

Dell™ PowerEdge™ R300 Systems Hardware Owner's Manual

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.

**Information in this document is subject to change without notice.
© 2007 Dell Inc. All rights reserved.**

Reproduction in any manner whatsoever without the written permission of Dell Inc. is strictly forbidden.

Trademarks used in this text: *Dell*, the *DELL* logo, *PowerEdge*, and *PowerVault* are trademarks of Dell Inc.; *Microsoft*, *MS-DOS*, *Windows*, and *Windows Server* are either trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries; *Red Hat* is a registered trademark of Red Hat, Inc.; *UNIX* is a registered trademark of The Open Group in the United States and other countries; *EMC* is a registered trademark of EMC Corporation.

Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell Inc. disclaims any proprietary interest in trademarks and trade names other than its own.

Model SMT

December 2007

P/N XK127

Rev. A00

Contents

| | | |
|---|--|----|
| 1 | About Your System | 11 |
| | Other Information You May Need | 11 |
| | Accessing System Features During Startup | 12 |
| | Front-Panel Features and Indicators | 13 |
| | Hard-Drive Indicator Codes | 17 |
| | Back-Panel Features and Indicators | 19 |
| | Connecting External Devices | 19 |
| | Power Indicator Codes | 20 |
| | NIC Indicator Codes | 21 |
| | LCD Status Messages | 22 |
| | Solving Problems Described by LCD Status Messages | 33 |
| | Removing LCD Status Messages | 33 |
| | System Messages | 34 |
| | Warning Messages | 43 |
| | Diagnostics Messages | 44 |
| | Alert Messages | 44 |

| | | |
|---|--|-----------|
| 2 | Using the System Setup Program | 45 |
| | Entering the System Setup Program | 45 |
| | Responding to Error Messages | 45 |
| | Using the System Setup Program | 46 |
| | System Setup Options | 46 |
| | Main Screen | 46 |
| | Memory Information Screen | 49 |
| | CPU Information Screen | 50 |
| | SATA Configuration Screen | 51 |
| | Integrated Devices Screen | 51 |
| | Serial Communication Screen | 52 |
| | System Security Screen | 53 |
| | Exit Screen | 56 |
| | System and Setup Password Features | 56 |
| | Using the System Password | 57 |
| | Using the Setup Password | 59 |
| | Disabling a Forgotten Password | 60 |
| | Baseboard Management Controller Configuration | 61 |
| | Entering the BMC Setup Module | 61 |
| | BMC Setup Module Options | 61 |
| 3 | Installing System Components | 63 |
| | Recommended Tools | 63 |
| | Inside the System | 64 |
| | Front Bezel | 67 |
| | Removing the Front Bezel | 67 |
| | Replacing the Front Bezel | 68 |

| | |
|---|-----------|
| Opening and Closing the System | 68 |
| Opening the System | 69 |
| Closing the System | 69 |
| System Board Shroud | 70 |
| Removing the System Board Shroud | 71 |
| Installing the System Board Shroud | 72 |
| Hard Drives | 73 |
| Removing a Drive Blank | 73 |
| Installing a Hard-Drive Blank | 74 |
| Removing a Hot-Plug Hard Drive | 74 |
| Installing a Hot-Plug Hard Drive | 75 |
| Replacing a Hard-Drive Carrier | 77 |
| Removing a Hard Drive From a Hard-Drive Carrier | 77 |
| Installing a Hard Drive Into a Drive Carrier | 77 |
| Optical Drive | 79 |
| Removing the Optical Drive from the System | 79 |
| Installing the Optical Drive | 80 |
| Installing the Optical Drive in the Optical Drive Tray | 82 |
| Removing the Optical Drive From the Optical Drive Tray | 82 |
| Cooling Fan Modules | 83 |
| Removing the Fan Assembly | 84 |
| Installing the Fan Assembly | 86 |
| Power Supply Fan Assembly | 86 |
| Removing the Power Supply Fan Assembly | 86 |
| Installing the Power Supply Fan Assembly | 88 |

| | |
|--|------------|
| Power Supplies | 88 |
| Removing a Power Supply | 88 |
| Replacing a Power Supply | 89 |
| Internal USB Memory Key | 90 |
| Installing the Optional Internal USB Memory Key | 90 |
| RAC Card | 92 |
| Removing the RAC Card | 92 |
| Installing a RAC Card | 94 |
| Expansion Cards | 95 |
| Installing an Expansion Card | 95 |
| Removing an Expansion Card | 96 |
| Riser Cards | 97 |
| Removing the Riser Card | 98 |
| Installing the Riser Card | 99 |
| Backplane Board | 100 |
| Removing the Backplane Board | 100 |
| Installing the Backplane Board | 102 |
| System Memory | 102 |
| Memory Module Installation Guidelines | 102 |
| Installing Memory Modules | 104 |
| Removing Memory Modules | 106 |
| Processor | 106 |
| Replacing the Processor | 106 |
| Installing a Processor | 109 |
| System Battery | 111 |
| Replacing the System Battery | 111 |

| | |
|--|------------|
| Control Panel Assembly (Service-only Procedure) | 113 |
| Removing the Control Panel Assembly | 113 |
| Installing the Control Panel Assembly | 115 |
| Power Distribution Board | 116 |
| Removing the Power Distribution Board | 116 |
| Replacing the Power Distribution Board | 118 |
| System Board (Service-Only Procedure) | 118 |
| Removing the System Board Assembly | 119 |
| Installing the System Board Assembly | 121 |
| | |
| 4 Troubleshooting Your System | 123 |
| | |
| Safety First—For You and Your System | 123 |
| | |
| Start-Up Routine | 123 |
| | |
| Checking the Equipment | 124 |
| Troubleshooting External Connections | 124 |
| Troubleshooting the Video Subsystem | 124 |
| Troubleshooting the Keyboard | 125 |
| Troubleshooting the Mouse | 126 |
| | |
| Troubleshooting Serial I/O Problems | 126 |
| Troubleshooting a Serial I/O Device | 127 |
| Troubleshooting a USB Device | 127 |
| | |
| Troubleshooting a NIC | 129 |
| | |
| Troubleshooting a Wet System | 130 |
| | |
| Troubleshooting a Damaged System | 131 |
| | |
| Troubleshooting the System Battery | 132 |

| | |
|---|------------|
| Troubleshooting Power Supplies | 133 |
| Troubleshooting System Cooling Problems | 134 |
| Troubleshooting a Fan | 134 |
| Troubleshooting System Memory | 135 |
| Troubleshooting an Internal USB Key | 137 |
| Troubleshooting a Diskette Drive | 138 |
| Troubleshooting an Optical Drive | 140 |
| Troubleshooting a SCSI Tape Drive | 141 |
| Troubleshooting a Hard Drive | 142 |
| Troubleshooting a Hot-plug Hard Drive | 143 |
| Troubleshooting a SAS or SAS RAID Controller | 145 |
| Troubleshooting Expansion Cards | 147 |
| Troubleshooting the Microprocessors | 149 |
| | |
| 5 Running the System Diagnostics | 151 |
| Using Dell PowerEdge Diagnostics | 151 |
| System Diagnostics Features | 151 |
| When to Use the System Diagnostics | 152 |
| Running the System Diagnostics | 152 |
| System Diagnostics Testing Options | 152 |

| | |
|--|------------|
| Using Custom Test Options | 153 |
| Selecting Devices for Testing | 153 |
| Selecting Diagnostics Options | 153 |
| Viewing Information and Results | 154 |
| | |
| 6 Jumpers and Connectors | 155 |
| System Board Jumpers | 155 |
| System Board Connectors | 155 |
| Riser Card Connectors | 158 |
| Control Panel Assembly Connectors | 159 |
| SAS/SATA Backplane Board Connectors | 160 |
| Expansion Card Connectors for SAS Controller Daughter Cards | 160 |
| Disabling a Forgotten Password | 162 |
| | |
| 7 Getting Help | 165 |
| Contacting Dell | 165 |
| | |
| Glossary | 167 |
| | |
| Index | 179 |

About Your System

This section describes the physical, firmware, and software interface features that provide and ensure the essential functioning of your system. The physical connectors on your system's front and back panels provide convenient connectivity and system expansion capability. The system firmware, applications, and operating systems monitor the system and component status and alert you when a problem arises. System conditions can be reported by any of the following:

- Front or back panel indicators
- LCD status messages
- System messages
- Warning messages
- Diagnostics messages
- Alert messages

This section describes each type of message, lists the possible causes, and provides steps to resolve any problems indicated by a message. The system indicators and features are illustrated in this section.

Other Information You May Need



CAUTION: The *Product Information Guide* provides important safety and regulatory information. Warranty information may be included within this document or as a separate document.

- The *Rack Installation Guide* and *Rack Installation Instructions* included with your rack solution describe how to install your system into a rack.
- The *Getting Started Guide* provides an overview of system features, setting up your system, and technical specifications.
- CDs included with your system provide documentation and tools for configuring and managing your system.
- Systems management software documentation describes the features, requirements, installation, and basic operation of the software.

- Operating system documentation describes how to install (if necessary), configure, and use the operating system software.
- Documentation for any components you purchased separately provides information to configure and install these options.
- Updates are sometimes included with the system to describe changes to the system, software, and/or documentation.



NOTE: Always check for updates on support.dell.com and read the updates first because they often supersede information in other documents.

- Release notes or readme files may be included to provide last-minute updates to the system or documentation or advanced technical reference material intended for experienced users or technicians.

Accessing System Features During Startup

Table 1-1 describes keystrokes that may be entered during startup to access system features. If your operating system begins to load before you enter the keystroke, allow the system to finish booting, and then restart your system and try again.

Table 1-1. Keystrokes for Accessing System Features

| Keystroke | Description |
|-----------|---|
| <F2> | Enters the System Setup program. See "Entering the System Setup Program" on page 45. |
| <F10> | Opens the utility partition, allowing you to run the system diagnostics. See "Running the System Diagnostics" on page 152. |
| <F11> | Enters the boot mode selection screen, allowing you to choose a boot device. |
| <F12> | Starts PXE boot. |
| <Ctrl+E> | Enters the Baseboard Management Controller (BMC) Management Utility, which allows access to the system event log (SEL) and configuration of the remote access controller (RAC) card. See the <i>Dell OpenManage™ Baseboard Management Controller User's Guide</i> for more information on setup and use of BMC. |
| <Ctrl+C> | This keystroke enters the SAS Configuration Utility. See your SAS controller <i>User's Guide</i> for more information. |

Table 1-1. Keystrokes for Accessing System Features (continued)

| Keystroke | Description |
|-----------|---|
| <Ctrl+R> | If you have the optional battery-cached SAS RAID controller, this keystroke enters the RAID configuration utility. For more information, see the documentation for your SAS controller card. |
| <Ctrl+S> | If you have PXE support enabled through the System Setup Program (see "Integrated Devices Screen" on page 51), this keystroke allows you to configure NIC settings for PXE boot. For more information, see the documentation for your integrated NIC. |

Front-Panel Features and Indicators

Figure 1-1 shows the controls, indicators, connectors, and features on the system front panel behind the optional bezel. (To remove the bezel, press the latch at the left end of the bezel. See "Opening and Closing the System" on page 68.) Table 1-2 provides component descriptions.

Figure 1-1. Front-Panel Features and Indicators

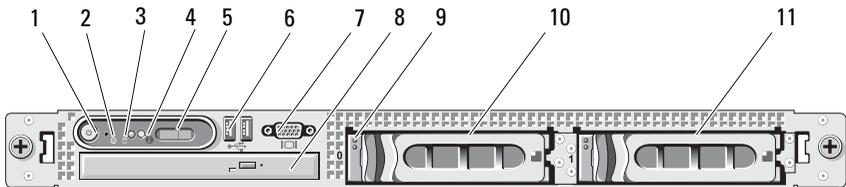


Table 1-2. Front-Panel Components

| Item | Component | Icon | Description |
|------|----------------------------------|---|--|
| 1 | Power-on indicator, power button |  | <p>The power button turns system power off and on.</p> |

➔ NOTICE: If you turn off the system using the power button and the system is running an ACPI-compliant operating system, the system can perform an orderly shutdown before power is turned off. If the power button is pressed for more than 4 seconds, the system power will turn off regardless of the current operating system state. If the system is not running an ACPI-compliant operating system, power is turned off immediately after the power button is pressed.

The power button is enabled in the System Setup program. When disabled, the button can only turn the system power on. For more information, see "Using the System Setup Program" on page 46 and the operating system's documentation.

The power-on indicator lights or blinks to indicate the status of power to the system.

The power-on indicator lights when the system is on. The indicator is off when the system is off and power is disconnected from the system. The indicator blinks when the system is on but in standby state, or when the system is off but is still connected to the power source.

To exit from the standby state, briefly press the power button.

Table 1-2. Front-Panel Components (continued)

| Item | Component | Icon | Description |
|------|-------------------------------|---|--|
| 2 | NMI button |  | Used to troubleshoot software and device driver errors when using certain operating systems. This button can be pressed using the end of a paper clip. Use this button only if directed to do so by qualified support personnel or by the operating system's documentation. |
| 3 | Hard-drive activity indicator |  | Indicates current hard-drive activity on the system. |
| 4 | System identification button |  | The identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pushed, the LCD panel on the front and the blue system status indicator on the back blink until one of the buttons is pushed again. |
| 5 | LCD panel | | <p>Provides system ID, status information, and system error messages.</p> <p>The LCD lights during normal system operation. Both the systems management software and the identification buttons located on the front and back of the system can cause the LCD to flash blue to identify a particular system.</p> <p>The LCD lights amber when the system needs attention, and the LCD panel displays an error code followed by descriptive text.</p> <p>NOTE: If the system is connected to AC power and an error has been detected, the LCD lights amber regardless of whether the system has been powered on.</p> |
| 6 | USB connectors (2) |  | Connect USB 2.0-compliant devices to the system. |

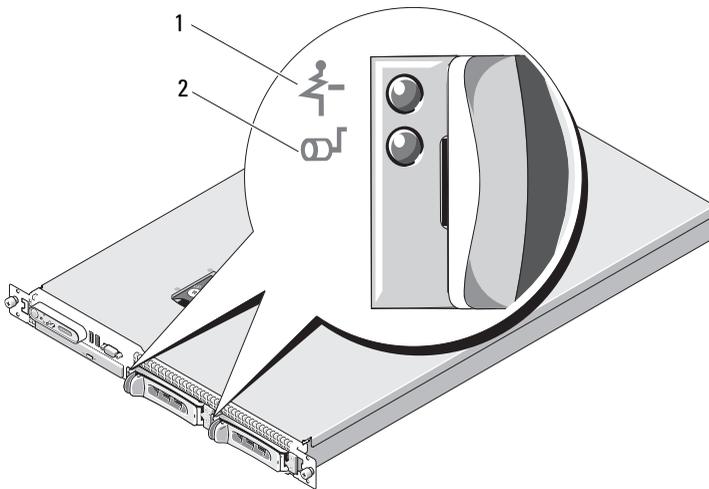
Table 1-2. Front-Panel Components (continued)

| Item | Component | Icon | Description |
|------|-------------------------------|---|--|
| 7 | Video connector |  | Connects a monitor to the system. |
| 8 | Optical drive (optional) | | One optional slim-line SATA DVD-ROM drive or DVD-RW drive, or combination CD-RW/DVD drive (when available). NOTE: DVD devices are data only. |
| 9 | Hard-drive activity indicator |  | The green hard-drive activity indicator flashes when the hard drives are in use. |
| 10 | Hard drive 0 | | Optional 3.5-inch SAS or SATA hot-plug hard drive. |
| 11 | Hard drive 1 | | Optional 3.5-inch SAS or SATA hot-plug hard drive. |

Hard-Drive Indicator Codes

The hard-drive carriers have two indicators—the drive-activity indicator and the drive-status indicator. See Figure 1-2. In RAID configurations, the drive-status indicator lights to indicate the status of the drive. In non-RAID configurations, only the drive-activity indicator lights; the drive-status indicator is off.

Figure 1-2. Hard-Drive Indicators



1 drive-status indicator (green and amber)

2 green drive-activity indicator

Table 1-3 lists the drive indicator patterns for RAID hard drives. Different patterns are displayed as drive events occur in the system. For example, if a hard drive fails, 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 insertion or removal" pattern. After the replacement drive is installed, the "drive being prepared for operation" pattern appears, followed by the "drive online" pattern.



NOTE: For non-RAID configurations, only the drive-activity indicator is active. The drive-status indicator is off.

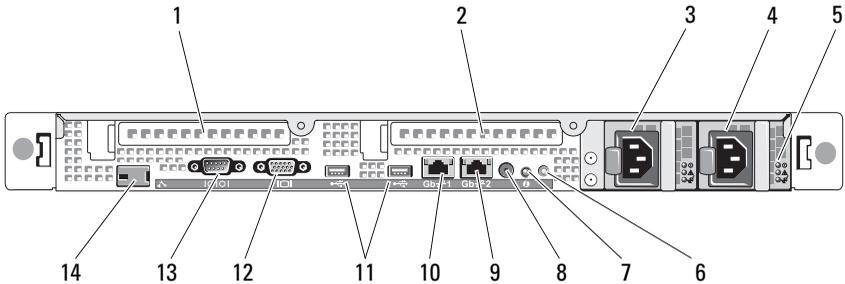
Table 1-3. Hard-Drive Indicator Patterns for RAID

| Condition | Drive-Status Indicator Pattern |
|--------------------------------------|---|
| Identify drive/preparing for removal | Blinks green two times per second |
| Drive ready for insertion or removal | Off |
| Drive predicted failure | Blinks green, amber, and off. |
| Drive failed | Blinks amber four times per second. |
| Drive rebuilding | Blinks green slowly. |
| Drive online | Steady green. |
| Rebuild aborted | Blinks green three seconds, amber three seconds, and off six seconds. |

Back-Panel Features and Indicators

Figure 1-3 shows the controls, indicators, and connectors located on the system's back panel.

Figure 1-3. Back-Panel Features and Indicators



- | | | | |
|----|---------------------------------------|----|---|
| 1 | PCIe slot 1- riser card | 2 | PCIe slot 2 - riser card |
| 3 | power supply bay 1 (PS1) | 4 | power supply bay 2 (PS2) |
| 5 | redundant power supply indicators (2) | 6 | system identification button |
| 7 | system status indicator | 8 | system status indicator connector |
| 9 | NIC2 connector (Gb) | 10 | NIC1 connector (Gb) |
| 11 | 2.0-compliant USB connectors (2) | 12 | video connector |
| 13 | serial connector | 14 | remote access controller (RAC) connector (optional) |

Connecting External Devices

When connecting external devices to your system, follow these guidelines:

- Most devices must be connected to a specific connector and device drivers must be installed before the device operates properly. (Device drivers are normally included with your operating system software or with the device itself.) See the documentation that accompanied the device for specific installation and configuration instructions.

- Always attach an external device while your system and the device are turned off. Next, turn on any external devices before turning on the system (unless the documentation for the device specifies otherwise).

See "Using the System Setup Program" on page 46 for information about enabling, disabling, and configuring I/O ports and connectors.

Power Indicator Codes

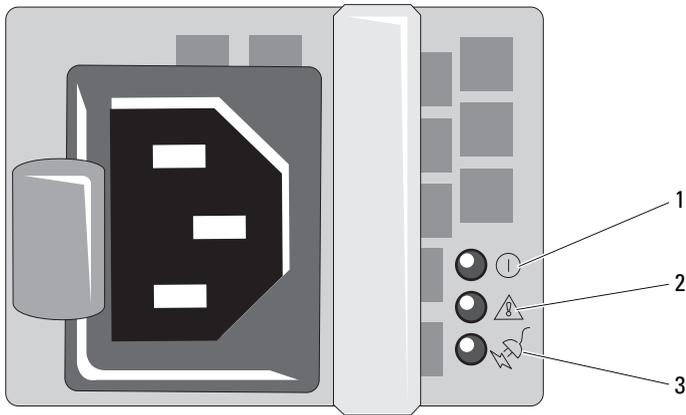
The power button on the front panel controls the power to the system from the system's power supplies. The power indicator lights green when the system is on.

The indicators on the redundant power supplies show whether power is present or whether a power fault has occurred (see Figure 1-4). Table 1-4 lists the power supply indicator codes.

Table 1-4. Redundant Power Supply Indicators

| Indicator | Function |
|---------------------|---|
| Power supply status | Green indicates that the power supply is operational and providing DC power to the system. |
| Power supply fault | Amber indicates a problem with the power supply. |
| AC line status | Green indicates that a valid AC source is connected to the power supply and is operational. |

Figure 1-4. Redundant Power Supply Indicators



1 power supply status
(DC out is operational)

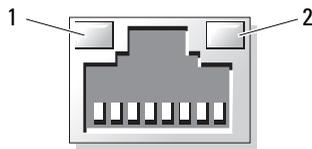
2 power supply fault

3 AC line status (AC in is operational)

NIC Indicator Codes

Each NIC on the back panel has an indicator that provides information on network activity and link status. See Figure 1-5. Table 1-5 lists the NIC indicator codes.

Figure 1-5. NIC Indicators



1 link indicator

2 activity indicator

Table 1-5. NIC Indicator Codes

| Indicator | Indicator Code |
|--|--|
| Link and activity indicators are off. | The NIC is not connected to the network. |
| Link indicator is green. | The NIC is connected to a valid link partner on the network. |
| Activity indicator is blinking yellow. | Network data is being sent or received. |

LCD Status Messages

The system's control panel LCD provides status messages to signify when the system is operating correctly or when the system needs attention.

The LCD lights blue to indicate a normal operating condition, and lights amber to indicate an error condition. The LCD scrolls a message that includes a status code followed by descriptive text. Table 1-6 lists the LCD status messages that can occur and the probable cause for each message. The LCD messages refer to events recorded in the System Event Log (SEL). For information on the SEL and configuring system management settings, see the systems management software documentation.

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

 **NOTE:** If your system fails to boot, press the System ID button for at least five seconds until an error code appears on the LCD. Record the code, then see "Getting Help" on page 165.

Table 1-6. LCD Status Messages

| Code | Text | Causes | Corrective Actions |
|-------------|---------------------------|--|--|
| <i>N/A</i> | <i>SYSTEM NAME</i> | <p>A 62-character string that can be defined by the user in the System Setup program.</p> <p>The <i>SYSTEM NAME</i> displays under the following conditions:</p> <ul style="list-style-type: none">• The system is powered on.• The power is off and active errors are displayed. | <p>This message is for information only.</p> <p>You can change the system ID and name in the System Setup program. See "Entering the System Setup Program" on page 45.</p> |
| E1000 | FAILSAFE, Call Support | Check the system event log for critical failure events. | See "Getting Help" on page 165. |
| E1114 | Temp Ambient | Ambient system temperature is out of acceptable range. | See "Troubleshooting System Cooling Problems" on page 134. |
| E1115 | Temp Planar | Planar system temperature is out of acceptable range. | See "Troubleshooting System Cooling Problems" on page 134. |
| E1118 | CPU Temp Interface | The BMC is unable to determine the CPU(s) temperature status. Consequently, the BMC increases the CPU fan speed to maximum as a precautionary measure. | Turn off power to the system and restart the system. See "Getting Help" on page 165. |
| E1210 | CMOS Batt | CMOS battery is missing, or the voltage is out of acceptable range. | See "Troubleshooting the System Battery" on page 132. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|--------------------|---|---|
| E1211 | ROMB Batt | RAID battery is either missing, bad, or unable to recharge due to thermal issues. | Reseat the RAID battery connector. See "Troubleshooting a SAS or SAS RAID Controller" on page 145, and "Troubleshooting System Cooling Problems" on page 134. |
| E1214 | ## PwrGd | Specified voltage regulator has failed. | See "Getting Help" on page 165. |
| E1215 | ## PwrGd | Specified voltage regulator has failed. | See "Getting Help" on page 165. |
| E1226 | PCI Rsr 1.5V PwrGd | 1.5V Riser Card Power Good failure. | See "Getting Help" on page 165. |
| E1229 | CPU # VCORE | Processor # VCORE voltage regulator has failed. | See "Getting Help" on page 165. |
| E122A | CPU VTT PwrGd | Processor # VTT voltage has exceeded the allowable voltage range | See "Getting Help" on page 165. |
| E1310 | RPM Fan ## | RPM of specified cooling fan is out of acceptable operating range. | See "Troubleshooting System Cooling Problems" on page 134. |
| E1311 | FAN MOD ## RPM | RPM of specified cooling fan module is out of acceptable operating range. | See "Troubleshooting System Cooling Problems" on page 134. |
| E1313 | Fan Redundancy | The system is no longer fan-redundant. Another fan failure will put the system at risk of over-heating. | Check control panel LCD for additional scrolling messages. See "Troubleshooting System Cooling Problems" on page 134. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|--------------------|---|---|
| E1410 | CPU # IERR | Specified microprocessor is reporting an internal error. | See your system's "Information Update Tech Sheet" located on support.dell.com for the most current system information. If the problem persists, see "Getting Help" on page 165. |
| E1414 | CPU # Thermtrip | Specified microprocessor is out of acceptable temperature range and has halted operation. | See "Troubleshooting System Cooling Problems" on page 134. If the problem persists, ensure that the microprocessor heat sinks are properly installed. See "Troubleshooting the Microprocessors" on page 149. NOTE: The LCD continues to display this message until the system's power cord is disconnected and reconnected to the AC power source, or the SEL is cleared using either Server Management Utility or the BMC Management Utility. See the <i>Dell™ OpenManage™ Baseboard Management Controller User's Guide</i> for information about these utilities. |
| E1418 | CPU # Presence | Specified processor is missing or bad, and the system is in an unsupported configuration. | See "Troubleshooting the Microprocessors" on page 149. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|-----------------|--|---|
| E141C | CPU Mismatch | Processors are in a configuration unsupported by Dell. | Ensure that your processors match and conform to the type described in the Microprocessor Technical Specifications outlined in your system's <i>Getting Started Guide</i> . |
| E141F | CPU Protocol | The system BIOS has reported a processor protocol error. | See "Getting Help" on page 165. |
| E1420 | CPU Bus PERR | The system BIOS has reported a processor bus parity error. | See "Getting Help" on page 165. |
| E1421 | CPU Init | The system BIOS has reported a processor initialization error. | See "Getting Help" on page 165. |
| E1422 | CPU Machine Chk | The system BIOS has reported a machine check error. | See "Getting Help" on page 165. |
| E1610 | PS # Missing | No power is available from the specified power supply; specified power supply is improperly installed or faulty. | See "Troubleshooting Power Supplies" on page 133. |
| E1614 | PS # Status | No power is available from the specified power supply; specified power supply is improperly installed or faulty. | See "Troubleshooting Power Supplies" on page 133. |
| E1618 | PS # Predictive | Power supply voltage is out of acceptable range; specified power supply is improperly installed or faulty. | See "Troubleshooting Power Supplies" on page 133. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|-------------------------|---|--|
| E161C | PS # Input Lost | Power source for specified power supply is unavailable, or out of acceptable range. | Check the AC power source for the specified power supply. If the problem persists, see "Troubleshooting Power Supplies" on page 133. |
| E1624 | PS Redundancy | The power supply subsystem is no longer redundant. If the last supply fails, the system will go down. | See "Troubleshooting Power Supplies" on page 133. |
| E1710 | I/O Channel Chk | The system BIOS has reported an I/O channel check. | See "Getting Help" on page 165. |
| E1711 | PCI PERR B## D## F## | The system BIOS has reported a PCI parity error on a component that resides in PCI configuration space at bus ##, device ##, function ##. | Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| | PCI PERR Slot # | The system BIOS has reported a PCI parity error on a component that resides in the specified PCIe slot. | Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|----------------------------------|--|---|
| E1712 | PCI SERR B## D## F## | The system BIOS has reported a PCI system error on a component that resides in PCI configuration space at bus ##, device ##, function ##. | Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| | PCI SERR Slot # | The system BIOS has reported a PCI system error on a component that resides in the specified slot. | Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| E1714 | Unknown Err | The system BIOS has determined that there has been an error in the system, but is unable to determine its origin. | See "Getting Help" on page 165. |
| E171F | PCIE Fatal Err B## D## F## | The system BIOS has reported a PCIe fatal error on a component that resides in PCIe configuration space at bus ##, device ##, function ##. | Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| | PCIE Fatal Err Slot # | The system BIOS has reported a PCIe fatal error on a component that resides in the specified slot. | Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| E1810 | HDD ## Fault | The SAS subsystem has determined that hard drive ## has experienced a fault. | See "Troubleshooting a Hard Drive" on page 142. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|-------------------------------|--|---|
| E1811 | HDD ## Rbl'd Abrt | The specified hard drive has experienced a rebuild abort. | See "Troubleshooting a Hard Drive" on page 142. If the problem persists, see your RAID documentation. |
| E1812 | HDD ## Removed | The specified hard drive has been removed from the system. | Information only. |
| E1913 | CPU & Firmware Mismatch | The BMC firmware does not support the CPU. | Update to the latest BMC firmware. See the <i>BMC User's Guide</i> for more information on setup and use of BMC. |
| E1A12 | PCI Rsr Config | One or all of the PCIe risers is configured incorrectly, preventing the system from powering on. | Reinstall the missing riser card(s). |
| E1A12 | PCI Rsr Missing | One or all of the PCIe risers is missing, preventing the system from powering on. | Check that all connections are secure and correctly positioned. |
| E1A14 | SAS Cable A | SAS cable A is missing or bad. | Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 165. |
| E1A15 | SAS Cable B | SAS cable B is missing or bad. | Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 165. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|------------------|---|---|
| E1A15 | SAS Cable C | SAS cable C is missing or bad. | Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 165. |
| E1A18 | PDB Ctrl Cable | Control cable for the power distribution board (PDB) is missing or bad | Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 165. |
| E2010 | No Memory | No memory is installed in the system. | Install memory. See "Installing Memory Modules" on page 104. |
| E2011 | Mem Config Err | Memory detected, but is not configurable. Error detected during memory configuration. | See "Troubleshooting System Memory" on page 135. |
| E2012 | Unusable Memory | Memory is configured, but not usable. Memory subsystem failure. | See "Troubleshooting System Memory" on page 135.. |
| E2013 | Shadow BIOS Fail | The system BIOS failed to copy its flash image into memory. | See "Troubleshooting System Memory" on page 135. |
| E2014 | CMOS Fail | CMOS failure. CMOS RAM not functioning properly. | See "Getting Help" on page 165. |
| E2015 | DMA Controller | DMA controller failure. | See "Getting Help" on page 165. |
| E2016 | Int Controller | Interrupt controller failure. | See "Getting Help" on page 165. |
| E2017 | Timer Fail | Timer refresh failure. | See "Getting Help" on page 165. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|-------------------|--|--|
| E2018 | Prog Timer | Programmable interval timer error. | See "Getting Help" on page 165. |
| E2019 | Parity Error | Parity error. | See "Getting Help" on page 165. |
| E201A | SIO Err | SIO failure. | See "Getting Help" on page 165. |
| E201B | Kybd Controller | Keyboard controller failure. | See "Getting Help" on page 165. |
| E201C | SMI Init | System management interrupt (SMI) initialization failure. | See "Getting Help" on page 165. |
| E201D | Shutdown Test | BIOS shutdown test failure. | See "Getting Help" on page 165. |
| E201E | POST Mem Test | BIOS POST memory test failure. | See "Troubleshooting System Memory" on page 135. If problem persists, see "Getting Help" on page 165. |
| E201F | DRAC Config | Dell remote access controller (DRAC) configuration failure. | Check screen for specific error messages. Ensure that DRAC cables and connectors are properly seated. If problem persists, see your DRAC documentation. |
| E2020 | CPU Config | CPU configuration failure. | Check screen for specific error messages. |
| E2021 | Memory Population | Incorrect memory configuration. Memory population order incorrect. | Check screen for specific error messages. See "Troubleshooting System Memory" on page 135. |
| E2022 | POST Fail | General failure after video. | Check screen for specific error messages. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|---|--|--|
| E2110 | MBE DIMM # & # | One of the DIMMs in the set implicated by "# & #" has had a memory multi-bit error (MBE). | See "Troubleshooting System Memory" on page 135. |
| E2111 | SBE Log Disable DIMM # | The system BIOS has disabled memory single-bit error (SBE) logging, and will not resume logging further SBEs until the system is rebooted. "#" represents the DIMM implicated by the BIOS. | See "Troubleshooting System Memory" on page 135. |
| E2112 | Mem Spare DIMM # | The system BIOS has spared the memory because it has determined that the memory had too many errors. "# & #" represents the DIMM pair implicated by the BIOS. | See "Troubleshooting System Memory" on page 135. |
| I1910 | Intrusion | System cover has been removed. | Information only. |
| I1911 | >3 ERRs Chk Log | LCD overflow message. A maximum of three error messages can display sequentially on the LCD. The fourth message displays as the standard overflow message. | Check the SEL for details on the events. |
| I1912 | SEL Full | System Event Log is full of events, and is unable to log any more events. | Clear the log by deleting event entries. |
| I1915 | Video Off (LCD lights with a blue or amber background.) | The video has been turned off by the RAC remote user. | Information only. |

