also special configurations may require the use of “Y” cables, trilink connectors, or terminators. This appendix lists UltraSCSI connection components.

The I/O module can be connected to the external SCSI bus using a combination of:

- VHDCI cables
- Adapter cables
- Trilink connectors
- VHDCI terminator blocks
Connecting an UltraSCSI Subsystem

Components

You can connect an UltraSCSI subsystem using the following components:

<table>
<thead>
<tr>
<th>Description</th>
<th>Model Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-Pin, VHDCI, Trilink, (3–Connector Block)</td>
<td>H8861–AA</td>
<td>A/R</td>
</tr>
<tr>
<td>68-Pin, VHDCI, Terminator Block—Differential</td>
<td>H8863–AA</td>
<td>A/R</td>
</tr>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>BN37B–0B</td>
<td>1^2</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight, receptacle connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 68-pin, high-density, right-angle, plug connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>BN38A–0B</td>
<td>1^3</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight, plug connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 50-pin, high-density, receptacle connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>BN38B–01</td>
<td>1^4</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight, plug connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 68-pin, high-density, straight, receptacle connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>BN38E–0B</td>
<td>A/R</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight, receptacle connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 68-pin, high-density, straight, plug connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>BN37C–0C</td>
<td>A/R</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight, plug connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 ea. 68-pin, VHDCI, straight, receptacle connector with jack screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redundant, 180 W, SBB Shelf, Power Supply</td>
<td>DS–BA35X–HH</td>
<td>1^5</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Terminator Board</td>
<td>BA35X–ME</td>
<td>A/R</td>
</tr>
<tr>
<td>16–Bit, SBB Shelf, Jumper Board</td>
<td>BA35X–MF</td>
<td>A/R</td>
</tr>
</tbody>
</table>

^2 One adapter cable is required for each 68-pin, high-density, right-angle connection.
^3 One adapter cable is required for each 50-pin, high-density connection.
^4 One adapter cable is required for each 68-pin, high-density connection.
^5 Installing a redundant power supply reduces the maximum number of 3.5–inch disk drives per shelf to six.
Connecting an UltraSCSI Subsystem

Selecting Components

Use the following table to select the VHDCI compatible cables, adapter cables, trilinks, and terminator blocks for connecting an UltraSCSI subsystem:

<table>
<thead>
<tr>
<th>Connector “A”</th>
<th>Connector “B”</th>
<th>Use a…</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-pin, VHDCI plug</td>
<td>68-pin, VHDCI plug</td>
<td>BN37A</td>
</tr>
</tbody>
</table>

**Adapter Cables**

<table>
<thead>
<tr>
<th>Connector “A”</th>
<th>Connector “B”</th>
<th>Use a…</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-pin, VHDCI plug</td>
<td>Two 68-pin, VHDCI receptacles</td>
<td>BN37C</td>
</tr>
<tr>
<td>68-pin, VHDCI plug</td>
<td>68-pin, high-density receptacle</td>
<td>BN38B</td>
</tr>
<tr>
<td>68-pin, VHDCI plug</td>
<td>50-pin, high-density receptacle</td>
<td>BN38A</td>
</tr>
<tr>
<td>68-pin, VHDCI receptacle</td>
<td>68-pin, high-density plug</td>
<td>BN38E</td>
</tr>
<tr>
<td>68-pin, VHDCI receptacle</td>
<td>68-pin, high-density, right-angle plug</td>
<td>BN37B</td>
</tr>
</tbody>
</table>

**Special Connectors**

<table>
<thead>
<tr>
<th>Special Connectors</th>
<th>Use a…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential, terminator block (68-pin VHDCI plug)</td>
<td>H8863–AA</td>
</tr>
<tr>
<td>Single-ended, terminator block (68-pin VHDCI plug)</td>
<td>H8865–AA</td>
</tr>
<tr>
<td>Trilink connector (1 ea. 68-pin, VHDCI plug; 2 ea. 68-pin, VHDCI receptacles)</td>
<td>H8861–AA</td>
</tr>
</tbody>
</table>
Connecting an UltraSCSI Subsystem

BN37A Series UltraSCSI Cables

You can use these cables to connect devices with 68-pin, VHDCI, receptacle connectors.

