CHALLENGE™ Vault Rack and SCSIBox 2 Installation Instructions

Document Number 108-7044-040

Contributors

Written by Pablo Rozal
Production by Laura Cooper
Illustrations by Dan Young, Cheri Brown
Engineering contributions by David Alexander, Ted Wong, Suzy Jones, Greg Schaem, Rich Altmaier, John Kraft, Jeremy Higdon

CHALLENGE Vault Rack and SCSIBox 2 Installation Instructions
Document Number 108-7044-040

Silicon Graphics, Inc.
Mountain View, California

Contents

Figures

Tables

print/1-1.chal.vault.rack.ai 1-2
print/1-2.SCSIbox.ai 1-3
print/1-3.12.drive.vault.box.ai 1-5
print/4-1.scsibox2.front.ai 4-2
print/4-2.vaultscsibox2.rear.ai 4-3
print/4-3.differential.cabling.ai 4-5
print/4-4.sngl.ended.cabling.ai 4-5
print/4-5.scsi.backplane.front.ai 4-6
print/4-6.scsi.backplane.rear.ai 4-6
print/4-7.vaultbox.rackmt.box.comparo.ai 4-8
print/4-8.NCR.board.ai 4-10
print/4-9.rancho.bd.2.jumper.ai 4-11
print/4-10.rancho.3.ai 4-12
print/4-11a.12vault.ai 4-13
print/5-1.remove.side.panels.ai 5-3
print/5-2.SCSIBox2.install.ai 5-4
print/5-3.scsi.box.caution.ai 5-5
print/5-4.scsi.drive.sled.bd.ai 5-7
print/5-5.install.rem.scsibox.drive.ai 5-9
print/5-6.rem.scsibox2.drive.shelf.ai 5-10
print/scsi.terminator.markings.ai 5-12
print/5-8.connect.rack.to.desksd.ai 5-14
print/scsi.label.024.0610.ai 5-16
print/scsi.label.024.0637.ai 5-16
print/scsi.label.024.0610.ai 5-16
print/scsi.label.024.0637.ai 5-16
print/scsi.label.024.0610.ai 5-17
print/scsi.label.024.0637.ai 5-17
print/scsi.bulkhead.conn.ai 5-17
print/scsi.drive.adaptor.label.ai 5-17
print/scsi.label.024.0632.ai 5-17
print/scsi.label.024.0610.ai 5-17
print/scsi.label.024.0637.ai 5-17
print/scsi.label.024.0671.ai 5-18
print/scsi.label.024.0655.ai 5-18
print/scsi.label.024.0610.ai 5-18
print/scsi.label.024.0637.ai 5-18
print/scsi.terminator.label.ai 5-18
print/scsi.label.024.0610.ai 5-18
print/scsi.label.024.0637.ai 5-18

Chapter 1

General Information

This manual provides instructions for installing and operating the CHALLENGE™ Vault peripherals rack (see Figure 1-1) and the SCSIBox 2 (see Figure 1-2). The SCSIBox 2 (Model No. CMN AS02) houses SCSI drives for use with the Vault rack. This information is written for Silicon Graphics® system support engineers (SSEs) and third-party field support groups responsible for product installation and testing.

Note: This document covers the 12-drive box Vault (CMN A012B). The 12-drive box Vault (see Figure 1-3) supports front and rear drive box installation. The 7-drive box Vault holds only drive boxes in the front of the chassis and does not have any supporting railing in the back of the chassis. Both versions also have the same product name. The newer 12-drive box model replaces the older 7-drive box Vault, which is no longer being manufactured by Silicon Graphics.

Caution: You cannot upgrade an existing 7-drive box Vault to a 12-drive box Vault by installing additional rails in the rear.

1.1 Manual Organization

This manual is divided into seven chapters as follows:

Chapter 1, “General Information,” introduces the CHALLENGE Vault rack and the SCSIBox 2.

Chapter 2, “Components,” provides parts lists for the upgrades.

Chapter 3, “Specifications,” discusses preinstallation requirements and lists pertinent product specifications.

Chapter 4, “Chassis Tour,” describes the controls, connectors, indicators, and available product configurations.

Chapter 5, “Installation,” discusses how to install the SCSI drive box and the Vault rack.

Chapter 6, “Verifying Installation,” describes how to test the installation.

Chapter 7, “Software Guidelines,” provides guidelines to reconfigure the system software if needed to operate the rack and drive box.

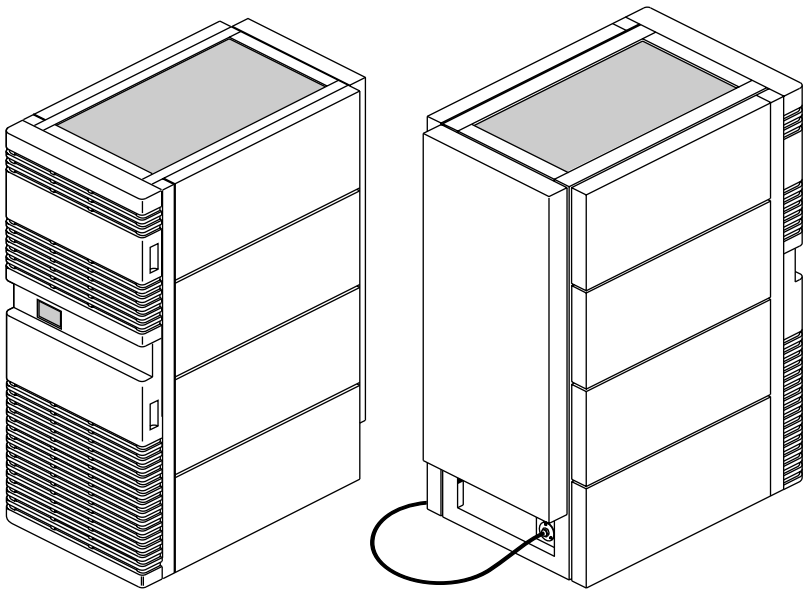


Figure 1-1 CHALLENGE Vault Rack

Figure 1-2 Vault SCSIBox 2

1.2 Safety Information

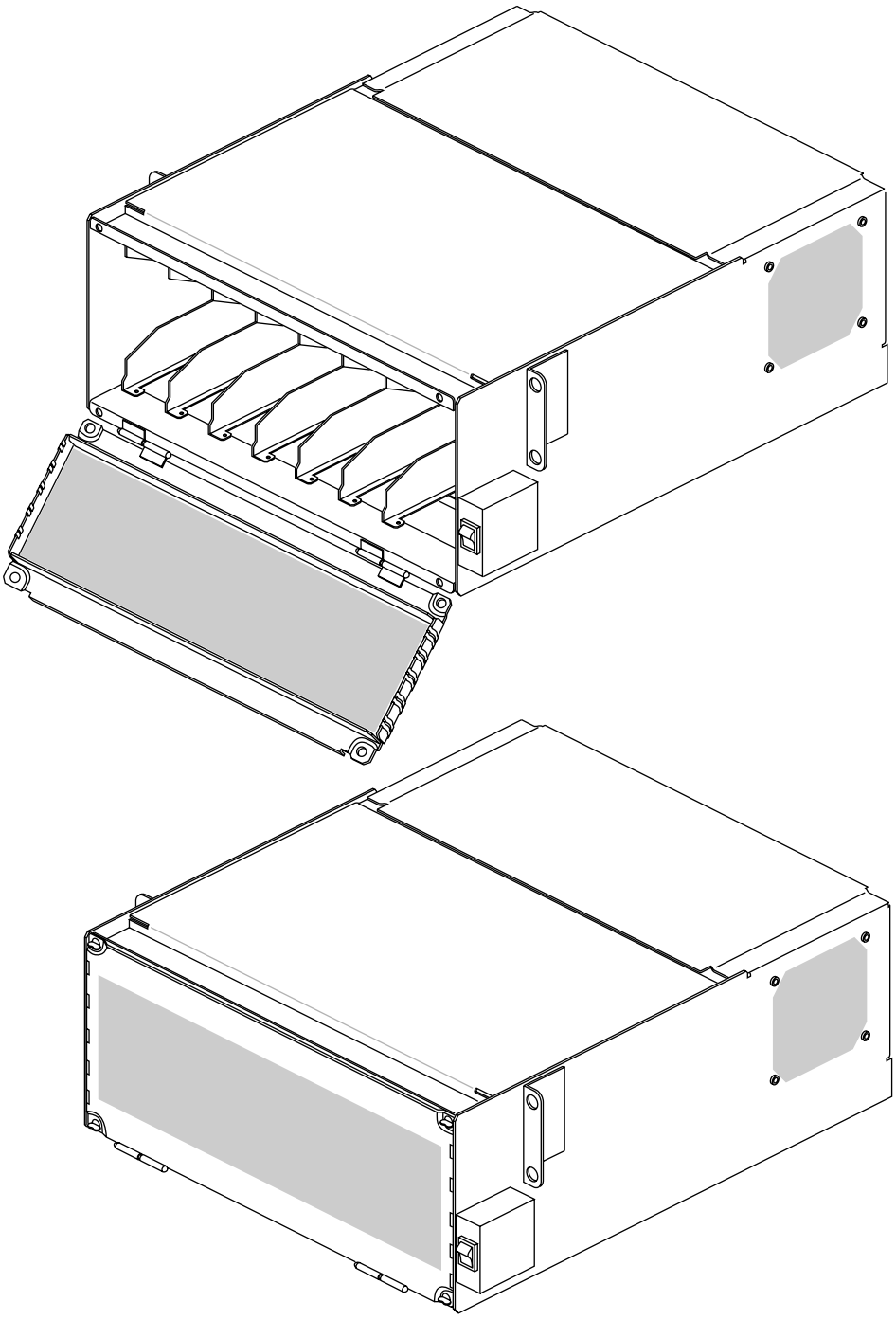
Be sure to read the following information before you begin installation.

Warning: **Installation of these upgrades requires specific training and technical knowledge. These instructions have been provided for use by Silicon Graphics system support engineers (SSEs) or other Silicon Graphics-trained personnel only. This equipment utilizes electrical power internally that is hazardous if the equipment is improperly disassembled.**

Caution: This equipment is extremely sensitive and susceptible to damage caused by electrostatic discharge (ESD). ESD is an electrical discharge (spark) caused by the buildup of electrostatic potential on clothing and other materials.

You must use proper ESD preventive measures and observe these precautions:

- Connect a ground strap to your wrist when connecting / disconnecting peripherals.



- Be sure that you and all of the electrical equipment that you handle during this installation are at ground potential to avoid damage from ESD.
- Keep the boards or drives in the antistatic bags provided. Remove a board or drive from its antistatic bag only when you are properly grounded to the chassis ground with a ground strap.

- There are 14 fuses installed on the backplane. For continued protection against risk of fire, replace only with the same type and rating of fuse: Cooper Industries, Bussman Div., P / N MCR-5, rated at 125V, 5A.

1.3 Vault Features

The Vault rack can house a number of different drives, including SCSI hard disks, helical scan 8-mm tape, and RAID (redundant array of inexpensive disks). The Vault (see Figure 1-3) can also hold up 12 drive boxes and up to 96 half-height or 48 full-height drives.

Figure 1-3 12-Drive Box Vault

Note: The 12-drive box Vault supports SCSIBox 2s in the front and rear of the chassis.

1.4 CHALLENGE Vault SCSIBox 2 Features

The Vault SCSIBox 2 (see Figure 1-2) provides enhancement to previous Silicon Graphics SCSI boxes and features the following improvements:

- supports up to 8 half-height or 4 full-height SCSI drives
- comes in single-ended or differential SCSI configurations
- provides front-loading drive capability

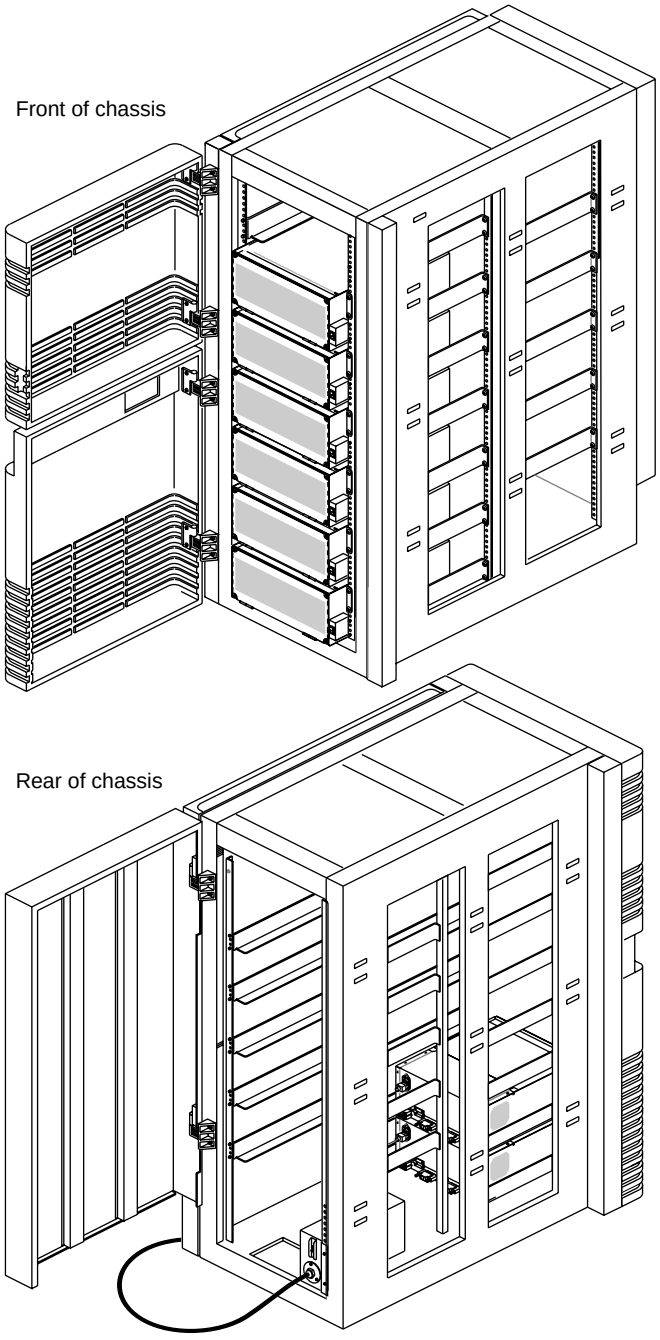
Note: The Vault SCSIBox 2 is different from the SCSIBox 2 that installs into the Onyx™ and CHALLENGE rackmount chassis. For a list of differences between these two drive boxes, see Chapter 4, “Chassis Tour.”

1.5 Minimum Hardware and Software Requirements

The Vault rack operates with only the Onyx and CHALLENGE rackmount and deskside systems, and the Vault SCSIBox 2 works only in the Vault rack.

Caution: You cannot use a Vault SCSIBox 2 in an Onyx or CHALLENGE rackmount chassis; nor can you use an Onyx or CHALLENGE SCSIBox 2 in a Vault rack.

Note: To support this upgrade, you need to install IRIX 5.0 or later.


Front of chassis
Rear of chassis

Chapter 2

Components

This chapter provides parts lists for the SCSIBox 2 (single-ended and differential) and the Vault rack.

Note: Parts and part numbers are subject to change.

2.1 Single-Ended SCSIBox 2

Table 2-1 is a parts list for the single-ended SCSIBox 2 upgrade (marketing code P-S-SBX2-XSE).