Table 1-6. LCD Status Messages (continued)

| Code | Text | Causes | Corrective Actions |
|-------------|--|---|---|
| I1916 | Video Off in ## (LCD lights with a blue or amber background.) | The video will be turned off in xx seconds by the RAC remote user. | Information only. |
| W1228 | ROMB Batt < 24hr | Warns predictively that the RAID battery has less than 24 hours of charge left. | Replace RAID battery. See "Expansion Cards" on page 95. |

NOTE: For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 167.

Solving Problems Described by LCD Status Messages

The code and text on the LCD can often specify a very precise fault condition that is easily corrected. For example, if the code E1418 CPU_1_Presence appears, you know that a microprocessor is not installed in socket 1.

In contrast, you might be able to determine the problem if multiple related errors occur. For example, if you receive a series of messages indicating multiple voltage faults, you might determine that the problem is a failing power supply.

Removing LCD Status Messages

For faults associated with sensors, such as temperature, voltage, fans, and so on, the LCD message is automatically removed when that sensor returns to a normal state. For example, if temperature for a component goes out of range, the LCD displays the fault; when the temperature returns to the acceptable range, the message is removed from the LCD. For other faults, you must take action to remove the message from the display:

- Clear the SEL — You can perform this task remotely, but you will lose the event history for the system.
- Power cycle — Turn off the system and disconnect it from the electrical outlet; wait approximately ten seconds, reconnect the power cable, and restart the system.

Any of these actions will remove fault messages, and return the status indicators and LCD colors to the normal state. Messages will reappear under the following conditions:

- The sensor returns to a normal state but fails again, resulting in a new SEL entry.
- The system is reset and new error events are detected.
- A failure is recorded from another source that maps to the same display entry.

System Messages

System messages appear on the screen to notify you of a possible problem with the system. Table 1-3 lists the system messages that can occur and the probable cause and corrective action for each message.



NOTE: If you receive a system message that is not listed in Table 1-3, check the documentation for the application that is running when the message appears or the operating system's documentation for an explanation of the message and recommended action.



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

Table 1-7. System Messages

| Message | Causes | Corrective Actions |
|---|--|--|
| Alert! DIMM1_A and DIMM1_B must be populated with a matched set of DIMMs if more than one DIMM is present. The following memory DIMMs have been disabled: | If more than one DIMM is present, DIMMs must be installed in matching pairs. | Check other system messages for additional information for possible causes. For memory configuration information, see "Memory Module Installation Guidelines" on page 102. If the problem persists, see "Troubleshooting System Memory" on page 135. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|--|---|--|
| Alert! Unsupported memory, incomplete sets, or unmatched sets. The following memory is disabled: | Unsupported DIMMs, mismatched DIMMs, or unmatched DIMMs have been detected. If more than one DIMM is present, DIMMs must be installed in matching pairs. | For memory configuration information, see "Memory Module Installation Guidelines" on page 102. If the problem persists, see "Troubleshooting System Memory" on page 135. |
| Attempting to update Remote Configuration. Please wait... | Remote Configuration request has been detected and is being processed. | Wait until the process is complete. |
| BIOS Update Attempt Failed! | Remote BIOS update attempt failed. | Retry the BIOS update. If problem persists, see "Getting Help" on page 165. |
| Caution! NVRAM_CLR jumper is installed on system board. | NVRAM_CLR jumper is installed. CMOS has been cleared. | Remove NVRAM_CLR jumper. See Figure 6-1 for jumper location. |
| Decreasing available memory | Faulty or improperly installed memory modules. | See "Troubleshooting System Memory" on page 135. |
| Diskette drive 0 seek failure. | Faulty or improperly inserted diskette, incorrect configuration settings in the System Setup program, or loose diskette/tape drive interface cable, or loose power cable. Replace the diskette. | See "Troubleshooting a Diskette Drive" on page 138. |
| Diskette read failure. | Faulty diskette, faulty or improperly connected diskette/tape drive interface cable, or loose power cable. | See "Troubleshooting a Diskette Drive" on page 138. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|--|--|---|
| Diskette subsystem reset failed. | Faulty diskette/tape drive controller. | See "Troubleshooting a Diskette Drive" on page 138. |
| Drive not ready. | Diskette missing from or improperly inserted in diskette drive. | See "Troubleshooting a Diskette Drive" on page 138. |
| Error: Remote Access Controller initialization failure | The Remote Access Controller failed to initialize. | Ensure that the Remote Access Controller is properly installed. |
| Error 8602 - Auxiliary Device Failure Verify that mouse and keyboard are securely attached to correct connectors. | The mouse cable connector is loose or improperly connected, or the mouse is defective. | Check the connection from mouse cable to the system. If the problem persists, try another mouse, or see "Getting Help" on page 165. |
| Fatal Error caused a system reset: Please check the system event log for details | A fatal system error occurred and caused the system to reboot. | Check the SEL for information that was logged during the error. See the applicable troubleshooting section in "Troubleshooting Your System" on page 123 for any faulty components specified in the SEL. |
| Gate A20 failure | Faulty keyboard controller; faulty system board. | See "Getting Help" on page 165. |
| General failure | The operating system is unable to carry out the command. | This message is usually followed by specific information. Note the information, and take the appropriate action to resolve the problem. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|---|---|--|
| Keyboard Controller failure | Faulty keyboard controller; faulty system board | See "Getting Help" on page 165. |
| Keyboard data line failure | Keyboard cable connector is loose or improperly connected, defective keyboard, or defective keyboard/mouse controller | Check the keyboard connection to the system. If the problem persists, try another keyboard, or see "Getting Help" on page 165. |
| Keyboard stuck key failure | | |
| Keyboard fuse has failed | Overcurrent has been detected at the keyboard connector. | See "Getting Help" on page 165. |
| Manufacturing mode detected | System is in manufacturing mode. | Reboot to take the system out of manufacturing mode. |
| Memory address line failure at <i>address</i> , read <i>value</i> expecting <i>value</i> | Faulty or improperly installed memory modules. | See "Troubleshooting System Memory" on page 135. |
| Memory double word logic failure at <i>address</i> , read <i>value</i> expecting <i>value</i> | | |
| Memory odd/even logic failure at <i>address</i> , read <i>value</i> expecting <i>value</i> | | |
| Memory write/read failure at <i>address</i> , read <i>value</i> expecting <i>value</i> | | |
| Memory tests terminated by keystroke | POST memory test terminated by pressing the spacebar. | Information only. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|------------------------------|---|--|
| No boot device available | Faulty or missing optical drive subsystem, hard drive, or hard-drive subsystem, or no bootable USB key installed. | Use a bootable USB key, CD, or hard drive. If the problem persists, see "Troubleshooting an Internal USB Key" on page 137 and "Troubleshooting a Hard Drive" on page 142. See "Entering the System Setup Program" on page 45 for information on setting the order of boot devices. |
| No boot sector on hard drive | Incorrect configuration settings in System Setup program, or no operating system on hard drive. | Check the hard-drive configuration settings in the System Setup program. See "Entering the System Setup Program" on page 45. If necessary, install the operating system on your hard drive. See your operating system documentation. |
| No timer tick interrupt | Faulty system board. | See "Getting Help" on page 165. |
| Not a boot diskette | No operating system on diskette. | See "Troubleshooting a Diskette Drive" on page 138. |
| PCI BIOS failed to install | PCIe device BIOS (Option ROM) checksum failure detected during shadowing. Cables to expansion card(s) loose; faulty or improperly installed expansion card(s). | Reseat the expansion card(s). Ensure that all appropriate cables are securely connected to the expansion card(s). If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|---|--|---|
| PCIe Fatal Error caused a system reset: Slot X Embedded Bus#XX/Dev#XX/Func X Please check the system event log for details | PCI Express fatal errors occurred during the previous boot. | Reseat the PCIe card in the specified slot number. See "Installing an Expansion Card" on page 95. If the problem persists, see "Getting Help" on page 165. |
| Plug & Play Configuration Error | Error encountered in initializing PCIe device; faulty system board. | Install the NVRAM_CLR jumper and reboot the system. See Figure 6-1 for jumper location. If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| Read fault Requested sector not found | The operating system cannot read from the hard drive or USB device, the system could not find a particular sector on the disk, or the requested sector is defective. | Replace the USB medium or device. Ensure that the USB or hard drive cables are properly connected. See "Troubleshooting a USB Device" on page 127, "Troubleshooting an Internal USB Key" on page 137, and "Troubleshooting a Hard Drive" on page 142. |
| Remote configuration update attempt failed | System unable to process Remote Configuration request. | Retry Remote Configuration. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|---|---|--|
| ROM bad checksum = <i>address</i> | Expansion card improperly installed or faulty. | Reseat the expansion card(s). Ensure that all appropriate cables are securely connected to the expansion card(s). If the problem persists, see "Troubleshooting Expansion Cards" on page 147. |
| SATA PORT <i>x</i> drive not found | SATA port <i>x</i> was turned on in setup, but a drive was not found. | See "Troubleshooting a Hard Drive" on page 142 for the appropriate drive(s) installed in your system. |
| Sector not found Seek error Seek operation failed | Faulty hard drive, USB device, or USB medium. | See "Troubleshooting a USB Device" on page 127, "Troubleshooting an Internal USB Key" on page 137, and "Troubleshooting a Hard Drive" on page 142. |
| Shutdown failure | Shutdown test failure. | See "Troubleshooting System Memory" on page 135. |
| The amount of system memory has changed | Memory has been added or removed or a memory module may be faulty. | If memory has been added or removed, this message is informative and can be ignored. If memory has not been added or removed, check the SEL to determine if single-bit or multi-bit errors were detected and replace the faulty memory module. See "Troubleshooting a Hard Drive" on page 142. |
| Time-of-day clock stopped | Faulty battery or faulty chip. | See "Troubleshooting the System Battery" on page 132. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|--|--|---|
| Time-of-day not set - please run SETUP program | Incorrect Time or Date settings; faulty system battery. | Check the Time and Date settings. See "Entering the System Setup Program" on page 45. If the problem persists, replace the system battery. See "Troubleshooting the System Battery" on page 132. |
| Timer chip counter 2 failed | Faulty system board. | See "Getting Help" on page 165. |
| TPM configuration operation honored | System will now restart. | Information only. |
| TPM failure | A Trusted Platform Module (TPM) function has failed. | See "Getting Help" on page 165. |
| TPM operation is pending. Press I to Ignore or M to Modify to allow this change and reset the system. WARNING: Modifying could prevent security. | Configuration change has been requested. | Press I to continue system boot. Press M to modify the TPM setting and restart. |
| Unexpected interrupt in protected mode | DIMMs are improperly seated or the keyboard/mouse controller chip has failed. | Reseat the DIMMs. See "Troubleshooting System Memory" on page 135. If the problem persists, see "Getting Help" on page 165. |
| Unsupported DIMM detected in the RAID DIMM slot! | DIMM installed in RAID DIMM slot is not supported. | See "Troubleshooting System Memory" on page 135. If the problem persists, see "Getting Help" on page 165. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|--|--|---|
| Unsupported RAID key detected. | The RAID key installed in the system is not supported on this system. | Information only. |
| Utility partition not available | The <F10> key was pressed during POST, but no utility partition exists on the boot hard drive. | Create a utility partition on the boot hard drive. See the CDs that came with your system. |
| Warning: A fatal error has caused system reset! Please check the system event log! | A fatal system error occurred and caused the system to reboot. | Check the SEL for information that was logged during the error. See the applicable troubleshooting section in "Troubleshooting Your System" on page 123 for any faulty components specified in the SEL. |
| Warning! No micro code update loaded for processor n | Microcode update failed. | Update the BIOS firmware. See "Getting Help" on page 165. |
| Warning! Detected missing RAID hardware for the embedded RAID subsystem. | RAID key or RAID DIMM missing when system is in RAID mode. | Information only. |
| Warning! Detected mode change from SCSI to RAID on channel x of the embedded RAID subsystem. | Embedded RAID subsystem configuration has changed in System Setup. | See "Using the System Setup Program" on page 46. |
| Warning! Detected mode change from RAID to SCSI on channel x of the embedded RAID subsystem. | Embedded RAID subsystem configuration has changed in System Setup. | See "Using the System Setup Program" on page 46. |

Table 1-7. System Messages (continued)

| Message | Causes | Corrective Actions |
|--|---|---|
| Warning! Embedded RAID firmware is not present. | Embedded RAID firmware does not respond. | See "Using the System Setup Program" on page 46. |
| Warning! Embedded RAID error! | Embedded RAID firmware responds with an error. | See "Using the System Setup Program" on page 46. |
| Warning: The installed memory configuration is not optimal. For more information on valid memory configurations, please see the system documentation on support.dell.com | Invalid memory configuration. | Ensure that the memory modules are installed in a valid configuration. See "Memory Module Installation Guidelines" on page 102. If the problem persists, see "Troubleshooting System Memory" on page 135. |
| Write fault Write fault on selected drive | Faulty USB device, USB medium, optical drive assembly, hard drive, or hard-drive subsystem. | See "Troubleshooting a USB Device" on page 127, "Troubleshooting an Internal USB Key" on page 137, and "Troubleshooting a Hard Drive" on page 142. |

NOTE: For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 167.

Warning Messages

A warning message alerts you to a possible problem and prompts you to respond before the system continues a task. For example, before you format a diskette, a message will warn you that you may lose all data on the diskette. Warning messages usually interrupt the task and require you to respond by typing *y* (yes) or *n* (no).



NOTE: Warning messages are generated by either the application or the operating system. For more information, see the documentation that accompanied the operating system or application.

Diagnostics Messages

The system diagnostic utilities produce messages from diagnostic tests run on your system. See "Running the System Diagnostics" on page 152 for more information about system diagnostics.

Alert Messages

Systems management software generates alert messages for your system. Alert messages include information, status, warning, and failure messages for drive, temperature, fan, and power conditions. For more information, see the systems management software documentation.

Using the System Setup Program

After you set up your system, run the System Setup program to familiarize yourself with your system configuration and optional settings. Record the information for future reference.

You can use the System Setup program to:

- Change the system configuration stored in NVRAM after you add, change, or remove hardware
- Set or change user-selectable options—for example, the time or date
- Enable or disable integrated devices
- Correct discrepancies between the installed hardware and configuration settings

Entering the System Setup Program

- 1 Turn on or restart your system.
- 2 Press <F2> immediately after you see the following message:

<F2> = System Setup

If your operating system begins to load before you press <F2>, allow the system to finish booting, and then restart your system and try again.

 **NOTE:** To ensure an orderly system shutdown, see the documentation that accompanied your operating system.

Responding to Error Messages

You can enter the System Setup program by responding to certain error messages. If an error message appears while the system is booting, make a note of the message. Before entering the System Setup program, see "System Messages" on page 34 for an explanation of the message and suggestions for correcting errors.

 **NOTE:** After installing a memory upgrade, it is normal for your system to send a message the first time you start your system.

Using the System Setup Program

Table 2-1 lists the keys that you use to view or change information on the System Setup program screens and to exit the program.

Table 2-1. System Setup Program Navigation Keys

| Keys | Action |
|---|--|
| Up arrow or <Shift><Tab> | Moves to the previous field. |
| Down arrow or <Tab> | Moves to the next field. |
| Spacebar, <+>, <->, left and right arrows | Cycles through the settings in a field. In many fields, you can also type the appropriate value. |
| <Esc> | Exits the System Setup program and restarts the system if any changes were made. |
| <F1> | Displays the System Setup program's help file. |



NOTE: For most of the options, any changes that you make are recorded but do not take effect until you restart the system.

System Setup Options

Main Screen

When you enter the System Setup program, the main System Setup program screen appears (see Figure 2-1).

Figure 2-1. Main System Setup Program Screen

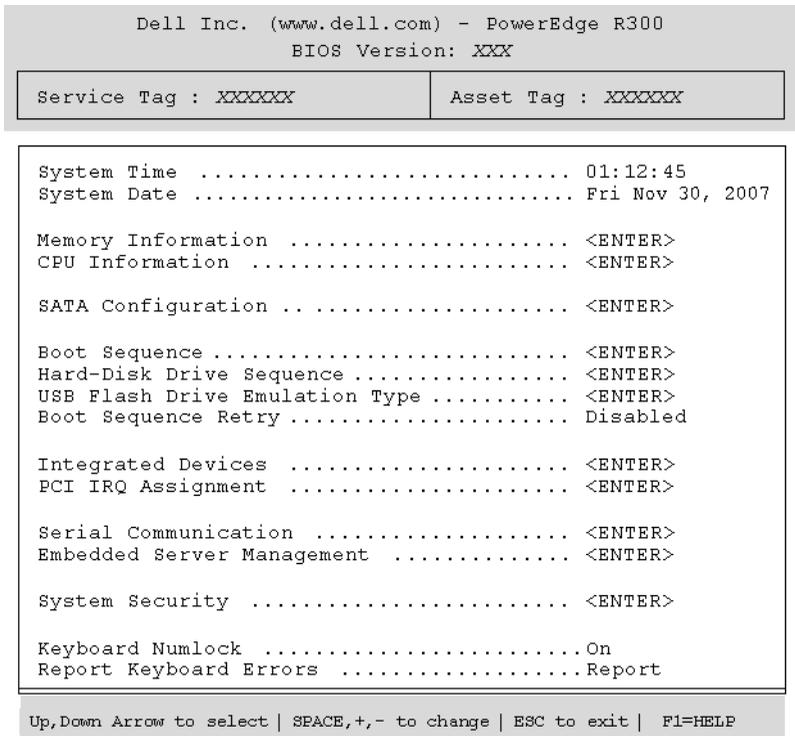


Table 2-2 lists the options and descriptions for the information fields that appear on the main System Setup program screen.

 **NOTE:** The options for the System Setup program change based on the system configuration.

 **NOTE:** The System Setup program defaults are listed under their respective options, where applicable.

Table 2-2. System Setup Program Options

| Option | Description |
|-------------|--|
| System Time | Sets the time on the system's internal clock. |
| System Date | Sets the date on the system's internal calendar. |

Table 2-2. System Setup Program Options (continued)

| Option | Description |
|---|---|
| Memory Information | Displays a screen to view memory information and to configure certain memory features. See Table 2-3. |
| CPU Information | Displays information related to microprocessors (speed, cache size, and so on). See Table 2-4. |
| SATA Configuration | Enables or disables a Serial Advanced Technology Attachment (SATA) device (such as hard drive, CD drive, or DVD drive). See "SATA Configuration Screen" on page 51. |
| Boot Sequence | Determines the order in which the system searches for boot devices during system startup. Available options can include the diskette drive, CD drive, hard drives, and network. If you have installed a RAC, additional options such as virtual floppy and virtual CD-ROM may be present. NOTE: System boot is not supported from an external device attached to a SAS or SCSI adapter. See support.dell.com for the latest support information about booting from external devices |
| Hard-Disk Drive Sequence | Determines the order in which the system searches the hard drives during system startup. The selections depend on the hard drives installed in your system. |
| USB Flash Drive Emulation Type (Auto default) | Determines the emulation type for a USB flash drive. Hard disk allows the USB flash drive to act as a hard drive. Floppy allows the USB flash drive to act as a removal diskette drive. Auto automatically chooses an emulation type. |
| Boot Sequence Retry (Disabled default) | Enables or disables the Boot Sequence Retry feature. When set to Enabled , the system re-attempts the boot sequence after a 30-second timeout if the previous boot attempt failed. |
| Integrated Devices | Displays a screen to configure the system's integrated devices. |
| PCI IRQ Assignment | Displays a screen to change the IRQ assigned to each of the integrated devices on the PCI bus, and any installed expansion cards that require an IRQ. |

Table 2-2. System Setup Program Options (continued)

| Option | Description |
|---|--|
| Serial Communication | Displays a screen to configure serial communication, external serial connector, fail-safe baud rate, remote terminal type, and redirection after boot. |
| Embedded Server Management | Displays a screen to configure the front-panel LCD options and to set a user-defined LCD string. |
| System Security | Displays a screen to configure the system password and setup password features. See Table 2-8. For further information, see "Using the System Password" on page 57 and "Using the Setup Password" on page 59. |
| Keyboard NumLock (On default) | Determines whether your system starts up with the NumLock mode activated on 101- or 102-key keyboards (does not apply to 84-key keyboards). |
| Report Keyboard Errors (Report default) | Enables or disables reporting of keyboard errors during the POST. Select Report for host systems that have keyboards attached. Select Do Not Report to suppress all error messages relating to the keyboard or keyboard controller during POST. This setting does not affect the operation of the keyboard itself if a keyboard is attached to the system. |

Memory Information Screen

Table 2-3 lists the descriptions for the information fields that appear on the **Memory Information** screen.

Table 2-3. Memory Information Screen

| Option | Description |
|-----------------------|--|
| System Memory Size | Displays the amount of system memory. |
| System Memory Type | Displays the type of system memory. |
| System Memory Speed | Displays the system memory speed. |
| Video Memory | Displays the amount of video memory. |
| System Memory Testing | Specifies whether system memory tests are run at system boot. Options are Enabled and Disabled . |

CPU Information Screen

Table 2-4 lists the options and descriptions for the information fields that appear on the **CPU Information** screen.

Table 2-4. CPU Information Screen

| Option | Description |
|--|--|
| 64-bit | Specifies if the installed processors support 64-bit extensions. |
| Core Speed | Displays the clock speed of the processors. |
| Bus Speed | Displays the bus speed of the processors. |
| Virtualization Technology (Disabled default) | Displays when the processor(s) support Virtualization Technology. Enabled permits virtualization software to utilize Virtualization Technology functions incorporated in the processor design. This feature can only be used by software that supports Virtualization Technology. |
| Adjacent Cache Line Prefetch (Enabled default) | Enables or disables optimal use of sequential memory access. Disable this option for applications that require high use of random memory access. |
| Hardware Prefetcher (Enabled default) | Enables or disables the hardware prefetcher. |
| Demand-Based Power Management (Enabled default) | NOTE: Check your operating system documentation to verify if the operating system supports this feature. Enables or disables demand-based power management. When enabled, the CPU Performance State tables will be reported to the operating system; when disabled, the CPU Performance State tables will not be reported to the operating system. If any of the CPUs do not support demand-based power management, the field will become read-only, and will automatically set to Disabled . |
| Processor X ID | Displays the family, model, and stepping of the specified processor. |

SATA Configuration Screen

Table 2-5 lists the options and descriptions for the information fields that appear on the **SATA Configuration** screen.



NOTE: When a SAS Card is installed in the system, the **SATA Configuration** screen changes. The **SATA controller** field displays **ATA Mode** and will be unchoosable. **Port A, Port B, Port C, and Port D** display **off** and are also unchoosable. When the SAS Card is plugged out, the **SATA Configuration** screen settings will be loaded to default values.

