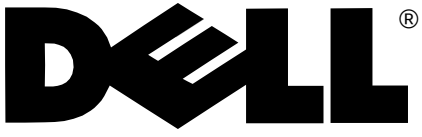
Dell® PowerEdge® SDS 100 Storage System

INSTALLATION AND SERVICE GUIDE



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Safety Instructions

Use the following safety guidelines to help protect your Dell PowerEdge Scalable Disk System 100 (SDS 100) storage system from potential damage and to ensure your own personal safety.

Before You Begin

Observe the following warnings while servicing this storage system:

WARNING: The power supplies in this storage system produce high voltages and energy hazards, which can cause bodily harm. Only trained service technicians are authorized to remove the covers and access any of the components inside the storage system.

WARNING: This storage system may have more than one power supply cable. To reduce the risk of electrical shock, a trained service technician must disconnect all power supply cables before servicing the storage system.

VAROVÁNÍ:Tento systém může mít více napájecích kabelů. Ke snížení rizika úrazu elektrickým proudem je nutné, aby školený servisní technik před prováděním servisu systému odpojil všechny napájecí kabely.

ADVARSEL: Dette system kan have mere end et strømforsyningskabel. For at reducere risikoen for elektrisk stød, bør en professionel servicetekniker frakoble alle strømforsyningskabler, før systemet serviceres.

VAROITUS: Tässä järjestelmässä voi olla useampi kuin yksi virtajohto. Sähköiskuvaaran pienentämiseksi ammattitaitoisen huoltohenkilön on irrotettava kaikki virtajohdot ennen järjestelmän huoltamista.

ПРЕДУПРЕЖДЕНИЕ: Данная система может иметь несколько кабелей электропитания. Во избежание электрического удара квалифицированный техник должен отключить все кабели электропитания прежде чем приступить к обслуживанию системы.

OSTRZEŻENIE: System ten może mieć więcej niż jeden kabel zasilania. Aby zmniejszyć ryzyko porażenia prądem, przed naprawą lub konserwacją systemu wszystkie kable zasilania powinny być odłączone przez przeszkolonego technika obsługi.

ADVARSEL! Det er mulig at dette systemet har mer enn én strømledning. Unngå fare for støt: En erfaren servicetekniker må koble fra alle strømledninger før det utføres service på systemet.

VARNING: Detta system kan ha flera nätkablar. En behörig servicetekniker måste koppla loss alla nätkablar innan service utförs för att minska risken för elektriska stötar.

When Working Inside the Storage System

Before taking the cover off of the storage system, perform the following steps in the sequence indicated:

1. **Turn off the storage system.**
2. **Disconnect the storage system from its power source. Also, disconnect the server management bus (SMB) cable from the storage system.**

   Doing so reduces the potential for personal injury or shock.
3. **Touch an unpainted metal surface on the storage system chassis, such as the power supply, before touching anything inside the storage system.**

   While you work, periodically touch an unpainted metal surface on the chassis to dissipate any static electricity that might harm internal components.

In addition, take note of these safety guidelines when appropriate:

- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, make sure both connectors are correctly oriented and aligned.
- Handle components and boards with care. Don't touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket.

Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside the storage system. To prevent static damage, discharge static electricity from your body before you touch any of the storage system's electronic components. You can do so by touching an unpainted metal surface on the storage system chassis.

As you continue to work inside the storage system, periodically touch an unpainted metal surface to remove any static charge your body may have accumulated.

In addition to the preceding precautions, you can also take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until you are ready to install the component in the storage system. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

The following caution may appear throughout this document to remind you of these precautions:

CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

When Using the Storage System

As you use the storage system, observe the following safety guidelines:

- To help prevent electric shock, plug the storage system and peripheral power cables into properly grounded power sources. These cables are equipped with 3-prong plugs to ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If you must use an extension cable, use a three-wire cable with properly grounded plugs.
- To help protect the storage system from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply.
- Be sure nothing rests on the storage system's cables and that the cables are not located where they can be stepped on or tripped over.
- Do not spill food or liquids on the storage system. If the storage system gets wet, see Chapter 4, "Getting Help."
- Do not push any objects into the openings of the storage system. Doing so can cause fire or electric shock by shorting out interior components.
- Keep the storage system away from radiators and heat sources. Also, do not block cooling vents. Avoid placing loose papers underneath the storage system; do not place the storage system in a closed-in wall unit or on a rug.

Preface

About This Guide

This guide is intended for users of the Dell PowerEdge Scalable Disk System 100 (SDS 100) storage system who want to learn about its features and operation and for qualified service technicians who upgrade or service the storage system. The chapters and appendixes are summarized as follows:

- Everyone should read Chapter 1, "Introduction," for an overview of the storage system's features, a description of the controls and indicators on the front panel, and information on where to get help if you need it.
- Chapter 2, "Installing Your Storage System," is intended for persons setting up the storage system and connecting it to the host computer.
- Chapter 3, "Installing Drives and Power Supplies," describes how to install small computer system interface (SCSI) hard-disk drives in the storage system's drive bays and how to replace a power supply.
- Chapter 4, "Getting Help," describes the help tools Dell provides to assist you should you have a problem with the storage system. It also explains how and when to call Dell for technical assistance.
- Appendix A, "Technical Specifications," is intended primarily as reference material for users interested in learning more about the details of the storage system.
- Appendix B, "Service Information for Technicians," discusses upgrade and service procedures for the storage system.
- Appendix C, "Maintaining the Storage System," describes preventive maintenance procedures that you should perform regularly to keep your storage system in top operating condition.
- Appendix D, "Regulatory Notices," is for users who are interested in which regulatory agencies have tested and approved the SDS 100 storage system.
- Appendix E, "Warranties and Return Policy," describes the warranty for the storage system and the "Total Satisfaction" Return Policy.
- See "Abbreviations and Acronyms" for a list of acronyms and abbreviations used in this guide.

Other Documents You May Need

In addition to this *Installation and Service Guide*, you may also have one or more of the following documents:

- The *Dell Hardware Instrumentation Package for Intel LANDesk Server Manager* user's guide, which describes the server management software's extensive capabilities.
- The Intel LANDesk Server Manager, which includes a CD-ROM containing the server manager software, plus the following documents: *LANDesk Server Manager Setup Guide*, *LANDesk Server Manager User's Guide*, *LANDesk Server Control Installation and User's Guide*, and *LANDesk Server Monitor Module Installation and User's Guide*.
- The *User's Guide* and/or *Installation and Troubleshooting Guide* for the host computer.
- The *Using the Dell Server Assistant CD* document, which provides instructions for using the *Dell Server Assistant* CD.
- The *Dell PowerEdge RAID Controller User's Guide*, which includes information on this SCSI host adapter.

Warranty and Return Policy Information

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. For information about the Dell warranty for your storage system, see Appendix E, "Warranties and Return Policy."

Notational Conventions

The following subsections describe notational conventions used in this document.

Warnings, Cautions, and Notes

Throughout this guide, there may be blocks of text printed in bold type within boxes or in italic type. These blocks are warnings, cautions, and notes, and they are used as follows:

WARNING: A WARNING indicates the potential for bodily harm and tells you how to avoid the problem.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

NOTE: A NOTE indicates important information that helps you make better use of your storage system.

Typographical Conventions

The following list defines (where appropriate) and illustrates typographical conventions used as visual cues for specific elements of text throughout this document:

- *Keycaps*, the labeling that appears on the keys on a keyboard, are enclosed in angle brackets.

  Example: <Enter>

- *Key combinations* are series of keys to be pressed simultaneously (unless otherwise indicated) to perform a single function.

  Example: <Ctrl><Alt><Enter>

- *Commands* presented in lowercase bold are for reference purposes only and are not intended to be typed when referenced.

  Example: "Use the **format** command to . . . ."

  In contrast, commands presented in the Courier New font are part of an instruction and intended to be typed.

  Example: "Type `format a:` to format the diskette in drive A."

- *Filenames* and *directory names* are presented in lowercase bold.

  Examples: **autoexec.bat** and **c:\windows**

- *Syntax lines* consist of a command and all its possible parameters. Commands are displayed in lowercase bold; variable parameters (those for which you substitute a value) are displayed in lowercase italics; constant parameters are displayed in lowercase bold. The brackets indicate items that are optional.

  Example: **del** [*drive***:**] [*path*] *filename* [**/p**]

- *Command lines* consist of a command and may include one or more of the command's possible parameters. Command lines are presented in the Courier New font.

  Example: `del c:\myfile.doc`

- *Screen text* is text that appears on the screen of your monitor or display. It can be a system message, for example, or it can be text that you are instructed to type as part of a command (referred to as a *command line*). Screen text is presented in the Courier New font.

  Example: The following message appears on your screen:

  ```
  No boot device available
  ```

  Example: "Type `md c:\dos` and press <Enter>."

- *Variables* are placeholders for which you substitute a value. They are presented in italics.

  Example: SIMM*n* (where *n* represents the SIMM socket designation)

Contents

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Chapter 1
Introduction

The Dell® PowerEdge® Scalable Disk System 100 (SDS 100) storage system is a high-performance storage system that offers extensive reliability and server management features. This chapter describes the features and software requirements of the storage system.

General Description

The SDS 100 storage system offers the following major features:

- Support for up to eight ultra-wide small computer system interface (SCSI) hard-disk drives via a SCSI backplane board and special SCSI hard-disk drive carriers. The SCSI backplane automatically configures SCSI identification (ID) numbers on individual hard-disk drives, greatly simplifying drive installation.

  If an optional Dell PowerEdge Expandable RAID Controller SCSI host adapter card is installed in the host computer, the drives are hot-pluggable. (Other host adapters may also be qualified by Dell to support hot-pluggable drives in the storage system.)

  The SCSI backplane can be configured as a 1 x 8 parallel backplane or as a 2 x 4 split-backplane to support internal duplexing.

  Up to four storage systems can be connected to a Dell PowerEdge 2100, Dell PowerEdge 4100, or Dell PowerEdge 6100 computer system.
- An optional redundant, hot-pluggable power supply.
- Three redundant cooling fans.
- Enclosure management circuitry that monitors critical voltages and temperatures as well as operation of the cooling fans. The enclosure management circuitry works in conjunction with the Intel® LANDesk® Server Manager and the Dell Hardware Instrumentation Package (HIP) server management program installed on the host computer. (See the Preface found earlier in this guide for a list of documents that describe installation and use of the LANDesk Server Manager and Dell HIP software.) You can remotely monitor server management functions by connecting a server management bus (SMB) cable to the SMB connector on the storage system's back panel.
- SCSI management support for communicating SCSI hard-disk drive status, activity, and failure information through the SCSI cable to the host computer. The SDS 100 storage system is SAF-TE 1.0-compliant.
- Follow-mode control of the storage system power. (In follow mode, the storage system automatically mirrors the power state of the host computer.)
- Free-standing (stackable or vertical-mount) or rack installation using an optional rack-mounting kit. The storage system supports SCSI cables up to 3 meters (m) long between the storage system and the host computer.
- System security features, including an intrusion-detection switch and keylocks for the hard-disk drive carriers, the storage system cover, and any power supplies.

System Requirements

The SDS 100 storage system is designed for use with Dell PowerEdge 2100, Dell PowerEdge 4100, and Dell PowerEdge 6100 computer systems. (Other Dell systems may be qualified in the future to support the storage system.)

For hot-plug insertion and removal of SCSI drives, the storage system *must* be connected to a Dell PowerEdge

Expandable RAID Controller SCSI host adapter card or other host adapter qualified by Dell.

Dell supports the following network operating systems for use on host computers connected to the storage system:

- Microsoft® Windows NT® Server 3.51 and 4.*x*
- Novell® NetWare® 3.12 and 4.1 (and later versions)

The Dell HIP server management application program (version 2.52 or greater) and Intel LANDesk Server Manager should be installed on the host computer.

The host computer must have appropriate SCSI device drivers installed. For more information on these drivers, see the chapter titled "Installing and Configuring SCSI Drivers" in the host computer's *User's Guide*.

Controls and Indicators

The following controls and indicators are located on the storage system's front panel (see Figure 1-1):

- The green *follow-mode indicator* lights up when the storage system is mirroring the power state of the host computer.
- The *power button* on the front panel allows you to manually turn the storage system power on or off (the storage system normally operates in follow mode).
- The green *power indicator* in the center of the power button lights up when the storage system is turned on.
- The yellow *system fault indicator* lights up if one of the storage system's internal self-tests fails during system start-up.

Three indicator lights adjacent to each of the eight SCSI hard-disk drive bays provide information on the drive in that bay:

- The green *drive online indicator* (identified by a round icon) lights up when the hard-disk drive is receiving power.
- The green *drive activity indicator* (identified by a cylinder-shaped icon) lights up when data is being transferred to or from the hard-disk drive.
- If a Dell PowerEdge Expandable RAID Controller SCSI host adapter card is installed in the host computer, the yellow *drive fault indicator* (identified by a triangular icon) blinks if a disk failure is detected.

Getting Help

If at any time you don't understand a procedure described in this guide, or if your storage system does not perform as expected, Dell provides a number of tools to help you. For more information on these help tools, see the chapter titled "Getting Help" found later in this guide.

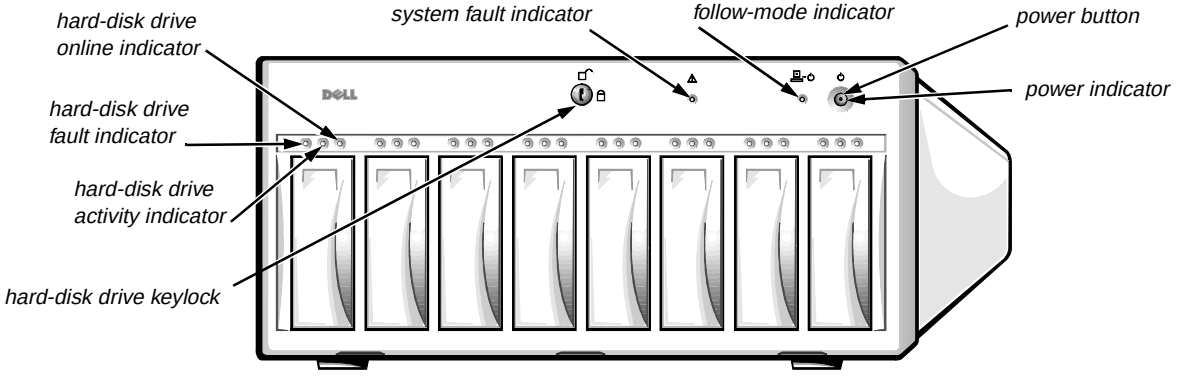


Figure 1-1. Front Panel

Chapter 2
Installing Your Storage System

This chapter describes how to connect as many as four storage systems to your host computer. You can set up the storage system in either a free-standing (vertical-mount or horizontal [stackable]) configuration or a rack-mounted configuration.

Setting Up a Free-Standing Storage System

You can stack up to three storage systems horizontally and adjacent to the host computer. (If you are connecting four storage systems to a host computer, do not place more than three storage systems in a single "stack.") The feet on the upper storage system chassis fit into the corresponding indentations on the top of the lower chassis. You can also set up a single storage system beneath the host computer.

You can set up a storage system in a vertical configuration by installing the vertical-mount pedestal provided with the storage system.

Perform the following steps to set up a free-standing storage system:

1. **Unpack the storage system, and place it near the host computer so that the external small computer system interface (SCSI) cable and the server management bus (SMB) cable easily reach the back of the host computer.**
2. ***If you are setting up the storage system in a vertical configuration*, follow these steps to prepare the storage system:**
    a. Carefully place the storage system on its right side (see Figure 2-1).
    b. Remove the screws securing the four feet on the underside of the storage system.
    c. Reinstall two of the feet near the front edge of the storage system's left side (see Figure 2-1).
    d. Remove the two screws securing the vertical-mount pedestal to the underside of the system. Using these screws, reinstall the pedestal near the back edge of the storage system's left side.

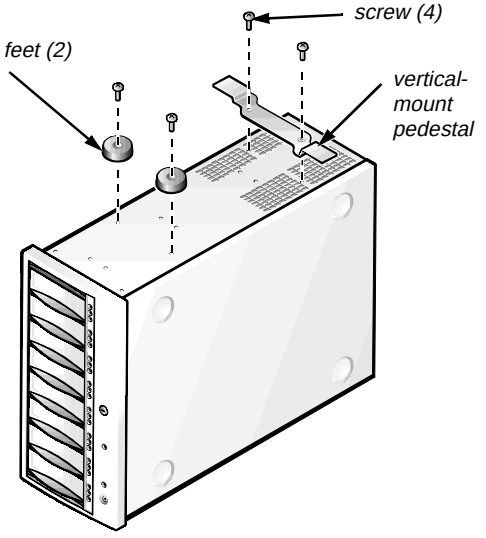


Figure 2-1. Installing the Feet and Vertical-Mount Pedestal

3. **Connect the storage system's SCSI and SMB cables to the host computer.**

    See "Connecting the Storage System to the Host Computer," found later in this chapter, for instructions.

Setting Up a Rack-Mounted Storage System

A rack installation kit is available from Dell for installing one or more storage systems in a Rittal Corporation VR series 19-inch electronic enclosure (called a *rack* in the remainder of this guide). One rack kit is required for each storage system that you install in the rack.

Rack Installation Restrictions

The rack kit is intended to be installed in a Rittal VR series rack by a certified service technician. If you install the kit in any other rack, be sure that the rack meets the specifications of the Rittal rack.

WARNING: The rack in which you install the kit must meet the Rittal rack specifications in order to prevent the potential for bodily injury to the installer and/or user.

Rack Stabilizer Feet

WARNING: Installing a storage system in the Rittal rack without the stabilizer feet installed could allow the rack to tip over and potentially cause bodily injury. Always install the stabilizer feet before installing components in the rack.

Before installing the kit in the rack, you must install the three stabilizer feet provided with the Rittal VR rack. The stabilizer feet help prevent the rack from tipping over when a storage system is installed and then pulled out of the rack to the fully extended position of the slide assemblies. Refer to the documentation that accompanied the rack for instructions on installing the stabilizer feet.

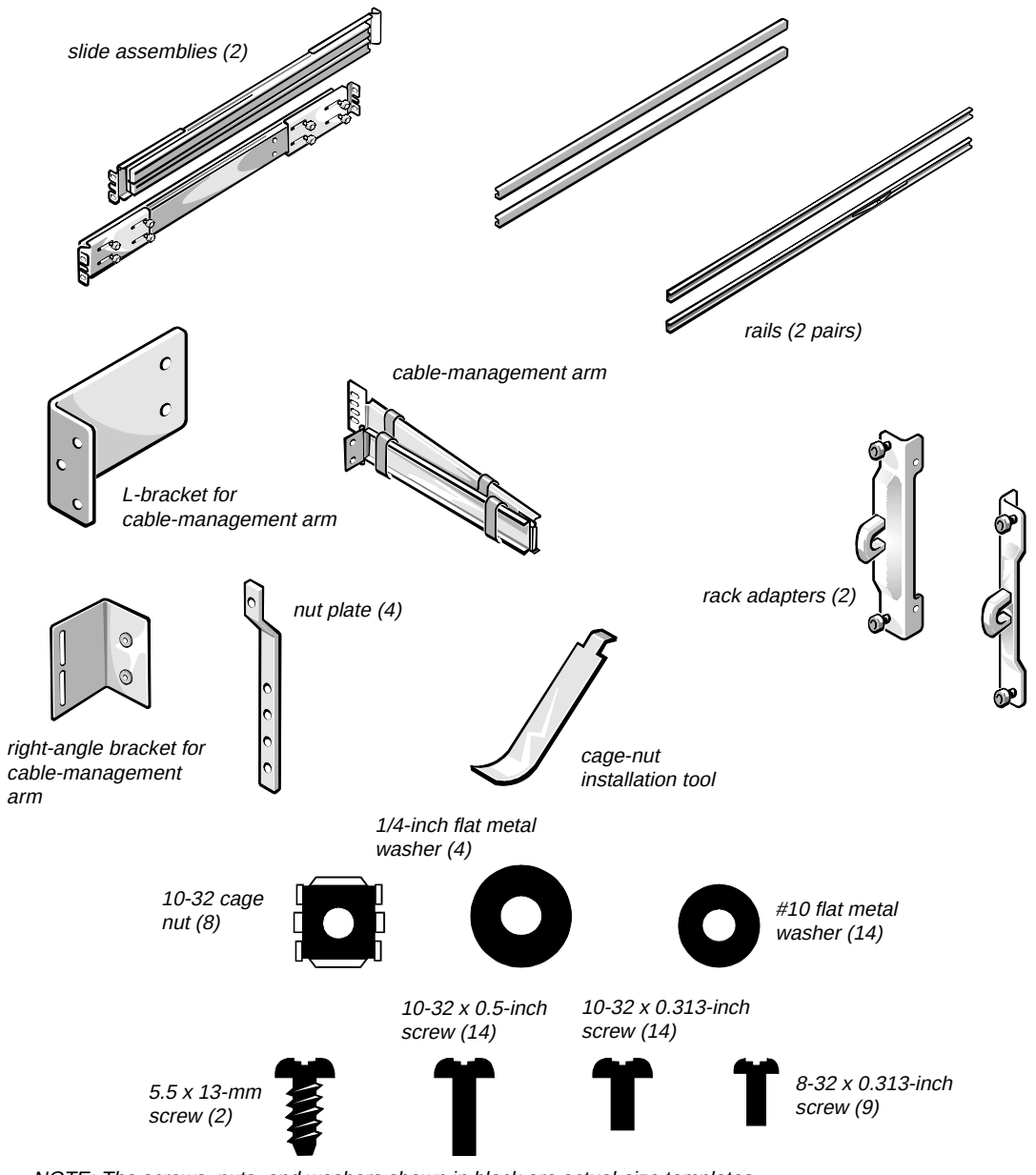
WARNING: After installing components in a rack, never pull more than one computer or storage system out of the rack on its slides at one time. The weight of more than one computer or storage system extended on slides could cause the potential for the rack to tip over and cause bodily injury.

