

Dell Precision™ Workstation T3400

User's Guide

Model DCTA

Notes, Notices, and Cautions



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



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



CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

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Model DCTA

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Finding Information

 **NOTE:** Some features or media may be optional and may not ship with your computer. Some features or media may not be available in certain countries.

 **NOTE:** Additional information may ship with your computer.

What Are You Looking For?

- A diagnostic program for my computer
- Drivers for my computer
- Desktop System Software (DSS)

Find It Here

Drivers and Utilities Disc

NOTE: The *Drivers and Utilities* disc may be optional and may not ship with your computer.

Documentation and drivers are already installed on your computer. You can use the *Drivers and Utilities* disc to reinstall drivers (see "Reinstalling Drivers and Utilities" on page 132), or to run the Dell Diagnostics (see "Dell Diagnostics" on page 107).

Readme files may be included on your disc to provide last-minute updates about technical changes to your computer or advanced technical-reference material for technicians or experienced users.



Drivers and documentation updates can be found at support.dell.com.

What Are You Looking For?

- How to set up my computer
- How to care for my computer
- Basic troubleshooting information
- How to run the Dell Diagnostics
- Tools and utilities
- How to open my computer

Find It Here

Quick Reference Guide



NOTE: This document is available as a PDF at support.dell.com.

-
- Warranty information
 - Terms and Conditions (U.S. only)
 - Safety instructions
 - Regulatory information
 - Ergonomics information
 - End User License Agreement

Dell™ Product Information Guide



-
- How to remove and replace parts
 - Specifications
 - How to configure system settings
 - How to troubleshoot and solve problems

Dell Precision™ User's Guide

Microsoft Windows XP and Windows Vista™ Help and Support Center

- 1** Click **Start**→ **Help and Support**→ **Dell User and System Guides**→ **System Guides**.
- 2** Click the *User's Guide* for your computer.

What Are You Looking For?

- Service Tag and Express Service Code
- Microsoft® Windows® Product Key

Find It Here**Service Tag and Microsoft Windows Product Key**

These labels are located on your computer.

- Use the Service Tag to identify your computer when you use support.dell.com or contact support.
- Enter the Express Service Code to direct your call when contacting support.



NOTE: As an increased security measure, the newly designed Microsoft Windows license label incorporates a missing portion, or *hole*, to discourage removal of the label.

What Are You Looking For?	Find It Here
<ul style="list-style-type: none"> • Solutions — Troubleshooting hints and tips, articles from technicians, online courses, and frequently asked questions • Community — Online discussion with other Dell customers • Upgrades — Upgrade information for components, such as the memory, hard drive, and operating system • Customer Care — Contact information, service call and order status, and warranty and repair information • Service and support — Service call status, support history, service contract, and online discussions with support • Dell Technical Update Service — Proactive e-mail notification of software and hardware updates for your computer • Reference — Computer documentation, details on my computer configuration, product specifications, and white papers • Downloads — Certified drivers, patches, and software updates 	<p data-bbox="537 231 965 263">Dell Support Website — support.dell.com</p> <p data-bbox="537 263 965 367">NOTE: Select your region or business segment to view the appropriate support site.</p>
<ul style="list-style-type: none"> • Desktop System Software (DSS)— If you reinstall the operating system for your computer, you should also reinstall the DSS utility. DSS automatically detects your computer and operating system and installs the updates appropriate for your configuration, providing critical updates for your operating system and support for processors, optical drives, USB devices, etc. DSS is necessary for correct operation of your Dell computer. 	<p data-bbox="537 965 965 1005">To download Desktop System Software:</p> <ol style="list-style-type: none"> <li data-bbox="537 1005 965 1093">1 Go to support.dell.com, select your country/region, and then click Drivers & Downloads. <li data-bbox="537 1093 965 1220">2 Click Select Model or Enter a Tag, make the appropriate selections or enter the appropriate information for your computer, and then click Confirm. <li data-bbox="537 1220 965 1348">3 Scroll down to System and Configuration Utilities→ Desktop System Software, and then click Download Now. <p data-bbox="537 1348 965 1410">NOTE: The support.dell.com user interface may vary depending on your selections.</p>

What Are You Looking For?

- How to use Windows XP
- How to use Windows Vista
- How to work with programs and files
- How to personalize my desktop

Find It Here

Windows Help and Support Center

- 1** Click **Start**→ **Help and Support**.
- 2** Type a word or phrase that describes your problem and click the arrow icon.
- 3** Click the topic that describes your problem.
- 4** Follow the instructions on the screen.

-
- How to reinstall my operating system

Operating System Media

The operating system is already installed on your computer. To reinstall your operating system, use the *Operating System* reinstallation media that came with your computer (see "Restoring Your Operating System" on page 136).



After you reinstall your operating system, use the optional *Drivers and Utilities* disc to reinstall drivers for the devices that came with your computer.

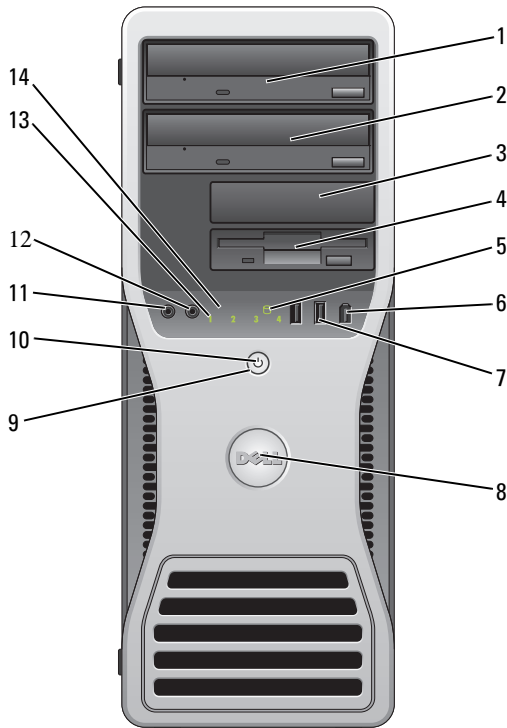
Your operating system product key label is located on your computer.

NOTE: The color of your operating system installation media varies according to the operating system you ordered.