Table 2-5. SATA Configuration Screen

| Option | Description |
|--------------------------|---|
| Port A (Auto default) | Displays the model number, drive type, and size of the device attached to Port A. When set to Auto (default), the port is enabled if devices are attached to the port. |
| Port B (Off default) | Displays the model number, drive type, and size of the device attached to Port B. When set to Auto (default), the port is enabled if devices are attached to the port. |
| Port C (Off default) | Displays the model number, drive type, and size of the device attached to Port C. When set to Auto (default), the port is enabled if devices (optional diskette drive) are attached to the port. |

Integrated Devices Screen

Table 2-6 lists the options and descriptions for the information fields that appear on the **Integrated Devices** screen.

Table 2-6. Integrated Devices Screen Options

| Option | Description |
|--|--|
| Internal USB Port (On default) | Enables or disables the system's internal USB port. |
| Embedded Gb NICx (NIC1 default: Enabled with PXE ; Other NICs: Enabled) | Enables or disables the system's integrated NIC. Options are Enabled , Enabled with PXE , Enabled with iSCSI Boot , and Disabled . PXE support allows the system to boot from the network. Changes take effect after the system reboots. |

Table 2-6. Integrated Devices Screen Options (continued)

| Option | Description |
|---|---|
| MAC Address | Displays the MAC address for the integrated 10/100/1000 NIC. This field does not have user-selectable settings. |
| OS Watchdog Timer (Disabled default) | NOTE: This feature is usable only with operating systems that support WDAT implementations of the Advanced Configuration and Power Interface (ACPI) 3.0b specification. Sets a timer that monitors the operating system for activity and aids in recovery if the system stops responding. When this field is set to Enabled , the operating system is allowed to initialize the timer. When set to Disabled , the timer is not initialized. |
| I/OAT DMA Engine (Disabled default) | Enables the I/O Acceleration Technology (I/OAT) option. This feature should be enabled only if the hardware and software support I/OAT. The I/OAT Data Memory Transfer (DMA) Engine transfers data between memory modules, allowing data to bypass the CPU. I/OAT will be supported on the NICs. |
| System Interrupt Assignment (Standard) | Controls the interrupt assignment of PCI devices in the system. When set to distributed, the interrupt routing will be swizzled to minimize IRQ sharing. |

Serial Communication Screen

Table 2-7 lists the options and descriptions for the information fields that appear on the **Serial Communication** screen.

Table 2-7. Serial Communication Screen Options

| Option | Description |
|---|--|
| Serial Communication (On without Console Redirection default) | Options are On without Console Redirection , On with Console Redirection via COM1 , On with Console Redirection via COM2 , and Off . |
| External Serial Connector (COM1 default) | Specifies whether COM1 , COM2 , or Remote Access Device has access to the external serial connector for serial communications. |

Table 2-7. Serial Communication Screen Options (continued)

| Option | Description |
|---|--|
| Failsafe Baud Rate (115200 default) | Displays the failsafe baud rate used for console redirection when the baud rate cannot be negotiated automatically with the remote terminal. This rate should not be adjusted. |
| Remote Terminal Type (VT 100/VT 220 default) | Select either VT 100/VT 220 or ANSI. |
| Redirection After Boot (Enabled default) | Enables or disables BIOS console redirection after your system boots to the operating system. |

System Security Screen

Table 2-8 lists the options and descriptions for the information fields that appear on the System Security screen.



NOTE: Systems shipping in China are not equipped with TPM. Disregard any TPM options listed in the System Security Screen.

Table 2-8. System Security Screen Options

| Option | Description |
|-----------------|--|
| System Password | Displays the current status of your system's password security feature and allows you to assign and verify a new system password. NOTE: See "Using the System Password" on page 57 for instructions on assigning a system password and using or changing an existing system password. |
| Setup Password | Restricts access to the System Setup program in the same way that you restrict access to your system using the system password feature. NOTE: See "Using the Setup Password" on page 59 for instructions on assigning a setup password and using or changing an existing setup password. |

Table 2-8. System Security Screen Options (continued)

| Option | Description |
|-------------------------------|---|
| Password Status | <p>Setting the Setup Password option to Enabled prevents the system password from being changed or disabled at system start-up.</p> <p>To <i>lock</i> the system password, assign a setup password in the Setup Password option and then change the Password Status option to Locked. In this state, you cannot change the system password using the System Password option and cannot be disabled at system start-up by pressing <Ctrl> <Enter>.</p> <p>To <i>unlock</i> the system password, enter the setup password in the Setup Password field and then change the Password Status option to Unlocked. In this state, you can disable the system password at system start-up by pressing <Ctrl> <Enter> and then change the password using the System Password option.</p> |
| TPM Security (Off default) | <p>Sets the reporting of the Trusted Platform Module (TPM) in the system.</p> <p>NOTE: See support.dell.com for additional documentation on TPM technology.</p> <p>When set to Off (default), the presence of the TPM is not reported to the operating system.</p> <p>When set to On with Pre-boot Measurements, the system reports the TPM to the operating system and stores the pre-boot measurements (compliant with Trusted Computing Group standards) to the TPM during POST.</p> <p>When set to On without Pre-boot Measurements, the system reports the TPM to the operating system and bypasses pre-boot measurements.</p> |

Table 2-8. System Security Screen Options (continued)

| Option | Description |
|-----------------------------------|---|
| TPM Activation | <p>Changes the operational state of the TPM.</p> <p>When set to Activate, the TPM is enabled and activated at default settings.</p> <p>When set to Deactivate, the TPM is disabled and deactivated.</p> <p>The No Change state initiates no action. The operational state of the TPM remains unchanged (all user settings for the TPM are preserved).</p> <p>NOTE: This field is read-only when TPM Security is set to Off.</p> |
| TPM Clear (No default) | <p> NOTICE: Clearing the TPM will cause loss of all encryption keys in the TPM. This option will prevent booting to the operating system and will result in loss of data if the encryption keys cannot be restored. Be sure to back up the TPM keys prior to enabling this option.</p> <p>When set to Yes, all the contents of the TPM are cleared.</p> <p>NOTE: This field is read-only when TPM Security is set to Off.</p> |
| Power Button (Enabled default) | <p>Turns system's power off and on. On an ACPI-compliant operating system, the system performs an orderly shutdown before power is turned off.</p> <p>The button is enabled in the System Setup program. When disabled, the button can only turn on system power.</p> <p>NOTE: You can still turn on the system by using the power button, even if the Power Button option is set to Disabled.</p> |
| NMI Button (Disabled default) | <p> NOTICE: Use the NMI button only if directed to do so by qualified support personnel or by the operating system's documentation. Pressing this button halts the operating system and displays a diagnostic screen.</p> <p>Sets the NMI feature to On or Off.</p> |

Table 2-8. System Security Screen Options (continued)

| Option | Description |
|-------------------------------------|--|
| AC Power Recovery (Last default) | Determines how the system reacts when power is restored to the system. If the system is set to Last , the system returns to the last power state. On turns on the system after power is restored. When set to Off , the system remains off after power is restored. |

Exit Screen

After you press <Esc> to exit the System Setup program, the **Exit** screen displays the following options:

- Save Changes and Exit
- Discard Changes and Exit
- Return to Setup

System and Setup Password Features

- ➔ **NOTICE:** The password features provide a basic level of security for the data on your system. If your data requires more security, use additional forms of protection, such as data encryption programs.
- ➔ **NOTICE:** Anyone can access the data stored on your system if you leave the system running and unattended without having a system password assigned, or if you leave your system unlocked so that someone can disable the password by changing a jumper setting.

Your system is shipped to you without the system password feature enabled. If system security is a concern, operate your system only with system password protection.

To change or delete an existing password, you must know the password (see "Deleting or Changing an Existing System Password" on page 59). If you forget your password, you cannot operate your system or change settings in the System Setup program until a trained service technician changes the password jumper setting to disable the passwords, and erases the existing passwords. This procedure is described in "Disabling a Forgotten Password" on page 162.

Using the System Password

After a system password is assigned, only those who know the password have full use of the system. When the **System Password** option is set to **Enabled**, the system prompts you for the system password after the system starts.

Assigning a System Password

Before you assign a system password, enter the System Setup program and check the **System Password** option.

When a system password is assigned, the setting shown for the **System Password** option is **Enabled**. If the setting shown for the **Password Status** is **Unlocked**, you can change the system password. If the **Password Status** option is **Locked**, you cannot change the system password. When the system password feature is disabled by a jumper setting, the system password is **Disabled**, and you cannot change or enter a new system password.

When a system password is not assigned and the password jumper on the system board is in the enabled (default) position, the setting shown for the **System Password** option is **Not Enabled** and the **Password Status** field is **Unlocked**. To assign a system password:

- 1 Verify that the **Password Status** option is set to **Unlocked**.
- 2 Highlight the **System Password** option and press <Enter>.
- 3 Type your new system password.

You can use up to 32 characters in your password.

As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.

The password assignment is not case-sensitive. However, certain key combinations are not valid. If you enter one of these combinations, the system beeps. To erase a character when entering your password, press <Backspace> or the left-arrow key.

 **NOTE:** To escape from the field without assigning a system password, press <Enter> to move to another field, or press <Esc> at any time prior to completing step 5.

- 4 Press <Enter>.

- 5 To confirm your password, type it a second time and press <Enter>. The setting shown for the **System Password** changes to **Enabled**. Exit the System Setup program and begin using your system.
- 6 Either reboot your system now for your password protection to take effect or continue working and reboot your system at a later time.



NOTE: Password protection does not take effect until you reboot the system.

Using Your System Password to Secure Your System



NOTE: If you have assigned a setup password (see "Using the Setup Password" on page 59), the system accepts your setup password as an alternate system password.

When the **Password Status** option is set to **Unlocked**, you have the option to leave the password security enabled or to disable the password security.

To leave the password security enabled:

- 1 Turn on or reboot your system by pressing <Ctrl><Alt>.
- 2 Type your password and press <Enter>.

To disable the password security:

- 1 Turn on or reboot your system by pressing <Ctrl><Alt>.
- 2 Type your password and press <Ctrl><Enter>.

When the **Password Status** option is set to **Locked** whenever you turn on your system or reboot your system by pressing <Ctrl><Alt>, type your password and press <Enter> at the prompt.

After you type the correct system password and press <Enter>, your system operates as usual.

If an incorrect system password is entered, the system displays a message and prompts you to re-enter your password. You have three attempts to enter the correct password. After the third unsuccessful attempt, the system displays an error message showing the number of unsuccessful attempts and that the system has halted and will shut down. This message can alert you to an unauthorized person attempting to use your system.

Even after you shut down and restart the system, the error message continues to be displayed until the correct password is entered.



NOTE: You can use the **Password Status** option in conjunction with the **System Password** and **Setup Password** options to further protect your system from unauthorized changes.

Deleting or Changing an Existing System Password

- 1 When prompted, press <Ctrl><Enter> to disable the existing system password.

If you are asked to enter your setup password, contact your network administrator.

- 2 Enter the System Setup program by pressing <F2> during POST.
- 3 Select the **System Security** screen field to verify that the **Password Status** option is set to **Unlocked**.
- 4 When prompted, type the system password.
- 5 Confirm that **Not Enabled** is displayed for the **System Password** option.

If **Not Enabled** is displayed for the **System Password** option, the system password has been deleted. If **Enabled** is displayed for the **System Password** option, press the <Alt> key combination to restart the system, and then repeat steps 2 through 5.

Using the Setup Password

Assigning a Setup Password

You can assign (or change) a setup password only when the **Setup Password** option is set to **Not Enabled**. To assign a setup password, highlight the **Setup Password** option and press the <+> or <-> key. The system prompts you to enter and verify the password. If a character is illegal for password use, the system beeps.



NOTE: The setup password can be the same as the system password. If the two passwords are different, the setup password can be used as an alternate system password. However, the system password cannot be used in place of the setup password.

You can use up to 32 characters in your password.

As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.

The password assignment is not case-sensitive. However, certain key combinations are not valid. If you enter one of these combinations, the system beeps. To erase a character when entering your password, press <Backspace> or the left-arrow key.

After you verify the password, the **Setup Password** setting changes to **Enabled**. The next time you enter the System Setup program, the system prompts you for the setup password.

A change to the **Setup Password** option becomes effective immediately (restarting the system is not required).

Operating With a Setup Password Enabled

If **Setup Password** is set to **Enabled**, you must enter the correct setup password before you can modify most of the System Setup options. When you start the System Setup program, the program prompts you to enter a password.

If you do not enter the correct password in three attempts, the system lets you view, but not modify, the System Setup screens—with the following exception: If **System Password** is not set to **Enabled** and is not locked through the **Password Status** option, you can assign a system password (however, you cannot disable or change an existing system password).



NOTE: You can use the **Password Status** option in conjunction with the **Setup Password** option to protect the system password from unauthorized changes.

Deleting or Changing an Existing Setup Password

- 1 Enter the System Setup program and select the **System Security** option.
- 2 Highlight the **Setup Password** option, press <Enter> to access the setup password window, and press <Enter> twice to clear the existing setup password.

The setting changes to **Not Enabled**.

- 3 If you want to assign a new setup password, perform the steps in "Assigning a Setup Password" on page 59.

Disabling a Forgotten Password

See "Disabling a Forgotten Password" on page 162.

Baseboard Management Controller Configuration

The Baseboard Management Controller (BMC) enables configuring, monitoring, and recovery of systems remotely. BMC provides the following features:

- Uses the system's integrated NIC
- Enables fault logging and SNMP alerting
- Provides access to system event log and sensor status
- Allows control of system functions including power on and off
- Functions independently of the system's power state or the system's operating system
- Provides text console redirection for system setup, text-based utilities, and operating system consoles



NOTE: To remotely access the BMC through the integrated NIC, you must connect the network connection to integrated NIC1.

For additional information on using BMC, see the documentation for the BMC and systems management applications.

Entering the BMC Setup Module

- 1 Turn on or restart your system.
- 2 Press <Ctrl-E> when prompted after POST.

If your operating system begins to load before you press <Ctrl-E>, allow the system to finish booting, and then restart your system and try again.

BMC Setup Module Options

For information about the BMC Setup Module options and how to configure the emergency management port (EMP), see the BMC documentation.

Installing System Components

This section describes how to install the following system components:

- Front bezel
- System board shroud
- Hard drives
- Optical drive
- Cooling fan modules
- Power supplies
- Internal USB Memory Connector
- RAC Card
- Expansion cards
- Riser cards
- Backplane board
- System memory
- Processor
- System battery
- Control panel assembly
- Power distribution board
- System board

Recommended Tools

You may need the following items to perform the procedures in this section:

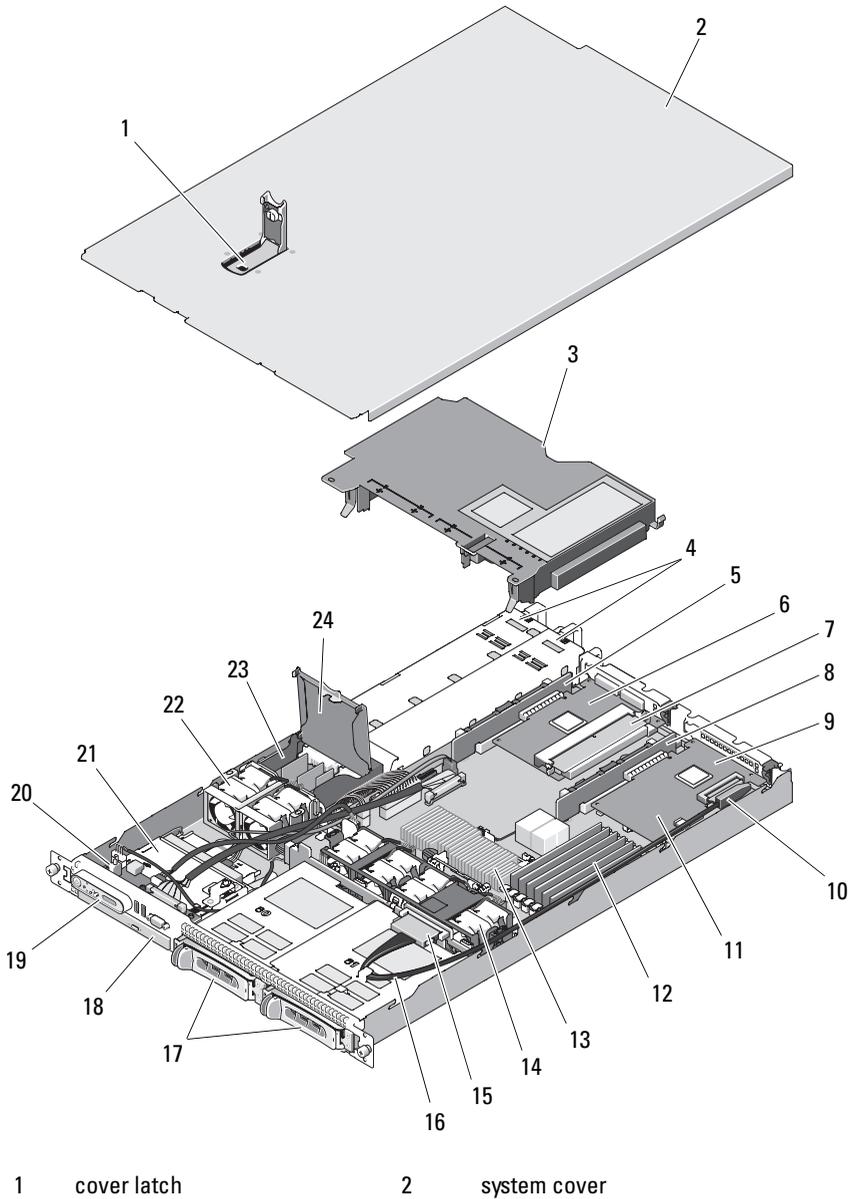
- Key to the system keylock
- #1 and #2 Phillips screwdrivers
- T-10 Torx driver
- Wrist grounding strap

Inside the System

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

In Figure 3-1, the bezel and system cover are removed to provide an interior view of the system.

Figure 3-1. Inside the System



| | | | |
|----|--|----|---|
| 3 | system board shroud | 4 | redundant power supplies (optional) |
| 5 | left riser | 6 | SAS external controller daughter card |
| 7 | SAS RAID external controller daughter card battery and memory module | 8 | center riser |
| 9 | SAS internal RAID controller daughter card | 10 | SAS card connector |
| 11 | RAC card | 12 | memory modules (6) |
| 13 | CPU/heatsink | 14 | dual fan module bays 1 and 2 (4 fans) |
| 15 | SAS/SATA backplane cable connector | 16 | SATA/SAS backplane cable |
| 17 | hot plug hard drive bays 0 and 1 | 18 | one optional slimline drive |
| 19 | LCD control panel | 20 | chassis intrusion switch |
| 21 | control panel assembly | 22 | power supply dual fan modules (2 fans) |
| 23 | power distribution board | 24 | power distribution board cover |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

The system board holds the system's control circuitry and other electronic components. The processor and memory are installed directly on the system board. Using a riser card, the system can accommodate two expansion cards. The peripheral bays provide space for up to two hard drives and an optional optical drive. Power is supplied to the system board and drives through one nonredundant power supply. The optical drive connects to the SATA controller on the system board. For more information, see "Optical Drive" on page 79.

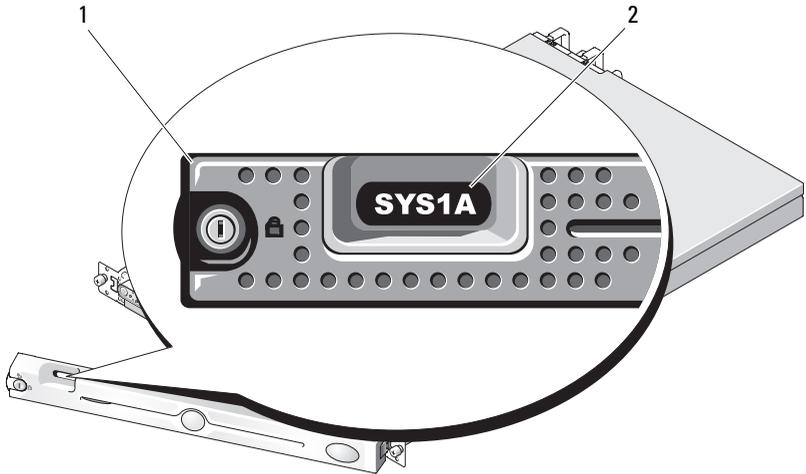
The hard-drive bays provide space for up to two 3.5-inch SAS or two 3.5-inch SATA hard drives. The hard drives connect to a SAS controller card through the SAS/SATA backplane board. For more information, see "Hard Drives" on page 73, "Backplane Board" on page 100, and "Expansion Cards" on page 95.

During an installation or troubleshooting procedure, you may be required to change a jumper setting. For more information, see "System Board Jumpers" on page 155.

Front Bezel

A lock on the bezel restricts access to the power button, optical drive, and hard drive(s). A control panel LCD located on the front panel and accessible through the front bezel displays the system's status. See Figure 3-2.

Figure 3-2. Control Panel LCD With Bezel Installed



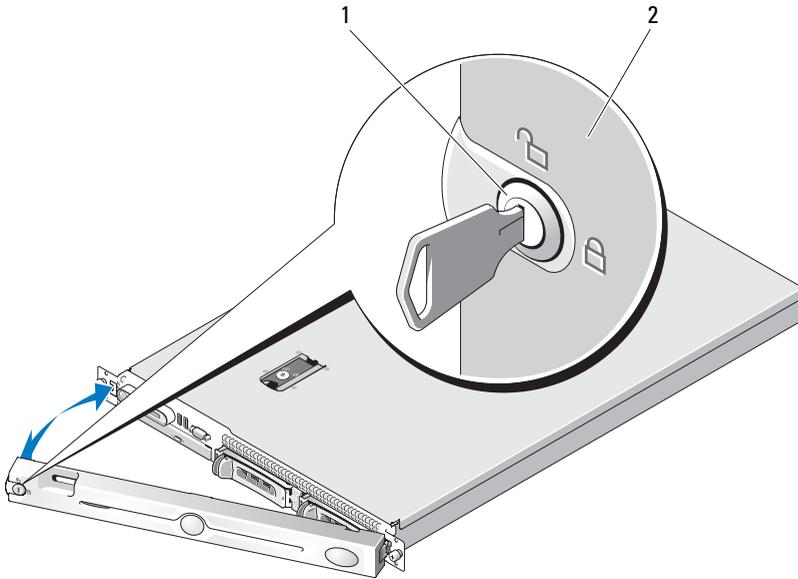
1 bezel

2 control panel LCD

Removing the Front Bezel

- 1 Using the system key, unlock the bezel.
- 2 Press the tab at the left end of the bezel.
- 3 Rotate the left end of the bezel away from the system to release the right end of the bezel.
- 4 Pull the bezel away from the system. See Figure 3-3.

Figure 3-3. Installing and Removing the Optional Bezel



1 bezel lock

2 bezel

Replacing the Front Bezel

To replace the front bezel, perform the above steps in reverse.

Opening and Closing the System

⚠ CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

Opening the System

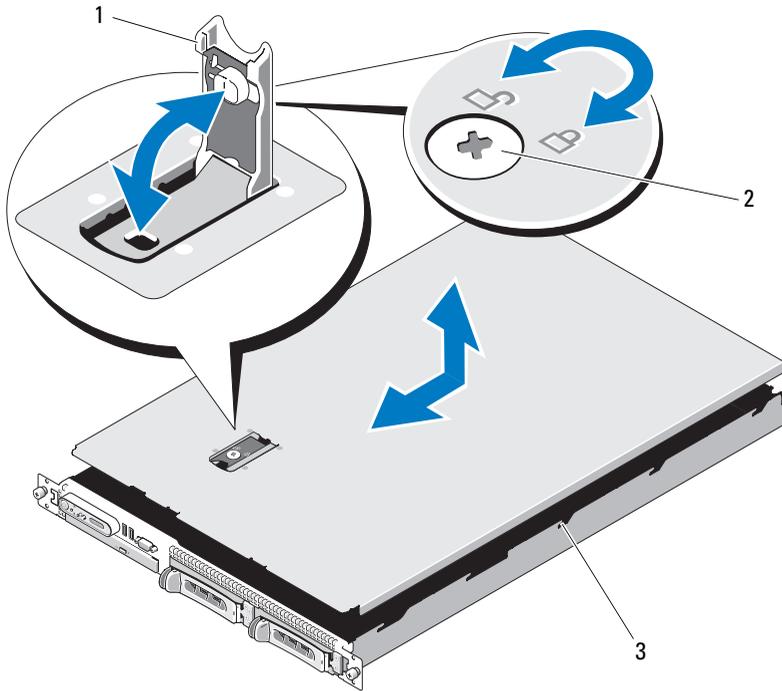
To upgrade or troubleshoot the system, remove the system cover to gain access to internal components.

- 1** Unless you are installing a hot-plug component such as a power supply, turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
- 2** To remove the system cover, turn the latch release lock counter-clockwise to the unlocked position. See Figure 3-4.
- 3** Lift up on the latch on top of the system. See Figure 3-4.
- 4** Grasp the cover on both sides and carefully lift the cover away from the system.

Closing the System

- 1** Lift up the latch on the cover.
- 2** Place the cover on top of the system and offset the cover slightly back so that it clears the chassis J hooks and lays flush on the system chassis. See Figure 3-4.
- 3** Push down the latch to lever the cover into the closed position.
- 4** Rotate the latch release lock in a clockwise direction to secure the cover.

Figure 3-4. Installing and Removing the System Cover



- 1 latch
- 2 latch release lock
- 3 alignment J hooks

System Board Shroud

The system board shroud covers the processor, heatsink, memory modules, and system battery and provides air flow to these components. Airflow is facilitated by the cooling fan modules, which are positioned directly behind the system board shroud.

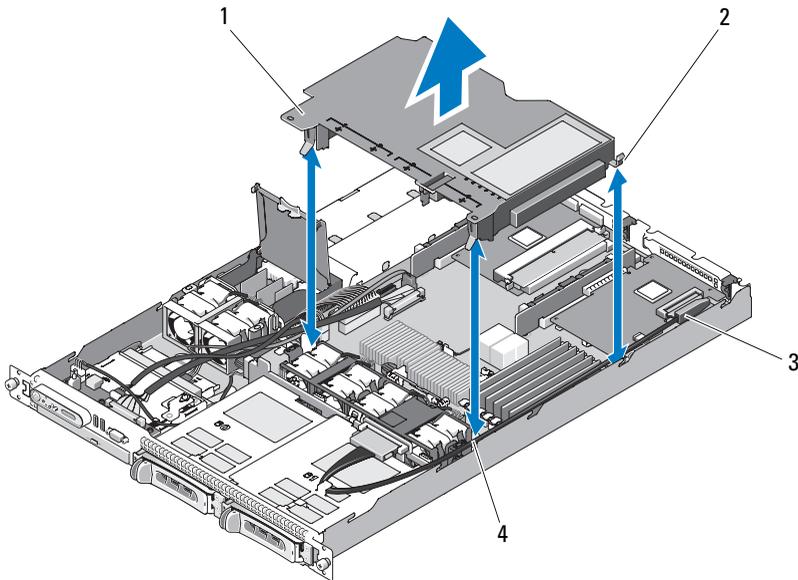
Removing the System Board Shroud



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 If applicable, disconnect the SAS cable connector on the expansion card.
- 3 Locate the attachment slots on the left and right sides of the fan modules and in front of the memory modules. See Figure 3-5.
- 4 Grasping the right and left sides, gently lift the shroud straight up and away from the fan assembly. See Figure 3-5.
- 5 Remove the system board shroud.

Figure 3-5. Installing and Removing the System Board Shroud



- | | | | |
|---|---------------------|---|---------------|
| 1 | system board shroud | 2 | tabs (3) |
| 3 | SAS cable connector | 4 | tab slots (3) |

NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Installing the System Board Shroud

- 1 Align the shroud using both ends of the numbered fan bays as a guide and locate the three tab slots on the left and right sides of the fan modules and a third tab at the upper right corner in front of the memory modules. See Figure 3-5.
- 2 Push the system board shroud down until all edges are seated in the slots, securing the shroud to the system board.

- 3 Connect the SAS cable to the connector on the expansion card and route the cable through the slot between the shroud and the chassis sidewall. See Figure 3-5.
- 4 Close the system. See "Opening and Closing the System" on page 68.