Rack Kit Contents

The rack kit includes the following items (as illustrated in Figure 2-2):

- One pair of slide assemblies with mounting brackets
- Two pairs of rails
- Two rack adapters
- One cable-management arm
- One L-bracket for cable-management arm
- One right-angle bracket for cable-management arm
- Four nut plates
- One cage-nut installation tool
- Fourteen 10-32 x 0.313-inch Phillips-head screws
- Fourteen 10-32 x 0.5-inch Phillips-head screws
- Nine 8-32 x 0.313-inch Phillips-head screws
- Two 5.5 x 13-millimeter (mm) Phillips-head self-threading screws
- Fourteen #10 flat metal washers
- Four 1/4-inch flat metal washers
- Eight 10-32 cage nuts

NOTE: Nonmetric screws referred to in illustrations and procedural steps are identified by size and then the number of threads per inch. For example a number-8 screw with 32 threads per inch is identified as an 8-32 screw. Metric screws are identified by the thread diameter and then the length of the threaded area. For example, the 5.5 x 13 mm screws used to secure the cable-management arm to the rack have a thread diameter of 5.5 mm and a threaded area that is 13 mm long.



NOTE: The screws, nuts, and washers shown in black are actual-size templates.

Figure 2-2. Rack Kit Contents

Recommended Tools

To install the rack kit in the rack, you will use the following tools:

- 3/8-inch nut driver
- 3/8-inch wrench
- 7/16-inch wrench (or an adjustable wrench)
- Medium-size flat-blade screwdriver
- Number-2 Phillips screwdriver
- Cage-nut installation tool included in the kit
- Steel measuring tape

Installing the Rack Kit

Perform the following tasks (as described in the following subsections) to install the rack kit in the rack:

- Remove the rack's front and back doors.
- Install the nut plates on the rack's front and back vertical rails.
- Install the slide assemblies in the rack.

Removing the Doors From the Rack

You must remove the doors from the rack to provide access to the interior of the rack and to prevent damage to the doors while installing the storage system. Use the following procedure to remove the doors.

WARNING: To prevent personal injury due to the size and weight of the doors, never attempt to remove or replace the doors by yourself.

1. **Open the latch on the front door (see Figure 2-3).**

   Slide the latch's push button cover up as far as it will go, press the push button, rotate the handle clockwise until the latch releases, and then pull the door open.

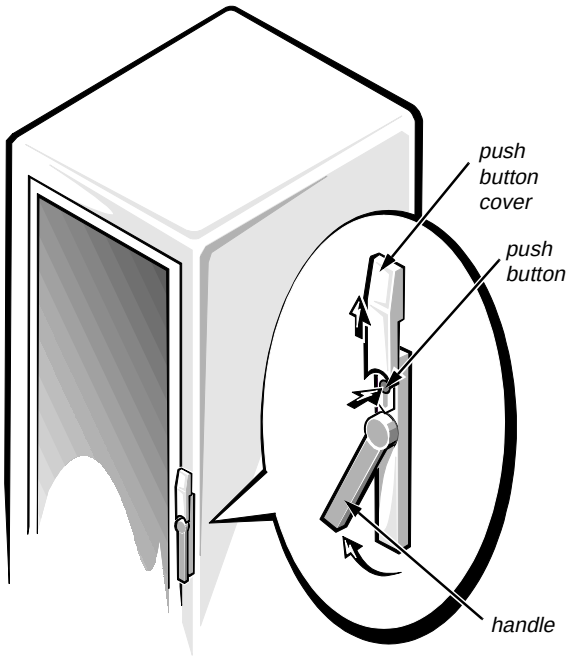


Figure 2-3. Opening the Latch on the Front Door

2. **Remove the front door as shown in Figure 2-4.**

   a. One person should grasp the top of the door to stabilize it. The other person should grasp the bottom of the door.

   b. The person holding the bottom of the door should press the release lever on the bottom hinge and then pull the bottom of the door away from the rack a few inches.

   c. The person holding the top of the door should press the release lever on the top hinge (see Figure 2-4) and then pull the door away from the rack.

   d. Store the door in an area where it cannot fall over while you install the kit.

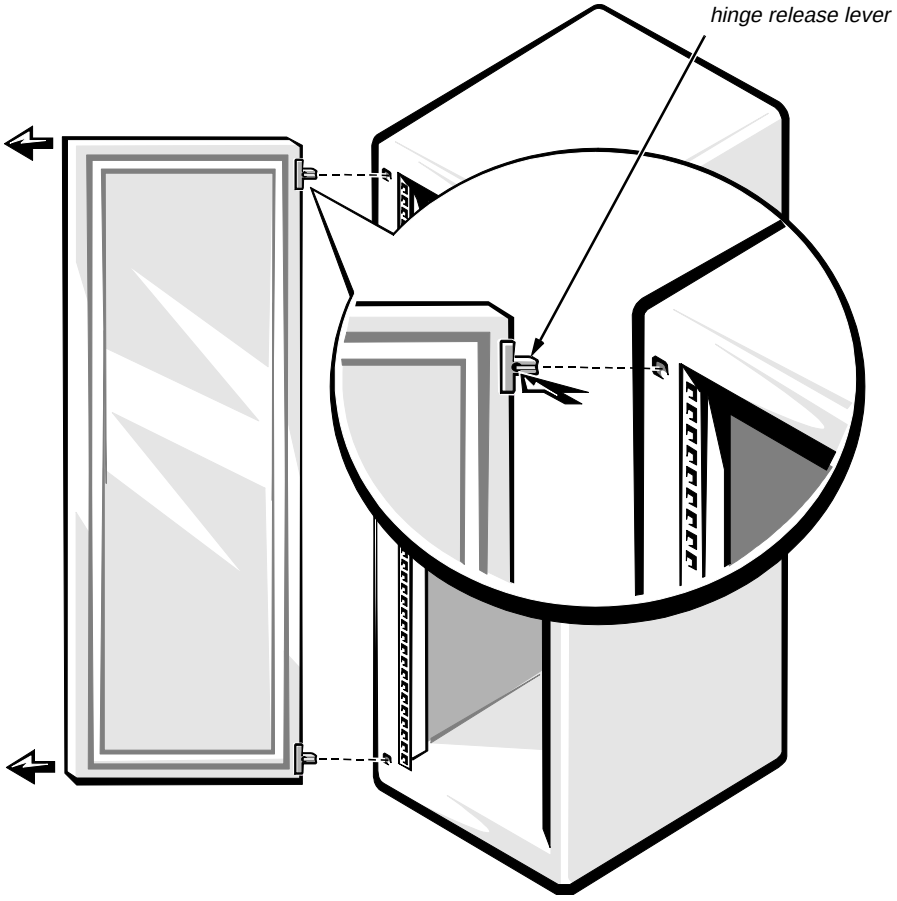


Figure 2-4. Removing the Front Door

3. Repeat steps 1 and 2 to remove the back door.

WARNING: If you are installing more than one storage system, install the first storage system in the lowest position to help prevent the rack from tipping and injuring someone when the storage system is pulled out of the rack on the slide assemblies.

Installing the Nut Plates

Use the following procedure to install the nut plates on the front and back vertical rails of the rack:

1. **Determine where to install the slide assemblies.**

   If you intend to install more than one storage system in the rack, you must install the slide assemblies so that there is at least 8.75 inches of vertical space between the bottom of one slide assembly and the top of the next (see Figure 2-5). In the Rittal VR rack, this distance corresponds to 15 holes in the rails between slide assemblies.

   After determining where you want to install the slide assemblies, mark the locations on the rack's vertical rails with a felt-tipped marker or masking tape.

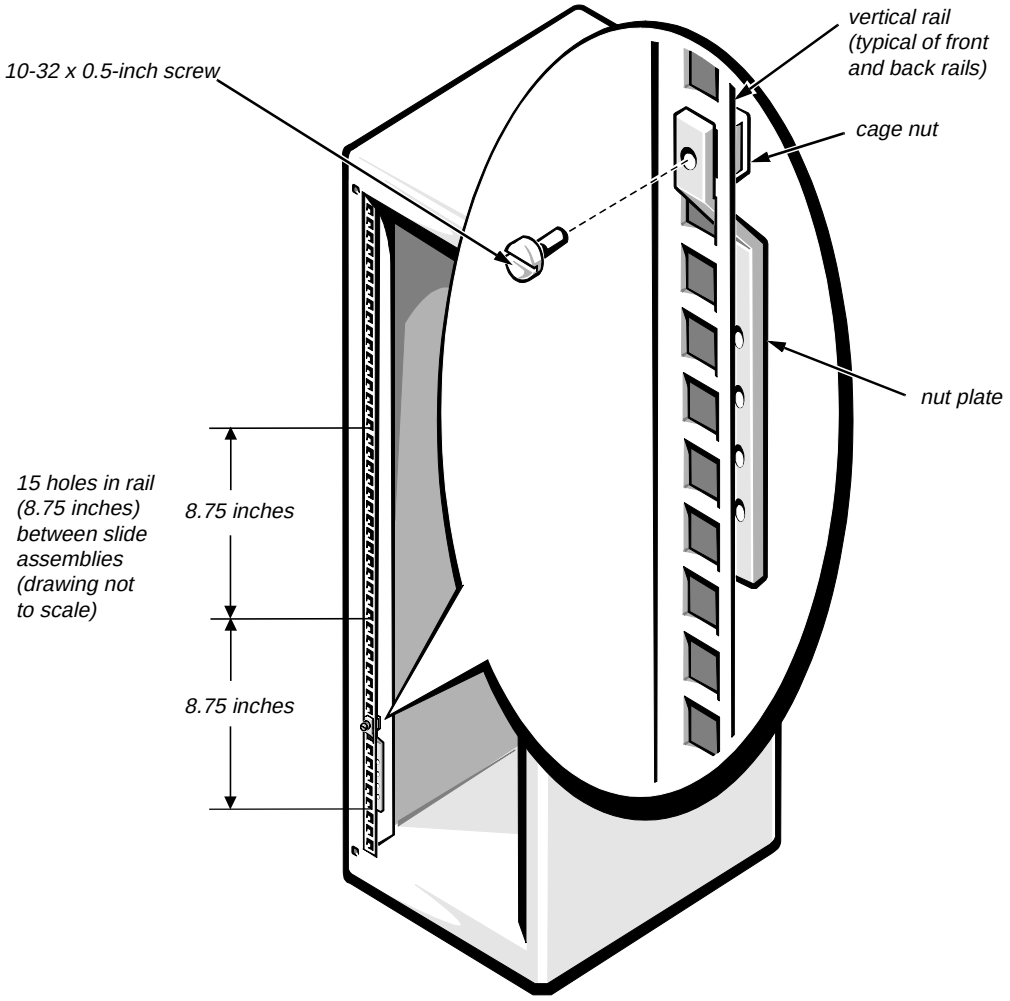


Figure 2-5. Determining Where to Install the Slides

2. Install the nut plates.

Install the nut plates on the vertical rails where you want the ends of the slide assemblies to be located (see Figure 2-6). Each nut plate is held in place by one 10-32 x 0.5-inch screw and one 10-32 cage nut.

NOTE: To install a rack kit in the rack's lowest position, select the fifteenth hole from the bottom in the front vertical rails and the fifteenth hole from the bottom in the back vertical rails to install the cage nuts for the nut plates.

The following substeps explain how to install the cage nuts and the nut plates:

a. Insert the lower lip of the cage nut over the bottom of the opening in the back of a rail as shown in Figure 2-6. Then insert the small end of the cage-nut installation tool through the opening in the rail (from the front), and hook the tool over the top lip of the cage nut.

b. Push in on the cage nut while rotating the tool up and pulling it back toward you until the top lip of the cage nut snaps into position.

c. Repeat substeps a and b to install the remaining cage nuts in the appropriate locations.

d. To install one of the nut plates, insert it through the hole below the cage nut (from the back of the rail) as shown in Figure 2-6, and then secure the nut plate in place with a 10-32 x 0.5-inch screw.

Repeat substeps a through d to install the remaining nut plates.

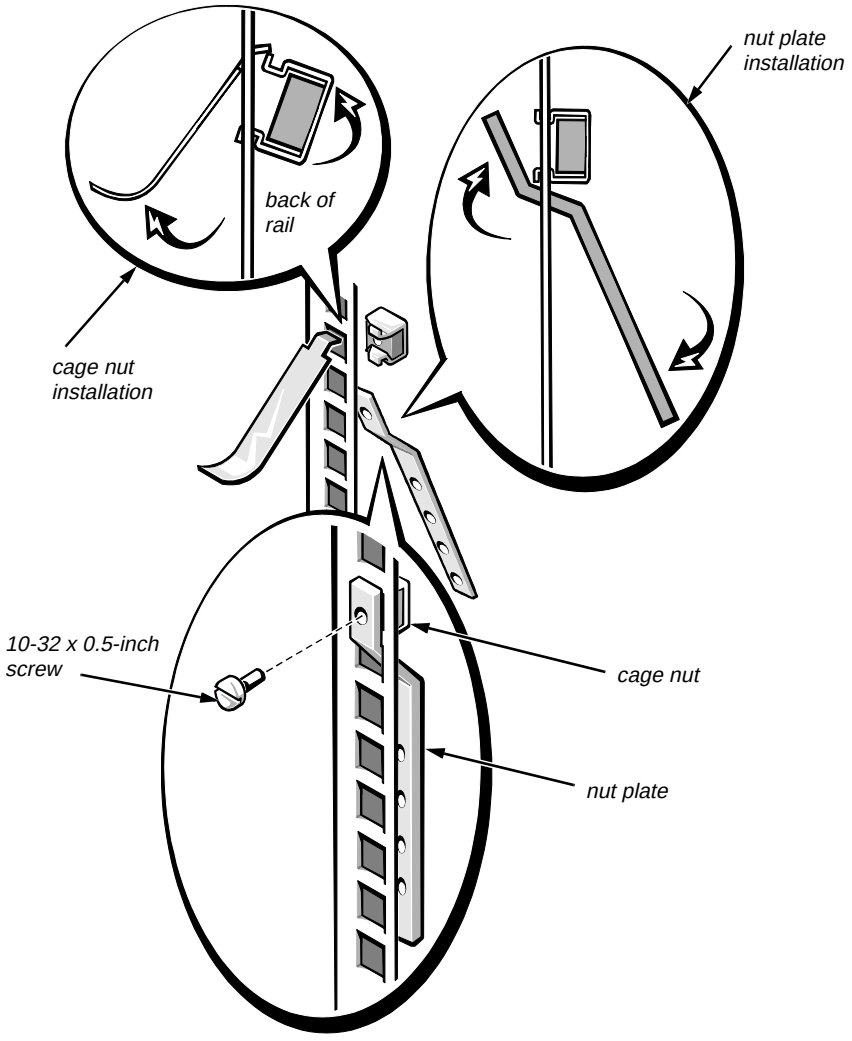


Figure 2-6. Installing the Cage Nuts and Nut Plates

Installing the Slide Assemblies in the Rack

Use the following procedure to install the slide assemblies in the rack:

1. **Remove any obstructions.**

   The vertical rails are held in position with adjustable T-shaped brackets. If any of these brackets are positioned so that they will interfere with the proper fit of a slide, move the bracket to the next adjacent three-hole grouping in the vertical rail.

2. **Using a 3/8-inch nut driver and a flat-blade screwdriver, slightly loosen the four nuts that hold the back slide-mounting bracket to the exterior slide, and remove the temporary spacers (see Figure 2-7).**

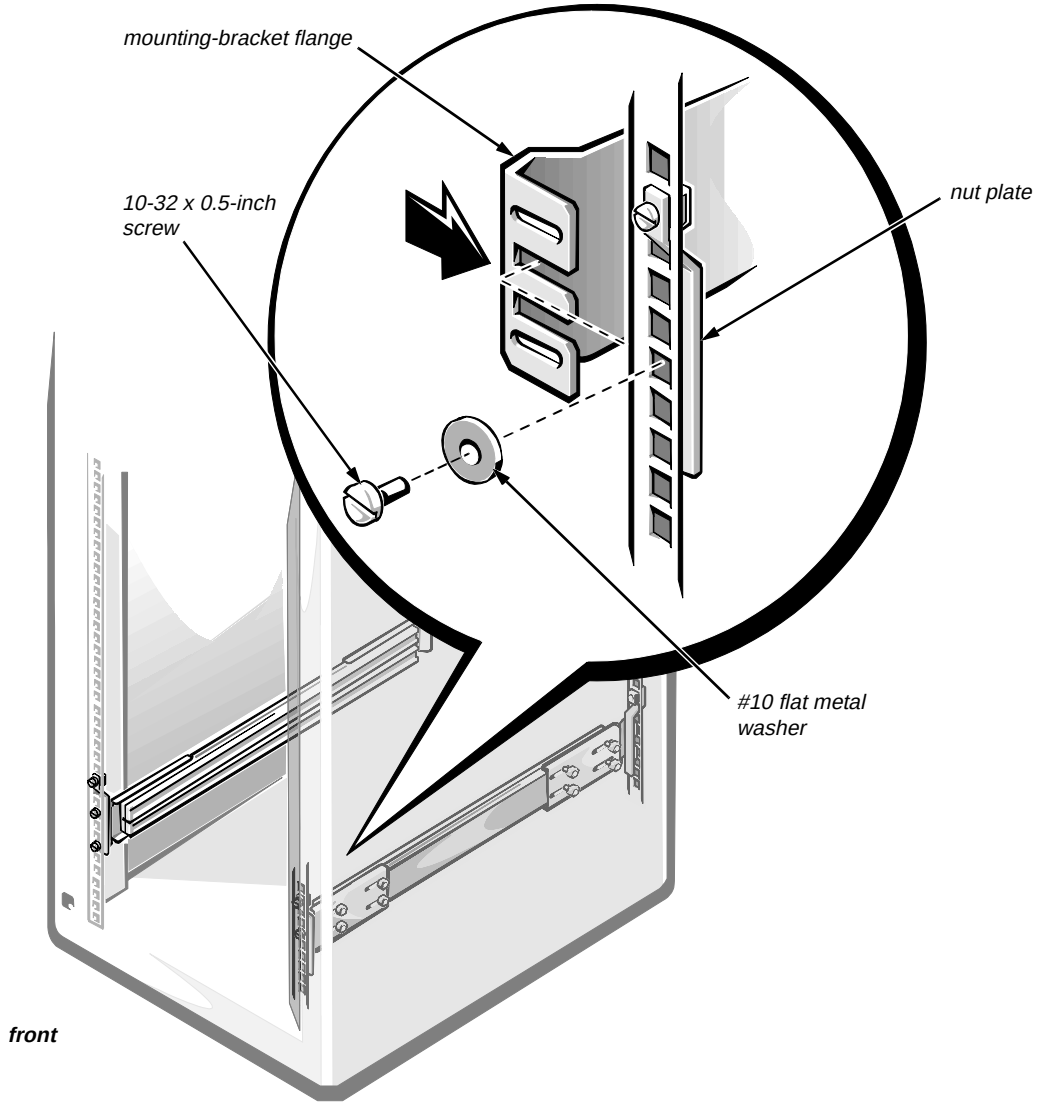


Figure 2-7. Adjusting the Length of the Slide Assemblies

3. Insert the slide assembly in the rack, and adjust the length (see Figure 2-7) as follows.

NOTES: Be sure that the green plastic stops in the ends of the channels on the slide are at the back of the rack and the green push button is on the bottom half of the interior slide. (Figure 2-13 shows the location of the green push button.)

If the slide assembly is completely extended and locked in position, press the spring located on the inside of the interior slide (near the end with the green plastic stops) to release the slide so that it can be returned to the retracted position.

a. Insert the slide's mounting-bracket flanges between the nut plates and the rack's vertical rails as shown in Figure 2-7.

b. To hold the slide assembly in place while you make minor adjustments, install a single 10-32 x 0.5-inch screw and a #10 flat metal washer in each end of the slide assembly (see Figure 2-7).

c. Adjust the slide assembly's length until the mounting-bracket flanges fit snugly against the back of the rails on both ends as shown in Figure 2-8.

d. Pull the interior slide out until you have access to the back mounting-bracket screws, and then tighten the screws.

e. Push the interior slide back to the retracted position.

4. Install the remaining screws in the slide-assembly mounting bracket.

Secure the mounting bracket on each end of the slide assembly with two 10-32 x 0.5-inch screws and two #10 flat metal washers per bracket as shown in Figure 2-8. Do not completely tighten the slide-assembly mounting screws until you install the storage system and verify that the width between slide assemblies is correct. Have another person grasp the interior and exterior slides and compress them while you tighten the mounting-bracket screws.

