


Dell™ PowerVault™ 200S, 201S, 210S, and 211S Storage Systems Installation and Service Guide

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[Table of Contents](#)

[Safety Instructions](#)

[Preface](#)

[Introduction](#)

[Installing Your Rack-Mount Storage System](#)

[Installing Your Stand-Alone Storage System](#)

[Configuring Your ESEM or SEMM for Cluster Operation](#)

[Connecting Your Storage System to the Host Computer](#)

[Installing Drives](#)

[Service Information for Technicians](#)

[Getting Help](#)

[Technical Specifications](#)

[Maintaining Your Storage System](#)

[Regulatory Notices](#)

[Limited Warranty and Return Policy](#)

[Abbreviations and Acronyms](#)

[Index](#)



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Model AMP

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Contents

Chapter 1	Introduction	1-1
	2xxS Storage System Features	1-1
	200S and 201S Storage System Features	1-3
	210S and 211S Storage System Features	1-3
	System Requirements	1-3
	Indicators	1-4
	Enclosure Indicators	1-4
	SCSI Hard-Disk Drive Indicators	1-5
	Back Panel Indicators	1-6
	Data Protection	1-7
	Getting Help	1-7
Chapter 2	Installing Your Rack-Mounted Storage System	2-1
Chapter 3	Installing Your Stand-Alone Storage System	3-1
	Setting Up a Stand-Alone Storage System	3-1
	Rack Installation Restrictions	3-1
	Stand-Alone Kit Contents	3-1
	Installing the Stand-Alone Kit	3-2
	Attaching the Hat Flanges to the Storage System	3-2
	Attaching Stabilizers to the Stand-Alone Chassis	3-3
	Installing the Storage System in the Stand-Alone Chassis	3-4
	Completing the Installation	3-6

Chapter 4	Configuring Your ESEM or SEMM for Cluster Operation	4-1
	Configuring the ESEM or SEMM for Cluster Operation	4-2
	Installing the ESEM or SEMM	4-3
	Managing the PowerVault 2xxS Storage System in a Cluster Configuration	4-5
Chapter 5	Connecting Your Storage System to the Host Computer.	5-1
	Preparing the Storage System	5-1
	Connecting the Storage System	5-1
	Preventing Unauthorized Access to the Storage System	5-5
	Running the Diagnostics	5-5
Chapter 6	Installing Drives	6-1
	SCSI Hard-Disk Drive Configuration	6-1
	Removing and Installing SCSI Hard-Disk Drives in the Drive Bays	6-3
	SCSI Hard-Disk Drive Indicator Patterns	6-3
	Removing a SCSI Hard-Disk Drive From the Storage System	6-4
	Installing a SCSI Hard-Disk Drive in the Storage System	6-7
Chapter 7	Service Information for Technicians	7-1
	Precautionary Measures	7-1
	Troubleshooting Overview	7-2
	Indicators Overview	7-2
	Troubleshooting SCSI Hard-Disk Drives	7-3
	Troubleshooting the System	7-4
	Troubleshooting a Cooling Fan	7-6
	Troubleshooting a Power Supply	7-7
	System Messages	7-9
	Parts Replacement Procedures	7-9
	Recommended Tools	7-9
	Computer Orientation	7-9
	Component Locations	7-11
	Replacing the Power Supply	7-11
	Procedure for a Redundant Storage System	7-11
	Procedure for a Nonredundant Storage System	7-13
	Replacing a Cooling Fan	7-14
	Replacing an Enclosure Module	7-15
	Removing and Reinstalling the Component Mounting Bracket	7-17
	Removing the Dual-Bus Split Backplane Module	7-19
	Removing the SCSI Backplane Board	7-20

Removing and Reinstalling the Lock Bar	7-24
Installing Redundant Components Procedures	7-25
Recommended Tools	7-26
Installing the Redundant Power Supply	7-26
Installing the Redundant Cooling Fan	7-28
Installing the Second Enclosure Module	7-30

Chapter 8 Getting Help 8-1

Technical Assistance	8-1
Help Tools	8-2
World Wide Web	8-2
AutoTech Service	8-3
TechFax Service	8-3
TechConnect BBS	8-3
Automated Order-Status System	8-3
Technical Support Service	8-4
Problems With Your Order	8-4
Product Information	8-4
Returning Items for Warranty Repair or Credit	8-4
Before You Call	8-5
Dell Contact Numbers	8-7

Appendix A Technical Specifications A-1

Appendix B Maintaining Your Storage System B-1

Data Preservation	B-1
Scheduling Backups	B-1
Backup Devices	B-1
Cleaning Storage System Components	B-2
Recommended Tools and Accessories	B-2
Cleaning the Storage System Exterior	B-2
Environmental Factors	B-2
Temperature	B-2
Humidity	B-3
Altitude	B-3
Dust and Particles	B-4
Corrosion	B-4
ESD	B-4
Electromagnetic and Radio Frequency Interference	B-5
Magnetism	B-5
Shock and Vibration	B-6
Power Source Interruptions	B-6

Power Protection Devices.	B-7
Surge Protectors	B-7
Line Conditioners.	B-7
Uninterruptible Power Supply	B-7

Appendix C Regulatory Notices C-1

FCC Notices (U.S. Only)	C-2
Class A.	C-2
Class B.	C-3
IC Notice (Canada Only)	C-3
CE Notice (European Union)	C-4
EN 55022 Compliance (Czech Republic Only).	C-5
VCCI Notice (Japan Only)	C-5
Class A ITE.	C-5
Class B ITE.	C-6
MOC Notice (South Korea Only)	C-6
Class A Device.	C-6
Class B Device.	C-7
Polish Center for Testing and Certification Notice	C-7
Wymagania Polskiego Centrum BadaŃ i Certyfikacji	C-8
PozostaŃe instrukcje bezpieczeŃstwa	C-8
NOM Information (Mexico Only).	C-9
Informaci3n para NOM (3nicamente para M3xico).	C-9
BSMI Notice (Taiwan Only).	C-10

Appendix D Limited Warranty and Return Policy. D-1

Three-Year Limited Warranty (U.S. Only)	D-1
Coverage During Year One	D-2
Coverage During Years Two and Three	D-2
General Provisions	D-3
Three-Year Limited Warranty (Canada Only)	D-3
Coverage During Year One	D-4
Coverage During Years Two and Three	D-4
General Provisions	D-5
One-Year End-User Manufacturer Guarantee (Latin America and the Caribbean Only)	D-6
Guarantee	D-6
Exclusions	D-6
Making a Claim	D-6
Limitation and Statutory Rights	D-6
“Total Satisfaction” Return Policy (U.S. and Canada Only).	D-7

Index

Figures

Figure 1-1. Front Panel for PowerVault 2xxS Storage Systems
(Shown on PowerVault 210S/211S) 1-5

Figure 1-2. Back Panel for PowerVault 2xxS Storage Systems 1-6

Figure 3-1. Removing the Sliding Lock Bar or Nut-Plate Mounting Screws. 3-2

Figure 3-2. Installing the Hat Flange 3-3

Figure 3-3. Attaching the Stabilizers 3-4

Figure 3-4. Installing the Storage System in the Back of the Chassis 3-5

Figure 3-5. Installing the Front Screws 3-6

Figure 4-1. ESEM and SEMM Jumpers 4-2

Figure 4-2. Removing the Existing Module (Left Side) 4-4

Figure 5-1. Back Panel Showing Redundant Configuration 5-2

Figure 5-2. SCSI ID Numbers for PowerVault 200S and 201S. 5-3

Figure 5-3. SCSI ID Numbers for PowerVault 210S and 211S. 5-4

Figure 5-4. Keylock for PowerVault 2xxS
(Shown on PowerVault 200S/201S) 5-5

Figure 6-1. Drive Numbers and SCSI Numbers for
PowerVault 200S/201S 6-2

Figure 6-2. Drive Numbers and SCSI Numbers for
PowerVault 210S/211S 6-2

Figure 6-3. Keylock and Lock Bar for PowerVault 2xxS
(Shown in PowerVault 200S/201S) 6-5

Figure 6-4. Drive Carrier Lock 6-6

Figure 6-5. Drive Carrier Handle. 6-6

Figure 6-6. Installing a SCSI Hard-Disk Drive 6-7

Figure 7-1. Cooling Fans for PowerVault 2xxS Storage Systems 7-6

Figure 7-2. Power Supply 7-7

Figure 7-3. Storage System Orientation for PowerVault 2xxS
(Shown From Top View of PowerVault 200S/201S) 7-10

Figure 7-4. Component Locations 7-11

Figure 7-5. Removing a Power Supply on a Redundant System 7-12

Figure 7-6. Removing a Power Supply on a Nonredundant System 7-13

Figure 7-7. Removing a Cooling Fan 7-15

Figure 7-8. Removing the Existing Module (Left Side) 7-16

Figure 7-9. Removing the Component Mounting Bracket 7-18

Figure 7-10. Dual-Bus Split Backplane Module Location 7-20

Figure 7-11. Screw Location 7-21

Figure 7-12. Screw Location in the Left Module Bay. 7-22

Figure 7-13. Chassis Separation. 7-22

Figure 7-14. Keylock and Lock Bar for PowerVault 2xxS
(Shown on PowerVault 200S/201S) 7-25

Figure 7-15.	Removing the Power-Supply Blank	7-27
Figure 7-16.	Inserting the Redundant Power Supply.	7-28
Figure 7-17.	Removing the Cooling-Fan Blank.	7-29
Figure 7-18.	Inserting the Redundant Cooling Fan	7-30
Figure 7-19.	Terminator Blank Removal	7-31
Figure 7-20.	Second Module Insertion	7-31
Figure 8-1.	Diagnostics Checklist	8-6
Figure C-1.	VCCI Class A ITE Regulatory Mark	C-5
Figure C-2.	VCCI Class B ITE Regulatory Mark	C-6
Figure C-3.	MOC Class A Regulatory Mark	C-7
Figure C-4.	MOC Class B Regulatory Mark	C-7

Tables

Table 1-1	PowerVault 2xxS Enclosure Module Feature Comparison	1-3
Table 5-1.	Storage System Operation and Cable Connections	5-3
Table 6-1.	SCSI Hard-Disk Drive Indicator Patterns	6-3
Table 7-1.	System Indicators	7-3
Table 8-1.	International Dialing Codes	8-8
Table 8-2.	Dell Contact Numbers	8-9
Table A-1.	PowerVault 200S and 201S.	A-1
Table A-2.	PowerVault 210S and 211S.	A-3



Safety Instructions

Use the following safety guidelines to ensure your own personal safety and to help protect your computer or storage system from potential damage.

Notes, Notices, Cautions, and Warnings

Throughout this guide, blocks of text may be accompanied by an icon and printed in bold type or in italic type. These blocks are notes, notices, cautions, and warnings, and they are used as follows:



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

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



CAUTION: A CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



WARNING: A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious bodily injury.



Safety Caution and Warnings

Observe the following caution and warnings while servicing this system:

CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

WARNING: The power supplies in your computer or storage system may produce high voltages and energy hazards, which can cause bodily harm. Only trained service technicians are authorized to remove the computer covers and access any of the components inside the computer. This warning applies to Dell PowerEdge 4xxx or higher servers and Dell PowerVault 2xxS storage systems.

WARNING: This 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 system.

DŮLEŽITÉ UPOZORNĚNÍ: 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.

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



Additional Safety Precautions

To reduce the risk of bodily injury, electrical shock, fire, and damage to the equipment, observe the following precautions.

General Precautions

Observe the following general precautions for using and working with your system:

- Observe and follow service markings. Do not service any Dell product except as explained in your Dell system documentation. Opening or removing covers that are marked with the triangular symbol with a lightning bolt may expose you to electrical shock. Components inside these compartments should be serviced only by a Dell authorized service technician.
- If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your Dell authorized service provider:
 - The power cable, extension cable, or plug is damaged.

- An object has fallen into the product.
 - The product has been exposed to water.
 - The product has been dropped or damaged.
 - The product does not operate correctly when you follow the operating instructions.
- Keep your system components away from radiators and heat sources. Also, do not block cooling vents.
 - Do not spill food or liquids on your system components, and never operate the product in a wet environment. If the computer gets wet, see the appropriate chapter in your troubleshooting guide or contact a Dell-authorized service provider.
 - Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
 - Use the product only with Dell products or other Dell-approved equipment.
 - Allow the product to cool before removing covers or touching internal components.
 - Use the correct external power source. Operate the product only from the type of power source indicated on the electrical ratings label. If you are not sure of the type of power source required, consult your Dell service provider or local power company.
 - To help avoid damaging your system components, be sure the voltage selection switch (if provided) on the power supply is set to match the power available at your location:
 - 115 volts (V)/60 hertz (Hz) in most of North and South America and some Far Eastern countries such as South Korea and Taiwan
 - 100 V/50 Hz in eastern Japan and 100 V/60 Hz in western Japan
 - 230 V/50 Hz in most of Europe, the Middle East, and the Far East

Also be sure that your monitor and attached devices are electrically rated to operate with the power available in your location.

- Use only approved power cable(s). If you have not been provided with a power cable for your computer or storage system or for any AC-powered option intended for your system, purchase a power cable that is approved for use in your country. The power cable must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cable should be greater than the ratings marked on the product.
- To help prevent electric shock, plug the system/components and peripheral power cables into properly grounded electrical outlets. These cables are equipped with three-prong plugs to help 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.

- Observe extension cable and power strip ratings. Make sure that the total ampere rating of all products plugged into the extension cable or power strip does not exceed 80 percent of the extension cable or power strip ampere ratings limit.
- Do not use appliance/voltage converters or kits sold for appliances with your Dell product.
- To help protect your system/components from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Position system cables and power cables carefully; route system cables and the power cable and plug so that they cannot be stepped on or tripped over. Be sure that nothing rests on your system components' cables or power cable.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local/national wiring rules.
- To help avoid possible damage to the system board, wait 5 seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device from the computer.
- Handle batteries carefully. Do not disassemble, crush, puncture, short external contacts, dispose of in fire or water, or expose batteries to temperatures higher than 60 degrees Celsius (140 degrees Fahrenheit). Do not attempt to open or service batteries; replace batteries only with batteries designated for the product.
- Turn down the volume before using headphones or other audio devices.

Precautions for Server and Storage Systems

Observe the following additional safety guidelines for your system:

- Unless your installation and/or troubleshooting documentation specifically allows it, do not remove enclosure covers, attempt to override the safety interlocks, or access any components inside the system. Depending on your system, installation and repairs may be done only by individuals who are qualified to service your computer or storage system equipment and trained to deal with products capable of producing hazardous energy levels.
- When connecting or disconnecting power to hot-pluggable power supplies, if offered with your Dell product, observe the following guidelines:
 - Install the power supply before connecting the power cable to the power supply.
 - Unplug the power cable before removing the power supply.
 - If the system has multiple sources of power, disconnect power from the system by unplugging *all* power cables from the power supplies.
- Move products with care; ensure that all casters and/or stabilizers are firmly connected to the computer or storage system. Avoid sudden stops and uneven surfaces.

Precautions for Rack-Mountable Products

Observe the following precautions for rack stability and safety. Also refer to the rack installation documentation accompanying the system and the rack for specific warning and/or caution statements and procedures.

Server and storage systems are considered to be components in a rack. Thus, “component” refers to any server or storage system, as well as to various peripherals or supporting hardware.



WARNING: Installing Dell system components in a Dell rack without the front and side stabilizers installed could cause the rack to tip over, potentially resulting in bodily injury under certain circumstances. Therefore, always install the stabilizers before installing components in the rack.

After installing system/components in a rack, never pull more than one component out of the rack on its slide assemblies at one time. The weight of more than one extended component could cause the rack to tip over and injure someone.



NOTE: Dell's server and storage systems are certified as components for use in Dell's rack cabinet using the Dell customer rack kit. The final installation of Dell systems and rack kits in any other brand of rack cabinet has not been approved by any safety agencies. It is the customer's responsibility to have the final combination of Dell systems and rack kits for use in other brands of rack cabinets evaluated for suitability by a certified safety agency.

- System rack kits are intended to be installed in a Dell rack by trained service technicians. If you install the kit in any other rack, be sure that the rack meets the specifications of a Dell rack.
- Do not move large racks by yourself. Due to the height and weight of the rack, Dell recommends a minimum of two people to accomplish this task.
- Before working on the rack, make sure that the stabilizers are secure to the rack, extend to the floor, and that the full weight of the rack rests on the floor. Install front and side stabilizers on a single rack or front stabilizers for joined multiple racks before working on the rack.
- Always load the rack from the bottom up, and load the heaviest item in the rack first.
- Make sure that the rack is level and stable before extending a component from the rack.
- Use caution when pressing the component rail release latches and sliding a component into or out of a rack; the slide rails can pinch your fingers.
- After a component is inserted into the rack, carefully extend the rail into a locking position, and then slide the component into the rack.
- Do not overload the AC supply branch circuit that provides power to the rack. The total rack load should not exceed 80 percent of the branch circuit rating.
- Ensure that proper airflow is provided to components in the rack.

- Do not step on or stand on any system/component when servicing other systems/components in a rack.

Precautions for Products With Modems, Telecommunications, or Local Area Network Options

Observe the following guidelines when working with options:

- Do not connect or use a modem or telephone during a lightning storm. There may be a risk of electrical shock from lightning.
- Never connect or use a modem or telephone in a wet environment.
- Do not plug a modem or telephone cable into the network interface controller (NIC) receptacle.
- Disconnect the modem cable before opening a product enclosure, touching or installing internal components, or touching an uninsulated modem cable or jack.
- Do not use a telephone line to report a gas leak while you are in the vicinity of the leak.

Precautions for Products With Laser Devices

Observe the following precautions for laser devices:

- Do not open any panels, operate controls, make adjustments, or perform procedures on a laser device other than those specified in the product's documentation.
- Only authorized service technicians should repair laser devices.

When Working Inside Your Computer

Before you remove the computer covers, perform the following steps in the sequence indicated.

NOTICE: Some Dell systems can be serviced only by trained service technicians because of high voltages and energy hazards. Do not attempt to service the computer system yourself, except as explained in this guide and elsewhere in Dell documentation. Always follow installation and service instructions closely.

NOTICE: To help avoid possible damage to the system board, wait 5 seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device from the computer.

1. Turn off your computer and any devices.
2. Ground yourself by touching an unpainted metal surface on the chassis, such as the metal around the card-slot openings at the back of the computer, before touching anything inside your computer.

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

3. Disconnect your computer and devices from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.

Doing so reduces the potential for personal injury or shock.

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 that both connectors are correctly oriented and aligned.
- Handle components and cards with care. Don't touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a microprocessor chip by its edges, not by its pins.



CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Protecting Against Electrostatic Discharge

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

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

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 from the antistatic packing material until you are ready to install the component in your computer. 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 notice may appear throughout this document to remind you of these precautions:

NOTICE: See “Protecting Against Electrostatic Discharge” in the safety instructions at the front of this guide.

Ergonomic Computing Habits



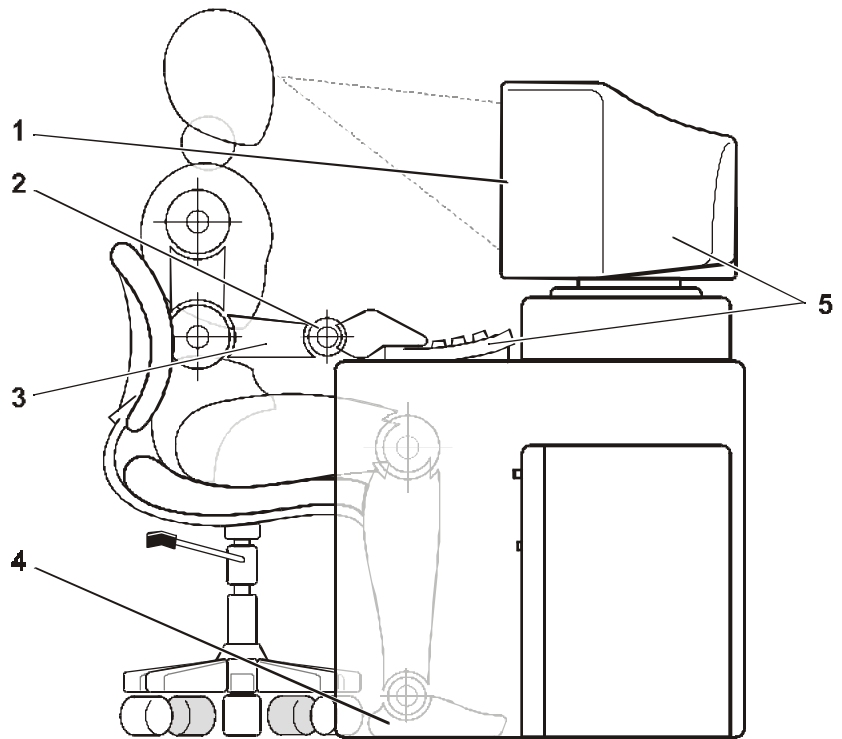
CAUTION: Improper or prolonged keyboard use may result in injury.