Hard Drives

This subsection describes how to install and configure SAS or SATA hard drives in the system's internal hard-drive bays. Your system features up to two 3.5-inch SAS or SATA hot-pluggable hard drives. All drives connect to the system board through the SAS/SATA backplane board. See "Backplane Board" on page 100 and Figure 6-4. Hard drives are supplied in special hot-pluggable drive carriers that fit in the hard-drive bays.

 **NOTICE:** Before attempting to remove or install a drive while the system is running, see the documentation for the SAS controller daughter card to ensure that the host adapter is configured correctly to support hot-plug drive removal and insertion.

 **NOTE:** All installed drives must be either SAS or SATA. Mixed drive configurations are not supported.

 **NOTE:** It is recommended that you use only drives that have been tested and approved for use with the SAS/SATA backplane board.

You may need to use different programs than those provided with the operating system to partition and format SAS or SATA hard drives.

 **NOTICE:** Do not turn off or reboot your system while the drive is being formatted. Doing so can cause a drive failure.

When you format a hard drive, allow enough time for the formatting to be completed. Be aware that high-capacity hard drives can take a number of hours to format.

Removing a Drive Blank

 **NOTICE:** To maintain proper system cooling, all empty hard-drive bays must have drive blanks installed. If you remove a hard-drive carrier from the system and do not reinstall it, you must replace the carrier with a drive blank.

Removing a hard-drive blank is slightly different than removing the 3.5-inch hard drive carrier:

- 1 Remove the front bezel, if attached. See "Removing the Front Bezel" on page 67.
- 2 Locate the pushbutton locking tab on the right side of the blank to release the hard-drive blank.
- 3 Slide the hard-drive blank out until it is free of the drive bay.

Installing a Hard-Drive Blank

Installing the hard-drive blank is slightly different than installing the 3.5-inch hard drive carrier:

- 1 Remove the front bezel, if attached. See "Removing the Front Bezel" on page 67.
- 2 Locate the hard-drive blank that ships with your system. (Dell part number H7511)
- 3 Insert the hard-drive blank into the drive bay until the blank is fully seated.
- 4 The pushbutton locking tab should click as the drive blank snaps into place.
- 5 Replace the front bezel, if it was removed in step 1.

Removing a Hot-Plug Hard Drive

- 1 Remove the front bezel, if attached. See "Removing the Front Bezel" on page 67.
- 2 From the RAID management software, prepare the drive for removal and wait until the hard-drive indicators on the drive carrier signal that the drive can be removed safely. See your SAS controller documentation for information about hot-plug drive removal.

If the drive has been online, the green activity/fault indicator will flash as the drive is powered down. When both drive indicators are off, the drive is ready for removal.

- 3 Open the drive carrier release handle to release the drive. See Figure 3-6.
- 4 Slide the hard drive out until it is free of the drive bay.

- 5 If you do not replace the hard drive, insert a drive blank in the vacated drive bay. See "Installing a Hard-Drive Blank" on page 74.

 **NOTICE:** To maintain proper system cooling, all empty hard-drive bays must have drive blanks installed.

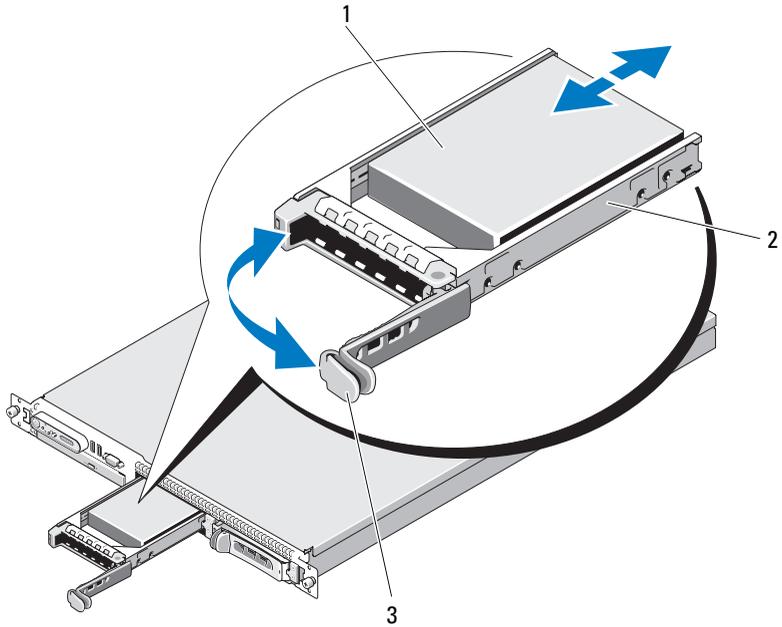
Installing a Hot-Plug Hard Drive

 **NOTICE:** When installing a hard drive, ensure that the adjacent drives are fully installed. Inserting a hard-drive carrier and attempting to lock its handle next to a partially installed carrier can damage the partially installed carrier's shield spring and make it unusable.

 **NOTICE:** Not all operating systems support hot-plug drive installation. See the documentation supplied with your operating system.

- 1 Remove the front bezel, if attached. See "Removing the Front Bezel" on page 67.
- 2 If a drive blank is present in the bay, remove it. See "Removing a Drive Blank" on page 73.

Figure 3-6. Installing a Hot-Plug Hard Drive



- 1 hard drive
- 2 drive carrier
- 3 drive carrier release handle

- 3** Install the hot-plug hard drive.
 - a** Open the handle on the hard-drive carrier.
 - b** Insert the hard-drive carrier into the drive bay until the carrier contacts the backplane.
 - c** Close the handle to lock the drive in place.
- 4** Replace the front bezel, if it was removed in step 1. See "Front Bezel" on page 67.

Replacing a Hard-Drive Carrier

Two versions of hard-drive carriers are used with your system. The version for SATA hard drives has a single set of (four) mounting holes on the side rails. The second version, called a SAS/SATAu hard-drive carrier, has an extra four mounting holes to enable either a "SAS" and "SATAu" mounting position. When using the SAS/SATAu hard-drive carrier, observe these rules with regard to your system:

- Use only SAS hard drives with SAS/SATAu drive carriers.
- Use only the "SAS" mounting position on the carrier. (The SATAu position is reserved.)

Figure 3-7 illustrates a SAS hard drive being installed in a SAS/SATAu hard-drive carrier.

Removing a Hard Drive From a Hard-Drive Carrier

Remove the four screws from the slide rails on the hard-drive carrier and separate the hard drive from the carrier.

Installing a Hard Drive Into a Drive Carrier

- 1 Insert the hard drive into the hard-drive carrier with the connector end of the drive at the rear. See Figure 3-7.
- 2 Viewing the assembly as shown in Figure 3-7, align the screw holes on the hard drive with the rear set of holes on the hard drive carrier.

When aligned correctly, the rear of the hard drive will be flush with the rear of the hard drive carrier.

- 3 Attach the four screws to secure the hard drive to the hard drive carrier. See Figure 3-7.

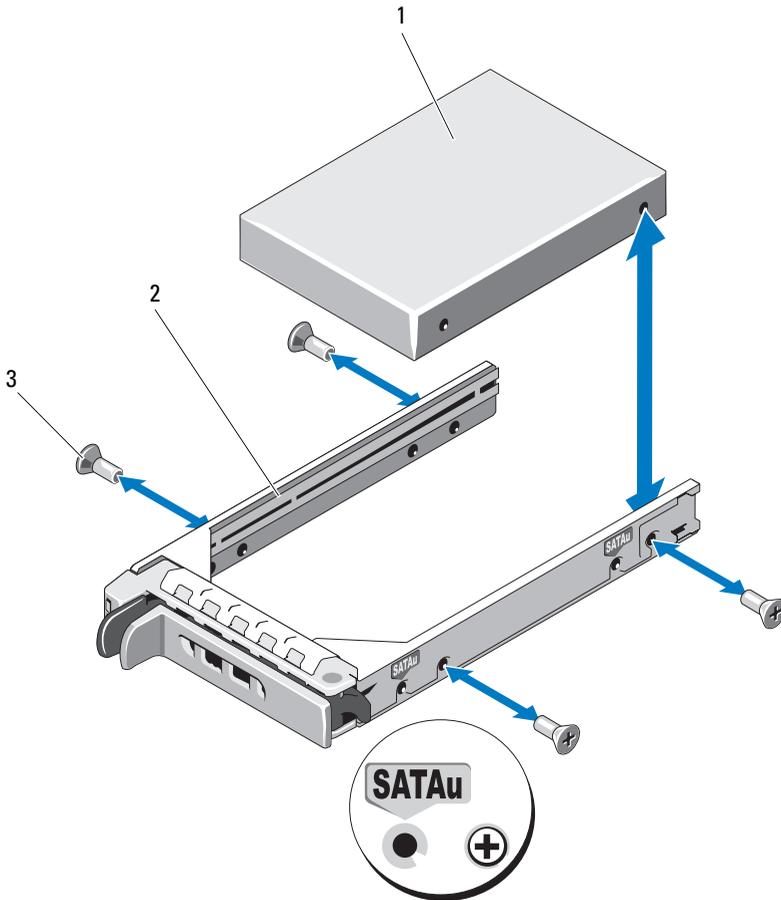


NOTE: The procedure for installing a cabled hard drive that is not hot pluggable is not shown in the preceding illustration. If your system ships with a cabled hard drive, follow these installation steps.

- a Place the hard-drive bracket directly over the hard drive, bending the bracket to seat over the hard drive.
- b Locate the pin and screw hole on the carrier and align the pin with the screw hole.
- c Push the pin into the hard-drive carrier.

- d As you seat the hard drive into the hard-drive bay, ensure the carrier latch contacts the carrier bracket and ensure that all latches are fully engaged.

Figure 3-7. Installing a SAS Hard Drive Into a SAS/SATAu Drive Carrier



- 1 screws (4)
- 3 hard drive

- 2 drive carrier

 **NOTE:** The procedure for installing a cabled hard-drive carrier for a hard drive that is not hot pluggable is not shown in the proceeding instructions and illustration. If your system ships with a cabled hard drive, follow these installation steps.

- e Place the hard-drive carrier bracket directly over the hard drive, bending it to seat it over the hard drive.
- f Locate the pin on the carrier and align it with the screw hole on the hard drive.
- g Push the pin into the hard drive.
- h As you seat the hard drive in the hard-drive bay, ensure the carrier latch contacts the carrier bracket and ensure that all latches are fully engaged.

Optical Drive

An optional slimline DVD or CD-RW/DVD-RW optical drive is mounted on a tray that slides in the front panel and connects to the controller on the system board.

 **NOTE:** DVD devices are data only.

Removing the Optical Drive from the System



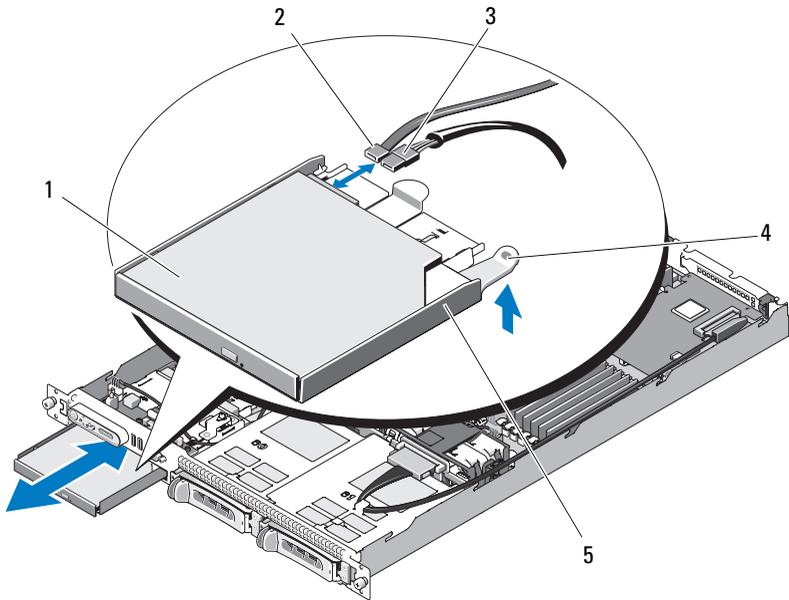
CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
- 2 Open the system. See "Opening and Closing the System" on page 68.
- 3 Disconnect the power and interface cables from the optical drive. See Figure 3-8
- 4 To remove the optical drive, pull up on the blue release tab at the back of the optical drive tray and push the tray out of the system. See Figure 3-8.

Installing the Optical Drive

- 1** Align the optical-drive tray with its opening in the front panel. See Figure 3-8.
- 2** Slide in the drive tray until the tray snaps into place.
- 3** Connect the optical-drive cable to the back of the drive tray.
- 4** If not already done, connect the power and interface cables from the optical drive to the system board connectors.
 - a** Connect the power cable to the CD_PWR connector on the SATA ODD. See Figure 6-4 for the location of the connector and see Figure 3-8 for the routing of the cable.
 - b** Route the interface cable along the inside right-chassis side panel, inserting the cable under each of the cable routing tabs. See Figure 3-8.
 - c** Connect the interface cable to the SATA_C connector on the system board. See Figure 3-8 for the location of the connector.
- 5** Close the system. See "Closing the System" on page 69.
- 6** Replace the bezel. See "Replacing the Front Bezel" on page 68.
- 7** Reconnect your system and peripherals to their electrical outlets, and turn on the system.

Figure 3-8. Removing and Installing the Optional Optical Drive



- | | | | |
|---|--------------------|---|-------------------------------|
| 1 | optical drive | 2 | optical-drive interface cable |
| 3 | power cable | 4 | optical-drive release tab |
| 5 | optical-drive tray | | |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Installing the Optical Drive in the Optical Drive Tray



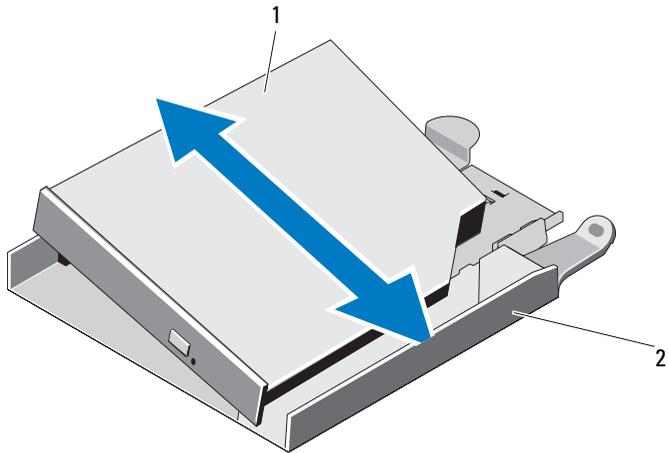
CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Align the optical drive's mounting holes with the retaining pins on the optical-drive tray. See Figure 3-8.
- 2 With the optical drive at a slight angle to the drive tray, lower the right side of the optical drive down onto the right side of the drive tray. See Figure 3-9.
- 3 Lower the left side of the optical drive and press the drive down into the tray until it snaps into place.
- 4 Connect the interface and power cables to the connectors on the optical drive.
- 5 Close the system. See "Opening and Closing the System" on page 68.

Removing the Optical Drive From the Optical Drive Tray

Pull outward on the tab at the back of the carrier on the left side and simultaneously pull up on the left side of the optical drive to separate the drive from the tray. See Figure 3-9.

Figure 3-9. Removing and Installing the Optical Drive in the Optical Drive Carrier



1 optical drive

2 optical drive tray

Cooling Fan Modules

The fan assembly contains four dual-motor fans and provides cooling for the processor and memory modules and two dual-motor fans for the redundant power supplies.

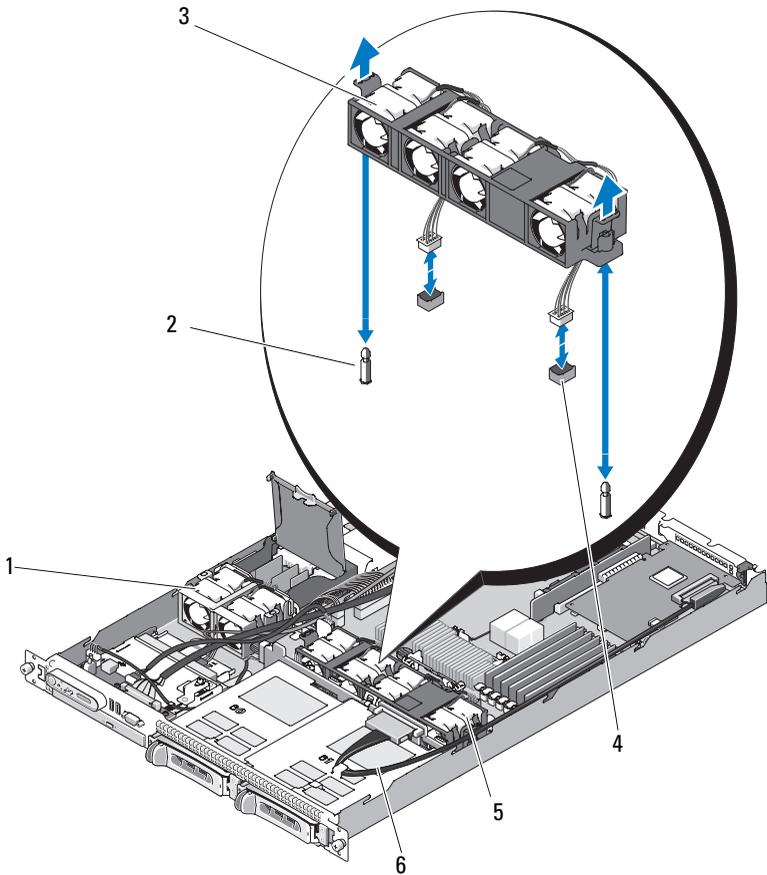
Removing the Fan Assembly



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 Remove the system board shroud. See "Removing the System Board Shroud" on page 71.
- 3 Disconnect the fan connectors on the system board FAN_MOD1 and FAN_MOD2. See Figure 3-10.
- 4 While pulling the two release levers on the fan assembly, lift the fan assembly off of the two securing posts and out of the chassis. See Figure 3-10.

Figure 3-10. Installing and Removing the Fan Assembly



- | | | | |
|---|-------------------------------|---|-------------------------------|
| 1 | power supply fan bay assembly | 2 | securing posts (2) |
| 3 | release levers (2) | 4 | fan cables and connector |
| 5 | system fan bay assembly | 6 | SAS expansion card data cable |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Installing the Fan Assembly

- 1 Align the holes in the fan assembly with the two fan assembly securing posts on the chassis. See Figure 3-10.
- 2 Lower the fan assembly until the release lever snaps and the fan assembly is seated onto the securing posts.
- 3 Reconnect the two fan connectors to the system board. See Figure 3-10.
- 4 Install the system board shroud. See "Installing the System Board Shroud" on page 72.
- 5 Close the system. See "Opening and Closing the System" on page 68.

Power Supply Fan Assembly

The power supply dual fan module provides cooling for the power supplies.



NOTICE: Your system requires the power supply fan assembly if your system has a SAS controller that can be connected to an external storage system. Removing the fan assembly or disabling the fan could result in your system overheating and shutting down unexpectedly.

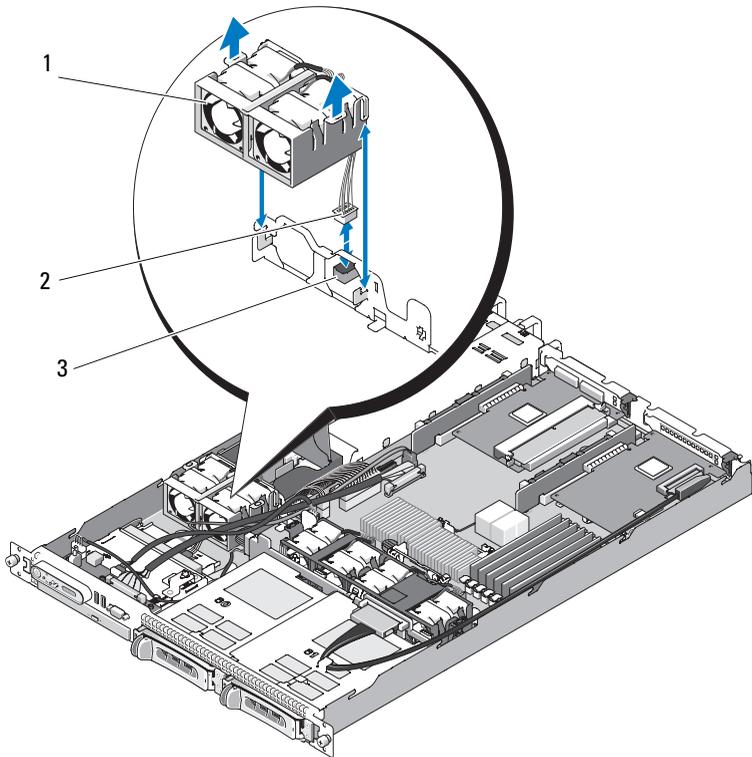
Removing the Power Supply Fan Assembly



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 Open the power distribution board cover by rotating it upward until it catches on the cover detent. See Figure 3-10.
- 3 Disconnect the fan cable on the power distribution board. See Figure 3-10.
- 4 Remove the fan assembly from the system.

Figure 3-11. Installing and Removing the Power Supply Fan Assembly



- | | | | |
|---|---|---|--------------------------|
| 1 | power supply fan assembly | 2 | fan cables and connector |
| 3 | FAN_MOD connector on power distribution board | | |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Installing the Power Supply Fan Assembly

- 1 Connect the fan's power cable to the FAN_MOD connector on the power distribution board. See Figure 3-11 for the location of the connector.
- 2 Route the fan cable through the slot on the shroud partition.
- 3 Close the power distribution board cover by rotating it downward until it seats directly over the board.
- 4 Close the system. See "Opening and Closing the System" on page 68.

Power Supplies

Your system supports one or two power supplies rated at an output of 400 W. If only one power supply is installed, it must be installed in the left power supply bay (PS1). If two power supplies are installed, the second power supply provides hot-pluggable, power redundancy. In redundant mode, the system distributes the power load across both power supplies to maximize efficiency. When a power supply is removed with the system powered on, the full power load is picked up by the remaining power supply.

 **NOTICE:** To ensure proper system cooling, the power supply blank must be installed on the unoccupied power supply bay in a nonredundant configuration.

Removing a Power Supply

 **NOTICE:** The system requires one power supply to operate the system normally. On power-redundant systems, remove and replace only one power supply at a time in a system that is powered on.

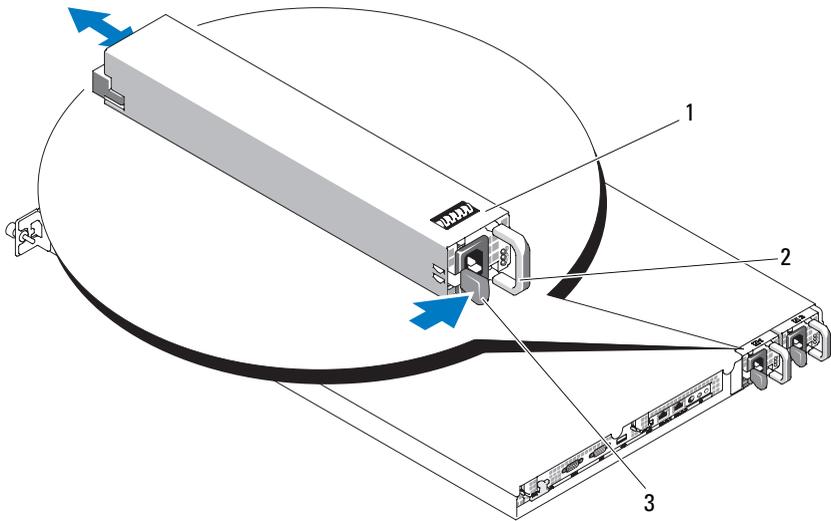
 **NOTE:** On your rack system, you may have to unlatch and lift the optional cable management arm if it interferes with power supply removal. For information about the cable management arm, see the system's *Rack Installation Guide*.

- 1 If your system has a single power supply, turn off the system and all attached peripherals. For a redundant system, you can leave the system running and proceed to the next step.
- 2 Disconnect the power cable from the power source.
- 3 Disconnect the power cable from the power supply and remove the Velcro straps that bundle and secure the system cables.

NOTE: For nonredundant power supplies, remove the power cord retention bracket that secures the system cables. See the *Getting Started Guide* that ships with your system for more information.

- 4 Release the locking tab on the left side of the power supply by pressing in toward the right.. See Figure 3-12.
- 5 Pull the power supply straight out to release it from the power distribution board and clear the chassis.

Figure 3-12. Installing and Removing the Power Supply



- | | | | |
|---|----------------------------|---|---------------------|
| 1 | redundant power supply (2) | 2 | power-supply handle |
| 3 | locking tab | | |

Replacing a Power Supply

- 1 Slide the new power supply straight into the chassis. See Figure 3-12.
- 2 Push the handle all the way down until it is completely flush with the power-supply faceplate and the orange locking tab engages. See Figure 3-12.

- 3 Connect the power cable to the power supply.
 - a Secure and bundle the system cables with the Velcro straps that ship with your system. Loop the power cable and use the Velcro straps to attach the cable to the handle.
 - b Plug the other end of the cable into a power distribution unit (PDU) or power outlet.



NOTE: For nonredundant power supplies, loop the cable from the cable retention bracket up to the power plug at the back of the power supply, and connect the cable. See the *Getting Started Guide* for more information.



NOTE: After installing a new power supply, allow several seconds for the system to recognize the power supply and determine whether it is working properly. The power supply status indicator will turn green to signify that the power supply is functioning properly. See Figure 1-4.

Internal USB Memory Key

The system provides an internal USB connector located on the front control board for use with a USB flash memory key. The USB memory key can be used as a boot device, security key, or mass storage device. To use the internal USB connector, the **Internal USB Port** option must be enabled in the **Integrated Devices** screen of the System Setup program.

To boot from the USB memory key, you must configure the USB memory key with a boot image and then specify the USB memory key in the boot sequence in the System Setup program. See "System Setup Options" on page 46. For information on creating a bootable file on the USB memory key, see the user documentation that accompanied the USB memory key.

Installing the Optional Internal USB Memory Key

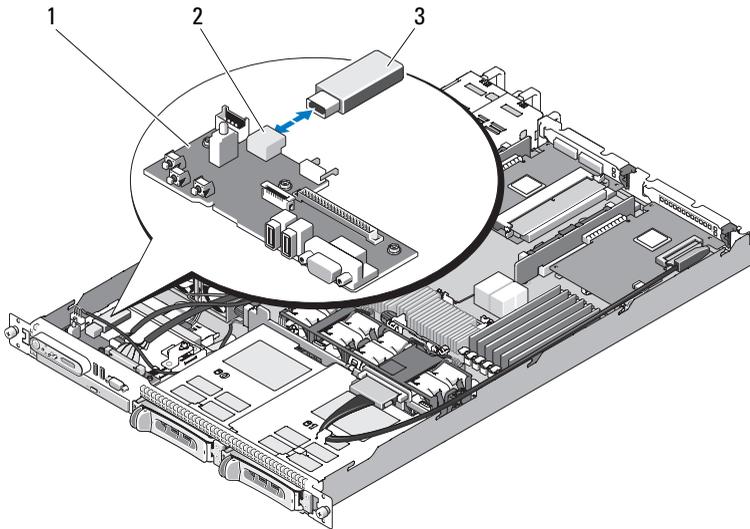


CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet and peripherals.
- 2 Open the system. See "Opening and Closing the System" on page 68.
- 3 Locate the USB connector on the front control board (see Figure 6-3).

- 4 Insert the USB memory key into the USB connector onto the board. See Figure 3-13.
- 5 Close the system. See "Opening and Closing the System" on page 68.
- 6 Reattach any peripherals, then connect the system to the electrical outlet.
- 7 Turn on the system and attached peripherals.
- 8 Enter the System Setup program and verify that the USB key has been detected by the system. See "Entering the System Setup Program" on page 45.