What Are You Looking For?	Find It Here
<ul style="list-style-type: none">• How to use Linux• E-mail discussions with users of Dell Precision products and the Linux operating system• Additional information regarding Linux and my Dell Precision computer	<p>Dell Supported Linux Sites</p> <ul style="list-style-type: none">• linux.dell.com• lists.us.dell.com/mailman/listinfo/linux-precision

About Your Computer

Front View (Tower Orientation)

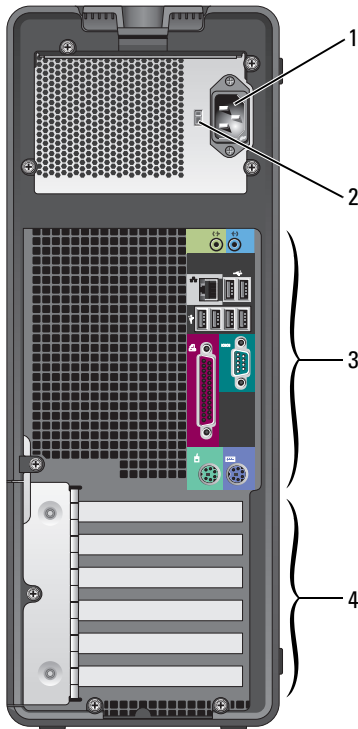


1	upper 5.25-inch drive bay	Supports an optical drive.
2	lower 5.25-inch drive bay	Supports an optical drive or an additional hard drive (SATA only).
3	upper 3.5-inch drive bay	Supports a floppy drive, a Media Card Reader, or an additional hard drive (SATA or SAS).

4	lower 3.5-inch drive bay	Supports a floppy drive or a Media Card Reader.
5	hard drive activity light	The hard drive activity light is on when the computer reads data from or writes data to the hard drive. The light may also be on when a device such as an optical drive is in operation.
6	IEEE 1394 connector (optional)	Use the optional IEEE 1394 connector for high-speed data devices such as digital video cameras and external storage devices.
7	USB 2.0 connectors (2)	Use the front USB connectors for devices that you connect occasionally, such as flash memory keys or cameras, or for bootable USB devices (see "System Setup" on page 81 for more information on booting to a USB device). NOTE: It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.
8	Dell badge (rotatable)	Use the plastic handle on the back of the Dell badge to rotate the badge for tower-to-desktop or desktop-to-tower conversion.
9	power button	Press to turn on the computer.  NOTICE: To avoid losing data, do not use the power button to turn off the computer. Instead, perform an operating system shutdown.  NOTICE: If your operating system has ACPI enabled, when you press the power button the computer will perform an operating system shutdown. NOTE: The power button can also be used to wake the system or to place it into a power-saving state (see "Power Management" on page 40 for more information).

10	power light	<p>The power light illuminates and blinks or remains solid to indicate different states:</p> <ul style="list-style-type: none"> • No light — The computer is turned off (S4, S5, or mechanical OFF). • Steady green — The computer is in a normal operating state. • Blinking green — The computer is in a power-saving state (S1 or S3). • Blinking or solid amber — See "Power Problems" on page 123. <p>To exit from a power-saving state, press the power button or use the keyboard or mouse if it is configured as a wake device in the Windows Device Manager. For more information about sleep states and exiting from a power-saving state, see "Power Management" on page 40.</p> <p>For a description of diagnostic light codes for troubleshooting problems with your computer, see "Diagnostic Lights" on page 100.</p>
11	microphone connector	Use the microphone connector to attach a personal computer microphone for voice or musical input into a sound or telephony program.
12	headphone connector	Use the headphone connector to attach headphones.
13	diagnostic lights (4)	Use the diagnostic lights to help you troubleshoot a problem with your computer (see "Diagnostic Lights" on page 100).
14	network link light	The network link light is on when a good connection exists between a 10-Mbps, 100-Mbps, or 1000-Mbps (1-Gbps) network and the computer.

Back View (Tower Orientation)



1	power connector	Insert the power cable.
2	voltage selection switch	See the safety instructions in the <i>Product Information Guide</i> for more information. NOTE: The voltage selection switch is available on the 375-W PSU only.
3	back panel connectors	Plug serial, USB, and other devices into the appropriate connector.

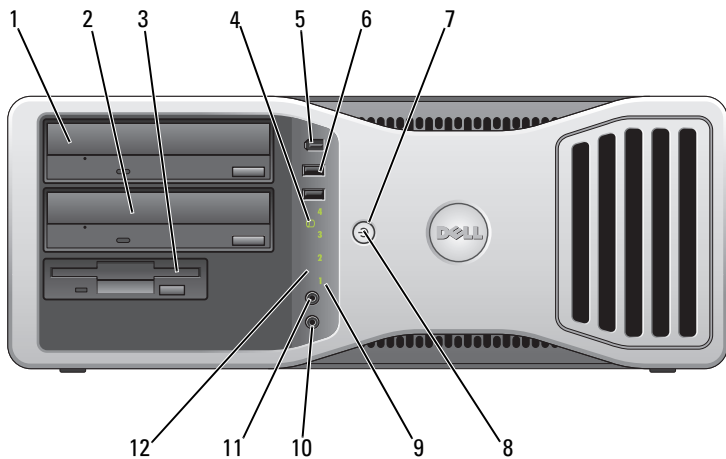
4 card slots

Access connectors for any installed PCI or PCI Express cards.

NOTE: The upper five connector slots support full-length cards; the connector slot at the bottom supports a half-length card.

NOTE: Check the documentation for cards to ensure that you can accommodate them in your configuration. Some cards that require more physical space and power (such as PCI Express graphics cards) may restrict the use of other cards.

Front View (Desktop Orientation)





1 upper 5.25-inch drive bay Supports an optical drive.

2 lower 5.25-inch drive bay Supports an optical drive or an additional hard drive (SATA only).

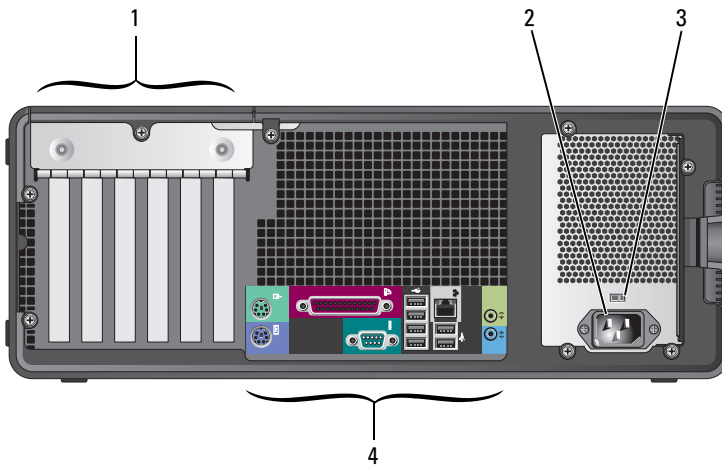
3 3.5-inch drive bay Supports a floppy drive or a Media Card Reader.

4 hard drive activity light The hard drive activity light is on when the computer reads data from or writes data to the hard drive. The light may also be on when a device such as an optical drive is in operation.