CAUTION: Viewing the monitor screen for extended periods of time may result in eye strain.

For comfort and efficiency, observe the following ergonomic guidelines when you set up and use your computer system:

- Position your system so that the monitor and keyboard are directly in front of you as you work. Special shelves are available (from Dell and other sources) to help you correctly position your keyboard.
- Set the monitor at a comfortable viewing distance (usually 510 to 610 millimeters [20 to 24 inches] from your eyes).
- Make sure that the monitor screen is at eye level or slightly lower when you sit in front of the monitor.
- Adjust the tilt of the monitor, its contrast and brightness settings, and the lighting around you (such as overhead lights, desk lamps, and the curtains or blinds on nearby windows) to minimize reflections and glare on the monitor screen.
- Use a chair that provides good lower back support.
- Keep your forearms horizontal with your wrists in a neutral, comfortable position while you use the keyboard or mouse.
- Always leave space to rest your hands while you use the keyboard or mouse.
- Let your upper arms hang naturally at your sides.
- Sit erect, with your feet resting on the floor and your thighs level.
- When sitting, make sure the weight of your legs is on your feet and not on the front of your chair seat. Adjust your chair’s height or use a footrest, if necessary, to maintain proper posture.
- Vary your work activities. Try to organize your work so that you do not have to type for extended periods of time. When you stop typing, try to do things that use both hands.



-
- 1 Monitor screen at or below eye level
 - 2 Wrists relaxed and flat
 - 3 Arms at desk level
 - 4 Feet flat on the floor
 - 5 Monitor and keyboard positioned directly in front of user
-



Preface

About This Guide

This guide is intended for users of the Dell PowerVault 200S, 201S, 210S, and 211S storage systems (hereafter called 2xxS storage systems) who want to learn about its features and operation and for qualified service technicians who upgrade or service the storage system. The chapters are summarized as follows:

- Chapter 1, "Introduction," provides 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 Rack-Mounted Storage System," describes setting up the rack-mounted storage system.
- Chapter 3, "Installing Your Stand-Alone Storage System," describes setting up the stand-alone storage system.
- Chapter 4, "Configuring Your ESEM or SEMM for Cluster Operation," describes how to configure the storage system.
- Chapter 5, "Connecting Your Storage System to the Host Computer," describes how to connect your storage system to the host computer.
- Chapter 6, "Installing Drives," describes how to install small computer system interface (SCSI) hard-disk drives in the storage system's drive bays.
- Chapter 7, "Service Information for Technicians," discusses upgrade and service procedures for the storage system.
- Chapter 8, "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," provides reference material for users interested in learning more about the details of the storage system.
- Appendix B, "Maintaining Your Storage System," describes preventive maintenance procedures that you should perform regularly to keep your storage system in top operating condition.
- Appendix C, "Regulatory Notices," provides information about regulatory agencies that have tested and approved the PowerVault 2xxS storage system.

- Appendix D, "Limited Warranty and Return Policy," describes the warranty for the storage system and the "Total Satisfaction" Return Policy.
- "Abbreviations and Acronyms" defines the acronyms and abbreviations used in this guide.

Limited 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 limited warranty for your system, see Appendix D, Limited Warranty and Return Policy."

Other Documents You May Need

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

- *User's Guide* or *Installation and Troubleshooting Guide* for the host computer.
- Dell PowerEdge Expandable RAID Controller (PERC) 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI documentation, which includes information on the SCSI host adapter.
- HP OpenView Network Node Manager Special Edition (NNM SE) x.x and Dell OpenManage Hardware Instrumentation Package (HIP) x.x documentation, which includes information on operating the Dell OpenManage HIP server management application program.
- Dell PowerEdge cluster installation and troubleshooting documentation.



NOTE: Documentation updates are sometimes included with your system or software to describe changes to your system or software. Always read these updates before consulting any other documentation because the updates often contain the latest information.

Notes, Notices, Cautions, and Warnings

Throughout this guide, blocks of text may be accompanied by an icon and printed in bold type or in italic type. These blocks are notes, notices, cautions, and warnings, and they are used as follows:



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

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



CAUTION: A CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



WARNING: A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious bodily injury.

Typographical Conventions

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

- *Interface components* are window titles, button and icon names, menu names and selections, and other options that appear on the monitor screen or display. They are presented in bold.
Example: Click **OK**.
- *Keycaps* are labels that appear on the keys on a keyboard. They 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 presented in lowercase bold; variable parameters (those for which you substitute a value) are presented in lowercase italics; constant parameters are presented 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 a message or 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:\programs and press <Enter>."

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

Example: DIMM_x (where x represents the DIMM socket designation)



CHAPTER 1

Introduction

The Dell™ PowerVault™ 2xxS storage systems are high-performance storage systems that offer extensive reliability and server management features. This chapter describes the features and software requirements of these storage systems.

2xxS Storage System Features

All PowerVault 2xxS storage systems offer the following features. Features for specific PowerVault 2xxS storage systems are listed after the common features.

- Hot-pluggable drives if an optional or Dell PowerEdge™ Expandable RAID Controller (PERC) 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI host adapter card is installed in the host computer. (Other host adapters may also be qualified by Dell to support hot-pluggable drives in the storage system.)
- Multiple storage systems that can be connected to a Dell PowerEdge 8450, 6350, 6300, 4400, 4350, 4300, 2450, 2400, 2300, or 1300 computer system using the following host adapter cards:
 - Dell PERC 2
 - Dell PERC 2/SC
 - Dell PERC 2/DC
 - Dell PERC 3/DI
 - Adaptec AHA-2940U2W Peripheral Component Interconnect (PCI)
- Hot-pluggable power supply with an optional redundant second power supply.
- Two hot-pluggable cooling fan modules with an optional redundant third cooling fan module.
- 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 HP OpenView Network Node Manager Special Edition (NNM SE) x.x and the Dell OpenManage™ Hardware Instrumentation Package (HIP) x.x server management program installed on the host computer.
- Small computer system interface (SCSI) management support for communicating SCSI hard-disk drive status, activity, and failure information through the SCSI

cable to the host computer. The PowerVault 2xxS storage system is SAF-TE 1.0-compliant and SES (draft)-compliant.

- Follow-mode control of the storage system power. (In follow mode, the storage system automatically mirrors the power state of the host computer.)



*NOTE: For the PowerVault 2xxS to power on, the PowerVault 2xxS **must** be attached to a host adapter and the host server **must** be powered on.*

- Rack or stand-alone (tower) configuration support.
- Multiple cable-length options:
 - When the storage system has an enclosure services module (ESM) or SCSI management module (SMM), the system supports SCSI cables up to 10 meters (m) long between the storage system and the host computer.
 - When the storage system has an enclosure services expander module (ESEM) or SCSI expander management module (SEMM), the system supports SCSI cables up to 20 m long between the storage system and the host computer.
- System security provided by a key-locking mechanism for the hard-disk drive carriers.
- ESEM features:
 - Use of technology provided by the Ultra2-multimode SCSI bus expander chip
 - SCSI cable support for longer cables (up to 20 m)
 - Cluster operation support



NOTE: The ESEM is labeled "ES Expander Module." The label is located adjacent to the SCSI connector.

- SEMM features:
 - Use of technology provided by the Ultra3 multimode SCSI bus expander chip
 - SCSI cable support for longer cables (up to 20 m)
 - Cluster operation support



NOTE: The SEMM is labeled "SCSI Expander Mngmt Module." The label is located adjacent to the SCSI connector.

- Over the lifetime of the PowerVault 2xxS, Dell has continued to upgrade the capabilities of the PowerVault storage system. Table 1-1 summarizes the capabilities of the PowerVault 2xxS enclosure modules. These modules include: ESM, ESEM, SMM, and SEMM.

Table 1-1. PowerVault 2xxS Enclosure Module Feature Comparison

Feature	ESM	ESEM	SMM	SEMM
Cluster		X		X
Non cluster	X	X	X	X
Ultra2 SCSI	X	X	X	X
Ultra3 SCSI	X		X	X
PowerVault 20xS	X	X	X	X
PowerVault 21xS		X	X	X
20 m cable		X		X

200S and 201S Storage System Features

The PowerVault 200S and 201S storage systems offer the following features:

- Support for up to eight 1.0-inch or 1.6-inch Ultra2 low voltage differential (LVD) SCSI hard-disk drives via a SCSI backplane board and special SCSI hard-disk drive carriers. The SCSI backplane automatically configures SCSI ID numbers on individual hard-disk drives, greatly simplifying drive installation.
- Support for up to eight 1.0-inch or 1.6-inch Ultra3 SCSI hard-disk drives when using an ESM, SMM, or SEMM, and an approved Ultra3 SCSI or RAID controller.
- The SCSI backplane can be configured as an eight-drive (1 x 8) backplane or electrically split into two separate four-drive (2 x 4) backplanes.

210S and 211S Storage System Features

The PowerVault 210S and 211S storage systems offer the following features:

- Support for up to 12 1.0-inch (only) Ultra2 LVD SCSI hard-disk drives via a SCSI backplane board and special SCSI hard-disk drive carriers. The SCSI backplane automatically configures SCSI ID numbers on individual hard-disk drives, greatly simplifying drive installation.
- Support for up to 12 1.0-inch (only) Ultra3 SCSI hard-disk drives when using an SMM or SEMM, and an approved Ultra3 SCSI or RAID controller.
- The SCSI backplane can be configured as a 12-drive (1 x 12) backplane or electrically split into two separate six-drive (2 x 6) backplanes.

System Requirements

The PowerVault 2xxS storage system is designed for use with Dell PowerEdge 1300, 2300, 2400, 2450, 4300, 4350, 4400, 6300, 6350, and 8450 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 PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI 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 4.0 or later
- Novell® NetWare® 4.11 or later




The HP OpenView NNM SE x.x and Dell OpenManage HIP x.x server management application programs (version 3.2 or later) 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*.

Indicators

Enclosure Indicators

The following enclosure status indicator lights are located on the front panel of the enclosure (see Figure 1-1):




- The green *power indicator*  lights when the storage system is turned on.
- The green *dual-bus indicator* (middle)  lights when the PowerVault 2xxS is operating in dual-bus split backplane mode.
- The amber *system fault indicator*  lights if one of the storage system's internal self-tests fails during system start-up or whenever a fault is detected.



NOTE: You can use Dell OpenManage HIP to enable an audible fault indicator. See the HP OpenView NNM SE x.x and Dell OpenManage HIP x.x documentation.

SCSI Hard-Disk Drive Indicators

The following SCSI hard-disk drive indicator lights are located at the top of each SCSI hard-disk drive carrier and provide information on the drive in that bay (see Figure 1-1):

- The green *drive online indicator*  lights when the hard-disk drive is receiving power.
- The green *drive activity indicator*  lights when data is being transferred to or from the hard-disk drive.
- If a Dell PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI host adapter card is installed in the host computer, the amber *drive fault indicator*  lights if a disk failure is detected.

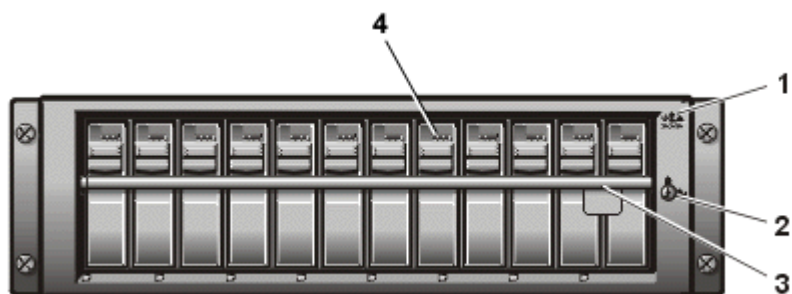





Figure 1-1. Front Panel for PowerVault 2xxS Storage Systems (Shown on PowerVault 210S/211S)

-
- 1 Enclosure status indicators
 - 2 Keylock
 - 3 Lock bar
 - 4 SCSI hard-disk drive indicators
-

Back Panel Indicators

The following indicators are located on the storage system's back panel (see Figure 1-2):

- The amber *cooling fan fault indicator*  lights if a fault is detected in a cooling fan.
- The green *power supply indicator*  lights when the storage system is turned on.
- The amber *power supply fault indicator*  lights if one of the storage system's internal self-tests fails during system start-up or whenever a fault is detected.

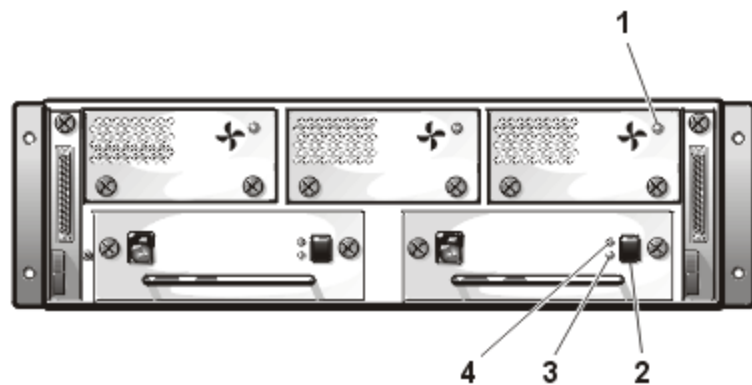


Figure 1-2. Back Panel for PowerVault 2xxS Storage Systems

-
- | | |
|---|------------------------------|
| 1 | Cooling fan fault indicator |
| 2 | Power supply switch |
| 3 | Power supply indicator |
| 4 | Power supply fault indicator |
-

Data Protection

To safeguard your system before installing or maintaining your storage system, see Appendix B, "Maintaining Your Storage System," for information about scheduling backups, backup devices, cleaning storage system components, environmental factors, and power protection devices.

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 Chapter 8, "Getting Help."



CHAPTER 2

Installing Your Rack-Mounted Storage System

For information on how to install your Dell PowerVault 200S and 210S storage systems in a rack, see the documentation that is included with your rack installation kit. For information on the stand-alone configuration, see Chapter 3, "Installing Your Stand-Alone Storage System."



CHAPTER 3

Installing Your Stand-Alone Storage System

This chapter describes how to install the Dell PowerVault 201S and 211S storage systems in a free-standing, vertical configuration, also called a tower.

Setting Up a Stand-Alone Storage System

A stand-alone installation kit is available from Dell for installing a rack storage system in a stand-alone unit. One stand-alone unit is required for each rack storage system installed.

If you have an upgrade kit, perform all the steps. If you ordered your PowerVault 201S or 211S from Dell, perform the steps described in "Attaching Stabilizers to the Stand-Alone Chassis," found later in this chapter; the other steps have already been completed.

Rack Installation Restrictions

The stand-alone kit is intended to be installed by a certified service technician.

Stand-Alone Kit Contents

The stand-alone kit includes the following items:

- One stand-alone chassis
- Two hat flanges (top and bottom)
- Two stabilizers
- Eight 6-32 x 1/2-inch Phillips pan-head screws
- Four 6-32 x 1/2-inch Phillips hex-head screws
- Eight 6-32 x 1/4-inch Phillips flat-head screws

NOTE: Some parts may be preinstalled.



Installing the Stand-Alone Kit

To install the rack storage system in a stand-alone unit, perform the following tasks (as described in the following subsections):

1. Attach the hat flanges to the storage system.
2. Attach the stabilizers to the stand-alone chassis.
3. Install the storage system in the stand-alone chassis.
4. Complete the installation.

Attaching the Hat Flanges to the Storage System

1. Remove all of the installed hard-disk drives from the storage system.
2. Carefully place the storage system on its left side.

The enclosure indicator lights should be at the top.
3. If the nut-plate mounting screws (shown in Figure 3-1) and the sliding lock bar are present, remove the front two screws and discard them.

If neither the screws nor the bar is present, go to step 4.

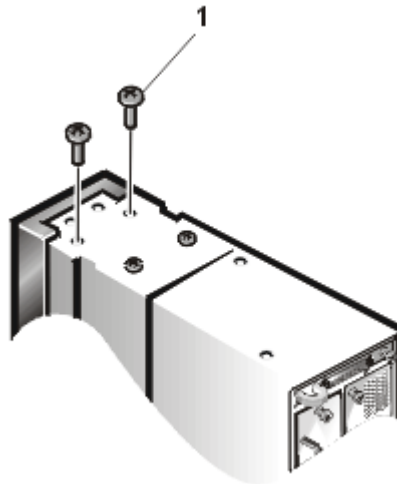


Figure 3-1. Removing the Sliding Lock Bar or Nut-Plate Mounting Screws

1 Nut-plate mounting screws

4. Place the top hat flange along the right side of the storage system and align the screw holes (see Figure 3-2).

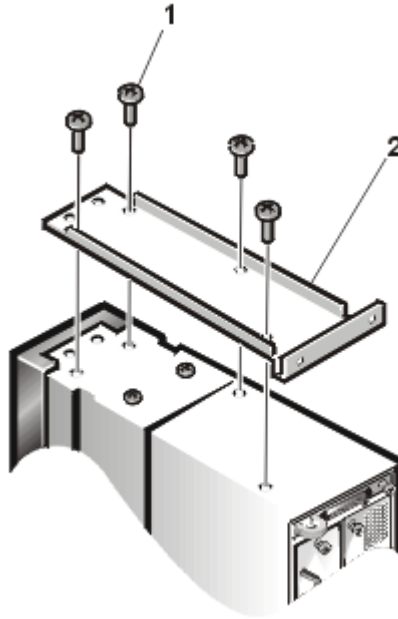


Figure 3-2. Installing the Hat Flange

-
- | | |
|---|----------------------------------|
| 1 | 6-32 x 1/4-inch flat-head screws |
| 2 | Hat flange |
-

5. Using a Phillips-head screwdriver, attach the hat flange to the chassis with four 6-32 x 1/4-inch flat-head screws as shown in Figure 3-2.
6. Carefully place the storage system on its right side.
The enclosure indicator lights should be at the bottom.
7. Repeat steps 3 through 5 to mount the bottom hat flange on the storage system.

Attaching Stabilizers to the Stand-Alone Chassis

1. Carefully turn the stand-alone chassis upside down.
2. Locate the two pairs of screw holes on the bottom panel.

3. Align the stabilizers with the screw holes and attach the stabilizers to the chassis using a Phillips-head screwdriver and four 6-32 x 1/2-inch hex-head screws (see Figure 3-3).

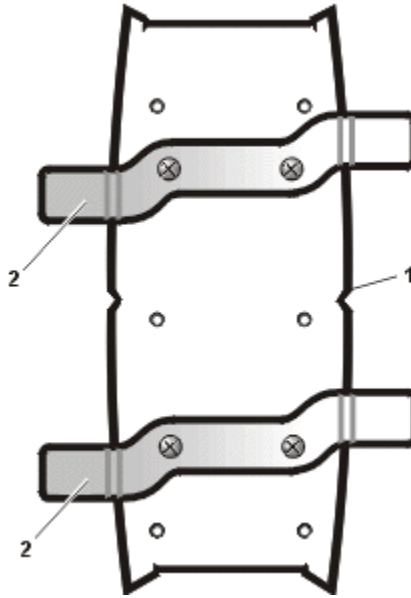


Figure 3-3. Attaching the Stabilizers

-
- | | |
|---|-------------------------------|
| 1 | Bottom of stand-alone chassis |
| 2 | Stabilizers (2) |
-

Installing the Storage System in the Stand-Alone Chassis

1. Place the stand-alone chassis in an upright position.
2. Carefully place the front of the storage system into the back of the stand-alone chassis.

The top hat flange on the storage system aligns with the top hat bracket in the enclosure. The bottom hat flange on the storage system aligns with the bottom hat bracket in the enclosure (see Figure 3-4).

