

Dell™ PowerVault™ 220S and 221S Systems Installation and Troubleshooting Guide

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Notes, Notices, and Cautions



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



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 potential for property damage, personal injury, or death.

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Introduction

Dell™ PowerVault™ 220S and 221S Systems Installation and Troubleshooting Guide

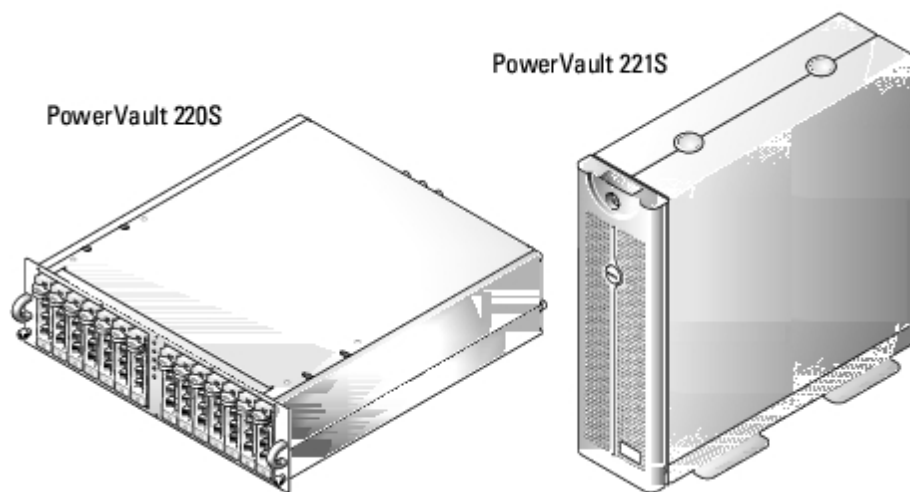
- [Front-Panel Features and Indicators](#)
- [Back-Panel Features and Indicators](#)
- [Audible Alarm](#)

Dell™ PowerVault™ 220S and 221S systems are reliable, flexible, external SCSI expansion enclosures designed to support multiple Dell storage environments and RAID configurations. Each system offers maximized drive-spindle count, hot-plug hard drives, optional redundant power supplies, redundant cooling modules, rackmount capability, systems management features, and a modular design for easy upgrades. Most major components, including hard drives and power supply/cooling modules are hot-pluggable and can be removed and replaced easily. The enclosure management module (EMM), split-bus module, and SCSI terminator card are "warm-pluggable." This means they can be removed or inserted while the power is on, but all I/O activity has ceased. This section identifies front- and back-panel components and LED indicators. For more information on system features and specifications, see your *User's Guide*.

Front-Panel Features and Indicators

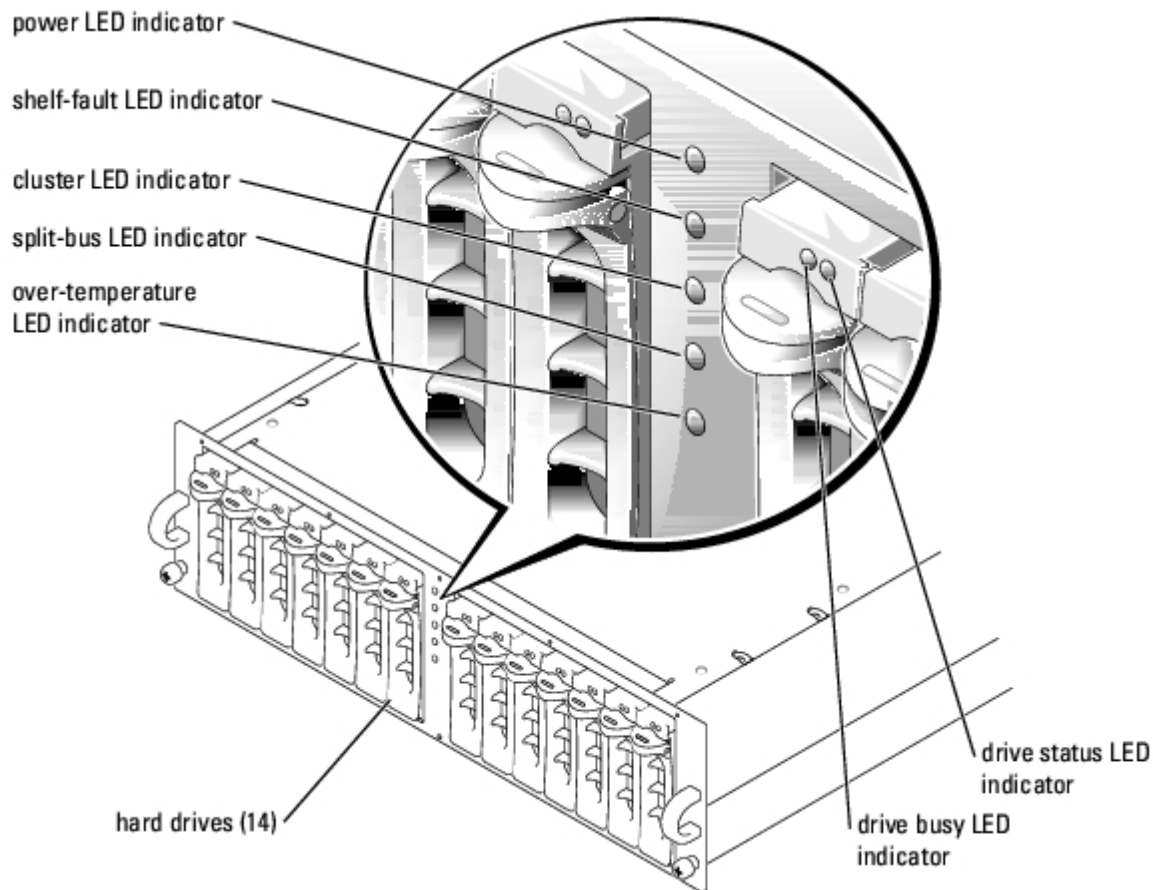
[Figure 1-1](#) shows the front-view orientation of both systems.

Figure 1-1. System Orientation



[Figure 1-2](#) illustrates LED indicators and components on the system's front panel. [Table 1-1](#) lists conditions indicated by each LED.

Figure 1-2. Front-Panel Features

**Table 1-1. Front-Panel Indicators**

LED Indicator	LED Icon	Condition
Power (green)	ⓘ	At least one power supply is supplying power to the system.
Shelf-fault (amber)	⚠	One of the following conditions has occurred: power-supply failure, EMM failure, cooling module failure, over-temperature condition, or firmware currently being downloaded. For more information, see " Troubleshooting ."
Cluster (green)	⏏	The system is configured for cluster mode. For more information, see " Split-Bus Module ."
Split-bus (green)	⏏	The system is configured for split-bus mode. For more information, see " Split-Bus Module ."
Over-temperature (amber)	🔥	An over-temperature condition has occurred. (The system will shut down when the temperature inside the box exceeds 50°C [122°F].) For more information, see " Troubleshooting ." For the locations of the temperature probes, see " Temperature Probes ."



NOTE: For the full name of an abbreviation or acronym used in this table, see "[Abbreviations and Acronyms](#)."

Hard-Drive Carrier LED Indicators

Each of your storage system's 14 hard-drive carriers has two LED indicators: a busy indicator and a status indicator (see [Figure 1-2](#)). [Table 1-2](#) shows the hard-drive LED indicators with the associated LED icons. [Table 1-3](#) lists the flash patterns for the hard-drive status indicator.

Table 1-2. Hard-Drive Carrier LED Indicators

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LED Indicator	LED Icon	Condition
Busy (green)		The hard drive is active on the SCSI bus. NOTE: This LED is controlled by the hard drive.
Status (green and amber)		See Table 1-3 for flash patterns and conditions.

NOTE: For the full name of an abbreviation or acronym used in this table, see "[Abbreviations and Acronyms](#)."

Table 1-3. Hard-Drive Carrier Status Indicator Flash Patterns

Condition	Status Indicator Pattern
Slot empty, ready for insert/remove	Off
Drive online, prepare for operation	Steady green
Drive identify	Flashes green four times per second
Prepare for removal	Flashes green twice per second at equal intervals
Drive rebuild	Flashes green twice per second at unequal intervals
Drive fail	Flashes amber four times per second
Predicted failure	Flashes green, then amber, then off, repeating this sequence every two seconds

Back-Panel Features and Indicators

[Figure 1-3](#) illustrates the back-panel features for systems with redundant EMMs and redundant power supplies. [Figure 1-4](#) illustrates the back-panel features for non-redundant systems. See [Figure 1-5](#), [Figure 1-6](#), and [Figure 1-7](#) for more detail on the back-panel indicators.

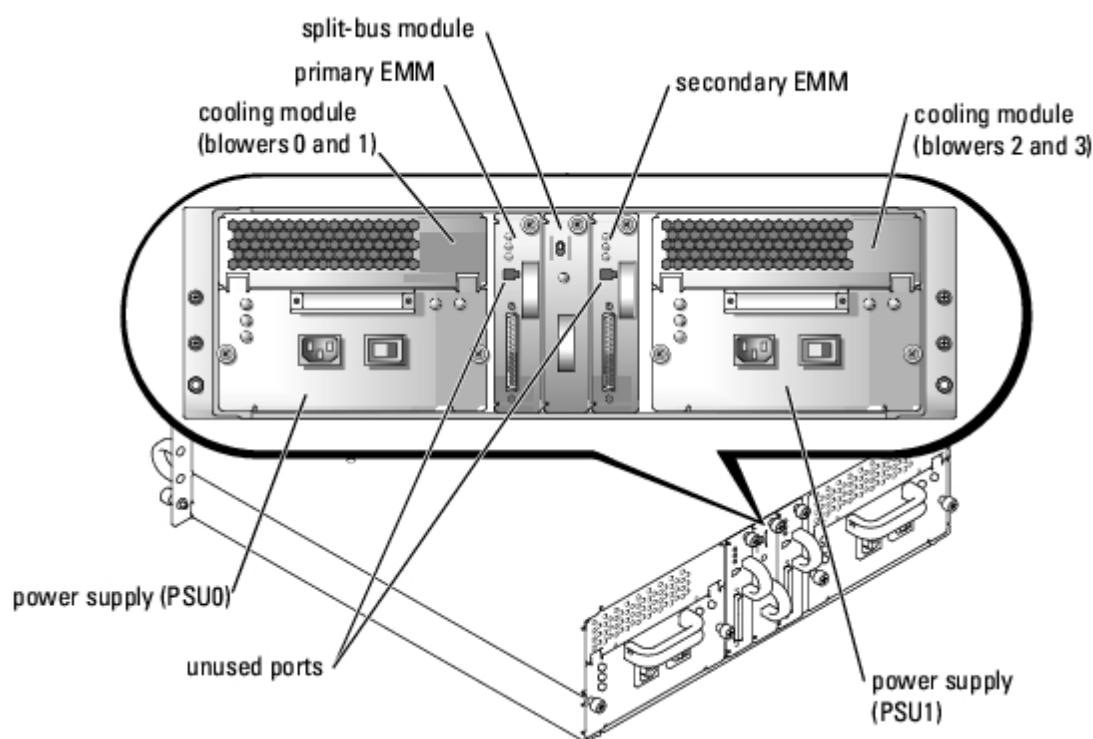
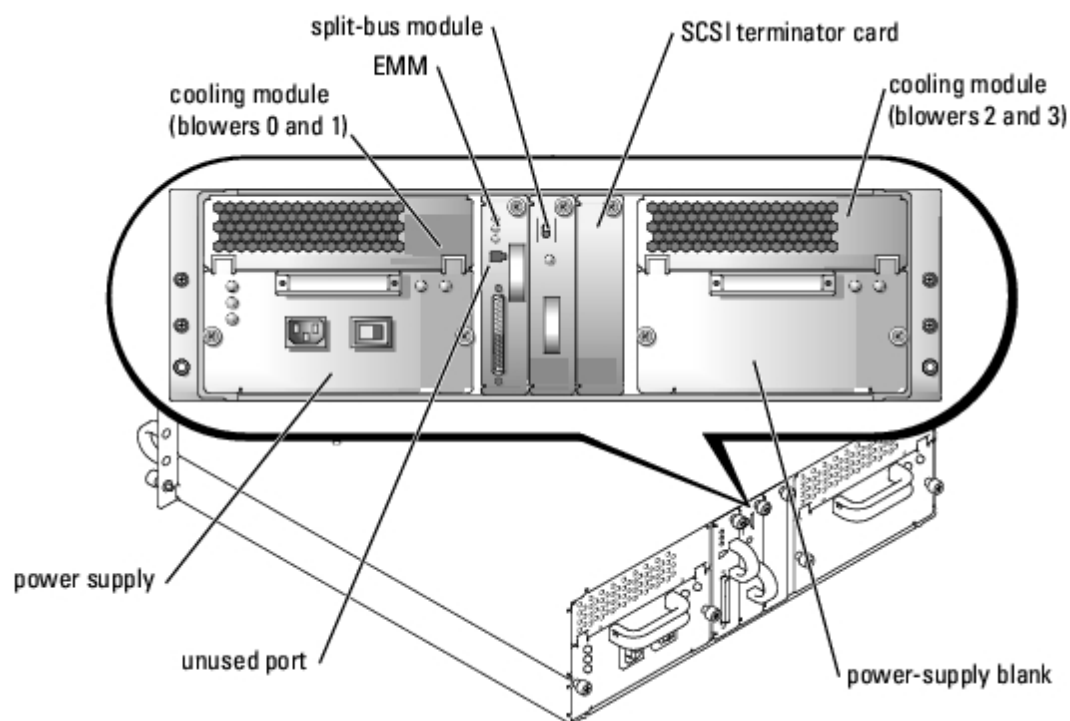
Figure 1-3. Back-Panel Features (Systems With Redundant EMMs and Redundant Power Supplies)

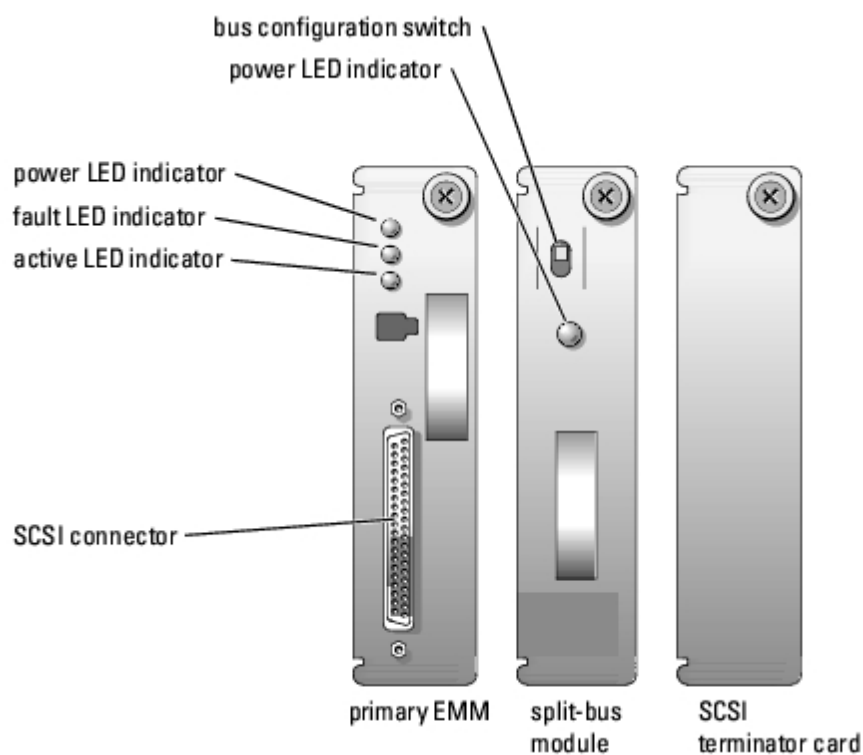
Figure 1-4. Back-Panel Features (Systems With Nonredundant EMMs and Nonredundant Power Supplies)



Back-Panel Modules

[Figure 1-5](#) illustrates the back-panel modules features and indicators. See [Figure 1-6](#) for more information about bus configuration switch modes.