5	IEEE 1394 connector (optional)	Use the optional IEEE 1394 connector for high-speed data devices such as digital video cameras and external storage devices.
6	USB 2.0 connectors (2)	<p>Use the front USB connectors for devices that you connect occasionally, such as flash memory keys or cameras, or for bootable USB devices (see "System Setup" on page 81 for more information on booting to a USB device).</p> <p>NOTE: It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.</p>
7	power button	<p>Press to turn on the computer.</p> <p> NOTICE: To avoid losing data, do not use the power button to turn off the computer. Instead, perform an operating system shutdown.</p> <p> NOTICE: If your operating system has ACPI enabled, when you press the power button the computer will perform an operating system shutdown.</p> <p>NOTE: The power button can also be used to wake the system or to place it into a power-saving state. See "Power Management" on page 40 for more information.</p>

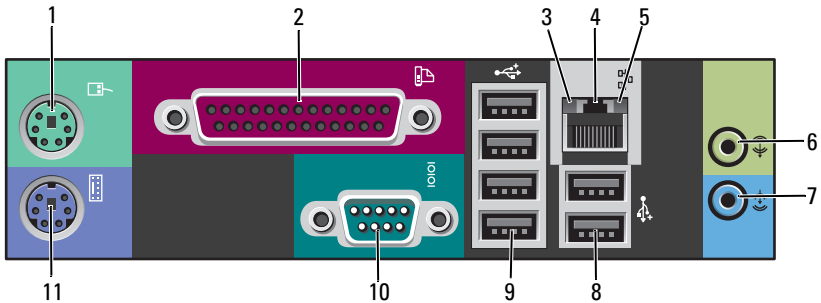
8	power light	<p>The power light illuminates and blinks or remains solid to indicate different states:</p> <ul style="list-style-type: none"> • No light — The computer is turned off (S4, S5, or mechanical OFF). • Steady green — The computer is in a normal operating state. • Blinking green — The computer is in a power-saving state (S1 or S3). • Blinking or solid amber — See "Power Problems" on page 123. <p>To exit from a power-saving state, press the power button or use the keyboard or mouse if it is configured as a wake device in the Windows Device Manager. For more information about sleep states and exiting from a power-saving state, see "Power Management" on page 40.</p> <p>For a description of diagnostic light codes for troubleshooting problems with your computer, see "Diagnostic Lights" on page 100.</p>
9	diagnostic lights (4)	<p>Use the diagnostic lights to help you troubleshoot a problem with your computer (see "Diagnostic Lights" on page 100).</p>
10	microphone connector	<p>Use the microphone connector to attach a personal computer microphone for voice or musical input into a sound or telephony program.</p>
11	headphone connector	<p>Use the headphone connector to attach headphones.</p>
12	network link light	<p>The network link light is on when a good connection exists between a 10-Mbps, 100-Mbps, or 1000-Mbps (or 1-Gbps) network and the computer.</p>

Back View (Desktop Orientation)




1	card slots	Access connectors for any installed PCI or PCI Express cards. NOTE: Check the documentation for cards to ensure that you can accommodate them in your configuration. Some cards that require more physical space and power (such as PCI Express graphics cards) may restrict the use of other cards.
2	power connector	Insert the power cable.
3	voltage selection switch	See the safety instructions in the <i>Product Information Guide</i> for more information. NOTE: The voltage selection switch is available on the 375-W PSU only.
4	back panel connectors	Plug serial, USB, and other devices into the appropriate connector.

Back Panel Connectors



1	mouse connector	Plug a PS/2 mouse into the green mouse connector. Turn off the computer and any attached devices before you connect a mouse to the computer. If you have a USB mouse, plug it into a USB connector.
2	parallel connector	Connect a parallel device, such as a printer, to the parallel connector. If you have a USB printer, plug it into a USB connector. NOTE: The integrated parallel connector is automatically disabled if the computer detects an installed card containing a parallel connector configured to the same address. For more information, see "System Setup Options" on page 82.
3	link integrity light	<ul style="list-style-type: none"> • Green — A good connection exists between a 10-Mbps network and the computer. • Orange — A good connection exists between a 100-Mbps network and the computer. • Yellow — A good connection exists between a 1000-Mbps (or 1-Gbps) network and the computer. • Off — The computer is not detecting a physical connection to the network.

4	network adapter connector	<p>To attach your computer to a network or broadband device, connect one end of a network cable to either a network jack or your network or broadband device. Connect the other end of the network cable to the network adapter connector on your computer. A click indicates that the network cable has been securely attached.</p> <p> NOTICE: Do not plug a telephone cable into the network connector.</p> <p>On computers with an additional network connector card, use the connectors on the card and on the back of the computer when setting up multiple network connections (such as a separate intra- and extranet).</p> <p>It is recommended that you use Category 5 wiring and connectors for your network. If you must use Category 3 wiring, force the network speed to 10 Mbps to ensure reliable operation.</p>
5	network activity light	<p>The network activity light is on (flashing) when the computer is transmitting or receiving network data. A high volume of network traffic may make this light appear to be in a steady <i>on</i> state.</p>
6	line-out connector	<p>Use the green line-out connector to attach headphones and most speakers with integrated amplifiers.</p> <p>On computers with a sound card, use the connector on the card.</p>
7	line-in connector	<p>Use the blue line-in connector to attach a record/playback device such as a microphone, cassette player, CD player, or VCR.</p> <p>On computers with a sound card, use the connector on the card.</p>
8	Rear Dual USB 2.0 connectors (2)	<p>Use the back USB connectors for devices that typically remain connected, such as printers and keyboards.</p> <p>NOTE: It is recommended that you use the front USB connectors for devices that you connect occasionally, such as flash memory keys or cameras, or for bootable USB devices.</p>

9 Rear Quad USB 2.0 connectors (4)	Use the back USB connectors for devices that typically remain connected, such as printers and keyboards. NOTE: It is recommended that you use the front USB connectors for devices that you connect occasionally, such as flash memory keys or cameras, or for bootable USB devices.
10 serial connector	Connect a serial device, such as a handheld device, to the serial port. The default designations are COM1 for serial connector 1 and COM2 for the optional serial connector 2. For more information, see "System Setup Options" on page 82.
11 keyboard connector	If you have a PS/2 keyboard, plug it into the purple keyboard connector. If you have a USB keyboard, plug it into a USB connector.

Specifications



NOTE: Offerings may vary by region. For more information regarding the configuration of your computer, click **Start** → **Help and Support** and select the option to view information about your computer.