<table>
<thead>
<tr>
<th>Description</th>
<th>Meters</th>
<th>Feet</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-conductor, SCSI cable with: 2 ea. 68-pin, VHDCI, straight-plug connectors with jack screws</td>
<td>0.3</td>
<td>1.0</td>
<td>BN37A-0C</td>
</tr>
<tr>
<td>0.5</td>
<td>1.6</td>
<td>BN37A-0E</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>3.3</td>
<td>BN37A-01</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>4.9</td>
<td>BN37A-1E</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>6.6</td>
<td>BN37A-02</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>8.2</td>
<td>BN37A-02</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>9.8</td>
<td>BN37A-03</td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>16.4</td>
<td>BN37A-05</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>32.8</td>
<td>BN37A-10</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td>49.2</td>
<td>BN37A-15</td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>65.6</td>
<td>BN37A-20</td>
<td></td>
</tr>
<tr>
<td>25.0</td>
<td>82.0</td>
<td>BN37A-25</td>
<td></td>
</tr>
</tbody>
</table>

BN37B Series UltraSCSI Adapter Cables

You can use these adapter cables to connect devices with 68-pin, VHDCI, plug connectors to cables or devices with 68-pin, high-density, receptacle connectors.

<table>
<thead>
<tr>
<th>Description</th>
<th>Meters</th>
<th>Feet</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-conductor, SCSI, adapter cable with: 1 ea. 68-pin, VHDCI, straight receptacle connector with screw locks 1 ea. 68-pin, high-density, right-angle, plug connector with jack screws</td>
<td>0.2</td>
<td>0.6</td>
<td>BN37B-0B</td>
</tr>
</tbody>
</table>
Connecting an UltraSCSI Subsystem

**BN37C Series UltraSCSI “Y” Adapter Cables**

You can use this adapter cable to connect two devices with 68-pin, VHDCI, plug connectors to cables or devices with a 68-pin, high-density, receptacle connector.

<table>
<thead>
<tr>
<th>Description</th>
<th>Meters</th>
<th>Feet</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-conductor, SCSI, adapter cable with: 1 ea. 68-pin, VHDCI, straight-plug connector with jack screws</td>
<td>Leg A–0.4</td>
<td>Leg A–1.3</td>
<td>BN37C–0C</td>
</tr>
<tr>
<td>2 ea. 68-pin, VHDCI, straight-receptacle connector with screw locks</td>
<td>Leg B–0.2</td>
<td>Leg B–0.6</td>
<td></td>
</tr>
</tbody>
</table>

**BN38A Series UltraSCSI Adapter Cables**

You can use this series of adapter cables to connect devices with 68-pin, VHDCI, receptacle connectors to cables or devices with 50-pin, high-density, plug connectors.

<table>
<thead>
<tr>
<th>Description</th>
<th>Meters</th>
<th>Feet</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>0.2</td>
<td>0.6</td>
<td>BN38A–0B</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight-plug connector with jack screws</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 50-pin, high-density, receptacle connector with squeeze-to-release posts</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Connecting an UltraSCSI Subsystem

**BN38B Series UltraSCSI Adapter Cables**

You can use these adapter cables to connect devices with 68-pin receptacle, VHDCI connectors to cables or devices with 68-pin, high-density, plug connectors.

<table>
<thead>
<tr>
<th>Description</th>
<th>Meters</th>
<th>Feet</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>1.0</td>
<td>3.3</td>
<td>BN38B–01</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight plug connector with jack screws</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 68-pin, high-density, straight receptacle connector with screw locks</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BN38E Series UltraSCSI Adapter Cables**

You can use these adapter cables to connect devices with a 68-pin receptacle, VHDCI connector to cables or devices with a 68-pin, high-density, plug connector.