Figure 1-5. Back-Panel Modules Features and Indicators



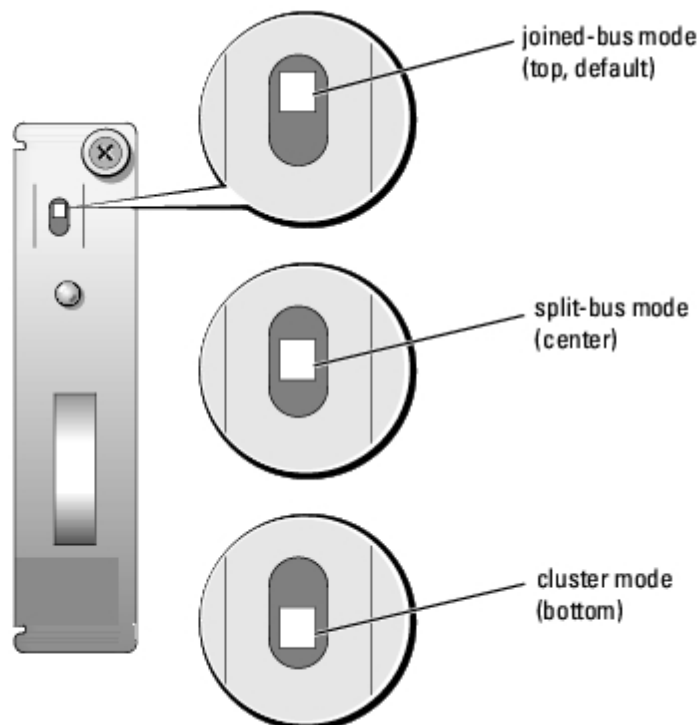
Split-Bus Module

Your storage system supports three SCSI bus modes controlled by the split-bus module:

- Joined-bus mode
- Split-bus mode
- Cluster mode

These modes are controlled by the position of the bus configuration switch when the system is turned on. [Figure 1-6](#) illustrates the switch position for each mode. For more information on configuring the SCSI bus modes, see "[Cabling Your System for Joined-Bus, Split-Bus, or Cluster Mode.](#)"

Figure 1-6. Bus Configuration Switch Modes





The only difference between cluster mode and joined-bus mode is the SCSI ID assigned to the enclosure services processor on the EMM. When cluster mode is detected, the processor SCSI ID changes from 6 to 15. As a result, SCSI ID 15 is disabled, leaving 13 available hard drives in cluster mode. This allows a second initiator, such as a host bus adapter or RAID controller card on a second host system, to use SCSI ID 6 (see [Table 2-1](#) for SCSI ID assignments).

See [Table 1-4](#) for a description of split-bus module modes and functions.

NOTE: To change the SCSI bus mode, you must change the position of the bus configuration switch *before* turning on the storage system. Changing the position of the bus configuration switch while the system is on will not affect system operation. If you change the configuration, you must first reboot the storage system, and then the host system for the changes to take effect. See "[Changing the SCSI Bus Mode.](#)"

Table 1-4. Split-Bus Module Modes

Mode	LED Icon	Position of Bus Configuration Switch	Function
Joined-bus mode		Top	LVD termination on the split-bus module is disabled, electrically joining the two SCSI buses to form one contiguous bus. In this mode, neither the split-bus nor the cluster LED indicators on the front of the system (see Figure 1-2 for locations) are illuminated.

Split-bus mode		Center	LVD termination on the split-bus module is enabled and the two buses are electrically isolated, resulting in two seven-drive SCSI buses. The split-bus LED indicator on the front of the system (see Figure 1-2 for location) is illuminated while the system is in split-bus mode.
Cluster mode		Bottom	LVD termination is disabled and the buses are electrically joined. The cluster LED on the front of the system is illuminated while the system is in cluster mode.
NOTE: For the full name of an abbreviation or acronym used in this table, see " Abbreviations and Acronyms ."			

The split-bus module has only one LED indicator (see [Figure 1-5](#) for LED location), which is illuminated when the module is receiving power.


Enclosure Management Module (EMM)


The EMM serves two primary functions in your storage system:

- SCSI bus expansion — Acts as a buffer for the SCSI bus, electrically dividing the bus into two independent segments while logically allowing all SCSI bus traffic to pass through it transparently. The buffer improves the quality of the SCSI signals and allows longer cable connections.
- Management functions — Includes SES and SAFTE reporting to the host system, control of all system LED indicators, and monitoring of all environmental elements, such as temperature sensors, cooling modules, and power supplies.

A system with redundant enclosure management features has two EMMs that are designated as primary and secondary that can be configured in either a cluster or joined-bus mode. A system with nonredundant enclosure management has one EMM and one SCSI terminator card configured in a joined-bus mode or two EMMs configured in a split-bus mode. In redundant EMM systems, only one EMM per SCSI bus is active at one time, so only one EMM per SCSI bus can respond to SCSI commands from an initiator.

In joined-bus and cluster modes, if a secondary EMM receives a message that the primary EMM has failed, the fault LED indicator on the primary EMM is illuminated and the condition is reported to the host system. The secondary EMM becomes active and holds the failed primary EMM in a reset state until it is replaced. If the primary EMM detects that the secondary has failed, the secondary's fault LED indicator is illuminated and the failed status is reported back to the host system.




 **NOTE:** In split-bus mode, although each EMM monitors the entire storage system, it controls only half of the hard-drive slots. If one EMM fails in split-bus mode, the second EMM will report the failure, but will not assume control of the hard-drive slots that were previously controlled by the failed EMM.

 **NOTE:** The EMM is "warm-pluggable." This means it can be removed or inserted while the power is on. However, all I/O activity between the host and the storage system must be stopped.

The primary EMM is always plugged into the slot on the left (viewed from the back of the system). In systems with redundant EMMs configured for joined-bus mode, the primary EMM assumes control of all the system's functionality. In addition, the active EMM is the only module that reports system status to the host system through SES and SAFTE protocols. Because the secondary EMM must assume the responsibilities of the primary in the event that the primary fails, both the primary and secondary EMMs are continuously monitoring the status of the system's components.

[Table 1-5](#) lists the conditions for each EMM LED indicator. See [Figure 1-5](#) for location of the indicator LEDs.

Table 1-5. EMM LED Indicators

LED Indicator	LED Icon	Condition
Power (green)		The system is receiving power.
Fault (amber)		An EMM has failed.
Active (green)		The EMM is operating normally and performing all the responsibilities of the primary EMM.

NOTE: For the full name of an abbreviation or acronym used in this table, see "[Abbreviations and Acronyms](#)."

Temperature Probes

Your storage system contains four temperature probes that monitor system temperature and shut down the system in the event of overheating. Each EMM and both the primary and secondary backplanes contain temperature probes. [Table 1-6](#) identifies the location of each probe.

Table 1-6. Temperature Probe Locations

Probe	Location
Probe 0	Primary EMM
Probe 1	Secondary EMM
Probe 2	Drive backplane behind drive ID #3
Probe 3	Drive backplane behind drive ID #12

Power Supply/Cooling Modules

Your storage system supports two combined power supply and cooling modules. While the system is designed to operate normally with only one functional power supply, both cooling modules (each with two blowers) must be present for proper cooling. If only one power supply is needed, a blank must be inserted into the other slot to mount the second cooling module. In this nonredundant power-supply configuration, the power-supply blank has the capacity to transfer power and control signals to and from the cooling module.

If one blower within a cooling module fails, your storage system reverts to a nonredundant fan configuration. The remaining three blowers in both cooling modules operate at higher speeds to maintain proper system cooling and produce higher acoustical noise than in the redundant fan configuration (with four blowers in two cooling modules).

CAUTION: A power supply and cooling module can be removed from a powered-on system for a maximum period of *five minutes*. Beyond that time, the system begins to overheat, and at a critical temperature, shuts down to prevent damage.

The cooling module is securely mounted to the power supply using a hook-and-latch fastener. This simplifies the removal and installation of cooling modules and power supplies.

[Figure 1-7](#) illustrates the power supply and cooling module features and LED indicators. [Table 1-7](#) lists the function of each power supply and cooling module indicator.

Figure 1-7. Power Supply and Cooling Module LED Features and Indicators

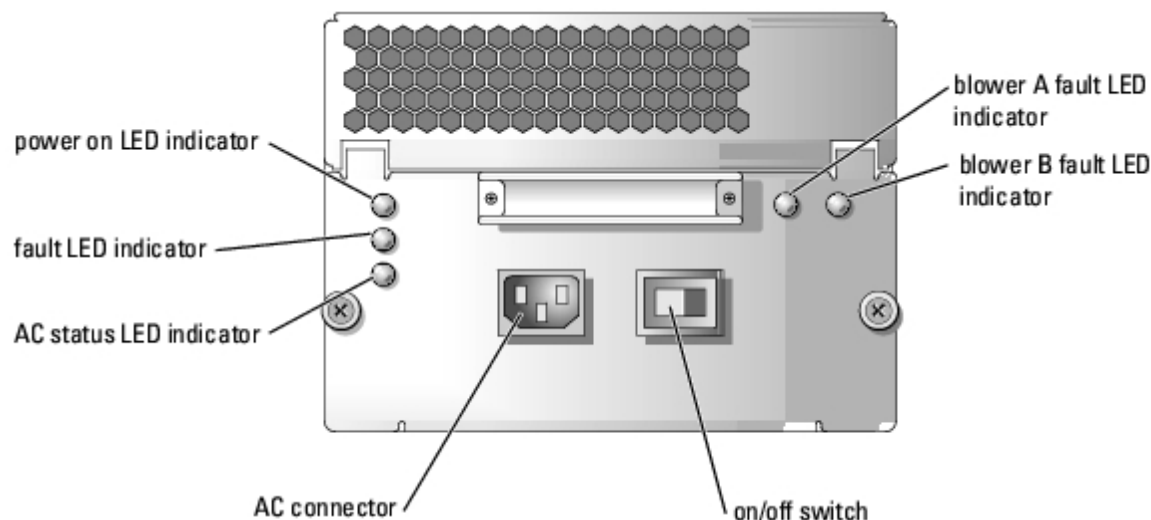










Table 1-7. Power Supply/Cooling Module LED Indicators

Module Icon	LED Indicator	LED Icon	Function
	Power on (green)		DC output voltages are within specifications.
	Fault (amber)		One of the DC output voltages is not within specifications.
	AC status (green)		AC input voltage is within specifications regardless of the position of the power switch.
	Blower A fault (amber)		Cooling module blower A has failed.
	Blower B fault (amber)		Cooling module blower B has failed.

NOTE: For the full name of an abbreviation or acronym used in this table, see "[Abbreviations and Acronyms](#)."

Audible Alarm

The primary EMM activates an audible alarm if any of the shelf-fault conditions listed in [Table 1-8](#) occur. If a critical event occurs, the alarm sounds continuously. If a noncritical event occurs, the alarm sounds every 10 seconds. [Table 1-8](#) lists critical and noncritical events.

 **NOTE:** The audible alarm is disabled by default. To enable the alarm, you must change the default setting using your array management software. For more information, see your array management software documentation.



 **NOTE:** When the system is on and a split-bus module is not detected, the audible alarm will sound regardless of whether it is enabled or disabled.

Table 1-8. Audible Alarm Critical and Noncritical Events

Critical Events	Noncritical Events
Two or more cooling-module blowers have failed or a cooling module is not installed.	One power supply has failed.
One or more temperature sensors are in critical range (in excess of 50°C [122°F] inside the box).	One cooling-module blower has failed.
The split-bus module is not installed.	<ul style="list-style-type: none"> One or more temperature sensors are in the warning range. One EMM has failed

NOTE: For the full name of an abbreviation or acronym used in this table, see "[Abbreviations and Acronyms](#)."

 **NOTE:** It is rare for both EMMs to fail simultaneously. However, if this event occurs, the system cannot issue critical or noncritical event alarms for any system component. If both power supplies fail simultaneously, the system can issue critical or noncritical event alarms only if 5-V power is available.

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Connecting and Operating Your Storage System

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- [Connecting SCSI Cables](#)
- [Cabling Your System for Joined-Bus, Split-Bus, or Cluster Mode](#)
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- [Upgrading to a Redundant System](#)
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This section provides procedures for connecting your storage system to a host system for each mode of operation: joined-bus, split-bus, and cluster.

Before You Begin

Before connecting your storage system, ensure that the following are available:

- The components that came with your storage system, including:
 - Power cord(s) and SCSI cable(s)
 - *Resource* CD
 - Drive carrier labels
 - Optional rail kit for rackmount systems
- Your array management software CD that came with your Dell server
- Relevant documentation:
 - Your system's *User's Guide*
 - Your system's *Rack Installation Guide*
 - Your *Product Information* document (for important safety, regulatory, and warranty information)
 - readme files included on your PowerVault system's *Resource* CD
 - If applicable, your rack-to-tower or tower-to-rack conversion kit documentation
 - Your array management software documentation
 - RAID controller and HBA documentation
- #2 Phillips screwdriver

Installing Your Rack-Mounted Storage System

For information on how to install your Dell™ PowerVault™ 220S in a rack, see the *Rack Installation Guide* included with your storage system.

Converting Your System From Tower-to-Rack or Rack-to-Tower

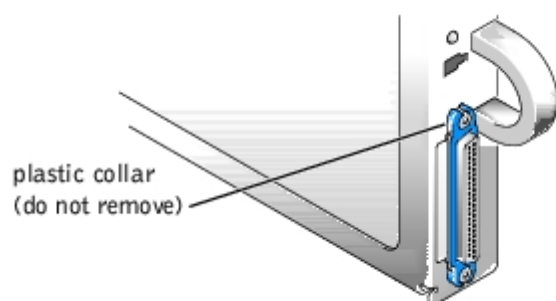
Dell offers conversion kits that allow you to convert your PowerVault 220S to a tower/standalone system, and your 221S to a rack system. Before performing the installation procedures in this section, use the documentation included in your conversion kit to complete the conversion.