Part Number	Description
013-0567-001	SCSIBox 2, single-ended
024-0632-001	SCSI device label
024-0610-001	SCSI channel label set
024-0603-001	System label set
9290053	68-pin cable assembly (50 ft)
9350053	250 V, 10 A power cord
9290055	68-pin cable assembly (2 ft)

Table 2-1 Single-ended SCSIBox 2 Parts List

2.2 Differential SCSIBox 2

Table 2-2 is a parts list for the differential SCSIBox upgrade (marketing code P-S-SBX2-X).

Part Number	Description
013-0566-001	SCSIBox 2, differential
024-0632-001	SCSI device label

Table 2-2 Differential SCSIBox 2 Parts List

Part Number	Description
024-0610-001	SCSI channel label set
024-0603-001	System label set
024-0608-001	Overheating caution label
9290053	68-pin cable assembly (50 ft)
9350053	10A, 250 V power cord
7270109	10-32 x 3/8 screw

Table 2-2 Differential SCSIBox 2 Parts List

2.3 Vault Rack

Table 2-3 is a parts list for the Vault (marketing code P-S-VXL-12).

Part Number	Description
024-0603-001	System label set
050-0037-001	Side rack plastic panel
013-0671-001	Upper front door assembly
013-0673-001	Lower front door assembly
024-0622-001	Vault door label (upper)
007-1762-020	CHALLENGE Vault/SCSIBox 2 Owner's Guide
013-0624-002	RS232 plate assembly
013-0589-003	T2, cabinet subassembly
026-0806-001	Rack shipping kit
024-0615-001	Vault door label (lower)
024-0610-001	Label set, SCSI channel
024-0648-001	Label set, SCSI channel, 30-37
024-0649-001	Label set, SCSI channel, 40-47
024-0650-001	Label set, SCSI channel, 50-57
024-0651-001	Label set, SCSI channel, 70-77
024-0652-001	Label set, SCSI channel, 90-97
024-0653-001	Label set, SCSI channel, 110-117
024-0654-001	Label set, SCSI channel, 130-137

Table 2-3 Vault Rack Parts List

Chapter 3

Specifications

Electrical and environmental requirements and specifications for the Vault rack and SCSIBox 2 are described in this chapter.

3.1 Vault Specifications

Table 3-1 lists the Vault rack specifications.

Parameters	Characteristics
Dimensions (Height x Width x Depth)	62.3” (158 cm) x 27” (69 cm) x 48” (122 cm)
Weight	320 lb (145 kg) without boxes or drives 1199 lb (544 kg) fully loaded
Electrical	
Voltage	208 to 230 VAC, single phase
Frequency	50 Hz (minimum) 60 Hz (maximum)
Current	220VAC at 16A, single phase
Connector	NEMA L6-30P, 2-P, 3-2 30A, 250V (U.S., Canada, and Japan); IEC-309 2-P, 3-W, 30A, 240V (International)
Safety	
UL	Listed under UL 478–Data Processing Equipment, Electronic
Canadian Standards Association (CSA)	Certified under CSA 220-M1986–Information Processing and Business Equipment
TUV	Licensed under CENELEC European Norm EN 60 950 / 09.87
EMI	FCC Class A, VDE Level A, DOC Class A, VCCI Class 1, CISPR-22 Class 1
Product Model No.	CMN A012B

Table 3-1 Vault Specifications

Parameters	Characteristics
Environmental	
Temperature	5 to 35 degrees C at sea level (operating) –15 to +65 degrees C at sea level (nonoperating)
Relative Humidity	
Operating	20 to 80%, noncondensing (operating) 10 to 90%, noncondensing (nonoperating)
No. of SCSI Boxes	Up to 12 (7 in the front of chassis and up to 5 in the rear of the chassis)
Peripherals Supported (SCSI only). See note below.	780 MB fast 1.2 GB 1.6 GB full-height 2.0 GB half-height 2.4 GB full-height 8-mm tape RAID

Table 3-1 (continued) Vault Specifications

Note: The Vault supports 8-bit differential (10 MB/sec) and 16-bit differential (20 MB/sec) SCSI drives.

3.2 SCSIBox 2 Specifications

Table 3-2 lists the SCSIBox 2 specifications.

Parameters	Characteristics
Dimensions (Height x Width x Depth)	7.5” (19.05 cm) x 17.25” (43.82 cm) x 20.5” (52.07 cm)
Weight	35 lb (15.88 kg)–without drives
Device Weight	4.5 to 7.6 lbs (2.04 to 3.45 kg)
Electrical	
Power Supplies	5 VDC at 16 A 12 VDC at 20 A
Voltage	208 to 230 VAC, single phase
Frequency	50 Hz (minimum) 60 Hz (maximum)
Line Current	1.5 A

Table 3-2 SCSIBox 2 Specifications

Parameters	Characteristics
Safety	
UL	UL 1950
CSA	CSA C22.2 No. 154-M1983 or CAN / CSA-C22.2 No. 950-M89
TUV	EN60 950
EMI	FCC, Part 15, Class A VDE 0871 / 6.78, Level A V.C.C.I., Class 1 Limits
Product Model No.	CMN AS02
Environmental	
Operating	5 to 35 degrees C at sea level
Nonoperating	-15 to +65 degrees C at sea level
Relative Humidity	
Operating	20 to 80%, noncondensing
Nonoperating	10 to 90%, noncondensing

Table 3-2 (continued) SCSIBox 2 Specifications

Chapter 4

Chassis Tour

This chapter describes the product controls and connectors on the SCSIBox 2 and Vault.

4.1 SCSIBox 2 Chassis Tour

Figures 4-1 through 4-4 and the following sections describe the major components of the SCSIBox 2.

4.1.1 Front View

The front of the SCSIBox 2 chassis has these major components (see Figure 4-1):

Drive door — opens and closes using two quarter-turn wing-nut fasteners near the top corners of the box. To open and close the door, push in on the fastener and turn partway. *Do not overturn the fasteners, they can snap off and break.*

Caution: The drive door must be in place during operation to comply with FCC regulations and to ensure proper air flow through the drive box.

On / Off switch — controls power to all drives. This green switch illuminates when turned on.

Drive shelves — house the SCSI drives and drive sled. The shelves are removable to accommodate full-height drives. See Section 5.3.5, “Removing a Drive Shelf to Install a Full-Height Drive.”

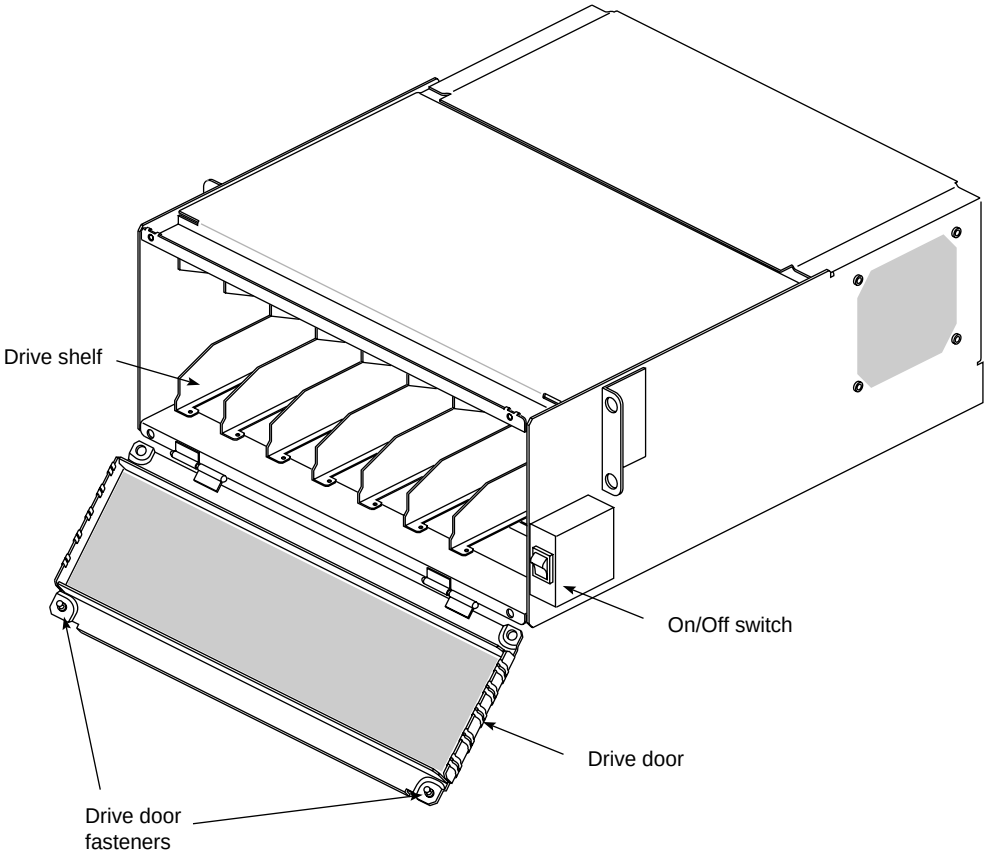
Note: The full-height drives require two half-height slots.

Figure 4-1 SCSIBox 2 (Front View)

Caution: Do not overturn the quarter-turn door fasteners or else they may break.

4.1.2 Rear View

These major components are located on the back of the SCSIBox 2 (see Figure 4-2):



SCSI In (A / B) provides a 68-pin SCSI-2 differential connector.

Note: Each SCSIBox 2 provides two SCSI In connectors for disk striping and increased I / O throughput.

SCSI Out (A / B)
provides connection for SCSI termination or a daisy-chain connection to another SCSI box.

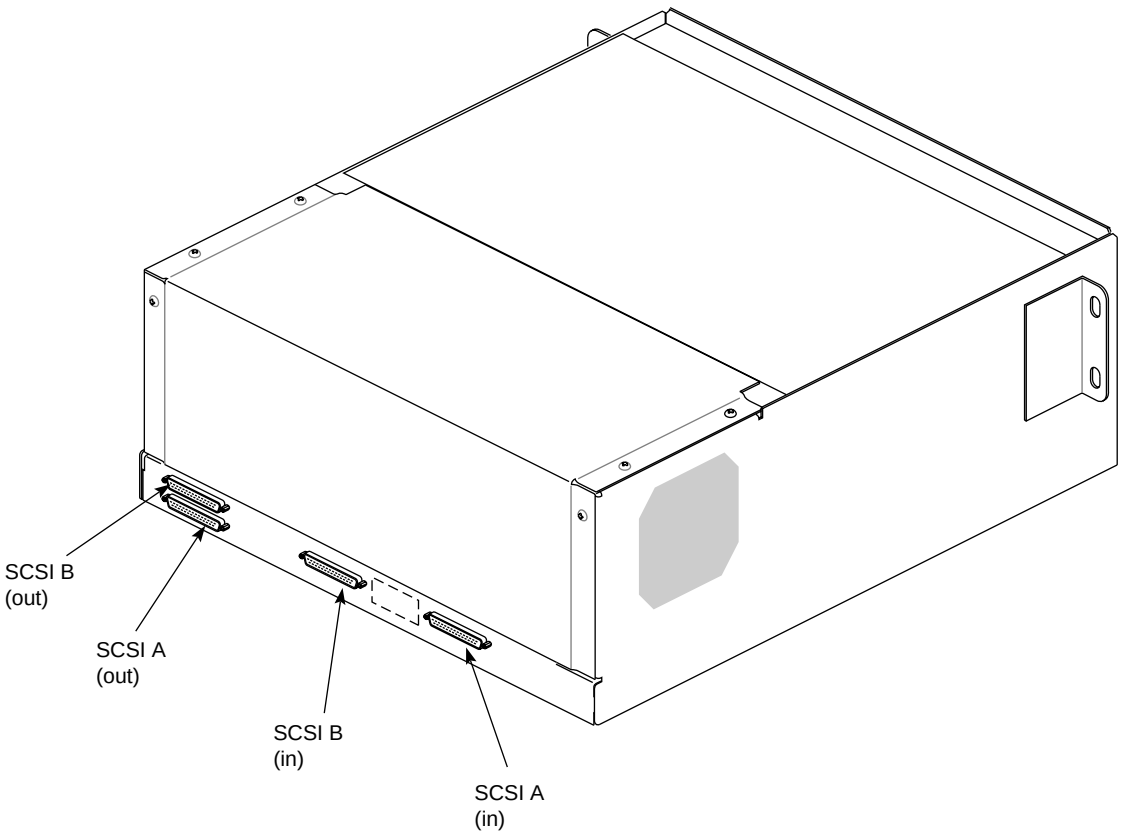
Figure 4-2 Vault SCSIBox 2 (Rear View)

4.1.3 Inside View

These parts are located inside the SCSIBox 2 (see Figures 4-3 and 4-4):

Power supply provides 5 and 12 volts of power to all drives and fans in the box, respectively.

Differential converter boards
convert the differential SCSI signals from the IO4 to allow connection to single-ended devices.



Note: The differential converter boards are present only in single-ended SCSI boxes.

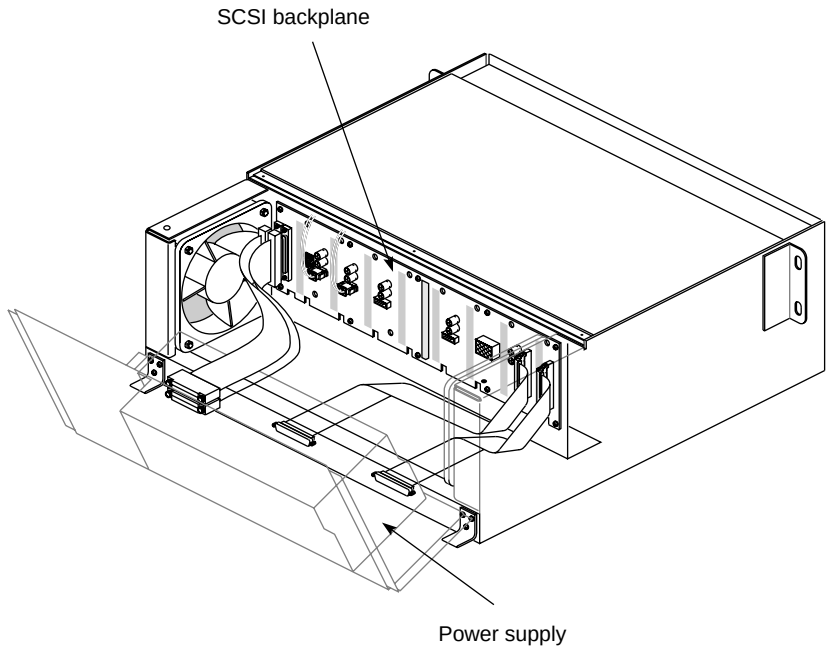
SCSI backplane

enables connection to SCSI devices. This backplane is the same in both single-ended and differential SCSI boxes.

Figure 4-5 shows the front view of the SCSI backplane. Note the pair of green LEDs associated with each drive bay. When illuminated, the top LED signifies that the drive is receiving 5 volts, and the lower LED signifies that the drive is receiving 12 volts.

Figure 4-6 shows the rear view of the SCSI backplane and the required jumper settings.