5. Repeat steps 1 through 4 to install the remaining slide assemblies.

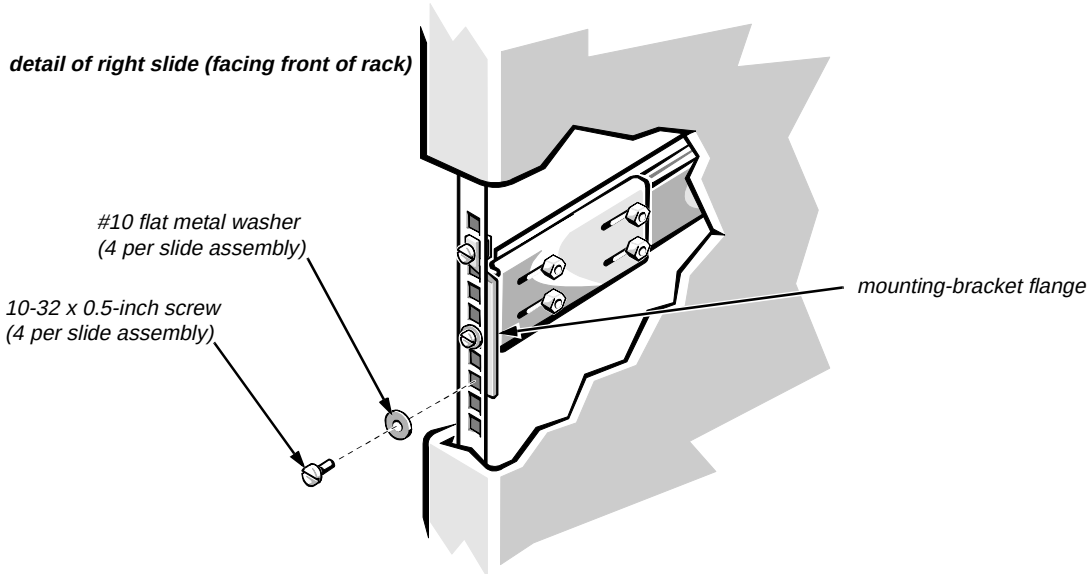


Figure 2-8. Installing the Slide Assemblies

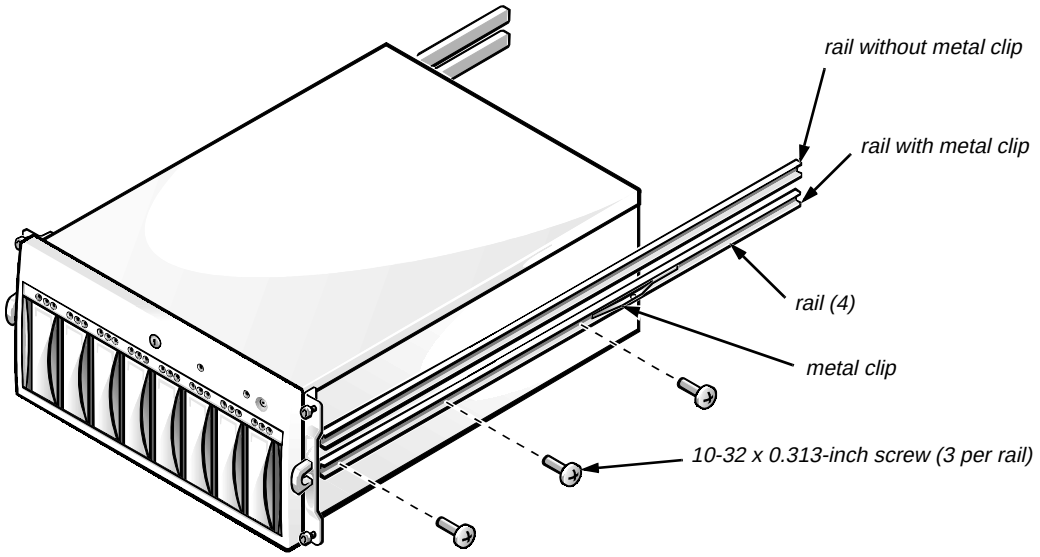


Figure 2-9. Installing the Rails

Installing the Rails

Use the following procedure to install the four rails on the storage system:

1. **Install two rails on one side of the storage system (see Figure 2-9).**

   Install the rails so that the lower rail is the one that has a metal clip on its outer side. Orient each rail such that the three holes near the rear of each rail are near the back of the storage system. Attach each rail with three 10-32 x 0.313-inch Phillips-head screws.

2. **Install the remaining pair of rails on the other side of the storage system.**

Installing the Cable-Management Arm

Use the following procedure to install the cable-management arm on the storage system:

1. **Install the right-angle bracket on the end of the cable-management arm (see Figure 2-10).**

   Use two 10-32 x 0.313-inch Phillips-head screws and two #10 flat washers to secure the bracket.

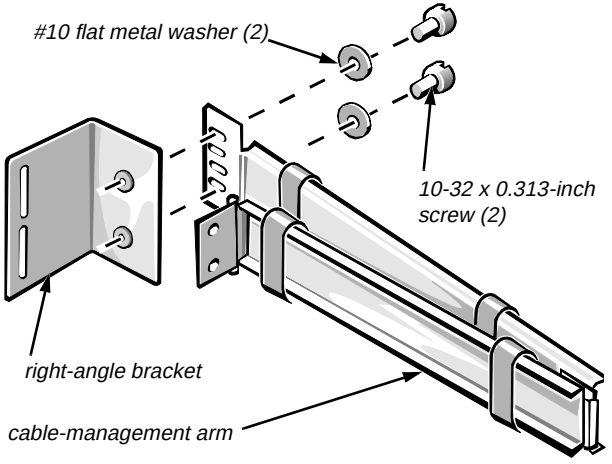


Figure 2-10. Installing the Right-Angle Bracket on the Cable-Management Arm

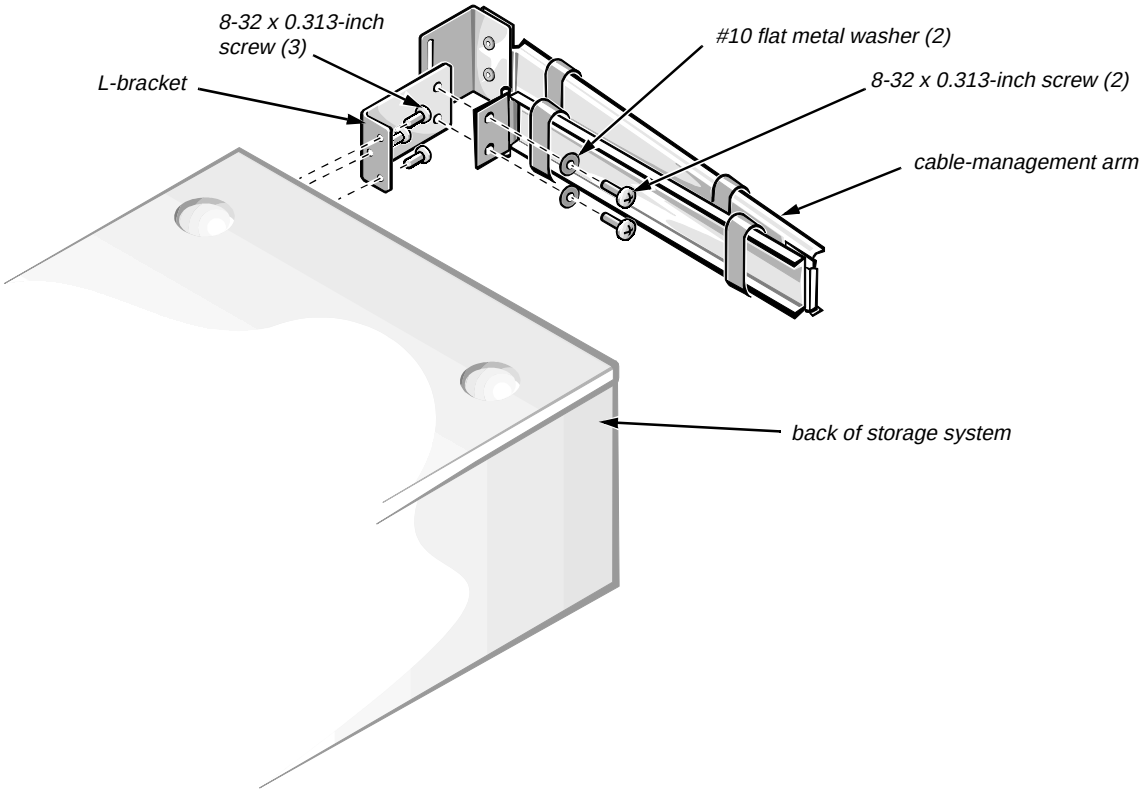


Figure 2-11. Installing the L-Bracket and Cable-Management Arm

2. **Attach the L-bracket to the back of the storage system (see Figure 2-11).**

   Secure the bracket by installing three 8-32 x 0.313 Phillips-head screws in the corresponding mounting holes in the storage system back panel (see Figure 2-15).

3. **Attach the cable-management arm to the L-bracket (see Figure 2-11).**

   Secure the arm using two 8-32 x 0.313 Phillips-head screws and two #10 flat metal washers.

Installing the Storage System in the Rack

Use the following procedure to install the storage system in the rack.

WARNING: The storage system weighs 28.8 kg (63.5 lb) when fully loaded. To prevent personal injury, use the help of another person to lay the storage system on its side so that you can remove the feet in the following procedure.

1. **Remove all four feet from the storage system.**

   Carefully lay the storage system on its side on a piece of foam or cardboard (to prevent damage to the finish) while you remove the screws securing the feet to the storage system.

2. **Install the rack adapters on the front of the storage system (see Figure 2-12).**

   Secure each adapter to the storage system with two 8-32 x 0.313-inch screws.

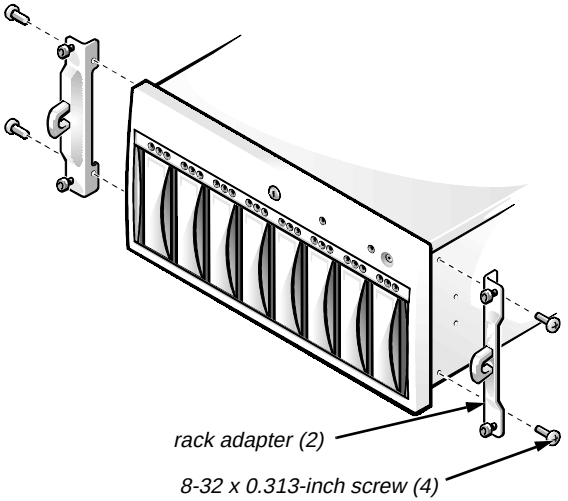


Figure 2-12. Installing the Rack Adapters

3. **Extend the two interior slides out of the rack until they lock in the extended position.**

4. **Lift the storage system into position, and insert the storage system's rails into the channels of the interior slides (see Figure 2-13).**

> **WARNING: To prevent personal injury, use the help of another person to lift the storage system and hold it in position while inserting the storage system's rails into the slides.**

The slotted holes in the slide-mounting brackets allow for adjustment if the width between the slide assemblies is not correct. Adjust the width so that the storage system slides easily into place.

NOTE: As you push the storage system into the interior slides, the slide assemblies lock in the extended position. Press the green push button near the end of each interior slide to release the locks (see Figure 2-13), and then slide the storage system completely into the rack

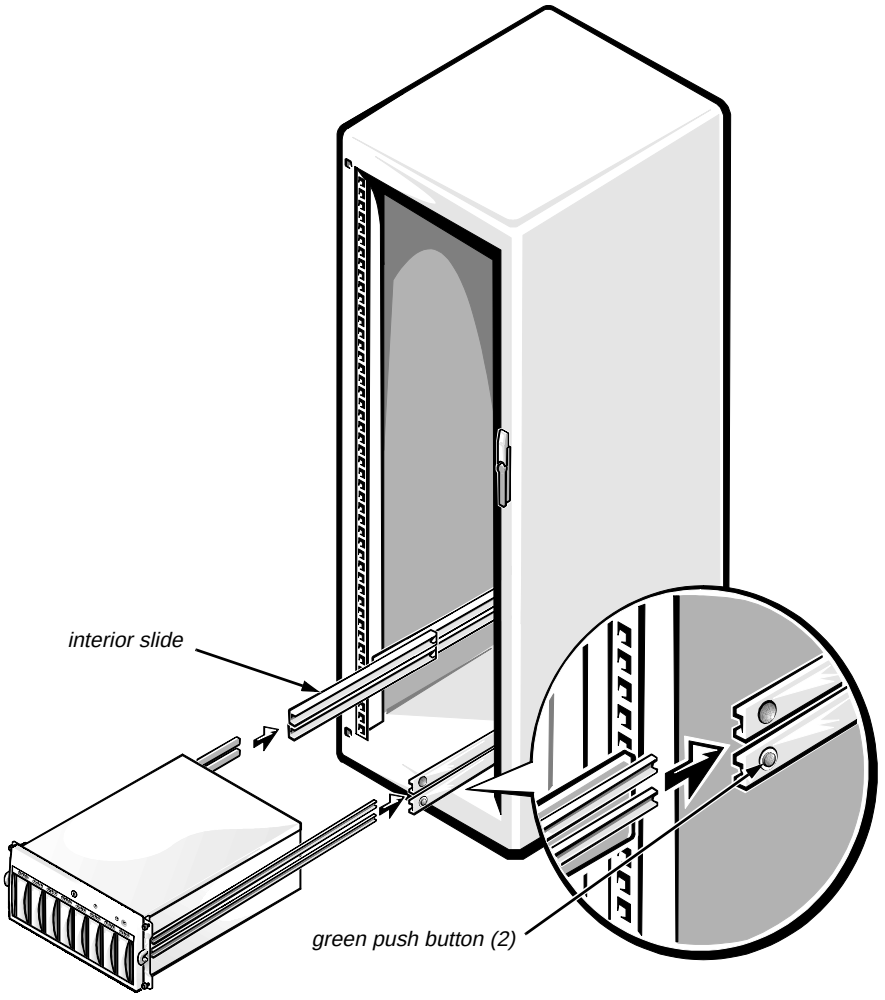


Figure 2-13. Installing the Storage System in the Rack

5. **Tighten all of the slide-assembly mounting screws securely.**

   After you tighten all of the mounting-bracket screws, slide the storage system in and out a few times to ensure that none of the adjustments changed as you tightened the screws.

6. **Slide the storage system completely into the rack.**

7. **Install cage nuts for the rack-adapter thumbscrews.**

   a. Mark the location on the front vertical rails where the thumbscrews contact the rails.

   b. Slide the storage system out to the fully extended position while you install the cage nuts.

c. Install one cage nut for each thumbscrew. See "Installing the Nut Plates," found earlier in this chapter, for instructions on installing the cage nuts.

d. Slide the storage system back into the rack and tighten the thumbscrews to hold the storage system in position.

8. Secure the loose end of the cable-management arm to the back vertical rail (see Figure 2-14).

Use two 5.5 x 13-mm Phillips-head screws and two 1/4-inch flat metal washers to secure the cable-management arm's right-angle bracket to the back vertical rail. (This is the rail on the right as you face the back of the rack.)

9. Install the cables.

Connect the storage system's SCSI and SMB cables to the host computer. See "Connecting the Storage System to the Host Computer" found later in this chapter.

10. Secure the cables.

After connecting the cables to the storage system, route the cables along the cable-management arm, and secure the cables to the cable-management arm with the Velcro strips attached to the cable-management arm.

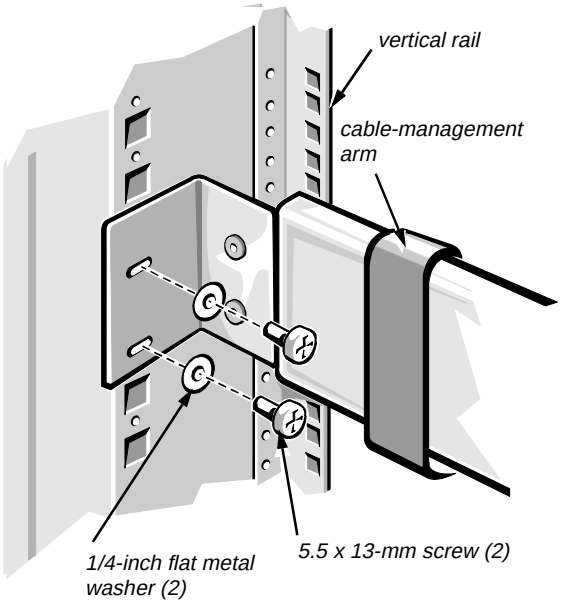


Figure 2-14. Securing the Cable-Management Arm

Replacing the Doors

Using the help of another person, replace the rack's front and back doors as follows:

1. **Lift the front door into position, and align the hinges with the holes in the rack as shown in Figure 2-4.**
2. **Slide the hinges into the holes in the rack until the hinge release levers lock the hinges into position.**
3. **Close the door latch by rotating the handle counterclockwise until it stops, push the handle in until it locks in position, and then slide the cover down over the push button (see Figure 2-3).**
4. **Repeat steps 1 through 3 to install the back door.**

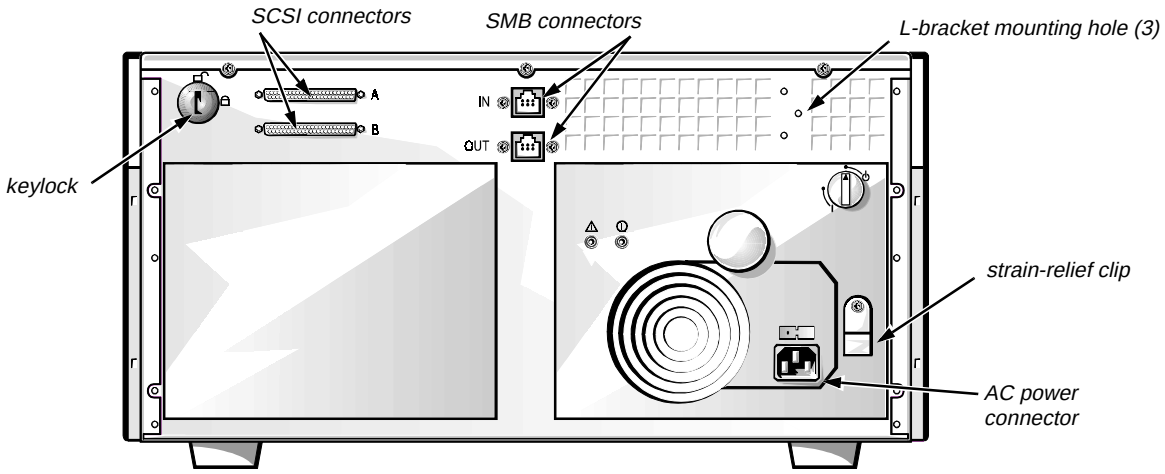


Figure 2-15. Storage System Back-Panel Features

Connecting the Storage System to the Host Computer

After setting up the storage system as described in either of the preceding sections, "Setting Up a Free-Standing Storage System" or "Setting Up a Rack-Mounted Storage System," perform the following steps to connect the storage system to the host computer:

1. **Turn off the host computer and all peripheral devices connected to it.**
2. **Connect the storage system to the SCSI host adapter(s) in the host computer.**

   NOTE: The connectors on the SCSI cable(s) are keyed for proper orientation.

   - *If you are operating the storage system in a parallel-backplane (1 x 8) configuration*, connect the external SCSI cable supplied with the storage system between SCSI connector A on the back panel of the storage system (see Figure 2-15) and the SCSI host adapter card in the host computer. Then skip to step 4.
   - *If you are operating the storage system in a split-backplane (2 x 4) configuration*, continue to step 3.
3. **Connect the two SCSI cables supplied with the storage system to the SCSI connectors on the storage system's back panel (see Figure 2-15) and to the SCSI host adapter(s) in the host computer.**

   Beginning with the drive bay adjacent to the power button, the eight drive bays' respective SCSI ID numbers are 0, 1, 2, 3, 4, 5, 8, and 9. Connect the SCSI cables as follows:

   - SCSI connector A on the storage system back panel connects to SCSI IDs 0, 1, 2, and 3.
   - SCSI connector B connects to SCSI IDs 4, 5, 8, and 9.
4. **Connect one end of the SMB cable (supplied with the storage system) to the SMB connector labeled "OUT" on the storage system's back panel (see Figure 2-15).**

   Both connectors on the SMB cable are identical. The connectors are keyed for proper orientation.
5. **Connect the other end of the SMB cable to the host computer or another storage system.**

   - *If you are connecting only one storage system to the host computer*, connect the SMB cable to the SMB connector on the host computer's back panel (see Figure 2-15).

- *If you are connecting two or more storage systems to the host computer*, link the storage systems in daisy-chain fashion to the host computer. Connect the SMB cable to the SMB connector labeled "IN" on the next storage system in the chain. The first storage system in the chain connects to the SMB connector on the host computer's back panel.

6. **Connect the storage system power cable to an alternating current (AC) power source.**

   When connecting the power cable to the storage system, ensure that the power cable is secured by the plastic strain-relief clip on the power supply (see Figure 2-15).

   To help safeguard your storage system from power problems, connect the AC power cable to an uninteruptable power supply (UPS), line conditioner, or surge protector. If your storage system includes an optional redundant power supply, connect the two power supplies to different circuits, if possible.