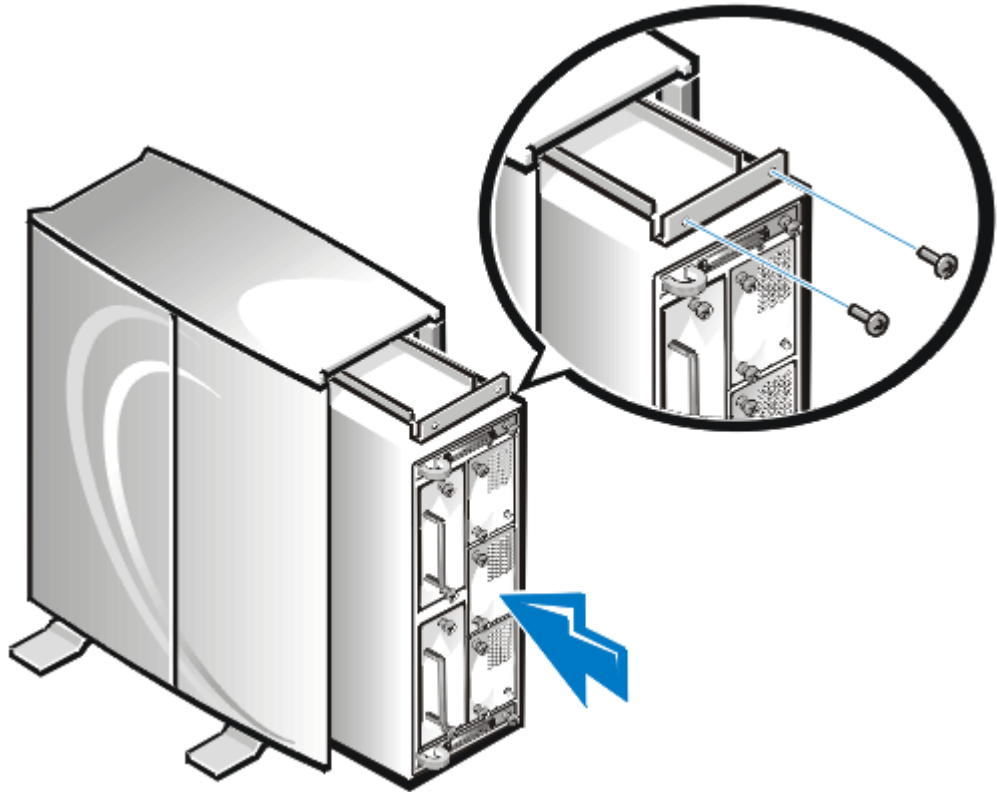


Figure 3-4. Installing the Storage System in the Back of the Chassis

3. Slide the storage system all the way into the stand-alone chassis until it stops. The front of the storage system is seated into the front of the stand-alone chassis, which provides access to both the status indicators and the locking mechanism.
4. From the front of the storage system, look through the open hard-disk drive bays and locate the two screw holes at the bottom (see Figure 3-5).
5. Start two 6-32 x 1/2-inch pan-head screws in the bottom screw holes and tighten them using a Phillips-head screwdriver.

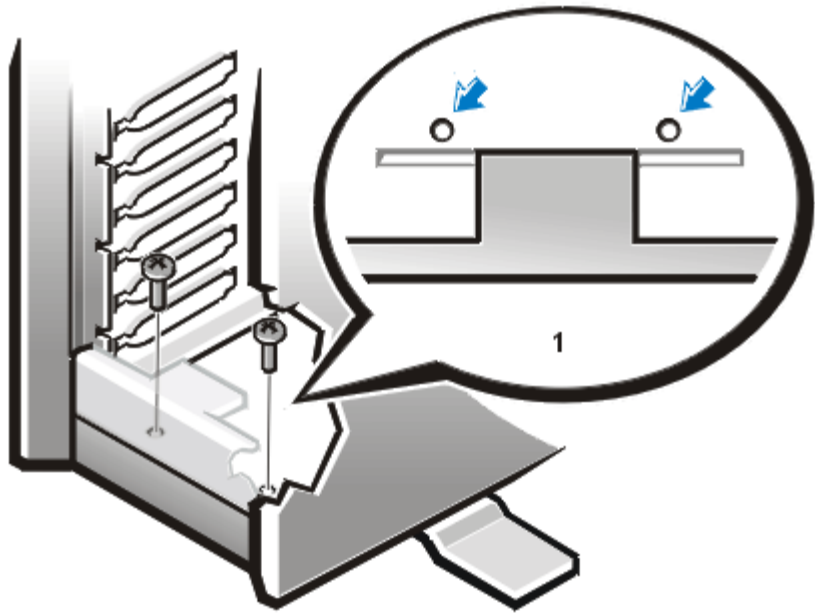


Figure 3-5. Installing the Front Screws

1 Top view

6. Repeat steps 4 and 5 for the two screw holes located at the top.
7. Locate the four screw holes at the back of the storage system (see Figure 3-4).
8. Start four 6-32 x 1/2-inch screws in the screw holes and tighten them using a Phillips-head screwdriver.

Completing the Installation

1. Replace the hard-disk drives.
2. Connect the small computer system interface (SCSI) cable(s) to the host computer and then to the storage system.



CHAPTER 4

Configuring Your ESEM or SEMM for Cluster Operation

The following configuration information applies only for cluster operation on Dell PowerVault 2xxS storage systems. No changes are required for noncluster operation, which is the default configuration. You can change the configuration by using the hardware procedure recommended by Dell as described in "Configuring the ESEM or SEMM for Cluster Operation," found later in this chapter.



NOTES: Two ESEMs or SEMMs are required for cluster operation.

The ESEM is labeled "ES Expander Module." The label is located adjacent to the small computer systems interface (SCSI) connector.

The SEMM is labeled "SCSI Expander Mngmt Module." The label is located adjacent to the SCSI connector.

If the ESEMs or SEMMs are already installed in your system, see "Replacing an Enclosure Module" in Chapter 7 for instructions on removing the modules.

Use the forced joined mode for cluster operation. Using this mode prevents the operation of the storage system in a dual-bus split backplane (2 x 4 or 2 x 6) configuration when two cables are attached.

Configuring the ESEM or SEMM for Cluster Operation

To configure the ESEMs or SEMMs for cluster operation, perform the following steps:

1. Locate the two-pin jumper labeled "FORCED JOINED JP8" on the ESEM or SEMM (see Figure 4-1).



NOTE: Only the FORCE JOINED JP8 jumper has a jumper plug installed. The Dell-installed defaults for jumpers JP1, JP2, JP6, and JP7 are NO jumper plugs (empty).

The ESEM and SEMM is shipped with a jumper plug that is connected to only one pin of the jumper.

2. Move the jumper plug to connect the two pins of the FORCED JOINED JP8 jumper.
3. Repeat steps 1 and 2 for the second ESEM or SEMM.
4. Install the two ESEMs or SEMMs into the PowerVault 2xxS storage system.

See "Installing the Second Enclosure Module" in Chapter 7.

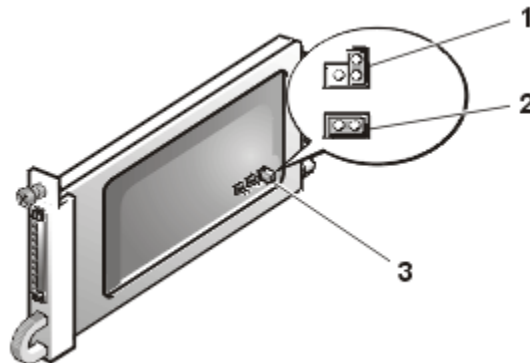


Figure 4-1. ESEM and SEMM Jumpers

-
- | | |
|----------|--|
| 1 | Noncluster operation (default configuration) |
| 2 | Cluster operation (forced joined mode) |
| 3 | Two-pin jumper (FORCED JOINED JP8) |
-

To configure the ESEMs or SEMMs from a cluster operation to a noncluster operation, perform the following steps on *each* module:

1. Remove the ESEM or SEMM.
2. Locate the two-pin jumper labeled "FORCED JOINED JP8" on the ESEM or SEMM (see Figure 4-1).



NOTE: Only the FORCE JOINED JP8 jumper has a jumper plug installed. The Dell-installed defaults for jumpers JP1, JP2, JP6, and JP7 are NO jumper plugs (empty).

3. Move the jumper plug to connect only one pin of the FORCED JOINED JP8 jumper (see Figure 4-1).
4. Install the ESEM or SEMM in the PowerVault 2xxS storage system.

Installing the ESEM or SEMM



NOTE: The ESEM is labeled "ES Expander Module." The label is located adjacent to the SCSI connector.

The SEMM is labeled "SCSI Expander Mngmt Module." The label is located adjacent to the SCSI connector.

To install the ESEM or SEMM in the Dell PowerVault 2xxS storage system, perform the following steps.



NOTE: Perform the installation by viewing the PowerVault 2xxS storage system from its back panel (see Figure 4-2).

1. Turn off the storage system.
2. Disconnect the power cable(s) from the electrical outlet and the power supply.
3. Using a Phillips-head screwdriver, loosen the captive screw at the top of the existing ESEM or SEMM on the left-back side of the storage system (see Figure 4-2).
4. Grasp the handle of the existing module and pull it from the module bay.

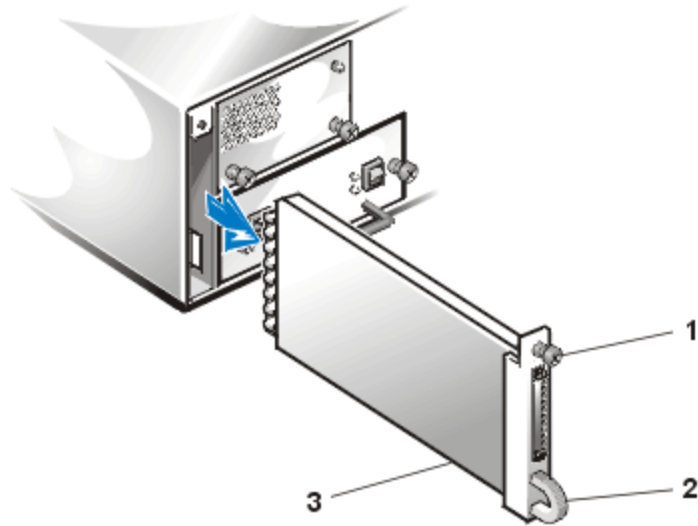


Figure 4-2. Removing the Existing Module (Left Side)

-
- | | |
|---|---------------|
| 1 | Captive screw |
| 2 | Handle |
| 3 | ESEM or SEMM |
-

5. Carefully insert the ESEM or SEMM into the module bay.
6. Push the module to the back of the bay until it is seated in the connector. The module is seated when its front plate is even with the neighboring components.
7. Using a Phillips-head screwdriver, tighten the captive screw at the top of the ESEM or SEMM to secure the module to the chassis.
8. Repeat steps 3 through 7 to install the second ESEM or SEMM on the right-back side of the storage system.
9. To validate proper cabling, proceed to Chapter 5, "Connecting Your Storage System to the Host Computer."

Managing the PowerVault 2xxS Storage System in a Cluster Configuration

You can use Dell OpenManage Hardware Instrumentation Package (HIP) to manage the shared PowerVault 2xxS storage system in a cluster configuration. See the HP OpenView Network Node Manager Special Edition (NNM SE) x.x and Dell OpenManage HIP x.x documentation.



CHAPTER 5

Connecting Your Storage System to the Host Computer

Preparing the Storage System

This chapter describes connecting the Dell PowerVault 2xxS storage systems to the host computer for three types of operations:

- Single-bus backplane operation with one cable attached
- Dual-bus split backplane operation with two cables attached
- Cluster operation with two cables attached

For the single-bus backplane and dual-bus split backplane operations, be sure you have set up your storage system as described in Chapter 2, "Installing Your Rack-Mounted Storage System," or Chapter 3, "Installing Your Stand-Alone Storage System."

For the cluster operation, see the following information:

- For configuration information, see Chapter 4, "Configuring Your ESEM or SEMM for Cluster Operation."
- For information on cabling the PowerVault 2xxS storage system for cluster operation, see the Dell PowerEdge cluster installation and troubleshooting documentation.



NOTE: When you configure the ESEMs or SEMMs using the forced joined mode for cluster operation, the storage system cannot operate in a dual-bus split backplane (2 x 4 or 2 x 6) configuration when two cables are attached.

Connecting the Storage System

To connect the PowerVault 2xxS storage system to the host computer, perform the following steps:

1. Turn off the host computer and all attached devices.
2. Route the small computer system interface (SCSI) cable(s) that came with the storage system from the host computer to the PowerVault 2xxS.

3. Connect the SCSI cable(s) to the SCSI connectors on the storage system's back panel (see Figure 5-1) and to the SCSI host adapter(s) in the host computer.

If you are attaching one cable to the PowerVault 2xxS storage system, connect the Dell external SCSI cable between SCSI connector A on the storage system's back panel (see Figure 5-1) and the SCSI host adapter card in the host computer.

If you are attaching a second cable to the PowerVault 2xxS storage system, connect the Dell external SCSI cable between SCSI connector B on the storage system's back panel (see Figure 5-1) and the SCSI host adapter card in the host computer.



NOTE: The connectors on the SCSI cable(s) are keyed for proper orientation. The 20-meter (m) cable can be used only with the ESEM and SEMM.

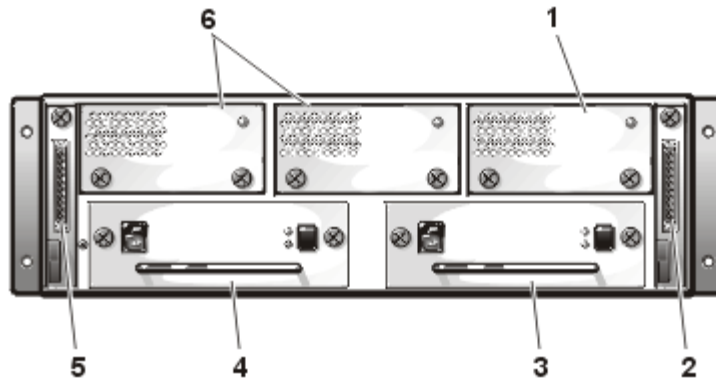


Figure 5-1. Back Panel Showing Redundant Configuration

-
- 1 Redundant cooling fan
 - 2 SCSI connector B (second enclosure module)
 - 3 Redundant power supply
 - 4 Power supply
 - 5 SCSI connector A (enclosure module)
 - 6 Cooling fan(s)
-

4. Use Table 5-1 to identify the type of operation for your PowerVault 2xxS storage system and to validate which connector to use.

See Figure 5-2 for the PowerVault 200S and 201S and Figure 5-3 for the PowerVault 210S and 211S.

Table 5-1. Storage System Operation and Cable Connections

Type of Operation	SCSI Connector(s)	PowerVault 20xS SCSI IDs Controlled Through Cable	PowerVault 21xS SCSI IDs Controlled Through Cable
Single-bus backplane operation with one cable attached	A	0, 1, 2, 3, 8, 9, 10, and 11	0, 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, and 13
Dual-bus split backplane operation with two cables attached	A	0, 1, 2, and 3	0, 1, 2, 3, 4, and 5
	B	8, 9, 10, and 11	8, 9, 10, 11, 12, and 13
Cluster operation with two cables attached	A and B	0, 1, 2, 3, 8, 9, 10, and 11	0, 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, and 13

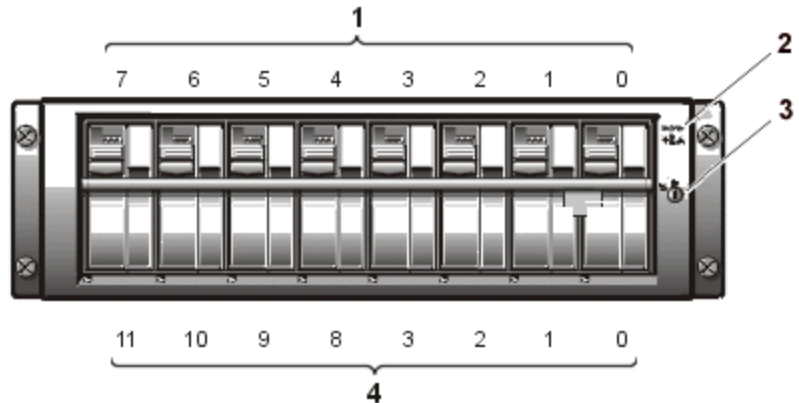


Figure 5-2. SCSI ID Numbers for PowerVault 200S and 201S

- 1 Drive numbers
- 2 Enclosure status indicators
- 3 Keylock
- 4 SCSI ID numbers

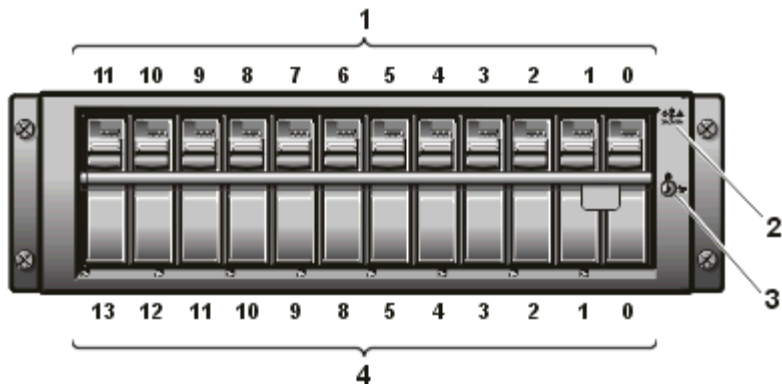


Figure 5-3. SCSI ID Numbers for PowerVault 210S and 211S

-
- 1 Drive numbers
 - 2 Enclosure status indicators
 - 3 Keylock
 - 4 SCSI ID numbers
-

5. Connect the storage system power cable to the power supply and to an electrical outlet.

To help safeguard your storage system from power problems, connect the AC power cable to an uninterruptible 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.



*NOTE: For the PowerVault 2xxS to power on, the PowerVault 2xxS **must** be attached to a host adapter and the host server **must** be powered on.*

Preventing Unauthorized Access to the Storage System

To prevent unauthorized access to the storage system hard-disk drives, you can lock the hard-disk drives using a key provided with the storage system. The keylock is located on the front panel (see Figure 5-4).

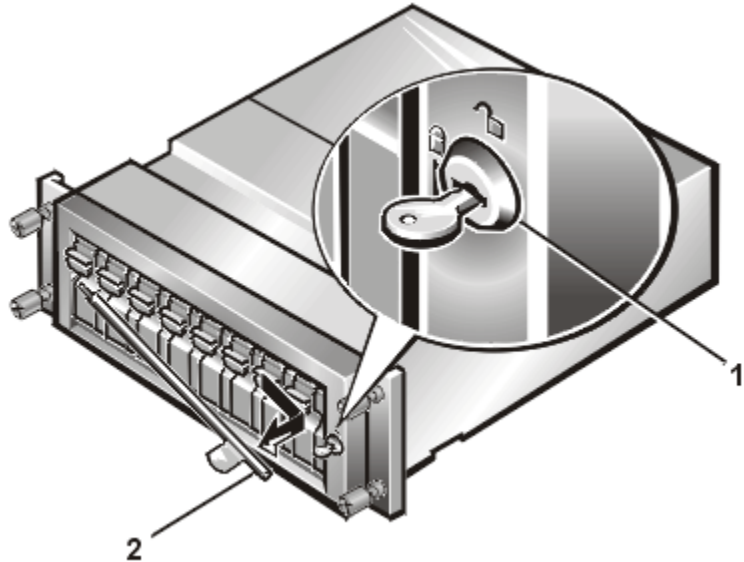


Figure 5-4. Keylock for PowerVault 2xxS (Shown on PowerVault 200S/201S)

-
- 1 Keylock
 - 2 Lock bar
-

Running the Diagnostics

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



CHAPTER 6

Installing Drives

This chapter describes how to remove and install hard-disk drives in Dell PowerVault 2xxS storage systems.

The storage system includes a small computer system interface (SCSI) backplane board that greatly simplifies cabling and configuration for SCSI hard-disk drives. The SCSI backplane configures all SCSI ID and termination for the hard-disk drives.

When used in combination with an optional Dell PowerEdge Expandable RAID Controller (PERC) 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI 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. The SCSI backplane board sets all SCSI ID numbers for the drives.