Figure 4-3 Differential SCSIBox 2 (Inside Box)



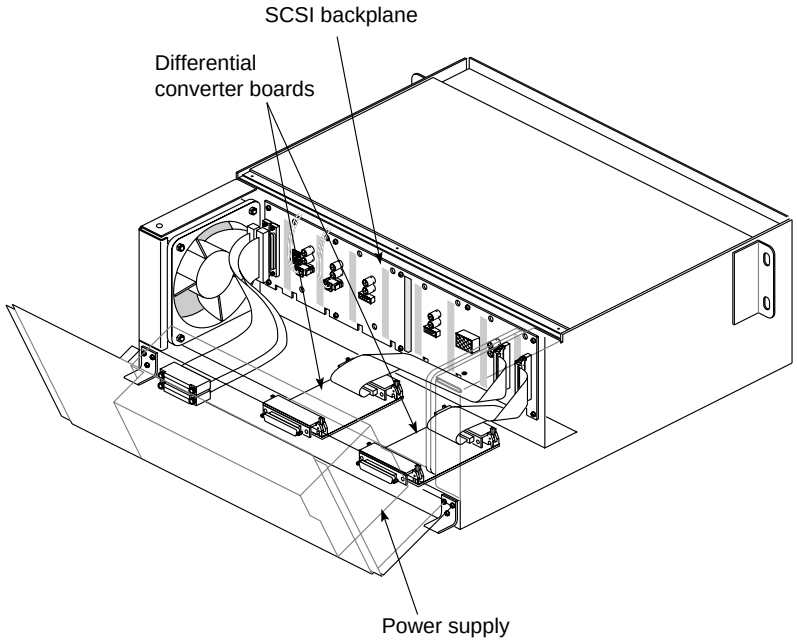


Figure 4-4 Single-Ended SCSIBox 2 (Inside Box)

Figure 4-5 SCSI Backplane (Front View)

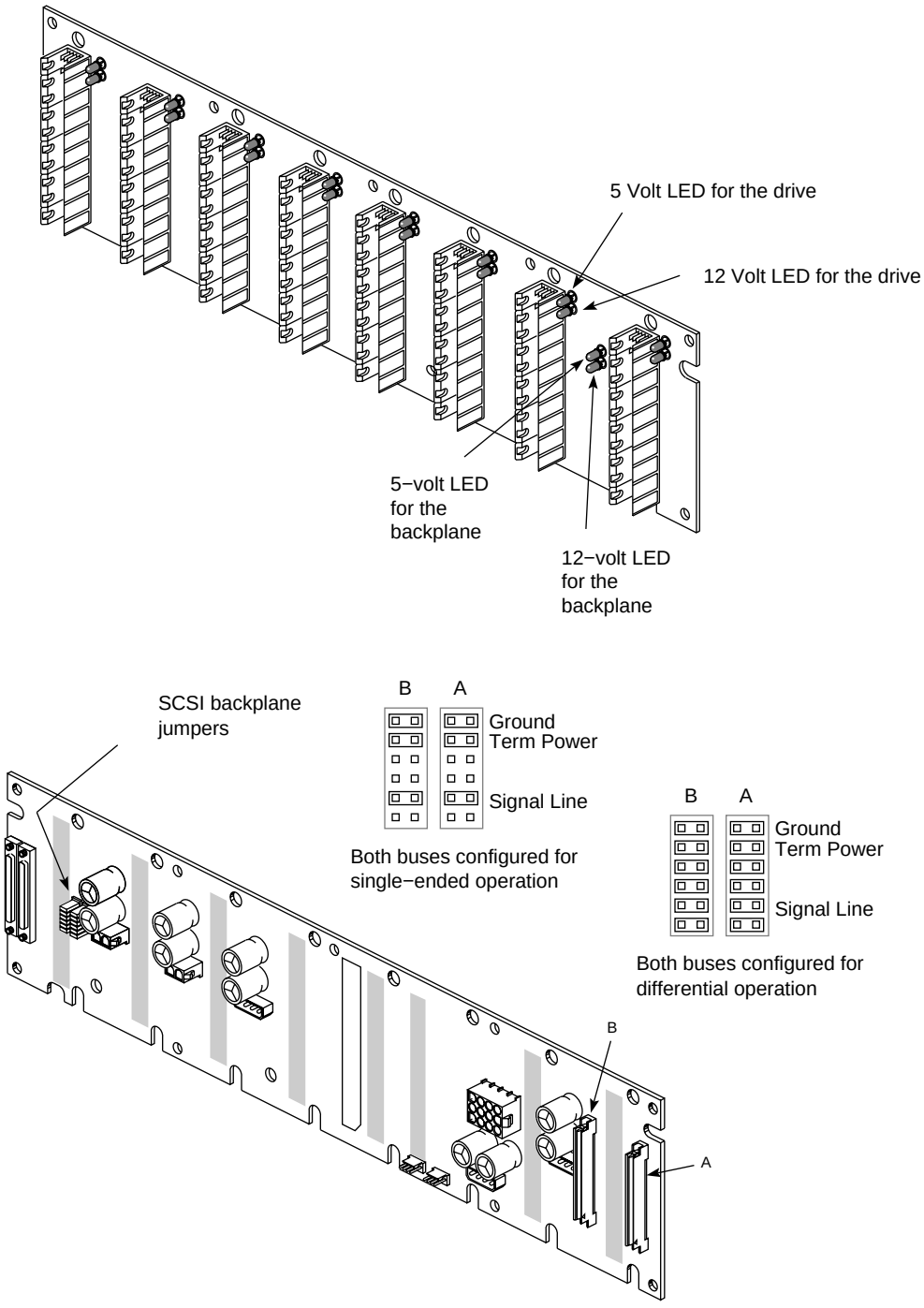


Figure 4-6 SCSI Backplane (Rear View)

4.1.4 Comparing SCSIBox 2s

As stated in Chapter 1, “General Information,” the Vault SCSIBox 2 and the Onyx and CHALLENGE rackmount SCSIBox 2 (also known as the *stubbi-SCSI box*) are two different

SCSI boxes and are not interchangeable. The Vault SCSIBox 2 can install only into a Vault peripherals rack and the other SCSIBox 2 can install only into an Onyx and CHALLENGE rackmount system. The differences between these two drive boxes are: (see also Figure 4-7).

- The Vault SCSIBox 2 has a self-contained power supply that directly converts the 220 VAC input to 5 and 12 VDC. The other SCSIBox 2 contains a 512S power board that converts the 48 VDC from the off-line switching (OLS) power supply in the Onyx and CHALLENGE rackmount system to the required voltages.
- The Vault SCSIBox 2 has two internal fans; the other SCSIBox 2 is cooled by two large, central fans in the Onyx and CHALLENGE rackmount chassis.
- The Vault SCSIBox 2 is a slighter longer box.

Note: Other than these differences, the Vault SCSIBox 2 and the Onyx and CHALLENGE SCSIBox 2 are essentially the same. Drives are directly interchangeable between the two boxes. No drive sled or drive shelf modification is required.

Figure 4-7 Vault SCSIBox 2 and Onyx and CHALLENGE Rackmount SCSIBox 2 Comparison

4.2 SCSIBox 2 Configurations

The SCSIBox 2 is available in three configurations:

- single-ended
- differential
- RAID

Note: For information on RAID installation, see the *Raid Hardware Installation and Upgrade Instructions* (P / N 108-0104-*xxx*) as required.

The single-ended configuration enables you to use single-ended devices in the rack. This box contains two differential converter boards.

Caution: The total cable length from the IO4 board to the last device in this configuration cannot exceed 81 feet (25 meters).

4.3 Differential-to-Single-ended SCSI Converter Boards

The single-ended SCSIBox 2 uses three versions of the converter board. Two are manufactured by Rancho and the third board is produced by NCR. If you are replacing a converter board in the SCSI box, ensure that the replacement board is jumpered according to Figure 4-8 through Figure 4-10.

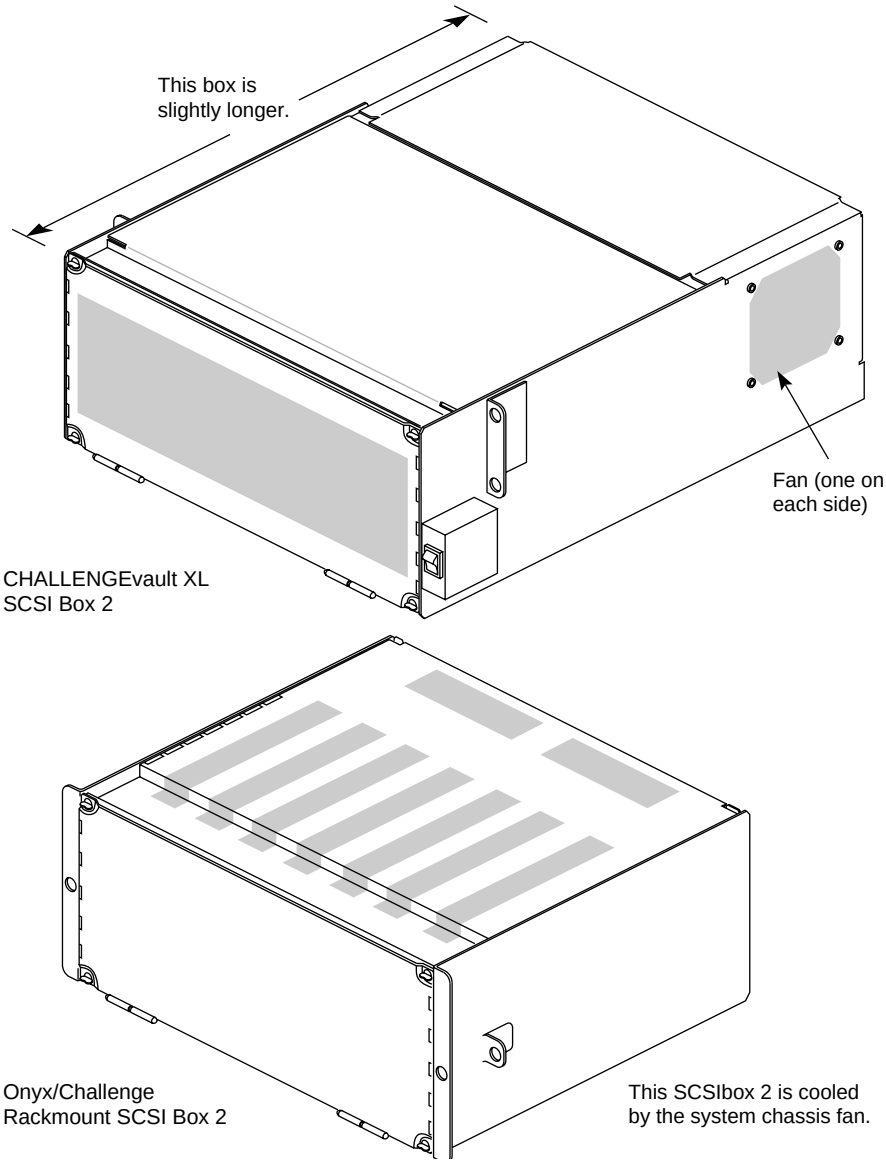


Figure 4-8 NCR Differential Converter Board Jumpering

Figure 4-9 Rancho Differential Converter Board Jumpering (Two Jumper Version)

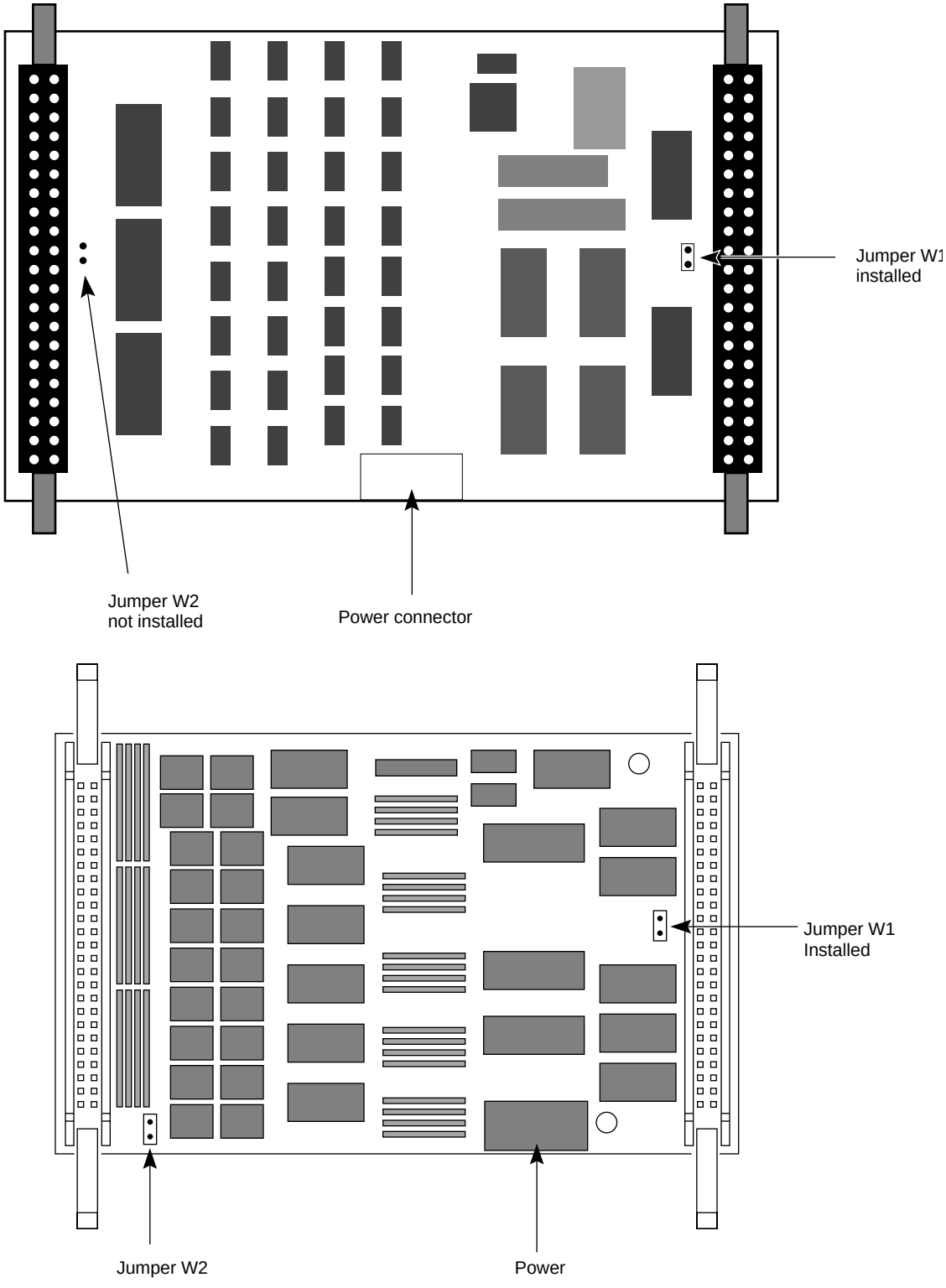
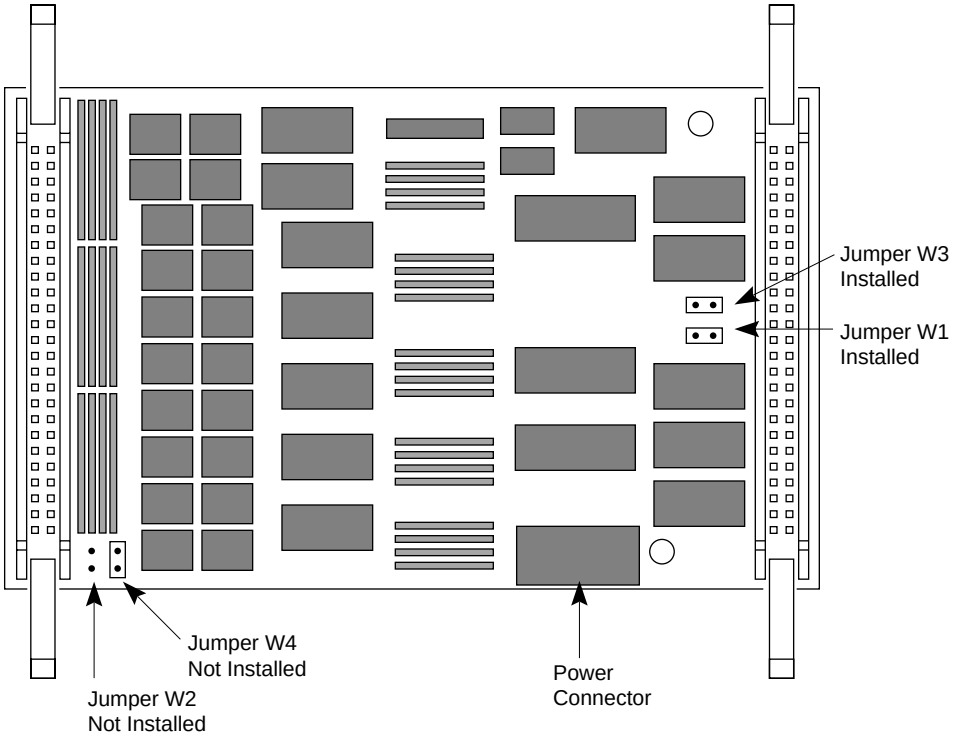