Connecting SCSI Cables

Use caution when connecting the SCSI cables to your storage system because an incorrect connection could damage the connectors. When connecting the SCSI cables to your storage system, observe the following guidelines:

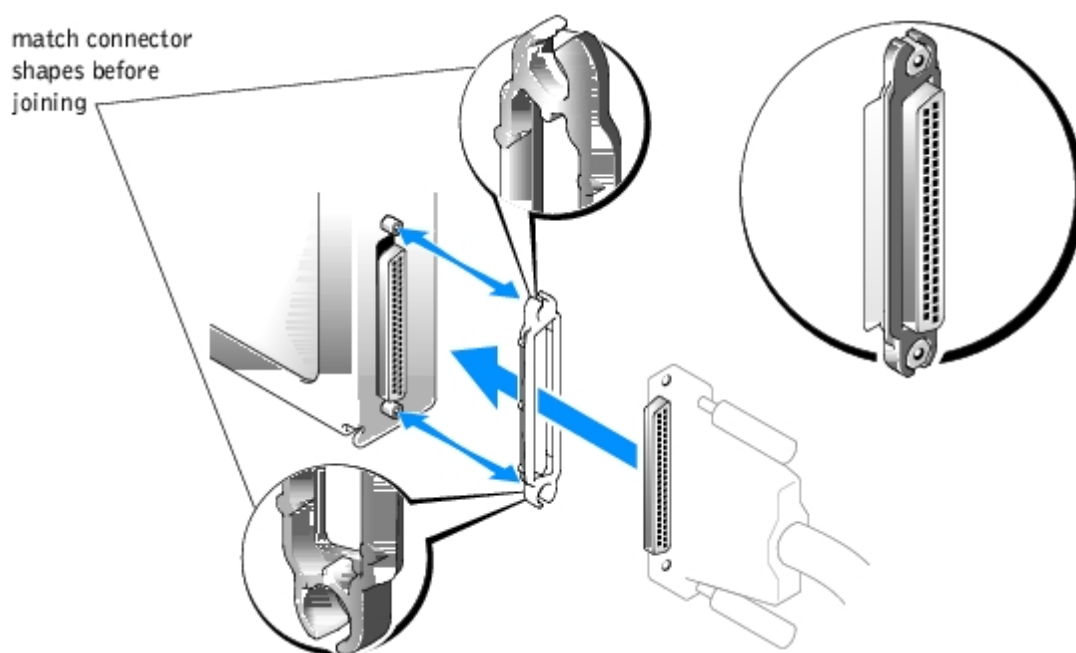
- If your SCSI card connector has a protective plastic collar like that shown in [Figure 2-1](#), do **not** attempt to remove the collar.

Figure 2-1. SCSI Connector Collar



- Before joining the connectors, ensure that the long and short edges of each connector are aligned for correct insertion, as shown in [Figure 2-2](#).

Figure 2-2. Connecting the SCSI Cable



- Ensure that the cable connectors are firmly seated before you tighten the captive thumbscrews.
- When detaching the cable, avoid damage to the cable by grasping and pulling on the cable connector rather than the cable. Also, separate the connectors carefully to avoid damage to the connector pins.

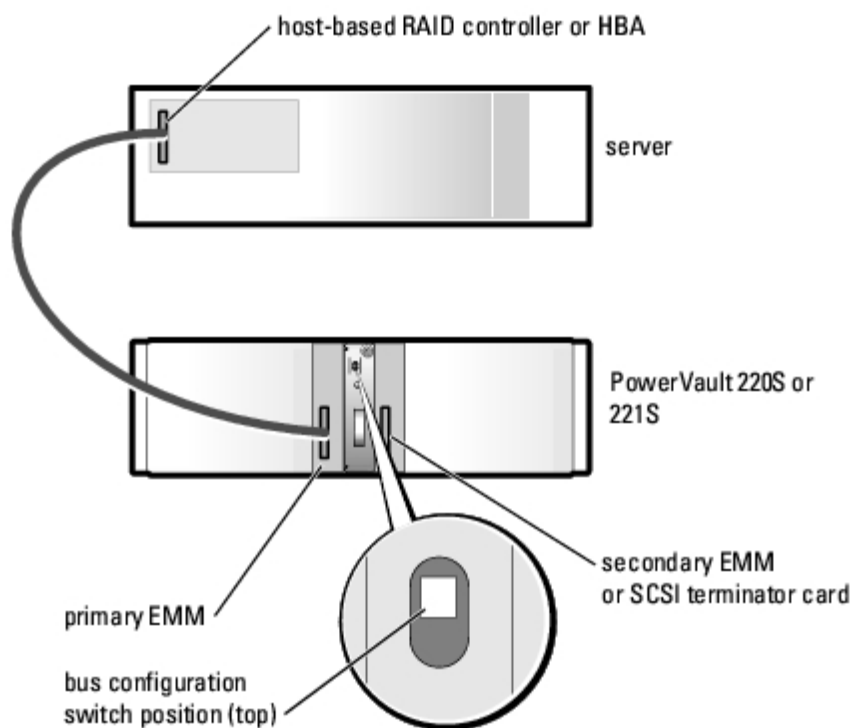
Cabling Your System for Joined-Bus, Split-Bus, or Cluster Mode

How you cable your storage system to your host system(s) depends on the bus configuration you choose: joined-bus, split-bus, or cluster.

- A joined-bus configuration is one in which two SCSI buses are joined to form one contiguous bus.
- A split-bus configuration enables you to connect your storage system to either one server with a multichannel RAID controller, or to two servers. However, if one server fails, information controlled by that server is inaccessible.
- A cluster configuration offers multiple paths to the system, which provides high data availability.

[Figure 2-3](#), [Figure 2-4](#) and [Figure 2-5](#) illustrate the cabling configuration and split-bus switch position for each SCSI bus mode.

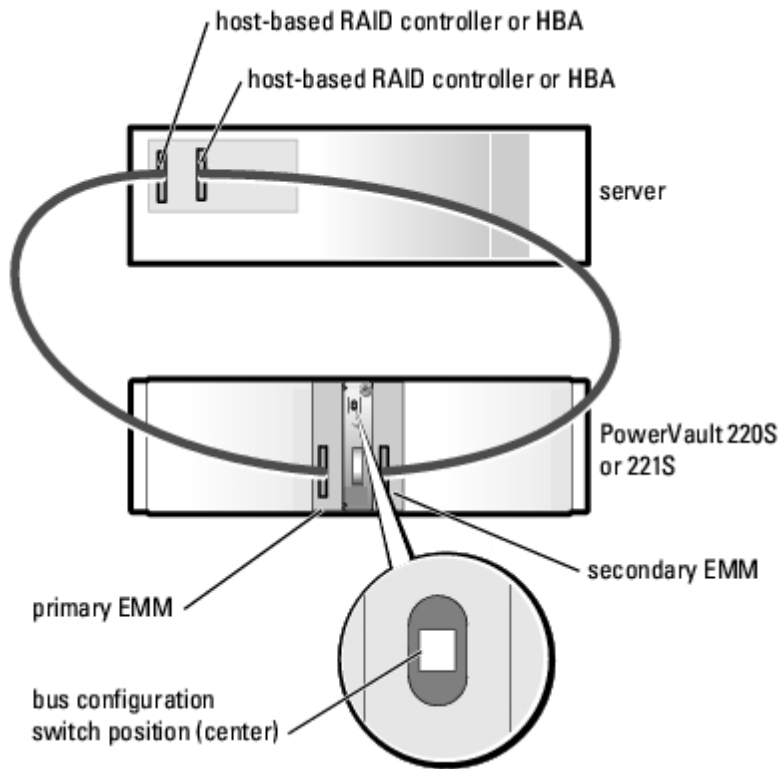
Figure 2-3. Joined-Bus Configuration



NOTE: In the joined-bus configuration, only one cable is required to connect the primary EMM or the secondary EMM to the RAID controller or HBA. Do not connect both EMMs to host system at the same time.

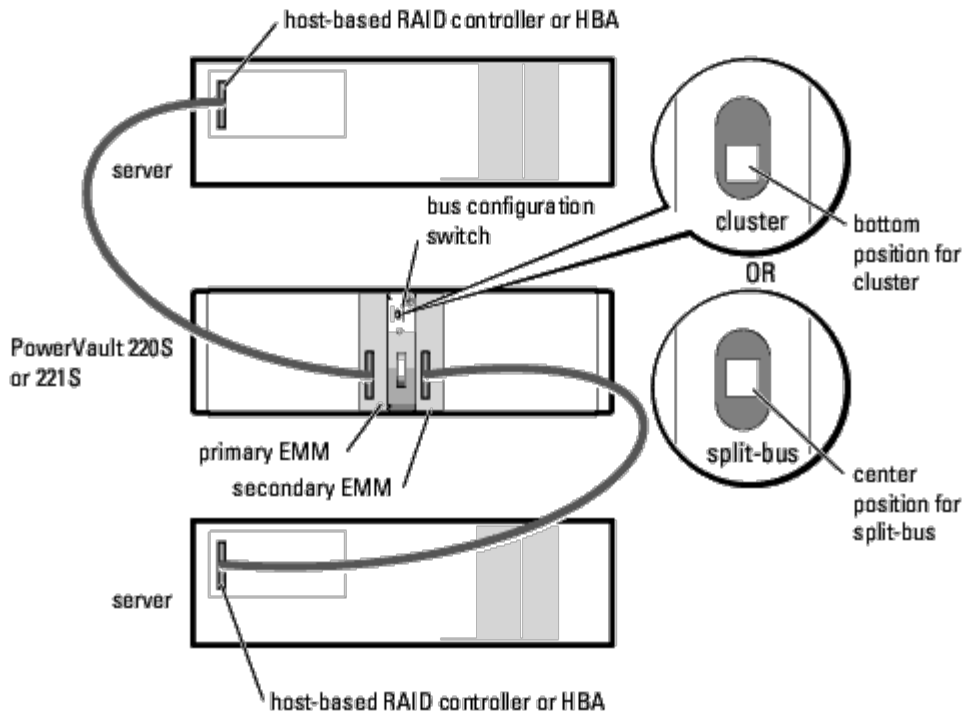
NOTE: If you are using a multichannel host-based RAID controller or HBA, you can connect a separate, joined-bus storage system to each channel of a single host system.

Figure 2-4. Split-Bus Configuration (One Server)



NOTE: The split-bus configuration also supports the attachment of one storage system to one server using two channels on the same RAID controller, as well as two servers to one storage system (see [Figure 2-5](#)).


Figure 2-5. Cluster Configuration or Split-Bus Configuration (Two Servers)



NOTE: The PowerVault storage system reserves SCSI IDs 6 and 7 for the SCSI controllers on the host systems. In a cluster configuration, two host systems are connected to the same SCSI bus. Consequently, ensure that each host system has a different SCSI ID and that both systems are not set to the same SCSI ID of 6 or 7.

Connecting the Storage System

1. Turn on the host system, with a RAID controller or HBA installed, and all attached devices.

 **NOTE:** The storage system does not support HVD or single-ended SCSI controllers. For more information on supported controllers, see your system's readme file.

2. If your host system is a Dell system, confirm that the latest version of the array management software is installed. For installation instructions and supported operating systems, see your array management software documentation. For the latest version of the array management software, see the Dell Support website located at support.dell.com.
3. Use your array management software to check the configuration of the controller for an available channel to connect the system (a channel not already configured to control internal drives). See your array management software documentation for more information. If your operating system does not provide array management software, check the Dell support website at support.dell.com for available configuration utilities for your operating system.
4. Turn off the host system and all attached devices.
5. Connect the SCSI cable(s) from the host system to the storage system.
6. Connect the SCSI cable(s) to the EMM SCSI connectors on the back panel of the storage system (see [Figure 1-5](#)) and to the RAID controller or HBA on the host system. (See your RAID controller documentation to ensure the controller is properly installed).
 - If you are attaching only one cable to the storage system, connect the SCSI cable between the primary EMM SCSI connector and the RAID controller or HBA on the host system (see [Figure 2-3](#)).
 - If you are attaching a second cable to the storage system, connect the SCSI cable between the secondary EMM SCSI connector and the RAID controller or HBA in the host system. (See [Figure 2-4](#) for split-bus mode and [Figure 2-5](#) for cluster or two-server split-bus modes).
7. Use the split-bus module bus configuration switch to select your mode of operation: joined- bus, split-bus, or cluster. See [Figure 1-6](#) for switch positions.

All SCSI IDs are hard-wired in the storage system. The SCSI IDs that are available for hard-drive use are assigned to specific hard drive slots. SCSI IDs 6 and 7 are reserved in all configurations for use by the storage system and the host system. In cluster mode, SCSI ID 15 is also reserved for storage system use; consequently, drive slot 15 is not used in cluster mode. [Table 2-1](#) lists the SCSI IDs as they are used in each bus configuration, as well as the number of cables used for each configuration. [Figure 2-6](#) shows the SCSI ID assigned to each drive slot.

Table 2-1. SCSI ID Assignments

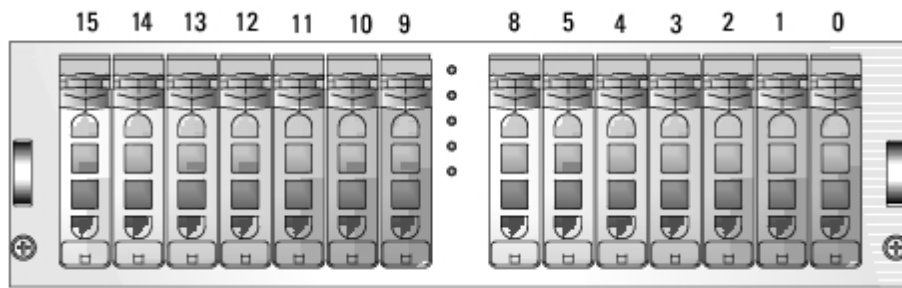
Configuration	Cables Used	SCSI IDs Used															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Joined-bus	1									H	S						
Split-bus—primary EMM	1									H	S						
Split-bus—secondary EMM	1									H	S						
Cluster	2	S								H	H						

NOTE: The unshaded SCSI IDs are available for hard-drive use as indicated for each configuration. The reserved SCSI IDs are used as follows:

H = used by the host system initiator.

S = used by the storage system SES.

Figure 2-6. SCSI ID Numbers and Associated Hard Drives



8. Connect power to the power supplies.

NOTICE: To safeguard your storage system from power problems, connect the AC power cable to a protected power supply, such as a 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.

9. Turn on the storage system by pressing the on/off switch on the power supply. If you have a system with redundant power supplies, make sure *both* on/off switches have been turned on (see [Figure 1-7](#) for switch locations).

10. Turn on power to the host system.

11. Check the LED indicators on the front and back of the storage system. If any amber fault indicators are illuminated, see "[Troubleshooting](#)."

12. Using your array management software, enable the system's audible alarm (optional). For more information, see your array management software.

NOTE: The audible alarm is disabled by default.

Using Array Manager to Manage Your Storage System

Dell OpenManage™ Array Manager software provides a comprehensive storage management solution with an integrated graphical view. From a single location, Array Manager enables you to configure and manage local and remote storage attached to a server while the server is online and continuing to process requests.

Array Manager obtains information about storage devices and the logical volumes contained on those devices. Array Manager displays storage configuration information in both physical and logical views. The physical view shows the physical connections among the storage devices. The logical view shows a logical representation of your storage as logical volumes.

From the Array Manager console, you can perform the following:


- Create and manage software and hardware RAID solutions
- Display your storage information
- Customize the Array Manager interface to suit your individual needs
- Enable the system's audible alarm
- Download firmware for the enclosure

For more information on using Array Manager to configure and manage your storage system, see your Array Manager documentation.

Changing the SCSI Bus Mode

To change your storage system's SCSI bus mode:

1. Turn off power to the storage system.

 **NOTE:** If you have a redundant system, be sure to turn off the on/off switch on *both* power supplies..

2. Power down the attached servers.
3. Turn off the storage system.
4. Complete step [step 5](#) through step [step 11](#) in "[Connecting the Storage System](#)."

Upgrading to a Redundant System

If you have a storage system with nonredundant EMMs and/or nonredundant power supplies, you can upgrade to a redundant system by adding an EMM and/or power supply. See "[Installing an EMM or SCSI Terminator Card](#)" and "[Replacing the Power Supply](#)" for more information.