For the PowerVault 200S and 201S, the eight drive bays' respective SCSI ID numbers are 0, 1, 2, 3, 8, 9, 10, and 11 (see Figure 6-1). The drive bays support 1.6-inch or 1.0-inch hard-disk drives.

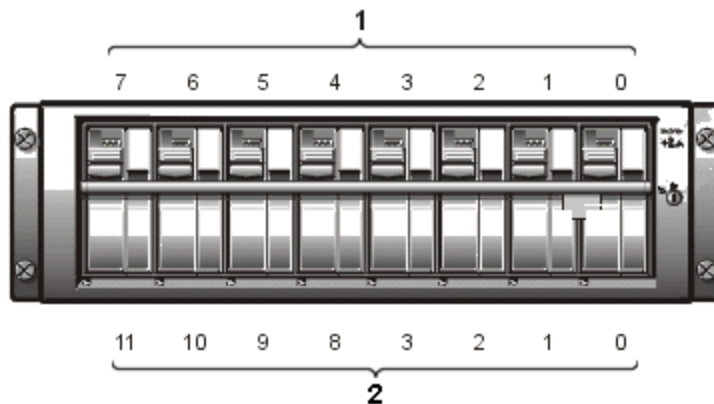


Figure 6-1. Drive Numbers and SCSI Numbers for PowerVault 200S/201S

-
- 1 Drive numbers
 - 2 SCSI ID numbers
-

For the PowerVault 210S and 211S, the 12 drive bays' respective SCSI ID numbers are 0, 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, and 13 (see Figure 6-2). The drive bays support 1.0-inch hard-disk drives.

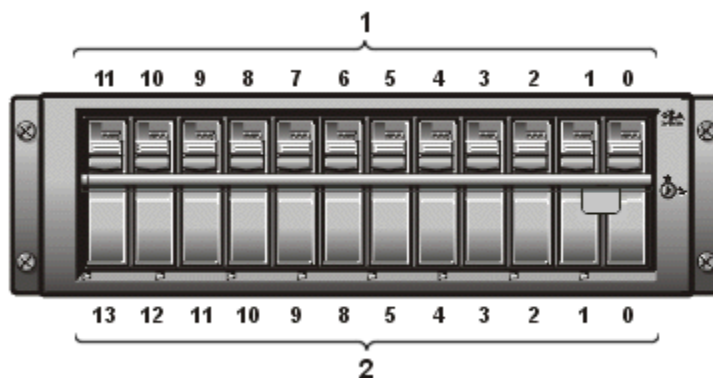


Figure 6-2. Drive Numbers and SCSI Numbers for PowerVault 210S/211S

-
- 1 Drive numbers
 - 2 SCSI ID numbers
-

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 PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI 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 PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI host adapter card to ensure that the host adapter is configured correctly to support drive removal and insertion.

NOTICE: Removing and installing SCSI hard-disk drives with the storage system running is not supported for systems without a Dell PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI 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 at the top of the hard-disk drive carriers provide information on the status of the hard-disk drives. The storage system firmware controls the drive online and drive fault indicators, while the drive itself usually controls the activity indicator.

Table 6-1 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 6-1. 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 removal	All three indicators flash simultaneously for 30 seconds.
Drive ready for insertion	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.

Table 6-1. SCSI Hard-Disk Drive Indicator Patterns (continued)

Condition	Indicator Pattern
Drive predicted failure	The drive online indicator turns on. 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 drive status indicators flash simultaneously on all of the installed drives.

Removing a SCSI Hard-Disk Drive From the Storage System

To remove a SCSI hard-disk drive and carrier from a drive bay, perform the following steps:

1. Grasp the tab on the far right end of the bar.
2. Turn the key to the left to unlock the keylock.
3. Pull the lock bar out to release it from the system (see Figure 6-3).

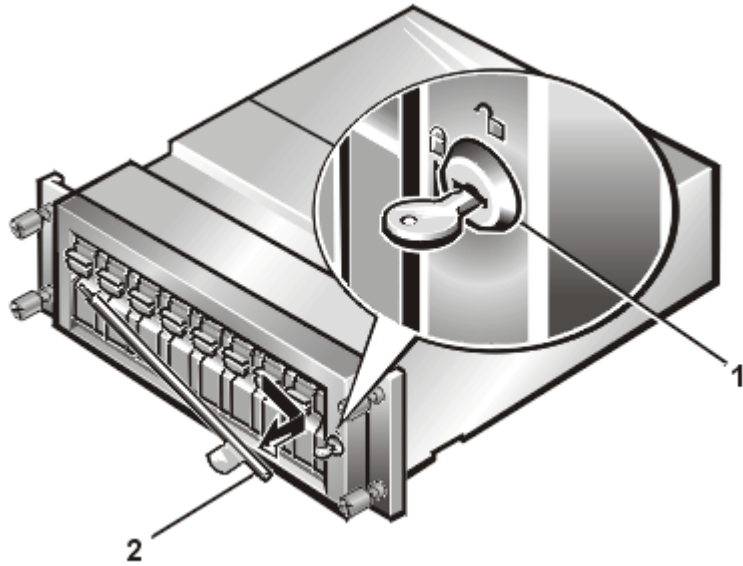


Figure 6-3. Keylock and Lock Bar for PowerVault 2xxS (Shown in PowerVault 200S/201S)

1 Keylock

2 Lock bar

4. Take the hard-disk drive off-line and prepare it for removal. (For instructions, see the Dell PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI host adapter card documentation.)

The three hard-disk drive indicators flash sequentially as the hard-disk drive is prepared for removal. When the sequence ends, the hard-disk drive indicators flash simultaneously for approximately 30 seconds to indicate that this is the hard-disk drive to be removed and that it is safe to do so. If the hard-disk drive is not removed within the 30 seconds, it is switched from off-line to online.

NOTICE: Extra care must be taken when handling the hard-disk drive. The carriers provide some protection, but the hard-disk drives can be damaged by rough handling. When removing the hard-disk drives from the storage system, place them on a padded surface. Never drop the hard-disk drives.

5. Remove the hard-disk drive as follows:
 - a. Release the hard-disk drive carrier by pressing down on the hard-disk drive carrier lock (see Figure 6-4).

- b. Swing the carrier handle down (see Figure 6-5).

Wait 10 seconds before removing the carrier to ensure that the hard-disk drive has time to stop spinning.

- c. *Slowly* pull the carrier toward you until it slides free of the drive bay.

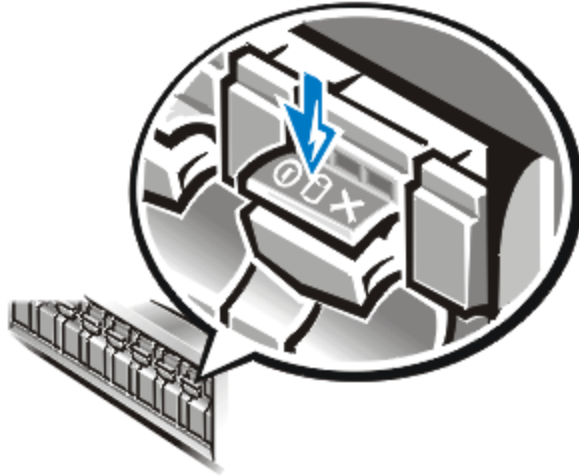


Figure 6-4. Drive Carrier Lock

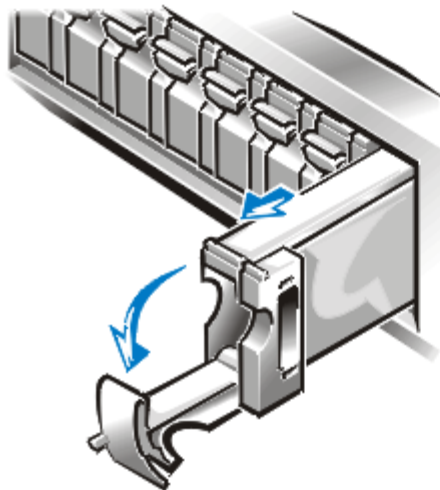


Figure 6-5. Drive Carrier Handle

Installing a SCSI Hard-Disk Drive in the Storage System

To install a SCSI hard-disk drive and carrier in a drive bay, perform the following steps.

NOTICE: Extra care must be taken when handling the hard-disk drives. The carriers provide some protection, but the hard-disk drives can be damaged by rough handling. When installing hard-disk drives, use gentle pressure to slide them in the drive bays. Insert them slowly; never use force.

1. If the drive bay is occupied by an empty carrier, remove the carrier from the drive bay.
2. Carefully slide the replacement drive carrier into the bay (see Figure 6-6). When the carrier is almost all the way into the bay, the carrier handle will flip up.

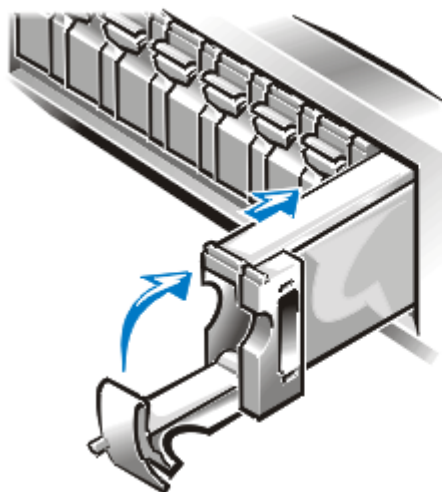


Figure 6-6. Installing a SCSI Hard-Disk Drive

3. Close the handle to draw the drive carrier into the bay and lock the drive in place.
When the controller recognizes the hard-disk drive, the drive online indicator turns on.
4. Replace the lock bar in the lock position.
5. Use the key to lock the keylock.



CHAPTER 7

Service Information for Technicians

This chapter discusses upgrade and service procedures for the Dell PowerVault 2xxS storage systems.

Precautionary Measures

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



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 when working inside the storage system, 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 WHEN WORKING INSIDE THE STORAGE SYSTEM:

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.**

NOTICE: To safeguard your system before installing or maintaining your storage system, see Appendix B, "Maintaining Your Storage System" for information about scheduling backups, backup devices, cleaning storage system components, environmental factors, and power protection devices.


Troubleshooting Overview







*NOTE: For the PowerVault 2xxS to power on, the PowerVault 2xxS **must** be attached to a host adapter and the host server **must** be powered on.*

The following subsections provide general troubleshooting information for various components of the PowerVault 2xxS storage systems.

Indicators Overview








The amber *system fault indicator*  located on the enclosure (see "Indicators" in Chapter 1) lights if one of the storage system's internal self-tests fails during system start-up or whenever one of the following faults is detected:

- Power supply fault — The amber *power supply fault indicator*  located on the back panel (see "Indicators" in Chapter 1) lights if a power supply fault is detected.
- Fan fault — The amber *cooling fan fault indicator*  located on the back panel (see "Indicators" in Chapter 1) lights if a cooling fan fault is detected.
- Small computer system interface (SCSI) hard-disk drive fault — The amber *drive fault indicator*  located at the top of each SCSI hard-disk drive carrier (see "Indicators" in Chapter 1) lights if a disk failure is detected.
- Temperature fault — The amber *system fault indicator*  located on the enclosure (see "Indicators" in Chapter 1) lights if a temperature fault is detected.

NOTE: You can use Dell OpenManage Hardware instrumentation Package (HIP) to manage the system temperature. See the HP OpenView Network Node Manager Special Edition (NNM SE) x.x and Dell OpenManage HIP x.x documentation.

Table 7-1 lists the indicators that can be displayed and suggested remedies for each situation.

Table 7-1. System Indicators

Indicator(s) Displayed	Corrective Action
No indicators are lighted	See "Troubleshooting a Power Supply," found later in this chapter.
System fault indicator  and drive fault indicator 	See "Troubleshooting SCSI Hard-Disk Drives," found later in this chapter.
System fault indicator  and power supply fault indicator 	See "Troubleshooting a Power Supply," found later in this chapter.
System fault indicator  and cooling fan fault indicator 	See "Troubleshooting a Cooling Fan," found later in this chapter.
System fault indicator 	Use Dell OpenManage HIP to check the system temperature. See the HP OpenView NNM SE x.x and Dell OpenManage HIP x.x documentation. If a temperature fault is not indicated, see "Troubleshooting the System," found later in this chapter.





Troubleshooting SCSI Hard-Disk Drives

Hard-disk drive problems can be caused by a number of conditions, including problems with the drive itself, other electronics in the system, or an interface cable.

You can resolve many hard-disk drive problems by validating the SCSI cable connections as described in Chapter 5, "Connecting Your Storage System to the Host Computer." The SCSI bus has limits based on the type of host adapter that is connected to the PowerVault 2xxS.

The optional Dell PowerEdge Expandable RAID Controller (PERC) 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI host adapter card monitors the internal SCSI hard-disk drives connected to the backplane board. For more information, see the Dell PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI documentation.

In the event of a drive failure, systems with these host adapter cards display the following SCSI hard-disk drive indicator lights located at the top of each SCSI hard-disk drive carrier (see "Indicators" in Chapter 1):

- If a drive shows signs of imminent failure, the *drive online indicator*  turns on 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.

For all SCSI hard-disk drive light indicator scenarios, including the faults described above, see Table 6-1 in Chapter 6, "Installing Drives."

Troubleshooting the System

When the storage system power is turned on, the system performs a power-on self-test (POST), which checks all the components. During POST, all of the indicators for each SCSI hard-disk drive blink briefly, all of the enclosure indicators light, and the enclosure buzzer beeps briefly. When the POST is completed, the indicators are lighted based on the descriptions in "Indicators," in Chapter 1.

To troubleshoot the storage system, perform the following steps:

1. Is one of the following three events occurring?
 - All the installed hard-disk drive status indicators and the enclosure status indicators remain lit after system start-up for more than 10 seconds.
 - The enclosure status indicators stay lit while the installed hard-disk drive status indicators blink.
 - Only the enclosure status fault indicator stays lit while all other indicators are off.

Yes. On a nonredundant storage system, the enclosure module could be defective. Replace the module.

On a redundant storage system, one of the enclosure modules could be defective. Perform the following steps:

- a. Turn off the power.
- b. Loosen the screw at the top of module B (see Figure 7-4) and pull it halfway out of the module bay.
- c. Turn on the power.

If the indicator light-emitting diodes (LED) go out after the POST, module B could be defective. If the LEDs stay on, module A could be defective.
- d. Try replacing the enclosure module that is suspected of being defective.

No. Go to step 2.

2. Are all the installed hard-disk drives' online indicators on?

Yes. Go to step 4.

No. Go to step 3.

3. If a hard-disk drive's online indicator is off, reseal the hard-disk drive by removing it from its drive bay and then reinstalling it. Is the problem resolved?

Yes. End troubleshooting.

No. Install a new hard-disk drive. Do not swap hard-disk drives. If the problem is not resolved by installing the new hard-disk drive, go to step 4.

NOTICE: Replacing the hard-disk drive in a non-RAID system will cause all data on that drive to be lost. Only replace the hard-disk drive when using a PERC 2, PERC 2/DC, PERC 2/SC, or PERC 3/DI controller.

4. Is the storage system connected to a Dell PERC 2, Dell PERC 2/DC, Dell PERC 2/SC, or Dell PERC 3/DI host adapter card?

Yes. Go to step 5.

No. There could be a poor connection between the enclosure module and the backplane board. Reseat the module. If the problem is not resolved, go to step 5.



NOTES: The connectors on the SCSI cable(s) are keyed for proper orientation. The 20-meter (m) cable can be used only with the ESEM and SEMM.

5. Check the SCSI cable connections from the enclosure module to the SCSI host adapter card in the host computer. Remove the connectors and check for bent pins. If there are bent pins, replace the SCSI cable. Reconnect the SCSI cable(s) to the storage system and host computer. Is the problem resolved?

Yes. End troubleshooting.

No. Go to step 6.

6. The enclosure module or other electronics in the system could be defective. When replacing electronic components, perform the steps in the following order.



WARNING: See the "Precautionary Measures" at the beginning of this chapter.

- a. Replace the enclosure module.
- b. Replace the dual-bus split backplane module.

- c. Replace the SCSI backplane board.


Before replacing the SCSI backplane board, consider obtaining technical assistance to see if other checks should be performed.

Is the problem resolved?

Yes. End troubleshooting.

No. See Chapter 8, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting a Cooling Fan

A redundant storage system contains three cooling fans, and a nonredundant storage system contains two cooling fans. If the amber *cooling fan fault indicator*  lights up (see Figure 7-1) or the HP OpenView NNM SE x.x and the Dell OpenManage HIP x.x server management programs issue a fan-related error message, replace the fan as described in "Replacing a Cooling Fan," found later in this chapter.

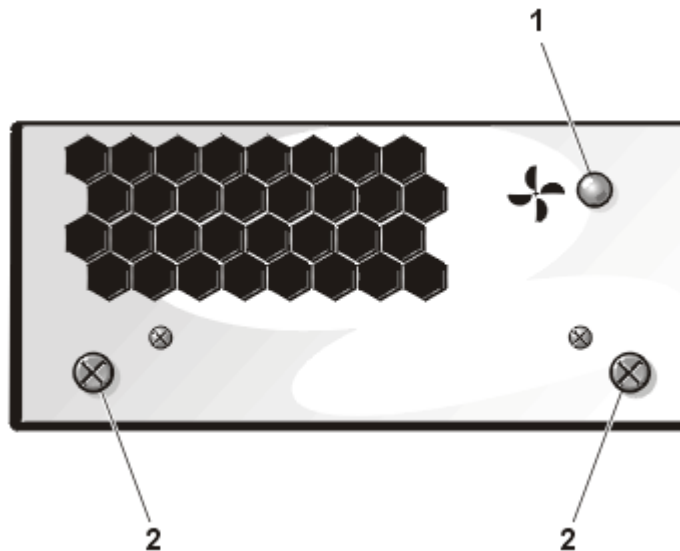




Figure 7-1. Cooling Fans for PowerVault 2xxS Storage Systems

-
- 1 Fan fault indicator
 - 2 Captive screws
-

Troubleshooting a Power Supply

The following two LEDs on the back of the power supply (see Figure 7-2) signal the status of the power supply when the supply is connected to the backplane board:

- Green *power supply indicator*  (bottom LED) — lights when all DC output voltages are within normal operating ranges.
- Amber *power supply fault indicator*  (top LED) — lights if a fault is detected in the power supply.

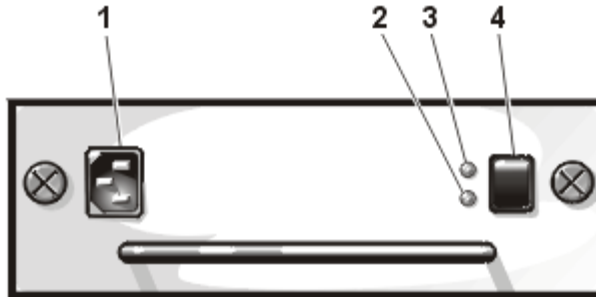


Figure 7-2. Power Supply

-
- 1 Power receptacle
 - 2 Power supply indicator
 - 3 Power supply fault indicator
 - 4 Power switch
-

If both power supply LEDs are off or if the power supply fault indicator is lit, perform the following steps.



NOTE: For the PowerVault 2xxS to power on, the PowerVault 2xxS must be attached to a host adapter and the host server must be powered on.

1. Is the power switch on the power supply turned on?

Yes. Go to step 2.

No. Turn on the power switch.

Is the problem resolved?

Yes. End troubleshooting.

No. Go to step 2.

2. Ensure that there is power at the electrical outlet and check the power cable connection from the electrical outlet to the power supply. Is power getting to the power supply?

Yes. Go to step 3.

No. Replace the power cable.

Is the problem resolved?

Yes. End troubleshooting.

No. Go to step 3.

3. Check the SCSI cable connection(s) from the enclosure module(s) to the host computer.



NOTE: The power supply will not power on if the SCSI cable is not connected to the enclosure module.

Are the proper cable connections made?

Yes. Go to step 4.

No. Connect or reseal the connections.

Is the problem resolved?

Yes. End troubleshooting.

No. Go to step 4.

4. Is the host computer turned on?



*NOTE: For the PowerVault 2xxS to power on, the PowerVault 2xxS **must** be attached to a host adapter and the host server **must** be powered on.*

Yes. Go to step 5.

No. Turn on the host computer.

Is the problem resolved?

Yes. End troubleshooting.

No. Go to step 5.

5. Reseat the power supply in the power-supply bay.

Is the problem resolved?