<table>
<thead>
<tr>
<th>Description</th>
<th>Meters</th>
<th>Feet</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-conductor, SCSI, adapter cable with:</td>
<td>0.2</td>
<td>0.6</td>
<td>BN38E–0B</td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, straight plug connector with jack screws</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 ea. 68-pin, high-density, straight plug connector with jack screws</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCSI VHDCI Trilink Connector

You can use these trilink connectors with:

- Devices that have 68-pin, VHDCI, receptacle connectors
  and
- Cables which have 68-pin, VHDCI, plug connectors

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-pin, trilink connector with:</td>
<td>H8861–AA</td>
</tr>
<tr>
<td>2 ea. 68-pin, VHDCI, receptacle connectors with screw locks</td>
<td></td>
</tr>
<tr>
<td>1 ea. 68-pin, VHDCI, plug connectors with jack screws</td>
<td></td>
</tr>
</tbody>
</table>

CX05744A
Connecting an UltraSCSI Subsystem

VHDCI Terminator Blocks

You can use these terminator blocks with devices, cables, or trilinks which have 68-pin, VHDCI, receptacle connectors.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68-pin, active, single-ended, SCSI bus, terminator block plug connectors with jack screws</td>
<td>H8865–AA</td>
</tr>
<tr>
<td>68-pin, differential, SCSI bus, terminator block plug connectors with jack screws</td>
<td>H8863–AA</td>
</tr>
</tbody>
</table>
adapter

See SCSI signal bus converter.

ambient temperature

Ambient temperature is the temperature of the environment in which the system resides.

backplane

A backplane is the electronic, printed circuit board mounted in a shelf. This board contains the SBB, power supply, terminator board, jumper board, and I/O module connectors.

blower assembly

A blower assembly is the device that cools the StorageWorks devices by drawing air in through the front of the shelf, through the devices, and exhausting it out the rear.

branch

A branch is an UltraSCSI bus configuration where an expander, located in the middle of a bus segment, enables the bus to branch or create a “tree” configuration, rather than a point-to-point configuration. Also known as a “tree” configuration.
**bus expander**

A bus expander is a SCSI device that couples **bus segments** without any impact on the SCSI protocol, the firmware, or software. The DWZZx family includes both single-ended-to-differential and single-ended-to-single-ended **bus extenders**. The term extender is a general term which includes "extender," "repeater," and "isolator."

Bus expanders can be used to extend the effective length of an UltraSCSI bus, to couple differential bus segments to single-ended bus segments which allows the mixing of these two devices on same bus, and to allow isolation of bus segments from each other for maintenance purposes.

Expanders do not have to be placed at the physical ends of the bus segments which they join. They can also be used to create a "branch" from the middle of an existing bus segment.

- The table-top expander functions as both an extender and an isolator. The extender function increases the overall bus length (Segment 2) by +20 m (65.6 ft). The isolator function separates Bus 1 from Bus 2.

- The single-ended-to-single-ended, SBB shelf, 16-bit, expander, I/O module functions as a both an extender and an isolator. The extender function increases the overall bus length by 1 m (3.3 ft). The isolator function separates the shelf bus, Bus 3 from Bus 2.
bus extender

See bus expander.

bus segment

A SCSI bus segment is defined as an unbroken electrical path consisting of conductors (in cables or on backplanes) and connectors. Every bus segment must have two terminators, one at each end of the bus segment.

Bus segments can be either single-ended (SE) or differential (DF) depending on the type of terminators used in that segment. The terminator properties determine the bus segment type. A bus segment can support only devices of the same type as its terminators. You cannot put a differential SCSI device on a single-ended bus segment.