Preventing Unauthorized Access to the Storage System

To prevent unauthorized access to the inside of the storage system, you can lock the cover and hard-disk drives using a key provided with the storage system. The hard-disk drive keylock is located on the front panel (see Figure 1-1), while the cover keylock is located on the back panel (see Figure 2-16). The same key operates both keylocks.

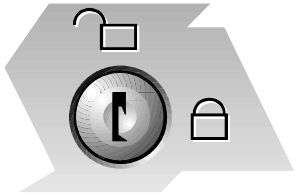


Figure 2-16. Keylock

Updating the System BIOS and Diagnostics

CAUTION: To use the storage system with the host computer system, you must update the host computer system's basic input/output system (BIOS). Instructions are provided as follows.

Use the diskettes that came with your storage system to perform the following updates:

- Use the BIOS update diskette to update the instructions necessary for the host computer system to communicate with the SCSI backplane board.
- Use the diagnostics diskette included with the storage system instead of the diagnostics on the *Dell Server Assistant CD* to allow the host computer system to work with the storage system during diagnostics.
- If an optional Dell PowerEdge Expandable RAID Controller SCSI host adapter card is installed in the host computer, use the firmware update diskette to update the firmware for the host adapter card.

The following diskettes are shipped with your storage system:

- *Customer BIOS Update for Dell PowerEdge 4100*
- *Customer BIOS Update for Dell PowerEdge 6100*
- *Customer Diagnostics*
- *Customer Firmware Update for Dell PowerEdge Expandable RAID Controller*

NOTES: Use only the Customer BIOS Update *diskette identified for the host computer system to update the system BIOS. You do not need to use the other* Customer BIOS Update *diskettes included with your storage system.*

If the system BIOS version is equal or greater than the BIOS update version, do not perform the update. For example, if the system BIOS is A03, and the BIOS update diskette is A02, then you do not need to perform the update.

The Customer Diagnostics *diskette is not system-specific and can be used with all Dell PowerEdge systems.*

Before You Update the System BIOS

CAUTION: Updating the BIOS may change settings in the complementary metal-oxide semiconductor (CMOS) and SCSI nonvolatile random-access memory (NVRAM). Changing these settings could compromise security, degrade performance, or result in loss of data. After updating the BIOS, check the computer system configurations, and reset them if necessary.

Before you update your system BIOS, use the SCSI*Select* and system configuration utilities and/or the System Setup program to record your system configuration settings. For information on these utilities or the System Setup program, see your system *User's Guide*.

Updating the Dell PowerEdge 4100 System BIOS

CAUTION: Do not turn off the host computer system during the BIOS update. If you turn off the host computer system during the BIOS update, your system will become non-functional.

To update the system BIOS for a Dell PowerEdge 4100 system, perform the following steps:

1. **Insert the *Customer BIOS Update for Dell PowerEdge 4100* diskette into drive A, and restart the system.**

   A message appears on the screen, verifying the new BIOS.

2. **Press any key to continue.**

   The system loads the files from the diskette and displays a message stating that it is about to update the system BIOS.

3. **Press <y> to begin the BIOS update.**

   While the BIOS is updating, a series of status messages appears on the screen. Another message appears when the update is completed.

4. **Remove the BIOS update diskette from drive A.**

5. **Press any key to restart the system with the new BIOS.**

6. **After the system restarts, press <F2> to access the System Setup program.**

7. **Use the arrow keys to select the Exit menu.**

8. **Select Save Changes and Exit, and then press <Enter>.**

   The system loads the BIOS default settings. A message appears on the screen, stating that the changes have been saved.

9. **Press <Enter> to exit the System Setup Program.**

Updating the Dell PowerEdge 6100 System BIOS

To update the system BIOS for a Dell PowerEdge 6100 system, perform the following steps:

1. **Insert the *Customer BIOS Update for Dell PowerEdge 6100* diskette into drive A, and restart the system.**

   The BIOS update menu appears. From this menu, you can update the system BIOS and load the BIOS default settings.

2. **Press <1> to select the BIOS update option.**

   A message appears on the screen, asking if you want to reset the ErrorLog Area prior to updating the BIOS.

3. **Press <y> for yes or <n> for no.**

   A second message appears, asking if you want to erase the SCSI NVRAM.

4. **Press <y> for yes or <n> for no.**

   A third message appears, stating that the system is ready to update the BIOS.

5. **Press <Enter>.**

   While the BIOS is updating, a series of status messages appears on the screen. Another message appears when the upgrade is completed.

6. **Restart the system with the diskette still in drive A.**

   The BIOS update menu appears.

7. **Press <2> to load the BIOS default settings.**

   The system loads the BIOS default settings. When the system restarts, it detects the updated BIOS and default settings.

Updating the Dell PowerEdge Expandable RAID Controller SCSI Host Adapter Card Firmware

To update the firmware for a Dell PowerEdge Expandable RAID Controller SCSI host adapter card, perform the following steps:

1. **Insert the *Customer Firmware Update for Dell PowerEdge Expandable RAID Controller* diskette into drive A, and restart the system.**

   A message appears on the screen, verifying the new firmware.

2. **Press <Enter> to continue.**

   The system loads the files from the diskette and displays a message stating that it is about to update the host adapter card with the new firmware.

3. **Press <y> to begin the firmware update.**

   A message appears when the update is completed, prompting you to restart the system.

4. **Remove the firmware update diskette from drive A, and restart the system.**

Running the Diagnostics

Use the diagnostics diskette included with the storage system to run the diagnostics for the host computer system. For instructions, see the *Diagnostics and Troubleshooting Guide* or the *Installation and Troubleshooting Guide* that accompanied your host computer system.

Chapter 3
Installing Drives and Power Supplies

This chapter describes how to remove and install hard-disk drives and power supplies in a Dell PowerEdge SDS 100 storage system.

Drive Installation and Removal

The storage system includes a small computer system interface (SCSI) backplane board that greatly simplifies cabling and configuration for SCSI hard-disk drives. All SCSI identification (ID) and termination for the hard-disk drives is configured by the SCSI backplane, rather than on individual drives.

When used in combination with an optional Dell PowerEdge Expandable RAID Controller host adapter card in the host computer, the SCSI backplane board allows you to remove and insert hard-disk drives without shutting down the storage system—an invaluable feature for servers that contain important data and programs for an entire network of users. You can replace a failed drive without forcing all users on the network to log off and lose valuable time and possibly data. See "Removing and Installing SCSI Hard-Disk Drives in the Drive Bays," found later in this chapter, for details.

SCSI Hard-Disk Drive Configuration

The SCSI backplane board provides termination for the SCSI bus. None of the drives connected to the SCSI backplane board should have their termination enabled. All SCSI ID numbers for the drives are set by the SCSI backplane board. Beginning with the drive bay adjacent to the power button, the eight drive bays' respective SCSI ID numbers are 0, 1, 2, 3, 4, 5, 8, and 9.

Removing and Installing SCSI Hard-Disk Drives in the Drive Bays

The following subsections describe how to remove or install hard-disk drive carriers in the storage system's drive bays.

If the storage system is connected to a Dell PowerEdge Expandable RAID Controller host adapter card or another host adapter card approved by Dell for hot-pluggable drives, you can remove and insert SCSI hard-disk drives while the storage system is running.

Before attempting to remove or insert a drive while the storage system is running, see the documentation for the Dell PowerEdge Expandable RAID Controller host adapter card to ensure that the host adapter is configured correctly to support drive removal and insertion.

CAUTION: Removing and installing SCSI hard-disk drives with the storage system running is *not* supported for systems *without* a Dell PowerEdge Expandable RAID Controller host adapter card. Removing a drive in this situation will result in loss of data.

SCSI Hard-Disk Drive Indicator Patterns

The three light-emitting diode (LED) indicators adjacent to each of the eight hard-disk drive bays provide information on the status of the hard-disk drives. The SCSI backplane firmware controls the drive online and drive fault indicators, while the drive activity indicator is usually controlled by the drive itself.

Table 3-1 lists the various drive indicator patterns. Different patterns are displayed as drive events occur. For example, in the event of a hard-disk drive failure, the "drive failed" pattern appears. After the drive is selected for removal, the "drive being prepared for removal" pattern appears, followed by the "drive ready for removal" pattern. After the replacement drive is installed, the "drive being prepared for operation" pattern appears, followed by the "drive online" pattern.

Table 3-1. SCSI Hard-Disk Drive Indicator Patterns

Condition	Indicator Pattern
Identify drive	All three drive status indicators flash simultaneously.
Drive being prepared for removal	The three drive status indicators flash sequentially.
Drive ready for insertion or removal	All three indicators are off.
Drive being prepared for operation	The drive online indicator is on. The drive activity indicator may flash briefly.
Drive bay empty	All three indicators are off.
Drive predicted failure	The drive online indicator turns off. The drive fault indicator blinks on briefly each second.
Drive failed	The drive online indicator turns off. The drive fault indicator blinks off briefly each second.
Drive rebuilding	The drive online indicator blinks rapidly.
Drive online	The drive online indicator is on.
Identify storage system	All 24 drive status indicators flash simultaneously.

Removing a SCSI Hard-Disk Drive From the Storage System

Remove a SCSI hard-disk drive and carrier from a drive bay as follows:

1. **Power down the hard-disk drive.**

   - *If a Dell PowerEdge Expandable RAID Controller host adapter card is installed in the host computer,* power down the hard-disk drive. If the drive is online, the three drive indicators flash sequentially as the drive is powered down.

     For more information, refer to the Dell PowerEdge Expandable RAID Controller documention.

   - *If a Dell PowerEdge Expandable RAID Controller host adapter card is not installed in the host computer,* turn off the host computer and storage system.

2. **Wait until all three drive status indicators adjacent to the drive bay turn off, signaling that the drive may be removed.**

3. **Remove the hard-disk drive.**

   Release the drive carrier by opening the plastic drive handle. Slide the carrier toward you until it is free of the drive bay.

Installing a SCSI Hard-Disk Drive in the Storage System

Install a SCSI hard-disk drive and carrier in a drive bay as follows.

NOTE: This procedure assumes that the upgrade kit included the drive already installed in the carrier. If this is not the case, see "Installing a Hard-Disk Drive in a Drive Carrier" found later in this section.

1. **Remove the drive or empty carrier from the drive bay as described in the preceding subsection, "Removing a SCSI Hard-Disk Drive From the Storage System."**

2. **Insert the replacement drive carrier into the bay.**

   Holding the drive carrier by its sides, insert the carrier into the bay (see Figure 3-1).

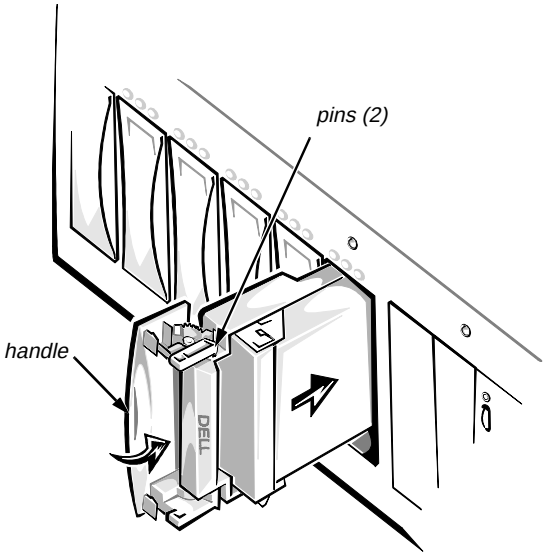


Figure 3-1. Installing a SCSI Hard-Disk Drive

3. **When the pins on the drive carrier handle contact the drive bay, close the handle to draw the drive carrier into the bay and lock the drive in place.**
4. **When the controller recognizes the hard-disk drive, the drive online indicator turns on.**

Installing a Hard-Disk Drive in a Drive Carrier

Hard-disk drive upgrade kits from Dell contain the following parts:

- Hard-disk drive
- Plastic drive carrier
- Adapter card (to provide a stable connection between the drive and the SCSI backplane board in the storage system)
- Four screws to secure the hard-disk drive to the carrier

Some upgrade kits also contain a die-cut adhesive-backed panel. Instructions for using this panel are included in this subsection.

NOTE: Dell recommends that you use only drives that it has tested and approved for use with the SCSI backplane board.

Install a hard-disk drive in a drive carrier by performing the following steps:

1. **Insert the adapter card into the drive carrier.**
   a. Hold the adapter card so that the adapter-card cable connector is facing into the carrier (see Figure 3-2). The adapter-card cable connector is at the loose end of the adapter card cable. The SCSI backplane board interface connector is soldered onto the adapter card; it should be facing away from the carrier.

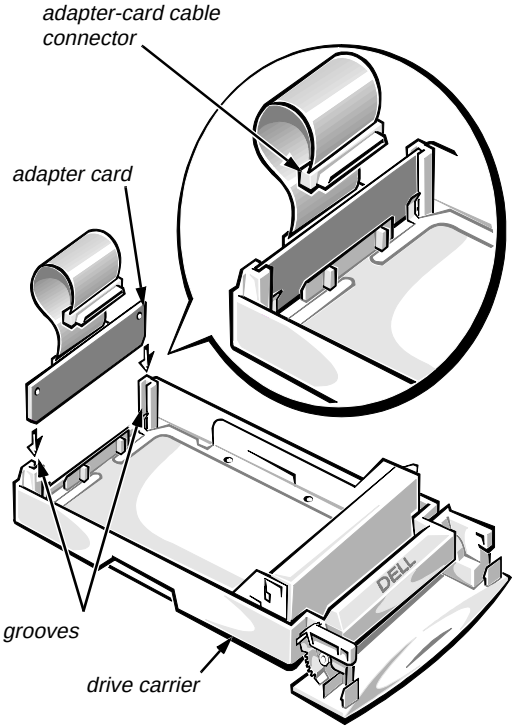


Figure 3-2. Installing the Adapter Card

b. Slide the bottom of the card (the edge with angled corners) into the grooves on the back of the carrier. Then push the card down firmly until it stops.

NOTE: The plastic carrier may bend a bit as the card is inserted. If necessary, slide one end of the card into the groove first, and then slide in the other end of the card.

c. Gently push the SCSI backplane board interface connector toward the inside of the carrier while pushing down on the card.

The card snaps into place. If the plastic carrier was flexed while the card was being inserted, it should now be straight. The top edge of the card should not extend above the grooves in the carrier.

When properly installed, the adapter card sits between the metal grounding fingers and the outer lip of the carrier. The grounding fingers ground the drive to the storage system chassis and keep the adapter card stable inside the carrier.

If improperly installed, the carrier does not fit into the storage system's drive bay. In that case, remove the drive carrier and reseat the adapter card.

2. If the upgrade kit contains a die-cut adhesive-backed panel, peel the thin plastic film off the backing and lay it over the component board of the hard-disk drive. (If the upgrade kit does not contain the adhesive panel, continue to step 3.)

When a Seagate 4-gigabyte (GB) SCSI hard-disk drive is attached to the carrier, the drive's component board is accessible. The plastic film protects the drive from damage if a person touches the component board while the storage system is on and the drive carrier is installed in the storage system. It is also possible, although unlikely, that a mild electric shock may be experienced if a person touches the unprotected component board while the storage system is on and the drive carrier is installed in the storage system. The plastic film protects against this possibility.

3. Attach the drive to the adapter-card cable connector (see Figure 3-3).

The adapter-card cable connector and the interface connector on the hard-disk drive are keyed to prevent improper attachment.

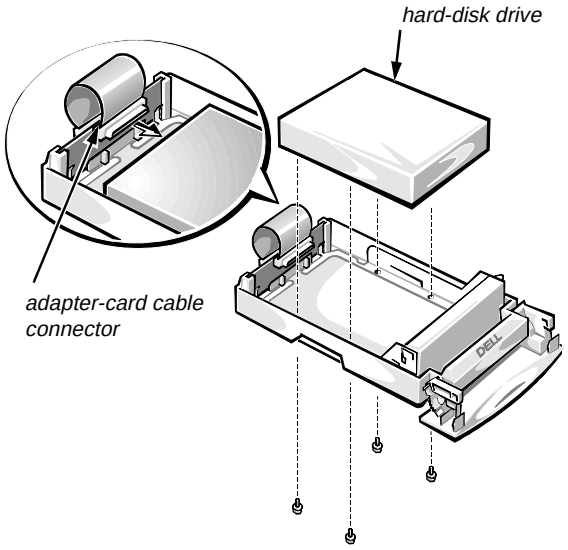


Figure 3-3. Attaching the Drive to the Adapter-Card Cable Connector

4. Place the drive into the carrier.

The four screw holes on the bottom of the drive should face down in the carrier. To help with the next step, locate the screw holes before placing the drive in the carrier.

5. Attach the drive to the carrier.

Hold the drive securely in the carrier, and turn over the carrier. Align the four screw holes on the bottom of the drive with the four small holes on the bottom of the carrier (two on each side of the carrier). Use a 1/4-inch nut driver to attach the four screws to the bottom of the carrier and to the hard-disk drive.

Installing a Power Supply

Use the following procedure for replacing either a primary or an optional redundant power supply. If an optional redundant power supply is installed in the storage system, it is controlled by a power-supply paralleling board (PSPB). If a power-supply paralleling board is installed, the LEDs on the back of the power supply (see Figure 3-4) signal the status of the power supply. If the red power-supply fault indicator lights up, replace the power supply.

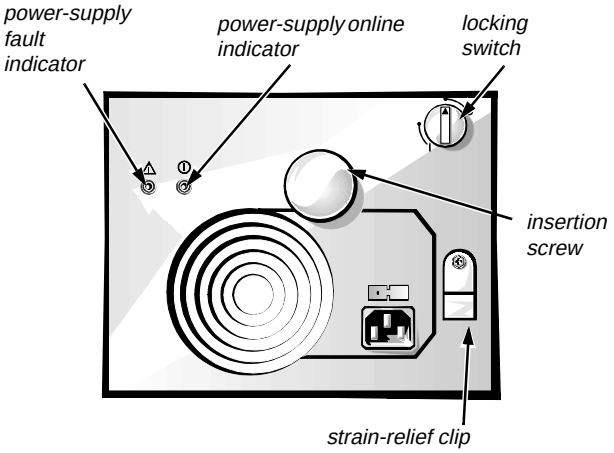


Figure 3-4. Power Supply Features

Follow these steps to replace a power supply:

1. **Disconnect the alternating current (AC) power cable from the power outlet, and then disconnect the other end of the cable from the power supply.**

   Open the plastic strain-relief clip, and remove the AC power cable.

2. **Turn the rotary locking switch on the power supply clockwise to the "off" position, marked by a "0."**

3. **Turn the insertion screw counterclockwise to release the power supply.**

4. **Slide the power supply out of the chassis (see Figure 3-5).**

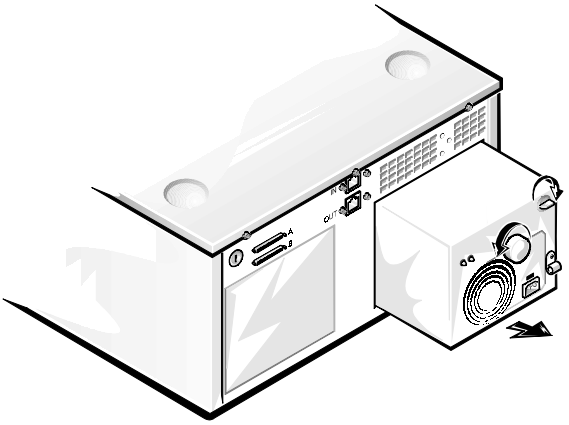


Figure 3-5. Removing the Power Supply

5. **Check that the locking switch on the new power supply is set to the "off" position, and then slide the power supply into the chassis.**

6. **Turn the insertion screw clockwise until the replacement power supply is secured in the chassis.**

7. **Connect the AC power cable to the power supply and to the power outlet.**

   Make sure that the AC power cable passes through the plastic strain-relief clip.

8. **Turn the locking switch on the power supply counterclockwise to the "on" position, marked by an "I."**

   The green online indicator on the power supply lights up.

Chapter 4
Getting Help

This chapter describes the tools Dell provides to help you when you have a problem with your Dell PowerEdge SDS 100 storage system. It also tells you when and how to call Dell Computer Corporation for technical or customer assistance in the following situations:

- *If you have a technical problem*, read the next section, "Technical Assistance."
- *If you are looking for information about a specific subject or about Dell's services*, read "Help Tools" found later in this chapter.
- *If you have a problem with your order*, read "Problems With Your Order" found later in this chapter.
- *If you need to return an item for warranty repair or credit*, read "Returning Items for Warranty Repair or Credit" found later in this chapter.
- *If you would like to place an order or need information about additional products available from Dell*, call Dell at the appropriate telephone number listed in "Dell Contact Numbers" found later in this chapter.

Technical Assistance

If you need assistance with a technical problem, perform the following steps:

1. **Review the documentation that accompanied your Dell storage system.**

   To help you determine which document may have the answers you need, consult "Other Documents You May Need" in the Preface found earlier in this guide.

2. **Make a copy of the Diagnostics Checklist (found later in this chapter), and fill it out.**

   NOTE: Save the Diagnostics Checklist in this chapter as a master so you can use it to make copies as needed.

   On your copy of the Diagnostics Checklist, document any error messages or beep codes as they occur so you can inform the Dell technician of them. Describe what you were doing when the error occurred. Note the steps you have taken to solve the problem.