Yes. End troubleshooting.

No. Replace the power supply.

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 the HP OpenView NNM SE x.x and Dell OpenManage HIP x.x documentation for suggestions on resolving any problems indicated by the message.

Parts Replacement Procedures

This section provides information about the following procedures for removing and replacing components and assemblies in the storage system:

- Replacing the Power Supply
- Replacing a Cooling Fan
- Replacing an Enclosure Module
- Removing and Reinstalling the Component Mounting Bracket
- Removing the Dual-Bus Split Backplane Module
- Removing the SCSI Backplane Board
- Removing and Reinstalling the Lock Bar

Unless otherwise noted, each procedure assumes the following conditions:

- You have performed the steps in "Precautionary Measures," found earlier in this chapter.
- 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:

- Number 1 and number 2 Phillips-head screwdrivers
- 11 1/2-inch-long Allen, 5/64-inch ball driver (magnetized)
- Wrist grounding strap, as explained in "Precautionary Measures," found earlier in this chapter

Computer Orientation

When performing the procedures in this section, refer to the locations or directions relative to the storage system as shown in Figure 7-3, unless otherwise specified.

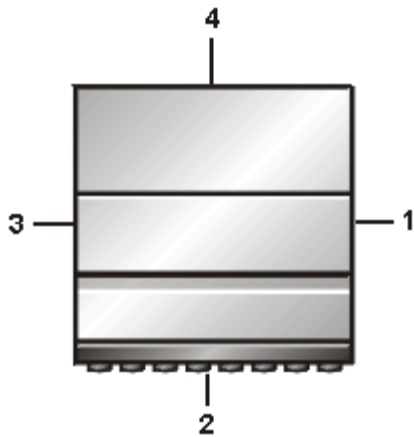


Figure 7-3. Storage System Orientation for PowerVault 2xxS (Shown From Top View of PowerVault 200S/201S)

-
- 1 Right side
 - 2 Front
 - 3 Left side
 - 4 Back
-

Component Locations

The components discussed in this section are identified in Figure 7-4.

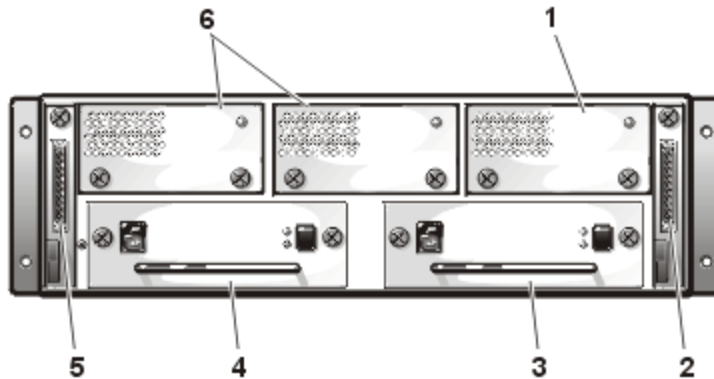


Figure 7-4. Component Locations

-
- | | |
|---|------------------------------------|
| 1 | Redundant cooling fan |
| 2 | Module B (second enclosure module) |
| 3 | Redundant power supply |
| 4 | Power supply |
| 5 | Module A (enclosure module) |
| 6 | Cooling fan(s) |
-

Replacing the Power Supply

To replace a power supply in a storage system using two power supplies (primary and redundant), perform the following procedures.

Procedure for a Redundant Storage System



NOTE: Some components of the Dell PowerVault 2xxS storage system are hot-pluggable. If one power supply provides power to the storage system, you can install or remove another power supply while the system is turned on.

1. Turn off the power switch on the power supply.
2. Disconnect the power cable from the electrical outlet and the power supply.
3. Using a Phillips-head screwdriver, turn the two captive screws counterclockwise to release the power supply from the power-supply bay.

4. Holding the handle on the power supply, carefully pull the power supply out of the power-supply bay (see Figure 7-5).



NOTE: The power-supply handle is provided to ease the task of pulling the power supply free from the bay. Do not use the handle to carry the Dell PowerVault 2xxS storage system.

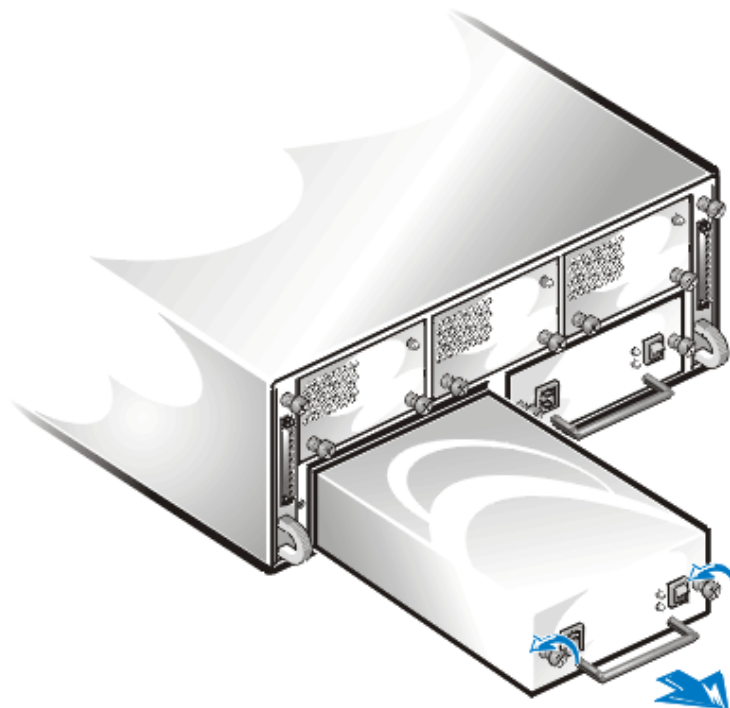



Figure 7-5. Removing a Power Supply on a Redundant System

5. Carefully slide the new power supply into the empty power-supply bay. Push the power supply all the way to the back of the bay until it is seated in the connector. The power supply is seated when its front plate is even with the front plate of the neighboring power supply.



NOTE: The amber power supply fault indicator  located on the back panel (see "Indicators" in Chapter 1) lights until you connect the AC power cable to the power supply and turn on the power supply switch.

6. Using a Phillips-head screwdriver, turn the two captive screws clockwise until the new power supply is secured to the power-supply bay.
7. Connect the AC power cable to the new power supply and to an electrical outlet.
8. Turn on the power switch on the new power supply.

The green indicator on the new power supply lights up.

Procedure for a Nonredundant Storage System

To replace the power supply in a storage system using a primary power supply only, perform the following steps:

1. Turn off the power switch on the power supply.
2. Disconnect the power cable from the electrical outlet and the power supply.
3. Using a Phillips-head screwdriver, turn the two captive screws counterclockwise to release the power supply from the power-supply bay.
4. Holding the handle on the power supply, carefully pull the power supply out of the power-supply bay (see Figure 7-6).



NOTE: The power-supply handle is provided to ease the task of pulling the power supply free from the bay. Do not use the handle to carry the Dell PowerVault 2xxS storage system.

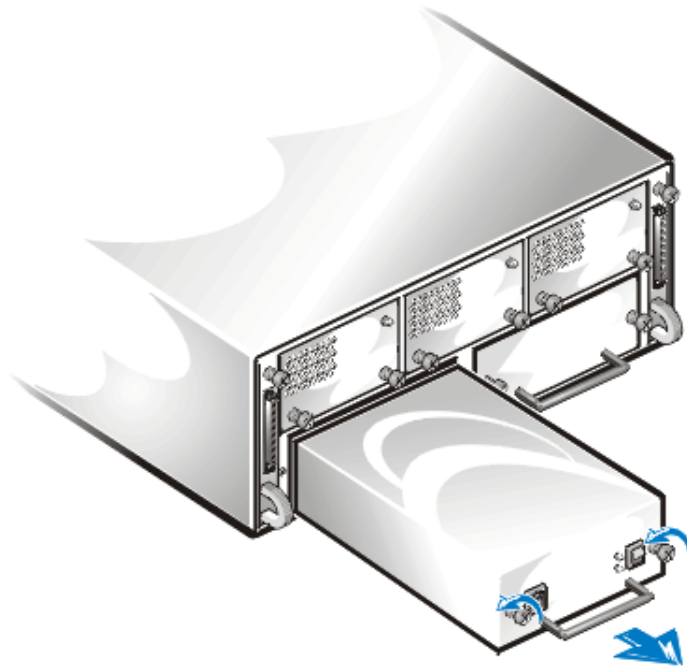



Figure 7-6. Removing a Power Supply on a Nonredundant System

- Carefully slide the new power supply into the empty power-supply bay. Push the power supply all the way to the back of the bay until it is seated in the connector. The power supply is seated when its front plate is even with the front plate of the neighboring power supply.



NOTE: The amber power supply fault indicator  located on the back panel (see "Indicators" in Chapter 1) lights until you connect the AC power cable to the power supply and turn on the power supply switch.

- Using a Phillips-head screwdriver, turn the two captive screws clockwise until the new power supply is secured to the power-supply bay.
- Connect the AC power cable to the new power supply and to an electrical outlet.
- Turn on the power switch on the new power supply. The green indicator on the new power supply lights up.



NOTE: For the PowerVault 2xxS to power on, the PowerVault 2xxS **must** be attached to a host adapter and the host server **must** be powered on.

Replacing a Cooling Fan

To replace a cooling fan, perform the following steps.



NOTE: Some components of the Dell PowerVault 2xxS storage system are hot-pluggable. If one power supply provides power to the storage system, you can install or remove a cooling fan while the system is turned on.

- Using a Phillips-head screwdriver, turn the two captive screws counterclockwise to release the cooling fan (see Figure 7-1) from the cooling-fan bay.
- Holding the captive screws, carefully pull the cooling fan out of the cooling-fan bay (see Figure 7-7).

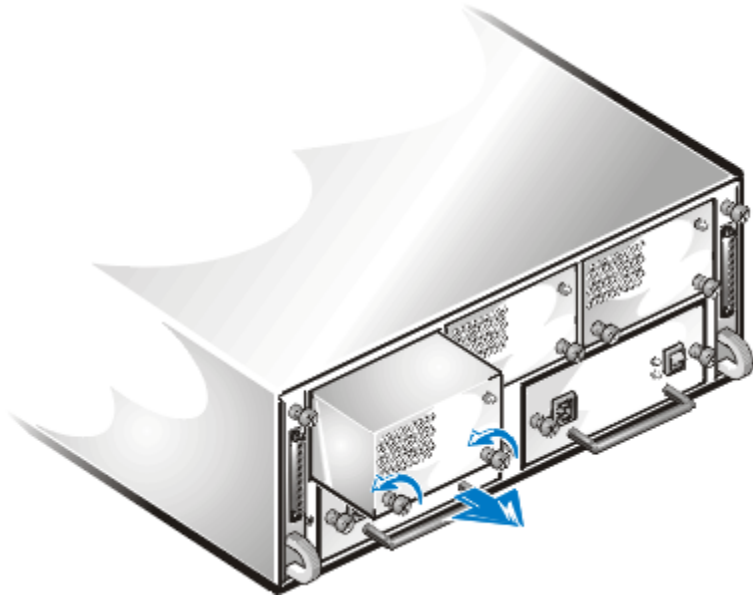


Figure 7-7. Removing a Cooling Fan

3. Carefully slide the new cooling fan into the empty cooling-fan bay. Push the cooling fan all the way to the back of the bay until it is seated in the connector. The cooling fan is seated when its front plate is even with the front plate of the neighboring fan.
4. Using a Phillips-head screwdriver, turn the two captive screws clockwise until the cooling fan is secured to the cooling-fan bay. The cooling fan starts.

Replacing an Enclosure Module



NOTE: In a cluster configuration, you must turn off any server nodes connected to the PowerVault 2xxS storage system while you replace an ESEM or SEMM.

When you need to replace enclosure module A in a redundant storage system, replace it with enclosure module B. Then replace module B with a new one (see Figure 7-4).

In a redundant configuration, module A copies system-specific information to module B. Both modules retain the same information. By replacing module A with module B and then installing the new module in the module B bay, what is now module A copies the system-specific information to the new module B.

If you need to replace only module B, replace it with a new module.

To replace module A, perform the following steps.



WARNING: See "Precautionary Measures," found earlier in this chapter, before performing the following steps.

1. Turn off the storage system.
2. Disconnect the power cable(s) from the electrical outlet and the power supply.
3. Disconnect any SCSI cables between the module and the server.
4. Using a Phillips-head screwdriver, loosen the captive screw at the top of the module (see Figure 7-8).

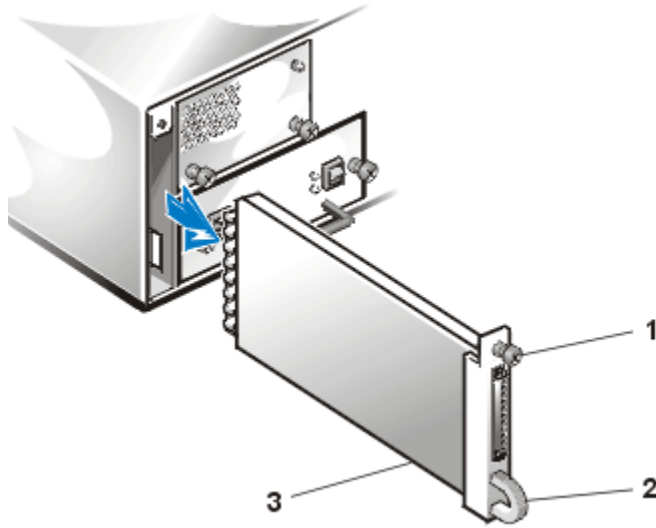


Figure 7-8. Removing the Existing Module (Left Side)

-
- | | |
|---|---------------|
| 1 | Captive screw |
| 2 | Handle |
| 3 | Module |
-

5. Grasp the handle on the module and pull it from the module bay.
6. Carefully insert the replacement module into the module bay.

7. Push the module to the back of the bay until it is seated in the connector.
The module is seated when its front plate is even with the neighboring components.
8. Using a Phillips-head screwdriver, tighten the captive screw at the top of the module to secure the module to the chassis.
9. Reattach the SCSI cables to the module(s).

Removing and Reinstalling the Component Mounting Bracket

To remove and reinstall the component mounting bracket, perform the following steps:

1. Remove all power supplies from the back of the storage system (see "Replacing the Power Supply," found earlier in this chapter).
2. Remove all cooling fans from the back of the storage system (see "Replacing a Cooling Fan," found earlier in this chapter).
3. Remove the enclosure module(s) (see "Replacing an Enclosure Module," found earlier in this chapter).
4. Using a Phillips-head screwdriver, remove the two screws that secure the component mounting bracket to the chassis (see Figure 7-9).
5. Lift the component mounting bracket slightly and slide it out of the chassis.

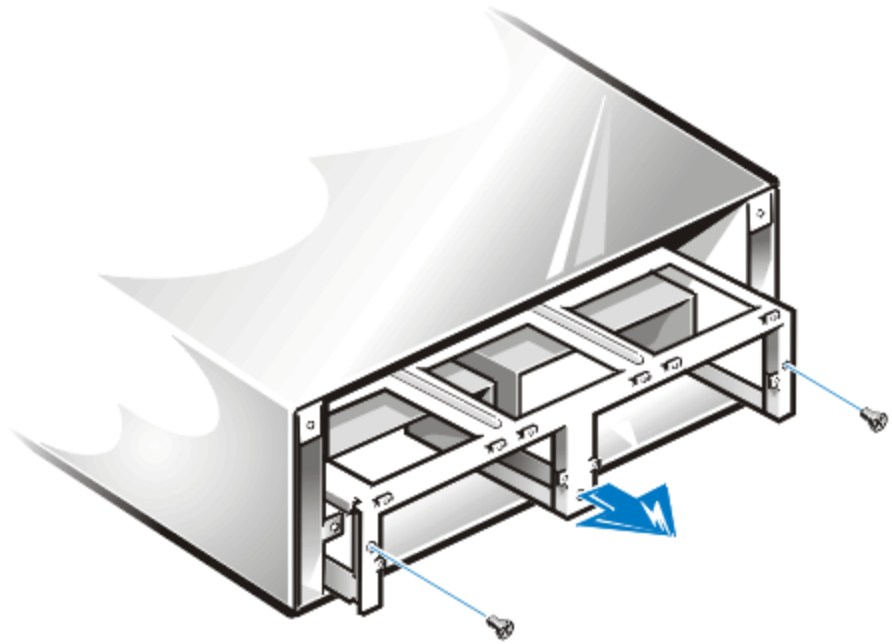


Figure 7-9. Removing the Component Mounting Bracket

To install the component mounting bracket, perform the following steps:

1. Carefully insert the component mounting bracket into the back of the storage system.
2. Slowly slide the bracket all the way into the housing.

Some up-down and side-to-side motion may be necessary to slide the bracket in. Ensure that the center guide tab at the bottom of the housing goes into the slot on the center support of the component mounting bracket.
3. Insert the two screws and, using a Phillips-head screwdriver, tighten the screws to secure the component mounting bracket to the chassis.
4. Reinstall the power supplies (see "Replacing the Power Supply," found earlier in this chapter) and cooling fans (see "Replacing a Cooling Fan," found earlier in this chapter).

Removing the Dual-Bus Split Backplane Module

To remove the dual-bus split backplane module, perform the following steps:

1. Remove all power supplies from the back of the storage system (see "Replacing the Power Supply," found earlier in this chapter).
2. Remove all cooling fans from the back of the storage system (see "Replacing a Cooling Fan," found earlier in this chapter).
3. Remove the enclosure module(s) (see "Replacing an Enclosure Module," found earlier in this chapter).
4. Remove the component mounting bracket (see "Removing and Reinstalling the Component Mounting Bracket," found earlier in this chapter).
5. Using both hands, carefully hold the dual-bus split backplane module on both sides and, using a wiggle motion, pull the module from the backplane board (see Figure 7-10).

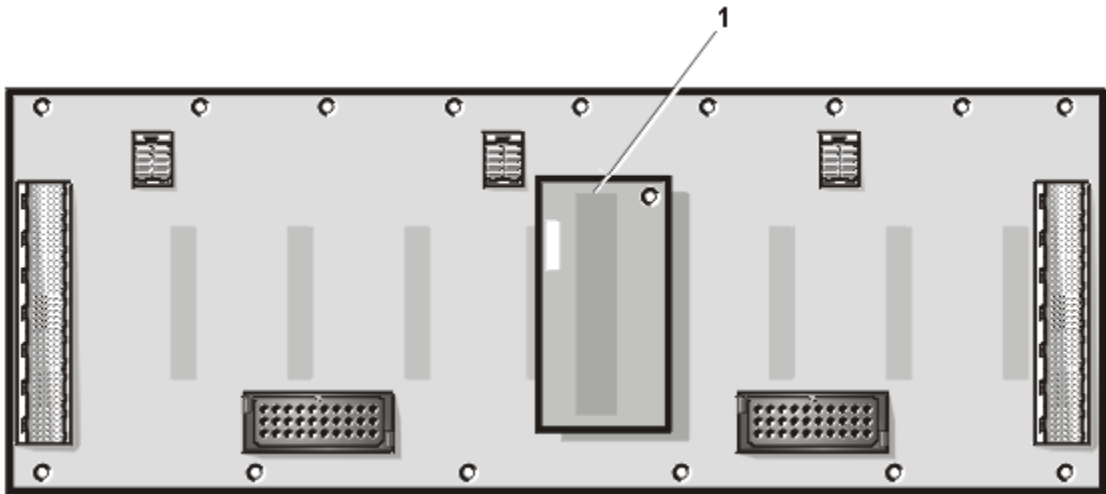


Figure 7-10. Dual-Bus Split Backplane Module Location

1 Dual-bus split backplane module

6. Install the replacement dual-bus split backplane module onto the backplane board. The dual-bus split backplane module is keyed, but make sure you do not bend the contact pins.
7. Reinstall the component mounting bracket (see "Removing and Reinstalling the Component Mounting Bracket," found earlier in this chapter).
8. Reinstall the enclosure module(s) (see "Replacing an Enclosure Module," found earlier in this chapter).
9. Reinstall all of the cooling fans (see "Replacing a Cooling Fan," found earlier in this chapter).
10. Reinstall all of the power supplies (see "Replacing the Power Supply," found earlier in this chapter).