Caution

The device transceiver type (single-ended or differential) must match the bus segment type. Devices which do not meet this condition cannot operate.

The allowed length of a bus segment depends on the electrical loading, transmission media type, and data transfer rate. In many cases, heavier loading, smaller wires, and higher speeds demand shorter lengths. Loading is produced by increasing the number of devices in a given length of the bus, by using longer stubs, or higher capacitance devices.

bus segment types

The following are SCSI bus segments types:

- Single-ended (SE)
- High-voltage differential (HVD)

The terminator properties (single-ended or differential) determine the bus segment type. Devices which do not have the same transceiver type as the terminators cannot operate in the segment defined by the terminators.
Glossary

**cabinet**
A cabinet is the StorageWorks enclosure that has exterior panels and doors containing the cable or power distribution units, shelves, fans, and cables which form a storage subsystem.

**cable connector**
A cable connector is any connector which physically is part of a cable assembly.

**cache memory**
Cache memory is a fast storage buffer.

**carrier**
*See modular carrier.*

**CE-Mark**
A CE-Mark is an European Economic Community (EEC) certification label that identifies devices authorized for sale within member nations.

**CE-Mark Class A**
A CE-Mark Class A is similar to the FCC Class A certification, but has European limitations. This certification label appears on electronic devices that are used in a commercial environment.

**CE-Mark Class B**
A CE-Mark Class B is similar to the FCC Class B certification, has European limitations. This certification label appears on electronic devices that are for use in either a home or commercial environment.

**certified device**
A certified device is a storage device that has been tested in a specific configuration and has been determined to be in compliance with a country-specific certification standard.

**channel**
A channel is another term for a SCSI bus.
cold swap
A cold swap is a method used for replacing storage devices when the subsystem power has been removed. Use this method during initial installation, StorageWorks subsystem upgrades, or when conditions preclude using either the “warm swap” or “hot swap” method.

See also warm swap and hot swap.

compatible device
A compatible device is a storage device that has been tested in a specific enclosure and found to be compatible.

cantron
A controller is a hardware-firmware device that manages communications on behalf of host systems over the SCSI bus to devices. Controllers typically differ by the type of interface to the host and provide functions beyond those the devices support. (2) A standalone device that connects a host adapter to the storage SCSI bus. This device provides RAID functionality, typically has multiple SCSI bus ports, performs the lower layers of the SCSI protocol, and normally operates in the initiator role.

converter
See SCSI signal bus converter.

desk side expansion unit
A desk side expansion unit is an enclosure, commonly referred to as a pedestal, which houses a StorageWorks shelf in a vertical position. This pedestal is assembled from a pedestal kit, a user-supplied SBB shelf, storage SBBs, and an ac power cord. The number of devices that can be used, the SCSI buses supported, and the location of the pedestal is determined by the SBB shelf, the storage SBBs, and the SCSI controller used.

devices
Devices are the targets, initiators, hubs, converters, bus expanders, and similar devices interconnected to form a SCSI bus. Connectors, expanders, and hubs do not use SCSI bus IDs.

See also node.
**device connector**
A device connector is any connector that physically is part of a SCSI device. These are the targets, initiators, hubs, converters, bus expanders, and similar devices interconnected to form a SCSI bus. Connectors, expanders, and hubs do not use a SCSI bus ID.

**differential bus**
A bus is a bus in which the potential difference between two wires determines the signal level. A differential bus is more robust and less subject to electrical noise than is a single-ended bus.

**disk array controller**
See **controller**.

**dual bus**
A dual bus is a single SBB shelf SCSI bus that is configured as two individual buses (a four-device bus and a three-device bus). Commonly referred to as a “split bus.”

**dual power configuration**
See **redundant power configuration**.

**dual redundant configuration**
A dual redundant configuration is a controller configuration that consists of a primary and a backup controller mounted in the same controller shelf. When the primary controller fails, the backup controller assumes control over the devices.