Processor

Microprocessor types	Intel® Core™ 2 Duo processors Intel Core 2 Quad processors Intel Core 2 Extreme processors
Cache	1 MB minimum up to 12 MB (depending on your processor)

System Information

Chipset	Intel X38 Express Chipset/ICH9R
Data bus width	64 bits
Address bus width	32 bits
DMA channels	eight
Interrupt levels	24
BIOS chip (NVRAM)	8 Mb

System Information

Memory speed	667/800 MHz
NIC	Integrated network interface with ASF 2.0 support as defined by DMTF Capable of 10/100/1000-Mbps communication: <ul style="list-style-type: none">• Green — A good connection exists between a 10-Mbps network and the computer.• Orange — A good connection exists between a 100-Mbps network and the computer.• Yellow — A good connection exists between a 1000-Mbps (1-Gb) network and the computer.• Off — The computer is not detecting a physical connection to the network.
SAS controller	add-in SAS 6/iR card
System clock	800-MHz, 1066-MHz, or 1333-MHz data rate (depending on your processor)

Controller

Hard drive	integrated serial ATA (4), with RAID 0, RAID 1, RAID 5, RAID 10 (0+1), and command queuing
------------	--

Drives

Available devices	serial ATA drive, SAS drive, floppy drive, CD drive, DVD drive, Media Card Reader, and USB memory devices
Externally accessible:	one 3.5-inch drive bay (FlexBay) in desktop orientation, or two 3.5-inch drive bays (FlexBay) in tower orientation two 5.25-inch bays
Internally accessible:	four 3.5-inch hard drive bays

Memory

Type	667-MHz ECC and non-ECC and 800-MHz ECC DDR2 SDRAM NOTE: Ensure that you do not mix ECC and non-ECC memory. NOTE: Your computer does not support registered or buffered memory.
Memory connectors	four
Memory capacities	512 MB, 1 GB, or 2 GB
Minimum memory	1 GB
Maximum memory	4 GB for 32-bit operating systems 8 GB for 64-bit operating systems
BIOS address	F0000h

Connectors

External connectors:

Serial	one 9-pin connector (16550C-compatible)
Parallel	one 25-hole connector (bidirectional)
IEEE 1394a/b	one front-panel 6-pin serial connector (with optional card)
Video	DVI connector on graphics card VGA connector on graphics card
Network adapter	RJ45 connector
PS/2 (keyboard and mouse)	two 6-pin mini-DIN
USB	two front-panel and six back-panel USB 2.0-compliant connectors
Audio	two rear connectors for line-in and line-out; two front-panel connectors for headphones and microphone

Connectors

System board connectors:

Serial ATA	six 7-pin connectors
serial connector	12-pin connector
Floppy drive	34-pin connector
Fan	three 5-pin connectors
PCI	three 120-pin connectors
PCI Express x8	98-pin connector
PCI Express x16	two 164-pin connectors
FlexBay	2-port USB header
uDOC	1-port USB header
speaker	4-pin connector
SAS activity LED	4-pin connector
chassis intrusion switch	3-pin connector

Video

Type

PCI Express x16



NOTICE: Installing graphics cards that exceed the specified wattage for your power supply may result in your computer not functioning properly. See the documentation for your graphics card for power requirements.

Supported Configurations:

375-W PSU

75-W PCI Express x16 (single or dual)

NOTE: 150-W PCI Express x16 graphics card not supported.

525-W PSU

75-W PCI Express x16 (single or dual);

150-W PCI Express x16 (single or dual);

225-W PCI Express x16 and 75-W PCI Express x16

Audio

Type	internal stereo: integrated HD audio or PCI option cards
Stereo conversion	24-bit analog-to-digital; 24-bit digital-to-analog

Controls and Lights

Power control	push button
Power light	green light — blinking green in sleep state; solid green for power-on state amber light — solid amber indicates a problem with an installed device; blinking amber indicates an internal power problem (see "Power Problems" on page 123)
Hard-drive access light	green
Link integrity light (on integrated network adapter and on front panel)	on back panel integrated network adapter: green light for 10-Mb operation; orange light for 100-Mb operation; yellow light for a 1000-Mb (1-Gb) operation on front panel: displays solid green when a network connection is present
Activity light (on integrated network adapter)	yellow blinking light when there is network activity
Diagnostic lights	four lights on the front panel (see "Diagnostic Lights" on page 100)
Standby power light	AUX_PWR_LED on the system board

Power

DC power supply:

Wattage	375/525 W
Heat dissipation	375-W PSU: 1279 BTU/hr 525-W PSU: 1790 BTU/hr

NOTE: Heat dissipation is calculated based upon the power supply wattage rating.

Voltage	manual selection power supplies—90 to 135 V at 50/60 Hz; 180 to 265 V at 50/60 Hz
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Backup battery	3-V CR2032 lithium coin cell
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Physical

Height	44.8 cm (17.6 inches)
Width	17.1 cm (6.8 inches)
Depth	46.7 cm (18.4 inches)
Weight	17.7 kg (39 lb)
Supported monitor weight (in desktop orientation)	45.4 kg (100 lb)

Environmental

Temperature:

Operating	10° to 35°C (50° to 95°F)
Storage	-40° to 65°C (-40° to 149°F)

Relative humidity	20% to 80% (noncondensing)
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Maximum vibration:

Operating	0.25 G at 3 to 200 Hz at 0.5 octave/min
Storage	0.5 G at 3 to 200 Hz at 1 octave/min

Environmental

Maximum shock:

Operating	bottom half-sine pulse with a change in velocity of 50.8 cm/sec (20 inches/sec)
Storage	27-G faired square wave with a velocity change of 508 cm/sec (200 inches/sec)

Altitude:

Operating	-15.2 to 3048 m (-50 to 10,000 ft)
Storage	-15.2 to 10,668 m (-50 to 35,000 ft)

Advanced Features

LegacySelect Technology Control

LegacySelect technology control offers legacy-full, legacy-reduced, or legacy-free solutions based on common platforms, hard drive images, and help desk procedures. Control is provided to the administrator through System Setup, Dell OpenManage™ IT Assistant, or Dell custom factory integration.

LegacySelect allows administrators to electronically activate or deactivate connectors and media devices that include serial and USB connectors, PCI slots, a parallel connector, a floppy drive, and a PS/2 mouse. Connectors and media devices that are deactivated make resources available. You must restart the computer to effect the changes.

Manageability

Dell OpenManage™ IT Assistant

IT Assistant configures, manages, and monitors computers and other devices on a corporate network. IT Assistant manages assets, configurations, events (alerts), and security for computers equipped with industry-standard management software and supports instrumentation that conforms to SNMP, DMI, and CIM industry standards.

Dell OpenManage Client instrumentation, which is based on DMI and CIM, is available for your computer. For information on IT Assistant, see the *Dell OpenManage IT Assistant User's Guide* available on the Dell Support website at support.dell.com.

Dell OpenManage Client Instrumentation

Dell OpenManage Client Instrumentation is software that enables remote management programs such as IT Assistant to do the following:

- Access information about your computer, such as the number processors installed and the computer's operating system.
- Monitor the status of your computer, such as listening for thermal alerts from temperature probes or hard drive failure alerts from storage devices.
- Change the state of your computer, such as updating the BIOS or shutting down the computer remotely.