Removing the SCSI Backplane Board

To remove the SCSI backplane board, perform the following steps:

1. Remove all of the hard-disk drives from the storage system (see "Removing and Installing SCSI Hard-Disk Drives in the Drive Bays" in Chapter 6).
2. Remove all power supplies from the back of the storage system (see "Replacing the Power Supply," found earlier in this chapter).

3. Remove all cooling fans from the back of the storage system (see "Replacing a Cooling Fan," found earlier in this chapter).
4. Remove the enclosure module(s), hereafter called a module (see "Replacing an Enclosure Module," found earlier in this chapter).
5. Remove the component mounting bracket (see "Removing and Reinstalling the Component Mounting Bracket," found earlier in this chapter).
6. Remove the dual-bus split backplane module (see "Removing the Dual-Bus Split Backplane Module," found earlier in this chapter).
7. Looking in the back of the storage system, locate the 15 screws that secure the two halves of the chassis together. There are nine across the top and six across the bottom of the backplane board (see Figure 7-11).

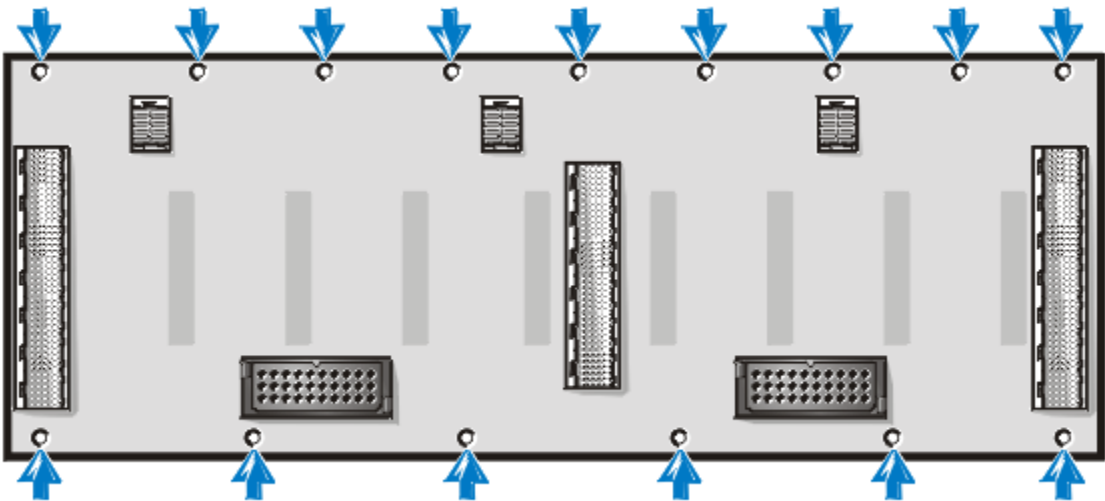


Figure 7-11. Screw Location

8. Using an 11 1/2-inch-long Allen, 5/64-inch ball driver, remove the 15 screws.
9. Use the ball driver to remove the screws located inside the module bays on the left and right side of the chassis (see Figure 7-12).

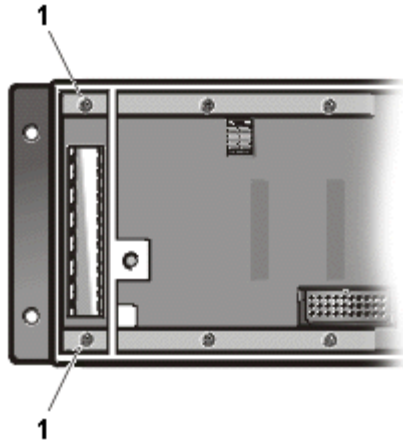


Figure 7-12. Screw Location in the Left Module Bay

1 Screws

10. Separate the two chassis halves to remove the backplane board (see Figure 7-13).

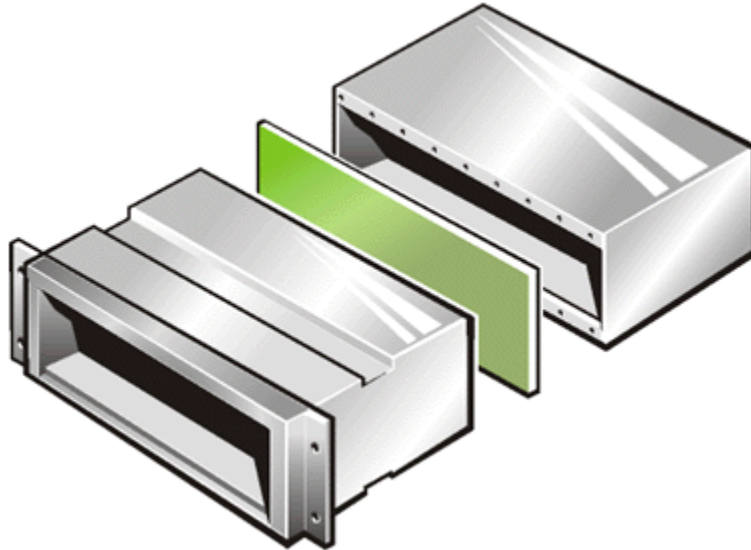


Figure 7-13. Chassis Separation

11. To install the replacement backplane board, place the board between the chassis halves.

Ensure that the board is right-side up and the dual-bus split backplane connector faces the back half of the chassis while the hard-disk drive connectors face the front half.



NOTE: The PowerVault 200S and 201S only accept an eight-hard-disk drive backplane; the PowerVault 210S and 211S only accept a 12-hard-disk drive backplane.

12. Using an 11 1/2-inch-long Allen, 5/64-inch ball driver, thread two screws through the left module bay, through the screw holes in the backplane board, and into the screw holes of the front half of the chassis.

Turn the screws until they catch in the screw holes of the front half of the chassis. Do not tighten the screws at this time. Install the two screws in the right module bay in the same manner.



NOTE: A magnetized ball driver makes it easier to install the screws in the module bays.

13. Thread the 11 remaining screws through the inside of the component area of the back chassis half, through the screw holes in the backplane board, and into the screw holes of the front half of the chassis. Turn the screws until they catch in the screw holes of the front half of the chassis. Do not tighten the screws at this time.

14. Carefully insert the left module (module A) into the left module bay.

Push the module all the way to the back of the bay and at the same time adjust the backplane board so the board connector aligns with the module connector. Push the module until it is seated in the board connector.



NOTE: Temporarily installing the modules and seating their connectors to the connectors on the backplane board ensures that the backplane board will be aligned when you screw the two chassis halves together.

15. Using a Phillips-head screwdriver, tighten the screw to secure the module to the chassis.
16. Repeat steps 14 and 15 for the right (second) module or terminator blank.
17. Tighten the 11 screws on the inside of the component area to secure the chassis front, backplane board, and chassis back together.
18. Using a Phillips-head screwdriver, loosen the captive screws at the top of the modules.
19. Remove both modules.
20. Using an 11 1/2-inch-long Allen, 5/64-inch ball driver, tighten the two screws in the left module (module A) bay (see Figure 7-12) and then tighten two screws in the right module (module B) bay.

21. Reinstall the dual-bus split backplane module (see "Removing the Dual-Bus Split Backplane Module," found earlier in this chapter).
22. Reinstall the component mounting bracket (see "Removing and Reinstalling the Component Mounting Bracket," found earlier in this chapter).
23. Reinstall the module(s) (see "Replacing an Enclosure Module," found earlier in this chapter).
24. Reinstall all of the cooling fans (see "Replacing a Cooling Fan," found earlier in this chapter).
25. Reinstall all of the power supplies (see "Replacing the Power Supply," found earlier in this chapter).

Removing and Reinstalling the Lock Bar

To remove the lock bar for the PowerVault 2xxS storage systems, perform the following steps:

1. Grasp the tab on the far right end of the bar.
2. Use the key to unlock the keylock.
3. Pull the lock bar out to release it from the system (see Figure 7-14).

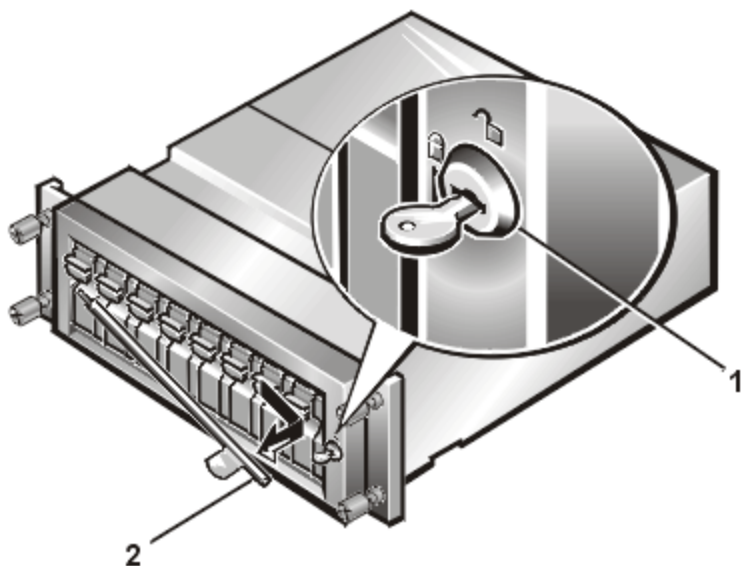


Figure 7-14. Keylock and Lock Bar for PowerVault 2xxS (Shown on PowerVault 200S/201S)

-
- | | |
|---|----------|
| 1 | Keylock |
| 2 | Lock bar |
-

4. To reinstall the lock bar, grasp the tab and insert the bar in the opening on the left.
5. Align the bar with the locking mechanism by the keylock.
6. Use the key to lock the keylock.

Installing Redundant Components Procedures

This section provides information about the following procedures for installing redundant components in the storage system:

- Installing the redundant power supply
- Installing the redundant cooling fan
- Installing the second enclosure module

Unless otherwise noted, each procedure assumes the following conditions:

- You have performed the steps in "Precautionary Measures," found earlier in this chapter.
- 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:

- Number 1 and number 2 Phillips-head screwdrivers
- Wrist grounding strap, as explained in "Precautionary Measures," found earlier in this chapter.

Installing the Redundant Power Supply

To upgrade the storage system with a redundant power supply, perform the following steps.



NOTE: Some components of the Dell PowerVault 2xxS storage system are hot-pluggable. If one power supply provides power to the storage system, you can install or remove another power supply while the system is turned on.

1. Using a Phillips-head screwdriver, turn the two captive screws counterclockwise to release the power-supply blank from the right power-supply bay.

2. Holding the handle on the power-supply blank, carefully pull the blank out of the power-supply bay (see Figure 7-15).



NOTE: The power-supply handle is provided to ease the task of pulling the power supply free from the bay. Do not use the handle to carry the Dell PowerVault 2xxS storage system.

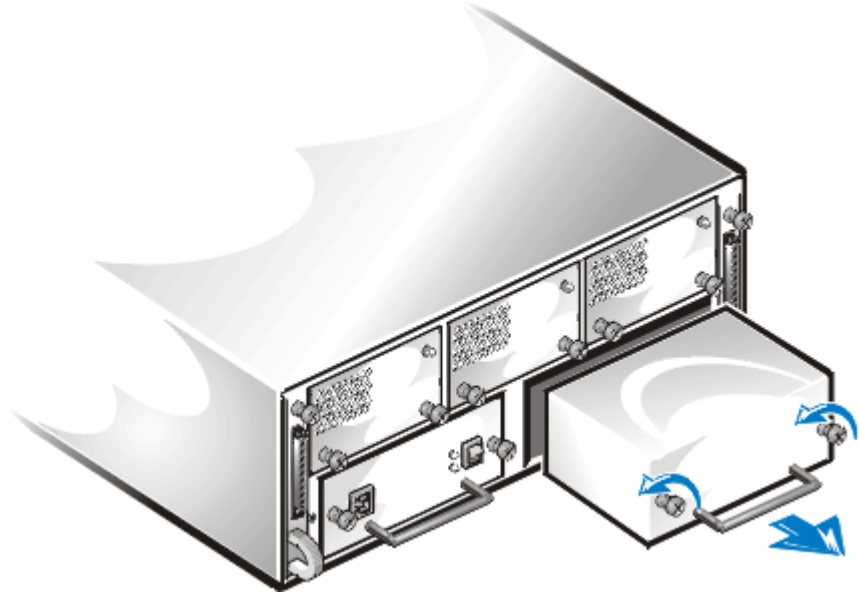


Figure 7-15. Removing the Power-Supply Blank

3. Carefully slide the redundant power supply into the empty power-supply bay (see Figure 7-16).

Push the power supply all the way to the back of the bay until it is seated in the connector. The power supply is seated when its front plate is even with the front plate of the neighboring power supply.

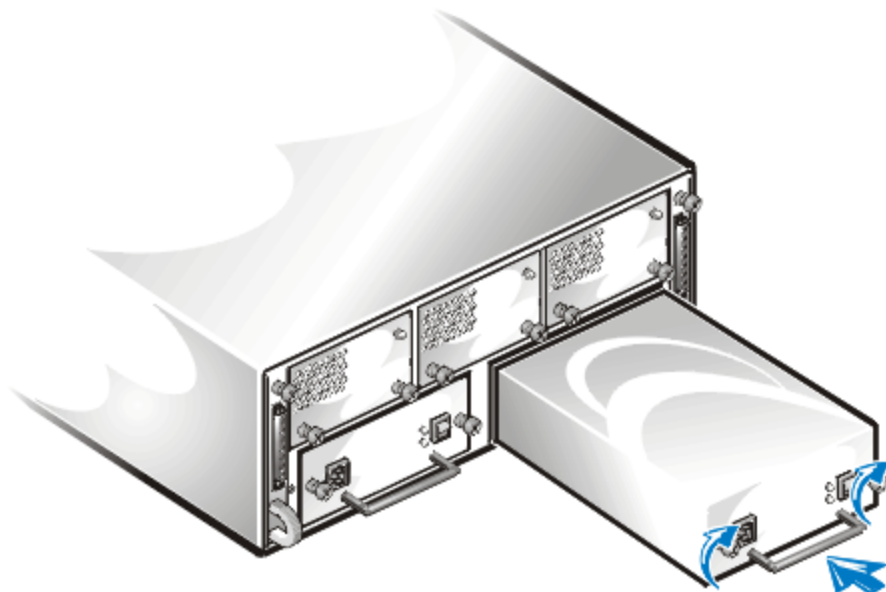


Figure 7-16. Inserting the Redundant Power Supply

4. Using a Phillips-head screwdriver, turn the two captive screws clockwise until the redundant power supply is secured to the power-supply bay.
5. Connect the AC power cable to the redundant power supply and to an electrical outlet.
6. Turn on the power switch on the redundant power supply.
The green indicator on the redundant power supply lights up.

Installing the Redundant Cooling Fan

To upgrade the storage system with a redundant cooling fan, perform the following steps.



NOTE: Some components of the Dell PowerVault 2xxS storage system are hot-pluggable. If one power supply provides power to the storage system, you can install or remove the redundant cooling fan while the system is turned on.

1. Using a Phillips-head screwdriver, turn the two captive screws counterclockwise to release the cooling-fan blank from the right cooling-fan bay.
2. Holding the captive screws, carefully pull the blank out of the cooling-fan bay (see Figure 7-17).

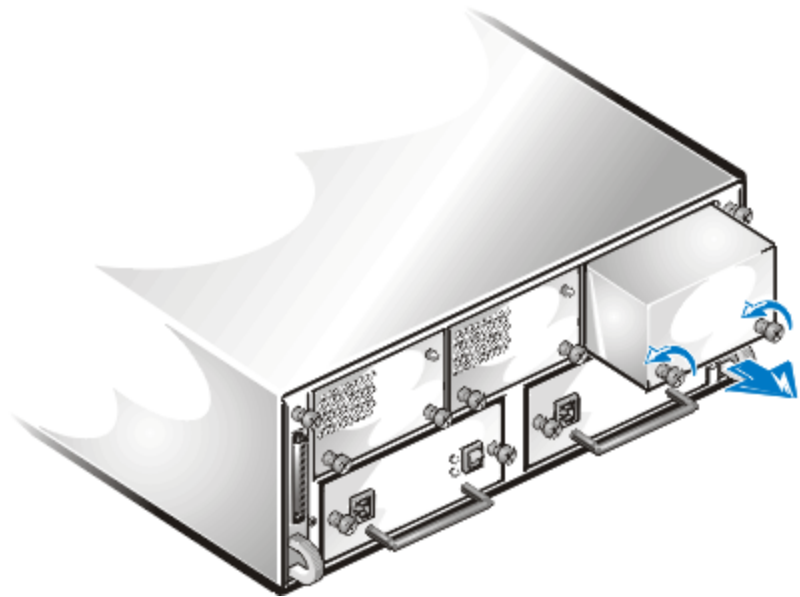


Figure 7-17. Removing the Cooling-Fan Blank

3. Carefully slide the redundant fan into the empty fan bay (see Figure 7-18).

Push the redundant fan all the way to the back of the bay until it is seated in the connector. The fan is seated when the front plate of the fan is even with the front plate of the neighboring fan.

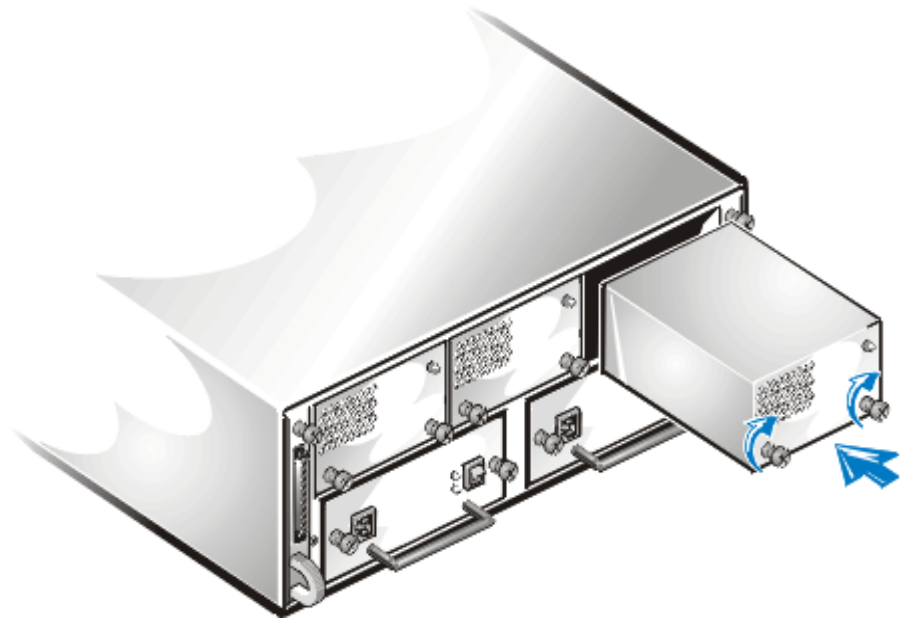


Figure 7-18. Inserting the Redundant Cooling Fan

4. Using a Phillips-head screwdriver, turn the two captive screws clockwise until the redundant fan is secured to the fan bay.

The redundant fan starts.

Installing the Second Enclosure Module

To install the second enclosure module (hereafter called module), perform the following steps:

1. Using a Phillips-head screwdriver, loosen the captive screw at the top of the terminator blank on the right-side back of the storage system.
2. Grasp the handle on the terminator blank and pull it from the module bay (see Figure 7-19).

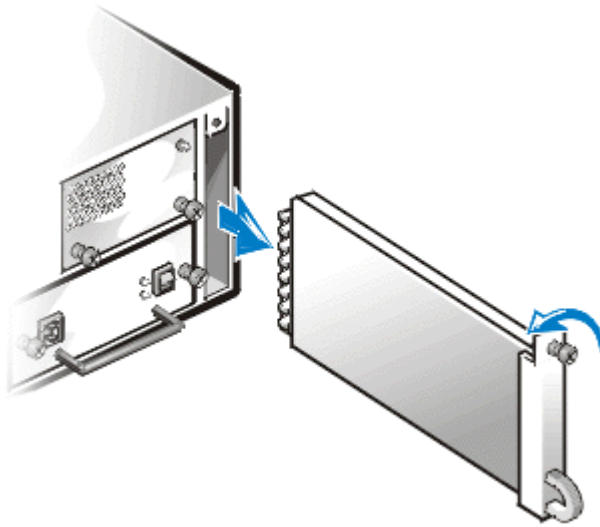


Figure 7-19. Terminator Blank Removal

3. Carefully insert the second module into the module bay (see Figure 7-20).

Push the module all the way to the back of the bay until it is seated in the connector. The module is seated when its front plate is even with the neighboring components.