Downloading Firmware

You can download firmware updates for your storage system enclosure using your array management software. For more information on downloading firmware, see your array management documentation. If your operating system does not provide array management software, see Dell's Support website at support.dell.com for available configuration utilities for your operating system.

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Removing and Installing Hard Drives


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Your storage system features a SCSI backplane that simplifies cabling and configuring your storage system's SCSI hard drives. The SCSI backplane configures all SCSI IDs.


When used in combination with a host RAID controller that supports hot-pluggable drives, the SCSI backplane allows you to remove and insert hard drives without shutting down the storage system. You can replace a failed drive without requiring network users to log off, thus avoiding potential loss of time and data. To verify that your RAID controller supports hot-plugging, see your RAID controller documentation.

 **NOTICE:** If the storage system is connected to a supported RAID controller, you can remove and insert the SCSI hard drives while the storage system is running. However, hot-plugging hard drives without a supported RAID controller card could result in data loss. See your RAID controller documentation to ensure that the host adapter is configured correctly to support hot-plug hard drive removal and insertion.

 **NOTICE:** HBA cards do not support hot-plugging. For information on supported cards, see your system's readme file.

This section describes how to remove and install hard drives in your storage system.

 **CAUTION:** See "Protecting Against Electrostatic Discharge" in the safety instructions in your *Product Information* document.


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


Recommended Tools


The procedures in this section require the use of one or more of the following tools:

- #2 Phillips-head screwdriver
- Wrist grounding strap, as explained in the safety instructions found in your *Product Information* document
- Standard flat-blade screwdriver

Removing Hard Drives

 **NOTICE:** To avoid damage, never leave a drive carrier partially removed from the storage system. Rotating a carrier handle next to an unseated drive carrier will result in serious damage to the unseated drive carrier.

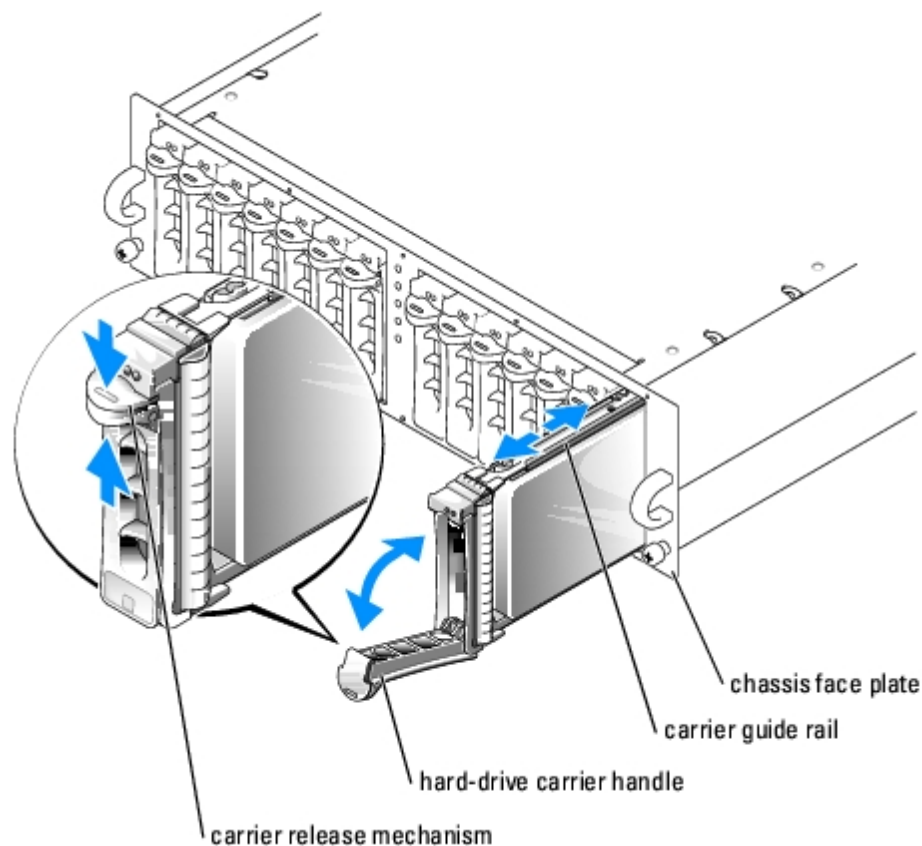
 **NOTICE:** To avoid data loss when removing a hard drive from an active RAID array, you must first use the array management software to prepare the drive for removal. See your array management software documentation for more information.

 **NOTICE:** Always wear a wrist grounding strap when handling equipment with static-sensitive components.

1. Use your array management software to prepare the drive for removal.
2. Wait until the LED indicators on the drive carrier stop flashing.

3. Squeeze the release mechanism on the front of the hard-drive carrier (see [Figure 3-1](#)).

Figure 3-1. Installing and Removing Hard Drives



4. Open the hard-drive carrier handle.
5. Gently but firmly pull the hard-drive carrier from its slot.

NOTE: If the wrong drive is inadvertently removed, your array management software issues a message that a logical disk has failed after I/O has started. For more information about what to do if the wrong drive is removed, see your array management documentation.

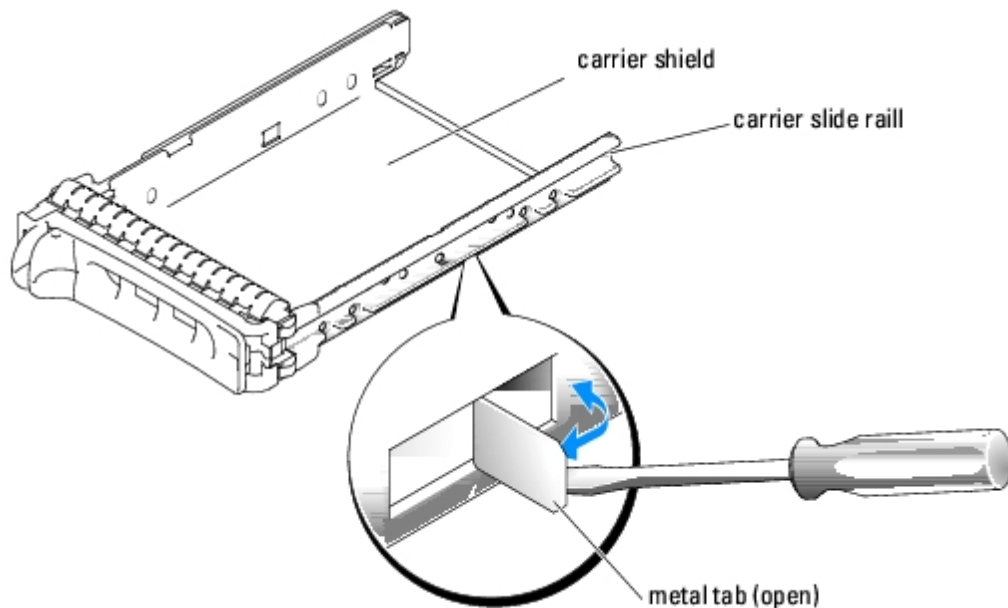
Installing Hard Drives

NOTE: To ensure proper airflow for system cooling, each slot should contain either an active drive and drive carrier or a carrier blank.

NOTE: Always wear a wrist grounding strap when handling equipment with static-sensitive components.

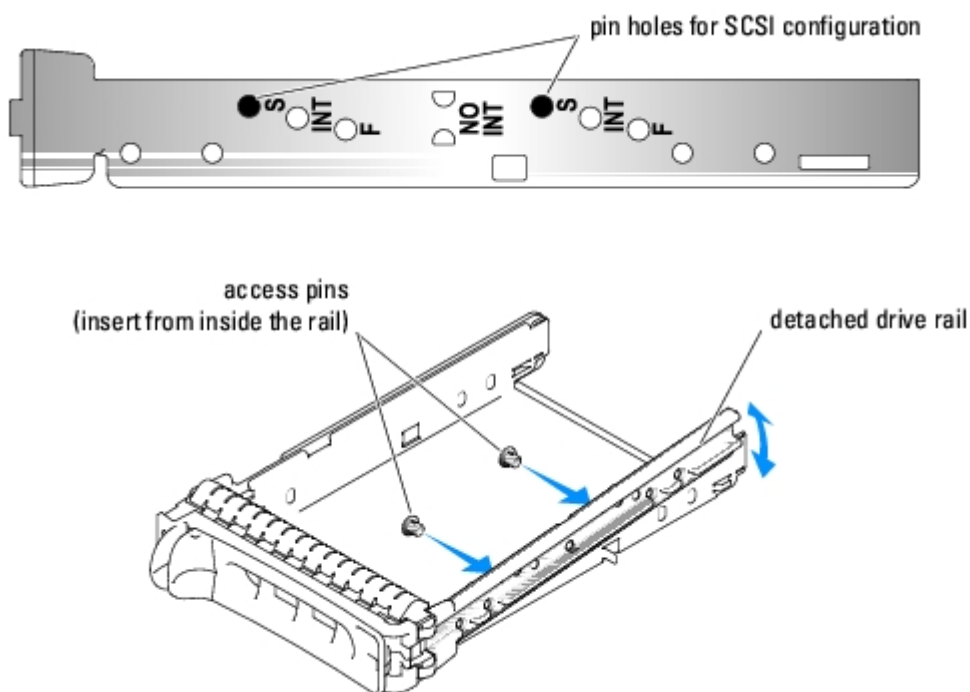
1. If applicable, configure your drive carrier for SCSI drive installation by setting the access pins inside the slide rail along the right side of the drive carrier (or bottom side for rackmount systems). When in place, the access pins prevent the carrier from being inserted into a non- SCSI hard-drive slot. If your drive carrier did not include access pins, skip to [step 2](#). Otherwise, perform the following steps to set the access pins:
 - a. Using a standard screwdriver, detach the slide rail on the right (or hinge) side of the carrier from the metal carrier shield by bending away the metal tab located beneath the rail that fastens the rail to the shield (see [Figure 3-2](#)).

Figure 3-2. Detaching the Carrier Slide Rail



- b. Separate the rail from the shield with enough space to insert the access pins.
- c. Find the two holes on the slide rail labeled "S" and insert access pins in the holes by pressing the pins through from the inside of the rail (see [Figure 3-3](#)).

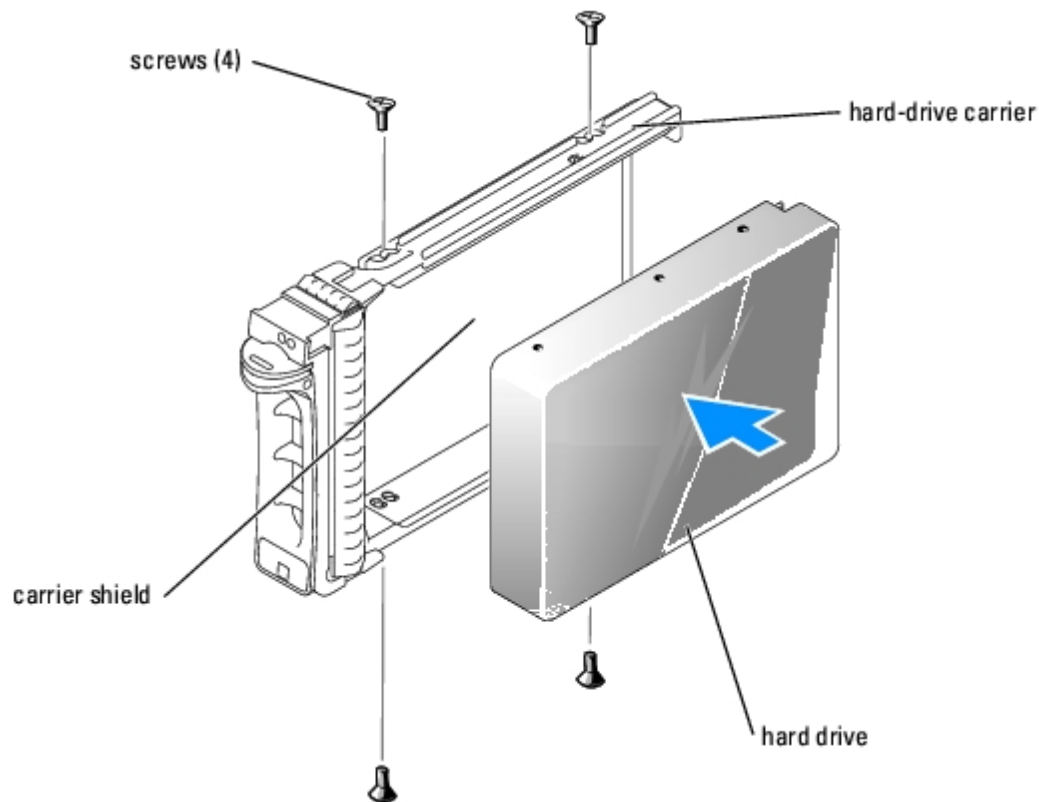
Figure 3-3. Configuring a SCSI Drive Carrier



- d. Reassemble the slide rail to the carrier shield and bend the metal retaining tab back into place.
2. Perform the following steps to install the new hard drive into the carrier:
 - a. If you are replacing a hard drive in the carrier, remove the four screws that secure the hard drive to its carrier (see [Figure 3-4](#)).
 - b. Position the replacement hard drive into the hard-drive carrier with the hard drive's controller board facing the carrier shield.

- c. Align the hard drive with the carrier by sliding the hard drive against the stop at the back of the carrier.
- d. Secure the hard drive to the carrier using the four screws removed earlier.

Figure 3-4. Installing the Hard Drive in the Carrier



3. With the hard-drive carrier handle open, carefully align the channel on the hard-drive carrier guide rail with the appropriate drive slot keying feature on the chassis face plate, and insert the hard drive (see [Figure 3-1](#)).
4. Push the hard-drive carrier into the slot until the bottom of the open carrier handle makes contact with the chassis face plate.
5. Rotate the carrier handle to the closed position while continuing to push the carrier into the slot.

The status LED indicator (see [Table 1-2](#) for description) is a steady green if the hard drive is inserted properly. If the indicator is not illuminated, see "[Troubleshooting SCSI Hard Drives](#)."

As the drive rebuilds, the hard-drive carrier LED flashes green twice per second at unequal intervals.

 **NOTE:** For information on adding a hard drive to a storage array, see your array management software documentation

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Removing and Installing EMMs and the SCSI Terminator Card



Dell™ PowerVault™ 220S and 221S Systems Installation and Troubleshooting Guide

- [Removing an EMM or SCSI Terminator Card](#)
- [Installing an EMM or SCSI Terminator Card](#)

A system with redundant enclosure management features two EMMs that are designated as primary and secondary and can be configured in either a cluster or joined-bus mode. A system with nonredundant enclosure management consists of one EMM and one SCSI terminator card configured in a joined-bus mode, or two EMMs configured in a split-bus mode. In redundant EMM systems, only one EMM per SCSI bus is active at one time, so only one EMM per SCSI bus can respond to SCSI commands from an initiator.

EMMs and the SCSI terminator card are "warm-pluggable" and can be removed and installed without shutting down the storage system, provided all I/O to the module has ceased.

This section describes how to remove and install EMMs and the SCSI terminator card in your storage system.

-  **NOTE:** In a joined-bus or cluster configuration, you must turn off any server nodes connected to the storage system while you replace an EMM.
-  **NOTICE:** To prevent damage to your storage system, you should wear a wrist grounding strap while performing the following procedures. See your *Product Information* document for safety information.