3. **Use the AutoTech service for help with installation and troubleshooting procedures.**

   For instructions on using the AutoTech service, see "AutoTech Service" found later in this chapter

4. **If the preceding steps have not resolved the problem and you need to talk to a Dell technician, you can call Dell's customer technical support service.**

   For instructions on using the technical support service, see "Technical Support Service" and "Before You Call" found later in this chapter.

Help Tools

Dell provides a number of tools to assist you. Table 4-1 lists subjects you may want information about, tasks you may want to perform, and the tool(s) you can use for help. Each tool is described later in this section.

Table 4-1. Help Tools

Subject or Task	Tool
BIOS revisions	TechConnect BBS
Frequently asked questions	AutoTech service
Information about Dell, its products, and its services	TechFax service, World Wide Web on the Internet
Installation instructions	*Installation and Service Guide*, technical support service, AutoTech service
Interrupt maps	TechFax service
Ordering parts	Technical support service, TechConnect BBS
Software update information	TechFax service
Board layouts	TechFax service, system documentation
Technical notes on system compatibility and revisions	TechFax service
Technical training class information	TechFax service
Technical specifications	TechFax service, *Installation and Service Guide*
Troubleshooting, step-by-step instructions	*Installation and Service Guide*, Dell diagnostics program, AutoTech service
Unresolved problems requiring assistance from a Dell technician	Technical support service, TechConnect BBS

NOTE: For the full name of an abbreviation or acronym used in this table, see the Abbreviations and Acronyms *list.*

Installation and Service Guide

The *Installation and Service Guide* includes information about features of the storage system, customizing the operation of the storage system, and diagnosing and troubleshooting problems.

World Wide Web on the Internet

Dell can be accessed electronically on the Internet via a World Wide Web site, a file transfer protocol (FTP) site, and electronic mail (e-mail) using the following addresses:

- World Wide Web

  http://www.dell.com/

- Anonymous FTP

  ftp.dell.com/

  Log in as `user: anonymous`, and use your e-mail address as your password.

- Electronic Support Service

  support@dell.com

- Electronic Quote Service

  sales@dell.com

- Electronic Information Service

  info@dell.com

Commercial Online Services

Dell can also be accessed electronically via commercial online services, such as CompuServe®, PRODIGY®, America Online, and the Microsoft Network, by using the following addresses:

- CompuServe

  Type `GO DELL`.

- PRODIGY

  Select Manufacturer's Corner; then select Dell.

- America Online

  Use the keyword `DELL`.

- Microsoft Network

  From the Edit menu, select Go To, select Other Places, and then type `DELL`.

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers.

When you call AutoTech, you use your touch-tone telephone to select the subjects that correspond to your questions. You can even interrupt an AutoTech session and continue the session later. The code number that the AutoTech service gives you allows you to continue your session where you ended it.

The information available through AutoTech includes:

- Specifications and prices for Dell computers currently on sale
- Installation instructions for Dell computers and peripherals
- Answers to questions about MS-DOS® and the Microsoft Windows® 95 and Windows 3.*x* operating systems
- Help in troubleshooting your Dell storage system

The AutoTech service is available 24 hours a day, seven days a week. You can also access this service through the technical support service. For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

NOTE: AutoTech is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

TechFax Service

Dell takes full advantage of fax technology to serve you better. Twenty-four hours a day, seven days a week, you can call the Dell TechFax line toll-free for all kinds of technical information.

Using a touch-tone phone, you can select from a full directory of topics. The technical information you request is sent within minutes to the fax number you designate. TechFax information includes:

- Board layouts and specifications.
- Technical notes on system compatibility and revisions.
- Descriptions of available technical training classes. For Dell-certified technicians, TechFax offers information such as parts lists, drawings, and maintenance and repair data.

For the TechFax telephone number, see "Dell Contact Numbers" found later in this chapter.

NOTE: TechFax is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

TechConnect BBS

Use your modem to access Dell's TechConnect Bulletin Board Service (BBS) 24 hours a day, seven days a week. The service is menu-driven and fully interactive. The modem settings for the BBS are 8 bit, no parity, 1 stop bit.

You can use the BBS to do the following:

- Send questions to a Dell technician
- Request a follow-up call or leave a message for a Dell technical support specialist
- Order parts
- Download basic input/output system (BIOS) and video driver upgrades
- Download updates

For the BBS telephone number, see "Dell Contact Numbers" found later in this chapter.

NOTE: The TechConnect BBS is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

Automated Order-Status System

You can call this automated service to check on the status of any Dell products that you have ordered. A recording prompts you for the information needed to locate and report on your order. For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

NOTE: The Automated Order-Status System is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

Technical Support Service

Dell's industry-leading hardware technical support service is open 24 hours a day, seven days a week. At any hour of any day, a Dell technical expert is ready with the answers to your questions about Dell hardware.

Our technical support staff pride themselves on their track record: more than 90 percent of all problems and questions are taken care of in just one toll-free call, usually in less than ten minutes. When you call, our experts can refer to records we keep on your specific Dell system to better understand your particular question. Our technical support staff use computer-based diagnostics to provide fast, accurate answers to your questions.

To contact Dell's technical support service, first refer to the section titled "Before You Call" and then call the number for your country as listed in "Dell Contact Numbers" found later in this chapter. (For information about receiving technical assistance in the U.K., refer to the *Placing a Service Call* card that came with your storage system.)

NOTE: Technical support services may vary outside the continental U.S. Contact your local Dell representative for more information.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell Computer Corporation for customer assistance. Have your invoice or packing slip handy when you call. For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

Product Information

If you need information about additional products available from Dell Computer Corporation, or if you would like to place an order, a sales specialist will be glad to help. For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1. **Call Dell to obtain an authorization number, and write it clearly and prominently on the outside of the box.**

   For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

2. **Include a copy of the invoice and a letter describing the reason for the return.**

3. **Include a copy of the Diagnostics Checklist indicating the tests you have run and any error messages reported by the Dell diagnostics.**

4. **Include any accessories that belong with the item(s) being returned (power cables, software diskettes, guides, and so on) if the return is for credit.**

5. **Pack the equipment to be returned in the original (or equivalent) packing materials.**

   Include return shipping expenses. You are responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell Computer Corporation. Collect on delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

Keep a record of your diagnostic and troubleshooting activities by photocopying the Diagnostics Checklist in Figure 4-1 and filling it out whenever you experience a problem with the storage system.

NOTE: Be sure to save the checklist in Figure 4-1 as a master, so you can use it to make copies as needed.

If you need to call Dell Computer Corporation for assistance, you will be able to inform the support technician of the actions you have taken to resolve the problem. If you must return a piece of hardware to Dell, a technician will assign a Return Material Authorization Number. Record the number on the checklist, and include the completed checklist in the shipping box.

Dell's technical support staff uses computer-based diagnostics to provide fast, accurate answers to your questions. When you call, the technical support staff refers to records regarding your specific Dell storage system to better understand your particular question.

NOTE: Have your express service code ready when you call. The code helps Dell's automated support telephone system direct your call more efficiently.

If possible, turn your system on before you call Dell for technical assistance and call from a telephone at or near the storage system. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the storage system itself.

WARNING: If you need to remove the storage system cover, be sure to first disconnect the storage system's power cables from all electrical outlets.

Diagnostics Checklist

Name: _____Date: _____

Address: _____Phone number:_____

Service tag (bar code on the back of the storage system):

_____

Express service code: _____

Return Material Authorization Number (if provided by Dell support technician): _____

Operating system and version: _____

Peripherals: _____

_____

_____

PC Cards or expansion cards:_____

_____

_____

Network, version, and network card: _____

Programs and versions:_____

_____

_____

_____

See your operating system documentation to determine the contents of the host computer's start-up files. If the host system is connected to a printer, print each file. Otherwise, record the contents of each file before calling Dell.

Error message or beep code:_____

Description of problem and troubleshooting procedures you performed: _____

_____

_____

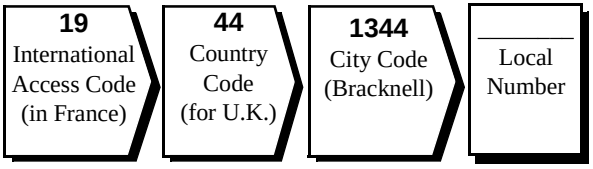
_____

_____

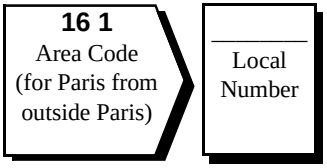
Figure 4-1. Diagnostics Checklist

Dell Contact Numbers

When you need to contact Dell, use the telephone numbers and codes provided in Tables 4-2 and 4-3. Table 4-2 provides the various codes required to make long-distance and international calls. Table 4-3 provides local telephone numbers, area codes, and toll-free numbers, if applicable, for each department or service available in various countries around the world. If you are making a direct-dialed call to a location outside of your local telephone service area, determine which codes to use (if any) in Table 4-2 in addition to the local numbers provided in Table 4-3. For example, to place an international call from Paris, France to Bracknell, England, dial the international access code for France followed by the country code for the U.K., the city code for Bracknell, and then the local number as shown in the following illustration.



To place a long-distance call within your own country, use area codes instead of international access codes, country codes, and city codes. For example, to call Paris, France from Montpellier, France, dial the area code plus the local number as shown in the following illustration.



The codes required depend on where you are calling from as well as the destination of your call; in addition, each country has a different dialing protocol. If you need assistance in determining which codes to use, contact a local or an international operator.

NOTE: Toll-free numbers are for use only within the country for which they are listed. Area codes are most often used to call long distance within your own country (not internationally)—in other words, when your call originates in the same country you are calling.

Table 4-2. International Dialing Codes

Country (City)	International Access Code	Country Code	City Code
Australia (Sydney)	0011	61	2
Austria (Vienna)	900	43	1
Belgium (Brussels)	00	32	2
Brunei	—	673	—
Canada (North York, Ontario)	011	—	Not required
China (Beijing)	—	86	10
Czech Republic (Prague)	00	42	2
Denmark (Horsholm)	009	45	Not required
Finland (Helsinki)	990	358	0
France (Paris) (Montpellier)	19	33	(1) (67)
Germany (Langen)	00	49	6103
Hong Kong	001	852	Not required
Ireland (Bray)	16	353	1
Italy (Milan)	00	39	2
Japan (Kawasaki)	001	81	44
Korea (Seoul)	001	82	2
Luxembourg	00	—	—
Macau	—	853	Not required
Malaysia (Penang)	007	60	4
Mexico (Colonia Granada)	95	52	5
Netherlands (Amsterdam)	00	31	20
New Zealand	00	64	—
Norway (Lysaker)	095	47	Not required
Poland (Warsaw)	011	48	22
Singapore (Singapore)	005	65	Not required
South Africa (Johannesburg)	09/091	27	11
Spain (Madrid)	07	34	1

Table 4-2. International Dialing Codes *(continued)*

Country (City)	International Access Code	Country Code	City Code
Sweden (Upplands Vasby)	009	46	8
Switzerland (Geneva)	00	41	22
Taiwan	002	886	—
Thailand	001	66	—
U.K. (Bracknell)	010	44	1344
U.S. (Austin, Texas)	011	1	Not required

Table 4-3. Dell Contact Numbers

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
Australia (Sydney)	Customer Technical Support		toll free: 1-800-808-378
	Customer Care		toll free: 1-800-819-339
	Sales		toll free: 1-800-808-312
	Fax		toll free: 1-800-818-341
Austria* (Vienna)	Switchboard		0224334100-0
	Technical Support		0660-8779
Belgium* (Brussels)	Customer Technical Support	02	481 92 88
	Customer Service	02	466 91 99
	Sales		toll free: 0800 16884
	SalesFax	02	466 47 89
	TechFax (International call to the Netherlands)		00 31 206829106
	TechConnect BBS (International call to the Netherlands)		00 31 206866504
Brunei	Customer Technical Support		60 4 810-4966
	Sales		60 4 810-4955

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
Canada (North York, Ontario) *NOTE: Customers in Canada call the U.S. for access to TechConnect BBS.*	Automated Order-Status System		toll free: 1-800-433-9014
	AutoTech (Automated technical support)		toll free: 1-800-247-9362
	Customer Care (From outside Toronto)		toll free: 1-800-387-5759
	Customer Care (From within Toronto)	416	758-2400
	Customer Technical Support (From outside Toronto)		toll free: 1-800-387-5757
	Customer Technical Support (From within Toronto)	416	758-2300
	Customer Account Services (Credit Return Authorization Numbers)		toll free: 1-800-387-5759
	Sales (Direct sales—from outside Toronto)		toll free: 1-800-387-5752
	Sales (Direct sales—from within Toronto)	416	758-2200
	Sales (Software and peripherals)		toll free: 1-800-667-7345
	Sales (Federal government, education, and medical)		toll free: 1-800-567-7542
	Sales (Major accounts)		toll free: 1-800-387-5755
	TechConnect BBS	512	728-8528
	TechFax		toll free: 1-800-950-1329
China (Beijing)	Sales		6846 1122
Czech Republic* (Prague)	Technical Support	02	8728 221
	Customer Service and Sales	02	879250
	TechConnect BBS	02	66710274

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
Denmark* (Horsholm)	Customer Care, Technical Support, and Sales		toll free: 800 171 62
Finland* (Helsinki)	Customer Support and Technical Support		toll free: 0800-534 55
	Sales		toll free: 0800-33 55
France* (Paris/Montpellier)	Technical Support (Paris)	16 1	47 62 68 90 67 06 62 86
	Customer Care (Paris)	16 1	47 62 69 39
	Customer Care (Fax) (Paris)	16 1	47 62 60 03
	Customer Care (Fax) (Montpellier)	16	06 60 03
	TechFax (Montpellier)	16	22 53 11
	TechConnect BBS (Montpellier)	16	22 53 04
	Sales (Major accounts) (Paris)	16 1	47 62 69 00
	Direct Sales (Paris)	16 1	47 62 68 50 47 62 68 68
	Corporate Sales (Paris)	16 1	47 62 69 00
Germany* (Langen)	Customer Technical Support	06103	971-200
	Customer Care	06103	971-500
	TechConnect BBS	06103	971-666
	Sales	06103	971-460
Hong Kong	Customer Technical Support		toll free: 800 4107
	Sales		toll free: 800 4109

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
Ireland* (Bray)	Customer Technical Support		1-850-543-543
	Sales		1-850-235-235
	SalesFax	01	286 2020
	Fax	01	286 6848
	TechConnect BBS	01	204 4761
	TechFax	01	204 4044
	Switchboard	01	286 0500
Italy* (Milan)	Switchboard		215.69.530
	Fax		215.69.444
Japan (Kawasaki)	Technical Support		toll free: 0088-22-7890
	Customer Care	044	556-4240
	Direct Sales	044	556-3344
	Commercial Sales	044	556-3430 556-3440
	Switchboard	044	556-4300
Korea (Seoul)	Technical Support		toll free: 080-200-3800
	Customer Service and Sales		toll free: 080-200-3600
	Fax		394 3122
	Switchboard		287 5600
Latin America *NOTE: Customers in Latin America call the U.S. for sales and technical assistance.*	Customer Technical Support	512	728-4093
	Customer Service	512	728-3619
	Fax (Technical Support and Customer Service)	512	728-3883
	Sales	512	728-4397
	SalesFax	512	728-4600 728-3772

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
Luxembourg* *NOTE: Customers in Luxembourg call Belgium for sales, customer assistance, and technical assistance, and they call the Netherlands for the SalesFax, TechFax, and TechConnect BBS services.*	Customer Technical Support (Brussels, Belgium)		toll free: 0800 2109
	Customer Service (Brussels, Belgium)	02	466 91 99
	Sales (Brussels, Belgium)		toll free: 0800 16884
	SalesFax (Brussels, Belgium)	02	466 47 89
	TechFax (Amsterdam, Netherlands)		682 91 06
	TechConnect BBS (Amsterdam, Netherlands)		686 65 04
Macau	Customer Technical Support		toll free: 0800 582
	Sales		toll free: 0800 581
Malaysia (Penang)	Customer Technical Support		toll free: 800 8298
	Sales		toll free: 800 8202
Mexico (Colonia Granada) *NOTE: Customers in Mexico call the U.S. for access to the Automated Order-Status System and AutoTech.*	Automated Order-Status System (U.S.)	512	728-0685
	AutoTech (U.S.) (Automated technical support)	512	728-0686
	Customer Technical Support	525	228-7870
	Sales	525	228-7811
			toll free: 91-800-900-37
			toll free: 91-800-904-49
	Customer Service	525	228-7878
	Main	525	228-7800
Netherlands* (Amsterdam)	Customer Technical Support	020	581 8838
	Direct Sales		toll free: 06-0663
	Direct SalesFax	020	682 7171
	Corporate Sales	020	581 8818
	Corporate SalesFax	020	686 8003
	TechFax	020	682 9106
	TechConnect BBS	020	686 6504

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
New Zealand	Technical Support		0800 446 255
	Sales		0800 441 567
	Fax		0800 441 566
Norway* (Lysaker)	Customer Technical Support and Customer Service		22-67 50 00
	Sales		67-125 711
Poland* (Warsaw)	Switchboard		620-7898
	Fax		620-4584
Singapore (Singapore)	Customer Technical Support		toll free: 800 6011 051
	Sales		toll free: 800 6011 054
South Africa (Johannesburg)	Switchboard		011 447-7567
	Fax		011 447 7549
Southeast Asian/ Pacific Countries (excluding Australia, Brunei, China, Hong Kong, Japan, Korea, Macau, Malaysia, New Zealand, Singapore, Taiwan, and Thailand—see individual listings for these countries)	Customer Technical Support		60 4 810-4977
	Sales		60 4 810-4988
Spain* (Madrid)	Technical Support	91	902.100.130
	Customer Service	91	329 10 80
	TechConnect BBS	91	329 33 53
	Sales	91	902.100.185
	Switchboard	91	329 10 80

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
Sweden* (Upplands Vasby)	Technical Support	08	590 05 199
	Customer Care	08	590 05 169
	TechConnect BBS	08	590 05 591
	Sales	08	590 05 185
Switzerland* (Geneva)	Technical Support (Swiss French)	022	979 01 50
	Technical Support (Swiss German)	022	979 01 55
	TechConnect BBS	022	979 01 88
			979 01 89
	Customer Service	022	979 01 50
Taiwan	Technical Support		toll free: 0080 651 226
	Sales		toll free: 0080 651 228
Thailand	Technical Support		toll free: 0880 06007
	Sales		toll free: 0880 06006
U.K.* (Bracknell)	Customer Technical Support (Dell Dimension® systems)	01344	720109
	Customer Technical Support (Other systems)	01344	723723
	Customer Care	01344	720110
	TechFax	01344	723178
	TechConnect BBS	01344	723858
	Sales	01344	720000

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.).*

Table 4-3. Dell Contact Numbers *(continued)*

Country	Department Name or Service	Area Code	Local Number or Toll-Free Number
U.S. (Austin, Texas)	Automated Order-Status System		toll free: 1-800-433-9014
	AutoTech (Automated technical support)		toll free: 1-800-247-9362
	Customer Technical Support (Server Hotline) (Return Material Authorization Numbers—warranty repairs)		toll free: 1-800-967-1068
	Dell Customer Service (Credit Return Authorization Numbers)		toll free: 1-800-624-9897
	Dell Sales		toll free: 1-800-247-4618
	DellWare®		toll free: 1-800-753-7201
	DellWare FaxBack Service	512	728-1681
	Fee-Based Technical Support		toll free: 1-800-433-9005
	Sales (Catalogs)		toll free: 1-800-426-5150
	Spare Parts Sales:		
	Dell Direct[1]		toll free: 1-800-274-1490
	Major Accounts[2]		toll free: 1-800-357-3355
	Fax		toll free: 1-800-727-8320
	TechFax		toll free: 1-800-950-1329
	TechConnect BBS	512	728-8528
	Switchboard	512	338-4400

1 *Use this telephone number if your call is about a system purchased for home, personal, or small-business use.*

2 *Use this telephone number if you are calling for an established Dell national account (have your account number handy), if you work for a governmental agency (local, state, or federal), or if you work for an educational or medical institution.*

Appendix A
Technical Specifications

Table A-1. Technical Specifications

Drives	
SCSI hard-disk drives	support for up to eight 2-, 4-, or 9-GB (when available) 3.5-inch SCSI hard-disk drives
External Ports	
Ultra wide SCSI-II	two 68-pin connectors
Server management bus	two 6-pin connectors
SCSI Backplane Board Connectors	
SCSI hard-disk drive connection sockets	eight 80-pin connectors
Ultra wide SCSI-II controllers	two 68-pin connectors
Power connector	one 14-pin connector
Server management connector	one 9-pin connector
Control panel connector	one 40-pin connector
Fan connectors	three 3-pin connectors
Intrusion switch connector	one 2-pin connector
Optional Power-Supply Paralleling Board Connectors	
PWR1 connector	one 18-pin connector
PWRSCSI connector.	one 14-pin connector

NOTE: For the full name of an abbreviation or acronym used in this table, see the Abbreviations and Acronyms *list.*

***Table A-1. Technical Specifications** (continued)*

Controls and Indicators	
Power control	push button
Power indicator	green LED
Follow mode indicator	green LED
Fault indicator	yellow LED
Hard-disk drive fault indicator	yellow LED
Hard-disk drive activity indicator	green LED
Hard-disk drive online indicator	green LED
Power-supply online indicator	green LED
Power-supply fault indicator	red LED
Power	
DC power supply:	
Wattage	230 W (optional redundant 230-W power supply is available)
Heat dissipation	990 BTUs (nominal)
Voltage	90 to 135 V at 60 Hz; 180 to 265 V at 50 Hz
Backup battery	3.0-V CR2450-type lithium coin cell
Physical	
Height (with feet)	23.4 cm (9.2 inches)
Width	42.5 cm (16.75 inches)
Depth	62.2 cm (24.5 inches)
Weight	28.8 kg (63.5 lb) or less, depending on options installed

NOTE: For the full name of an abbreviation or acronym used in this table, see the Abbreviations and Acronyms *list.*

Table A-1. Technical Specifications *(continued)*

Environmental	
Temperature:	
Operating	10° to 35°C (50° to 95°F)
Storage	-40° to 65°C (–40° to 149°F)
Relative humidity	8% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz for 30 min
Storage	0.5 G at 3 to 200 Hz for 30 min
Maximum shock:	
Operating	half-sine wave form: 38 G for 2 ms (20 in/sec)
Storage	half-sine wave form: 83 G for 2 ms (40 in/sec); square wave form: 20 G for 35 ms
Altitude:	
Operating	–16 to 3048 m (–50 to 10,000 ft)
Storage	–16 to 10,600 m (–50 to 35,000 ft)

NOTE: For the full name of an abbreviation or acronym used in this table, see the Abbreviations and Acronyms *list.*

Appendix B
Service Information for Technicians

This appendix discusses upgrade and service procedures for the Dell PowerEdge SDS 100 storage system.