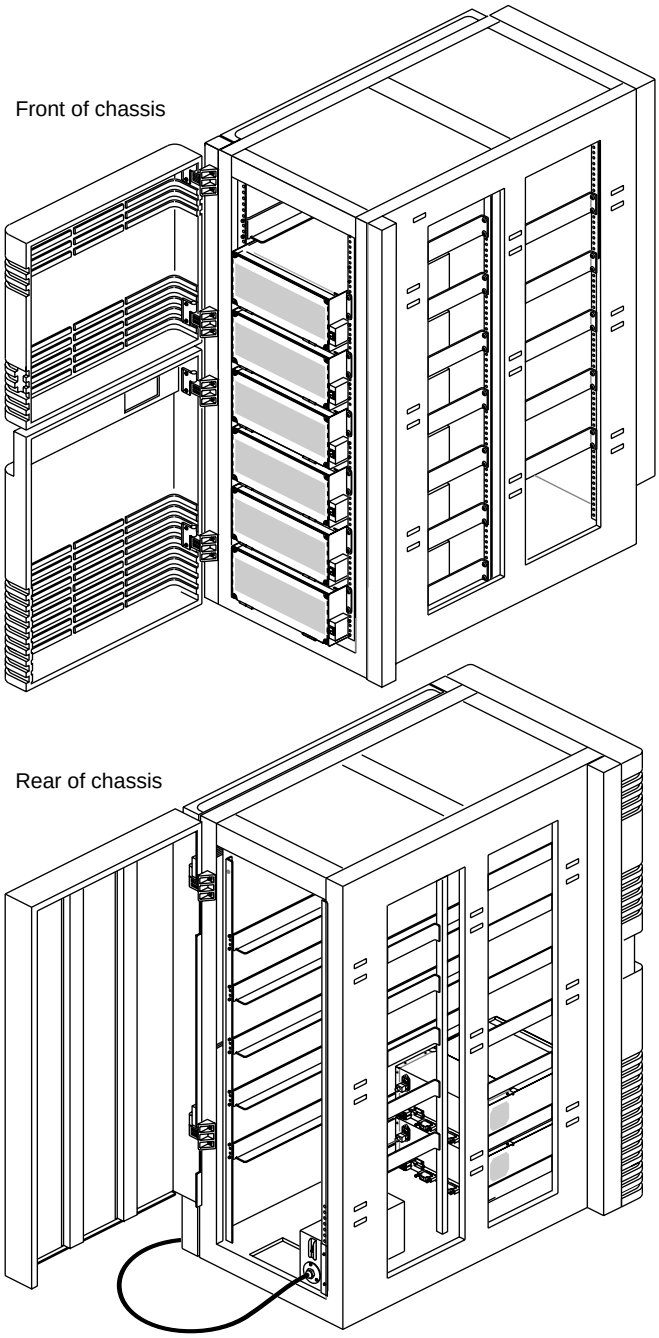
Figure 4-10 Rancho Differential Converter Board Jumpering (Three Jumper Version)



4.4 Vault Chassis Tour

Unlike previous peripheral racks such as the POWER Store™ (Tallboy / Julius), the Vault contains preinstalled drive rails for easier installation in the field. Figure 4-11 shows the front of rear view of the Vault.

Figure 4-11 Front and Rear View of the Vault Chassis


Front of chassis
Rear of chassis

Chapter 5

Installation

This chapter covers the following procedures:

- installing a SCSIBox 2
- installing devices into the drive box
- connecting the Vault to the host system
- connecting multiple Vaults

5.1 Preinstallation Checklist

Perform the following before you actually begin the installation:

- Check the number of available differential SCSI ports on the host system. Do you have the sufficient number of channels to support the rack configuration?

  Note: Each drive box requires at least one dedicated channel and two channels for disk striping.

- Ensure that you are using only differential SCSI channels on the I/O panel.
- Check that you have the required cabling. Do you have enough external SCSI cables (P/N 9290053) to handle your configuration? Are you planning to daisy-chain between boxes? If so, do you have enough 2-ft cables (P/N 9290055)?

  Note: There are also a few rules to follow when daisy-chaining between drive boxes. See 5.5.2, "Daisy-chaining between SCSIBox 2s," for more information.

5.2 Installing a SCSIBOX 2

This section describes how to install a single-ended or differential SCSIBox 2 into a Vault.

Caution: Do not attempt to install a SCSI Box 1 into a 12-drive box Vault (front- and back-loading chassis). The SCSI Box 1 is too long and will not fit properly into a 12-drive box Vault as they will bump against the boxes on the other side of the chassis. In addition, do not install a 1/2-inch tape drive into a Vault rack. This will violate the UL, TUV, and CSA agency approval rating of the Vault rack.

5.2.1 Installing a SCSIBox 2

The following installation procedure applies to only the Challenge Vault SCSIBox 2 and *not* the SCSIBox2 that installs into a Challenge or an Onyx rackmount system. See Section 4.1.4, "Comparing SCSIBox 2s," for more information.

These instructions apply to both the single-ended and differential SCSIBox 2.

Caution: The SCSIBox 2 weighs 35 lb (16 kg) without drives. For easier loading, it is recommended that the drives be inserted after the box is installed.

1. Remove the side panels on both sides of the chassis by tugging hard on the panel (towards the rear) and pulling them straight out and away. See Figure 5-1. This allows you to gain better access for cabling.

   Note: You can remove the panels just about anytime during the procedure, but it's recommended that you do it at the beginning to ease installation.

2. Lift up the first SCSIBox 2 and install it into the rails at the bottom. Always start with the lowest set of rails, then work your way up. See Figure 5-2.

   Caution: If you install the drive boxes in only the top portion of the Vault, the rack can tip over or the drive boxes can fall out when you try to remove them. See Figure 5-3.

   Note: The SCSIBox 2 is held in place by four screws and gravity. There is no additional holding mechanism to keep the boxes from falling after they have been pulled away from the rack.

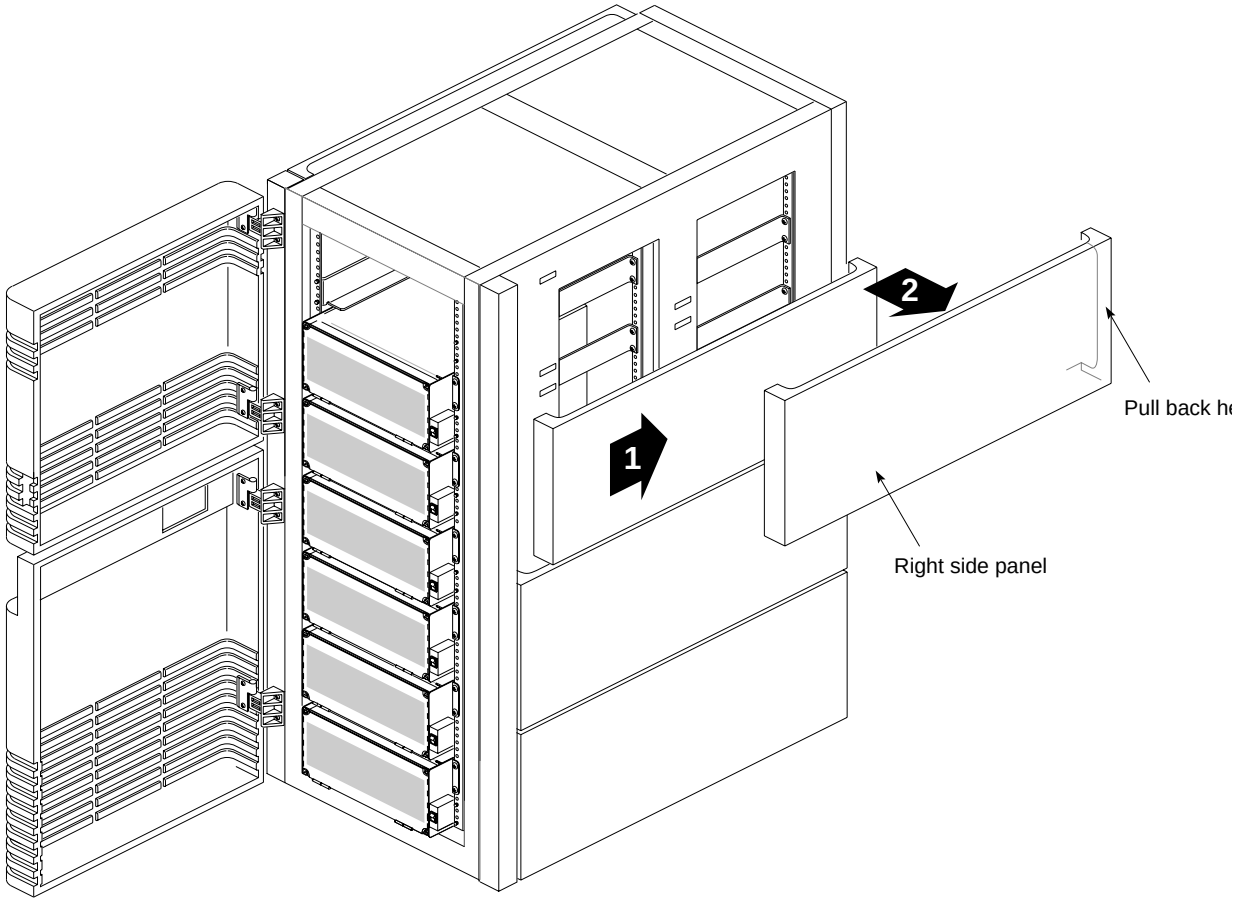
3. Secure the SCSIBox 2 to the vertical rails on the chassis using two screws on each side. Refer to Figure 5-2.

4. Use filler plates as required to cover open areas on the chassis.

Figure 5-1 Removing the Side Panels

Figure 5-2 SCSIBox 2 Installation

Figure 5-3 SCSI Box Caution



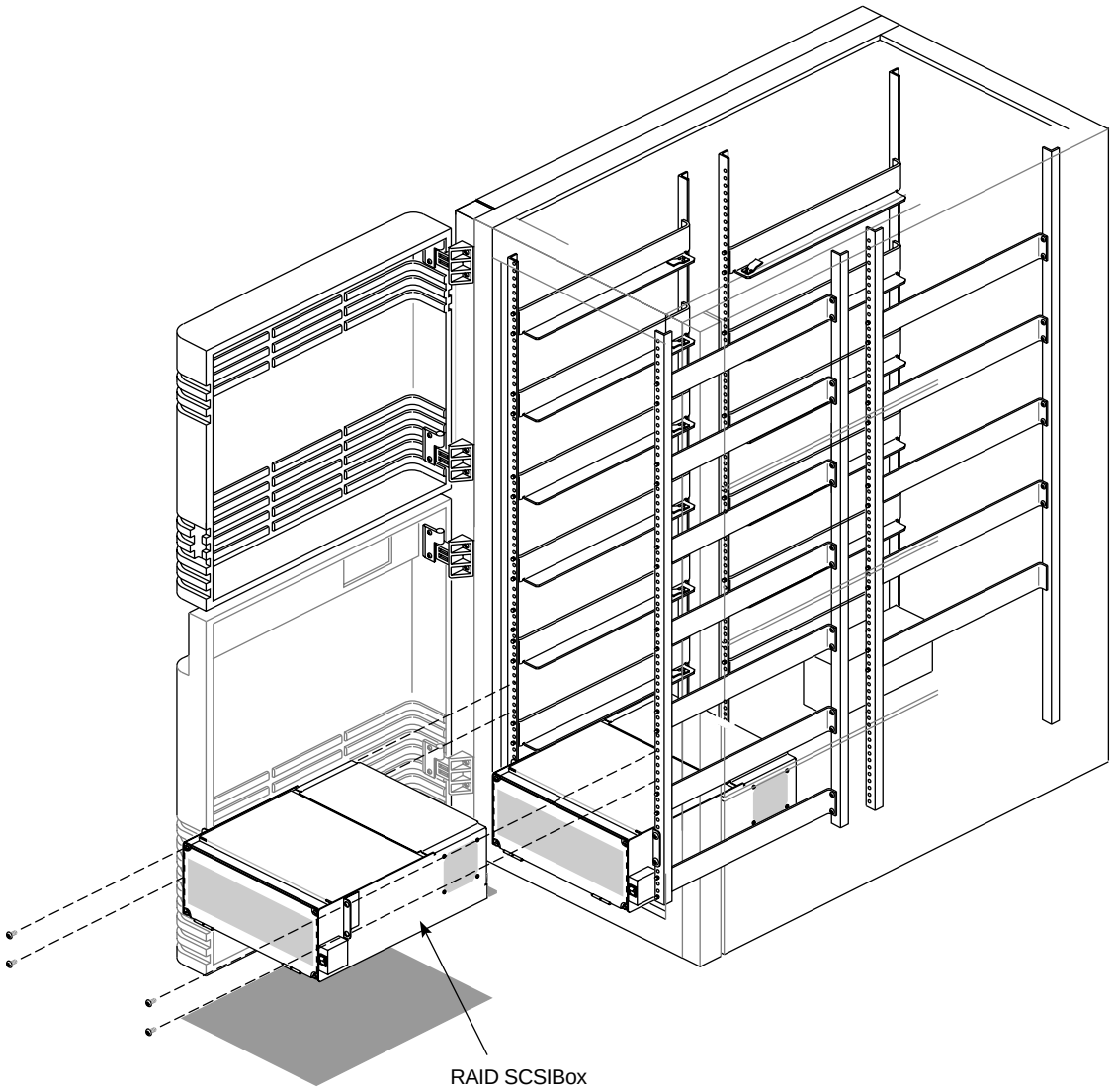
Caution: The Vault chassis does not have special support mechanisms to hold the SCSIBox 2 in place while the drive box is pulled out from the chassis. The top two SCSIBox 2s, especially, can easily fall to the ground and cause equipment damage or bodily injury, if they are pulled too far out and left sitting on the rails.