**electromagnetic interference**
See **EMI**.

**electrostatic discharge**
See **ESD**.

**EMI**
Electromagnetic interference (EMI) is the impairment of a signal by an electromagnetic disturbance.
Glossary

**ESD**
Electrostatic discharge (ESD) is the discharge of a potentially harmful static electric voltage which is a result of improper grounding.

**FAST 10**
FAST 10 is a SCSI bus which transfers data at a rate up to 10 MB/sec.

**FAST 20**
*See* UltraSCSI.

**FCC**
The Federal Communications Commission (FCC) is the federal agency responsible for establishing standards and approving electronic devices within the United States.

**FCC Class A**
The FCC Class A certification label appears on electronic devices that are used only in a commercial environment within the United States.

**FCC Class B**
This certification label appears on electronics that are used in either a home or commercial environment within the United States.

**Federal Communications Commission**
*See* FCC.

**field replaceable unit**
*See* FRU.

**FRU**
A field replaceable unit (FRU) is a hardware component that can be replaced in the field.

**host**
A host is the primary or controlling computer (in a multiple computer network) to which storage is attached.
host adapter
A host adapter is a device that connects the host system, I/O bus (for example, a PCI bus) to the storage SCSI bus. It also performs the lower layers of the SCSI protocol and normally operates in the initiator role.

host computer
See host.

host controller
A host controller is a device that connects the host system, I/O bus (for example, a PCI bus) to the storage SCSI bus. A host controller provides RAID functionality. It typically has multiple SCSI bus ports, performs the lower layers of the SCSI protocol, and normally operates in the initiator role.

hot swap
A hot swap is a method of replacing devices while the complete system remains online and active during device removal or insertion. The device being removed or inserted is the only device which cannot perform operations during this process.

See also cold swap and warm swap.

hub
A hub consists of a set of three or more bus expanders each coupling a common, short, single-ended bus segment (internal to the UltraSCSI hub) to an external bus segment. The external bus segments can be either single-ended or differential. Coupling all of the external bus segments to the internal bus segment also couples the external buses together. Using hubs enables the creation of a radial topology.

I/O module
An I/O module is a 16-bit SBB shelf device that integrates the SBB shelf with either an 8-bit single-ended, 16-bit single-ended, or differential SCSI bus.

See also shelf I/O module.

Input/Output module
See I/O module.
isolator
See bus extender.

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

logical units
A logical unit is a group of devices that is addressable as a virtual unit.

logical unit number
The software assigned number of a logical unit.

MB/sec
Megabytes per second (MB/s) is the transfer rate data that is determined by the bus width (8- or 16-bit) and the number of bytes per word (1 or 2, respectively).

megabytes per second
See MB/sec.

metric mounting kit
A kit containing brackets and associated hardware for mounting a StorageWorks shelf or enclosure in a cabinet with metric mounting rails. Metric mounting rail hole spacing is 25 mm (0.97 in).

modular carrier
A modular carrier is a StorageWorks-compatible plastic container in which storage devices or power supplies are mounted to create SBBs. These carriers are available in both 3.5-inch and 5.25-inch devices.
Glossary

node
A node is a SCSI bus target or initiator which uses a SCSI bus ID. For example, disk drives, tape drives, controllers, and adapters all have a SCSI bus IDs and are nodes. Hubs, expanders, and converters are devices and do not have SCSI bus IDs.

A wide bus can have a maximum of 16 nodes, SCSI bus addresses 0 through 15.

A narrow bus can have a maximum of eight nodes, SCSI bus addresses 0 through 7.

PDU
A power distribution unit is a data center cabinet that conditions and distributes ac power.

pedestal
A pedestal is the common name for a deskside expansion unit.