Precautionary Measures

Before you perform any of the procedures in this appendix, read the following warning for your personal safety and to prevent damage to the storage system from electrostatic discharge (ESD).

WARNING: This storage system may have more than one power supply cable. To reduce the risk of electrical shock, a trained service technician must disconnect all power supply cables before servicing the storage system.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT:

Before you start to work on the storage system, perform the following steps in the sequence listed:

1. **Turn off the storage system.**
2. **Disconnect the storage system from its power source(s).**
3. **Disconnect any communications cables.**
4. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as a part of the back panel, on the chassis.**
5. **If a wrist grounding strap is not available, touch the fan guard or some other unpainted metal surface on the back of the chassis to discharge any static charge from your body.**

Troubleshooting

The following subsections provide general troubleshooting information for various components of the storage system.

Troubleshooting SCSI Hard-Disk Drives

Hard-disk drive problems can be caused by a number of conditions, including problems with the drive itself, the small computer system interface (SCSI) backplane board, or an interface cable.

Drive Indicator Error Codes

The SCSI backplane board monitors the internal SCSI hard-disk drives connected to the backplane board. In the event of a drive failure, systems using the optional Dell PowerEdge Expandable RAID Controller host adapter card issue the following signals using the drive indicator lights adjacent to each SCSI hard-disk drive:

- If a drive shows signs of imminent failure, the drive online indicator turns off and the drive fault indicator blinks on briefly each second.
- If a drive fails, the drive online indicator turns off and the drive fault indicator blinks off briefly each second.

SCSI Hard-Disk Drive Troubleshooting

Use the following procedure to troubleshoot a hard-disk drive problem:

1. **Do all 24 hard-disk drive status indicators remain lit after system start-up for more than 10 seconds?**

   Yes. The SCSI backplane board is defective. See Chapter 4, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 2.

2. **Is the drive's online indicator on?**

   No. Go to step 3.

   Yes. Go to step 4

3. **Remove the drive carrier from its bay, and check the cable connections between the drive and the drive carrier. Reinstall the drive.**

   Is the problem resolved?

   Yes. The drive carrier was not firmly seated in the connector on the SCSI backplane board, or the cable in the drive carrier was installed incorrectly. You have fixed the problem.

   No. Go to step 4.

4. **Remove the drive carrier, and install it in another drive bay.**

   Is the problem resolved?

   Yes. The SCSI backplane board has a defective connector. See Chapter 4, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 5.

5. **Is the storage system connected to a Dell PowerEdge Expandable RAID Controller?**

   Yes. Go to step 6.

   No. The SCSI backplane board is defective. See Chapter 4, "Getting Help," for instructions on obtaining technical assistance.

6. **Remove the storage system cover as described in "Cover" found later in this appendix.**

   CAUTION: See the safety instructions at the beginning of this appendix.

7. **Check the SCSI cable connections to the SCSI backplane board and to the SCSI host adapter card in the host computer. Check the direct current (DC) power cable connection to the SCSI backplane board.**

   See "SCSI Backplane Board," found later in this appendix, for the location of the cable connector on the SCSI backplane board.

   Are the cables firmly connected?

   Yes. The SCSI backplane board is defective. See Chapter 4, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 8.

8. **Reseat the cable connectors, replace the storage system cover, reconnect the storage system to its AC power source, and turn it on.**

   Is the problem resolved?

   Yes. The cable connections were faulty. You have fixed the problem.

   No. See Chapter 4, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting a Cooling Fan

Three cooling fans are installed in the storage system. If the Dell Hardware Instrumentation Package (HIP) server management program issues a fan-related error message, replace the fan as described in "Cooling Fan" found later in this appendix.

Troubleshooting a Power Supply

The optional redundant power supply in the storage system is controlled by a power-supply paralleling board (PSPB). The two light-emitting diodes (LEDs) on the back of the power supply (see Figure B-1) signal the status of the power supply if the supply is connected to a PSPB. If the red power-supply fault indicator lights up, replace the power supply (see "Power Supply" found later in this appendix).

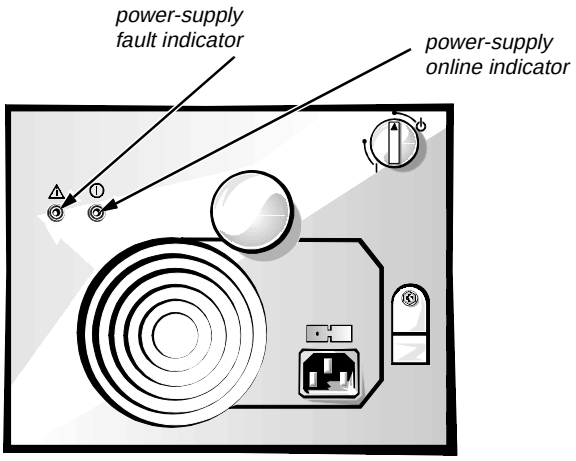


Figure B-1. Power Supply Indicators

Troubleshooting Power Cable Connections

Use the following procedure to troubleshoot a problem with power cables:

1. **Check the alternating current (AC) power outlet and power cable to ensure that they are securely connected.**
2. **Turn off the storage system and disconnect all the AC power cables from their power sources.**
3. **Remove the storage system cover.**

   See "Cover" found later in this appendix.
4. **Check the cable connections between the cable harness plate or optional PSPB and the SCSI backplane board.**
5. **Check the cable voltages.**

   Measure the power-supply output voltages for a storage system with redundant power supplies at the connectors labeled "PWR1" and "PWRSCSI" on the PSPB, as shown in Figures B-2 and B-3.

   NOTE: The power supply produces direct current (DC) voltages only under its loaded condition. Therefore, when you measure these voltages, the DC power connectors must be connected to their corresponding power input connectors on the system board or drives.

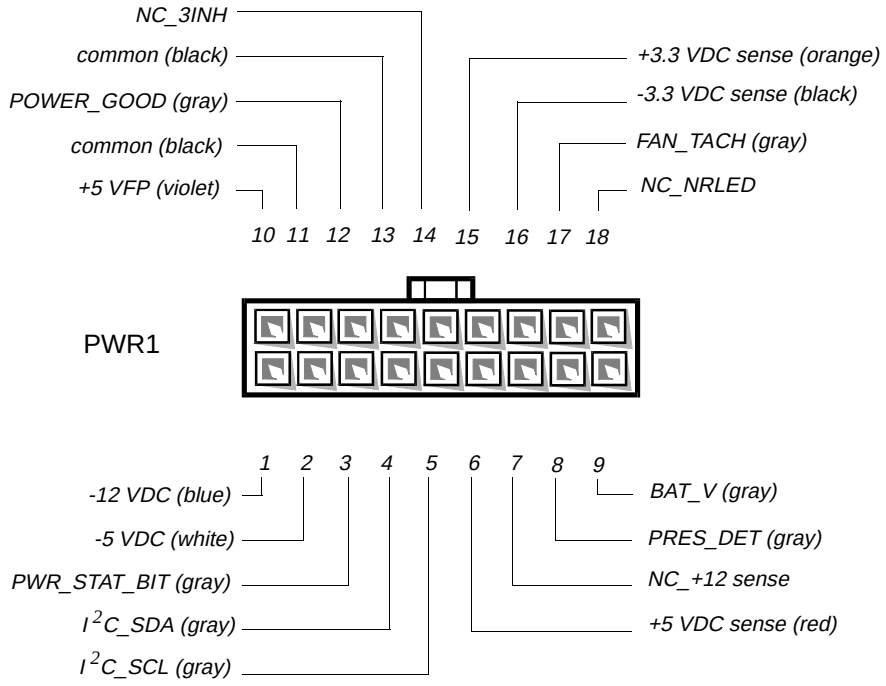


Figure B-2. DC Power Connector PWR1

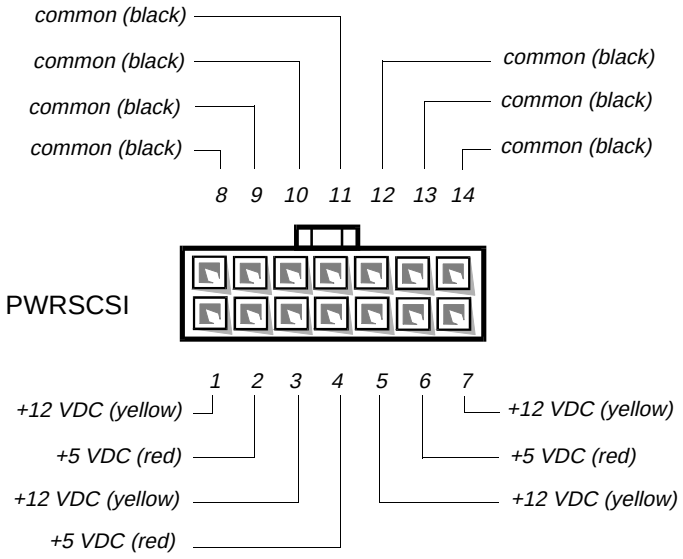


Figure B-3. DC Power Connector PWRSCSI

System Messages

System messages alert you to a possible operating problem or to a conflict between the software and hardware. If you receive a system message, see Table B-1 for suggestions on resolving any problems indicated by the message.

NOTE: If the system message you received is not listed in Table B-1, check the host computer's documentation for an explanation of the message and a recommended action.

Table B-1. System Messages

Message	Cause	Action
`Embedded server management error`	The embedded server management memory may be temporarily corrupted.	Turn off the storage system to clear the memory, and then restart the storage system. Check the server management bus (SMB) cable connections to the storage system back panel and to the SERVER MANAGEMENT connector on the SCSI backplane board.

`Embedded server management firmware download failed`
 	
`Power supply paralleling board firmware download failed`
 	
`System backplane firmware download failed`
 	
`Power supply paralleling board is not present`
	The cable connection to the SCSI backplane board may be loose, preventing the firmware from downloading during system start-up.	Check the SMB cable connections to the storage system back panel and to the SERVER MANAGEMENT connector on the SCSI backplane board. If the problem persists, see Chapter 4, "Getting Help," for instructions on obtaining technical assistance.

Parts Replacement Procedures

This section provides procedures for removing the components, assemblies, and subassemblies in the storage system. Unless otherwise noted, each procedure assumes the following:

- You have performed the steps in "Precautionary Measures" at the beginning of this appendix.
- You can replace or reinstall a part by performing the removal procedure in reverse order, unless additional information is provided.

Recommended Tools

Most of the procedures in this appendix require the use of one or more of the following tools:

- Small flat-blade and wide flat-blade screwdrivers
- Number 1 and number 2 Phillips-head screwdrivers
- 1/4-inch nutdriver

Also, use a wrist grounding strap as explained in "Precautionary Measures" found earlier in this appendix.

Computer Orientation

When performing the procedures in this appendix, the locations or directions relative to the storage system are shown in Figure B-4, unless otherwise specified.

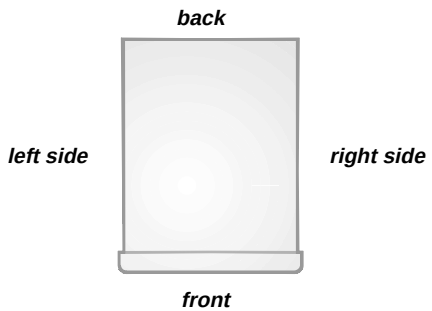


Figure B-4. Storage System Orientation

Cover

Follow these steps to remove the storage system cover:

1. **Turn off the storage system.**
2. ***If the storage system is installed in a rack*, open the back door of the rack enclosure.**

   ***If the storage system is installed in a freestanding configuration*, lay the storage system on its side with the cover facing upwards.**
3. **Disconnect the storage system from its AC power source.**
4. **Unlock the cover (see Figure B-5).**
5. **Remove the three screws from the back edge of the storage system cover (see Figure B-5).**
6. **Slide the cover 1/2 inch towards the back of the storage system, and then lift the cover straight up.**

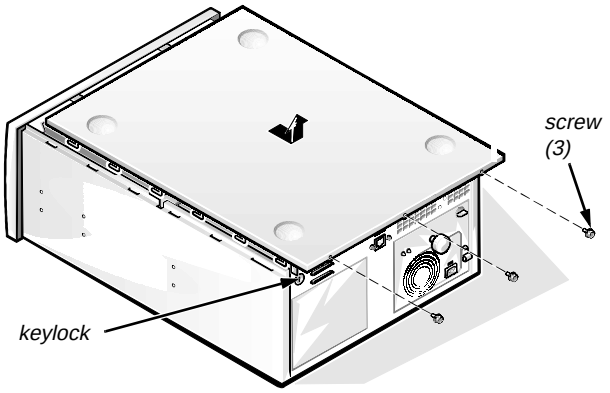


Figure B-5. Removing the Cover

Front Bezel

To remove the front bezel, follow these steps:

1. **Remove the storage system cover.**
2. **Lift the two tabs along the upper edge of the front bezel (see Figure B-6).**
3. **Remove the front bezel.**

   Rotate the upper edge of the front bezel away from the chassis, and disengage the three tabs along the lower edge of the bezel.

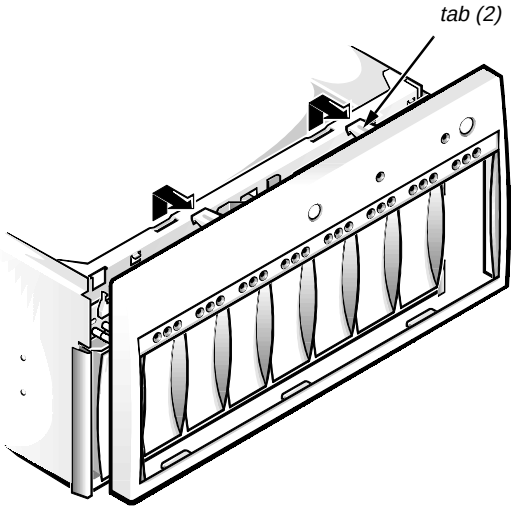


Figure B-6. Removing the Front Bezel

Control Panel Board

To remove the control panel board, follow these steps:

1. **Remove the storage system cover.**
2. **Remove the front bezel.**
3. **Disconnect the ribbon cable from the BACKPLANE connector on the control panel board (see Figure B-7).**

   To release the connector, carefully press down on the tabs at each end of the connector.

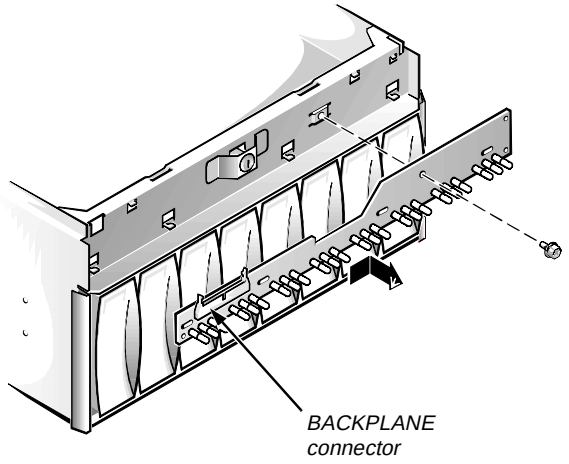


Figure B-7. Removing the Control Panel Board

4. **Remove the screw securing the control panel board.**
5. **Slide the control panel board a quarter of an inch to the right, and then lift the board off of the mounting tabs and away from the chassis.**

Power Supply

Follow these steps to remove the primary or secondary power supply:

1. **Disconnect the AC power cable from the power outlet, and then disconnect the other end of the cable from the power supply.**

   Open the plastic strain-relief clip, and remove the AC power cable.

2. **Turn the rotary switch on the power supply clockwise to the "off" position, marked by a "0" (see Figure B-8).**

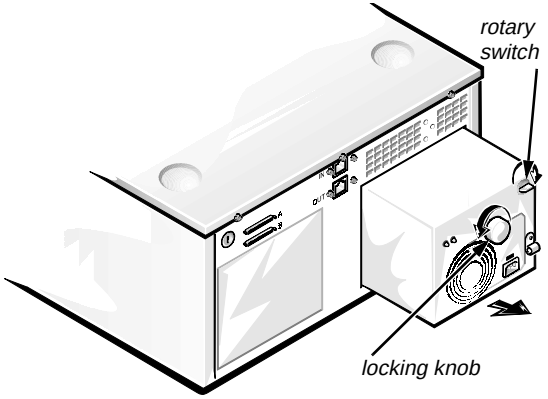


Figure B-8. Removing a Power Supply

3. **Turn the locking knob counterclockwise to release the power supply.**
4. **Slide the power supply out of the chassis.**

Power-Supply Paralleling Board

Follow these steps to remove the power-supply paralleling board (PSPB):

1. **Remove the storage system cover.**
2. **Remove any power supplies.**
3. **Disconnect the cooling fans from the SCSI backplane board.**
4. **Remove the fan midplane assembly from the chassis.**
5. **Disconnect the power cable from the connectors labeled "PWRSCSI" and "PWR1" on the PSPB (see Figure B-9).**

   Release the connectors by pressing the latch on the side of the connector.

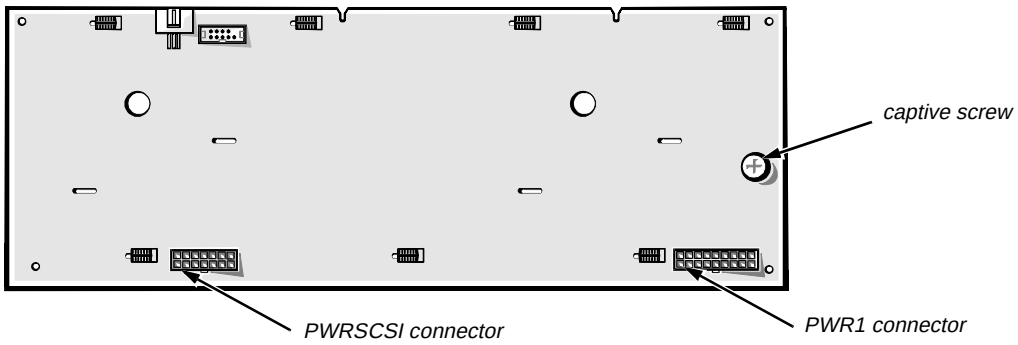


Figure B-9. Power-Supply Paralleling Board

6. **Remove the PSPB (see Figure B-10).**

   Loosen the captive screw on the PSPB. Slide the PSPB a quarter of an inch to the right, and then lift the board off of the mounting tabs and away from the chassis.