5.3 Installing and Removing SCSIBox 2 Drives

This section describes how to install and remove drives for the SCSIBox 2; however, before you install drives into the SCSIBox 2, you need to perform these tasks:

- select the SCSI ID for the drives
- select the correct channel (A or B) on the drive sled
- ensure that the drive sled jumpers are set correctly

Note: A set of jumpers is also located on the SCSI backplane of the SCSIBox 2; however, these jumpers should already be properly set at the factory. See Chapter 4, “Chassis Tour,” for more information.

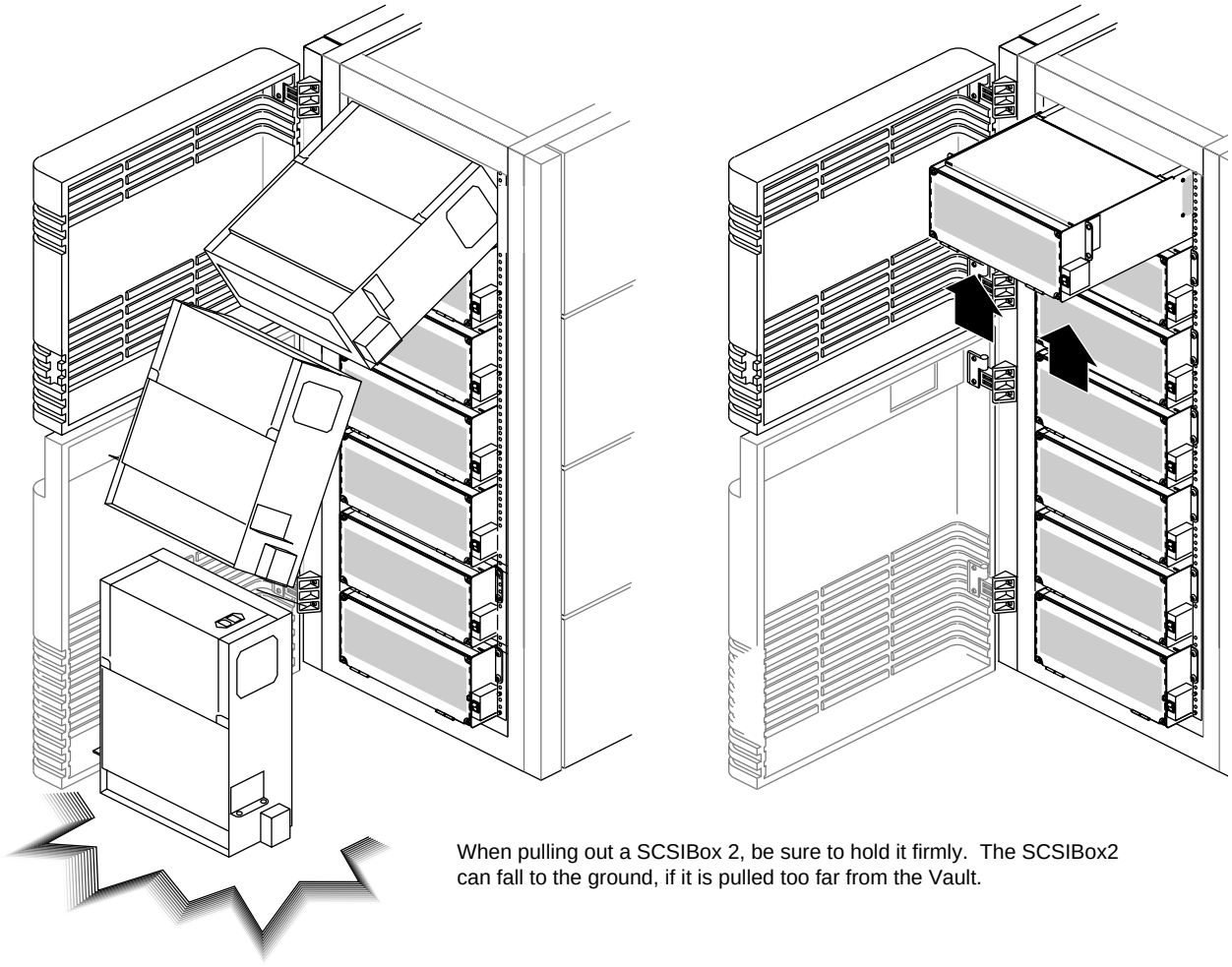


5.3.1 Selecting the SCSI ID

Jumper the SCSI ID for each drive to avoid addressing conflicts. For complete drive jumpering information, refer to the *Peripherals Guide*.

5.3.2 Selecting Channel A or B on the Drive Sled

Determine which channel (A or B) you want the drive to occupy, then plug the SCSI cable from the drive into the proper channel connector. See Figure 5-4.



When pulling out a SCSIBox 2, be sure to hold it firmly. The SCSIBox2 can fall to the ground, if it is pulled too far from the Vault.

5.3.3 Setting the Drive Sled Board Jumpers

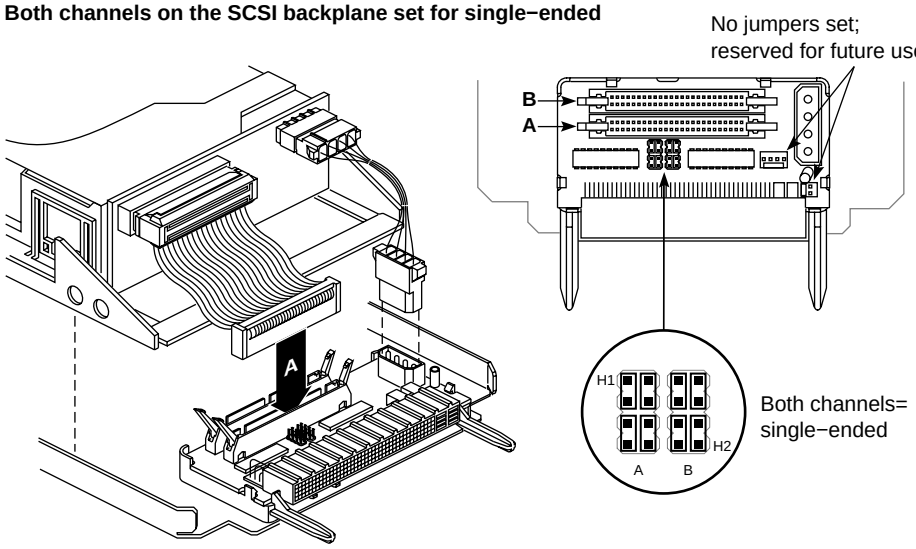
Depending on the SCSIBox 2 type, the drive sled board jumpers should be set for either single-ended or differential operation. See Figure 5-4 for the jumper configurations.

Figure 5-4 SCSI Drive Sled Board

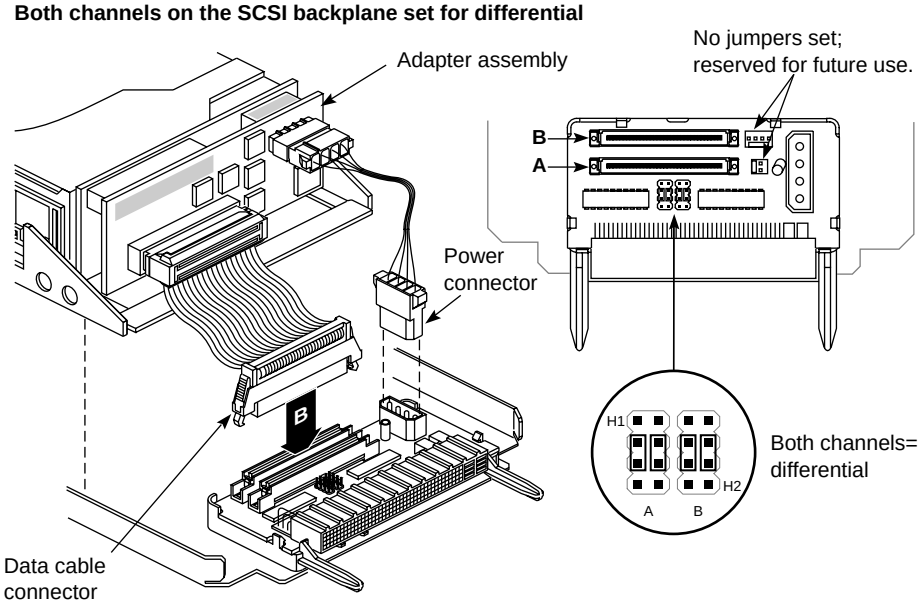
5.3.4 Installing and Removing Drives

The SCSIBox 2 uses front-loading drives mounted on drive sleds for easy installation and removal. To install or remove a drive, follow these instructions and see Figure 5-5.

Both channels on the SCSI backplane set for single−ended



Both channels on the SCSI backplane set for differential



1. Hold the drive sideways, with the top of the drive facing right and the bottom of the drive sled facing left.
2. Install the drive module into the drive shelf and slide the module all the way into place, then push the drive lever down. The drive module should click into place, flush with the slot, and should not come out when you pull it.
3. Close and screw in (one quarter-turn) the SCSI box door after you install all of the drives. *Be careful not to over tighten the fastener; it could break off.*

Caution: The front door must be closed during operation to comply with FCC regulations.

4. To remove the drive, push the drive lever up and then slide the module out.

   Caution: The SCSIBox 2 does not have a set of safety rails to hold it in place. If you have drives installed, do not pull the drive box too far out on the rails. The drive box and drives may fall to the ground and become damaged. See Figure 5-3.

   Note: The SCSI box can safely be pulled out a short distance (about 5 to 6 inches or 13 to 15 cm) on the rails without direct support.

5.3.5 Removing a Drive Shelf to Install a Full-Height Drive

Full-height drives require two half-height drive slots. To accommodate the greater size of the full-height drive, you must remove a drive shelf from the SCSIBox 2 by following these instructions:

1. Open the front door of the SCSIBox 2.
2. Select a drive shelf, then remove the two Phillips screws (No. 0 or 1) that secure the drive shelf to the top and bottom of the SCSIBox 2 chassis (see Figure 5-6).
3. Pull the drive shelf out of the chassis and store it for later possible use.

Figure 5-5 Installing and Removing a SCSIBox 2 Drive

Figure 5-6 Removing a Drive Shelf From the SCSIBox 2

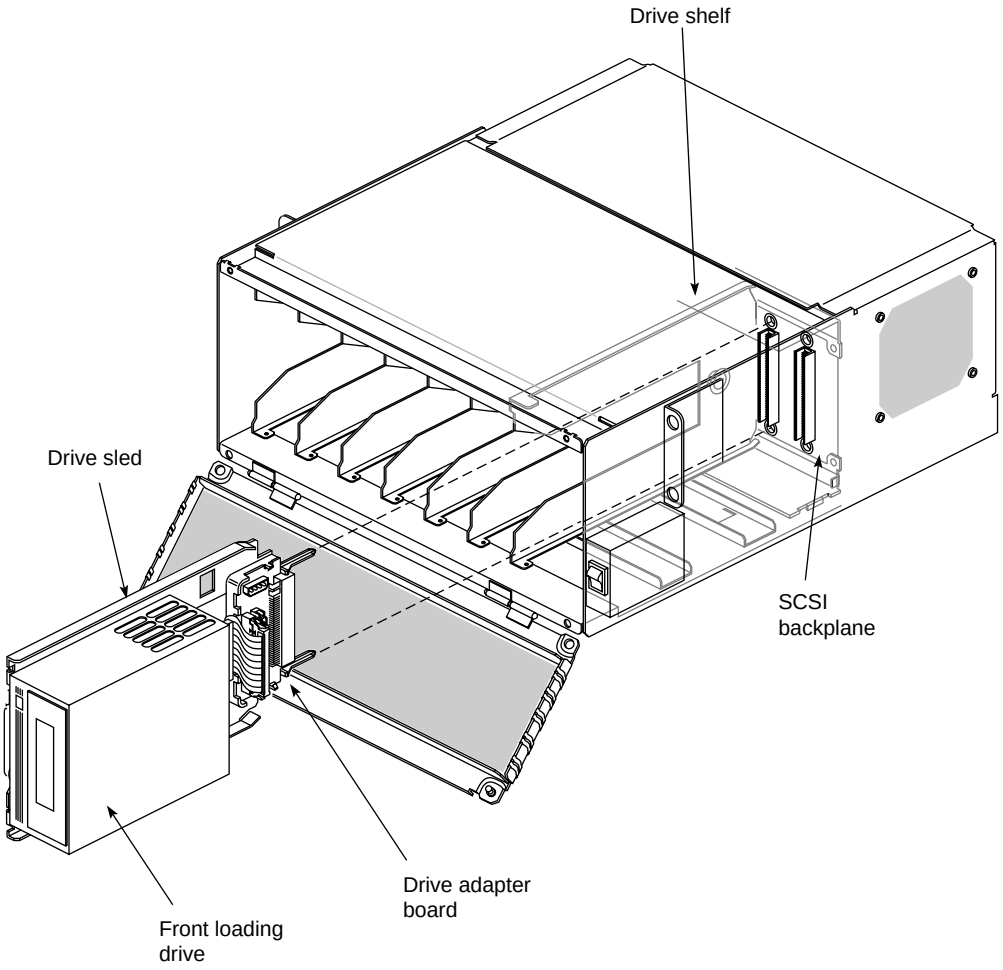
5.4 Distinguishing Between Single-Ended and Differential Devices

The physical differences between single-ended and differential SCSI devices may sometimes be obscure. Other than by the drive part number and description, there is no sure-fire way to always tell the difference between single-ended and differential devices.

5.4.1 SCSI Drives

Fortunately, most Silicon Graphics single-ended drives currently have the 50-pin, 8-bit, narrow SCSI connector, and all differential drives, such as the 3-1/2 inch IBM 2 GB hard disk, use the 68-pin, 16-bit, wide SCSI connector; however, this will not always be the case.

Future single-ended devices will also use the 68-pin, wide SCSI connector. So, while all 50-pin SCSI connectors will invariably be single-ended devices, not all 68-pin connectors will be differential devices.



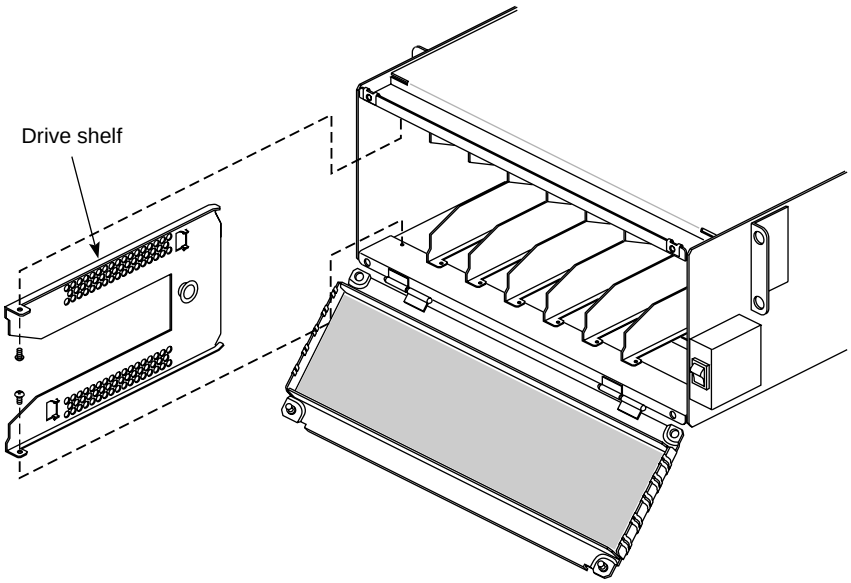
Note: The only major difference between a 68-pin single-ended SCSI drive and a 68-pin differential drive is that the differential drive has a differential converter board and the single-ended drive does not.