A managed system is one that has Dell OpenManage Client Instrumentation set up on a network that uses IT Assistant. For information about Dell OpenManage Client Instrumentation, see the *Dell OpenManage Client Instrumentation User's Guide* available on the Dell Support website at support.dell.com.

Power Management

Your computer can be set to use less power when you are not working. You control the power usage through the operating system installed on your computer and certain option settings in System Setup. Such periods of reduced power are called *sleep states*.

- **Standby (Windows XP):** Power is reduced or turned off for most components, including the cooling fans; however, system memory remains active.
- **Sleep (Windows Vista):** Reduces power consumption to a minimum by writing all data in system memory to a hard drive, and then turning off power for most components. Writing the data to a hard drive ensures that data is not lost if the computer loses power; however, system memory remains active to increase the restart time for the computer.
- **Hibernate:** Reduces power consumption to a minimum by writing all data in system memory to a hard drive, and then removing system power. Waking the computer from Hibernate restarts the computer, and restores the data stored in system memory. The computer then returns to the operating state it was in prior to entering hibernation mode.

- **Shutdown:** Removes all power from the computer except a small auxiliary amount. As long as the computer remains connected to an electrical outlet, it can be automatically or remotely started. For example, the **Auto Power On** option in System Setup (see "System Setup Options" on page 82) allows the computer to automatically start at a specified time. Your network administrator can also remotely start your computer using a power management event such as Remote Wake Up.



NOTE: All components installed in the computer must support Hibernate, Standby, and/or Sleep feature(s) and have the appropriate drivers loaded to enter either of these sleep states. For more information, see the manufacturer's documentation for each component.

The following table lists the sleep states and the corresponding methods you can use to wake the computer:

Sleep Mode	Wake-Up Methods
Standby	<ul style="list-style-type: none"> • Press the power button • Auto power on • Move or click the mouse • Type on the keyboard • USB device activity • Power management event
Sleep	<ul style="list-style-type: none"> • Press the power button • Auto power on • Power management event
Hibernate	<ul style="list-style-type: none"> • Press the power button • Auto power on • Power management event
Shutdown	<ul style="list-style-type: none"> • Press the power button • Auto power on • Power management event



NOTE: For more information on power management, see your operating system documentation.

About RAID Configurations

This section provides an overview of the RAID configuration you may have selected when you purchased your computer. There are several RAID configurations available in the computer industry for different types of uses. Your Dell Precision computer supports RAID level 0, RAID level 1, RAID level 5, or RAID level 10, also known as RAID level 1+0. A RAID level 0 configuration is recommended for high-performance programs, and a RAID level 1 configuration is recommended for users that desire a high level of data integrity.

All drives must be the same type (SAS and SATA drives cannot be mixed in a RAID array) and should also be the same size to ensure that the larger drive does not contain unallocated (and therefore unusable) space.

The Intel RAID controller on your computer can only create a RAID level 0 configuration using two or three physical drives. If a third or fourth drive is present, then the drive(s) can be made part of a RAID level 0 configuration using the Intel RAID configuration program, or the drive(s) can be used as a spare drive in a RAID level 1 configuration (see "Creating a Spare Hard Drive" on page 59).



NOTE: RAID levels do not represent a hierarchy. A RAID level 10 configuration is not inherently better or worse than a RAID level 0 configuration.

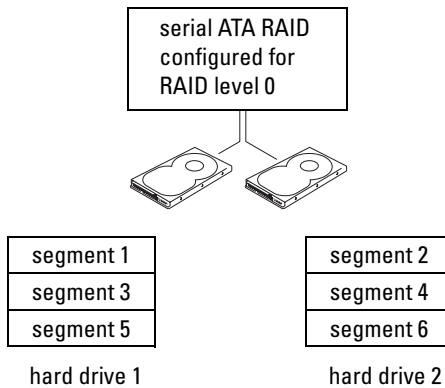
Using RAID with Hard Drive Passwords

If you are using the hard drive security option available in System Setup you should not use a RAID configuration. Using a RAID configuration requires that the hard drive password be cleared to allow data access.

RAID Level 0

NOTICE: Because a RAID level 0 configuration provides no data redundancy, a failure of one drive results in the loss of all data. To protect your data when using a RAID level 0 configuration, perform regular backups.

RAID level 0 uses a storage technique known as data striping to provide a high data access rate. Data striping is a method of writing consecutive segments, or stripes, of data sequentially across the physical drive(s) to create a large virtual drive. Data striping allows one of the drives to read data while the other drive is searching for and reading the next block.

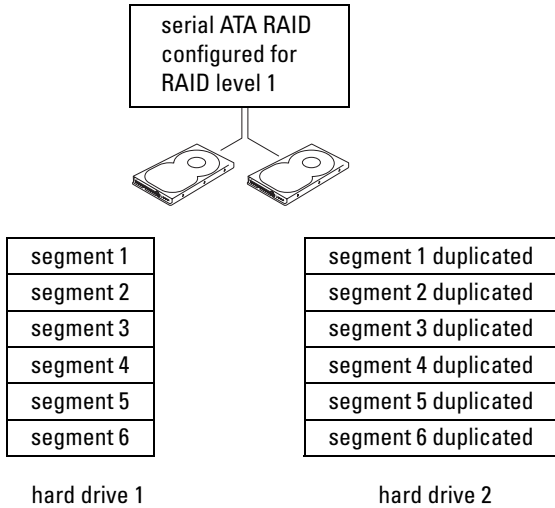


Another advantage of a RAID level 0 configuration is that it utilizes the full storage capacities of the drives. For example, two 120-GB hard drives combine to provide 240 GB of hard drive space on which to store data.

NOTE: In a RAID level 0 configuration, the size of the configuration is equal to the size of the smallest drive multiplied by the number of drives in the configuration.

RAID Level 1

RAID level 1 uses a data-redundancy storage technique known as mirroring to enhance data integrity. When data is written to the primary drive, the data is also duplicated, or mirrored, on the second drive in the configuration. A RAID level 1 configuration sacrifices high data-access rates for its data redundancy advantages.

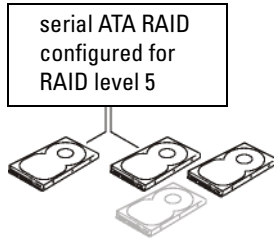


If a drive failure occurs, subsequent read and write operations are directed to the surviving drive. A replacement drive can then be rebuilt using the data from the surviving drive.

NOTE: In a RAID level 1 configuration, the size of the configuration is equal to the size of the smallest drive in the configuration.