Removing an EMM or SCSI Terminator Card

1. Turn off the storage system.

This step is optional if I/O activity to the device has ceased.

2. Using a #2 Phillips-head screwdriver, loosen the captive screw at the top of the EMM or SCSI terminator card (see [Figure](#)).
3. Grasp the handle of the module and pull it from the module slot.


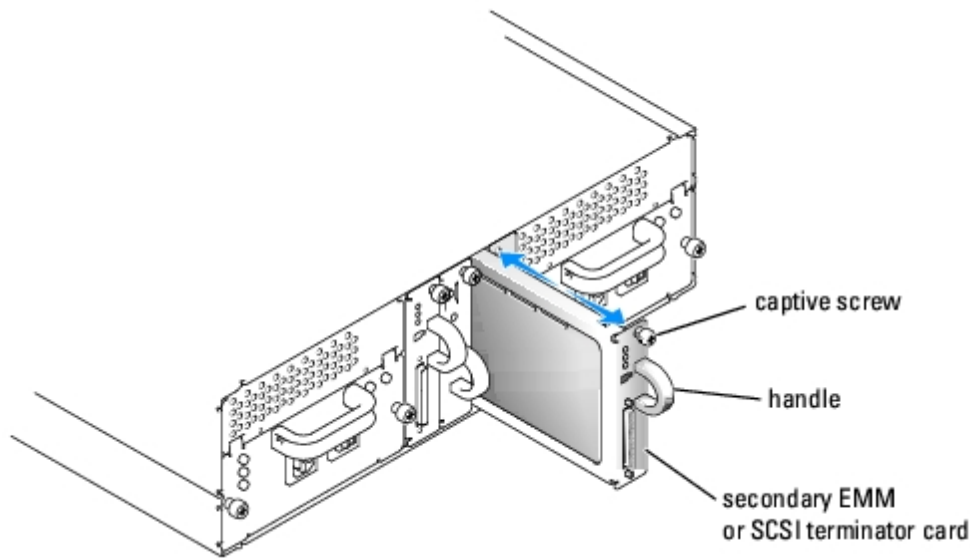

-  **NOTE:** If you did not turn off power to the storage system in step 1, after the module is removed from the system, the amber shelf fault light is illuminated until the module is replaced.

Figure 4-1. Removing and Installing an EMM or SCSI Terminator Card



Installing an EMM or SCSI Terminator Card

1. Carefully insert the EMM or SCSI terminator card into the empty module slot.
2. Push the module to the back of the slot until it is firmly seated in the backplane connector (see [Figure](#)).
3. Using a #2 Phillips-head screwdriver, tighten the captive screw at the top of the module to secure the module to the chassis.
4. If necessary, update the firmware for your EMM(s). See the Dell Support website at support.dell.com for the latest information on firmware updates.

 **NOTE:** If you have two EMMs installed, both must be running the same firmware level. Also, both EMMs must be the same speed. (A label on the EMM identifies whether the module is a U160 or a U320.)

For information on EMM connections and cabling, see "[Connecting the Storage System](#)."

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Troubleshooting

Dell™ PowerVault™ 220S and 221S Systems Installation and Troubleshooting Guide

- [Safety First—For You and Your System](#)
 - [Troubleshooting Overview](#)
 - [Troubleshooting SCSI Hard Drives](#)
 - [Troubleshooting the System](#)
 - [Troubleshooting a Cooling Module](#)
 - [Troubleshooting a Power Supply](#)
- [System Messages](#)
 - [Parts Replacement Procedures](#)
 - [Removing and Installing the Split-Bus Module](#)
 - [Replacing the Power Supply](#)
 - [Replacing a Cooling Module](#)

This section provides information to help you troubleshoot problems with your storage system and its components. It includes a summary of common system faults along with corrective actions. This section focuses primarily on hardware-based troubleshooting. For more information on troubleshooting using storage system configuration and management software, see your array management software documentation. See [Figure 1-2](#), [Figure 1-5](#), and [Figure 1-7](#) for locations of front- and back-panel LED indicators.

Safety First—For You and Your System

Do not attempt to service the system except as explained in this guide and elsewhere in Dell documentation. Additionally, before you service the system, review all of the procedures in "Safety Instructions" in your *Product Information* document.

Troubleshooting Overview

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

Cabling

System failures are frequently caused by unseated or disconnected cable connectors. Cables can become faulty or connector pins bent from normal system maintenance and reconfiguration. With any system failure, ensure that the system cabling is not the source of the problem. See "[Connecting SCSI Cables](#)" for important information about cabling your storage system.

Indicators

The LED indicators on your storage system provide valuable information when troubleshooting the system. Table 5-1 lists the most common system and component faults and tells you where to find more information on correcting the problem. For locations and descriptions of LED indicators, see "[Front-Panel Features and Indicators](#)" and "[Back-Panel Features and Indicators](#)."

Illuminated Indicator(s)	Corrective Action
Drive status LED (drive failure flash pattern)	See " Troubleshooting SCSI Hard Drives ."
Shelf-fault indicator only	See " Troubleshooting the System ."
Shelf-fault indicator and cooling fan fault indicator	See " Troubleshooting a Cooling Module ."
Shelf-fault indicator and power supply fault indicator	See " Troubleshooting a Power Supply ."
Shelf-fault indicator and over-temperature indicator	Use your array management software to check the system temperature. See your


	array management software documentation for more information. If a temperature fault is not indicated, see " Troubleshooting the System. "
None	See " Troubleshooting a Power Supply. "

Troubleshooting SCSI Hard Drives

Hard-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-drive problems by validating your SCSI cable connections as described in "[Connecting the Storage System.](#)"

The SCSI bus has limits based on the type of host adapter connected to the storage system. The optional RAID controller monitors the internal SCSI hard drives connected to the backplane board. It is possible that your host adapter card does not support hot-plug hard drives. For more information, see the documentation that came with the RAID controller card.

 **NOTE:** Not all SCSI cables are interchangeable. For your storage system to function properly, use the cables that are shipped with the system. If you use other SCSI cables, they must be approved for U160 use.

In the event of a drive failure event, the status LED indicator on the drive carrier, shown in [Figure 5-1](#), flashes the following patterns:

- Predicted failure — The status indicator flashes green, then amber, then off, repeating this sequence every two seconds if a drive is showing signs of imminent failure.
- Drive failure — The status indicator flashes amber four times per second if a drive fails.

Figure 5-1. Hard Drive Status LED Indicators



For a list of all SCSI hard-drive LED flash patterns, including the ones described previously, see [Table 1-3](#).

To troubleshoot your SCSI hard drives, complete the following steps:

1. Is the storage system turned off?

Yes. Turn on the storage system.

No. Go to [step 2](#).

2. Is the SCSI cable(s) damaged or not attached securely to the SCSI connectors on the EMM(s) and the host controller?

No. Go to [step 3](#).

Yes. Secure the cable(s) or check the connector pins for damage.

3. Does the bus configuration switch mode match your cabling configuration? For example, if you are operating in split-bus mode, is the cabling between the host(s) and the storage system appropriate for this mode? (For more information on cabling configurations, see "[Cabling Your System for Joined-Bus, Split-Bus, or Cluster Mode.](#)")

Yes. Go to [step 4](#).

No. Change either the bus configuration switch mode or cabling between the host and storage system. Then reboot the storage system and the host.

4. Are the status LED indicators for all the hard drives illuminated?


Yes. End troubleshooting.

No. Go to [step 5](#).

5. If a hard drive's status indicator is off, reseal the hard drive by removing it from its drive bay and reinstalling it (see "[Removing and Installing Hard Drives](#)"). Is the problem resolved?

Yes. End troubleshooting.

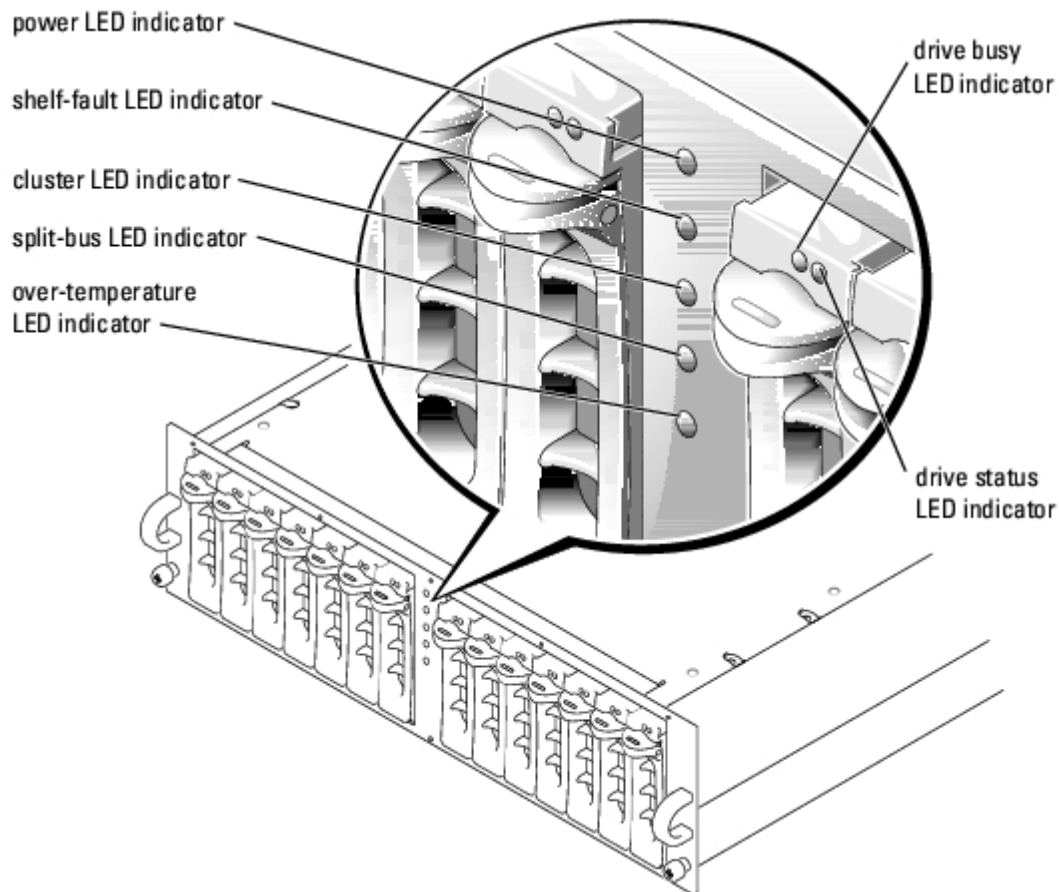
No. Install a new hard drive.

 **NOTICE:** Replacing the hard drive in a non-RAID system will cause all data on that drive to be lost. Only replace **the** hard drive when using a supported host adapter card. See your system's readme file for a list of supported cards.

Troubleshooting the System

When the storage system is turned on, the system performs a POST, which checks the system components. During POST, the indicators for each SCSI hard drive blink briefly, and the front-panel LED indicators are illuminated (see [Figure 5-2](#)). When the POST completes, the indicators are illuminated as described in [Table 1-3](#).

Figure 5-2. Front-Panel LED Indicators



When a problem exists with the storage system, one or more of the following events occur:

- Amber shelf fault LED is illuminated
- Audible alarm sounds (when enabled)
- Drive(s) not seen during the host boot

If any of these events occur, perform the following diagnostic steps:

1. Is the green AC status LED indicator on the power supply(s) illuminated? (See [Figure 1-7.](#))

No. See "[Troubleshooting a Power Supply.](#)"

Yes. Go to [step 2.](#)

2. Are the following system components updated with the latest firmware and device drivers?

- Enclosure EMM
- Hard-disk drives
- Host bus adapter or PERC

No. Download the latest firmware and/or drivers from support.dell.com.

Yes. Go to [step 3.](#)

3. Is the amber over-temperature LED on the front of the system illuminated? (See [Figure 1-2.](#))

No. Go to [step 4.](#)

Yes. One or more temperature sensors are in the warning range. Check environmental conditions (high ambient temperatures, ventilation blockage, etc.) and cooling modules for failures. Replace failed cooling modules (see

"[Replacing a Cooling Module](#)"). For more information, see "[Troubleshooting a Cooling Module](#)."

4. Is the amber fault indicator on the back of the power supply illuminated? (See [Figure 1-7](#).)

No. Go to [step 5](#).

Yes. A power supply has failed. Replace the failed power supply (see "[Replacing the Power Supply](#)"). For more information, see "[Troubleshooting a Power Supply](#)."

5. Is the amber fault indicator for either cooling module blower illuminated? (See [Figure 1-7](#).)

No. Go to [step 6](#).

Yes. One of the cooling module blowers has failed. Replace the failed module (see "[Replacing a Cooling Module](#)"). For more information, see "[Troubleshooting a Cooling Module](#)."

6. Is the amber fault indicator on an EMM illuminated? (See [Figure 1-5](#).)

No. Go to [step 7](#).

Yes. An EMM has failed. Replace the EMM (see "[Installing an EMM or SCSI Terminator Card](#)").

7. Is the power indicator on the split-bus module illuminated? (See [Figure 1-5](#).)

Yes. Go to [step 8](#).

No. The split-bus module has failed. Replace the split-bus module (see "[Installing a Split-Bus Module](#)").

8. Are the pins on the SCSI cable damaged or is the cable between the host and the storage system disconnected?

No. Go to [step 9](#).

Yes. Secure or replace the cable.

9. Replace the SCSI backplane board. Contact Dell for assistance.

See "Getting Help" for instructions on contacting Dell.

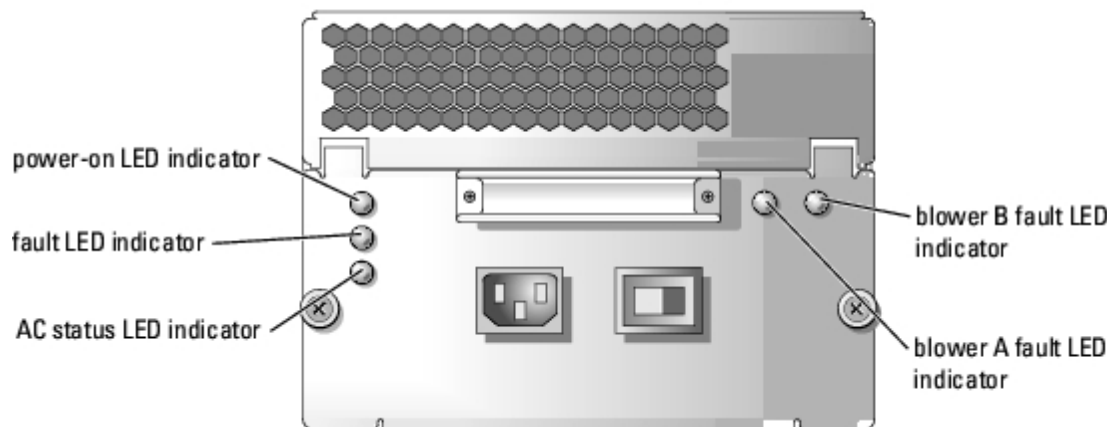
Troubleshooting a Cooling Module

The cooling module LED fault indicators are located in the upper-right corner of each power supply, as shown in [Figure 5-3](#). If a blower fault indicator is illuminated or your array management software issues a blower-related error message, reseal the cooling module onto the power supply. If reseating does not fix the problem, replace the cooling module (see "[Replacing a Cooling Module](#)").