5.4.2 SCSI Channel Terminators

SCSI terminators must be matched to the protocol of the SCSI channel. There are two different terminators: one for single-ended protocol and one for differential protocol. These terminators are visually identical, except for the manufacturing part numbers. See Table 5-1 and Figure 5-7.

Component	SGI Part Number	Distinguishing Marks
Single-ended terminator	9660008	AMP 869516-1 ACTIVE “P”
Differential terminator	9660006	AMP 869515-1 DIFFERENTIAL

Table 5-1 Identifying SCSI Channel Terminators



Caution: Never use a single-ended SCSI terminator on a differential channel. Connecting a single-ended terminator to a differential channel shorts power to ground.

Figure 5-7 Terminator Labels

5.5 Cabling the Vault Rack and SCSIBox 2

This section describes the following cabling:

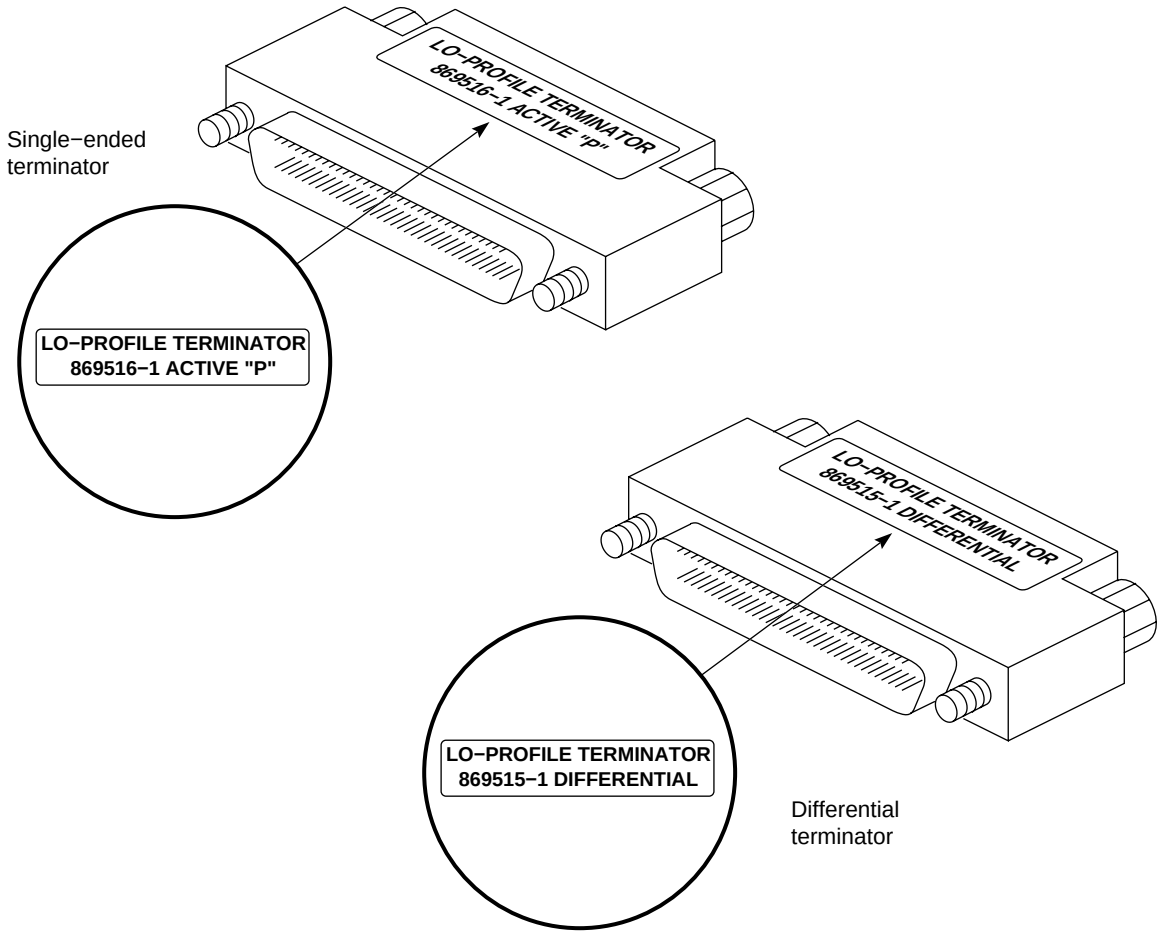
- connecting the SCSI cables from the Vault to the host system
- daisy-chaining between SCSIBox 2s

Caution: Make sure that the system power is turned off before beginning these steps.

5.5.1 Vault SCSI Cabling

Follow these instructions and see Figure 5-8 to cable the rack to the host system.

Note: The SCSIBox 2 has two SCSI channels (A and B) to help provide disk striping throughput capability.



1. Open the back door of the Vault.
2. Find the SCSI A or B connector on the SCSIBox 2.

   Note: You should have already selected an A or B channel for each drive in the SCSIBox 2 before getting to this stage. See Section 5.3, “Installing and Removing SCSIBox 2 Drives,” for more information.

3. Attach one end of the external 68-pin SCSI cable to the A or B connector.

   Note: If you are cabling between the host and the drive box, use the 68-pin 50-foot cable (P / N 9290053). If you are cabling between drive boxes, use the 2-foot cable (P / N 9290055). For more information on daisy-chaining, see Section 5.5.2, “Daisy-Chaining Between SCSIBox 2s.”

4. After installation, make sure you properly label all the drives and SCSI cables. See Section 5.7, “Labels on a SCSI Channel,” for more information.

   Note: On SCSI cables, use matching labels on each end of the connector to help identify these cables. An extra set of SCSI labels (P / N 024-0640-001) are provided for this purpose.

5. Open the front door of the deskside host system or rear door of the rackmount host system to access the I / O door. Attach the other end of the SCSI cable to a SCSI port on the I / O panel and also be sure to place a label on the SCSI connector for identification.

Note: The SCSIBox 2 in the Vault requires a differential SCSI connection. Ensure that the SCSI channel is set for differential operation.

6. Connect a terminator into the unused SCSI port on the SCSIBox 2.

   Note: If you are connecting boxes to both sides of the Vault rack, be sure to complete the cabling on one side of the rack before you begin SCSIBox 2 installation on the other side of the rack.

7. Use the openings on the side of the rack (created after you have removed the side panels) to cable the other side of the rack.

Note: If you have RAID drives, see the *Raid Hardware Installation and Upgrade Instructions* (P / N 108-0104-*xxx*) for installation information as required.

Figure 5-8 Connecting the Rack to the Host System

5.5.2 Daisy-Chaining Between SCSIBox 2s

Here is a list of do's and don'ts regarding SCSIBox 2 daisy-chaining:

- You cannot daisy-chain between racks.
- You cannot daisy-chain more than 15 drives on one channel.
- You can daisy-chain between SCSIBox 2s, but only if all of the drives in the SCSIBox 2s are 2.0 GB disks.

Follow these instructions to daisy-chain between drive boxes:

1. Use a 2-foot cable (P / N 9290055) to cable between the SCSIBox 2s.
2. Plug one end into an A or B channel on one SCSIBox 2. Plug the other end into the same channel on the other SCSIBox 2.
3. Plug a terminator into each unused A or B channel on the SCSIBox 2s.

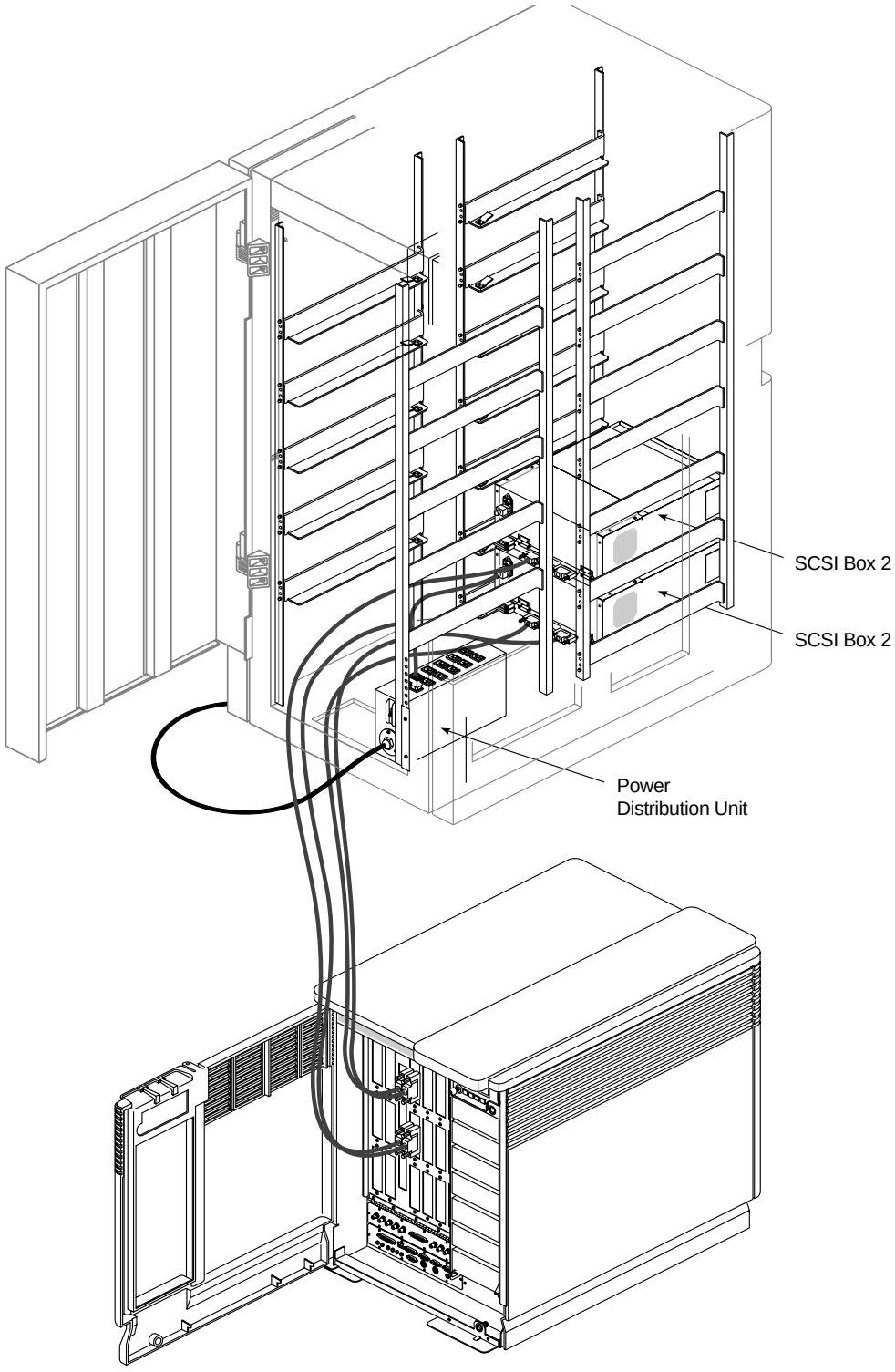
5.6 Connecting Two Racks

The host system can support up to two Vault racks. This section describes how to connect two racks to the host.

Caution: Each rack requires a direct connection to a SCSI channel on an IO4 or mezzanine board. You cannot daisy-chain drive boxes between Vault racks.

Follow these procedures to connect two racks to the system:

1. Open the back door of the Vault.
2. Find the SCSI A or B connector on the SCSIBox 2.



3. Attach one end of the external 68-pin SCSI cable to this connector.
4. Access the I/O panel of the host system.
5. Attach the other end of the SCSI cable to a SCSI port on the I/O panel.

6. Connect a terminator into the unused SCSI port on the SCSIBox 2.

5.7 Labels on a SCSI Channel

To simplify SCSI channel identification, labels are on the I/O panel SCSI connectors, cables, SCSI devices, SCSI boxes, and terminators. Depending on the component in question, a label may provide:

- a channel number to identify the I/O board that provides the SCSI signal
- a channel protocol to identify whether the channel is single-ended or differential
- a bus number to identify the bus inside a SCSI box that supplies the SCSI channel, either A or B

This section describes the SCSI channel labels for individuals who need to determine the configuration of a SCSI channel or modify the SCSI labels for a deskside, rackmount, or Vault chassis.

To determine the protocol of a SCSI channel with missing or unreadable labels, check the configuration of one or more components on the channel using the information in the system's installation instructions. The easiest component to reach is the drive adapter board. Also, channel adapter boards are color-coded to simplify identification. Single-ended channel adapter boards are green, and differential channel adapter boards are red. See Table 5-2 through Table 5-11 and Figure 5-21 through Figure 5-24 for additional information.

Note: The "key" number listed in the left column of Table 5-2 through Table 5-11, references callout numbers shown in Figure 5-21.

Key	Description	Procedure
1	Identifies SCSI protocol (SE or DF) and the bus number (0-7); SE SCSI 0 label is part number 024-0637-xxx; DF SCSI 1 label is part number 024-0640-xxx (see Figure 5-9). Secondary SCSI boxes are labeled from label set part numbers 024-0610-xxx through 024-0654-xxx.	Select label based on the slot and bus number of the I/O board. For example, bus 0 on an IO4 board in slot 13 gets the label DF SCSI 130. Place label on the flat face of the cable connector, aligning the bottom of the text along the outer long edge of the connector.

Table 5-2 Channel Adapter Board Label

Figure 5-9 Channel Adapter Board Label

Key	Description	Procedure
2	Identifies SCSI protocol (SE or DF) and the bus number (0-7); SE SCSI 0 label is part number 024-0637-xxx; DF SCSI 1 label is part number 024-0640-xxx (see Figure 5-10.) Secondary SCSI boxes are labeled from label set part numbers 024-0610-xxx through 024-0654-xxx.	Select label based on the slot and bus number of the I/O board. For example, bus 0 on an IO4 board in slot 13 gets the label DF SCSI 130. Place label on the flat face of the cable connector, aligning the bottom of the text along the inner long edge of the connector.

Table 5-1 SCSI Cable Label, Board End

Figure 5-10 SCSI Cable Label, Board End

Key	Description	Procedure
3	Identifies SCSI protocol (SE or DF) and the bus number (0-7); SE SCSI 0 label is part number 024-0637-xxx; DF SCSI 1 label is part number 024-0640-xxx (see Figure 5-11). Secondary SCSI boxes are labeled from label set part numbers 024-0610-xxx through 024-0654-xxx.	Select label based on the slot and bus number of the I/O board. For example, bus 0 on an IO4 board in slot 13 gets the label DF SCSI 130. Place label on the flat face of the cable connector, aligning the bottom of the text along the inner long edge of the connector.