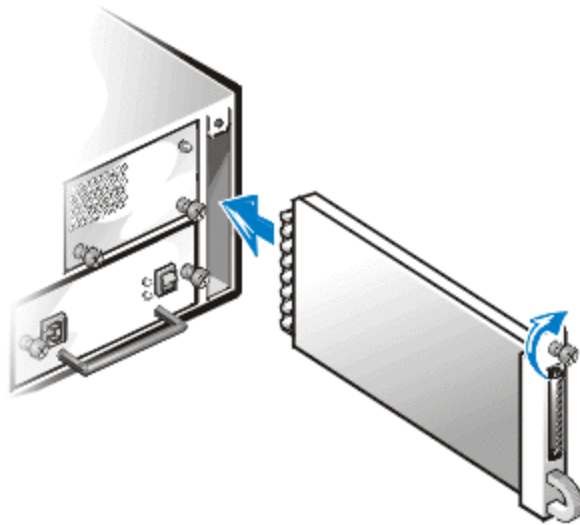


Figure 7-20. Second Module Insertion

4. Using a Phillips-head screwdriver, tighten the captive screw at the top of the second module to secure the module to the chassis.
5. Attach the SCSI cable to the second module.



CHAPTER 8

Getting Help

This chapter describes the tools Dell provides to help you when you have a problem with your PowerVault storage system. It also tells you when and how to call Dell for technical or customer assistance.

Technical Assistance

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

1. Make a copy of Figure 8-1, the Diagnostics Checklist, and fill it out.
2. Use Dell's extensive suite of online services available at Dell's World Wide Web site (<http://www.dell.com>) for help with installation and troubleshooting procedures.

For more information, refer to "World Wide Web" found later in this chapter.

3. If the preceding steps have not resolved the problem, call Dell for technical assistance.

When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.



NOTE: Dell's Express Service Code system may not be available in all countries.

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

Help Tools

Dell provides a number of tools to assist you. These tools are described in the following sections.



NOTE: Some of the following tools are not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

World Wide Web

The Internet is your most powerful tool for obtaining information about your PowerVault storage system and other Dell products. Through the Internet, you can access most of the services described in this section, including AutoTech, TechFax, order status, technical support, and product information.

You can access Dell's support Web site at **<http://support.dell.com>**. To select your country, click the map that appears. The **Welcome to support.dell.com** page opens. Enter your system information to access help tools and information.

Dell can be accessed electronically using the following addresses:

- World Wide Web
<http://www.dell.com/>
<http://www.dell.com/ap/> (for Asian/Pacific countries only)
<http://www.euro.dell.com> (for Europe only)
<http://www.dell.com/la> (for Latin American countries)

- Anonymous file transfer protocol (FTP)

[ftp.dell.com/](ftp.dell.com)

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

- Electronic Support Service
support@us.dell.com
apsupport@dell.com (for Asian/Pacific countries only)
support.euro.dell.com (for Europe only)
- Electronic Quote Service
sales@dell.com
apmarketing@dell.com (for Asian/Pacific countries only)
- Electronic Information Service
info@dell.com

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 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, refer to "Dell Contact Numbers" found later in this chapter.

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

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 protocol parameters for the BBS are 1200 to 19.2K baud, 8 data bits, no parity, 1 stop bit.

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, refer to "Dell Contact Numbers" found later in this chapter.

Technical Support Service

Dell's industry-leading hardware technical-support service is available 24 hours a day, seven days a week, to answer 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 10 minutes. When you call, our experts can refer to records kept on your Dell system to better understand your particular question. Our technical support staff use computer-based diagnostics to provide fast, accurate answers to 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.

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, refer to "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, visit Dell's World Wide Web site at <http://www.dell.com/>. For the telephone number to call to speak to a sales specialist, refer to "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, refer to "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.

You are responsible for paying shipping expenses. You are also 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



NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Remember to fill out the Diagnostics Checklist (Figure 8-1). If possible, turn on your PowerVault storage system before you call Dell for technical assistance and call from a telephone at or near the computer. 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 system itself. Make sure that the system documentation is available.



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

Diagnostics Checklist

Name: _____ Date: _____

Address: _____ Phone number: _____

Service tag (bar code on the back of the computer): _____

Express Service Code: _____

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

Operating system and version: _____

Peripherals: _____

Expansion cards: _____

Are you connected to a network? yes no

Network, version, and network card: _____

Programs and versions: _____

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

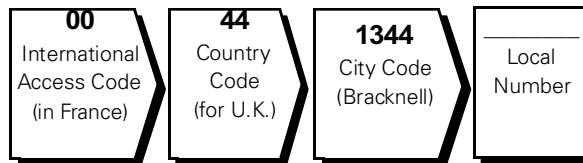
Error message, beep code, or diagnostic code: _____

Description of problem and troubleshooting procedures you performed: _____

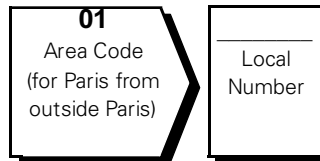
Figure 8-1. Diagnostics Checklist

Dell Contact Numbers

When you need to contact Dell, use the telephone numbers, codes, and electronic addresses provided in Table 8-1 and Table 8-2. Table 8-1 provides the various codes required to make long-distance and international calls. Table 8-2 provides local telephone numbers, area codes, toll-free numbers, Web site and e-mail addresses, 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 8-1 in addition to the local numbers provided in Table 8-2. 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 8-1. 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
Brazil	0021	55	51
Brunei	—	673	—
Canada (North York, Ontario)	011	—	Not required
Chile (Santiago)	—	56	2
China (Xiamen)	—	86	592
Czech Republic (Prague)	00	420	2
Denmark (Horsholm)	009	45	Not required
Finland (Helsinki)	990	358	9
France (Paris) (Montpellier)	00	33	(1) (4)
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	352	—
Macau	—	853	Not required
Malaysia (Penang)	00	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

Table 8-1. International Dialing Codes (continued)

Country (City)	International Access Code	Country Code	City Code
Spain (Madrid)	07	34	91
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.A. (Austin, Texas)	011	1	Not required

Table 8-2. Dell Contact Numbers

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Australia (Sydney)	Home and Small Business		1-300-65-55-33
	Government and Business		toll free: 1-800-633-559
	Preferred Accounts Division (PAD)		toll free: 1-800-060-889
	Customer Care		toll free: 1-800-819-339
	Corporate Sales		toll free: 1-800-808-385
	Transaction Sales		toll free: 1-800-808-312
	Fax		toll free: 1-800-818-341
Austria (Vienna) <i>NOTE: Customers in Austria call Germany for technical and customer assistance.</i>	Home/Small Business Sales	01 . . . . .	.795 567602
	Home/Small Business Fax	01 . . . . .	.795 67605
	Home/Small Business Customer Care	01 . . . . .	.795 67603
	Preferred Accounts/Corporate Customer Care		0660 8056
	Home/Small Business Technical Support	01 . . . . .	.795 67604
	Preferred Accounts/Corporate Technical Support		0660 8779
	Switchboard	01	491 04 0
	Web site: http://support.euro.dell.com		
E-mail: tech_support_germany@dell.com			

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Belgium (Brussels)	Technical Support	02	481 92 88
	Customer Care	02	481 91 19
	Home/Small Business Sales . . . . .		. toll free: 0800 16884
	Corporate Sales	02	481 91 00
	Fax	02	481 92 99
	Switchboard	02	481 91 00
	Web site: http://support.euro.dell.com E-mail: tech_be@dell.com		
Brazil	Sales, Customer Support, Technical Support		0800 90 3355
	Web site: http://www.dell.com/br		
Brunei <i>NOTE: Customers in Brunei call Malaysia for sales, customer, and technical assistance.</i>	Customer Technical Support (Penang, Malaysia) . . . . .		.810 4966
	Customer Service (Penang, Malaysia) . . . . .		.810 4949
	Transaction Sales (Penang, Malaysia) . . . . .		.810 4955
Canada (North York, Ontario) <i>NOTE: Customers in Canada call the U.S.A. for access to TechConnect BBS.</i>	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 . . . . .		. toll free: 1-800-847-4096
	Sales (Direct Sales—from outside Toronto) . . . . .		. toll free: 1-800-387-5752
	Sales (Direct Sales—from within Toronto)	416 . . . . .	.758-2200
	Sales (Federal government, education, and medical) . . . . .		. toll free: 1-800-567-7542
	Sales (Major Accounts) . . . . .		. toll free: 1-800-387-5755
	TechConnect BBS (Austin, Texas, U.S.A.)	512 . . . . .	.728-8528
	TechFax . . . . .		. toll free: 1-800-950-1329

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
<p>Chile (Santiago)</p> <p><i>NOTE: Customers in Chile call the U.S.A for sales, customer, and technical assistance.</i></p>	Sales, Customer Support, and Technical Support. toll free: 1230-020-4823		
<p>China (Xiamen)</p>	Customer Service toll free: 800 858 2437 Sales. toll free: 800 858 2222		
<p>Czech Republic (Prague)</p>	Technical Support02. 22 83 27 27 Customer Care02. 22 83 27 11 Fax02. 22 83 27 14 TechFax.02. 22 83 27 28 Switchboard02. 22 83 27 11 Web site: http://support.euro.dell.com E-mail: czech_dell@dell.com		
<p>Denmark (Horsholm)</p> <p><i>NOTE: Customers in Denmark call Sweden for fax technical support.</i></p>	Technical Support 45170182 Relational Customer Care. 45170184 Home/Small Business Customer Care 32875505 Switchboard 45170100 Fax Technical Support (Upplands Vasby, Sweden) 859005594 Fax Switchboard 45170117 Web site: http://support.euro.dell.com E-mail: den_support@dell.com		
<p>Finland (Helsinki)</p>	Technical Support09. 253 313 60 Technical Support Fax.09. 253 313 81 Relational Customer Care.09. 253 313 38 Home/Small Business Customer Care09. 693 791 94 Fax09. 253 313 99 Switchboard09. 253 313 00 Web site: http://support.euro.dell.com E-mail: fin_support@dell.com		

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
France (Paris/Montpellier)	Technical Support	0803 . . . . .	.387 270
	Customer Care (Paris)	01 . . . . .	.47 62 68 92
	Customer Care (Montpellier)	04 . . . . .	.67 06 61 96
	TechConnect BBS (Montpellier)	04 . . . . .	.67 22 53 04
	Fax (Montpellier)	04 . . . . .	.67 06 60 07
	Switchboard (Paris)	01 . . . . .	.47 62 69 00
	Switchboard (Montpellier)	04 . . . . .	.67 06 60 00
Web site: http://support.euro.dell.com			
E-mail: web_fr_tech@dell.com			
Germany (Langen)	Technical Support	06103 . . . . .	.766-7200
	Technical Support Fax	06103 . . . . .	.766-9222
	Home/Small Business Customer Care		0180-5-224400
	Global Segment Customer Care	06103 . . . . .	.766-9570
	Preferred Accounts Customer Care	06103 . . . . .	.766-9420
	Large Accounts Customer Care	06103 . . . . .	.766-9560
	Public Accounts Customer Care	06103 . . . . .	.766-9555
	TechConnect BBS	06103 . . . . .	.766-9666
	Switchboard	06103 . . . . .	.766-7000
Web site: http://www.dell.de/support			
E-mail: tech_support_germany@dell.com			
Hong Kong <i>NOTE: Customers in Hong Kong call Malaysia for customer assistance.</i>	Technical Support		toll free: 800 96 4107
	Customer Service (Penang, Malaysia) . . . . .		.810 4949
	Transaction Sales		toll free: 800 96 4109
	Corporate Sales		toll free: 800 96 4108

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Ireland (Bray)	Technical Support		1-850-543-543
	Customer Care	01	204 4026
	Sales		1-850-235-235
	SalesFax	01	286 2020
	Fax	01	286 6848
	TechConnect BBS	01	204 4711
	TechFax	01	204 4708
	Switchboard	01	286 0500
Web site: http://support.euro.dell.com			
E-mail: dell_direct_support@dell.com			
Italy (Milan)	Technical Support	2	57782.690
	Customer Care	2	57782.555
	Sales	2	57782.411
	Fax	2	57503530
	Switchboard	2	57782.1
	Web site: http://support.euro.dell.com		
E-mail: support_italy@dell.com			
Japan (Kawasaki)	Technical Support (Server)		toll free: 0120-1984-35
	Y2K Support	044	556-4298
	Customer Care	044	556-4240
	Home and Small Business Group Sales	044	556-3344
	Preferred Accounts Division Sales	044	556-3433
	Large Corporate Accounts	044	556-3430
	Faxbox Service		03-5972-5840
	Switchboard	044	556-4300
Web site: http://support.jp.dell.com			

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Korea (Seoul)	Technical Support		toll free: 080-200-3800
	Sales		toll free: 080-200-3777
	Customer Service (Seoul, Korea . . . . .		.2194-6220
	Customer Service (Penang, Malaysia)		604-810-4949
	Fax . . . . .		.2194-6202
Latin America <i>NOTE: Customers in Latin America call the U.S.A. for sales, customer, and technical assistance.</i>	Customer Technical Support (Austin, Texas, U.S.A.)	512 . . . . .	.728-4093
	Customer Service (Austin, Texas, U.S.A.)	512 . . . . .	.728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512 . . . . .	.728-3883
	Sales (Austin, Texas, U.S.A.)	512 . . . . .	.728-4397
	SalesFax (Austin, Texas, U.S.A.)	512 . . . . .	.728-4600 728-3772
Luxembourg <i>NOTE: Customers in Luxembourg call Belgium for sales, customer, and technical assistance.</i>	Technical Support (Brussels, Belgium)	02	481 92 88
	Home/Small Business Sales (Brussels, Belgium)		toll free: 080016884
	Corporate Sales (Brussels, Belgium)	02	481 91 00
	Customer Care (Brussels, Belgium)	02	481 91 19
	Fax (Brussels, Belgium)	02	481 92 99
	Switchboard (Brussels, Belgium)	02	481 91 00
Macau <i>NOTE: Customers in Macau call Malaysia for customer assistance.</i>	Technical Support		toll free: 0800 582
	Customer Service (Penang, Malaysia) . . . . .		.810 4949
	Transaction Sales		toll free: 0800 581
Malaysia (Penang)	Technical Support		toll free: 1 800 888 298
	Customer Service	04 . . . . .	.810 4949
	Transaction Sales		toll free: 1 800 888 202
	Corporate Sales . . . . .		.toll free: 1 800 888 213

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Mexico (Colonia Granada) <i>NOTE: Customers in Mexico call the U.S.A. for access to the Automated Order-Status System and AutoTech.</i>	Automated Order-Status System (Austin, Texas, U.S.A.)	512	728-0685
	AutoTech (Automated technical support) (Austin, Texas, U.S.A.)	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 Main	525 525	228-7878 228-7800
Netherlands (Amsterdam)	Technical Support	020	581 8838
	Customer Care	020	581 8740
	Home/Small Business Sales		toll free: 0800-0663
	Home/Small Business Sales Fax	020	682 7171
	Corporate Sales	020	581 8818
	Corporate Sales Fax	020	686 8003
	Fax	020	686 8003
	Switchboard	020	581 8818
New Zealand	Home and Small Business		0800 446 255
	Government and Business		0800 444 617
	Sales.		0800 441 567
	Fax		0800 441 566
Norway (Lysaker) <i>NOTE: Customers in Norway call Sweden for fax technical support.</i>	Technical Support		671 16882
	Relational Customer Care.		671 17514
	Home/Small Business Customer Care		23162298
	Switchboard		671 16800
	Fax Technical Support (Upplands Vasby, Sweden)		590 05 594
	Fax Switchboard		671 16865
	Web site: http://support.euro.dell.com E-mail: nor_support@dell.com		

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Poland (Warsaw)	Technical Support	22	60 61 999
	Customer Care	22	60 61 999
	Sales	22	60 61 999
	Fax	22	60 61 998
	Switchboard	22	60 61 999
	Web site: http://support.euro.dell.com E-mail: pl_support@dell.com		
Singapore (Singapore) <i>NOTE: Customers in Singapore call Malaysia for customer assistance.</i>	Technical Support	toll free: 800 6011 051	
	Customer Service (Penang, Malaysia)	04	810 4949
	Transaction Sales	toll free: 800 6011 054	
	Corporate Sales	toll free: 800 6011 053	
South Africa (Johannesburg)	Technical Support	011	709 7710
	Customer Care	011	709 7710
	Sales	011	706 7700
	Fax	011	709 0495
	Switchboard	011	709 7700
	Web site: http://support.euro.dell.com E-mail: dell_za_support@dell.com		
Southeast Asian/Pacific Countries (excluding Australia, Brunei, China, Hong Kong, Japan, Korea, Macau, Malaysia, New Zealand, Singapore, Taiwan, and Thailand—refer to individual listings for these countries)	Customer Technical Support, Customer Service, and Sales (Penang, Malaysia) 60 4 810-4810		

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Spain (Madrid)	Technical Support Corporate Customer Care Home/Small Business Customer Care TechConnect BBS.91 Corporate Sales Home/Small Business Sales Switchboard91 Web site: http://support.euro.dell.com E-mail: es_support@dell.com		902 100 130 902 118 546 902 118 540 329 33 53 902 100 185 902 118 541 722 92 00
Sweden (Upplands Vasby)	Technical Support08 Relational Customer Care.08 Home/Small Business Customer Care08 Fax Technical Support.08 Sales.08 Web site: http://support.euro.dell.com E-mail: swe_support@dell.com		590 05 199 590 05 642 587 70 527 590 05 594 590 05 185
Switzerland (Geneva)	Technical Support Customer Care Fax022 Switchboard022 Web site: http://support.euro.dell.com E-mail: swisstech@dell.com		0844 811 411 0848 802 802 799 01 90 799 01 01
Taiwan	Technical Support toll free: 0080 60 1255 Technical Support (servers) toll free: 0080 60 1256 Transaction Sales toll free: 0080 651 228/0800 33 556 Corporate Sales toll free: 0080 651 227/0800 33 555		
Thailand <i>NOTE: Customers in Thailand call Malaysia for customer assistance.</i>	Technical Support toll free: 0880 060 07 Customer Service (Penang, Malaysia)810 4949 Sales. toll free: 0880 060 09		

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
U.K. (Bracknell)	Technical Support		0870-908-0800
	Corporate Customer Care	01344	720206
	Home/Small Business Customer Care		0870-906-0010
	TechConnect BBS		0870-908-0610
	Sales	01344	720000
	AutoFax		0870-908-0510
	Web site: http://support.euro.dell.com E-mail: dell_direct_support@dell.com		

Table 8-2. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number	
U.S.A. (Austin, Texas)	Automated Order-Status System		toll free: 1-800-433-9014	
	AutoTech (Automated technical support)		toll free: 1-800-247-9362	
	Dell Home and Small Business Group:	Customer Technical Support		(Return Material Authorization Numbers) toll free: 1-800-624-9896
	Customer Service		(Credit Return Authorization Numbers) toll free: 1-800-624-9897	
	National Accounts (systems purchased by established Dell national accounts [have your account number handy], medical institutions, or value-added resellers [VARs]):	Customer Service and Technical Support		(Return Material Authorization Numbers) toll free: 1-800-822-8965
	Public Americas International (systems purchased by governmental agencies [local, state, or federal] or educational institutions):	Customer Service and Technical Support		(Return Material Authorization Numbers) toll free: 1-800-234-1490
	Dell Sales		toll free: 1-800-289-3355	
			toll free: 1-800-879-3355	
	Spare Parts Sales		toll free: 1-800-357-3355	
	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	
	Fax		toll free: 1-800-727-8320	
	TechFax		toll free: 1-800-950-1329	
	TechConnect BBS	512	728-8528	
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired		toll free: 1-877-DELLTTY (1-877-335-5889)	
	Switchboard		512338-4400	