Figure 3-13. Installing an Internal USB Key



- | | | | |
|---|---------------------|---|------------------------|
| 1 | front control board | 2 | internal USB connector |
| 3 | USB memory key | | |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

RAC Card

The optional Remote Access Controller (RAC) provides a set of advanced features for managing the server remotely.

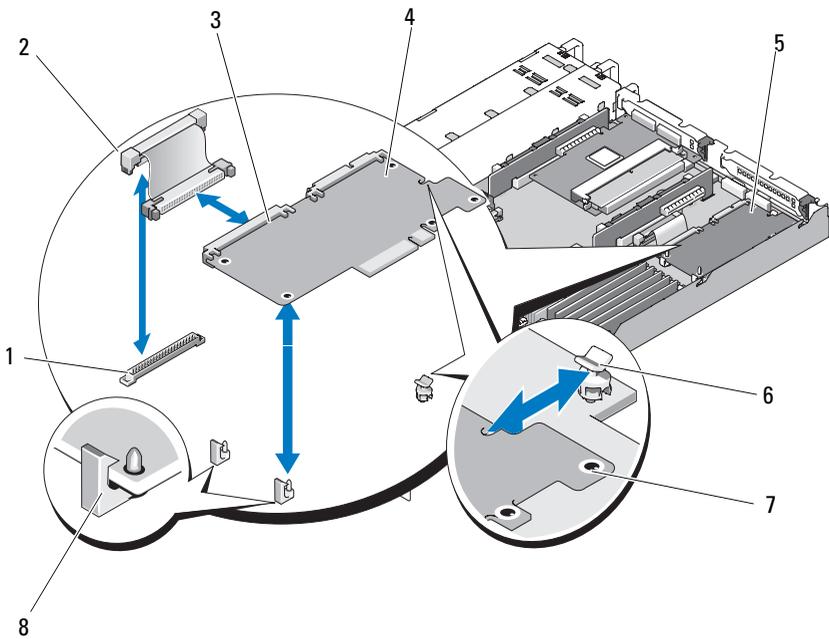
Removing the RAC Card



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
- 2 Open the system. See "Opening the System" on page 69.
- 3 Remove any expansion cards on the center (slot 1) riser board. See "Removing an Expansion Card" on page 96.
- 4 Remove the center riser card. See "Removing the Riser Card" on page 98.
- 5 Disconnect the short ribbon cable to the system board. See Figure 3-14.

Figure 3-14. Removing and Installing a RAC Card



- | | |
|-----------------------------------|-------------------------|
| 1 RAC-card system board connector | 2 RAC-card ribbon cable |
| 3 RAC-card connector | 4 RAC card |
| 5 RAC card bay | 6 retention standoffs |
| 7 standoff holes (5) | 8 support standoffs |

- 6** Pull back slightly on one of the blue retention standoff tabs and gently work the edge of RAC card off of the standoff. Repeat for the other retention standoff.
- 7** Angle the free end of the RAC card up and pull the card away from the support standoff.

- 8 If you are not replacing the RAC card, disconnect and remove the ribbon cables from the RAC card and insert the plastic filler plug in the system back panel.

 **NOTICE:** When detaching the RAC cables from the system board, squeeze the metal ends of the cable connectors and gently work the connector out of the socket. Do not pull on the cable to unseat the connector. Doing so can damage the cable.

- 9 Close the system. See "Closing the System" on page 69.

Installing a RAC Card

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
- 2 Open the system. See "Opening the System" on page 69.
- 3 Remove any expansion card that is already installed on the riser board. See "Removing an Expansion Card" on page 96.
- 4 Remove the plastic filler on the rear wall of the system. See Figure 3-14.
- 5 Connect the ribbon cable to the RAC card.

 **NOTE:** You must perform this step before connecting the RAC card to the system board. Once the card is fully seated on the standoffs, it will be difficult to connect the ribbon cable to the RAC card and to the system board.

- 6 Angle the RAC card so that its NIC connector inserts through the back-panel RAC card opening, and then straighten the card. See Figure 3-14.
- 7 Position the back edge of the card so that the cutout on the edge of the card inserts into the support standoff. See Figure 3-14.
- 8 Align the front edge of the RAC card with the two front plastic retention standoffs and press down the side of the card until it is fully seated on the standoffs. See Figure 3-14.

When the front of the card is fully seated, the plastic standoff snaps over the edge of the card.

- 9 Connect the ribbon cable to the system board. See Figure for the connector locations.

 **NOTICE:** Be careful when attaching cables to the system board that you do not damage the surrounding system board components.

- a Connect one cable to the RAC_CONN connector on the system board.

- 10 Close the system. See "Closing the System" on page 69.

See the RAC card documentation for information on configuring and using the RAC card.

Expansion Cards

See "Installing the Riser Card" on page 99 and "Expansion Card Connectors for SAS Controller Daughter Cards" on page 160 for general instructions about installing the SAS controller daughter card and the RAC card. See the controller card documentation for specific information on installing and configuring the card.

Installing an Expansion Card

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 Lift the expansion-card retainer that is adjacent to the PCI slots. See "Installing and Removing Expansion Cards" on page 97.
- 3 Slide the expansion-card sliding retainer to the retracted or open position. See Figure 3-15.
- 4 Remove the filler bracket on the slot you will be using.

 **NOTE:** Keep this bracket if you need to remove the expansion card. Filler brackets must be installed over empty expansion card slots to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

- 5 Insert the expansion card firmly into the expansion-card connector on the riser card until the card is fully seated.



NOTE: Ensure that the expansion-card bracket is also inserted into the securing slot on the chassis's back panel.

- 6 Replace the expansion-card retainer. See Figure 3-15.
- 7 Slide the expansion-card sliding retainer to the closed position so that it engages the edge of the expansion card. See Figure 3-15.
- 8 Connect any internal or external cable(s) to the expansion card.



NOTE: You will need to remove the riser card in order to install expansion cards with internal connectors. See "Riser Cards" on page 97.

- 9 Close the system. See "Opening and Closing the System" on page 68.

Removing an Expansion Card



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

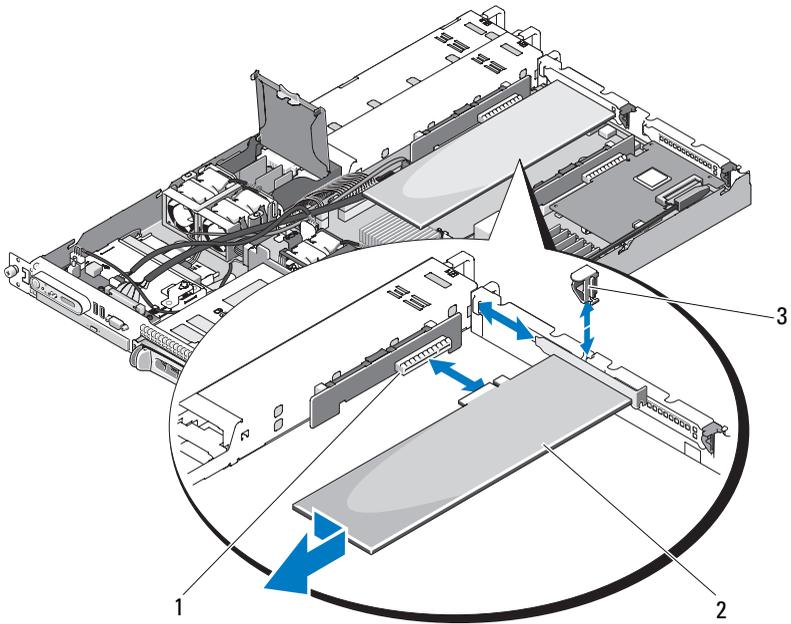
- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 Disconnect any internal or external cable(s) that are connected to the expansion card.
- 3 Lift the expansion-card retainer adjacent to the PCI slots. See Figure 3-17.
- 4 Slide the expansion-card sliding retainer to the retracted or open position. See Figure 3-17.
- 5 Grip the edges of the expansion card with the fingers of both hands and carefully work the card out of the expansion-card connector.
- 6 If you are permanently removing the card, replace the metal filler bracket over the empty card-slot opening.



NOTE: Filler brackets must be installed over empty expansion-card slots to maintain FCC certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

- 7 Replace the expansion-card retainer.
- 8 Close the system. See "Opening and Closing the System" on page 68.

Figure 3-15. Installing and Removing Expansion Cards



- 1 expansion-card connector (left riser card)
- 2 expansion card
- 3 expansion card back retainer

NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Riser Cards

The left and center riser cards each provide one expansion-card slot. The system is available with a x8-lane PCIe riser card for both slots on the left or center risers. The left riser has an optional PCI-X riser card slot. Both PCIe riser cards contain one PCIe expansion slot with an x8-lane connector with

x8-lane capability. The PCI-X left riser card provides one slot that can support either a 64-bit, 133 MHz PCI-X expansion slot or a PCIe x8-lane expansion slot.

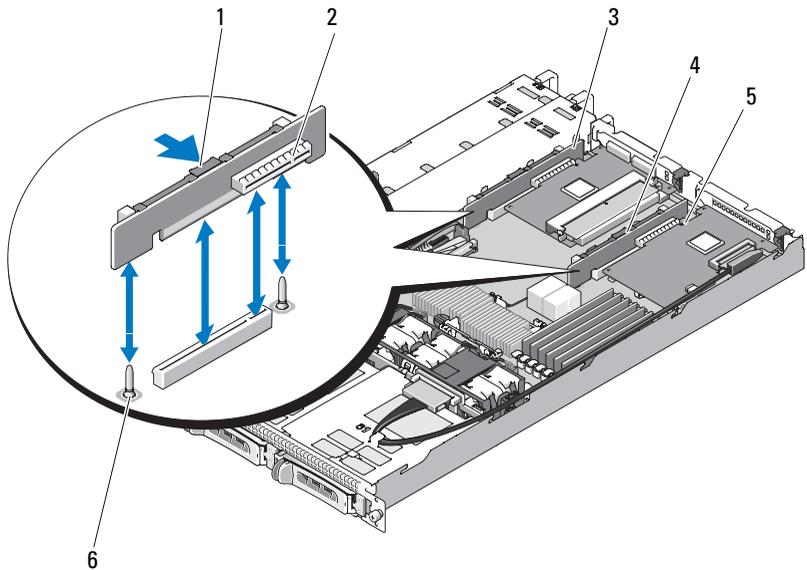
Removing the Riser Card



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 If applicable, remove the bezel. See "Front Bezel" on page 67.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 3 Open the system. See "Opening and Closing the System" on page 68.
- 4 If applicable, disconnect the cable connector on the expansion card. See "Removing an Expansion Card" on page 96.
- 5 If applicable, remove the expansion card from the riser.
- 6 Press the release latch(es) on the riser board and lift the riser board straight up from the system board. See Figure 3-16.

Figure 3-16. Installing and Removing the Riser Card



- | | |
|----------------------------|--|
| 1 riser card release latch | 2 riser card connector |
| 3 left riser card | 4 center riser card |
| 5 riser card connector | 6 center riser card alignment pins (2) |

Installing the Riser Card

⚠ CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Align the riser board with the alignment pins on the system board, then lower the board onto the pins.
- 2 Press down on the riser board until the edge connector(s) on the board is (are) fully seated in the riser board connector on the system board. See Figure 3-16.

- 3 If applicable, install the expansion card in the expansion-card slot.
- 4 If applicable, connect the expansion card in the expansion-card slot.
- 5 Close the system. See "Opening and Closing the System" on page 68.

Backplane Board

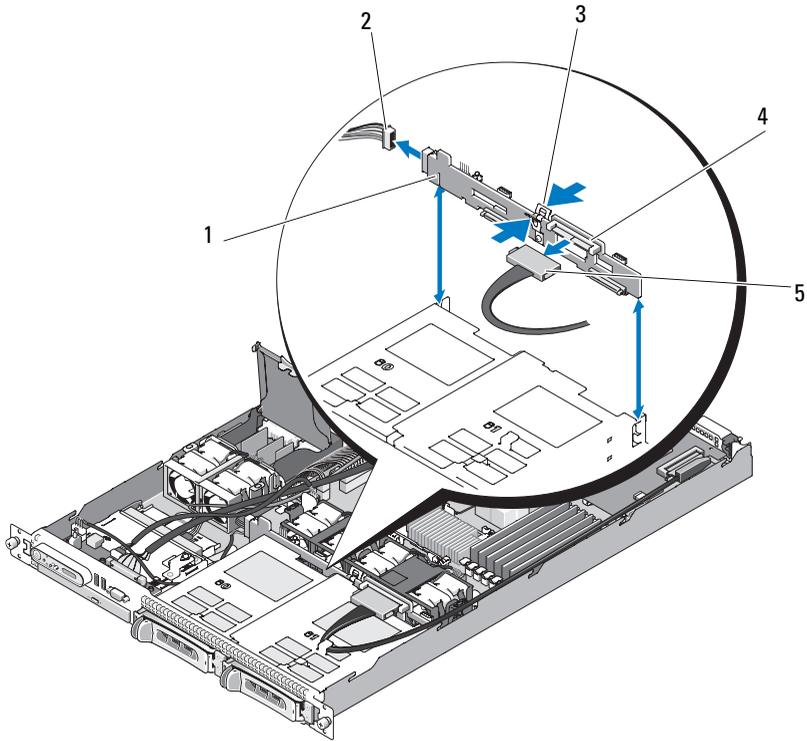
Removing the Backplane Board



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 If applicable, remove the bezel. See "Front Bezel" on page 67.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 3 Open the system. See "Opening and Closing the System" on page 68.
- 4 Remove the hard drives.
 - ➔ **NOTICE:** To properly reinstall the hard drives, ensure that you record which hard drive you remove from which bay.
- 5 Disconnect the SAS cable and power cable from the backplane. See Figure 3-17.
- 6 Remove the backplane by squeezing together both sides of the center release latch. See Figure 3-17.

Figure 3-17. Removing and Installing the Backplane



- | | | | |
|---|--------------------------------|---|-------------|
| 1 | backplane securing slot | 2 | power cable |
| 3 | backplane center release latch | 4 | backplane |
| 5 | SAS interface cable | | |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Installing the Backplane Board



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Ensure that the SAS interface cable connector is facing toward the hard-drive bays and align the backplane board with the left- and right-securing slots. See Figure 3-17.
- 2 Ensure that the backplane board center latch is engaged with the hard drive cage. See Figure 3-17.
- 3 Connect the SAS cable and power cable to the backplane connectors. See Figure 3-17.
- 4 Reinstall the hard drives. "Installing a Hot-Plug Hard Drive" on page 75.



NOTE: Reinstall the hard drives in the same drive bays from which they were removed.

- 5 Close the system.
- 6 If applicable, install the bezel. See "Replacing the Front Bezel" on page 68.

System Memory

The six memory module sockets are located to the right side of the system board and can accommodate 512 MB to 24 GB of registered PC-4200/5300, 533/667-MHz, DDR2 memory with ECC. See Figure 6-1 for the location of the memory module sockets.

You can upgrade the system memory by installing combinations of 512-MB, 1-GB, 2-GB, and 4-GB memory modules. You can purchase memory upgrade kits from Dell.



NOTE: The memory modules must be PC-4200/5300 compliant.

Memory Module Installation Guidelines

The memory module sockets are arranged in six ranks (1, 2, 3, 4, 5, and 6) on two channels (A and B).

The memory modules ranks are identified as follows:

Rank 1, 2: DIMM1_A and DIMM1_B

Rank 3, 4: DIMM2_A and DIMM2_B

Rank 5, 6: DIMM3_A and DIMM3_B

The memory modules must be installed in identical pairs in configurations that have more than one memory module. For example, if socket DIMM1_A contains a 512-MB memory module, then the second memory module to be installed must be a 512-MB memory module in socket DIMM1_B.

Table 3-1 shows examples of different memory configurations, based on the following guidelines:

- The minimum memory configuration is 512 MB.
- If only one memory module is installed, it must be installed in the DIMM1_A socket.
- A rank must contain identical memory modules.
- Install memory modules in rank 1, 2 (DIMM1_x) before installing memory modules in rank 3, 4 (DIMM2_x), and install memory modules in rank 3, 4 before installing rank 5, 6 (DIMM3_x).
- Configurations of three or five memory modules are not supported.

Table 3-1. Sample Memory Module Configurations

| Total Memory | DIMM1_A | DIMM1_B | DIMM2_A | DIMM2_B | DIMM3_A | DIMM3_B |
|---------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 512 MB | 512 MB | | | | | |
| 1 GB | 512 MB | 512 MB | | | | |
| 1 GB | 1 GB | | | | | |
| 2 GB | 512 MB | 512 MB | 512 MB | 512 MB | | |
| 2 GB | 1 GB | 1 GB | | | | |
| 3 GB | 512 MB |
| 4 GB | 1 GB | 1 GB | 1 GB | 1 GB | | |
| 4 GB | 2 GB | 2 GB | | | | |
| 6 GB | 1 GB | 1 GB | 1 GB | 1 GB | 1 GB | 1 GB |
| 8 GB | 2 GB | 2 GB | 2 GB | 2 GB | | |

Table 3-1. Sample Memory Module Configurations (continued)

| Total Memory | DIMM1_A | DIMM1_B | DIMM2_A | DIMM2_B | DIMM3_A | DIMM3_B |
|--------------|---------|---------|---------|---------|---------|---------|
| 12 GB | 2 GB | 2 GB | 2 GB | 2 GB | 2 GB | 2 GB |
| 24 GB | 4 GB | 4 GB | 4 GB | 4 GB | 4 GB | 4 GB |

Installing Memory Modules



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 Locate the memory module sockets. See Figure 6-1.
- 3 If applicable, disconnect the SAS connector on the expansion card, and then remove the system board shroud before proceeding to step 4.
- 4 Press the ejectors on the memory module socket down and out, as shown in Figure 3-18, to allow the memory module to be inserted into the socket.
- 5 Align the memory module's edge connector with the alignment keys of the memory module socket, and insert the memory module in the socket.



NOTE: The memory module socket has two alignment keys that allow you to install the memory module in the socket in only one way.

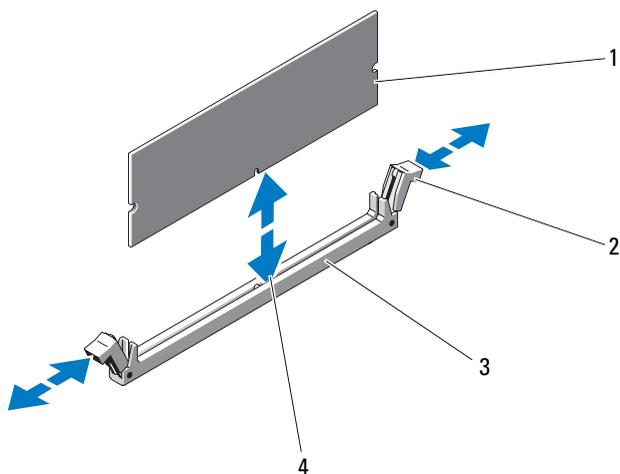
- 6 Replace the system board shroud and connect the SAS cable to the connector on the installed expansion card. Route the SAS cable through the slot between the system board shroud and the system sidewall. See Figure 3-5.
- 7 Press down on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the socket.

When the memory module is properly seated in the socket, the ejectors on the memory module socket align with the ejectors on the other sockets that have memory modules installed.

- 8 Repeat step 2 through step 7 of this procedure to install the remaining memory modules. See Table 3-1 for valid memory configurations.

- 9 Close the system. See "Opening and Closing the System" on page 68.
- 10 (Optional) Press <F2> to enter the System Setup program, and check the **System Memory** setting on the main **System Setup** screen.
The system should have already changed the value to reflect the newly installed memory.
- 11 If the value is incorrect, one or more of the memory modules may not be installed properly. Repeat step 1 through step 10 of this procedure, checking to ensure that the memory modules are firmly seated in their sockets.
- 12 Run the system memory test in the system diagnostics. See "Running the System Diagnostics" on page 151.

Figure 3-18. Installing and Removing a Memory Module



- | | | | |
|---|---------------|---|-----------------------------------|
| 1 | memory module | 2 | memory-module socket ejectors (2) |
| 3 | socket | 4 | alignment keys (2) |

Removing Memory Modules

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 If applicable, disconnect the SAS cable on the installed expansion card, and then remove the system board shroud before proceeding to step 3. See Figure 3-5.
- 3 Locate the memory module sockets. See Figure 6-1.
- 4 Press down and out on the ejectors on each end of the socket until the memory module pops out of the socket. See Figure 3-18.
- 5 Replace the system board shroud and connect the SAS connector to the installed expansion card, and then route the cable through the slot between the shroud and the system sidewall. See Figure 3-5.
- 6 Close the system. See "Opening and Closing the System" on page 68.

Processor

You can upgrade the processor to take advantage of future options in speed and functionality. The processor and its associated internal cache memory are contained in a land grid array (LGA) package that is installed in a ZIF socket on the system board.

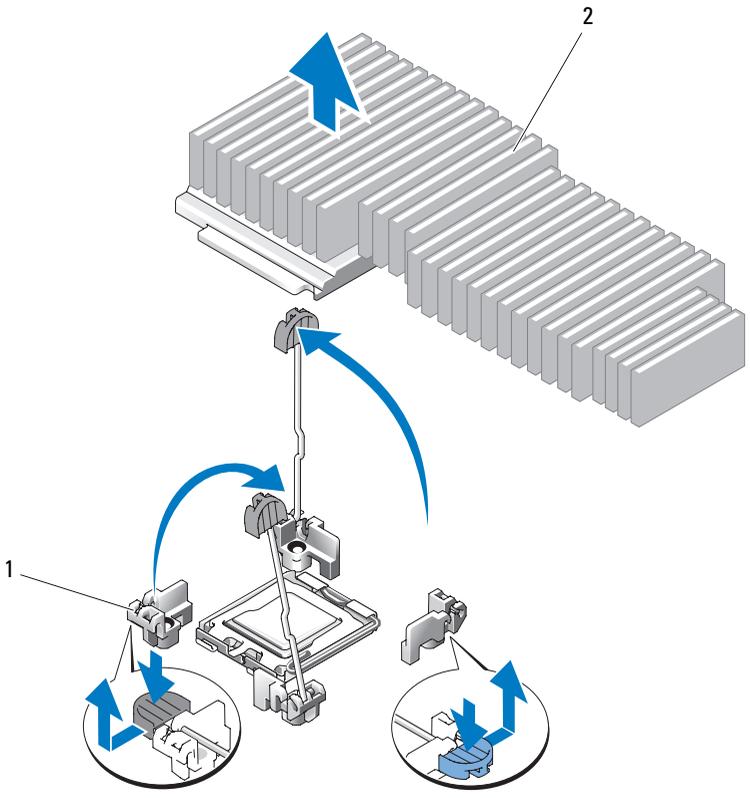
Replacing the Processor

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Prior to upgrading your system, download the latest system BIOS version on support.dell.com.
- 2 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
- 3 Open the system. See "Opening the System" on page 69.

- 4 If applicable, disconnect the SAS cable connector on the expansion card.
 - 5 Remove the system board shroud. See "Removing the System Board Shroud" on page 71.
 - 6 Position your thumb firmly over the socket-release lever and release the lever from the locked position. Rotate the lever 90 degrees upward until the processor is released from the socket. See Figure 3-20.
 - 7 Gently lift the heat sink off of the processor and set the heat sink aside.
-  **NOTICE:** The processor is held in its socket under strong pressure. Be aware that the release lever can spring up suddenly if not firmly grasped.

Figure 3-19. Installing and Removing the Heat Sink

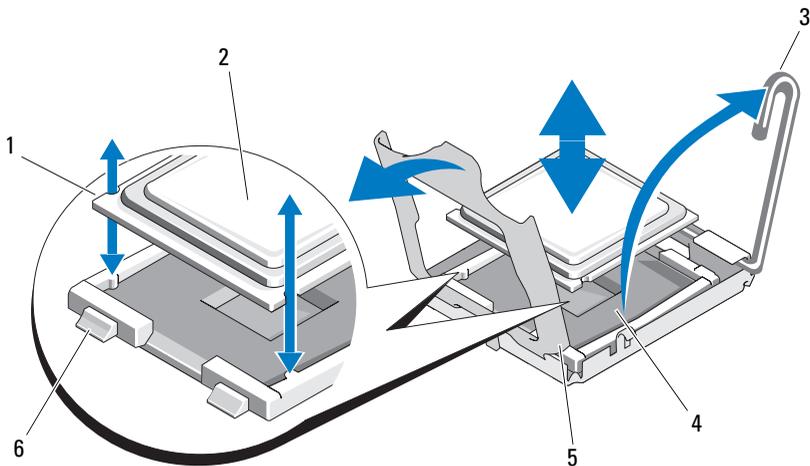


1 release levers (2)

2 heat sink

- 8 Release the socket-release lever before opening the processor shield.
 - 9 Rotate the processor shield upward and out of the way.
 - 10 Lift the processor out of the socket and leave the release lever up so that the socket is ready for the new processor.
- NOTICE:** Be careful not to bend any of the pins on the ZIF socket when removing the processor. Bending the pins can permanently damage the system board.

Figure 3-20. Installing and Removing the Processor



- | | | | |
|---|------------------------|---|----------------|
| 1 | notch in processor (2) | 2 | processor |
| 3 | socket-release lever | 4 | ZIF socket |
| 5 | processor shield | 6 | socket key (2) |

Installing a Processor

- 1 Unpack the new processor.
- 2 Align the processor with the socket keys on the ZIF socket. See Figure 3-20.
- 3 Install the processor in the socket.

NOTICE: Positioning the processor incorrectly can permanently damage the system board or the processor when you turn it on. When placing the processor in the socket, be careful not to bend the pins in the socket. Avoid touching the socket pins or the pads on the processor when handling the processor or the system board.

- a If the release lever on the processor socket is not positioned all the way up, move it to that position.
- b With the processor and the socket keys aligned, set the processor lightly in the socket.

 **NOTICE:** Do not use force to seat the processor. When the processor is positioned correctly, it engages easily into the socket.

- c** Close the processor shield. See Figure 3-20.
 - d** When the processor is fully seated in the socket, rotate the socket release lever back down until it snaps into place, securing the processor. See Figure 3-20.
- 4** Install the heat sink.
 - a** Using a clean lint-free cloth, remove the thermal grease from the heat sink removed from the old processor.
 - b** Open the grease packet included with your processor kit and apply thermal grease evenly to the top of the new processor.
 - c** Place the heat sink on the processor. See Figure 3-19.
 - d** Rotate the release lever downward until it snaps into place.
- 5** Replace the system board shroud. See "Installing the System Board Shroud" on page 72.
- 6** If applicable, connect the SAS cable connector on the installed expansion card, and then route the cable through the slot between the system board shroud and the system sidewall. See Figure 3-5.
- 7** Close the system. See "Closing the System" on page 69.
- 8** As the system boots, it detects the presence of the new processor and automatically changes the system configuration information in the System Setup program.
- 9** Press <F2> to enter the System Setup program, and check that the processor information matches the new system configuration. See "Entering the System Setup Program" on page 45.
- 10** Run the system diagnostics to verify that the new processor operates correctly.

See "Running the System Diagnostics" on page 152 for information about running the diagnostics.

System Battery

The system battery is a 3.0-volt (V), coin-cell battery.

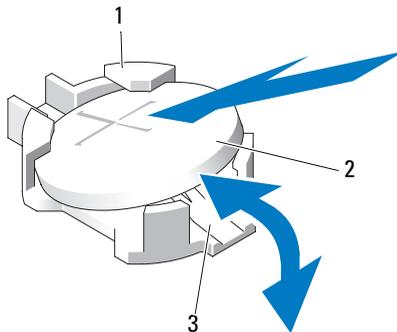
Replacing the System Battery

⚠ CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

⚠ 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. See your *System Information Guide* for additional information.

- 1 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
- 2 Open the system. See "Opening and Closing the System" on page 68.
- 3 Remove the left riser card (RISER2) and any installed expansion card. See "Removing the Riser Card" on page 98.