Table 5-2 SCSI Cable Label, Bulkhead End

Figure 5-11 SCSI Cable Label, Bulkhead End

Key	Description	Procedure
4	In early revisions, no markings for channel connectors A and B; channel A is the bottom connector, and channel B is the top connector; in later revisions, the markings JIA_SCSI and JIB_SCSI are on the bulkhead next to the connectors. See Figure 5-12.	None required.

Table 5-3 Bulkhead SCSI Cable Connector Markings

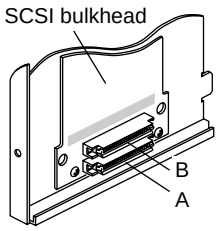


Figure 5-12 Bulkhead SCSI Cable Connector Markings

Key	Description	Procedure
5	On 50-pin adapter boards (see Figure 5-13), the two selectable connectors are marked JA1 and JB1; on 68-pin adapters, the connectors are marked J1_A and J1_B.	None required.

Table 5-4 Drive Adapter Board Markings for SCSI Channels A and B

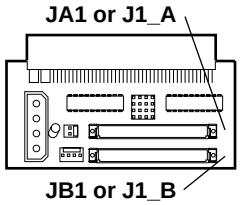


Figure 5-13 Drive Adapter Board Markings for SCSI Channels A and B

Key	Description	Procedure
6a	Identifies the SCSI channel (A or B) and the device ID number (1-15), part number 024-0632-xxx. See Figure 5-14.	Place label on the inner face of the drive door, along the hinged edge of the door and as close as possible to the corresponding drive.

Table 5-5 SCSI Device Label for Devices with Large Front Bezels

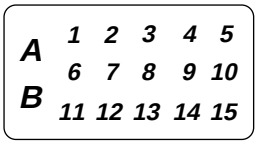


Figure 5-14 SCSI Device Label for Devices with Large Front Bezels

Key	Description	Procedure
6b	Identifies the SCSI protocol (SE or DF) and bus number (0-7): SE SCSI 0 label is part number 024-0637-xxx; DF SCSI 1 label is part number 024-0640-xxx (see Figure 5-15). Secondary SCSI boxes are labeled from label set part numbers 024-0610-xxx (shown) through 024-0654-xxx.	Select label based on the slot and bus number of the I/O board. For example, bus 0 on an IO4 board in slot 13 gets the label DF SCSI 130. Place label on the flat face of the cable connector, aligning the bottom of the text along the inner long edge of the connector.

Table 5-6 SCSI Device Label for Devices with Restricted Space on the Front Bezel

Figure 5-15 SCSI Device Label for Devices with Restricted Space on the Front Bezel

Key	Description	Procedure
6c	Identifies the SCSI channel (A or B), part number 024-0671-xxx. See Figure 5-16.	Place label directly on the face of the drive, ensuring that it does not block any airflow. Indicate whether the device is configured for channel A or B.

Table 5-7 SCSI Device Label for Devices with Minimal Space on the Front Bezel

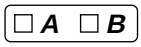


Figure 5-16 SCSI Device Label for Devices with Minimal Space on the Front Bezel

Key	Description	Procedure
7a	SCSI box label, part number 024-0655-xxx. See Figure 5-17.	Place label on the inner face of the drive door in the upper left corner. For each channel, indicate the channel protocol (SE for single-ended, DF for differential) and the SCSI bus number (0 or 1).

Table 5-8 SCSI Box Base Label

Figure 5-17 SCSI Box Base Label

Key	Description	Procedure
7b	Identifies SCSI protocol (SE or DF) and bus number (0-7). See Figure 5-18. SE SCSI 0 label is part number 024-0637-xxx; DF SCSI 1 label is part number 024-0640-xxx. Secondary SCSI boxes are labeled from label set part number s 024-0610-xxx (shown) through 024-0654-xxx.	Select label based on the slot and bus number of the I/O board. For example, bus 0 on an IO4 board in slot 13 gets the label DF SCSI 130. Place label on the flat face of the cable connector, aligning the bottom of the text along the inner long edge of the connector.

Table 5-9 SCSI Box Cover Label

Figure 5-18 SCSI Box Cover Label

Key	Description	Procedure
8	SCSI bulkhead (see Figure 5-19). In early revisions, no distinction between connectors A and B; channel A is the bottom connector, and channel B is the top connector; in later revisions, the markings JTA_SCSI and JTB_SCSI are on the bulkhead next to the connectors.	None required.

Table 5-10 Bulkhead Terminator Connector Markings

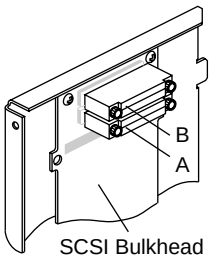


Figure 5-19 Bulkhead Terminator Connector Markings

Key	Description	Procedure
9	Identifies SCSI protocol (SE or DF) and bus number (0-7). See Figure 5-20. SE SCSI 0 label is part number 024-0637-xxx; DF SCSI 1 label is part number 024-0640-xxx.	Select label based on the slot and bus number of the I/O board. For example, bus 0 on an IO4 board in slot 13 gets the label DF SCSI 130. Place label on the flat face of the cable connector, aligning the bottom of the text along the inner long edge of the connector.