APPENDIX A

Technical Specifications

Table A-1. PowerVault 200S and 201S

Drives	
SCSI hard-disk drives	support for up to eight 4-, 9-, 18-, or 36-GB 3.5-inch SCSI hard-disk drives
External Ports	
Ultra2 SCSI (LVD) or Ultra3 SCSI	68-pin connector in a nonredundant configuration, and two 68-pin connectors in a redundant configuration (or Ultra2/ Ultra3 cluster mode for ESEM and SEMM)
SCSI Backplane Board Connectors	
SCSI hard-disk drive connection sockets	eight 80-pin connectors
Power connectors	two 30-pin connectors
Enclosure module	two 210-pin connectors
Fan connectors	three 8-pin connectors
Dual-bus module	180-pin connector
Controls and Indicators	
Power control	rocker switch on power supply
Storage system power indicator	green LED
Storage system fault indicator	amber LED
Hard-disk drive fault indicator	amber 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	amber LED

Table A-1. PowerVault 200S and 201S (continued)

Fan module fail	amber LED
Power	
DC power supply:	
Wattage	340 W/460 W peak (optional 340-W and 460-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
Physical	
Height	13.3 cm (5.25 inches)
Width	44.6 cm (17.55 inches)
Depth	43.2 cm (17.0 inches)
Weight	34.0 kg (75.0 lb) maximum with all components installed
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
Storage	0.5 G at 3 to 200 Hz
Maximum shock:	
Operating	half-sine wave form: 38 G for 2 ms (20 inches/sec)
Storage	half-sine wave form: 83 G for 2 ms (40 inches/sec); square wave form: 20 G
Altitude:	
Operating	-16 to 3048 m (-50 to 10,000 ft)
Storage	-16 to 10,600 m (-50 to 35,000 ft)

Table A-2. PowerVault 210S and 211S

Drives	
SCSI hard-disk drives	support for up to 12 4-, 9-, or 18-GB 3.5-inch SCSI hard-disk drives
External Ports	
Ultra2 SCSI (LVD) or Ultra3 SCSI	68-pin connector in a nonredundant configuration, and two 68-pin connectors in a redundant configuration (or Ultra2/Ultra3 cluster mode for ESEM and SEMM)
SCSI Backplane Board Connectors	
SCSI hard-disk drive connection sockets	12 80-pin connectors
Power connectors	two 30-pin connectors
Enclosure module	two 210-pin connectors
Fan connectors	three 8-pin connectors
Dual-bus module	180-pin connector
Controls and Indicators	
Power control	rocker switch on power supply
Storage system power indicator	green LED
Storage system fault indicator	amber LED
Hard-disk drive fault indicator	amber 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	amber LED
Fan module fail	amber LED
Power	
DC power supply:	
Wattage	340 W/460 W peak (optional 340-W and 460-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

Table A-2. PowerVault 210S and 211S (continued)

Physical	
Height	13.3 cm (5.25 inches)
Width	44.6 cm (17.55 inches)
Depth	43.2 cm (17.0 inches)
Weight	34.0 kg (75.0 lb) maximum with all components installed
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
Storage	0.5 G at 3 to 200 Hz
Maximum shock:	
Operating	half-sine wave form: 38 G for 2 ms (20 inches/sec)
Storage	half-sine wave form: 83 G for 2 ms (40 inches/sec); square wave form: 20 G
Altitude:	
Operating	-16 to 3048 m (-50 to 10,000 ft)
Storage	-16 to 10,600 m (-50 to 35,000 ft)



APPENDIX B

Maintaining Your Storage System

Proper use of preventive maintenance procedures can keep your Dell PowerVault 2xxS storage systems in top operating condition and minimize the need for costly, time-consuming service procedures. This chapter 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 and can often run unattended. Dell offers tape drives and recommends these drives and their associated backup software for use as system backup devices.

Cleaning Storage System Components

The fan modules cool the power supplies 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 a 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, perform the following 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 degrees Celsius (C) (50 degrees Fahrenheit (F)) or hotter than 35 degrees C (95 degrees 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," found earlier in this chapter.

ESD

Electrostatic discharge (ESD) results from the buildup of static electricity on the human body and certain other objects. This static electricity is often produced by simple movements such as walking across a carpet. ESD is a discharge of a static electrical charge that occurs when a person whose body contains such a charge touches a component in the system. This static discharge can cause components, especially chips, to fail. ESD is a problem particularly in dry environments where the relative humidity is below 50 percent. To reduce the effects of ESD, you should observe the following guidelines:

- When working inside the system, wear a wrist-grounding strap. If a wrist-grounding strap is unavailable, touch an unpainted metal surface on the chassis periodically to neutralize any static charge.
- If at all possible, stand on a concrete floor while working inside the system.
- Use an antistatic floor mat when working inside the system.
- If it is necessary to work in a carpeted area, spray the carpet with an antistatic spray and allow it to dry before beginning to work inside the system.
- Keep components in their antistatic packaging until they are installed.
- Avoid wearing clothing made of wool or synthetic materials.

Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) and radio frequency interference (RFI) from a computer can adversely affect devices such as radio and 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 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, always use shielded small computer system interface (SCSI) cables to connect the storage system to the host computer.

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.

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.

For maximum shock and vibration values, see Appendix A, "Technical Specifications."

Power Source Interruptions

Computer systems are especially sensitive to variations in voltage supplied by an electrical outlet. 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 as described in "Power Protection Devices," found later in this chapter.
- 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 electrical outlet. 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 voltage supplied by the electrical outlet 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 C

Regulatory Notices

Electromagnetic Interference (EMI) is any signal or emission, radiated in free space or conducted along power or signal leads, that endangers the functioning of a radio navigation or other safety service or seriously degrades, obstructs, or repeatedly interrupts a licensed radio communications service. Radio communications services include but are not limited to AM/FM commercial broadcast, television, cellular services, radar, air-traffic control, pager, and Personal Communication Services (PCS). These licensed services, along with unintentional radiators such as digital devices, including computer systems, contribute to the electromagnetic environment.

Electromagnetic Compatibility (EMC) is the ability of items of electronic equipment to function properly together in the electronic environment. While this computer system has been designed and determined to be compliant with regulatory agency limits for EMI, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference with radio communications services, 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 computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary, consult a Technical Support representative of Dell Computer Corporation or an experienced radio/television technician for additional suggestions. You may find the *FCC Interference Handbook, 1986*, to be helpful. It is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00450-7 or on the World Wide Web at <http://www.fcc.gov/Bureaus/Compliance/WWW/tvibook.html>.

Dell computer systems are designed, tested, and classified for their intended electromagnetic environment. These electromagnetic environment classifications generally refer to the following harmonized definitions:

- Class A is typically for business or industrial environments.
- Class B is typically for residential environments.

Information Technology Equipment (ITE), including peripherals, expansion cards, printers, input/output (I/O) devices, monitors, and so on, that are integrated into or connected to the system should match the electromagnetic environment classification of the computer system.

A Notice About Shielded Signal Cables: Use only shielded cables for connecting peripherals to any Dell device to reduce the possibility of interference with radio communications services. Using shielded cables ensures that you maintain the appropriate EMC classification for the intended environment. For parallel printers, a cable is available from Dell Computer Corporation. If you prefer, you can order a cable from Dell Computer Corporation on the World Wide Web at <http://www.dell.com/products/dellware/index.htm>.

Most Dell computer systems are classified for Class B environments. To determine the electromagnetic classification for your system or device, refer to the following sections specific for each regulatory agency. Each section provides country-specific EMC/EMI or product safety information.

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 can change the rating of some configurations to Class A. To determine which classification applies to your computer system, examine all FCC registration labels located on the bottom or back panel of your computer, on card-mounting brackets, and on the cards themselves. If any one of the labels carries a Class A rating, your entire system is considered to be a Class A digital device. If *all* labels carry an FCC Class B rating as distinguished by either an FCC ID number or the FCC logo, (**FCC**), your system is considered to be a Class B digital device.

Once you have determined your 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.

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.

Class A

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. 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. 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

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. 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 communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

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

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

- Model number: AMP
- Company name: Dell Computer Corporation
EMC Engineering 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 computer system (or other Dell digital apparatus), examine all registration labels located on the bottom or the back panel of your computer (or other digital apparatus). A statement in the form of "IC Class A ICES-003" or "IC Class B ICES-003" 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'enregistrement) respecte toutes les exigences du Règlement sur le Matériel Brouilleur du Canada.

CE Notice (European Union)

Marking by the symbol **CE** indicates compliance of this Dell system to the EMC Directive and the Low Voltage Directive of the European Union. Such marking is indicative that this Dell system meets the following technical standards:

- EN 55022 — “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.”
- EN 50082-1: 1992 — “Electromagnetic compatibility—Generic immunity standard Part 1: Residential, commercial, and light industry.”
- EN 60950 — “Safety of Information Technology Equipment.”



NOTE: EN 55022 emissions requirements provide for two classifications:

- *Class A is for typical commercial areas.*
- *Class B is for typical domestic areas.*

This Dell device is classified for use in a typical Class B domestic environment.

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



NOTE: Your system may also include circuit cards or other components that contain batteries. These batteries must also be disposed of in a battery deposit site. For information about such batteries, refer to the documentation for the specific card or component.

EN 55022 Compliance (Czech Republic Only)

This device belongs to Class B devices as described in EN 55022, unless it is specifically stated that it is a Class A device on the specification label. The following applies to devices in Class 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 štítku 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 jiných zařízení, je uživatel povinen provést taková opatření, aby rušení odstranil.

VCCI Notice (Japan Only)

Most Dell computer systems are classified by the Voluntary Control Council for Interference (VCCI) as Class B information technology equipment (ITE). However, the inclusion of certain options can change the rating of some configurations to Class A. ITE, including peripherals, expansion cards, printers, input/output (I/O) devices, monitors, and so on, integrated into or connected to the system, should match the electromagnetic environment classification (Class A or B) of the computer system.

To determine which classification applies to your computer system, examine the regulatory labels/markings (see Figure C-1 and Figure C-2) located on the bottom or back panel of your computer. Once you have determined your system's VCCI classification, read the appropriate VCCI notice.

Class A ITE

この装置は、情報処理装置等電波障害自主規制協議会 (VCCI) の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI) for information technology equipment. If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

VCCI-A

Figure C-1. VCCI Class A ITE Regulatory Mark

Class B ITE

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス B 情報技術装置です。この装置は家庭環境で使用することを目的としていますが、ラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをしてください。

This is a Class B product based on the standard of the Voluntary Control Council for Interference (VCCI) for information technology equipment. If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.



Figure C-2. VCCI Class B ITE Regulatory Mark

MOC Notice (South Korea Only)

To determine which classification (Class A or B) applies to your computer system (or other Dell digital device), examine the South Korean Ministry of Communications (MOC) registration labels located on your computer (or other Dell digital device). The MOC label may be located separately from the other regulatory marking applied to your product. The English text, “EMI (A),” for Class A products, or “EMI (B)” for Class B products, appears in the center of the MOC label (see Figure C-3 and Figure C-4).



NOTE: MOC emissions requirements provide for two classifications:

- *Class A devices are for business purposes.*
- *Class B devices are for nonbusiness purposes.*

Class A Device

장치 종류	사용자 안내문
A 급 기기	이 장치는 업무용으로 전자파 적합등록을 한 장치이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

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 nonbusiness device.



Figure C-3. MOC Class A Regulatory Mark

Class B Device

장치 종류	사용자 안내문
B급 기기	이 장치는 가정용으로 전자파 적합등록을 한 장치로서 주거지역에서는 물론 모든 지역에서 사용할 수 있습니다.

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

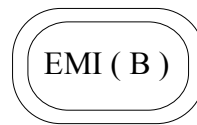


Figure C-4. MOC Class B Regulatory Mark

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 16 amperes (A).

To completely switch off the equipment, the power supply cable must be 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-EN 55022: 1996.

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 16A (amperów).

W celu całkowitego wyłączenia urządzenia z sieci zasilania, należy wyjąć wtyczkę kabla zasilającego z gniazdka, które powinno znajdować się w pobliżu urządzenia i być łatwo dostępne.

Znak bezpieczeństwa "B" potwierdza zgodność urządzenia z wymaganiami bezpieczeństwa użytkownika zawartymi w PN-93/T-42107 i PN-EN 55022:1996.

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 bezzakłócenowego 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 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):

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:	100-240 VAC
Frequency:	60/50 Hz
Input current rating:	5.0-2.1 A

Información para NOM (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):

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.

Exportador: Dell Computer Corporation
One Dell Way
Round Rock, TX 78682

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: 100-240 VAC

Frecuencia: 60/50 Hz

Consumo de
corriente: 5.0-2.1 A

BSMI Notice (Taiwan Only)

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。



APPENDIX D

Limited Warranty and Return Policy

Three-Year Limited 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 limited 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 limited warranty. Otherwise, this limited 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 limited 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 limited 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 limited 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 the chapter titled "Getting Help" in your system's troubleshooting documentation or, for some systems, the section titled "Dell Contact Numbers" in your system's online guide 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., where applicable. 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 and subject to Dell's Exchange Policy in effect on the date of the exchange, 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 (freight prepaid) if you use an address in the continental U.S., where applicable. 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. The process for returning replaced parts, and your obligation to pay for replacement parts if you do not return the replaced parts to Dell, will be in accordance with Dell's Exchange Policy in effect on the date of the exchange.

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 Provisions

THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS WHICH VARY FROM STATE TO STATE (OR JURISDICTION TO JURISDICTION). DELL'S RESPONSIBILITY FOR MALFUNCTIONS AND DEFECTS IN HARDWARE IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS LIMITED WARRANTY STATEMENT. ALL EXPRESS AND IMPLIED WARRANTIES FOR THE PRODUCT, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF AND CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE WARRANTY PERIOD SET FORTH ABOVE AND NO WARRANTIES, WHETHER EXPRESS OR IMPLIED, WILL APPLY AFTER SUCH PERIOD.

SOME STATES (OR JURISDICTIONS) DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE PRECEDING LIMITATION MAY NOT APPLY TO YOU.

DELL DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES SET FORTH IN THIS LIMITED 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 (OR 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 three-year limited warranty only. For provisions of any service contract covering your system, refer to your invoice or the separate service contract that you will receive.

If Dell elects to exchange a system or component, the exchange will be made in accordance with Dell's Exchange Policy in effect on the date of the exchange. In any instance in which Dell issues a Return Material Authorization Number, Dell must receive the product(s) for repair prior to the expiration of the warranty period in order for the repair(s) to be covered by the limited warranty.



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

Three-Year Limited 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.

Damage due to shipping the products to you is covered under this limited warranty. Otherwise, this limited 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 limited 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 limited 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 limited 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 the chapter titled "Getting Help" in your system's troubleshooting documentation or, for some systems, the section titled "Dell Contact Numbers" in your system's online guide 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, where applicable. 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 and subject to Dell's Exchange Policy in effect on the date of the exchange, 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 (freight prepaid) if you use an address in Canada, where applicable. 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. The process for returning replaced parts, and your obligation to pay for replacement parts if you do not return the replaced parts to Dell, will be in accordance with Dell's Exchange Policy in effect on the date of the exchange.

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 Provisions

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

If you are an end-user customer who bought new products directly from a Dell company, you may return them to Dell within 30 days of the date of invoice for a refund or credit of the product purchase price. If you are an end-user customer who bought reconditioned or refurbished products from a Dell company, you may return them to Dell within 14 days of the date of invoice for a refund or credit of the product purchase price. In either case, the refund or credit will not include any shipping and handling charges shown on your invoice. If you are an organization that bought the products under a written agreement with Dell, the agreement may contain different terms for the return of products than specified by this policy.

To return products, you must call Dell Customer Service to receive a Credit Return Authorization Number. Refer to the chapter titled “Getting Help” in your system's troubleshooting documentation or, for some systems, the section titled “Dell Contact Numbers” in your system's online guide to find the appropriate telephone number for obtaining customer assistance. To expedite the processing of your refund or credit, Dell expects you to return the products to Dell in their original packaging within five days of the date that Dell issues the Credit Return Authorization Number. You must also 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. For customers who want to return, for refund or credit only, either applications software or an operating

system that has been installed by Dell, the whole system must be returned, along with any media and documentation that may have been included in the original shipment.

This “Total Satisfaction” Return Policy does not apply to DellWare products, which may be returned under DellWare's then-current return policy. In addition, reconditioned parts purchased through Dell Spare Parts Sales in Canada are nonreturnable.



Abbreviations and Acronyms

The following list defines or identifies technical terms, abbreviations, and acronyms used in Dell user documents.

NOTE: Unless otherwise specified, these definitions may not apply to operating systems other than Microsoft Windows 9x and Windows NT.

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 für Zulassungen in der Telekommunikation

C

Celsius

CCFT

cold cathode fluorescent tube

CD

compact disc

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

DRAM

dynamic random-access memory

DS/DD

double-sided double-density

DS/HD

double-sided high-density

DSA

Dell SCSI Array

ECC

error checking and correction

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

ESEM

enclosure services expander module

ESM

enclosure services module

F

Fahrenheit

FAT

file allocation table

FCC

Federal Communications Commission

FIFO

first-in first-out

FTP

file transfer protocol

ft

feet

g

gram(s)

G

gravities

GB

gigabyte(s)

GUI

graphical user interface

h

hexadecimal

HIP

Hardware Instrumentation Program

HMA

high memory area

HPFS

High Performance File System

Hz

hertz

I/O

input/output

IC

Industry Canada

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)

LCD

liquid crystal display

LED

light-emitting diode

LIF

low insertion force

LN

load number

LVD

low voltage differential

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

PERC

PowerEdge Expandable RAID Controller

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 arrays of independent disks

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

SAF-TE

SCSI accessed fault-tolerant enclosures

SCSI

small computer system interface

SDS

scalable disk system

sec

second(s)

SEMM

SCSI expander management module

SMM

SCSI management module

SES

SCSI enclosure services

SIMM

single in-line memory module

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

V

volt(s)

VAC

volt(s) alternating current

VDC

volt(s) direct current

VDE

Verband Deutscher Elektrotechniker

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



Index

A

- assistance
 - telephone numbers, 8-7
 - warranty repair or credit, 8-4
- attaching
 - stabilizers to stand-alone chassis, 3-3
- AutoTech service, 8-3

C

- calling Dell, 8-7
- cautions, iii, xiv
- cleaning storage system components, B-2
- configuring
 - ESEM or SEMM for cluster operation, 4-2
- connecting the storage system, 5-1
- cooling fan, replacing, 7-14

D

- data preservation, B-1
- data protection, 1-7
- Diagnostics Checklist, 8-6
- diagnostics. *See* Dell Diagnostics

E

- enclosure module, replacing, 7-15
- environmental factors and system performance, B-2
- ESD, ix

G

- getting help, 1-7

H

- hat flanges, attaching, 3-2
- help tools
 - AutoTech service, 8-3
 - Internet, 8-2
 - TechConnect BBS, 8-3
 - TechFax service, 8-3

I

- indicators, 1-4
- installing
 - ESEM or SEMM, 4-3
 - redundant components, 7-25
 - redundant cooling fan, 7-28
 - redundant power supply, 7-26
 - SCSI hard-disk drive, 6-7

- second enclosure module, 7-30
- storage system in stand-alone chassis, 3-4

Internet help tools, 8-2

M

managing your system in a cluster configuration, 4-5

N

notational conventions, iii, xiv
notes, iii, xiv

P

parts replacement procedures, 7-9
power protection devices, B-7
power supply, replacing, 7-11
problems

- with your order, 8-4

product information, 8-4

R

regulatory notices, C-2
removing and reinstalling the component mounting bracket, 7-17
removing and reinstalling the lock bar, 7-24
removing SCSI hard-disk drive from system, 6-4
removing the dual-bus split backplane module, 7-19
removing the SCSI backplane board, 7-20
return policy, D-7

returns, 8-4
running the diagnostics, 5-5

S

safety instructions

- for preventing ESD, ix
- health considerations, x

SCSI hard-disk drives, removing and installing in drive bays, 6-3
standalone storage, setting up, 3-1
system messages, 7-9
system_requirements, 1-3

T

TechConnect BBS, 8-3
TechFax service, 8-3
technical assistance

- obtaining, 8-1
- warranty repair or credit, 8-4

troubleshooting, 7-2

- a cooling fan, 7-6
- a power supply, 7-7
- Diagnostics Checklist, 8-6
- Internet tools, 8-2
- SCSI hard-disk drives, 7-3
- the system, 7-4

typographical conventions, xv

W

warnings, iii, xiv
warranty information, xiv, D-1, D-3, D-6
warranty repair or credit, 8-4
World Wide Web help tools, 8-2