Figure 3-21. Replacing the Battery



- | | | | |
|---|------------------------------------|---|----------------|
| 1 | positive side of battery connector | 2 | system battery |
| 3 | negative side of battery connector | | |

- 4 Locate the battery socket. See "System Board Connectors" on page 155.
- ➔ **NOTICE:** If you pry the battery out of its socket with a blunt object, be careful not to touch the system board with the object. Ensure that the object is inserted between the battery and the socket before you attempt to pry out the battery. Otherwise, you may damage the system board by prying off the socket or by breaking circuit traces on the system board.
- ➔ **NOTICE:** To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.
- 5 Remove the system battery.
 - a Support the battery connector by pressing down firmly on the positive side of the connector.
 - b While supporting the battery connector, press the battery toward the positive side of the connector and pry it up out of the securing tabs at the negative side of the connector.
- ➔ **NOTICE:** To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.
- 6 Install the new system battery.
 - a Support the battery connector by pressing down firmly on the positive side of the connector.
 - b Hold the battery with the "+" facing up, and slide it under the securing tabs at the positive side of the connector.
 - c Press the battery straight down into the connector until it snaps into place.
- 7 Replace the left riser card (RISER2) and any installed expansion card. See "Installing the Riser Card" on page 99.
- 8 Close the system. See "Closing the System" on page 69.
- 9 Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
- 10 Enter the System Setup program to confirm that the battery is operating properly. See "Entering the System Setup Program" on page 45.
- 11 Enter the correct time and date in the System Setup program's **Time** and **Date** fields.
- 12 Exit the System Setup program.

- 13 To test the newly installed battery, turn off the system and disconnect it from the electrical outlet for at least an hour.
- 14 After an hour, reconnect the system to its electrical outlet and turn it on.
- 15 Enter the System Setup program and if the time and date are still incorrect, see "Getting Help" on page 165 for instructions on obtaining technical assistance.

Control Panel Assembly (Service-only Procedure)



NOTE: The control panel assembly consists of two separate modules—the display module and the control panel circuit board. Use the following instructions to remove and install either module.

Removing the Control Panel Assembly



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

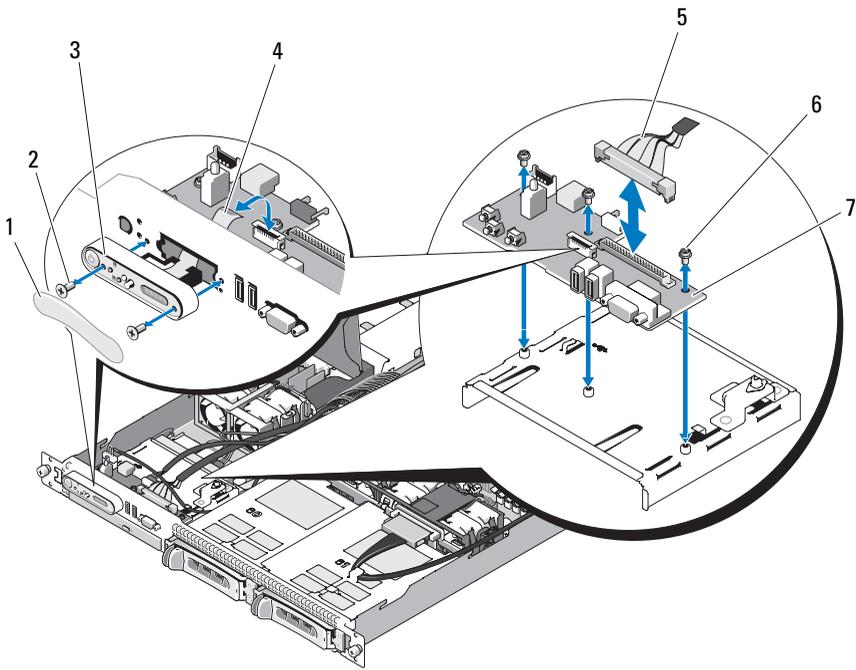
- 1 If applicable, remove the bezel. See "Removing the Front Bezel" on page 67.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
- 3 Open the system. See "Opening the System" on page 69.
- 4 Disconnect the control panel cable at back of the control panel board. See Figure 3-22.



NOTICE: Do not pull on the cable to unseat the connector. Doing so can damage the cable.

- a Squeeze the metal tabs on the ends of the cable connector.
- b Gently work the connector out of the socket.

Figure 3-22. Installing and Removing the Control Panel Assembly



- | | | | |
|---|-----------------------------|---|---|
| 1 | display-module label | 2 | display-module securing screws (2) |
| 3 | display module | 4 | display-module cable |
| 5 | control-panel cable | 6 | control-panel circuit board securing screws (3) |
| 7 | control-panel circuit board | | |

NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

- 5 Disconnect the internal USB key cable and, if applicable, the hard-drive backplane 12C cable. See "Installing the Optional Internal USB Memory Key" on page 90 and "Removing the Backplane Board" on page 100.

- 6** Disconnect the display module cable from the control panel board. See Figure 3-22.
- 7** Remove the three screws that secure the control panel board to the system chassis and remove the board. See Figure 3-22.
- 8** Remove the display module:
 - a** Insert the end of paper clip into the hole on the right side of the display module and gently pry off the label.
 - b** Using a T10 Torx driver, remove the two screws that secure the display module to the system chassis.
 - c** Remove the display module from the chassis cutout.

Installing the Control Panel Assembly

- 1** Insert the display module into the chassis cutout and secure with the two Torx screws.
- 2** Affix the display module label to the display module.
- 3** Install the control panel board in the system chassis and secure with the three Phillips screws. See Figure 3-22.
- 4** Connect the display module cable to the control panel board. See Figure 3-22.
- 5** Connect the internal USB key cable and, if applicable, the hard-drive backplane 12C cable. See "Installing the Optional Internal USB Memory Key" on page 90 and "Installing the Backplane Board" on page 102.
- 6** Connect the control panel cable to the control panel board. See Figure 3-22.
- 7** Close the system. See "Opening and Closing the System" on page 68.
- 8** Reconnect the system to the power source and turn on the system and attached peripherals.
- 9** If applicable, install the bezel.

Power Distribution Board

The power distribution board is located on your system directly behind the power supply fan modules. This feature provides additional cooling to the power supplies through the power distribution shroud that routes airflow to the power supplies. See Figure 3-23.

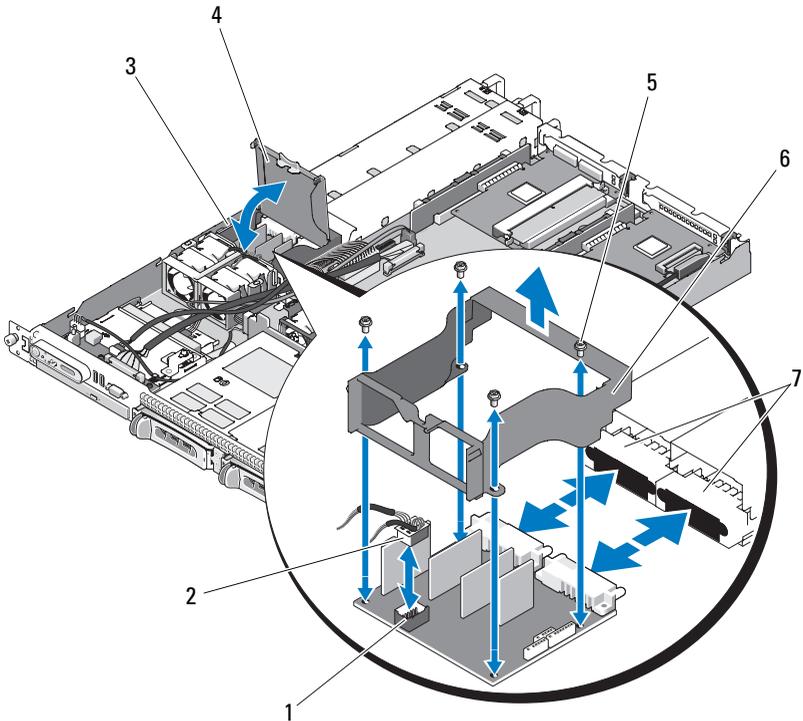
Removing the Power Distribution Board



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Remove the power supplies from the system. See "Removing a Power Supply" on page 88.
- 2 Disconnect all cable connectors from the system board, the front control board and the backplane. See "Removing the System Board Assembly" on page 119, "Removing the Control Panel Assembly" on page 113, and "Removing the Backplane Board" on page 100.
- 3 Locate the power distribution shroud cover and unlatch and rotate it up until it is stopped by a detent. See Figure 3-23.
- 4 Remove the shroud over the power distribution board by locating and removing the four captive screws that seat in the holes on the four corners of the power distribution board shroud. These captive screws also align and seat the power distribution board and shroud in the bay on the system. See Figure 3-23.
- 5 Lift off of the power distribution board shroud, and then lift the board off of the four standoffs in the system bay. See Figure 3-23.

Figure 3-23. Power Distribution Board



- | | | | |
|---|---|---|---------------------------------------|
| 1 | power-distribution board fan module connector | 2 | fan module cable connector |
| 3 | power-distribution board system bay | 4 | power-distribution board shroud cover |
| 5 | shroud captive screws (4) | 6 | power-distribution board shroud |
| 7 | power supply connectors (2) | | |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Replacing the Power Distribution Board



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Unpack the new power distribution board assembly.
- 2 Position and seat the power distribution board over the four standoffs on the chassis base, and then put the power distribution board shroud over the power distribution board and align the standoffs with the four locator holes on the four corners of the power distribution board shroud. See Figure 3-23.
- 3 Locate, align, and install the four captive screws that seat in the holes on the four corners of the power distribution board shroud. These captive screws also align and seat the power distribution board and shroud in the bay of the chassis base and the system. See Figure 3-23.
- 4 Connect the fan module cable connector to the power distribution board and then put the power distribution board shroud over the power distribution board, as shown in Figure 3-23.
- 5 Connect all cables to the system board, front control board, and backplane. See "Installing the System Board Assembly" on page 121, "Installing the Control Panel Assembly" on page 115, and "Installing the Backplane Board" on page 102.
- 6 Locate the hinged interior catches on either side of the shroud and align and seat the power distribution board cover, rotating it down and over the shroud. See Figure 3-23.
- 7 Install the power supplies in the system. "Replacing a Power Supply" on page 89.

System Board (Service-Only Procedure)

The system board and system board tray are removed and replaced as a single assembly.

Removing the System Board Assembly

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet. Open the system. See "Opening and Closing the System" on page 68.
- 2 Remove the system board cooling shroud. See "Removing the System Board Shroud" on page 71.
- 3 Remove the heat sink and processor. See "Replacing the Processor" on page 106.
- 4 Remove the memory modules. See "Removing Memory Modules" on page 106.



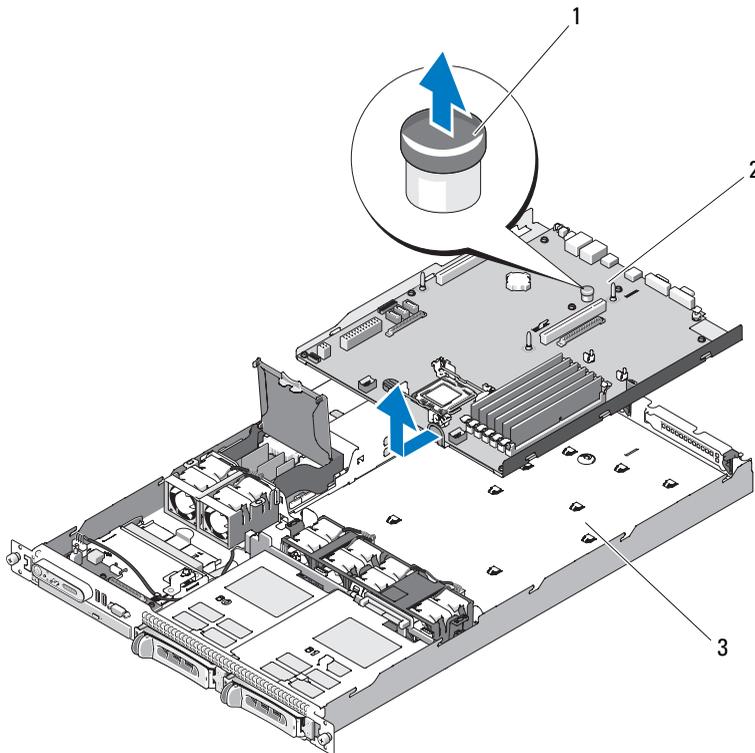
NOTE: As you remove the memory modules, record the memory-module socket locations to ensure proper installation.

- 5 Disconnect the control-panel interface cable from the CTRL_PNL connector on the system board. See Figure 6-1.
- 6 Disconnect the internal USB key cable from the connector USB_CONN on the system board. See Figure 6-1 and see "Internal USB Memory Key" on page 90.
- 7 Disconnect the power distribution board 12C cable from the connector PDB_12C on the system board. See Figure 6-1 and see "Removing the Power Distribution Board" on page 116.
- 8 Disconnect the hard-drive interface cables:
Disconnect the SATA cables from the hard drives and the optical drives (if applicable) from the SATA_A, SATA_B, and SATA_C connectors.
- 9 Disconnect the two fan module assemblies (1 and 2 , 3 and 4) from the fan FAN_MOD1 and FAN_MOD2 connectors on the system board.
- 10 Remove all expansion cards installed on the riser card. See "Removing an Expansion Card" on page 96.
- 11 Remove the riser cards. See "Removing the Riser Card" on page 98.
- 12 Disconnect the two power cables from the 12V and PWR_CONN connectors on the system board. See Figure 6-1.

CAUTION: Before removing the system board tray from the chassis, ensure that all system board cables are disconnected from their respective cable connectors.

- 13 Pull up on the plunger that secures the system board tray to the chassis floor. See Figure 3-24.
- 14 Using the tab on the system board tray, slide the system board forward (toward the front of the system) and lift the assembly up and out of the chassis. See Figure 3-24.
- 15 Lay the system board tray down on a smooth, nonconductive work surface.

Figure 3-24. Installing and Removing the System Board



- | | | | |
|---|-------------------|---|--------------|
| 1 | plunger | 2 | system board |
| 3 | system board tray | | |



NOTE: In the preceding figure, the 12C cable is shown connecting over the control panel cabling. This cable should be routed under the control panel cable and the internal USB key connector. The 12C cable seats in a cable guide clip that is directly beneath the control panel connector.

Installing the System Board Assembly



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Unpack the new system board assembly.
- 2 While sliding the system board tray into place, tilt the board at an angle to ensure that the cables from the power distribution board are above the system board assembly.
- 3 Slide the system board into the chassis ensuring that no cable connectors are under the system board assembly as you seat it in the chassis floor.
- 4 Slide the system board tray backward until it stops.
- 5 Press down on the plunger that secures the system board tray to the chassis. See Figure 3-24.
- 6 Install the PDB 12C cable to the connector PDB_12C. See Figure 6-1 and see "Replacing the Power Distribution Board" on page 118.
- 7 Install the internal USB key cable to the connector USB_CONN on the system board. See Figure 6-1 and see "Installing the Optional Internal USB Memory Key" on page 90.
- 8 Connect the two power cables to the 12V and PWR_CONN connectors on the system board. See Figure 6-1.
- 9 Install the riser cards. See "Installing the Riser Card" on page 99.
- 10 Install all expansion cards in expansion-card left or center riser (RISER1 or RISER2). See Figure 6-1 and see "Installing an Expansion Card" on page 95.
- 11 Connect the hard-drive interface cables.
- 12 Connect the fan module cables to the FAN_MOD1 and FAN_MOD2 connectors on the system board. See "Installing the Fan Assembly" on page 86.

- 13 Install the processor and heat sink. See "Replacing the Processor" on page 106.
- 14 Install the memory modules. See "Installing Memory Modules" on page 104.
 -  **NOTE:** Install the memory modules as noted in step 4 of the procedure in "Removing the System Board Assembly" on page 119.
- 15 Connect the control-panel interface cable to the CTRL_PNL connector on the system board. See Figure 6-1 for the location of the CTRL_PNL connector.
- 16 If applicable, connect the optical drive interface cable to the SATA_C connector on the system card. See Figure 6-1 for the location of the SATA connector.
- 17 Install the system board shroud. See "Installing the System Board Shroud" on page 72.
- 18 Close the system. See "Opening and Closing the System" on page 68.
- 19 If you are not replacing the RAC card, insert the plastic filler plug in the system back panel.
 -  **NOTICE:** When detaching the RAC cables from the system board, squeeze the metal ends of the cable connectors and gently work the connector out of the socket. Do not pull on the cable to unseat the connector. Doing so can damage the cable.
- 20 Close the system. See "Closing the System" on page 69.

Troubleshooting Your System

Safety First—For You and Your System

To perform certain procedures in this document, you must remove the system cover and work inside the system. While working inside the system, do not attempt to service the system except as explained in this guide and elsewhere in your system documentation.



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

Start-Up Routine

Look and listen during the system's start-up routine for the indications described in Table 4-1.

Table 4-1. Start-Up Routine Indications

| Look/listen for: | Action |
|---|--|
| A status or error message displayed on the front-panel LCD. | See "LCD Status Messages" on page 22. |
| An error message displayed on the monitor. | See "System Messages" on page 34. |
| Alert messages from the systems management software. | See the systems management software documentation. |
| The monitor's power indicator. | See "Troubleshooting the Video Subsystem" on page 124. |
| The keyboard indicators. | See "Troubleshooting the Keyboard" on page 125. |
| The USB diskette drive activity indicator. | See "Troubleshooting a Diskette Drive" on page 138. |

Table 4-1. Start-Up Routine Indications (continued)

| Look/listen for: | Action |
|--|---|
| The USB CD drive activity indicator. | See "Troubleshooting an Optical Drive" on page 140. |
| The hard-drive activity indicator. | See "Troubleshooting a Hard Drive" on page 142. |
| An unfamiliar constant scraping or grinding sound when you access a drive. | See "Getting Help" on page 165. |

Checking the Equipment

This section provides troubleshooting procedures for external devices attached to the system, such as the monitor, keyboard, or mouse. Before you perform any of the procedures, see "Troubleshooting External Connections" on page 124.

Troubleshooting External Connections

Loose or improperly connected cables are the most likely source of problems for the system, monitor, and other peripherals (such as a printer, keyboard, mouse, or other external device). Ensure that all external cables are securely attached to the external connectors on your system. See "Front-Panel Features and Indicators" on page 13 and "Back-Panel Features and Indicators" on page 19 for the front- and back-panel connectors on your system.

Troubleshooting the Video Subsystem

Problem

- Monitor is not working properly.
- Video memory is faulty.

Action

- 1 Check the system and power connections to the monitor.
- 2 Determine whether the system has an expansion card with a video output connector.

In this system configuration, the monitor cable should normally be connected to the connector on the expansion card, *not* to the system's integrated video connector.

To verify that the monitor is connected to the correct video connector, turn off the system and wait for 1 minute, then connect the monitor to the other video connector and turn the system on again.

- 3 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.

If the tests run successfully, the problem is not related to video hardware.

If the tests fail, see "Getting Help" on page 165.

Troubleshooting the Keyboard

Problem

- System message indicates a problem with the keyboard.
- Keyboard is not functioning properly.

Action

- 1 Enter the System Setup program and ensure that the USB ports are enabled. See "Entering the System Setup Program" on page 45.
- 2 Examine the keyboard and its cable for signs of damage.
- 3 Swap the faulty keyboard with a working keyboard.
If the problem is resolved, replace the faulty keyboard. See "Getting Help" on page 165.
- 4 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.
If the problem is not resolved, see "Getting Help" on page 165.

Troubleshooting the Mouse

Problem

- System message indicates a problem with the mouse.
- Mouse is not functioning properly.

Action

- 1** Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.
If the test fails, continue to the next step.
- 2** Examine the mouse and its cable for signs of damage.
If the mouse is not damaged, go to step 4.
If the mouse is damaged, continue to the next step.
- 3** Swap the faulty mouse with a working mouse.
If the problem is resolved, replace the faulty mouse. See "Getting Help" on page 165.
- 4** Enter the System Setup program and ensure that the mouse controller is enabled. See "Entering the System Setup Program" on page 45.
If the problem is not resolved, see "Getting Help" on page 165.

Troubleshooting Serial I/O Problems

Problem

- Error message indicates a problem with a serial port.
- Device connected to a serial port is not operating properly.

Action

- 1** Enter the System Setup program and ensure that the serial port is enabled and configured correctly for your application. See "Entering the System Setup Program" on page 45.
- 2** If the problem is confined to a particular application, see the application documentation for specific port configuration requirements that the program may require.

- 3 Run the appropriate online diagnostic test. See "Running the System Diagnostics" on page 151.

If the tests run successfully but the problem persists, see "Troubleshooting a USB Device" on page 127.

Troubleshooting a Serial I/O Device

Problem

- Device connected to the serial port is not operating properly.

Action

- 1 Turn off the system and any peripheral devices connected to the serial port.
- 2 Swap the serial interface cable with a working cable, and turn on the system and the serial device.

If the problem is resolved, replace the interface cable. See "Getting Help" on page 165.

- 3 Turn off the system and the serial device, and swap the device with a comparable device.
- 4 Turn on the system and the serial device.

If the problem is resolved, replace the serial device. See "Getting Help" on page 165.

If the problem persists, see "Getting Help" on page 165.

Troubleshooting a USB Device

Problem

- System message indicates a problem with a USB device.
- One or more USB devices are not operating properly.

Action

- 1 If a single USB device is experiencing a problem, perform the following procedure. For problems with multiple USB devices, skip to step 2.
 - a Turn off the USB device, disconnect the USB cable from the system briefly, and reconnect the cable.
 - b Restart the system, enter the System Setup program, and ensure that all USB ports are enabled. See "Using the System Setup Program" on page 46.
 - c Turn off the USB device and swap the interface cable with a working cable. Turn on the device.

If the problem is resolved, replace the interface cable.
 - d Turn off the USB device, connect it to another USB connector on the system, and turn on the USB device.

If the USB device functions, the USB connector on the system is likely defective. Otherwise, the USB device is faulty and needs to be replaced. See "Getting Help" on page 165.
- 2 Power down all USB peripheral devices and disconnect all USB devices from the system except the USB mouse and keyboard.
- 3 Restart the system and reconnect the USB devices.

If the problem is resolved, the problem was likely caused by an overcurrent event on one of the USB devices. If the problem persists, attempt to isolate the faulty device by trying different USB configurations.

If the problem is not resolved, proceed to the next step.

- 4 Reset the system BIOS to the default settings by setting the NVRAM _CLR jumper inside your system. Use the following procedure.



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- a Turn off the system and attached peripherals and unplug the system from the power source.
- b Open the system. See "Opening the System" on page 69.

- c Locate the NVRAM_CLR jumper on your system board (see "System Board Jumpers" on page 155) and set the jumper to the enabled position.
- d Close the system. See "Closing the System" on page 69.
- e Reconnect the system and peripherals to power and restart.
If all USB devices are operational, proceed to the next step.
If the USB devices are still not functioning, see "Getting Help" on page 165.
- f Repeat step a and step b.
- g Set the NVRAM_CLR jumper to the disabled position.
- h Close the system.
- i Reconnect the system and peripherals to power and restart.
- j Enter the System Setup program and re-enter any custom BIOS settings that were reset. Be sure to leave all USB ports enabled. See "Entering the System Setup Program" on page 45.

Troubleshooting a NIC

Problem

- NIC cannot communicate with network.

Action

- 1 Run the appropriate online diagnostic test. See "Using Server Administrator Diagnostics" in "Running the System Diagnostics" on page 152.
- 2 Check the appropriate indicator on the NIC connector. See "NIC Indicator Codes" on page 21.
 - If the link indicator does not light, check all cable connections.
 - If the activity indicator does not light, the network driver files might be damaged or missing.
Remove and reinstall the drivers if applicable. See the NIC's documentation.

- Change the autonegotiation setting, if possible.
- Use another connector on the switch or hub.

If you are using a NIC card instead of an integrated NIC, see the documentation for the NIC card.

- 3 Ensure that the appropriate drivers are installed and the protocols are bound. See the NIC's documentation.
- 4 Enter the System Setup program and confirm that the NICs are enabled. See "Entering the System Setup Program" on page 45.
- 5 Ensure that the NICs, hubs, and switches on the network are all set to the same data transmission speed. See the network equipment documentation.
- 6 Ensure that all network cables are of the proper type and do not exceed the maximum length.

If the problem persists, see "Getting Help" on page 165.

Troubleshooting a Wet System

Problem

- Liquid spilled on the system.
- Excessive humidity.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 2 Open the system. See "Opening and Closing the System" on page 68.
- 3 Remove all expansion cards installed in the system. See "Removing an Expansion Card" on page 96.
- 4 Let the system dry thoroughly for at least 24 hours.

- 5 Close the system. See "Opening and Closing the System" on page 68.
- 6 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the system does not start properly, see "Getting Help" on page 165.

- 7 If the system starts properly, shut down the system and reinstall all of the expansion cards that you removed. See "Installing an Expansion Card" on page 95.
- 8 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.

If the tests fail, see "Getting Help" on page 165.

Troubleshooting a Damaged System

Problem

- System was dropped or damaged.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Open the system. See "Opening and Closing the System" on page 68.
- 2 Ensure that the following components are properly installed:
 - Expansion cards
 - Power supplies
 - Fans
 - Processors and heat sinks
 - Memory modules
 - Drive-carrier connections to the SAS/SATA backplane, if applicable
- 3 Ensure that all cables are properly connected.
- 4 Close the system. See "Opening and Closing the System" on page 68.

- 5 Run the system board tests in the system diagnostics. See "Using Dell PowerEdge Diagnostics" on page 151.

If the tests fail, see "Getting Help" on page 165.

Troubleshooting the System Battery

Problem

- System message indicates a problem with the battery.
- System Setup program loses system configuration information.
- System date and time do not remain current.



NOTE: If the system is turned off for long periods of time (for weeks or months), the NVRAM may lose its system configuration information. This situation is caused by a defective battery.

Action

- 1 Re-enter the time and date through the System Setup program. See "Entering the System Setup Program" on page 45.
- 2 Turn off the system and disconnect it from the electrical outlet for at least one hour.
- 3 Reconnect the system to the electrical outlet and turn on the system.
- 4 Enter the System Setup program. See "Entering the System Setup Program" on page 45.

If the date and time are not correct in the System Setup program, replace the battery. See "System Battery" on page 111.

If the problem is not resolved by replacing the battery, see "Getting Help" on page 165.



NOTE: Some software may cause the system time to speed up or slow down. If the system seems to operate normally except for the time kept in the System Setup program, the problem may be caused by software rather than by a defective battery.

Troubleshooting Power Supplies

Problem

- System-status indicators are amber.
- Power-supply fault indicators are amber.
- Front-panel status LCD indicates a problem with the power supplies.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Run the appropriate online diagnostics test. See "Entering the System Setup Program" on page 45.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 3 Open the system. See "Opening and Closing the System" on page 68.
- 4 Locate the faulty power supply.

The power supply's fault indicator is lit. See "Power Indicator Codes" on page 20.



NOTICE: You can hot plug the power supplies. One power supply must be installed for the system to operate. The system is in the redundant mode when two power supplies are installed. Remove and install only one power supply at a time in a system that is powered on. Operating the system with only one power supply installed for extended periods of time can cause the system to overheat.

- 5 Ensure that the power supply is properly installed by removing and reinstalling it. See "Replacing a Power Supply" on page 89.



NOTE: After installing a power supply, allow several seconds for the system to recognize the power supply and to determine if it is working properly. The power indicator turns green to signify that the power supply is functioning properly. See "Power Indicator Codes" on page 20.

- 6 If the problem is resolved, close the system. See "Opening and Closing the System" on page 68.
If the problem persists, remove the faulty power supply. See "Removing a Power Supply" on page 88.
- 7 Install a new power supply. See "Replacing a Power Supply" on page 89.
If the problem persists, see "Getting Help" on page 165.