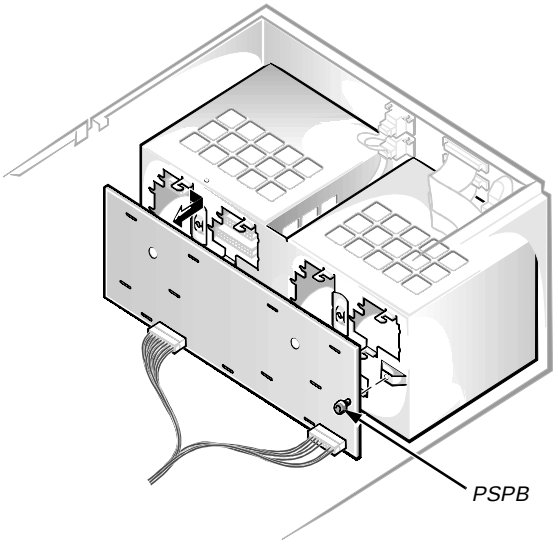


Figure B-10. Removing the Power-Supply Paralleling Board

SCSI Backplane Board

Follow these steps to remove the SCSI backplane board:

1. **Remove the storage system cover.**
2. **Disconnect the cooling fans from the FAN connectors on the SCSI backplane board.**
3. **Remove the fan midplane assembly from the chassis.**
4. **Disconnect the "Y" power cable from the POWER connector on the SCSI backplane board (see Figure B-11).**

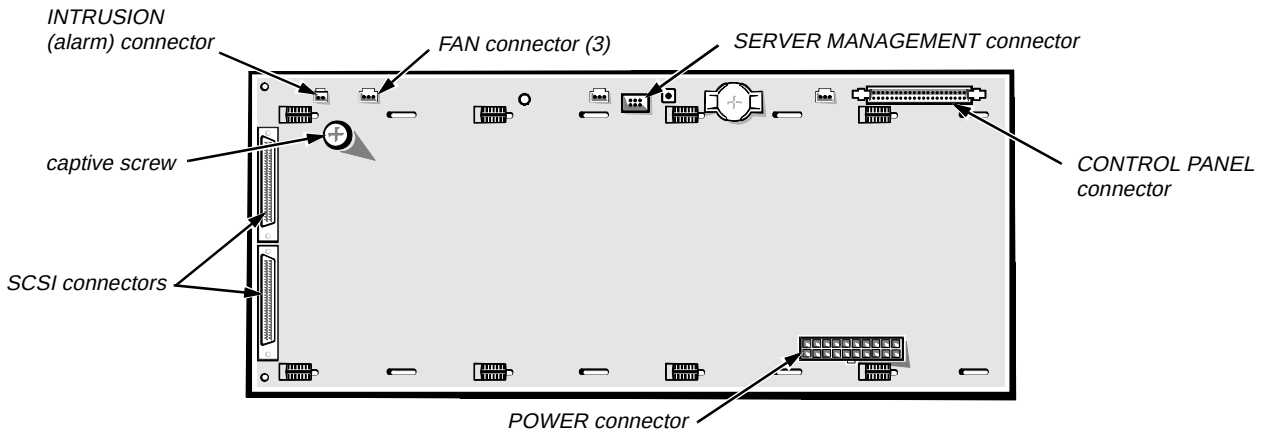


Figure B-11. SCSI Backplane Board

5. **Disconnect the SCSI cables from the SCSI connectors on the SCSI backplane board.**
6. **Disconnect the server management bus (SMB) cable from the SERVER MANAGEMENT connector on the SCSI backplane board.**
7. **Disconnect the control panel cable from the CONTROL PANEL connector on the SCSI backplane board.**
8. **Disconnect the intrusion-detection switch cable from the INTRUSION connector on the SCSI backplane board.**
9. **Loosen the captive screw on the SCSI backplane board.**
10. **Slide the SCSI backplane board a quarter of an inch to the left, and then lift the board off of the mounting tabs and away from the chassis.**

Cooling Fan

Follow these steps to remove a cooling fan:

1. **Remove the storage system cover.**
2. **Disconnect the cooling fan power cables from the FAN connectors on the SCSI backplane board.**
3. **Remove the fan midplane assembly.**

   The fan midplane assembly is the plastic housing supporting the three cooling fans. Lift the fan midplane assembly straight up and away from the chassis.
4. **Remove the cooling fan by releasing the fan retention tab (see Figure B-12).**

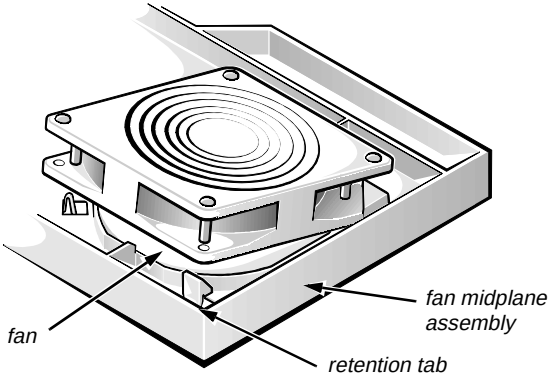


Figure B-12. Removing a Cooling Fan

When reinstalling the fan midplane assembly, ensure that the power cable harness passes though the concave area in the lower edge of the midplane.

Installing an Optional PSPB and Redundant Power Supply

Follow these steps to upgrade the storage system with a PSPB and redundant power supply:

1. **Remove the storage system cover**
2. **Disconnect the cooling fans from the SCSI backplane board.**
3. **Remove the fan midplane assembly.**
4. **Remove the power supply.**
5. **Remove the power supply closeout plate from the empty power supply bay.**

   Remove the screw securing the plate to the chassis. Swing the right edge of the plate away from the chassis until the tabs on the left edge of the plate disengage from the slots in the chassis.
6. **Disconnect the power cable harness from the POWER connector on the SCSI backplane board.**
7. **Remove the cable harness plate (see Figure B-13).**

   Remove the screw securing the cable harness plate to the chassis. Slide the plate to the right a quarter of an inch. Pull the plate straight forward, and lift it free from the chassis.

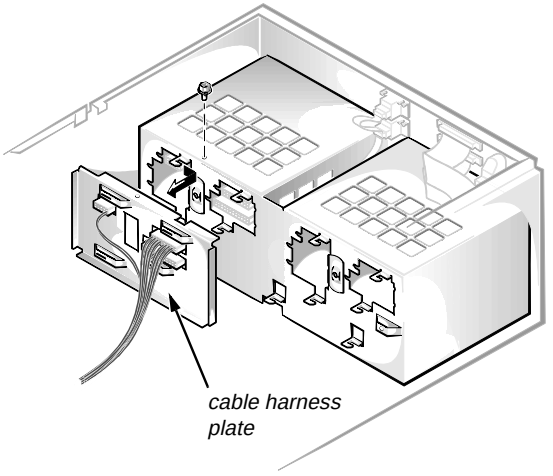


Figure B-13. Removing the Cable Harness Plate

8. **Install the PSPB (see Figure B-14).**

   While holding the PSPB by its edges, position the PSPB so that the 11 tabs on the power supply bay fit through the corresponding slots in the PSPB. Slide the PSPB to the left a quarter of an inch. Secure the PSPB by tightening the captive screw.

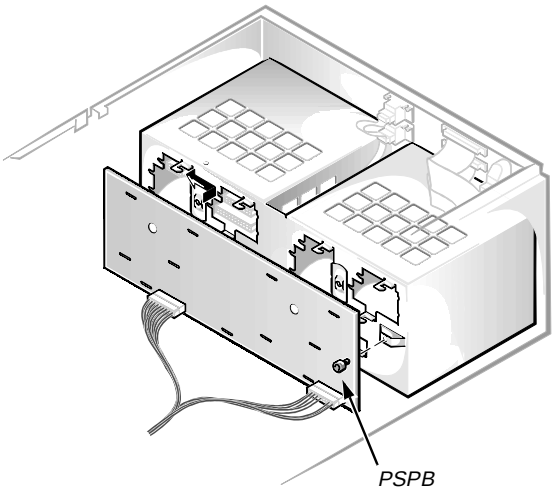


Figure B-14. Installing the Power-Supply Paralleling Board

9. **Connect the new power cable harness to the PSPB and the SCSI backplane board.**

   The 14-pin connector and 18-pin connector attach to the connectors labeled “PWRSCSI” and “PWR1,” respectively, on the PSPB (see Figure B-9). The 20-pin connector attaches to the POWER connector on the SCSI backplane board.
10. **Reinstall the primary power supply.**
11. **Install the secondary power supply.**

When reinstalling the fan midplane assembly, ensure that the power cable harness passes though the concave section in the lower edge of the midplane.

Appendix C
Maintaining the Storage System

Proper use of preventive maintenance procedures can keep your Dell PowerEdge SDS 100 storage system in top operating condition and minimize the need for costly, time-consuming service procedures. This appendix contains maintenance procedures that you should perform regularly.

Data Preservation

Everyone inadvertently deletes files at one time or another. Also, hard-disk drives can fail after extended use, so it is not a question of *whether* you will eventually lose data, but *when*. To avoid such loss of data, you should regularly make backup copies of all hard-disk drive files. Frequent, regular backups are a must for anyone using a hard-disk drive.

Scheduling Backups

The frequency with which backups should be made depends on the amount of storage space on a hard-disk drive and the volatility of the data contained on the drive. Heavily used systems require more frequent backups than systems in which files are seldom changed.

Dell recommends that you back up the hard-disk drive(s) at least once a week, with a daily backup of those files known to have been changed. Following these guidelines ensures the loss of no more than a day's work in the event of a hard-disk drive failure or if you inadvertently delete one or more important files.

As further insurance against data losses, you should keep duplicate copies of the weekly and monthly backups at an off-site location. Doing this ensures that you lose no more than a week's work, even if one of the on-site backups becomes corrupted.

Backup Devices

Tape drives are fast, convenient, and affordable devices that can back up data at rates of up to 1.6 megabytes per second (MB/sec) (sustained, with data compression) and can often run unattended. Dell offers tape drives with storage capacities in the range of 4 gigabytes (GB) to 32 GB per tape cartridge and recommends these drives and their associated backup software for use as system backup devices.

Cleaning Storage System Components

An exhaust fan in the power supply cools the power supply and storage system by drawing air in through various openings in the storage system and blowing it out the back. However, the fan also draws dust and other particles into the storage system, causing contaminant buildup, which results in an increase in the storage system's internal temperature and interferes with the operation of various system components.

To avoid these conditions, Dell recommends keeping your work environment clean to reduce the amount of dust and dirt around the storage system, thereby reducing the amount of contaminants drawn into the storage system by the power supply fan. In particular, you should keep the exterior of your storage system clean.

Recommended Tools and Accessories

Dell recommends that you use the following tools and accessories when you clean the storage system:

- *A soft, lint-free cleaning cloth* — Moisten the cleaning cloth with the dishwashing detergent solution to clean the exterior of the storage system.
- *A small vacuum cleaner with a brush attachment* — Use the vacuum cleaner to remove dust and dirt from the exterior of the storage system.

Cleaning the Storage System Exterior

To clean the exterior of the storage system, follow these steps:

1. **Turn off the storage system and disconnect it from its power source.**
2. **Use a vacuum cleaner to remove any dust from the slots and holes on the storage system.**
3. **Use the moistened cloth to wipe the storage system cover.**

Environmental Factors

This section discusses various environmental factors that can adversely affect system performance and longevity.

Temperature

Temperature extremes can cause a variety of problems, including premature aging and failure of chips or mechanical failure of devices. Extreme temperature fluctuations can cause chips to become loose in their sockets and can cause expansion and contraction of disk drive platters, resulting in read or write data errors. When you perform a low-level format operation on a hard-disk drive, it is important to ensure that the drive's surrounding temperature is at or near the temperature at which the drive will be operated. Failure to do so can result in relocation of the tracks on the disk platters.

To minimize the negative effects of temperature on system performance, follow these guidelines:

- Ensure that the storage system is operated in an environment no colder than 10° Celsius (C) (50° Fahrenheit [F]) or hotter than 35°C (95°F).
- Ensure that the storage system has adequate ventilation. Do not place it within a closed-in wall unit or on top of cloth material, which can act as insulation. Do not place it where it will receive direct sunlight, particularly in the afternoon. Do not place it next to a heat source of any kind, including heating vents during winter.
- Make sure that all slots and openings on the storage system remain unobstructed, especially the fan guard on the back of the storage system.
- Clean the storage system at regular intervals to avoid any buildup of dust and debris, which can cause a system to overheat.
- If the storage system is exposed to abnormally cold temperatures, allow a 15-minute warm-up period after it is turned on before attempting to read from or write to the hard-disk drive.

Humidity

High-humidity conditions can cause moisture migration and penetration into the storage system. This moisture can cause corrosion of internal components and degradation of properties such as electrical resistance, thermal conductivity, physical strength, and size. Extreme moisture buildup inside the storage system can result in electrical shorts, which can cause serious damage to the storage system.

The storage system is rated to operate at 8 to 80 percent relative humidity, with a humidity gradation of 10 percent per hour. In storage, the storage system can withstand from 8 to 95 percent relative humidity.

Buildings in which climate is controlled by air-conditioning in the warmer months and by heat during the colder months usually maintain an acceptable level of humidity for system equipment. However, if a storage system is located in an unusually humid location, a dehumidifier can be used to maintain the humidity within an acceptable range.

Altitude

Operating a storage system at high altitude (low pressure) reduces the efficiency of forced and convection cooling and can result in electrical problems related to arcing and corona effects. This condition can also cause sealed components with internal pressure, such as electrolytic

capacitors, to fail or perform at reduced efficiency. The storage system is rated to operate at altitudes from -16 to 3048 meters (m) (-50 to 10,000 feet [ft]) and can be stored at altitudes of -16 to 10,600 m (-50 to 35,000 ft).

Dust and Particles

A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the operation of a storage system's mechanical components. Also, in addition to regular cleaning, you should follow these guidelines to deter contamination of the storage system:

- Do not permit smoking anywhere near the storage system.
- Do not permit food or drink near the storage system.
- Use dust covers when the storage system is not in use.
- Close windows and outside doors to keep out airborne particles.

Corrosion

The oil from a person's fingers or prolonged exposure to high temperature or humidity can corrode the connectors and pin connectors on various devices in the storage system. This corrosion on computer connectors is a gradual process that can eventually lead to intermittent failures of electrical circuits.

To prevent corrosion, you should avoid touching contacts on cable connectors. Protecting the storage system from corrosive elements is especially important in moist and salty environments, which tend to promote corrosion. Also, as a further deterrent to corrosion, the storage system should not be used in extreme temperatures, as explained in "Temperature" discussed earlier in this appendix.

Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) and radio frequency interference (RFI) from a computer can adversely affect devices such as radio and television (TV) receivers operating near the computer. Radio frequencies emanating from a computer system can also interfere with cordless and low-power telephones. Conversely, RFI from high-power telephones can cause spurious characters to appear on the system's monitor screen.

RFI is defined as any EMI with a frequency above 10 kilohertz (kHz). This type of interference can travel from the storage system to other devices through the alternating current (AC) power cable and power source or through the air like transmitted radio waves. The Federal Communications Commission (FCC) publishes specific regulations to limit the amount of EMI and RFI emitted by computing equipment. Each Dell storage system meets these FCC regulations.

To reduce the possibility of EMI and RFI, follow these guidelines:

- Operate the storage system only with the cover installed.
- Ensure that the screws on all peripheral cable connectors are securely fastened to their corresponding connectors on the back of the storage system.

To prevent the possibility of RFI from a storage system affecting TV reception, follow these guidelines:

- Keep any TV set at least 6 ft away from the storage system.
- Use cable TV when possible.
- Use a directional outdoor TV antenna.
- Attach line filters to the TV set.
- Use 75-ohm coaxial cable for the TV set rather than twin-lead antenna wire.
- If interference occurs, rotate the storage system or the TV set 90 degrees.

Magnetism

Because they store data magnetically, hard-disk drives are extremely susceptible to the effects of magnetism from sources such as the following:

- Monitors
- TV sets
- Printers
- Telephones with real bells
- Fluorescent lights

Shock and Vibration

Excessive shock can damage the function, external appearance, and physical structure of the storage system. Each Dell storage system has been designed to operate properly after withstanding a minimum of six consecutively executed shock pulses in the positive and negative x, y, and z axes. Each shock pulse can measure up to 30 gravities (G) for 2 milliseconds (ms). In storage, the storage system can withstand shock pulses of 20 G with a velocity change of 5080 millimeters (mm) per second (200 inches per second).

Excessive vibration can cause the same problems as mentioned earlier for shock, as well as cause components to become loose in their sockets or connectors. Systems can be subject to significant vibration when being transported by vehicle or when operated in an environment with machinery that causes vibration.

Each Dell storage system, when operating, is designed to withstand 0.25 G (half-sine wave) at a sweep of 3 to 200 hertz (Hz) for 15 minutes. In storage, the storage system can withstand 0.5 G at 3 to 200 Hz for 15 minutes.

Power Source Interruptions

Computer systems are especially sensitive to variations in voltage supplied by the AC power source. Overvoltage, undervoltage, and transients (or spikes) can erase data from memory or even cause components to fail. To protect against these types of problems, power cables should always be properly grounded and one or both of the following methods should be used:

- Use an uninterruptible power supply (UPS) or one of the other power protection devices described in the following section, "Power Protection Devices."
- Place the storage system on a dedicated power circuit (rather than sharing a circuit with other heavy electrical equipment). In general, do not allow the storage system to share a circuit with any of the following:
  - — Copier machines
  - — Air conditioners
  - — Vacuum cleaners
  - — Space heaters
  - — Power tools
  - — Teletype machines
  - — Adding machines
  - — Laser printers
  - — Facsimile machines
  - — Any other motorized equipment

Besides these appliances, the greatest threat to a storage system's supply of power are surges or blackouts caused by electrical storms. Whenever possible, turn off the storage system and any peripherals and unplug them from their power sources during thunderstorms.

If a blackout occurs—even a temporary one—while the storage system is turned on, turn off the storage system immediately and disconnect it from its power source. Leaving the storage system turned on may cause problems when the power is restored; other appliances left on in the area can create large voltage spikes that can damage the storage system.

Power Protection Devices

A number of devices are available that protect against power problems, such as power surges, transients, and power failures. The following subsections describe some of these devices.

Surge Protectors

Surge protectors are available in a variety of types and usually provide a level of protection commensurate with the cost of the device. Surge protectors prevent voltage spikes, such as those caused during an electrical storm, from entering a storage system through the AC power source. Surge protectors, however, do not offer protection against brownouts, which occur when the voltage drops more than 20 percent below the normal AC line voltage.

Line Conditioners

Line conditioners go beyond the overvoltage protection of surge protectors. Line conditioners keep the AC power source voltage at a fairly constant level and, therefore, can handle brownouts. Because of this added protection, line conditioners cost more than surge protectors—up to several hundred dollars. However, these devices cannot protect against a complete loss of power.

Uninterruptible Power Supply

A UPS offers the most complete protection against variations in power because it uses battery power to keep the storage system running when AC power is lost. The battery is charged by the AC power while it is available, so once AC power is lost, the battery can provide power to the storage system for a limited amount of time—from 15 minutes to an hour or so—depending on the UPS system.

UPS systems range in price from a few hundred dollars to several thousand dollars, with the more expensive units allowing you to run larger computer systems for a longer period of time when AC power is lost. UPS systems that provide only 5 minutes of battery power let you conduct an orderly shutdown of the storage system, but are not intended to provide continued operation.

If you are using the optional redundant power supplies installed in your storage system, connect the two power supplies to different circuits, if possible.

Appendix D
Regulatory Notices

FCC Notices (U.S. Only)

Most Dell computer systems are classified by the Federal Communications Commission (FCC) as Class B digital devices. However, the inclusion of certain options changes the rating of some configurations to Class A. To determine which classification applies to your storage system, examine all FCC registration labels located on the back panel of your storage system. If any one of the labels carries a Class A rating, your storage system is considered to be a Class A digital device. If *all* labels carry either the Class B rating or the FCC logo (FC), your storage system is considered to be a Class B digital device.

Once you have determined your storage system's FCC classification, read the appropriate FCC notice. Note that FCC regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

A Notice About Shielded Cables: Use only shielded cables for connecting peripherals to any Dell device to reduce the possibility of interference with radio and television reception. Using shielded cables ensures that you maintain the appropriate FCC radio frequency emissions compliance (for a Class A device) or FCC certification (for a Class B device) of this product. For parallel printers, a cable is available from Dell Computer Corporation.

Class A

NOTE: This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

Class B

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

- Reorient the receiving antenna.
- Relocate the storage system with respect to the receiver.
- Move the storage system away from the receiver.
- Plug the storage system into a different outlet so that the storage system and the receiver are on different branch circuits.

If necessary, consult a representative of Dell Computer Corporation or an experienced radio/television technician

for additional suggestions. You may find the following booklet helpful: *FCC Interference Handbook, 1986*, available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00450-7.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

The following information is provided on the device or devices covered in this document in compliance with FCC regulations:

- Product name: *Dell PowerEdge SDS 100*
- Model number: *AMS*
- Company name: Dell Computer Corporation
  Regulatory Department
  One Dell Way
  Round Rock, Texas 78682 USA
  512-338-4400

IC Notice (Canada Only)

Most Dell computer systems (and other Dell digital apparatus) are classified by the Industry Canada (IC) Interference-Causing Equipment Standard #3 (ICES-003) as Class B digital devices. To determine which classification (Class A or B) applies to your storage system (or other Dell digital apparatus), examine all registration labels located on the bottom or the back panel of your storage system (or other digital apparatus). A statement in the form of "IC Class A ICES-3" or "IC Class B ICES-3" will be located on one of these labels.

Note that Industry Canada regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

This Class B (or Class A, if so indicated on the registration label) digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe B (ou Classe A, si ainsi indiqué sur l'étiquette d'enregistration) respecte toutes les exigences du Reglement sur le Materiel Brouilleur du Canada.

EN 55022 Compliance (Czech Republic Only)

This device belongs to category B devices as described in EN 55022, unless it is specifically stated that it is a category A device on the specification label. The following applies to devices in category A of EN 55022 (radius of protection up to 30 meters). The user of the device is obliged to take all steps necessary to remove sources of interference to telecommunication or other devices.

Pokud není na typovém štitku počítače uvedeno, že spadá do třídy A podle EN 55022, spadá automaticky do třídy B podle EN 55022. Pro zařízení zařazená do třídy A (ochranné pásmo 30m) podle EN 55022 platí následující. Dojde-li k rušení telekomunikačních nebo jinych zařízení, je uživatel povinen provést taková opatření, aby rušení odstranil.

CE Notice

Marking by the symbol CE indicates compliance of this Dell storage system to the EMC (Electromagnetic Compatibility) directive of the European Community. Such marking is indicative that this Dell storage system meets or exceeds the following technical standards:

- EN 55022 — "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment."