See also deskside expansion unit.

port
(1) A port is a logical route for data that is going in and out of a controller. It can have one or more channels that contain the same type of data. (2) The hardware and software which connects a host controller to a CI, SCSI, or SDI bus.

qualified device
See supported device.

quiesce
Quiesce is to keep quiet or still. To quiesce a bus is to make a bus inactive or dormant. For example, you must quiesce SCSI bus operations when warm swapping an SBB.

quiescent
Quiescent is the state of being still or inactive. A bus which is inactive or dormant is quiescent.

radio frequency interference
See RFI.
redundant power configuration
A redundant power supply configuration is a StorageWorks configuration that utilizes multiple power sources, power controllers, and supplies that are used to eliminate single points of failure.
1. For a cabinet, two ac power sources and two CDUs are used to distribute primary and redundant ac power to shelf power supplies.
2. For a shelf, the primary and redundant, shelf, SBB, power supplies ensure that dc power is available even when there is a failure of one supply, one ac source, or one CDU. Implementing the redundant power configuration provides protection against the loss or corruption of data.

repeater
See bus extender.

RETMA

RETMA mounting kit
A kit containing brackets and associated hardware for mounting a StorageWorks shelf or enclosure in a cabinet with RETMA mounting rails.

RFI
A radio frequency interference (RFI) is the impairment of a signal by an unwanted radio signal or radio disturbance.

SBB
A StorageWorks building block (SBB) is any device conforming to shelf mechanical and electrical standards that is installed in either a 3.5-inch or 5.25-inch carrier, and is considered to be an SBB, whether it is a storage device, a power supply, or another device.

SBB shelf
An SBB shelf is the common name for a StorageWorks storage device shelf. This shelf also contains shelf power supply SBBs.
Glossary

**SCSI**
A small computer system interface (SCSI) is an ANSI interface that defines the physical and electrical parameters of a parallel I/O bus used to connect computers and a maximum of seven devices. The StorageWorks subsystem implementation uses SCSI–2, for the synchronous transfer of 8-bit data at rates of up to 10 MB/s.

**SCSI bus connection**
A SCSI bus connection is a connection between two terminators.

**SCSI bus connector**
A SCSI bus connector is any connector that is used to create a SCSI bus segment. SCSI bus connectors are defined by both their function and their physical placement. There are only two functions allowed: bus-path and stub. There are numerous physical placement descriptions, for example, device stub connectors and terminator bus-path connectors.

**SCSI bus signal converter**
A SCSI bus, signal converter is also known 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.
3. The device that extends the length of a differential or single-ended SCSI bus.

*See also* [bus expander, shelf I/O module].

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

**SCSI device ID**
A SCSI device ID is the bit-significant representation of the SCSI addresses which refers to one of the signal lines numbered 0 through 7 for an 8-bit bus or 0 through 15 for a 16-bit bus. It is also known as the “target ID.”
**SCSI domain**  
A SCSI domain is a logical bus consisting of at least one bus segment, at least one initiator, and at least one target. The use of bus extenders can enable multiple bus segments within a domain. Domains are limited by the device addressing scheme. Domains are limited to a total of 16 initiators and targets without the use of logical unit number (LUN) bridges.

**SCSI hub**  
A SCSI hub is a device that connects multiple SCSI segments within a SCSI domain. This hub does not use a device ID.

**SCSI ID**  
*See SCSI device ID.*

**SCSI port**  
(1) Software. The channel that controls communications to and from a specific SCSI bus in the system. (2) Hardware. The name of the logical socket at the back of the system unit to which a SCSI device is connected.

**SCSI stubbing connection**  
A SCSI stubbing connection is a connection in the SCSI bus path that is between a terminator and a connector, such as a trilink connector, and is used to place a controller in the midbus position.

**shelf I/O module**  
A shelf I/O module is the circuit board that connects a 16–bit SBB shelf to a differential or single-ended SCSI bus.  
*See also* differential I/O module and single-ended I/O module.

**shelf power supply**  
Shelf power supply is the power supply that provides +5 V dc and +12 V dc to the StorageWorks shelves. These supplies can be either ac input (90–264 V ac) or dc (48 V dc).