Troubleshooting System Cooling Problems

Problem

- Systems management software issues a fan-related error message.

Action

Ensure that none of the following conditions exist:

- System cover, drive blanks, or shrouds are removed.
- Ambient temperature is too high.
- External airflow is obstructed.
- Cables inside the system obstruct airflow.
- An individual cooling fan is removed or has failed. See "Troubleshooting a Fan" on page 134.

Troubleshooting a Fan

Problem

- Systems management software issues a fan-related error message.
- Front panel LCD indicates a problem with the fan.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Run the appropriate diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
- 3 Open the system. See "Opening and Closing the System" on page 68.
- 4 Locate the faulty fan indicated by the LCD display or diagnostic software. For the identification number of each fan, see "Cooling Fan Modules" on page 83.
- 5 Ensure that the faulty fan's power cable is firmly attached to the fan power connector. See "Cooling Fan Modules" on page 83.
- 6 Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.
- 7 If the problem is not resolved, install a new fan. See "Cooling Fan Modules" on page 83.

If the replacement fan is working properly, close the system. See "Opening and Closing the System" on page 68.

If the replacement fan does not operate, see "Getting Help" on page 165.

Troubleshooting System Memory

Problem

- Faulty memory module.
- Faulty system board.
- Front-panel status LCD indicates a problem with system memory.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 If the system is operational, run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.

If diagnostics indicates a fault, follow the corrective actions provided by the diagnostic program. If the problem is not resolved or if the system is not operational, continue to the next step.

- 2 Turn off the system and attached peripherals, unplug the system from the power source and press the power button, and then reconnect the system to power.
- 3 Turn on the system and attached peripherals and, as the system boots, note the messages on the screen.

If an error messages appears indicating a fault with a specific memory module, go to step 12.

If any other system message appears that indicates a nonspecific memory problem, continue to the next step.

- 4 Enter the System Setup program and check the system memory setting. See "Entering the System Setup Program" on page 45.

If the installed memory does not match the amount of memory shown in the System Setup program, proceed to the next step.

If the memory settings and installed memory indicate no problems, go to step 12.

- 5 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 6 Open the system. See "Opening and Closing the System" on page 68.
- 7 Ensure that the memory banks are populated correctly. See "Memory Module Installation Guidelines" on page 102.

If the memory modules are populated correctly, continue to the next step.

- 8** Reseat the memory modules in their sockets. See "Installing Memory Modules" on page 104.
- 9** Close the system. See "Opening and Closing the System" on page 68.
- 10** Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.
- 11** Enter the System Setup program and check the system memory setting. See "Entering the System Setup Program" on page 45.
If the amount of memory installed still does not match the system memory setting, proceed to the next step.
- 12** Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.
- 13** Open the system. See "Opening and Closing the System" on page 68.
- 14** If a diagnostic test or error message indicates a specific memory module as faulty, swap or replace the module. Otherwise, swap the memory module in the first DIMM socket with a module of the same type and capacity that is known to be good. See "Installing Memory Modules" on page 104.
- 15** Close the system. See "Opening and Closing the System" on page 68.
- 16** Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.
- 17** As the system boots, observe any error message that appears and the diagnostic indicators on the front of the system.
- 18** If the memory problem is still indicated, repeat step 12 through step 17 for each memory module installed.
If the problem persists, see "Getting Help" on page 165.

Troubleshooting an Internal USB Key

Problem

- System cannot read data from a USB memory key.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Enter the System Setup program and ensure that the USB key port is enabled. See "Entering the System Setup Program" on page 45.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 3 Open the system. See "Opening and Closing the System" on page 68.
- 4 Reseat the USB key.
- 5 Close the system. See "Getting Help" on page 165.
- 6 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem is not resolved, proceed to the next step.

- 7 Repeat step 2 and step 3.
- 8 Insert a different USB key that you know works properly.
- 9 Close the system. See "Opening and Closing the System" on page 68.
- 10 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem is not resolved, see "Getting Help" on page 165.

Troubleshooting a Diskette Drive

Problem

- Error message indicates a diskette-drive problem.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1** Enter the System Setup program and verify that the diskette drive is configured correctly. See "Entering the System Setup Program" on page 45.
- 2** Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.
- 3** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 4** Open the system. See "Opening and Closing the System" on page 68.
- 5** Ensure that the diskette drive interface cable is securely connected to the diskette drive and the system board.
- 6** Ensure that a power cable is properly connected to the drive.
- 7** Close the system. See "Opening and Closing the System" on page 68.
- 8** Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
- 9** Run the appropriate online diagnostic test to see whether the diskette drive works correctly.

If the problem persists, continue with the following steps.

- 10** Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.
- 11** Open the system. See "Opening and Closing the System" on page 68.
- 12** Close the system. See "Opening and Closing the System" on page 68.
- 13** Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
- 14** Run the appropriate online diagnostic test to see whether the diskette drive works correctly.

If the tests run successfully, an expansion card may be conflicting with the diskette drive logic, or an expansion card may be faulty. Continue to the next step.

If the tests fail, see "Getting Help" on page 165.

- 15** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
- 16** Open the system. See "Opening and Closing the System" on page 68.
- 17** Close the system. See "Opening and Closing the System" on page 68.

- 18 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
 - 19 Run the appropriate online diagnostic test to see whether the diskette drive works correctly.
 - 20 Repeat step 15 through step 19 until all expansion cards are reinstalled or one of the expansion cards causes the tests to fail.
- If the problem is not resolved, see "Getting Help" on page 165.

Troubleshooting an Optical Drive

Problem

- System cannot read data from a CD or DVD in an optical drive.
- Optical drive indicator does not blink during boot.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Try using a different CD or DVD that you know works properly.
- 2 Enter the System Setup program and ensure that the optical drive controller is enabled. See "Entering the System Setup Program" on page 45.
- 3 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.
- 4 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 5 Open the system. See "Opening and Closing the System" on page 68.
- 6 Ensure that the interface cable is securely connected to the optical drive and to the controller.
- 7 Ensure that the power cable is properly connected to the drive.
- 8 Close the system. See "Opening and Closing the System" on page 68.

- 9 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem is not resolved, see "Getting Help" on page 165.

Troubleshooting a SCSI Tape Drive

Problem

- Defective tape drive
- Defective tape cartridge
- Missing or corrupted tape-backup software or tape drive device driver
- Defective SCSI controller

Action

- 1 Remove the tape cartridge you were using when the problem occurred, and replace it with a tape cartridge that you know works.
- 2 Ensure that the SCSI device drivers for the tape drive are installed and are configured correctly. See "Optical Drive" on page 79.
- 3 Reinstall the tape-backup software as instructed in the tape-backup software documentation.
- 4 Ensure that the tape drive's interface/DC power cable is connected to the tape drive and SCSI controller card.
- 5 Verify that the tape drive is configured for a unique SCSI ID number and that the tape drive is terminated or not terminated, based on the interface cable used to connect the drive.

See the documentation for the tape drive for instructions on selecting the SCSI ID number and enabling or disabling termination.
- 6 Run the appropriate online diagnostics tests. See "Using Dell PowerEdge Diagnostics" on page 151.
- 7 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 8 Open the system. See "Opening and Closing the System" on page 68.
- 9 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
- 10 If the problem is not resolved, see the documentation for the tape drive for additional troubleshooting instructions.
- 11 If you cannot resolve the problem, see "Getting Help" on page 165 for information on obtaining technical assistance.

Troubleshooting a Hard Drive

If your system has hot-pluggable hard drives in a front-loading hard drive bay (when available), see "Troubleshooting a Hot-plug Hard Drive" on page 143.

Problem

- Device driver error.
- One or more hard drives not recognized by the system.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.



NOTICE: This troubleshooting procedure can destroy data stored on the hard drive. Before you proceed, back up all files on the hard drive.

- 1 Run the appropriate online diagnostics test. See "Using Dell PowerEdge Diagnostics" on page 151.

Depending on the results of the diagnostics test, proceed as needed through the following steps.

- 2 If you are experiencing problems with multiple hard drives, skip to step 6. For a problem with a single hard drive, continue to the next step.

- 3 If your system has a SAS RAID controller, perform the following steps.
 - a Restart the system and press <Ctrl><R> to enter the host adapter configuration utility program.

See the documentation supplied with the host adapter for information about the configuration utility.
 - b Ensure that the hard drive has been configured correctly for the RAID.
 - c Exit the configuration utility and allow the system to boot to the operating system.
- 4 Ensure that the required device drivers for your SAS controller card or SAS RAID controller are installed and are configured correctly. See the operating system documentation for more information.
- 5 Verify that the controller is enabled and the drives appear in the System Setup program. See "Entering the System Setup Program" on page 45.
- 6 Check the cable connections inside the system:
 - a Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
 - b Open the system. See "Opening and Closing the System" on page 68.
 - c Verify that the cable connections between the hard drive(s) and the drive controller are correct, whether the connections are to the SATA connectors on the system board, a SAS expansion card, or a SAS RAID controller. See "Hard Drives" on page 73.
 - d Verify that the SAS or SATA cables are securely seated in their connectors.
 - e Close the system. See "Opening and Closing the System" on page 68.
 - f Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem persists, see "Getting Help" on page 165.

Troubleshooting a Hot-plug Hard Drive

Problem

- Device driver error.
- One or more hard drives not recognized by the system.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.



NOTICE: This troubleshooting procedure can destroy data stored on the hard drive. Before you proceed, back up all files on the hard drive.

- 1 Run the appropriate online diagnostics test. See "Using Dell PowerEdge Diagnostics" on page 151.

Depending on the results of the diagnostics test, proceed as needed through the following steps.

- 2 Remove the front drive bezel. See "Removing the Front Bezel" on page 67.
- 3 If you are experiencing problems with multiple hard drives, skip to step 9. For a problem with a single hard drive, continue to the next step.
- 4 Turn off your system, reseal the hard drive, and restart the system.
- 5 If your system has a SAS RAID controller, perform the following steps.
 - a Restart the system and press <Ctrl><R> to enter the host adapter configuration utility program.
See the documentation supplied with the host adapter for information about the configuration utility.
 - b Ensure that the hard drive has been configured correctly for the RAID.
 - c Exit the configuration utility and allow the system to boot to the operating system.
- 6 Ensure that the required device drivers for your controller are installed and are configured correctly. See the operating system documentation for more information.
- 7 Verify that the controller is enabled and the drives appear in the System Setup program. See "Entering the System Setup Program" on page 45.



NOTICE: Do not perform the following step if you have a SAS RAID controller.

- 8 If you have a non-RAID SAS controller, remove the hard drive and swap its drive bay location with another hard drive that is functioning properly.

If the problem is resolved, reinstall the hard drive in the original bay. See "Installing a Hot-Plug Hard Drive" on page 75.

If the hard drive functions properly in the original bay, the drive carrier could have intermittent problems. Replace the hard-drive carrier. See "Getting Help" on page 165.

If the hard drive functioned properly in another bay but does not function in the original bay, the SAS/SATA backplane has a defective connector. See "Getting Help" on page 165.

- 9 Check the cable connections inside the system:
 - a Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
 - b Open the system. See "Opening and Closing the System" on page 68.
 - c Verify that the cable connections between the SAS/SATA backplane and the SAS controller are correct. See "Installing the Backplane Board" on page 102.
 - d Verify that the SAS cables are securely seated in their connectors.
 - e Verify that the power cable on the SAS/SATA backplane is securely seated in the connector.
 - f Close the system. See "Opening and Closing the System" on page 68.
 - g Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem persists, see "Getting Help" on page 165.

Troubleshooting a SAS or SAS RAID Controller



NOTE: When troubleshooting a SAS or SAS RAID controller, also see the documentation for your operating system and the controller.

Problem

- Error message indicates a problem with the SAS or SAS RAID controller.
- SAS or SAS RAID controller performs incorrectly or not at all.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 151.
- 2 Enter the System Setup program and ensure that the SAS or SAS RAID controller is enabled. See "Entering the System Setup Program" on page 45.
- 3 Restart the system and press the applicable key sequence to enter the configuration utility program:
 - <Ctrl><C> for a SAS controller
 - <Ctrl><R> for a SAS RAID controller

See the controller's documentation for information about configuration settings.

- 4 Check the configuration settings, make any necessary corrections, and restart the system.
If the problem is not resolved, continue to the next step.
- 5 Turn off the system and attached peripherals, and disconnect the system from its electrical outlet and peripherals.
- 6 Open the system. See "Opening and Closing the System" on page 68.
- 7 Ensure that the controller card is firmly seated into the system board connector. See "Installing an Expansion Card" on page 95.
- 8 If you have a SAS RAID controller, ensure that the following RAID components are properly installed and connected:
 - Memory module
 - Battery
- 9 Verify that the cable connections between the hard drives and the SAS controller are correct. See "Hard Drives" on page 73.

Ensure that the cables are firmly connected to the SAS controller and the hard drives.

- 10 If your system has hot-pluggable hard drives in a front-loading drive bay (when available), verify that the cable connections between the SAS/SATA backplane and the SAS controller are correct. See "Installing the Backplane Board" on page 102.
- 11 Close the system. See "Opening and Closing the System" on page 68.
- 12 Reconnect the system to its electrical outlet, and turn on the system and attached peripherals. If the problem persists, see "Getting Help" on page 165.

Troubleshooting Expansion Cards



NOTE: When troubleshooting an expansion card, see the documentation for your operating system and the expansion card.

Problem

- Error message indicates a problem with an expansion card.
- Expansion card performs incorrectly or not at all.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Run the appropriate online diagnostic test for the expansion card which is exhibiting issues. See "Using Dell PowerEdge Diagnostics" on page 151. Follow any recommended actions provided by the diagnostics. If the problem persists, go to the next step.
- 2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 3 Open the system. See "Opening and Closing the System" on page 68.
- 4 Ensure that each expansion card is firmly seated in its connector. See "Installing an Expansion Card" on page 95.
- 5 Close the system. See "Opening and Closing the System" on page 68.

- 6 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem persists, go to the next step.

- 7 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

- 8 Open the system. See "Opening and Closing the System" on page 68.

- 9 Remove all expansion cards in the system. See "Replacing the Processor" on page 106.



NOTE: If your operating system is running off a disk controller card (such as a SAS controller card), do not remove it.

- 10 Close the system. See "Opening and Closing the System" on page 68.

- 11 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

- 12 Run the appropriate online diagnostic test.

If the tests fail, see "Getting Help" on page 165.

- 13 For each expansion card you removed in step 9, perform the following steps:

- a Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.

- b Open the system. See "Opening and Closing the System" on page 68.

- c Reinstall one of the expansion cards.

- d Close the system. See "Opening and Closing the System" on page 68.

- e Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

- f Run the appropriate online diagnostic test.

If the tests fail, repeat step 13 for each expansion card until you are able to single out the faulty expansion card.

If the tests fail for all expansion cards, see "Getting Help" on page 165.

Troubleshooting the Microprocessors

Problem

- Error message indicates a processor problem.
- Front-panel status LCD indicates a problem with the processors or system board.
- A heat sink is not installed for each processor.

Action



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1** If possible, run the appropriate online diagnostics test. See "Using Dell PowerEdge Diagnostics" on page 151.
- 2** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 3** Open the system. See "Opening and Closing the System" on page 68.
- 4** Ensure that each processor and heat sink is properly installed. See "Installing a Processor" on page 109.
- 5** Close the system. See "Opening and Closing the System" on page 68.
- 6** Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
- 7** If possible, run the appropriate online diagnostic test. See "Running the System Diagnostics" on page 152.
If the tests fail or the problem persists, continue to the next step.
- 8** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 9** Open the system. See "Opening and Closing the System" on page 68.

- 10** Remove processor 2. See "Replacing the Processor" on page 106.
To locate processor 2, see Figure 6-1.
If only one processor is installed, replace the processor. See "Getting Help" on page 165.
- 11** Close the system. See "Opening and Closing the System" on page 68.
- 12** Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
- 13** Run the appropriate online diagnostic test.
 - If the tests complete successfully, go to.
 - If the tests fail, the processor is faulty. See "Getting Help" on page 165.
- 14** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 15** Open the system. See "Opening and Closing the System" on page 68.
- 16** Swap processor 1 with processor 2. See "Replacing the Processor" on page 106.
- 17** If you have tested each processor and the problem persists, the system board is faulty. See "Getting Help" on page 165.

Running the System Diagnostics

If you experience a problem with your system, run the diagnostics before calling for technical assistance. The purpose of the diagnostics is to test your system's hardware without requiring additional equipment or risking data loss. If you are unable to fix the problem yourself, service and support personnel can use diagnostics test results to help you solve the problem.

Using Dell PowerEdge Diagnostics

To assess a system problem, first use the online Dell™ PowerEdge™ Diagnostics. Dell PowerEdge Diagnostics is a suite of diagnostic programs, or test modules, that include diagnostic tests on chassis and storage components such as hard drives, physical memory, communications and printer ports, NICs, CMOS, and more. If you are unable to identify the problem using the PowerEdge Diagnostics, then use the system diagnostics.

The files required to run PowerEdge Diagnostics for systems running supported Microsoft® Windows® and Linux operating systems are available at support.dell.com and on the CDs that came with your system. For information about using diagnostics, see the *Dell PowerEdge Diagnostics User's Guide*.

System Diagnostics Features

The system diagnostics provides a series of menus and options for particular device groups or devices. The system diagnostics menus and options allow you to:

- Run tests individually or collectively.
- Control the sequence of tests.
- Repeat tests.
- Display, print, or save test results.
- Temporarily suspend testing if an error is detected or terminate testing when a user-defined error limit is reached.
- View help messages that briefly describe each test and its parameters.

- View status messages that inform you if tests are completed successfully.
- View error messages that inform you of problems encountered during testing.

When to Use the System Diagnostics

If a major component or device in the system does not operate properly, component failure may be indicated. As long as the microprocessor and the system's input/output devices (monitor, keyboard, and diskette drive) are functioning, you can use the system diagnostics to help identify the problem.

Running the System Diagnostics

The system diagnostics is run from the utility partition on your hard drive.



NOTICE: Use the system diagnostics to test only your system. Using this program with other systems may cause invalid results or error messages. In addition, use only the program that came with your system (or an updated version of that program).

- 1 As the system boots, press <F10> during POST.
- 2 From the utility partition main menu, select **Run System Diagnostics**, or select **Run Memory Diagnostics** if you are troubleshooting memory.

When you start the system diagnostics, a message is displayed stating that the diagnostics are initializing. Next, the **Diagnostics** menu appears. The menu allows you to run all or specific diagnostics tests or to exit the system diagnostics.



NOTE: Before you read the rest of this section, start the system diagnostics so that you can see the utility on your screen.

System Diagnostics Testing Options

Click the testing option in the **Main Menu** window. Table 5-1 provides a brief explanation of testing options.

Table 5-1. System Diagnostics Testing Options

| Testing Option | Function |
|----------------|---|
| Express Test | Performs a quick check of the system. This option runs device tests that do not require user interaction. Use this option to quickly identify the source of your problem. |
| Extended Test | Performs a more thorough check of the system. This test can take an hour or longer. |
| Custom Test | Tests a particular device. |
| Information | Displays test results. |

Using Custom Test Options

When you select **Custom Test** in the **Main Menu** window, the **Customize** window appears and allows you to select the device(s) to be tested, select specific options for testing, and view the test results.

Selecting Devices for Testing

The left side of the **Customize** window lists devices that can be tested. Devices are grouped by device type or by module, depending on the option you select. Click the (+) next to a device or module to view its components. Click (+) on any component to view the tests that are available. Clicking a device, rather than its components, selects all of the components of the device for testing.



NOTE: After you select all the devices and components that you want to test, highlight **All Devices** and then click **Run Tests**.

Selecting Diagnostics Options

Use the **Diagnostics Options** area to select how you want to test a device. You can set the following options:

- **Non-Interactive Tests Only** — When checked, runs only tests that require no user intervention.
- **Quick Tests Only** — When checked, runs only the quick tests on the device. Extended tests will not run when you select this option.
- **Show Ending Timestamp** — When checked, time stamps the test log.

- **Test Iterations** — Selects the number of times the test is run.
- **Log output file pathname** — When checked, enables you to specify the diskette drive or USB memory key where the test log file is saved. You cannot save the file to a hard drive.

Viewing Information and Results

The tabs in the **Customize** window provide information about the test and the test results. The following tabs are available:

- **Results** — Displays the test that ran and the result.
- **Errors** — Displays any errors that occurred during the test.
- **Help** — Displays information about the currently selected device, component, or test.
- **Configuration** — Displays basic configuration information about the currently selected device.
- **Parameters** — If applicable, displays parameters that you can set for the test.

Jumpers and Connectors

This section provides specific information about the system jumpers and describes the connectors on the various boards in the system.

System Board Jumpers

Figure 6-1 shows the location of the configuration jumpers on the system board. Table 6-1 lists the jumper settings.

Table 6-1. System Board Jumper Settings

| Jumper | Setting | Description |
|-----------|---|--|
| PWRD_EN |  (default) | The password feature is enabled. |
| |  | The password feature is disabled. |
| NVRAM_CLR |  (default) | The configuration settings in NVRAM are retained at system boot. |
| |  | The configuration settings in NVRAM are cleared at next system boot. |

System Board Connectors

See Figure 6-1 and Table 6-2 for the location and description of the system board connectors.

Figure 6-1. System Board Connectors

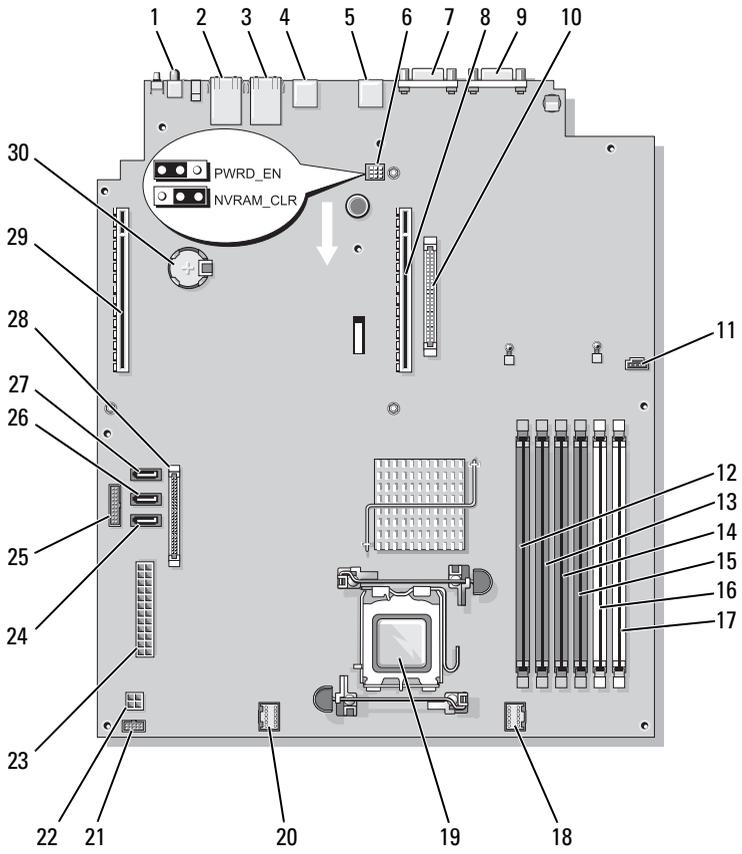


Table 6-2. System Board Connectors

| Item | Connector | Description |
|------|-----------|-------------------------|
| 1 | SYSTEM ID | System ID LED indicator |
| 2 | NIC2 | NIC 2 connector |
| 3 | NIC1 | NIC 1 connector |
| 4 | USB2 | USB connector |
| 5 | USB1 | USB connector |

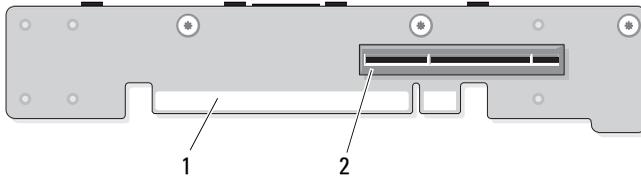
Table 6-2. System Board Connectors (continued)

| Item | Connector | Description |
|-------------|----------------------|--|
| 6 | PWRD_EN NVRAM_CLR | Password and configuration jumper |
| 7 | VGA | Video connector |
| 8 | RISER1 | Center riser expansion card interface connector |
| 9 | COM | Serial connector |
| 10 | RAC_CONN | Remote Access Control (RAC) card connector |
| 11 | HD_ACT_CARD | Hard drive activity connector (expansion controller) |
| 12 | DIMM3_B | Memory module (slot 6) |
| 13 | DIMM3_A | Memory module (slot 5) |
| 14 | DIMM2_B | Memory module (slot 4) |
| 15 | DIMM2_A | Memory module (slot 3) |
| 16 | DIMM1_B | Memory module (slot 2) |
| 17 | DIMM1_A | Memory module (slot 1) |
| 18 | FAN_MOD2 | Power connector for FAN3 and FAN4 |
| 19 | CPU | Processor socket |
| 20 | FAN_MOD1 | Power connector for FAN1 and FAN 2 |
| 21 | USB_CONN | Internal USB key connector |
| 22 | 12V | Power supply connector (12 volt) |
| 23 | PWR_CONN | Power supply connector |
| 24 | SATA_A | Connector for the SATA A CDRROM drive |
| 25 | PDB_12C | Power distribution board |
| 26 | SATA_B | Connector for the SATA B hard drive |
| 27 | SATA_C | Connector for the SATA C optical drive device (ODD) |
| 28 | CTRL_PNL | Control panel interface connector |
| 29 | RISER2 | Left riser expansion card interface connector |
| 30 | BATTERY | Connector for the 3.0 V coin battery |

Riser Card Connectors

The system is available with either a PCIe riser card or a PCI-X/PCIe riser card (not shown). See Figure 6-1 and Figure 6-2 for the location and description of the expansion-card slots on the two riser cards.

Figure 6-2. PCIe Center and Left Riser Card



Center Riser (RISER1)

- 1 system board connector
- 2 expansion card socket

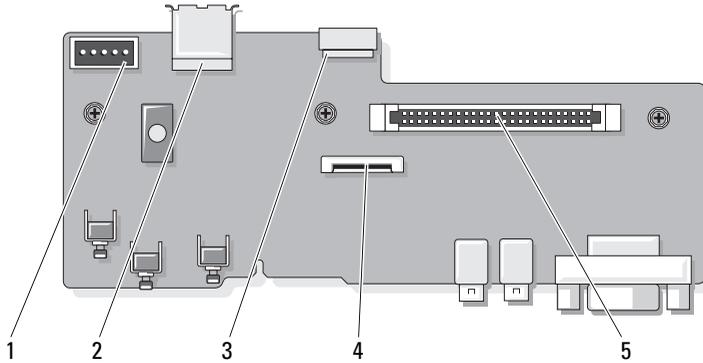
Left Riser (RISER2)

- 1 system board connector
- 2 expansion card socket

Control Panel Assembly Connectors

Figure 6-3 shows the configuration of the I/O control panel assembly connectors.

Figure 6-3. Input/Output Control Panel Board

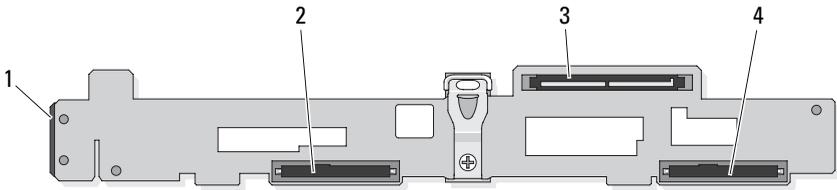


- | | | | |
|---|---|---|-----------------------------------|
| 1 | backplane connector (BP_12C) | 2 | internal USB connector (USB3) |
| 3 | internal USB key cable connector (USB_CONN) | 4 | LCD panel connector (FRONT PANEL) |
| 5 | control-panel system board connector (J_Planar) | | |

SAS/SATA Backplane Board Connectors

Figure 6-4 shows the location of the hard-drive connectors on the SAS/SATA backplane board.