CAUTION: A power supply and cooling module can be removed from a powered-on system for a maximum period of *five minutes*. Beyond that time, the system begins to overheat, and at a critical temperature, shuts down to prevent damage.

Figure 5-3. Power Supply and Cooling Module LED Indicators



Troubleshooting a Power Supply

The three power supply LEDs on the back of the power supply (see [Figure 5-3](#)) indicate the status of the power supply when it is connected to the backplane (see [Table 1-7](#) for a description of each indicator and its function).

If all three power-supply indicators are off or if the power-supply fault LED indicator is illuminated, perform the following steps:

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

Yes. Go to [step 3](#).

No. Replace the power cable.

Is the problem resolved?

Yes. End troubleshooting.

No. Go to [step 2](#).

2. Is the on/off switch on the power supply turned on?

Yes. Go to [step 3](#).

No. Turn on the power switch.

Is the problem resolved?

Yes. End troubleshooting.

No. Go to [step 3](#).

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

Is the problem resolved?

Yes. End troubleshooting.

No. Replace the power supply (see "[Replacing the Power Supply](#)").

System Messages

System messages alert you to a possible problem or to a conflict between the software and hardware. If you receive a system message, see your array management software documentation for suggestions on resolving problems indicated by

these messages.

Parts Replacement Procedures

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

- Removing and installing the split-bus module
- Replacing the power supply
- Replacing a cooling module

Unless otherwise noted, each procedure assumes the following conditions:


- You have read the safety instructions in your *Product Information* document. Always follow the instructions closely. While working on the system, do not attempt to service the system except as explained in this guide and elsewhere in Dell documentation.
- 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 section require the use of one or more of the following tools:

- # 2 Phillips-head screwdriver
 - Wrist grounding strap, as explained in the safety instructions found in your *Product Information* document
-

Removing and Installing the Split-Bus Module

 **NOTICE:** Always wear a wrist grounding strap when handling equipment with static-sensitive components.

Your storage system comes equipped with a "warm-pluggable" split-bus module which can be removed or replaced with the system powered on, provided that all I/O activity to the module has ceased. However, since the split-bus module is an extension of the backplane, it must be present for proper system operation. If you turn on your storage system without a split-bus module present or the module is removed while the system is powered on, the shelf-fault LED illuminates, and an audible alarm sounds continuously until a split-bus module is inserted. For more information on split-bus module features and functions, see "[Split-Bus Module](#)."

This sections describes how to remove and install split-bus modules in your storage system.

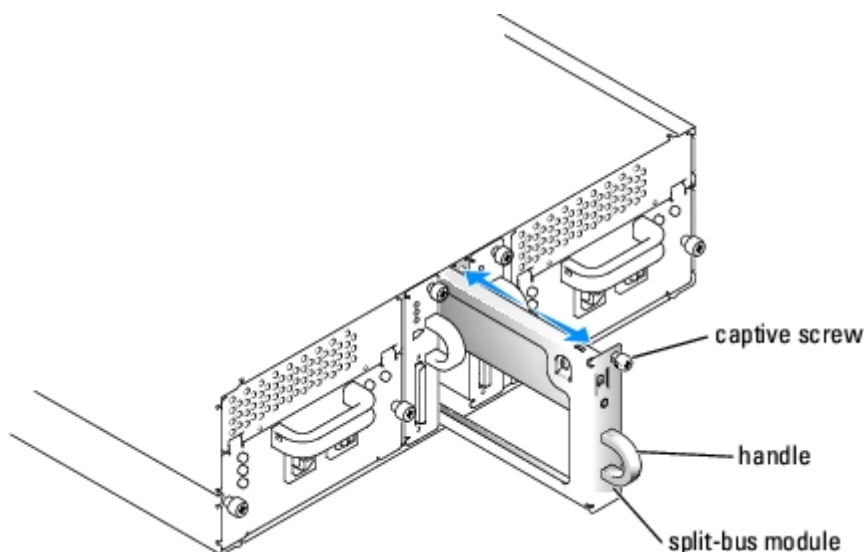
Removing a Split-Bus Module

1. Turn off the storage system.

This step is optional if I/O activity to the device has ceased.

2. Using a #2 Phillips-head screwdriver, loosen the captive screw at the top of the split-bus module (see [Figure](#)).
3. Grasp the handle of the module and pull it from the module slot.

Figure 5-4. Removing and Installing a Split -Bus Module



Installing a Split-Bus Module

1. Depending on your mode of operation, adjust the bus configuration switch to the proper position.
 - **Top position** for joined-bus mode
 - **Center position** for split-bus mode
 - **Bottom position** for cluster mode

For more information on these modes, see "[Split-Bus Module](#)."

2. Carefully insert the split-bus module into the empty module slot.
3. Push the module to the back of the slot until it is firmly seated in the backplane connector (see [Figure](#)).
4. Using a #2 Phillips-head screwdriver, tighten the captive screw at the top of the split-bus module to secure the module to the chassis.
5. If you changed the bus configuration mode after removing the split-bus module, you must reboot the storage system then the server.

Replacing the Power Supply

Your storage system supports two combined power supply and cooling modules. While the system is designed to operate normally with only one functional power supply, both cooling modules (with two blowers each) must be present for proper cooling. If only one power supply is needed, a blank must be inserted into the other slot to mount the second cooling module.

CAUTION: A power supply and cooling module can be removed from a powered-on system for a maximum period of *five minutes*. Beyond that time, the system begins to overheat, and at a critical temperature, shuts down to prevent damage.

The cooling module is securely mounted to the power supply using a hook-and-latch fastening design. This simplifies the removal and installation of cooling modules and power supplies.

Replacing a Power Supply in Systems With Redundant Power Supplies

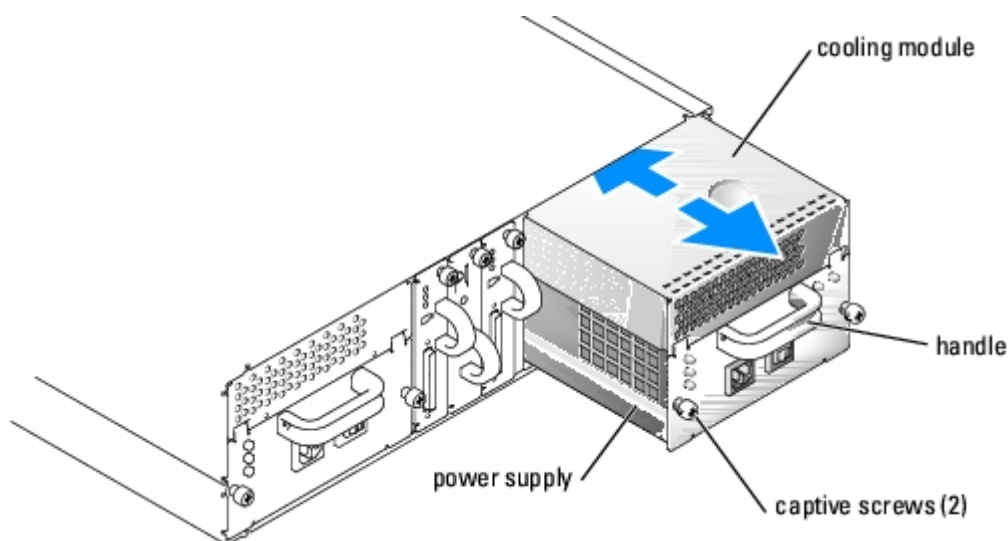
NOTICE: If you have a system with two power supplies, the power supplies are hot-pluggable. You can install or

remove one of the two power supplies while the system is turned on. If you have a system with only one power supply, you must turn off the system before replacing the power supply (see "[Replacing a Power Supply in Systems With Nonredundant Power Supplies](#)").

NOTE: When a power supply fails in systems using redundant power supplies, the fan speed of the cooling module attached to the redundant power supply increases to provide additional cooling. However, if you are removing a fully functioning power supply, the fan speed of the cooling module attached to the redundant power supply will increase when the power supply that is being removed is turned off or unplugged, and will decrease when it is removed from the system.

1. Using a Phillips-head screwdriver, turn the two captive screws counterclockwise to release the power supply and cooling module from the module bay (see [Figure 5-5](#)).

Figure 5-5. Replacing the Power Supply (Systems With Redundant Power Supplies)



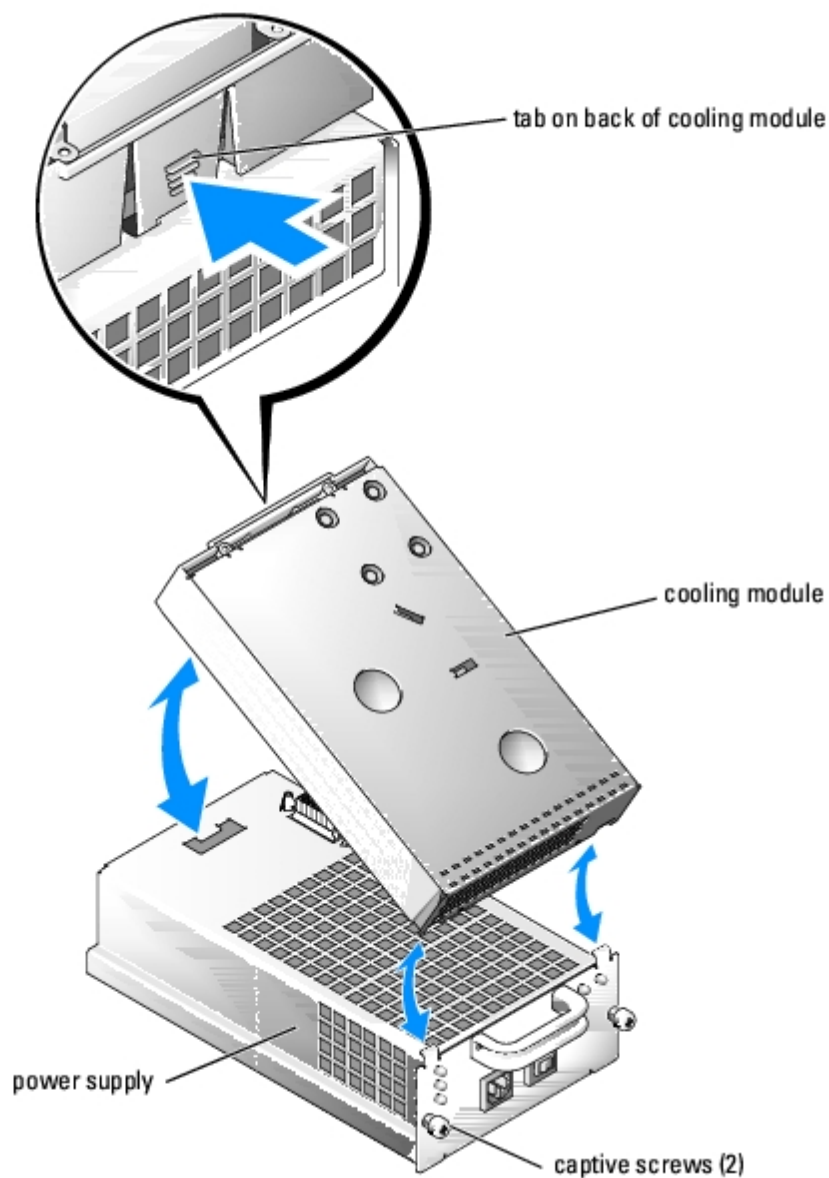
CAUTION: The power supply and cooling modules are heavy. Use both hands when removing.

2. Grasp the handle on the power supply and carefully pull the power supply and cooling module out of the module bay (see [Figure 5-5](#)).

NOTICE: The power-supply handle is provided to ease the task of pulling the power supply free from the bay. Do not use this handle to carry the storage system.

3. Detach the cooling module from the power supply by pressing the tab on the back of the cooling module and sliding the cooling module back and up (see [Figure 5-6](#)).

Figure 5-6. Detaching the Cooling Module From the Power Supply



4. Attach the cooling module to a new power supply by performing the reverse of step 3.
5. Carefully slide the new power supply and cooling module into the empty module bay, and push the module all the way to the back of the bay until it is seated in the backplane connector.

The power supply is seated when its front plate is even with the front plate of the adjacent power supply.

NOTE: The power-supply fault indicator (see [Figure 1-7](#)) remains illuminated until you connect the AC power cable to the power supply and turn on the on/off switch.

6. Tighten the two captive screws to secure the new power supply and cooling module in the module bay.
7. Connect the AC power cable to the new power supply and to an electrical outlet.
8. Turn on the on/off switch on the new power supply.


Replacing a Power Supply in Systems With Nonredundant Power Supplies

To replace the power supply in a system that uses only a single power supply (see [Figure 1-4](#)), perform the following steps:

1. Stop all client activity and power down the host system.
2. Turn off the power switch on the power supply (see [Figure 1-7](#)).
3. Disconnect the power cable from the electrical outlet and the power supply.
4. Using a #2 Phillips-head screwdriver, turn the two captive screws counterclockwise to release the power supply and cooling module from the module bay (see [Figure 5-5](#)).

 **CAUTION:** The power supply and cooling modules are heavy. Use both hands when removing.

5. Holding the handle on the power supply, carefully pull the power supply and cooling module out of the module bay.

 **NOTICE:** The power-supply handle is provided to ease the task of pulling the power supply free from the bay. Do not use this handle to carry your storage system.


6. Detach the cooling module from the power supply by pressing the tab on the back of the cooling module and sliding the cooling module back and up.
7. Attach the cooling module to a new power supply by performing the reverse of [step 6](#).
8. Carefully slide the new power supply and cooling module into the empty module bay, and push the module all the way to the back of the bay until it is seated in the backplane connector.

The power supply is seated when its front plate is even with the front plate of the adjacent power supply.

9. Re-insert the two captive screws and tighten until the new power supply and cooling module are secured in the module bay.
10. Connect the AC power cable to the new power supply and to an electrical outlet.
11. Turn on the on/off switch on the new power supply.

Replacing a Cooling Module

Your storage system supports two combined power supply and cooling modules. While the system is designed to operate normally with only one functional power supply, both cooling modules (with two blowers each) must be present for proper cooling. If only one power supply is needed, a blank must be inserted into the other slot to mount the second cooling module.

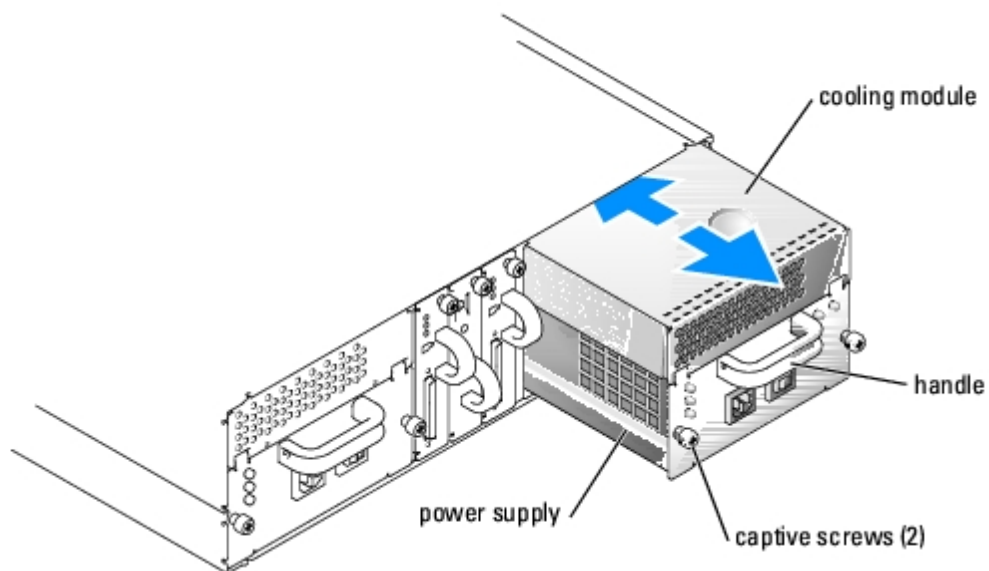
 **CAUTION:** A power supply and cooling module can be removed from a powered-on system for a maximum period of *five minutes*. Beyond that time, the system begins to overheat, and at a critical temperature, shuts down to prevent damage.