**single-ended bus**  
A single-ended bus is a bus in which the voltage of a single wire, in relation to a ground, determines each signal’s logic level.
single power configuration
A single power configuration is a power configuration in which there is only one ac power source and one CDU or PDU to distribute ac power.

Small Computer System Interface
See SCSI.

spin-down
Spin-down is the process that begins when power is removed from a storage device and data transfer halts, and ends when the device is stopped and can be moved. In the case of disk drives, the heads are retracted and the media is stopped.

spin-up
Spin-up is the process that begins when power is applied to a storage device, and ends when the device is determined to be operational and ready for data transfer operations.

split bus
See dual bus.

storage array
A storage array is an integrated set of storage devices.

storage array subsystem
See storage subsystem.

storage subsystem
A storage subsystem is a collection of controllers, storage devices, shelves, cables, and power supplies that form a mass storage subsystem.

StorageWorks
StorageWorks is the DIGITAL product set 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 to form storage subsystems. System level enclosures house the shelves.
StorageWorks building block

See SBB.

supported device

(1) A device that has been fully evaluated in an “approved” StorageWorks configuration (such as, shelf, cabinet, power supply, cabling, and so forth), and is in complete compliance with country-specific standards (for example, FCC, CE-Mark, CSA, TÜV, VDE, and so forth) and all DIGITAL standards. (2) A device supported by a controller or host operating system.

target

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

target ID

See SCSI device ID.

terminators

Terminators are the interconnect components that form the ends of the transmission lines in bus segments. A SCSI domain must have at least one segment and at least two terminators. The terminators ensure that inactive SCSI bus signals are in a known state. There are special cases where the electrical transmission lines are very short and only one termination or pull-up is required.

There are two basic types of terminators—active and passive:

- Single-ended bus segments use active, linear terminators.
- Differential bus segments use passive (linear totem pole) terminators.

topology

Topology is the physical arrangement and relationship of interconnected nodes and SCSI buses in a network. A network topology shows the hosts and the lines between them. A legal topology must satisfy all of the requirements for the associated SCSI bus (FAST 10, UltraSCSI, and so forth).
tree
A tree is an UltraSCSI bus configuration where an expander, located in the middle of a bus segment, enables the bus to "branch" or create a tree configuration, rather than a point-to-point configuration. It is also known as a "branch" configuration.

UL
Underwriters Laboratories (UL) is an organization that tests and certifies electrical devices.

UltraSCSI
UltraSCSI is an improvement in SCSI technology that was invented in 1993 by Digital Equipment Corporation StorageWorks Engineering Group. Subsequently the ANSI SCSI standards committee issued standard X3T10 for UltraSCSI.

The UltraSCSI improvements over Fast SCSI include the following:
- Maximum transfer rate increases from 10 MHz to 20 MHz.
- Maximum wide bus bandwidth increases from 20 MB/sec to 40 MB/sec.
- VHDCI (very high density, connector interface) cables and connectors are significantly thinner and smaller.

UltraSCSI device
An UltraSCSI device is a device that complies with UltraSCSI specifications.

UltraSCSI domain
An UltraSCSI domain is a single, logical, UltraSCSI bus that is composed of multiple, diverse, bus segments

See also bus segment.

Underwriters Laboratories
See UL.
universal ac input power supply

*See* shelf power supply.

VHDCI

A Very High Density Cable Interconnect (VHDCI) has a 68-pin interface with connectors on 8 mm centers. It is required for UltraSCSI.

warm swap

A warm swap is a method of device replacement when the complete system remains online during device removal or insertion. During device insertion or removal, the bus may halt for a brief period of time. System booting or code loading cannot occur until insertion of the replacement device is complete. There is no noticeable impact on user applications which are not dependent upon the devices on the “affected” SCSI bus.

*See also* cold swap and hot swap.