Figure 6-4. SAS/SATA Backplane Board Components



- | | | | |
|---|--|---|--------------------------------|
| 1 | power +12C connector | 2 | 3.5-inch SAS or SATA connector |
| 3 | SAS controller daughter card connector | 4 | 3.5-inch SAS or SATA connector |

Expansion Card Connectors for SAS Controller Daughter Cards

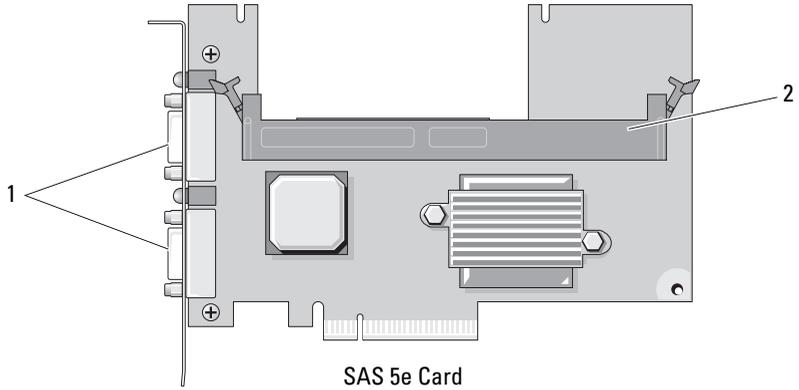
Figure , Figure , and Figure 6-7 show the locations of the connectors on each expansion card.

The optional SAS internal controller daughter cards are located directly above the DRAC 5 expansion card.

The SAS RAID external controller daughter card (PERC6 e) connects to the left riser board. This card contains a memory module slot and two external port connectors. The SAS RAID controller daughter card can support an optional RAID battery (not shown).

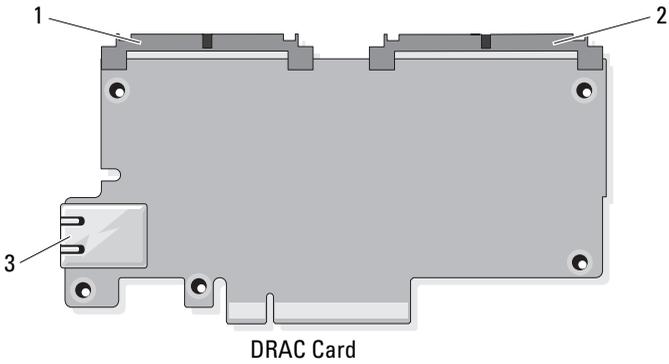
For more information, see "Expansion Cards" on page 95.

Figure 6-5. Expansion Card Connector for SAS RAID Controller Daughter Card



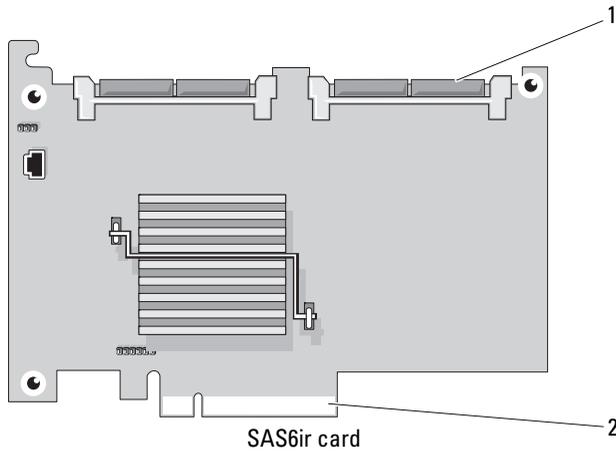
- 1 external port connectors
- 2 memory module slot

Figure 6-6. Expansion Card Connector for the RAC Card



- 1 TOE key connector (44 pin)
- 2 DRAC5 cable connector (50 pin)
- 3 NIC port connector

Figure 6-7. Expansion Card Connector for the SAS Controller Daughter Card



- 1 SAS6ir card cable connectors 2 center riser connector

Disabling a Forgotten Password

The system's software security features include a system password and a setup password, which are discussed in detail in "Using the System Setup Program" on page 46. The password jumper enables these password features or disables them and clears any password(s) currently in use.

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.

- 1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
- 2 Open the system. See "Opening and Closing the System" on page 68.
- 3 Remove the password jumper plug.
See Figure 6-1 to locate the password jumper on the system board.
- 4 Close the system. See "Opening and Closing the System" on page 68.

- 5 Reconnect the system to the electrical outlet, and turn on the system.

The existing passwords are not disabled (erased) until the system boots with the password jumper plug removed. However, before you assign a new system and/or setup password, you must install the jumper plug.



NOTE: If you assign a new system and/or setup password with the jumper plug still removed, the system disables the new password(s) the next time it boots.

- 6 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

- 7 Open the system.

- 8 Install the password jumper plug.

See Figure 6-1 to locate the password jumper on the system board.

- 9 Close the system, reconnect the system to the electrical outlet, and turn on the system.

- 10 Assign a new system and/or setup password.

To assign a new password using the System Setup program, see "Using the System Setup Program" on page 46.

Getting Help

Contacting Dell

For customers in the United States, call 800-WWW-DELL (800-999-3355).



NOTE: If you do not have an active Internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell product catalog.

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical support, or customer service issues:

- 1 Visit support.dell.com.
- 2 Verify your country or region in the **Choose A Country/Region** drop-down menu at the bottom of the page.
- 3 Click **Contact Us** on the left side of the page.
- 4 Select the appropriate service or support link based on your need.
- 5 Choose the method of contacting Dell that is convenient for you.

Glossary

This section defines or identifies technical terms, abbreviations, and acronyms used in your system documents.

A — Ampere(s).

AC — Alternating current.

ACPI — Advanced Configuration and Power Interface. A standard interface for enabling the operating system to direct configuration and power management.

ambient temperature — The temperature of the area or room where the system is located.

ANSI — American National Standards Institute. The primary organization for developing technology standards in the U.S.

application — Software designed to help you perform a specific task or series of tasks. Applications run from the operating system.

ASCII — American Standard Code for Information Interchange.

asset tag — An individual code assigned to a system, usually by an administrator, for security or tracking purposes.

backup — A copy of a program or data file. As a precaution, back up your system's hard drive on a regular basis. Before making a change to the configuration of your system, back up important start-up files from your operating system.

backup battery — A battery that maintains system configuration, date, and time information in a special section of memory when the system is turned off.

beep code — A diagnostic message in the form of a pattern of beeps from your system's speaker. For example, one beep, followed by a second beep, and then a burst of three beeps is beep code 1-1-3.

BIOS — Basic input/output system. Your system's BIOS contains programs stored on a flash memory chip. The BIOS controls the following:

- Communications between the processor and peripheral devices
- Miscellaneous functions, such as system messages

bit — The smallest unit of information interpreted by your system.

blade — A module that contains a processor, memory, and a hard drive. The modules are mounted into a chassis that includes power supplies and fans.

BMC — Baseboard management controller.

boot routine — A program that clears all memory, initializes devices, and loads the operating system when you start your system. Unless the operating system fails to respond, you can reboot (also called *warm boot*) your system by pressing <Ctrl><Alt>. Otherwise, you must restart the system by pressing the reset button or by turning the system off and then back on.

bootable diskette — A diskette that is used to start your system if the system will not boot from the hard drive.

BTU — British thermal unit.

bus — An information pathway between the components of a system. Your system contains an expansion bus that allows the processor to communicate with controllers for the peripheral devices connected to the system. Your system also contains an address bus and a data bus for communications between the processor and RAM.

C — Celsius.

cache — A fast storage area that keeps a copy of data or instructions for quick data retrieval. When a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

CD — Compact disc. CD drives use optical technology to read data from CDs.

cm — Centimeter(s).

cmos — Complementary metal-oxide semiconductor.

component — As they relate to DMI, components include operating systems, computer systems, expansion cards, and peripherals that are compatible with DMI. Each component is made up of groups and attributes that are defined as relevant to that component.

COM — The device names for the serial ports on your system.

control panel — The part of the system that contains indicators and controls, such as the power button and power indicator.

controller — A chip that controls the transfer of data between the processor and memory or between the processor and a peripheral.

conventional memory — The first 640 KB of RAM. Conventional memory is found in all systems. Unless they are specially designed, MS-DOS® programs are limited to running in conventional memory.

coprocessor — A chip that relieves the system's processor of specific processing tasks. A math coprocessor, for example, handles numeric processing.

CPU — Central processing unit. See *processor*.

DC — Direct current.

DDR — Double-data rate. A technology in memory modules that potentially doubles the output.

device driver — A program that allows the operating system or some other program to interface correctly with a peripheral. Some device drivers—such as network drivers—must be loaded from the `config.sys` file or as memory-resident programs (usually, from the `autoexec.bat` file). Others must load when you start the program for which they were designed.

DHCP — Dynamic Host Configuration Protocol. A method of automatically assigning an IP address to a client system.

diagnostics — A comprehensive set of tests for your system.

DIMM — Dual in-line memory module. See also *memory module*.

DIN — *Deutsche Industrie Norm*.

directory — Directories help keep related files organized on a disk in a hierarchical, “inverted tree” structure. Each disk has a “root” directory. Additional directories that branch off the root directory are called *subdirectories*. Subdirectories may contain additional directories branching off them.

DMA — Direct memory access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the processor.

DMI — Desktop Management Interface. DMI enables the management of your system’s software and hardware by collecting information about the system’s components, such as the operating system, memory, peripherals, expansion cards, and asset tag.

DNS — Domain Name System. A method of translating Internet domain names, such as `www.dell.com`, into IP addresses, such as 143.166.83.200.

DRAC — Dell Remote Access Controller.

DRAM — Dynamic random-access memory. A system’s RAM is usually made up entirely of DRAM chips.

DVD — Digital versatile disc.

ECC — Error checking and correction.

EEPROM — Electronically erasable programmable read-only memory.

EMC — Electromagnetic compatibility.

EMI — Electromagnetic interference.

EMP — Emergency management port.

ERA — Embedded remote access. ERA allows you to perform remote, or “out-of-band,” server management on your network server using a remote access controller.

ESD — Electrostatic discharge.

ESM — Embedded server management.

expansion bus — Your system contains an expansion bus that allows the processor to communicate with controllers for peripherals, such as NICs.

expansion card — An add-in card, such as a NIC or SCSI adapter, that plugs into an expansion-card connector on the system board. An expansion card adds some specialized function to the system by providing an interface between the expansion bus and a peripheral.

expansion-card connector — A connector on the system board or riser board for plugging in an expansion card.

F — Fahrenheit.

FAT — File allocation table. The file system structure used by MS-DOS to organize and keep track of file storage. The Microsoft® Windows® operating systems can optionally use a FAT file system structure.

flash memory — A type of EEPROM chip that can be reprogrammed from a utility on diskette while still installed in a system; most EEPROM chips can only be rewritten with special programming equipment.

format — To prepare a hard drive or diskette for storing files. An unconditional format deletes all data stored on the disk.

FSB — Front-side bus. The FSB is the data path and physical interface between the processor and the main memory (RAM).

ft — Feet.

FTP — File transfer protocol.

g — Gram(s).

G — Gravities.

Gb — Gigabit(s); 1024 megabits or 1,073,741,824 bits.

GB — Gigabyte(s); 1024 megabytes or 1,073,741,824 bytes. However, when referring to hard-drive capacity, the term is usually rounded to 1,000,000,000 bytes.

graphics mode — A video mode that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

group — As it relates to DMI, a group is a data structure that defines common information, or attributes, about a manageable component.

guarding — A type of data redundancy in which a set of physical drives stores data and an additional drive stores parity data. See also *mirroring*, *striping*, and *RAID*.

h — Hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the system's RAM and I/O memory addresses for devices. In text, hexadecimal numbers are often followed by *h*.

headless system — A system or device that functions without having a keyboard, mouse, or monitor attached. Normally, headless systems are managed over a network using an Internet browser.

host adapter — A host adapter implements communication between the system's bus and the controller for a peripheral device. (Hard-drive controller subsystems include integrated host adapter circuitry.) To add a SCSI expansion bus to your system, you must install or connect the appropriate host adapter.

Hz — Hertz.

I/O — Input/output. A keyboard is an input device, and a monitor is an output device. In general, I/O activity can be differentiated from computational activity.

ID — Identification.

IDE — Integrated drive electronics. A standard interface between the system board and storage devices.

integrated mirroring — Provides simultaneous physical mirroring of two drives. Integrated mirroring functionality is provided by the system's hardware. See also *mirroring*.

internal processor cache — An instruction and data cache built into the processor.

IP — Internet Protocol.

IPX — Internet package exchange.

IRQ — Interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the processor. Each peripheral connection must be assigned an IRQ number. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

jumper — Small blocks on a circuit board with two or more pins emerging from them. Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit, providing a simple and reversible method of changing the circuitry in a board.

K — Kilo-; 1000.

Kb — Kilobit(s); 1024 bits.

KB — Kilobyte(s); 1024 bytes.

Kbps — Kilobit(s) per second.

KBps — Kilobyte(s) per second.

key combination — A command requiring you to press multiple keys at the same time (for example, <Ctrl><Alt>).

kg — Kilogram(s); 1000 grams.

kHz — Kiloherertz.

KMM — Keyboard/monitor/mouse.

KVM — Keyboard/video/mouse. KVM refers to a switch that allows selection of the system from which the video is displayed and for which the keyboard and mouse are used.

LAN — Local area network. A LAN is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

lb — Pound(s).

LCD — Liquid crystal display.

LED — Light-emitting diode. An electronic device that lights up when a current is passed through it.

Linux — An open-source operating system, similar to the UNIX[®] operating system, that runs on a variety of hardware systems. Linux is freely available; however, the full distribution of Linux along with technical support and training are available for a fee from vendors such as Red Hat[®] Software.

local bus — On a system with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. See also *bus*.

LVD — Low voltage differential.

m — Meter(s).

mA — Milliampere(s).

MAC address — Media Access Control address. Your system's unique hardware number on a network.

mAh — Milliampere-hour(s).

Mb — Megabit(s); 1,048,576 bits.

MB — Megabyte(s); 1,048,576 bytes. However, when referring to hard-drive capacity, the term is often rounded to mean 1,000,000 bytes.

Mbps — Megabits per second.

MBps — Megabytes per second.

MBR — Master boot record.

memory address — A specific location, usually expressed as a hexadecimal number, in the system's RAM.

memory module — A small circuit board containing DRAM chips that connects to the system board.

memory — An area in your system that stores basic system data. A system can contain several different forms of memory, such as integrated memory (ROM and RAM) and add-in memory modules (DIMMs).

MHz — Megahertz.

mirroring — A type of data redundancy in which a set of physical drives stores data and one or more sets of additional drives stores duplicate copies of the data. Mirroring functionality is provided by software. See also *guarding*, *integrated mirroring*, *striping*, and *RAID*.

mm — Millimeter(s).

ms — Millisecond(s).

MS-DOS[®] — Microsoft Disk Operating System.

NAS — Network Attached Storage. NAS is one of the concepts used for implementing shared storage on a network. NAS systems have their own operating systems, integrated hardware, and software that are optimized to serve specific storage needs.

NIC — Network interface controller. A device that is installed or integrated in a system to allow connection to a network.

NMI — Nonmaskable interrupt. A device sends an NMI to signal the processor about hardware errors.

ns — Nanosecond(s).

NTFS — The NT File System option in the Windows 2000 operating system.

NVRAM — Nonvolatile random-access memory. Memory that does not lose its contents when you turn off your system. NVRAM is used for maintaining the date, time, and system configuration information.

parity — Redundant information that is associated with a block of data.

partition — You can divide a hard drive into multiple physical sections called *partitions* with the **fdisk** command. Each partition can contain multiple logical drives. You must format each logical drive with the **format** command.

PCI — Peripheral Component Interconnect. A standard for local-bus implementation.

PDU — Power distribution unit. A power source with multiple power outlets that provides electrical power to servers and storage systems in a rack.

peripheral — An internal or external device, such as a diskette drive or keyboard, connected to a system.

PGA — Pin grid array. A type of processor socket that allows you to remove the processor chip.

pixel — A single point on a video display. Pixels are arranged in rows and columns to create an image. A video resolution, such as 640 x 480, is expressed as the number of pixels across by the number of pixels up and down.

POST — Power-on self-test. Before the operating system loads when you turn on your system, the POST tests various system components such as RAM and hard drives.

processor — The primary computational chip inside the system that controls the interpretation and execution of arithmetic and logic functions. Software written for one processor must usually be revised to run on another processor. *CPU* is a synonym for processor.

protected mode — An operating mode that allows operating systems to implement:

- A memory address space of 16 MB to 4 GB
- Multitasking
- Virtual memory, a method for increasing addressable memory by using the hard drive

The Windows 2000 and UNIX 32-bit operating systems run in protected mode. MS-DOS cannot run in protected mode.

PS/2 — Personal System/2.

PXE — Preboot eXecution Environment. A way of booting a system via a LAN (without a hard drive or bootable diskette).

RAC — Remote access controller. Provides a set of advanced features for managing the server remotely.

RAID — Redundant array of independent disks. A method of providing data redundancy. Some common implementations of RAID include RAID 0, RAID 1, RAID 5, RAID 10, and RAID 50. See also *guarding*, *mirroring*, and *striping*.

RAM — Random-access memory. The system's primary temporary storage area for program instructions and data. Any information stored in RAM is lost when you turn off your system.

RAS — Remote Access Service. This service allows users running the Windows operating system to remotely access a network from their system using a modem.

readme file — A text file, usually shipped with software or hardware, that contains information supplementing or updating the product's documentation.

read-only file — A read-only file is one that you are prohibited from editing or deleting.

ROM — Read-only memory. Your system contains some programs essential to its operation in ROM code. A ROM chip retains its contents even after you turn off your system. Examples of code in ROM include the program that initiates your system's boot routine and the POST.

ROMB — RAID on motherboard.

rpm — Revolutions per minute.

RTC — Real-time clock.

SAS — Serial-attached SCSI.

SATA — Serial Advanced Technology Attachment. A standard interface between the system board and storage devices.

SCSI — Small computer system interface. An I/O bus interface with faster data transmission rates than standard ports.

SDRAM — Synchronous dynamic random-access memory.

sec — Second(s).

serial port — An I/O port used most often to connect a modem to your system. You can usually identify a serial port on your system by its 9-pin connector.

service tag — A bar code label on the system used to identify it when you call Dell for technical support.

simple disk volume — The volume of free space on a single dynamic, physical disk.

SMART — Self-Monitoring Analysis and Reporting Technology. Allows hard drives to report errors and failures to the system BIOS and then display an error message on the screen.

SMP — Symmetric multiprocessing. Used to describe a system that has two or more processors connected via a high-bandwidth link and managed by an operating system, where each processor has equal access to I/O devices.

SNMP — Simple Network Management Protocol. A standard interface that allows a network manager to remotely monitor and manage workstations.

spanning — Spanning, or concatenating, disk volumes combines unallocated space from multiple disks into one logical volume, allowing more efficient use of all the space and all drive letters on a multiple-disk system.

striping — Disk striping writes data across three or more disks in an array, but only uses a portion of the space on each disk. The amount of space used by a "stripe" is the same on each disk used. A virtual disk may use several stripes on the same set of disks in an array. See also *guarding*, *mirroring*, and *RAID*.

SVGA — Super video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

system board — As the main circuit board, the system board usually contains most of your system's integral components, such as the processor, RAM, controllers for peripherals, and various ROM chips.

system configuration information — Data stored in memory that tells a system what hardware is installed and how the system should be configured for operation.

system diskette — See *bootable diskette*.

system memory — See *RAM*.

System Setup program — A BIOS-based program that allows you to configure your system's hardware and customize the system's operation by setting features such as password protection. Because the System Setup program is stored in NVRAM, any settings remain in effect until you change them again.

system.ini file — A start-up file for the Windows operating system. When you start Windows, it consults the **system.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **system.ini** file records which video, mouse, and keyboard drivers are installed for Windows.

TCP/IP — Transmission Control Protocol/Internet Protocol.

termination — Some devices (such as the last device at each end of a SCSI cable) must be terminated to prevent reflections and spurious signals in the cable. When such devices are connected in a series, you may need to enable or disable the termination on these devices by changing jumper or switch settings on the devices or by changing settings in the configuration software for the devices.

TOE — TCP/IP offload engine.

UNIX — Universal Internet Exchange. UNIX, the precursor to Linux, is an operating system written in the C programming language.

uplink port — A port on a network hub or switch used to connect to other hubs or switches without requiring a crossover cable.

UPS — Uninterruptible power supply. A battery-powered unit that automatically supplies power to your system in the event of an electrical failure.

USB — Universal Serial Bus. A USB connector provides a single connection point for multiple USB-compliant devices, such as mice and keyboards. USB devices can be connected and disconnected while the system is running.

utility — A program used to manage system resources—memory, disk drives, or printers, for example.

UTP — Unshielded twisted pair. A type of wiring used to connect systems in a business or home to a telephone line.

V — Volt(s).

VAC — Volt(s) alternating current.

VDC — Volt(s) direct current.

VGA — Video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

video adapter — The logical circuitry that provides (in combination with the monitor) your system's video capabilities. A video adapter may be integrated into the system board or may be an expansion card that plugs into an expansion slot.

video driver — A program that allows graphics-mode application programs and operating systems to display at a chosen resolution with the desired number of colors. Video drivers may need to match the video adapter installed in the system.

video memory — Most VGA and SVGA video adapters include memory chips in addition to your system's RAM. The amount of video memory installed primarily influences the number of colors that a program can display (with the appropriate video drivers and monitor capabilities).

video resolution — Video resolution (800 x 600, for example) is expressed as the number of pixels across by the number of pixels up and down. To display a program at a specific graphics resolution, you must install the appropriate video drivers and your monitor must support the resolution.

W — Watt(s).

WH — Watt-hour(s).

win.ini file — A start-up file for the Windows operating system. When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard drive.

Windows 2000 — An integrated and complete Microsoft Windows operating system that does not require MS-DOS and that provides advanced operating system performance, improved ease of use, enhanced workgroup functionality, and simplified file management and browsing.

Windows Powered — A Windows operating system designed for use on NAS systems. For NAS systems, the Windows Powered operating system is dedicated to file service for network clients.

Windows Server 2003 — A set of Microsoft software technologies that enable software integration through the use of XML Web services. XML Web services are small reusable applications written in XML that allow data to be communicated between otherwise unconnected sources.

XML — Extensible Markup Language. XML is a way to create common information formats and to share both the format and the data on the World Wide Web, intranets, and elsewhere.

ZIF — Zero insertion force.

Index

A

alert messages, 44

B

backplane board, 100

installing, 102

removing, 100

baseboard management

controller

See BMC.

battery

removing or replacing, 111

replacing, 111

troubleshooting, 132

bezel control panel, 67

blank

hard drive, 73

BMC

configuring, 61

C

cabling

optical drive, 79

CD drive

installing, 82

removing, 79

CD/DVD drive

troubleshooting, 140

checking equipment, 124

closing the system, 68

connecting external devices, 19

connectors

riser card, 158-159

SAS/SATA backplane board, 160

system board, 155

contacting Dell, 165

control panel assembly

installing, 115

removing, 113

cooling fans

troubleshooting, 134

cooling shroud

installing, 72

removing, 71

cover

closing, 69

opening, 69

D

damaged systems

troubleshooting, 131

Dell

contacting, 165

- diagnostics
 - testing options, 152
 - when to use, 152

- diskette drive
 - troubleshooting, 138

- drive blank
 - installing, 74
 - removing, 73

- drive carrier
 - hard drive, 77

- drives
 - CD, 79
 - optical, 79

E

- error messages, 45

- expansion cards
 - installing, 95
 - removing, 96
 - troubleshooting, 147

- external devices
 - connecting, 19

F

- fan assembly (power supply)
 - installing, 88
 - removing, 86
- fan assembly (processor)
 - installing, 86
 - removing, 84

- features
 - back-panel, 19
 - front-panel, 13

H

- hard drive
 - drive carrier, 77
 - indicator codes, 17
 - installing, 75
 - removing, 74
 - troubleshooting, 142

- hard drives, 73

- hot-plug
 - hard drives, 73

I

- indicators
 - back-panel, 19
 - front-panel, 13
 - hard-drive, 17
 - NIC, 21
 - power, 20

- installing
 - backplane board, 102
 - CD drive, 82
 - control panel assembly, 115
 - cooling shroud, 72
 - expansion cards, 95
 - hard drive blank, 74
 - hard drives, 75
 - memory modules, 104
 - optical drive, 80, 82

installing (*continued*)
power supply fan assembly, 88
processor fan assembly, 86
RAC card, 94
riser card, 99
system board, 121
USB memory key, 90

J

jumpers
system board, 155

K

keyboard
troubleshooting, 125

M

memory
installation guidelines, 102
installing, 104
removing, 106
troubleshooting, 135
memory key connector (USB), 90
messages
alert, 44
error messages, 45
hard-drive indicator codes, 17
status LCD, 22
system, 34
warning, 43

microprocessor
troubleshooting, 149
mouse
troubleshooting, 126

N

NICs
indicators, 21
troubleshooting, 129
NMI button, 15

O

opening the system, 68
optical drive
installing, 80, 82
removing, 79
removing from tray, 82

P

password
disabling, 162
setup, 59
system, 57
phone numbers, 165
POST
accessing system features, 12
power indicators, 20

- power supplies
 - indicators, 20
 - removing, 88
 - replacing, 89
- power supply
 - troubleshooting, 133
- power supply fan assembly
 - installing, 88
 - removing, 86
- processor
 - replacing, 106
 - troubleshooting, 149

R

- RAC card, 92
 - installing, 94
 - removing, 92
- RAID controller card. *See* expansion cards.
- recommended tools, 63
- removing
 - backplane board, 100
 - CD drive, 79
 - control panel assembly, 113
 - cooling shroud, 71
 - expansion cards, 96
 - hard drive blank, 73
 - hard drive from a drive carrier, 77
 - hard drives, 74
 - memory modules, 106
 - optical drive, 79
 - optical drive from tray, 82

- removing (*continued*)
 - power supply, 88
 - power supply fan assembly, 86
 - processor fan assembly, 84
 - RAC card, 92
 - riser card, 98
 - system board, 119
- removing bezel, 67
- replacing
 - bezel, 68
 - power supply, 89
 - processor, 106
 - system battery, 111
- riser card
 - connectors, 158-159
 - installing, 99
 - removing, 98

S

- safety, 123
- SAS controller card
 - troubleshooting, 145
- SAS controller card. *See* expansion cards.
- SAS/SATA backplane board
 - connectors, 160
- SD card
 - troubleshooting, 137
- securing your system, 53, 58
- setup password, 59

- startup
 - accessing system features, 12
- support
 - contacting Dell, 165
- system battery
 - replacing, 111
- system board
 - connectors, 155
 - installing, 121
 - jumpers, 155
 - removing, 119
- system board view, 65
- system cooling
 - troubleshooting, 134
- system features
 - accessing, 12
- system messages, 34
- system password, 57
- system setup program
 - CPU options, 50
 - entering, 45
 - integrated devices options, 51
 - keystroke, 45
 - memory options, 49
 - serial communications
 - options, 52
 - system security options, 53

T

- tape drive
 - troubleshooting, 141

- telephone numbers, 165
- TPM security, 53
- troubleshooting
 - CD/DVD drive, 140
 - cooling fans, 134
 - damaged system, 131
 - diskette drive, 138
 - expansion cards, 147
 - external connections, 124
 - hard drive, 142
 - internal USB key, 137
 - keyboard, 125
 - memory, 135
 - microprocessor, 149
 - mouse, 126
 - NIC, 129
 - power supply, 133
 - SAS controller card, 145
 - SD card, 137
 - start-up routine, 123
 - system battery, 132
 - system cooling, 134
 - tape drive, 141
 - USB device, 127
 - video, 124
 - wet system, 130

U

- USB
 - internal connector for memory
 - key, 90
- USB device
 - troubleshooting, 127

USB key
troubleshooting, 137

V

video
troubleshooting, 124

W

warning messages, 43
warranty, 11
wet system
troubleshooting, 130