The cooling module is mounted to the power supply using a hook-and-latch fastening design. This design simplifies the removal and installation of cooling modules and power supplies.

To replace a cooling module, perform the following steps:

1. Using a #2 Phillips-head screwdriver, turn the two captive screws counterclockwise to release the power supply and cooling module (see [Figure](#).) from the module bay.

Figure 5-7. Replacing a Cooling Module



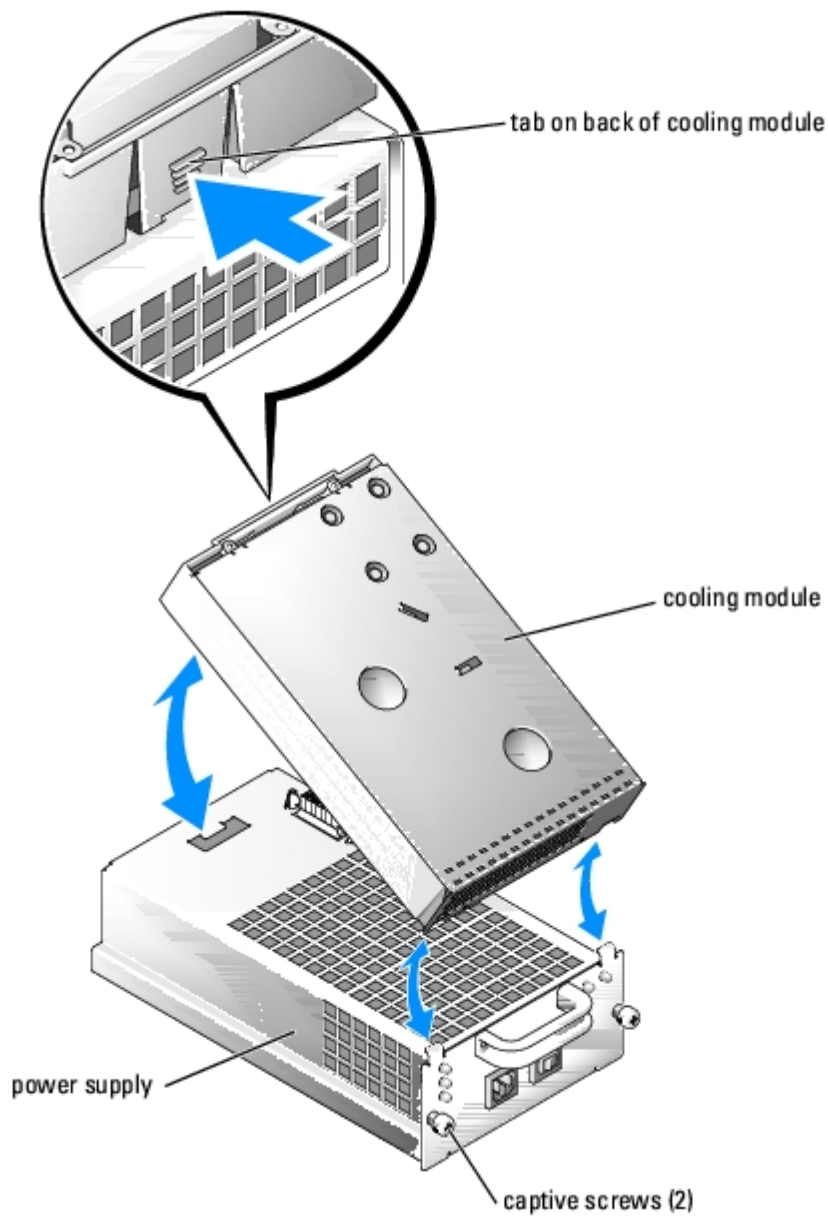
⚠ CAUTION: The power supply and cooling modules are heavy. Use both hands when removing.

2. Grasp the handle on the power supply and carefully pull the power supply and cooling module out of the module bay.

➡ NOTICE: The power-supply handle is provided to ease the task of pulling the power supply free from the bay. Do not use this handle to carry your storage system.

3. Detach the cooling module from the power supply by pressing the tab on the back of the cooling module and sliding the cooling module back and up (see [Figure 5-8](#)).

Figure 5-8. Detaching the Cooling Module From the Power Supply



4. Attach a new cooling module to the power supply by performing the reverse of step 3.
5. Carefully slide the new power supply and cooling module into the empty module bay, and push the module all the way to the back of the bay until it is seated in the backplane connector.

The power supply is seated when its front plate is even with the front plate of the adjacent power supply.

6. Turn on the power supply.

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Getting Help

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Technical Assistance

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

1. Complete the procedures in "Troubleshooting Your System."
2. Run the system diagnostics and record any information provided.
3. Use Dell's extensive suite of online services available at Dell Support at **support.dell.com** for help with installation and troubleshooting procedures.

For more information, see "Online Services."

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

 **NOTE:** Call technical support from a phone near or at the system so that technical support can assist you with any necessary procedures.

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

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.

For instructions on using the technical support service, see "[Technical Support Service](#)" and "[Before You Call](#)."

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

Online Services

You can access Dell Support at **support.dell.com**. Select your region on the **WELCOME TO DELL SUPPORT** page, and fill in the requested details to access help tools and information.

You can contact Dell electronically using the following addresses:

- World Wide Web

www.dell.com/

www.dell.com/ap/ (Asian/Pacific countries only)

www.dell.com/jp (Japan only)

www.euro.dell.com (Europe only)

www.dell.com/la (Latin American countries)

www.dell.ca (Canada only)

- Anonymous file transfer protocol (FTP)

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 (Asian/Pacific countries only)

support.jp.dell.com (Japan only)

support.euro.dell.com (Europe only)

- Electronic Quote Service

sales@dell.com

apmarketing@dell.com (Asian/Pacific countries only)

sales_canada@dell.com (Canada 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 about their portable and desktop computer systems.

When you call AutoTech, use your touch-tone telephone to select the subjects that correspond to your questions.

The AutoTech service is available 24 hours a day, 7 days a week. You can also access this service through the technical support service. See the contact information for your region.

Automated Order-Status Service

To check on the status of any Dell™ products that you have ordered, you can go to **support.dell.com**, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. See the contact information for your region.

Technical Support Service

Dell's technical support service is available 24 hours a day, 7 days a week, to answer your questions about Dell hardware. Our technical support staff use computer-based diagnostics to provide fast, accurate answers.

To contact Dell's technical support service, see "[Before You Call](#)" and then see the contact information for your region.

Dell Enterprise Training and Certification

Dell Enterprise Training and Certification is available; see **www.dell.com/training** for more information. This service may not be offered in all locations.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip available when you call. See the contact information for your region.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at www.dell.com. For the telephone number to call to speak to a sales specialist, see the contact information for your region.

Returning Items for Warranty Repair or Credit

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

1. Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.

For the telephone number to call, see the contact information for your region.

2. Include a copy of the invoice and a letter describing the reason for the return.
3. Include a copy of any diagnostic information indicating the tests you have run and any error messages reported by the system diagnostics.
4. Include any accessories that belong with the item(s) being returned (such as power cables, media such as CDs and diskettes, and guides) 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. 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.

If possible, turn on your 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 computer system itself. Ensure that the system documentation is available.



CAUTION: Before servicing any components inside your computer, see your *System Information Guide* for important safety information.


Contacting Dell

To contact Dell electronically, you can access the following websites:

- www.dell.com
- support.dell.com (technical support)

- **premiersupport.dell.com** (technical support for educational, government, healthcare, and medium/large business customers, including Premier, Platinum, and Gold customers)

For specific web addresses for your country, find the appropriate country section in the table below.

 **NOTE:** Toll-free numbers are for use within the country for which they are listed.

When you need to contact Dell, use the electronic addresses, telephone numbers, and codes provided in the following table. If you need assistance in determining which codes to use, contact a local or an international operator.

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Anguilla	General Support	toll-free: 800-335-0031
Antigua and Barbuda	General Support	1-800-805-5924
Argentina (Buenos Aires) International Access Code: 00 Country Code: 54 City Code: 11	Website: www.dell.com.ar	
	E-mail: us_latin_services@dell.com	
	E-mail for desktop and portable computers: la_techsupport@dell.com	
	E-mail for servers and EMC: la_enterprise@dell.com	
	Customer Care	toll-free: 0-800-444-0730
	Tech Support	toll-free: 0-800-444-0733
	Tech Support Services	toll-free: 0-800-444-0724
	Sales	0-810-444-3355
Aruba	General Support	toll-free: 800-1578
Australia (Sydney) International Access Code: 0011 Country Code: 61 City Code: 2	E-mail (Australia): au_tech_support@dell.com	
	E-mail (New Zealand): nz_tech_support@dell.com	
	Home and Small Business	1-300-655-533
	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
	Technical Support (portables and desktops)	toll-free: 1-300-655-533
	Technical Support (servers and workstations)	toll-free: 1-800-733-314
	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) International Access Code: 900 Country Code: 43 City Code: 1	Website: support.euro.dell.com	
	E-mail: tech_support_central_europe@dell.com	
	Home/Small Business Sales	0820 240 530 00
	Home/Small Business Fax	0820 240 530 49
	Home/Small Business Customer Care	0820 240 530 14
	Preferred Accounts/Corporate Customer Care	0820 240 530 16
Home/Small Business Technical Support	0820 240 530 14	

	Preferred Accounts/Corporate Technical Support	0660 8779
	Switchboard	0820 240 530 00
Bahamas	General Support	toll-free: 1-866-278-6818
Barbados	General Support	1-800-534-3066
Belgium (Brussels)	Website: support.euro.dell.com	
International Access Code: 00	E-mail for French-speaking Customers: support.euro.dell.com/be/fr/emaildell/	
Country Code: 32	Technical Support	02 481 92 88
City Code: 2	Technical Support Fax	02 481 92 95
	Customer Care	02 713 15 .65
	Corporate Sales	02 481 91 00
	Fax	02 481 92 99
	Switchboard	02 481 91 00
Bermuda	General Support	1-800-342-0671
Bolivia	General Support	toll-free: 800-10-0238
Brazil	Website: www.dell.com/br	
International Access Code: 00	Customer Support, Technical Support	0800 90 3355
Country Code: 55	Technical Support Fax	51 481 5470
City Code: 51	Customer Care Fax	51 481 5480
	Sales	0800 90 3390
British Virgin Islands	General Support	toll-free: 1-866-278-6820
Brunei	Customer Technical Support (Penang, Malaysia)	604 633 4966
Country Code: 673	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales (Penang, Malaysia)	604 633 4955
Canada (North York, Ontario)	Online Order Status: www.dell.ca/ostatus	
International Access Code: 011	AutoTech (automated technical support)	toll-free: 1-800-247-9362
	Customer Care (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Customer Care (med./large business, government)	toll-free: 1-800-326-9463
	Technical Support (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Technical Support (med./large bus., government)	toll-free: 1-800-387-5757
	Sales (Home Sales/Small Business)	toll-free: 1-800-387-5752
	Sales (med./large bus., government)	toll-free: 1-800-387-5755
	Spare Parts Sales & Extended Service Sales	1 866 440 3355
Cayman Islands	General Support	1-800-805-7541
Chile (Santiago)	Sales, Customer Support, and Technical Support	toll-free: 1230-020-4823
Country Code: 56		
City Code: 2		
China (Xiamen)	Technical Support website: support.dell.com.cn	
Country Code: 86	Technical Support E-mail: cn_support@dell.com	
City Code: 592	Customer Care E-mail: customer_cn@dell.com	

	Technical Support Fax	818 1350
	Technical Support (Dell™ Dimension™ and Inspiron™)	toll-free: 800 858 2969
	Technical Support (OptiPlex™, Latitude™, and Dell Precision™)	toll-free: 800 858 0950
	Technical Support (servers and storage)	toll-free: 800 858 0960
	Technical Support (projectors, PDAs, printers, switches, routers, and so on)	toll-free: 800 858 2920
	Customer Care	toll-free: 800 858 2060
	Customer Care Fax	592 818 1308
	Home and Small Business	toll-free: 800 858 2222
	Preferred Accounts Division	toll-free: 800 858 2557
	Large Corporate Accounts GCP	toll-free: 800 858 2055
	Large Corporate Accounts Key Accounts	toll-free: 800 858 2628
	Large Corporate Accounts North	toll-free: 800 858 2999
	Large Corporate Accounts North Government and Education	toll-free: 800 858 2955
	Large Corporate Accounts East	toll-free: 800 858 2020
	Large Corporate Accounts East Government and Education	toll-free: 800 858 2669
	Large Corporate Accounts Queue Team	toll-free: 800 858 2572
	Large Corporate Accounts South	toll-free: 800 858 2355
	Large Corporate Accounts West	toll-free: 800 858 2811
	Large Corporate Accounts Spare Parts	toll-free: 800 858 2621
Colombia	General Support	980-9-15-3978
Costa Rica	General Support	0800-012-0435
Czech Republic (Prague) International Access Code: 00 Country Code: 420	Website: support.euro.dell.com	
	E-mail: czech_dell@dell.com	
	Technical Support	22537 2727
	Customer Care	22537 2707
	Fax	22537 2714
	Tech Fax	22537 2728
	Switchboard	22537 2711
Denmark (Copenhagen) International Access Code: 00 Country Code: 45	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/dk/da/emaildell/	
	Technical Support	7023 0182
	Customer Care (Relational)	7023 0184
	Home/Small Business Customer Care	3287 5505
	Switchboard (Relational)	3287 1200
	Switchboard Fax (Relational)	3287 1201
	Switchboard (Home/Small Business)	3287 5000
	Switchboard Fax (Home/Small Business)	3287 5001
Dominica	General Support	toll-free: 1-866-278-6821
Dominican Republic	General Support	1-800-148-0530

Ecuador	General Support	toll-free: 999-119
El Salvador	General Support	01-899-753-0777
Finland (Helsinki) International Access Code: 990 Country Code: 358 City Code: 9	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/fi/fi/emaildell/	
	Technical Support	09 253 313 60
	Customer Care	09 253 313 38
	Fax	09 253 313 99
	Switchboard	09 253 313 00
France (Paris) (Montpellier) International Access Code: 00 Country Code: 33 City Codes: (1) (4)	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/fr/fr/emaildell/	
	Home and Small Business	
	Technical Support	0825 387 270
	Customer Care	0825 823 833
	Switchboard	0825 004 700
	Switchboard (calls from outside of France)	04 99 75 40 00
	Sales	0825 004 700
	Fax	0825 004 701
	Fax (calls from outside of France)	04 99 75 40 01
	Corporate	
	Technical Support	0825 004 719
	Customer Care	0825 338 339
	Switchboard	01 55 94 71 00
	Sales	01 55 94 71 00
	Fax	01 55 94 71 01
Germany (Langen) International Access Code: 00 Country Code: 49 City Code: 6103	Website: support.euro.dell.com	
	E-mail: tech_support_central_europe@dell.com	
	Technical Support	06103 766-7200
	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
	Switchboard	06103 766-7000
Greece International Access Code: 00 Country Code: 30	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/gr/en/emaildell/	
	Technical Support	00800-44 14 95 18
	Gold Service Technical Support	00800-44 14 00 83
	Switchboard	2108129810
	Gold Service Switchboard	2108129811
	Sales	2108129800