RAID Level 5

RAID level 5 uses a data-staging storage technique known as data parity. When data is written to the primary drive, the data is duplicated on at least three other drives. Unlike a RAID level 1 configuration which writes to one other volume that acts as a data mirror, a RAID level 5 configuration writes data to each drive in increments, placing data from each segment across multiple drives. A RAID level 5 configuration has higher data-access rates, but requires more storage space than a RAID level 0 or RAID level 1 configuration.



segment 1
segment 2
segment 3
segment 4
segment 5
segment 6

hard drive 1

segment 1 striped across at least 3 drives
segment 2 striped across at least 3 drives
segment 3 striped across at least 3 drives
segment 4 striped across at least 3 drives
segment 5 striped across at least 3 drives
segment 6 striped across at least 3 drives

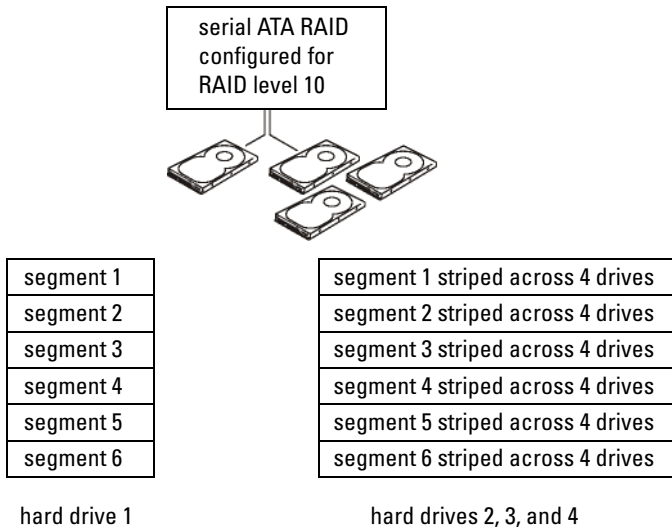
hard drives 2, 3 (and optionally, 4)

If a drive failure occurs, subsequent read and write operations are directed to the surviving drives. A replacement drive can then be rebuilt using the data from the surviving drives.

NOTE: In a RAID level 5 configuration, the size of the configuration is equal to the size of the smallest drive in the configuration multiplied by three.

RAID Level 10 (1+0)

RAID level 10, also known as RAID level 1+0, uses a data-staging storage technique known as data parity. When data is written to the primary drive, the data is then duplicated on four other drives. Unlike a RAID level 1 configuration which writes to one other volume that acts as a data mirror, a RAID level 10 configuration writes data to each drive in increments which places data from each segment across multiple drives. A RAID level 10 configuration has higher data access rates but requires more storage space than a RAID level 0 or RAID level 1 configuration.



If a drive failure occurs, subsequent read and write operations are directed to the surviving drives. A replacement drive can then be rebuilt using the data from the surviving drives.

NOTE: In a RAID level 10 configuration, the size of the configuration is equal to the size of the smallest drive in the configuration multiplied by two.


Configuring Your Computer for RAID

At some point you may want to configure your computer for RAID if you did not select a RAID configuration when you purchased your computer. You must have at least two hard drives installed in your computer to set up a RAID configuration. For instructions on how to install a hard drive, see "Hard Drive" on page 191.


You can use one of two methods to configure RAID hard drive volumes. One method uses the Intel RAID Option ROM utility and is performed *before* you install the operating system onto the hard drive. The second method uses the Intel Matrix Storage Manager, or Intel Matrix Storage Console, and this method is performed *after* you have installed the operating system and the

Intel Matrix Storage Console. Both methods require that you set your computer to RAID-enabled mode before starting any of the RAID configuration procedures in this document.


Setting Your Computer to RAID-Enabled Mode


- 1 Enter System Setup (see "Entering System Setup" on page 81).
- 2 Press the up- and down-arrow keys to highlight **Drives**, then press <Enter>.
- 3 Press the up- and down-arrow keys to highlight **SATA Operation**, then press <Enter>.
- 4 Press the left- and right-arrow keys to highlight **RAID On**, press <Enter>, and then press <Esc>.
 **NOTE:** For more information about RAID options, see "System Setup Options" on page 82.
- 5 Press the left- and right-arrow keys to highlight **Save/Exit**, and press <Enter> to exit System Setup and resume the boot process.

Configuring Your Computer for RAID Using the Intel® RAID Option ROM Utility


 **NOTE:** Although any size of drives may be used to create a RAID configuration when using the Intel RAID Option ROM utility, ideally the drives should be of equal size. In a RAID level 0 configuration, the size of the configuration will be the size of the smallest drive multiplied by the number (two) of drives in the configuration. In a RAID level 1 configuration, the size of the configuration will be the smaller of the two drives used.

Creating a RAID Level 0 Configuration

 **NOTICE:** You will lose any data on your hard drives when you create a RAID configuration using the following procedure. Back up data that you want to keep before continuing.

 **NOTE:** Use the following procedure only if you are reinstalling your operating system. Do not use the following procedure to migrate an existing storage configuration to RAID level 0 configuration.

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).

- 2 Press <Ctrl><i> when you are prompted to enter the Intel RAID Option ROM utility.
 - 3 Press the up- and down-arrow keys to highlight **Create RAID Volume**, and press <Enter>.
 - 4 Enter a RAID volume name or accept the default, and press <Enter>.
 - 5 Press the up- and down-arrow keys to select **RAID0(Stripe)**, and press <Enter>.
 - 6 If more than two hard drives are available, press the up- and down-arrow keys and spacebar to select the two or three drives that you want to use to make up your configuration, and then press <Enter>.
-  **NOTE:** Select the strip size closest to the size of the average file that you want to store on the RAID volume. If you do not know the average file size, choose 128 KB as your strip size.
- 7 Press the up- and down-arrow keys to change the strip size and press <Enter>.
 - 8 Select the desired capacity for the volume and press <Enter>. The default value is the maximum available size.
 - 9 Press <Enter> to create the volume.
 - 10 Press <y> to confirm that you want to create the RAID volume.
 - 11 Confirm that the correct volume configuration is displayed on the main Intel RAID Option ROM utility screen.
 - 12 Press the up- and down-arrow keys to select **Exit** and press <Enter>.
 - 13 Install the operating system (see "Restoring Your Operating System" on page 136).

Creating a RAID Level 1 Configuration

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Press <Ctrl><i> when you are prompted to enter the Intel RAID Option ROM utility.
- 3 Use the up- and down-arrow keys to highlight **Create RAID Volume** and press <Enter>.
- 4 Enter a RAID volume name or accept the default and press <Enter>.

- 5 Use the up- and down-arrow keys to select **RAID1 (Mirror)** and press <Enter>.
- 6 If there are more than two hard drives available, press the up- and down-arrow keys and spacebar to select the two drives you want to use to make up your volume, and then press <Enter>.
- 7 Select the desired capacity for the volume, and press <Enter>. The default value is the maximum available size.
- 8 Press <Enter> to create the volume.
- 9 Press <y> to confirm that you want to create the RAID volume.
- 10 Confirm that the correct volume configuration is displayed on the main Intel RAID Option ROM utility screen.
- 11 Use the up- and down-arrow keys to select **Exit** and press <Enter>.
- 12 Install the operating system (see "Restoring Your Operating System" on page 136).