  NOTE: EN 55022 emissions requirements provide for two classifications—Class A and Class B. If any one of the registration labels (located on the bottom or back panel of your storage system, on card-mounting brackets, or on the cards themselves) carries an FCC Class A rating, the following warning applies to your storage system.

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

- EN 50082-1 — "Electromagnetic compatibility—Generic immunity standard Part 1: Residential, commercial, and light industry."
- IEC 801-2 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements." — Severity level 3.
- IEC 801-3 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements." — Severity level 2.
- IEC 801-4 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements." — Severity level 2.
- EN60950:1992 + Amd.1:1993 + Amd.2:1993 — "Safety of Information Technology Equipment including Electrical Business Equipment."

A "Declaration of Conformity" in accordance with the preceding standards has been made and is on file at Dell Products Europe BV, Limerick, Ireland.

VCCI Notices (Japan Only)

Most Dell computer systems are classified by the Voluntary Control Council for Interference (VCCI) as Class 2 information technology equipment (ITE). However, the inclusion of certain options changes the rating of some configurations to Class 1. To determine which classification applies to your storage system, examine the FCC classification on the registration labels located on the back panel of your storage system. If any one of the labels carries an FCC Class A designation, your storage system is considered to be VCCI Class 1 ITE. If *all* labels carry either an FCC Class B identification number or the FCC logo (FC), your storage system is considered to be VCCI Class 2 ITE.

Once you have determined your storage system's VCCI classification, read the appropriate VCCI notice. Note that VCCI regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

Class 1 Notice

This equipment complies with the limits for a Class 1 digital device (devices used in commercial and/or industrial environments) and conforms to the standards for information technology equipment that are set by the Voluntary Control Council for Interference for preventing radio frequency interference in commercial and/or industrial areas.

Consequently, when used in a residential area or in an area adjacent to a residential area, this equipment may cause radio interference with radio and television receivers or other communications equipment.

To ensure that such radio interference does not occur, it is important to install and use this equipment in accordance with the manufacturer's instruction manual.

Class 2 Notice

This equipment complies with the limits for a Class 2 digital device (devices used in or adjacent to a residential environment) and conforms to the standards for information technology equipment that are set by the Voluntary Control Council for Interference for preventing radio frequency interference in residential areas.

However, this equipment does generate, use, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause interference with radio and television reception. Therefore, it is important to adhere to the manufacturer's instructions for installing and using this equipment.

Korean Regulatory Notice

To determine which classification (Class A or B) applies to your storage system (or other Dell digital apparatus), examine all registration labels located on the bottom or back panel of your storage system. If any one of the labels carries a Class A rating, your entire storage system is considered to be a Class A digital device. If *all* labels carry either the Class B rating or the FCC logo (FC), your storage system is considered to be a Class B digital device.

NOTE: Class A devices are for business purposes. Class B devices are for nonbusiness purposes.

Class A Device

Please note that this device has been approved for business purposes with regard to electromagnetic interference. If you find that this device is not suitable for your use, you may exchange it for a device that has been approved for use in residential as well as business environments.

Class B Device

Please note that this device has been approved for nonbusiness purposes and may be used in any environment, including residential areas.

Polish Center for Testing and Certification Notice

The equipment should draw power from a socket with an attached protection circuit (a three-prong socket). All equipment that works together (computer, monitor, printer, and so on) should have the same power supply source.

The phasing conductor of the room's electrical installation should have a reserve short-circuit protection device in the form of a fuse with a nominal value no larger than 10 amperes (A).

All the equipment that works together must switch off when the power supply cable plug is removed from the power supply socket, which should be located near the equipment and easily accessible.

A protection mark "B" confirms that the equipment is in compliance with the protection usage requirements of standards PN-93/T-42107 and PN-89/E-06251.

Wymagania Polskiego Centrum Badań i Certyfikacji

Urządzenie powinno być zasilane z gniazda z przyłączonym obwodem ochronnym (gniazdo z kołkiem). Współpracujące ze sobą urządzenia (komputer, monitor, drukarka) powinny być zasilane z tego samego źródła.

Instalacja elektryczna pomieszczenia powinna zawierać w przewodzie fazowym rezerwową ochronę przed zwarciami, w postaci bezpiecznika o wartości znamionowej nie większej niż 10A (amperów).

Całkowite odłączenie urządzenia od sieci zasilającej następuje po wyjęciu wtyczki sznura zasilającego z gniazda sieciowego, które powinno być usytuowane w pobliżu urządzenia i być łatwo dostępne.

Znak bezpieczeństwa "B" potwierdza zgodność urządzenia z wymaganiami bezpieczeństwa użytkowania zawartymi w PN-93/T-42107 i PN-89/E-06251.

Pozostałe instrukcje bezpieczeństwa

- Nie należy używać wtyczek adapterowych lub usuwać kołka obwodu ochronnego z wtyczki. Jeżeli konieczne jest użycie przedłużacza to należy użyć przedłużacza 3−żyłowego z prawidłowo połączonym przewodem ochronnym.
- System komputerowy należy zabezpieczyć przed nagłymi, chwilowymi wzrostami lub spadkami napięcia, używając eliminatora przepięć, urządzenia

dopasowującego lub bezzakłóceniowego źródła zasilania.

- Należy upewnić się, aby nic nie leżało na kablach systemu komputerowego, oraz aby kable nie były umieszczone w miejscu, gdzie można byłoby na nie nadeptywać lub potykać się o nie.
- Nie należy rozlewać napojów ani innych płynów na system komputerowy.
- Nie należy wpychać żadnych przedmiotów do otworów systemu komputerowego, gdyż może to spowodować pożar lub porażenie prądem, poprzez zwarcie elementów wewnętrznych.
- System komputerowy powinien znajdować się z dala od grzejników i źródeł ciepła. Ponadto, nie należy blokować otworów wentylacyjnych. Należy unikać kładzenia luźnych papierów pod komputer oraz umieszczania komputera w ciasnym miejscu bez możliwości cyrkulacji powietrza wokół niego.

NOM 024 Information (Mexico Only)

The following information is provided on the device(s) described in this document in compliance with the requirements of the official Mexican standards (NOM 024):

Exporter:	Dell Computer Corporation One Dell Way Round Rock, TX 78682
Importer:	Dell Computer de México, S.A. de C.V. Rio Lerma No. 302 - 4° Piso Col. Cuauhtemoc 16500 México, D.F.
Ship to:	Dell Computer de México, S.A. de C.V. al Cuidado de Kuehne & Nagel de México S. de R.I. Avenida Soles No. 55 Col. Peñon de los Baños 15520 México, D.F.
Supply voltage:	115/230 V.C.A. ±10%
Frequency:	60/50 Hz
Current consumption:	6.0/3.0 A

Información para Nom 024 (únicamente para México)

La información siguiente se proporciona en el dispositivo o en los dispositivos descritos en este documento, en cumplimiento con los requisitos de la norma oficial mexicana (Nom 024):

Exportador:	Dell Computer Corporation One Dell Way Round Rock, TX 78682
Importador:	Dell Computer de México, S.A. de C.V. Rio Lerma No. 302 - 4° Piso Col. Cuauhtemoc 16500 México, D.F.
Embarcar a:	Dell Computer de México, S.A. de C.V. al Cuidado de Kuehne & Nagel de México S. de R.I. Avenida Soles No. 55 Col. Peñon de los Baños 15520 México, D.F.
Tensión alimentación:	115/230 V.C.A. ±10%
Frecuencia:	60/50 Hz
Consumo de corriente:	6.0/3.0 A

Appendix E
Warranties and Return Policy

Limited Three-Year Warranty (U.S. Only)

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. Dell warrants that the hardware products it manufactures will be free from defects in materials and workmanship. The warranty term is three years beginning on the date of invoice, as described in the following text.

Damage due to shipping the products to you is covered under this warranty. Otherwise, this warranty does not cover damage due to external causes, including accident, abuse, misuse, problems with electrical power, servicing not authorized by Dell, usage not in accordance with product instructions, failure to perform required preventive maintenance, and problems caused by use of parts and components not supplied by Dell.

This warranty does not cover any items that are in one or more of the following categories: software; external devices (except as specifically noted); accessories or parts added to a Dell system after the system is shipped from Dell; accessories or parts added to a Dell system through Dell's system integration department; accessories or parts that are not installed in the Dell factory; or DellWare products. Monitors, keyboards, and mice that are Dell-branded or that are included on Dell's standard price list are covered under this warranty; all other monitors, keyboards, and mice (including those sold through the DellWare program) are not covered. Batteries for portable computers are covered only during the initial one-year period of this warranty.

Coverage During Year One

During the one-year period beginning on the invoice date, Dell will repair or replace products covered under this limited warranty that are returned to Dell's facility. To request warranty service, you must call Dell's Customer Technical Support within the warranty period. Refer to Chapter 4, "Getting Help," to find the appropriate telephone number for obtaining customer assistance. If warranty service is required, Dell will issue a Return Material Authorization Number. You must ship the products back to Dell in their original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. Dell will ship the repaired or replacement products to you freight prepaid if you use an address in the continental U.S. Shipments to other locations will be made freight collect.

NOTE: Before you ship the product(s) to Dell, back up the data on the hard-disk drive(s) and any other storage device(s) in the product(s). Remove any removable media, such as diskettes, CDs, or PC Cards. Dell does not accept liability for lost data or software.

Dell owns all parts removed from repaired products. Dell uses new and reconditioned parts made by various manufacturers in performing warranty repairs and building replacement products. If Dell repairs or replaces a product, its warranty term is not extended.

Coverage During Years Two and Three

During the second and third years of this limited warranty, Dell will provide, on an exchange basis, replacement parts for the Dell hardware product(s) covered under this limited warranty when a part requires replacement. You must report each instance of hardware failure to Dell's Customer Technical Support in advance to obtain Dell's concurrence that a part should be replaced and to have Dell ship the replacement part. Dell will ship parts using next-business-day delivery, shipping prepaid if you use an address in the continental U.S. Shipments to other locations will be made freight collect. Dell will include a prepaid shipping container with each replacement part for your use in returning the replaced part to Dell. Replacement parts are new or reconditioned. Dell may provide replacement parts made by various manufacturers when supplying parts to you. The warranty term for a replacement part is the remainder of the limited warranty term.

You will pay Dell for replacement parts if the replaced part is not returned to Dell within 30 days after the date the replacement part was shipped by Dell and for parts used to repair systems not covered by this limited warranty. In these events, replacement parts will be priced at Dell's then-current standard prices. Payment for these parts is due within 30 days from the date of invoice.

NOTE: You accept full responsibility for your software and data. Dell is not required to advise or remind you of appropriate backup and other procedures.

General

DELL MAKES NO EXPRESS WARRANTIES BEYOND THOSE STATED IN THIS WARRANTY STATEMENT. DELL DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW LIMITATIONS ON IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU.

DELL'S RESPONSIBILITY FOR MALFUNCTIONS AND DEFECTS IN HARDWARE IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS WARRANTY STATEMENT. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.

DELL DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES SET FORTH IN THIS WARRANTY STATEMENT OR LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR FOR LOST DATA OR SOFTWARE.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE PRECEDING EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

These provisions apply to Dell's U.S. limited three-year warranty only. For provisions of any service contract covering your system, refer to the separate service contract that you will receive.

NOTE: If you chose one of the available warranty and service options in place of the standard limited three-year warranty described in the preceding text, the option you chose will be listed on your invoice.

Limited Three-Year Warranty (Canada Only)

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. Dell warrants that the hardware products it manufactures will be free from defects in materials and workmanship. The warranty term is three years beginning on the date of invoice, as described in the following text. This warranty is transferable with the warranted products.

Damage due to shipping the products to you is covered under this warranty. Otherwise, this warranty does not cover damage due to external causes, including accident, abuse, misuse, problems with electrical power, servicing not authorized by Dell, usage not in accordance with product instructions, failure to perform required preventive maintenance, and problems caused by use of parts and components not supplied by Dell.

This warranty does not cover any items that are in one or more of the following categories: software; external devices (except as specifically noted); accessories or parts added to a Dell system after the system is shipped from Dell; accessories or parts added to a Dell system through Dell's system integration department; accessories or parts that are not installed in the Dell factory; or DellWare products. Monitors, keyboards, and mice that are Dell-branded or that are included on Dell's standard price list are covered under this warranty; all other monitors, keyboards, and mice (including those sold through the DellWare program) are not covered. Batteries for portable computers are covered only during the initial one-year period of this warranty.

Coverage During Year One

During the one-year period beginning on the invoice date, Dell will repair or replace products covered under this limited warranty that are returned to Dell's facility. To request warranty service, you must call Dell's Customer Technical Support within the warranty period. Refer to Chapter 4, "Getting Help," to find the appropriate telephone number for obtaining customer assistance. If warranty service is required, Dell will issue a Return Material Authorization Number. You must ship the products back to Dell in their original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. Dell will ship the repaired or replacement products to you freight prepaid if you use an address in Canada. Shipments to other locations will be made freight collect.

NOTE: Before you ship the product(s) to Dell, back up the data on the hard-disk drive(s) and any other storage device(s) in the product(s). Remove any removable media, such as diskettes, CDs, or PC Cards. Dell does not accept liability for lost data or software.

Dell owns all parts removed from repaired products. Dell uses new and reconditioned parts made by various manufacturers in performing warranty repairs and building replacement products. If Dell repairs or replaces a product, its warranty term is not extended, except as may be required by law.

Coverage During Years Two and Three

During the second and third years of this limited warranty, Dell will provide, on an exchange basis, replacement parts for the Dell hardware product(s) covered under this limited warranty when a part requires replacement. You must report each instance of hardware failure to Dell's Customer Technical Support in advance to obtain Dell's concurrence that a part should be replaced and to have Dell ship the replacement part. Dell will ship parts using next-business-day delivery, shipping prepaid if you use an address in Canada. Shipments to other locations will be made freight collect. Dell will include a prepaid shipping container with each replacement part for your use in returning the replaced part to Dell. Replacement parts are new or reconditioned. Dell may provide replacement parts made by various manufacturers when supplying parts to you. The warranty term for a replacement part is the remainder of the limited warranty term.

You will pay Dell for replacement parts if the replaced part is not returned to Dell within 30 days after the date the replacement part was shipped by Dell and for parts used to repair systems not covered by this limited warranty. In these events, replacement parts will be priced at Dell's then-current standard prices. Payment for these parts is due within 30 days from the date of invoice.

NOTE: You accept full responsibility for your software and data. Dell is not required to advise or remind you of appropriate backup and other procedures.

General

DELL MAKES NO EXPRESS WARRANTIES BEYOND THOSE STATED IN THIS WARRANTY STATEMENT. DELL DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW LIMITATIONS ON IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU.

DELL'S RESPONSIBILITY FOR MALFUNCTIONS AND DEFECTS IN HARDWARE IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS WARRANTY STATEMENT. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS, AND

YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM ONE JURISDICTION TO ANOTHER.

DELL DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES SET FORTH IN THIS WARRANTY STATEMENT OR LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR FOR LOST DATA OR SOFTWARE.

SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE PRECEDING EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

These provisions apply to Dell's Canadian limited three-year warranty only. For provisions of any service contract covering your system, refer to the separate service contract that you will receive.

NOTE: If you chose one of the available warranty and service options in place of the standard limited three-year warranty described in the preceding text, the option you chose will be listed on your invoice.

"Total Satisfaction" Return Policy (U.S. and Canada Only)

If you are an end-user customer who bought products directly from a Dell company, you may return them to Dell up to 30 days from the date of invoice for a refund of the product purchase price if already paid. This refund will not include any shipping and handling charges shown on your invoice. If your organization bought the products from Dell under a written agreement with Dell, there may be different terms for the return of products under this policy, based on your agreement with Dell. To return products, you must call Dell Customer Service at the telephone number shown in Chapter 4, "Getting Help," to receive a Credit Return Authorization Number. You must ship the products to Dell in their original packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. You may return software for refund or credit only if the sealed package containing the diskette(s) or CD(s) is unopened. Returned products must be in as-new condition, and all of the manuals, diskette(s), CD(s), power cables, and other items included with a product must be returned with it.

This "Total Satisfaction" Return Policy does not apply to DellWare products, which may be returned under DellWare's current return policy.

Abbreviations and Acronyms

Abbreviation or Acronym	Description
A	ampere(s)
AC	alternating current
ADC	analog-to-digital converter
ADI	Autodesk Device Interface
AI	artificial intelligence
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ASIC	application-specific integrated circuit
BASIC	Beginner's All-Purpose Symbolic Instruction Code
BBS	Bulletin Board Service
BIOS	basic input/output system
bpi	bits per inch
bps	bits per second
BTU	British thermal unit
BZT	*Bundesamt fur Zulassungen in der Telekommunikation*
C	Celsius
CCFT	cold cathode fluorescent tube
CD	compact disc

Abbreviation or Acronym	Description
CD-ROM	compact disc read-only memory
CGA	color graphics adapter
cm	centimeter(s)
CMOS	complementary metal-oxide semiconductor
C.O.D.	collect on delivery
cpi	characters per inch
cpl	characters per line
CPU	central processing unit
DAC	digital-to-analog converter
DASH	Dell Advanced SCSI Host
DAT	digital audio tape
dB	decibel(s)
dBA	adjusted decibel(s)
DC	direct current
DIN	*Deutsche Industrie Norm*
DIP	dual in-line package
DMA	direct memory access
DOC	Department of Communications (in Canada)
dpi	dots per inch

Abbreviation or Acronym	Description
DRAM	dynamic random-access memory
DS/DD	double-sided double-density
DS/HD	double-sided high-density
DSA	Dell SCSI Array
ECC	error correction code
EDO	extended-data out
EGA	enhanced graphics adapter
EIDE	enhanced integrated drive electronics
EISA	Extended Industry-Standard Architecture
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EMM	expanded memory manager
EMS	Expanded Memory Specification
EPP	Enhanced Parallel Port
EPROM	erasable programmable read-only memory
ESD	electrostatic discharge
ESDI	enhanced small-device interface
F	Fahrenheit
FAT	file allocation table
FCC	Federal Communications Commission
FIFO	first-in first-out
FTP	file transfer protocol
ft	feet
g	gram(s)

Abbreviation or Acronym	Description
G	gravities
GB	gigabyte(s)
GUI	graphical user interface
h	hexadecimal
HIP	Hardware Instrumentation Program
HMA	high memory area
HPFS	High Performance File System
IC	Industry-Canada
Hz	hertz
I/O	input/output
ID	identification
IDE	integrated drive electronics
IRQ	interrupt request
ITE	information technology equipment
ISA	Industry-Standard Architecture
JEIDA	Japanese Electronic Industry Development Association
K	kilo- (1024)
KB	kilobyte(s)
KB/sec	kilobyte(s) per second
Kbit(s)	kilobit(s)
Kbit(s)/sec	kilobit(s) per second
kg	kilogram(s)
kHz	kilohertz
LAN	local area network
lb	pound(s)

Abbreviation or Acronym	Description
LCD	liquid crystal display
LED	light-emitting diode
LIF	low insertion force
LN	load number
LIM	Lotus/Intel/Microsoft
lpi	lines per inch
m	meter(s)
mA	milliampere(s)
mAh	milliampere-hour(s)
MB	megabyte(s)
MB/sec	megabyte(s) per second
MBR	master boot record
MDA	monochrome display adapter
MGA	monochrome graphics adapter
MHz	megahertz
mm	millimeter(s)
ms	millisecond(s)
MS-DOS	Microsoft Disk Operating System
MTBF	mean time between failures
mV	millivolt(s)
NIC	network interface controller
NiCad	nickel cadmium
NiMH	nickel-metal hydride
NMI	nonmaskable interrupt
ns	nanosecond(s)
NTFS	NT File System
NVRAM	nonvolatile random-access memory
OTP	one-time programmable
PAL	programmable array logic
PCI	Peripheral Component Interconnect
PCMCIA	Personal Computer Memory Card International Association
PGA	pin grid array
POST	power-on self-test
ppm	pages per minute
PQFP	plastic quad flat pack
PS/2	Personal System/2
PSPB	power-supply paralleling board
PVC	polyvinyl chloride
QIC	quarter-inch cartridge
RAID	redundant array of inexpensive drives
RAM	random-access memory
RAMDAC	random-access memory digital-to-analog converter
REN	ringer equivalence number
RFI	radio frequency interference
RGB	red/green/blue
ROM	read-only memory
rpm	revolutions per minute
RTC	real-time clock

Abbreviation or Acronym	Description
SCSI	small computer system interface
SDS	scalable disk system
sec	second(s)
SIMM	single in-line memory module
SMB	server management bus
SNMP	simple network management protocol
SRAM	static random-access memory
SVGA	super video graphics array
TFT	thin film transistor
tpi	tracks per inch
TSR	terminate-and-stay-resident
TV	television
UL	Underwriters Laboratories
UMB	upper memory block
UPS	uninterruptible power supply
USOC	Universal Service Ordering Code

Abbreviation or Acronym	Description
V	volt(s)
VAC	volt(s) alternating current
VDC	volt(s) direct current
VDE	*Verband Deutscher Elektro-techniker*
VESA	Video Electronics Standards Association
VGA	video graphics array
VLSI	very-large-scale integration
VCCI	Voluntary Control Council for Interference
VRAM	video random-access memory
W	watt(s)
WH	watt-hour(s)
XMM	extended memory manager
XMS	eXtended Memory Specification
ZIF	zero insertion force

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