Table 5-11 SCSI Terminator Connector Label

Figure 5-20 SCSI Terminator Connector Label

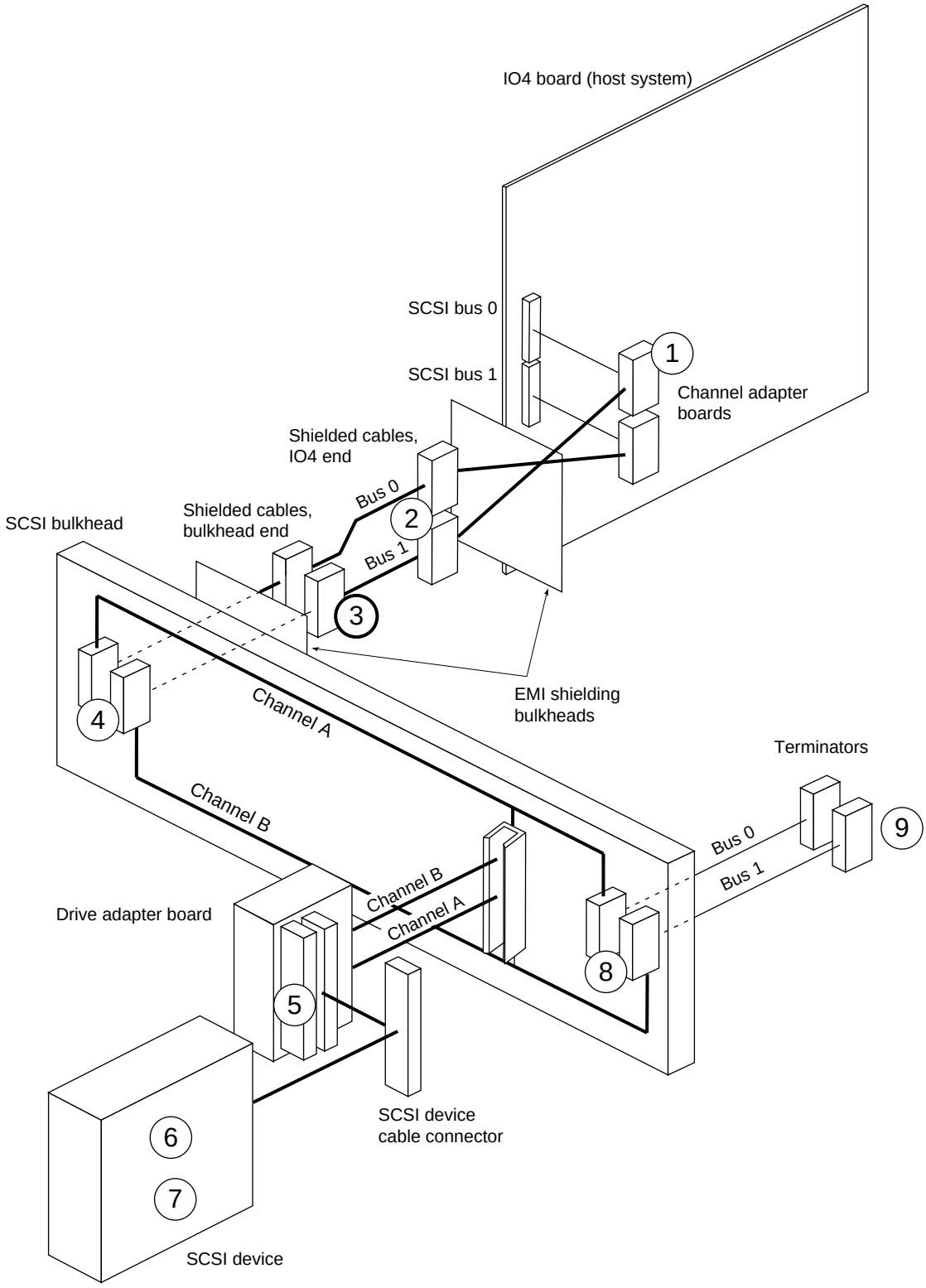


Figure 5-21 CHALLENGE Vault Internal SCSI Channel Components

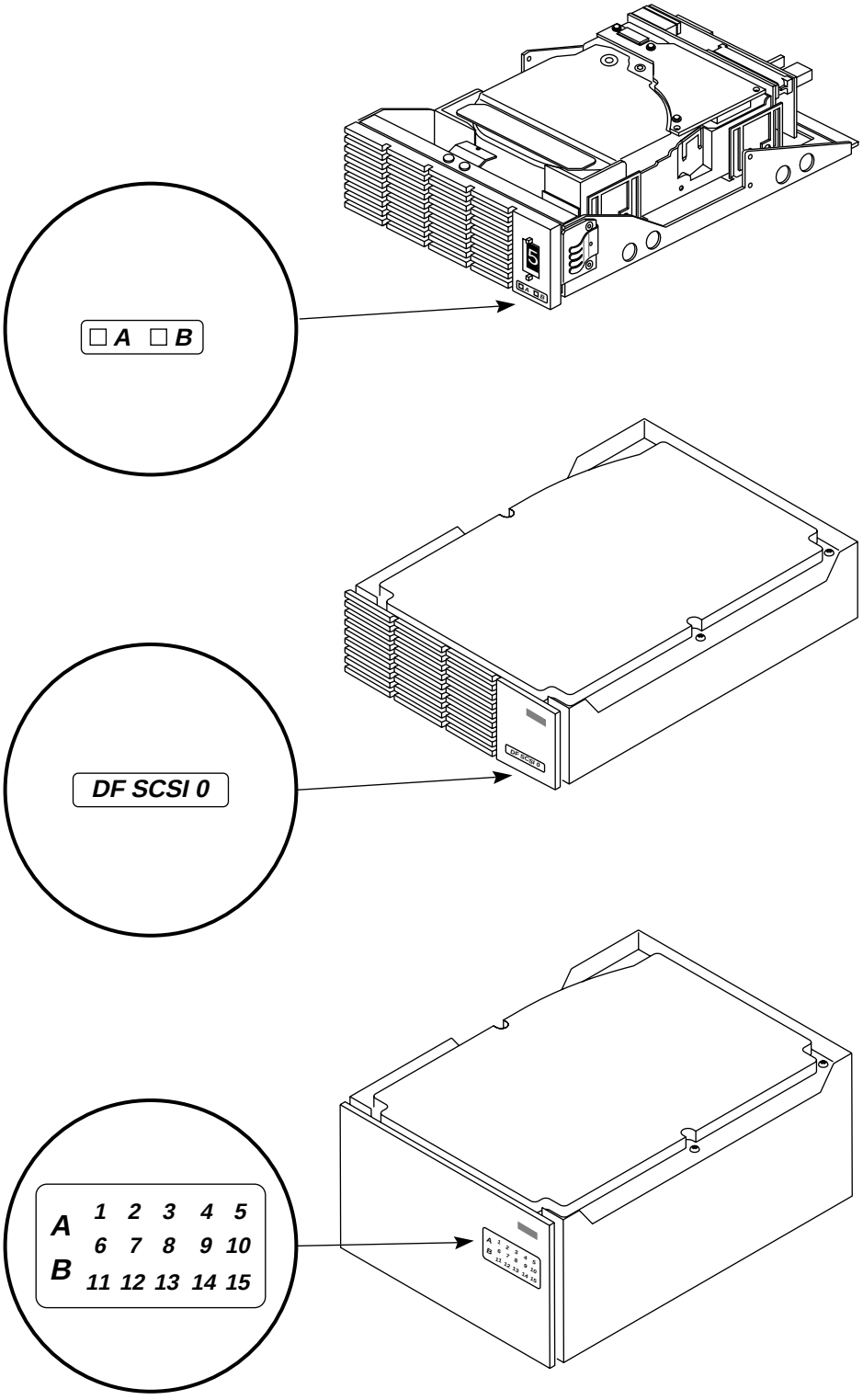


Figure 5-22 Location of SCSI Labels on Devices

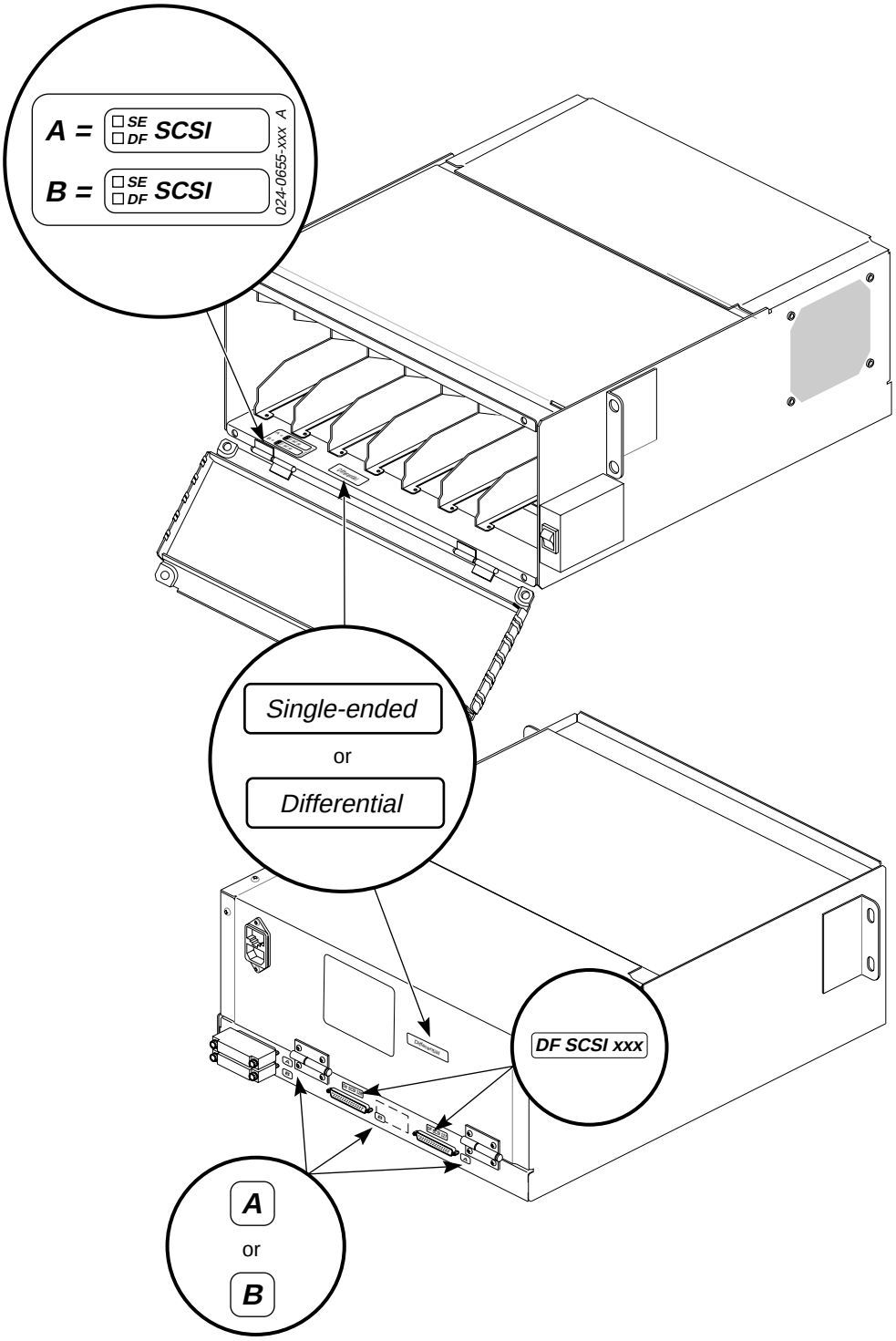


Figure 5-23 SCSI Label Placement on a Vault SCSIBox 2

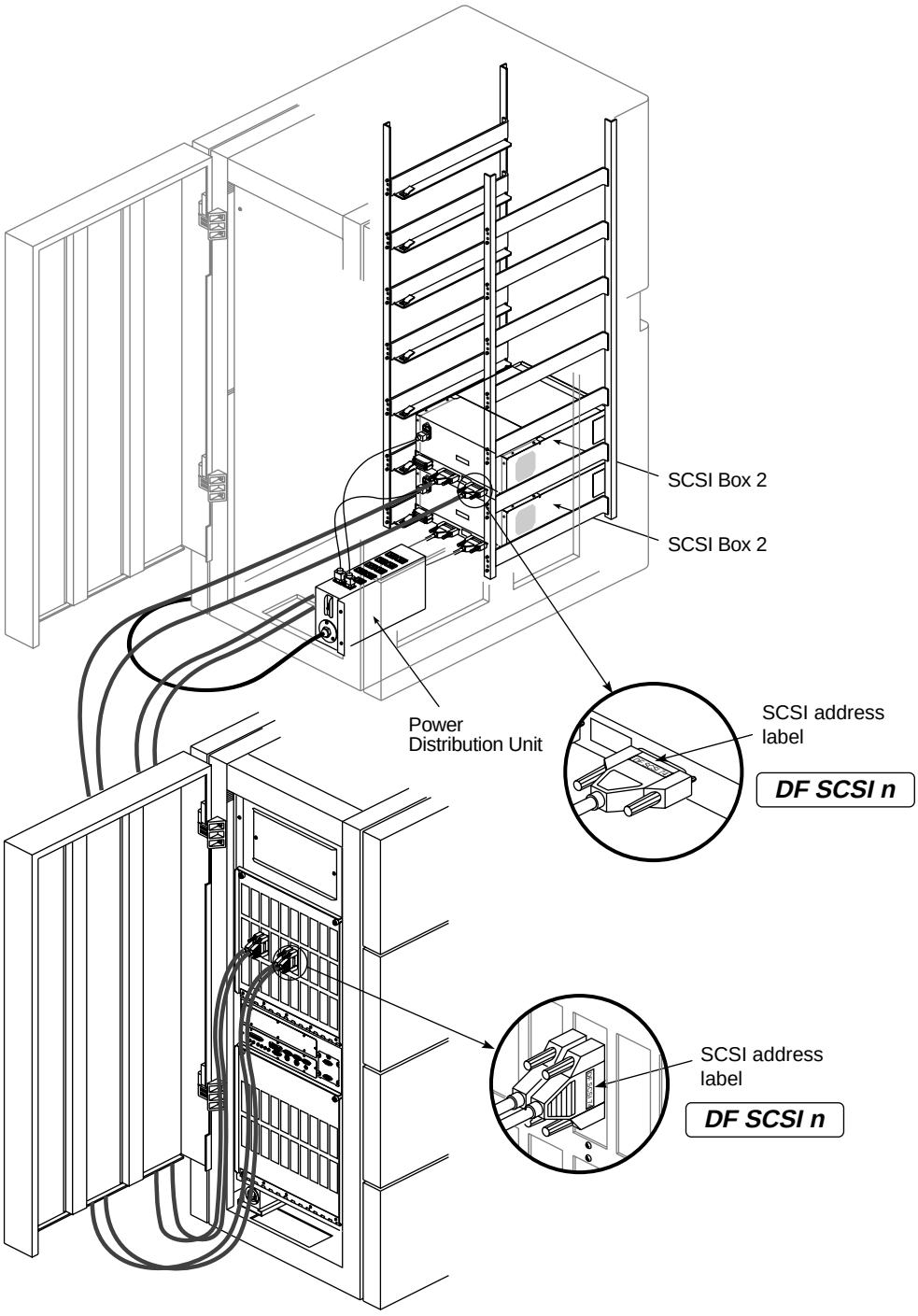


Figure 5-24 SCSI Cable Label Placement

Chapter 6

Verifying Installation

This chapter discusses how to verify the installation of the Vault rack and the SCSIBox 2.

6.1 General Procedures

After you complete the installation, follow these steps:

1. Connect the main power cord to the SCSI drive box.
2. Turn on the main power switch to the system and rack (if present).
3. Boot the operating system and install the new software if needed.
4. Afterward, a message asks if you wish to automatically reconfigure the operating system. Type **y** (yes).
5. After reconfiguration, you must reboot the system. Become superuser, then type **reboot**.
6. At the IRIX prompt, type **hinv -c disk** to make sure the drives are recognized. You should get a list similar to the following (depending on the configuration):

```
hinv -c disk
........
Disk drive: unit 12 on VME-SCSI controller 0
Disk drive: unit 11 on VME-SCSI controller 0
Disk drive: unit 10 on VME-SCSI controller 0
Disk drive: unit 9 on VME-SCSI controller 0
Interphase 4210 VME-SCSI controller 1: Firmware revision 01D
Integral SCSI controller 1: Version WD33C93A
Disk drive: unit 1 on SCSI controller 0
Integral SCSI controller 0: Version WD33C93A
```

7. If the drives are not acknowledged, recheck your connections.

6.2 Running *MAKEDEV*

The *MAKEDEV* command creates the specified device files for additional drives in the */dev* directory. To execute this command, follow this procedure:

Note: If you have just installed the option tape or a newer version of the operating system, you do not need to run the *MAKEDEV* command. The software installation process automatically updates the */dev* directory.

1. At the IRIX prompt, type **`cd /dev`**.
2. Afterward, become superuser.
3. Type **`./MAKEDEV`**. This command adds the newly installed drives into the */dev* directory.

   Note: The *MAKEDEV* command takes about 10 minutes to execute.

4. To verify that the drives have been added, type the following:

   `cd /dev/dsk`

   Note: *dsk* refers to disks.

5. Type **`ls`** (list) and check to see if the hard disk type is listed.

6.3 Running the *fx* Utility

It is recommended that you run *fx* to test the new drive to ensure proper operation. If you are unfamiliar with using *fx*, follow the instructions in this section.

Note: A new software drive numbering scheme has been implemented due to the increased number of channels on the IO4 board. If you are unfamiliar with this new numbering method, see Section 7.2, "New Addressing Scheme for Drives."

Caution: Remember, if you run *fx* in the extended mode (*fx -x*), you may overwrite existing files and destroy data. Be careful to specify only the new drives during this test.

The *fx* utility should be run in single-user mode. To enter this mode, reboot the system and invoke the command monitor (option 5) from the System Maintenance menu. At the prompt, type **`single`**, then press **`<Enter>`**.

After running *fx*, to switch from single-user to the standard multiuser mode, reboot the system, invoke the command monitor, and type **`multi`**.

Follow these procedures to run the *fx* utility:

1. Become superuser and type **`fx`** at the prompt. You should see a display similar to the following:

   ```
   fx version 3.3; Mon Nov 5 06:55:54 PST 1991
   fx: "device-name" = (dksc)
   ```

   Note: The information in parentheses is the default value. To select this value, press **`<Enter>`**.

2. Enter the device name; "dksc" is the default name for a SCSI hard disk connected to the IO4 board. See Chapter 7, "Software Guidelines," for further information.

After specifying the drive name, press **<Enter>**. You should get a message similar to the following:

```
fx: ctrl# = (0)
```

3. Enter the port number that the drive is connected to, then press **<Enter>**. You should get a message similar to the following:

   ```
   fx: drive# = (1)
   ```

4. Select the drive number and press **<Enter>**.
5. After the test configuration is set, the following menu is displayed:

   ```
   ----- please choose one of -----
   1) exit  2) badblock/   3) debug/     4) exercise/    5) label/
   fx>
   ```

6. Choose number 4 (exercise), then select the desired test when you are prompted by the menu options.

   Note: To terminate a test, press **<Ctrl-C>**; then type **/exit** to terminate the *fx* utility.

Chapter 7

Software Guidelines

This chapter provides software guidelines to operate the Vault and SCSIBox 2. The Vault and SCSIBox 2 require IRIX 5.0 or later.

7.1 Disk Striping

Disk striping increases workstation throughput by distributing file data across multiple disk drives through logical volumes. For detailed software descriptions of how hard drives are configured to support disk striping, see the "Logical Volumes" subsection in the *IRIX Advanced Site and Server Administration Guide*.

Caution: Systems utilizing disk striping must have a well-tested and maintained backup plan. If a single disk drive failure occurs, the entire file structure can be affected because sections of the filesystem are distributed among different disk drives.

7.2 New Addressing Scheme for Drives

An IO4 board can have up to eight SCSI bus interfaces (or channels). See Figure 7-1. Compare this with the IO3, the predecessor to the IO4, which has only two channels (or SCSI bus interfaces). In addition, the new, wider 68-pin SCSI connector on the chassis now enables connectivity with up to 15 devices per channel.

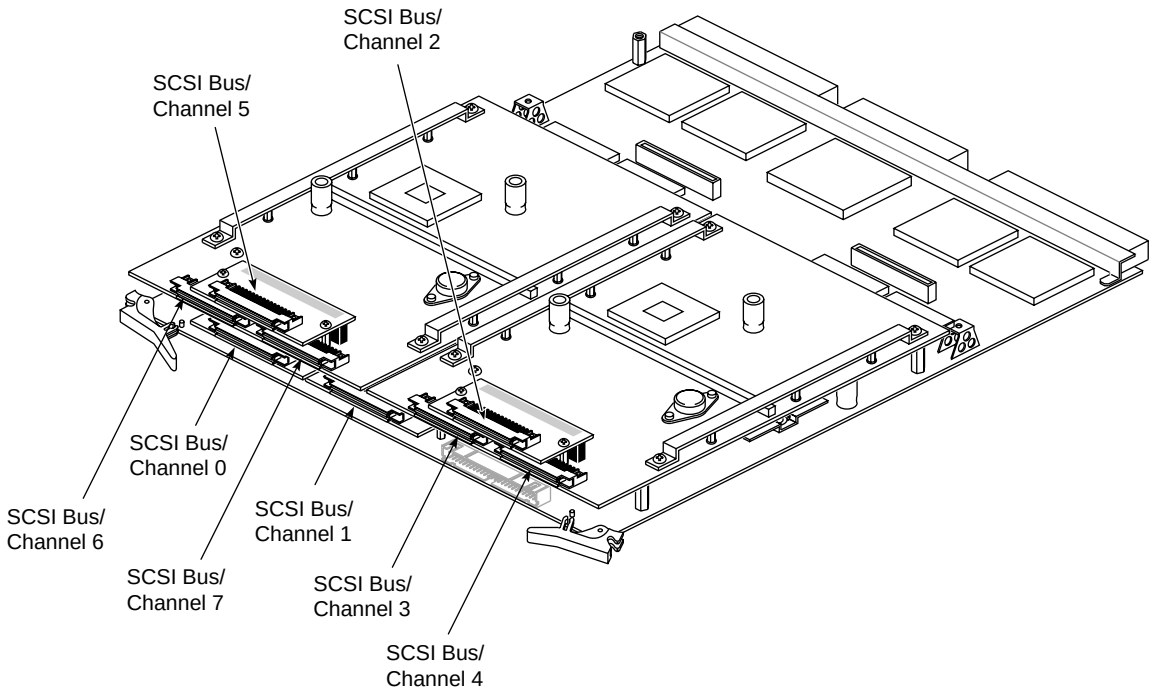
Due to this expanded connectivity, the IRIX and PROM monitor drive addressing scheme has been modified to accommodate the increased number of drives and channels.

Figure 7-1 SCSI Channels, or Bus Interfaces, on an IO4 Board With Two Mezzanine Boards

7.2.1 Addressing Drives Using the PROM

The previous PROM drive addressing format remains in place; for example:

dksc(a,b,c)



where *a* represents the SCSI bus number, *b* refers to the drive number, and *c* refers to the drive's partition number. The *dksc* designation is the monitor's name for SCSI.

Note: The PROM can address only the master IO4 board in a system. In a deskside system, the master IO4 resides in either slot 3 (Onyx) or slot 5 (CHALLENGE). In a rackmount system, the master IO4 resides in slot 15. If you need to address a drive connected to another IO4 board, you must do so under IRIX.

7.2.2 Addressing Drives Under IRIX

Under IRIX, the addressing scheme has changed as shown in the following new format:

/dev/dsk/dksSSSdDsP

where */dev/dsk* references the IRIX file directory of the drives and *dks* designates SCSI. The *SSS* designator represents the slot number of the IO4 board and / or the SCSI bus number (see Note below), *dD* refers to the drive number, and *sP* refers to the drive's partition number.

Note: If you are addressing a drive on the master IO4 board system, you need to specify *only* the applicable SCSI bus number. If you are addressing a drive on another IO4 board, you must specify both the slot number of the board and the applicable SCSI bus number.

If, for example, you are addressing a drive connected to an IO4 board in slot 4 and SCSI bus number 5 (on a deskside system), the *SSS* number would be 45.

With the earlier IO3 boards, the software required only single digits to differentiate drives; however, with the IO4 and new version of the software, the SCSI bus or *SSS* number can contain up to three digits. If *SSS* is a two- or three-digit number, the first one or two digits identify the IO4 board by the Ebus slot number. The final digit identifies which of the eight possible SCSI buses (0 through 7) on the IO4 board is used. Figure 7-1 illustrates how the buses are physically laid out on the IO4 board.

7.2.3 Forming the Drive Address

The software drive identification number uses the same form as in the addressing scheme described earlier. Insert the IO4 board slot number and / or the SCSI bus number, followed by the drive number and partition number, as required.

7.2.3.1 PROM Addressing

Assume that you want to address partition 0 on SCSI drive number 6. This drive connects to SCSI bus number 6. You can also assume that the master IO4 resides in slot number 15 in a rackmount system.

The PROM drive address is:

dksc(6,6,0)

7.2.3.2 IRIX Addressing

Assume that you want to address partition 0 on SCSI drive (number 6). This drive connects to SCSI bus number 6. Also assume that the IO4 resides in slot number 14.

The IRIX drive address is:

/dev/dsk/dks146d6s0

7.2.3.3 Using the New Address

You must know this new drive addressing and identification method to run the disk maintenance programs such as *fx* and *MAKEDEV*. For information on running these programs, see the system administration documents for your computer.