Creating a RAID Level 5 Configuration



- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Press <Ctrl><i> when you are prompted to enter the Intel RAID Option ROM utility.
- 3 Use the up- and down-arrow keys to highlight **Create RAID Volume**, and press <Enter>.
- 4 Enter a RAID volume name or accept the default, and press <Enter>.
- 5 Use the up- and down-arrow keys to select **RAID5 (Mirror)**, and press <Enter>.
- 6 Press the up- and down-arrow keys and spacebar to select the three or four drives you want to use to make up your volume, and then press <Enter>.
- 7 Select the desired capacity for the volume, and press <Enter>. The default value is the maximum available size.
- 8 Press <Enter> to create the volume.
- 9 Press <y> to confirm that you want to create the RAID volume.
- 10 Confirm that the correct volume configuration is displayed on the main Intel RAID Option ROM utility screen.

- 11 Use the up- and down-arrow keys to select **Exit**, and press <Enter>.
- 12 Install the operating system (see "Restoring Your Operating System" on page 136).

Creating a RAID Level 10 Configuration

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Press <Ctrl><i> when you are prompted to enter the Intel RAID Option ROM utility.
- 3 Use the up- and down-arrow keys to highlight **Create RAID Volume**, and press <Enter>.
- 4 Enter a RAID volume name or accept the default, and press <Enter>.
- 5 Use the up- and down-arrow keys to select **RAID10(Mirror)**, and press <Enter>.
- 6 Press the up- and down-arrow keys and spacebar to select the four drives you want to use to make up your volume, and then press <Enter>.
- 7 Select the desired capacity for the volume, and press <Enter>. The default value is the maximum available size.
- 8 Press <Enter> to create the volume.
- 9 Press <y> to confirm that you want to create the RAID volume.
- 10 Confirm that the correct volume configuration is displayed on the main Intel RAID Option ROM utility screen.
- 11 Use the up- and down-arrow keys to select **Exit**, and press <Enter>.
- 12 Install the operating system (see "Restoring Your Operating System" on page 136).

Deleting a RAID Volume

-  **NOTE:** When you perform this operation, all data on the RAID drives will be lost.
-  **NOTE:** If your computer currently boots to RAID and you delete the RAID volume in the Intel RAID Option ROM utility, your computer will become unbootable.
- 1 Press <Ctrl><i> when you are prompted to enter the Intel RAID Option ROM utility.

- 2 Use the up- and down-arrow keys to highlight **Delete RAID Volume**, and press <Enter>.
- 3 Use the up- and down-arrow keys to highlight the RAID volume you want to delete, and press <Delete>.
- 4 Press <y> to confirm the deletion of the RAID volume.
- 5 Press <Esc> to exit the Intel RAID Option ROM utility.

Configuring Your Computer for RAID Using the Intel Matrix Storage Manager

If you already have one hard drive with the operating system installed on it, and you want to add a second hard drive and reconfigure both drives into a RAID volume without losing the existing operating system and any data, you need to use the migrating option for a RAID level 0 configuration (see "RAID Level 0" on page 44) or a RAID level 1 configuration (see "RAID Level 1" on page 44.) Create a RAID level 0 volume or RAID level 1 volume only when:

- You are adding two new drives to an existing single-drive computer (and the operating system is on the single drive), and you want to configure the two new drives into a RAID volume.
- You already have a two-hard drive computer configured into a volume, but you still have some space left on the volume that you want to designate as a second RAID volume.

Creating a RAID Level 0 Configuration



NOTE: When you perform this operation, all data on the RAID drives will be lost.

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click **Start** and point to **Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.



NOTE: If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).

- 3 On the **Actions** menu, select **Create RAID Volume** to launch the Create RAID Volume Wizard, and then click **Next**.
- 4 On the **Select Volume Location** screen, click the first hard drive you want to include in your RAID level 0 volume, and then click the right arrow.

- 5 Click a second hard drive. To add a third hard drive in your RAID level 0 volume, click the right arrow and click on the third drive until three drives appear in the **Selected** window, and then click **Next**.
- 6 In the **Specify Volume Size** window, click the **Volume Size** desired, and then click **Next**.
- 7 Click **Finish** to create the volume, or click **Back** to make changes.

Creating a RAID Level 1 Configuration



NOTE: When you perform this operation, all data on the RAID drives will be lost.

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **Programs**→**Intel(R) Matrix Storage Manager**→**Intel Matrix Storage Console** to launch the Intel® Storage Utility.



NOTE: If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.

- 3 On the **Actions** menu, select **Create RAID Volume** to launch the Create RAID Volume Wizard.
- 4 Click **Next** at the first screen.
- 5 Confirm the volume name, select **RAID 1** as the RAID level, and then click **Next** to continue.
- 6 On the **Select Volume Location** screen, click the first hard drive you want to use to create your RAID level 1 volume, and then click the right arrow. Click a second hard drive until two drives appear in the **Selected** window, and then click **Next**.
- 7 In the **Specify Volume Size** window, select the **Volume Size** desired and click **Next**.
- 8 Click **Finish** to create the volume, or click **Back** to make changes.
- 9 Follow Microsoft Windows procedures for creating a partition on the new RAID volume.

Creating a RAID Level 5 Configuration



NOTE: When you perform this operation, all data on the RAID drives will be lost.

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.



NOTE: If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.

- 3 On the **Actions** menu, select **Create RAID Volume** to launch the Create RAID Volume Wizard.
- 4 Click **Next** at the first screen.
- 5 Confirm the volume name, select **RAID 5** as the RAID level, and then click **Next** to continue.
- 6 On the **Select Volume Location** screen, click the first hard drive you want to use to create your RAID level 5 volume, and then click the right arrow. Click two or three additional drives until either three or four drives appear in the **Selected** window, and then click **Next**.
- 7 In the **Specify Volume Size** window, select the **Volume Size** desired and click **Next**.
- 8 Click **Finish** to create the volume, or click **Back** to make changes.
- 9 Follow Microsoft Windows procedures for creating a partition on the new RAID volume.

Creating a RAID Level 10 Configuration



NOTE: When you perform this operation, all data on the RAID drives will be lost.

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.



NOTE: If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.

- 3 On the **Actions** menu, select **Create RAID Volume** to launch the Create RAID Volume Wizard.
- 4 Click **Next** at the first screen.
- 5 Confirm the volume name, select **RAID 10** as the RAID level, and then click **Next** to continue.
- 6 On the **Select Volume Location** screen, click the first hard drive you want to use to create your RAID level 10 volume, and then click the right arrow. Click three additional drives until four drives appear in the **Selected** window, and then click **Next**.
- 7 In the **Specify Volume Size** window, select the **Volume Size** desired and click **Next**.
- 8 Click **Finish** to create the volume, or click **Back** to make changes.
- 9 Follow Microsoft Windows procedures for creating a partition on the new RAID volume.