	Fax	2108129812
Grenada	General Support	toll-free: 1-866-540-3355
Guatemala	General Support	1-800-999-0136
Guyana	General Support	toll-free: 1-877-270-4609
Hong Kong International Access Code: 001 Country Code: 852	Website: support.ap.dell.com	
	Technical Support E-mail: apsupport@dell.com	
	Technical Support (Dimension and Inspiron)	2969 3188
	Technical Support (OptiPlex, Latitude, and Dell Precision)	2969 3191
	Technical Support (PowerApp™, PowerEdge™, PowerConnect™, and PowerVault™)	2969 3196
	Customer Care	3416 0910
	Large Corporate Accounts	3416 0907
	Global Customer Programs	3416 0908
	Medium Business Division	3416 0912
	Home and Small Business Division	2969 3105
India	Technical Support	1600 33 8045
	Sales (Large Corporate Accounts)	1600 33 8044
	Sales (Home and Small Business)	1600 33 8046
Ireland (Cherrywood) International Access Code: 16 Country Code: 353 City Code: 1	Website: support.euro.dell.com	
	E-mail: dell_direct_support@dell.com	
	Technical Support	1850 543 543
	U.K. Technical Support (dial within U.K. only)	0870 908 0800
	Home User Customer Care	01 204 4014
	Small Business Customer Care	01 204 4014
	U.K. Customer Care (dial within U.K. only)	0870 906 0010
	Corporate Customer Care	1850 200 982
	Corporate Customer Care (dial within U.K. only)	0870 907 4499
	Ireland Sales	01 204 4444
	U.K. Sales (dial within U.K. only)	0870 907 4000
	Fax/Sales Fax	01 204 0103
	Switchboard	01 204 4444
Italy (Milan) International Access Code: 00 Country Code: 39 City Code: 02	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/it/it/emaildell/	
	Home and Small Business	
	Technical Support	02 577 826 90
	Customer Care	02 696 821 14
	Fax	02 696 821 13
	Switchboard	02 696 821 12
	Corporate	
	Technical Support	02 577 826 90
	Customer Care	02 577 825 55

	Fax	02 575 035 30
	Switchboard	02 577 821
Jamaica	General Support (dial from within Jamaica only)	1-800-682-3639
Japan (Kawasaki)	Website: support.jp.dell.com	
International Access Code: 001	Technical Support (servers)	toll-free: 0120-198-498
Country Code: 81	Technical Support outside of Japan (servers)	81-44-556-4162
City Code: 44	Technical Support (Dimension and Inspiron)	toll-free: 0120-198-226
	Technical Support outside of Japan (Dimension and Inspiron)	81-44-520-1435
	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free: 0120-198-433
	Technical Support outside of Japan (Dell Precision, OptiPlex, and Latitude)	81-44-556-3894
	Technical Support (PDAs, projectors, printers, routers)	toll-free: 0120-981-690
	Technical Support outside of Japan (PDAs, projectors, printers, routers)	81-44-556-3468
	Faxbox Service	044-556-3490
	24-Hour Automated Order Service	044-556-3801
	Customer Care	044-556-4240
	Business Sales Division (up to 400 employees)	044-556-1465
	Preferred Accounts Division Sales (over 400 employees)	044-556-3433
	Large Corporate Accounts Sales (over 3500 employees)	044-556-3430
	Public Sales (government agencies, educational institutions, and medical institutions)	044-556-1469
	Global Segment Japan	044-556-3469
	Individual User	044-556-1760
	Switchboard	044-556-4300
Korea (Seoul)	Technical Support	toll-free: 080-200-3800
International Access Code: 001	Sales	toll-free: 080-200-3600
Country Code: 82	Customer Service (Penang, Malaysia)	604 633 4949
City Code: 2	Fax	2194-6202
	Switchboard	2194-6000
	Technical Support (Electronics and Accessories)	toll-free: 080-200-3801
Latin America	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 or 512 728-3772
Luxembourg	Website: support.euro.dell.com	
International Access Code: 00	E-mail: tech_be@dell.com	
Country Code: 352	Technical Support (Brussels, Belgium)	3420808075

	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
Macao	Technical Support	toll-free: 0800 105
Country Code: 853	Customer Service (Xiamen, China)	34 160 910
	Transaction Sales (Xiamen, China)	29 693 115
Malaysia (Penang)	Website: support.ap.dell.com	toll-free: 1 800 88 0193
International Access Code: 00	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free: 1 800 88 1306
Country Code: 60	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	
City Code: 4	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 88 1386
	Customer Service (Penang, Malaysia)	04 633 4949
	Transaction Sales	toll-free: 1 800 888 202
	Corporate Sales	toll-free: 1 800 888 213
Mexico	Customer Technical Support	001-877-384-8979 or 001-877-269-3383
International Access Code: 00	Sales	50-81-8800 or 01-800-888-3355
Country Code: 52	Customer Service	001-877-384-8979 or 001-877-269-3383
	Main	50-81-8800 or 01-800-888-3355
Montserrat	General Support	toll-free: 1-866-278-6822
Netherlands Antilles	General Support	001-800-882-1519
Netherlands (Amsterdam)	Website: support.euro.dell.com	
International Access Code: 00	Technical Support	020 674 45 00
Country Code: 31	Technical Support Fax	020 674 47 66
City Code: 20	Home/Small Business Customer Care	020 674 42 00
	Relational Customer Care	020 674 4325
	Home/Small Business Sales	020 674 55 00
	Relational Sales	020 674 50 00
	Home/Small Business Sales Fax	020 674 47 75
	Relational Sales Fax	020 674 47 50
	Switchboard	020 674 50 00
	Switchboard Fax	020 674 47 50
New Zealand	E-mail (New Zealand): nz_tech_support@dell.com	
International Access Code: 00	E-mail (Australia): au_tech_support@dell.com	
	Technical Support (for desktop and portable computers)	toll-free: 0800 446 255

Country Code: 64	Technical Support (for servers and workstations)	toll-free: 0800 443 563
	Home and Small Business	0800 446 255
	Government and Business	0800 444 617
	Sales	0800 441 567
	Fax	0800 441 566
Nicaragua	General Support	001-800-220-1006
Norway (Lysaker) International Access Code: 00 Country Code: 47	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/no/no/emaildell/	
	Technical Support	671 16882
	Relational Customer Care	671 17575
	Home/Small Business Customer Care	23162298
	Switchboard	671 16800
	Fax Switchboard	671 16865
Panama	General Support	001-800-507-0962
Peru	General Support	0800-50-669
Poland (Warsaw) International Access Code: 011 Country Code: 48 City Code: 22	Website: support.euro.dell.com	
	E-mail: pl_support_tech@dell.com	
	Customer Service Phone	57 95 700
	Customer Care	57 95 999
	Sales	57 95 999
	Customer Service Fax	57 95 806
	Reception Desk Fax	57 95 998
	Switchboard	57 95 999
Portugal International Access Code: 00 Country Code: 351	Website: support.euro.dell.com	
	E-mail: support.euro.dell.com/pt/en/emaildell/	
	Technical Support	707200149
	Customer Care	800 300 413
	Sales	800 300 410 or 800 300 411 or 800 300 412 or 21 422 07 10
	Fax	21 424 01 12
Puerto Rico	General Support	1-800-805-7545
St. Kitts and Nevis	General Support	toll-free: 1-877-441-4731
St. Lucia	General Support	1-800-882-1521
St. Vincent and the Grenadines	General Support	toll-free: 1-877-270-4609
Singapore (Singapore) International Access Code: 005 Country Code: 65	Website: support.ap.dell.com	
	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1800 394 7430
	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 394 7488
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 394 7478
	Customer Service (Penang, Malaysia)	604 633 4949

	Transaction Sales	toll-free: 1 800 394 7412
	Corporate Sales	toll-free: 1 800 394 7419
Slovakia (Prague)	Website: support.euro.dell.com	
International Access Code: 00	E-mail: czech_dell@dell.com	
Country Code: 421	Technical Support	02 5441 5727
	Customer Care	420 22537 2707
	Fax	02 5441 8328
	Tech Fax	02 5441 8328
	Switchboard (Sales)	02 5441 7585
South Africa (Johannesburg)	Website: support.euro.dell.com	
International Access Code:	E-mail: dell_za_support@dell.com	
09/091	Gold Queue	011 709 7713
Country Code: 27	Technical Support	011 709 7710
City Code: 11	Customer Care	011 709 7707
	Sales	011 709 7700
	Fax	011 706 0495
	Switchboard	011 709 7700
Southeast Asian and Pacific Countries	Customer Technical Support, Customer Service, and Sales (Penang, Malaysia)	604 633 4810
Spain (Madrid)	Website: support.euro.dell.com	
International Access Code: 00	E-mail: support.euro.dell.com/es/es/emaildell/	
Country Code: 34	Home and Small Business	
City Code: 91	Technical Support	902 100 130
	Customer Care	902 118 540
	Sales	902 118 541
	Switchboard	902 118 541
	Fax	902 118 539
	Corporate	
	Technical Support	902 100 130
	Customer Care	902 115 236
	Switchboard	91 722 92 00
	Fax	91 722 95 83
Sweden (Upplands Vasby)	Website: support.euro.dell.com	
International Access Code: 00	E-mail: support.euro.dell.com/se/sv/emaildell/	
Country Code: 46	Technical Support	08 590 05 199
City Code: 8	Relational Customer Care	08 590 05 642
	Home/Small Business Customer Care	08 587 70 527
	Employee Purchase Program (EPP) Support	20 140 14 44
	Technical Support Fax	08 590 05 594
	Sales	08 590 05 185
Switzerland	Website: support.euro.dell.com	

(Geneva) International Access Code: 00 Country Code: 41 City Code: 22	E-mail: Tech_support_central_Europe@dell.com	
	E-mail for French-speaking HSB and Corporate Customers: support.euro.dell.com/ch/fr/emaildell/	
	Technical Support (Home and Small Business)	0844 811 411
	Technical Support (Corporate)	0844 822 844
	Customer Care (Home and Small Business)	0848 802 202
	Customer Care (Corporate)	0848 821 721
	Fax	022 799 01 90
	Switchboard	022 799 01 01
Taiwan International Access Code: 002 Country Code: 886	Website: support.ap.dell.com	
	E-mail: ap_support@dell.com	
	Technical Support (OptiPlex, Latitude, Inspiron, Dimension, and Electronics and Accessories)	toll-free: 00801 86 1011
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 00801 60 1256
	Transaction Sales	toll-free: 00801 65 1228
	Corporate Sales	toll-free: 00801 651 227
Thailand International Access Code: 001 Country Code: 66	Website: support.ap.dell.com	
	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 0060 07
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 0600 09
	Customer Service (Penang, Malaysia)	604 633 4949
	Corporate Sales	toll-free: 1800 006 009
	Transaction Sales	toll-free: 1800 006 006
Trinidad/Tobago	General Support	1-800-805-8035
Turks and Caicos Islands	General Support	toll-free: 1-866-540-3355
U.K. (Bracknell) International Access Code: 00 Country Code: 44 City Code: 1344	Website: support.euro.dell.com	
	Customer Care website: support.euro.dell.com/uk/en/ECare/Form/Home.asp	
	E-mail: dell_direct_support@dell.com	
	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870 908 0500
	Technical Support (direct and general)	0870 908 0800
	Global Accounts Customer Care	01344 373 186
	Home and Small Business Customer Care	0870 906 0010
	Corporate Customer Care	01344 373 185
	Preferred Accounts (500–5000 employees) Customer Care	0870 906 0010
	Central Government Customer Care	01344 373 193
	Local Government & Education Customer Care	01344 373 199
	Health Customer Care	01344 373 194
	Home and Small Business Sales	0870 907 4000

	Corporate/Public Sector Sales	01344 860 456
	Home and Small Business Fax	0870 907 4006
Uruguay	General Support	toll-free: 000-413-598-2521
U.S.A. (Austin, Texas) International Access Code: 011 Country Code: 1	Automated Order-Status Service	toll-free: 1-800-433-9014
	AutoTech (portable and desktop computers)	toll-free: 1-800-247-9362
	Consumer (Home and Home Office)	
	Technical Support	toll-free: 1-800-624-9896
	Customer Service	toll-free: 1-800-624-9897
	DellNet™ Service and Support	toll-free: 1-877-Dellnet (1-877-335-5638)
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Financial Services website: www.dellfinancialservices.com	
	Financial Services (lease/loans)	toll-free: 1-877-577-3355
	Financial Services (Dell Preferred Accounts [DPA])	toll-free: 1-800-283-2210
	Business	
	Customer Service and Technical Support	toll-free: 1-800-822-8965
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Printers and Projectors Technical Support	toll-free: 1-877-459-7298
	Public (government, education, and healthcare)	
	Customer Service and Technical Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-234-1490
	Dell Sales	toll-free: 1-800-289-3355 or toll-free: 1-800-879-3355
	Dell Outlet Store (Dell refurbished computers)	toll-free: 1-888-798-7561
	Software and Peripherals Sales	toll-free: 1-800-671-3355
Spare Parts Sales	toll-free: 1-800-357-3355	
Extended Service and Warranty Sales	toll-free: 1-800-247-4618	
Fax	toll-free: 1-800-727-8320	
Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired	toll-free: 1-877-DELLTTY (1-877-335-5889)	
U.S. Virgin Islands	General Support	1-877-673-3355
Venezuela	General Support	8001-3605

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Abbreviations and Acronyms

Dell™ PowerVault™ 220S and 221S Systems Installation and Troubleshooting Guide

A

ampere(s)

AC

alternating current

ACM

advanced cooling module

BBS

Bulletin Board Service

bps

bits per second

BTU

British thermal unit

C

Celsius

cm

centimeter(s)

DC

direct current

ESD

electrostatic discharge

EMM

enclosure management module

F

Fahrenheit

FC

Fibre Channel

FCAL

Fibre Channel arbitrated loop

ft

feet

FTP

file transfer protocol

g

gram(s)

GB

gigabyte

Gb

gigabit

Gb/s

gigabits per second

GUI

graphical user interface

HBA

host bus adapter

HSSDC

high-speed serial data connector

HVD

high-voltage differential

Hz

hertz

ID

identification

I/O

input/output

JBOD

just a bunch/box of disks

K

kilo- (1024)

lb

pound(s)

LED

light-emitting diode

LS

loop resiliency circuit/SCSI enclosure services

LVD

low-voltage differential

m

meter

MB

megabyte(s)

MB/sec

megabyte(s) per second

MHz

megahertz

PCB

printed circuit board

PERC

PowerEdge™ Expandable RAID Controller

POST

power-on self-test

RAID

redundant array of independent disks

rpm

revolutions per minute

SAFTE

SCSI accessed fault-tolerant enclosures

SCSI

small computer system interface

sec

second(s)

SES

SCSI enclosure services

UPS

uninterruptible power supply

V

volt(s)

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