Deleting a RAID Volume



NOTE: While this procedure deletes the RAID 1 volume, it also splits the RAID 1 volume into two non-RAID hard drives with a partition, and leaves any existing data files intact. Deleting a RAID 0 volume, however, destroys all data on the volume.

- 1 Click the **Start** button and point to **Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.
- 2 Right-click the **Volume** icon of the RAID volume you want to delete, and select **Delete Volume**.
- 3 On the **Delete RAID Volume Wizard** screen, click **Next**.
- 4 Highlight the RAID volume you want to delete in the **Available** box, click the right-arrow button to move the highlighted RAID volume into the **Selected** box, and then click **Next**.
- 5 Click **Finish** to delete the volume.

Migrating to a RAID Level 0 Configuration

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **All Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.



NOTE: If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.

- 3 On the **Actions** menu, select **Create RAID Volume From Existing Hard Drive** to launch the Migration Wizard.
- 4 Click **Next** on the Migration Wizard screen.
- 5 Enter a RAID volume name or accept the default.
- 6 From the drop-down box, select **RAID 0** as the RAID level.



NOTE: Select the strip size closest to the size of the average file you want to store on the RAID volume. If you do not know the average file size, choose 128 KB as your strip size.

- 7 Select the appropriate strip size from the drop-down box, and then click **Next**.



NOTE: Select the hard drive that you want to use as your source hard drive (it should be the hard drive containing the data or operating system files that you want to keep on the RAID volume).

- 8 On the **Select Source Hard Drive** screen, double-click the hard drive from which you want to migrate, and click **Next**.
- 9 On the **Select Member Hard Drive** screen, double-click the hard drive(s) to select the member drive(s) to span the stripe array, and click **Next**.
- 10 On the **Specify Volume Size** screen, select the **Volume Size** you want, and click **Next**.



NOTE: In step 11, all data contained on the member drive will be removed.

- 11 Click **Finish** to start migrating, or click **Back** to make changes. You can use your computer normally during the migration process.

Migrating to a RAID Level 1 Configuration

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **All Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.



NOTE: If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.

- 3 On the **Actions** menu, click **Create RAID Volume From Existing Hard Drive** to launch the Migration Wizard.
- 4 Click **Next** on the first Migration Wizard screen.
- 5 Enter a RAID volume name or accept the default.
- 6 From the drop-down box, select **RAID 1** as the RAID level.



NOTE: Select the hard drive that you want to use as your source hard drive (it should be the hard drive containing the data or operating system files that you want to keep on the RAID volume).

- 7 On the **Select Source Hard Drive** screen, double-click the hard drive from which you want to migrate, and click **Next**.
- 8 On the **Select Member Hard Drive** screen, double-click the hard drive to select the member drive that you want to act as the mirror in the configuration, and click **Next**.
- 9 On the **Specify Volume Size** screen, select the volume size you want, and click **Next**.






NOTE: In step 10, all data contained on the member drive will be removed.


- 10 Click **Finish** to start migrating, or click **Back** to make changes. You can use your computer normally during migration process.

Migrating to a RAID Level 5 Configuration


- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **All Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.

-  **NOTE:** If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.
- 3 On the **Actions** menu, click **Create RAID Volume From Existing Hard Drive** to launch the Migration Wizard.
- 4 Click **Next** on the first Migration Wizard screen.
- 5 Enter a RAID volume name or accept the default.
- 6 From the drop-down box, select **RAID 5** as the RAID level.
-  **NOTE:** Select the hard drive that you want to use as your source hard drive (it should be the hard drive containing the data or operating system files that you want to keep on the RAID volume).
- 7 On the **Select Source Hard Drive** screen, double-click the hard drive from which you want to migrate, and click **Next**.
- 8 On the **Select Member Hard Drive** screen, double-click the two or three drives to select the member drives that you want to use in the configuration, and click **Next**.
- 9 On the **Specify Volume Size** screen, select the volume size you want, and click **Next**.
-  **NOTE:** In step 10, all data contained on the member drive will be removed.
- 10 Click **Finish** to start migrating, or click **Back** to make changes. You can use your computer normally during migration process.

Migrating to a RAID Level 10 Configuration

- 1 Set your computer to RAID-enabled mode (see "Setting Your Computer to RAID-Enabled Mode" on page 48).
- 2 Click the **Start** button and point to **All Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.
-  **NOTE:** If you do not see an **Actions** menu option, you have not yet set your computer to RAID-enabled mode.
- 3 On the **Actions** menu, click **Create RAID Volume From Existing Hard Drive** to launch the Migration Wizard.
- 4 Click **Next** on the first Migration Wizard screen.
- 5 Enter a RAID volume name or accept the default.

6 From the drop-down box, select **RAID 10** as the RAID level.

 **NOTE:** Select the hard drive that you want to use as your source hard drive (it should be the hard drive containing the data or operating system files that you want to keep on the RAID volume).

7 On the **Select Source Hard Drive** screen, double-click the hard drive from which you want to migrate, and click **Next**.

8 On the **Select Member Hard Drive** screen, double-click the three drives to select the member drives that you want to use in the configuration, and click **Next**.

9 On the **Specify Volume Size** screen, select the volume size you want, and click **Next**.

 **NOTE:** In step 10, all data contained on the member drive will be removed.

10 Click **Finish** to start migrating, or click **Back** to make changes. You can use your computer normally during migration process.

Creating a Spare Hard Drive

A spare hard drive may be created with a RAID level 1 configuration. The spare hard drive will not be recognized by the operating system, but you will be able to see the spare drive from within Disk Manager or the Intel RAID Option ROM utility. When a member of the RAID level 1 configuration is broken, the computer automatically rebuilds the mirror configuration using the spare hard drive as the broken member's replacement.

To mark a drive as a spare hard drive:

- 1 Click the **Start** button and point to **Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.
- 2 Right-click the hard drive you want to mark as a spare hard drive.
- 3 Click **Mark as Spare**.

To remove spare marking from a spare hard drive:

- 1 Right-click the spare hard-drive icon.
- 2 Click **Reset Hard Drive to Non-RAID**

Rebuilding a Degraded RAID Level 1 Configuration


If your computer does not have a spare hard drive, and the computer has reported a degraded RAID level 1 volume, you can manually rebuild the computer's redundancy mirror to a new hard drive:


- 1** Click the **Start** button and point to **Programs**→ **Intel(R) Matrix Storage Manager**→ **Intel Matrix Storage Console** to launch the Intel Storage Utility.
- 2** Right-click the available hard drive to which you want to rebuild the RAID level 1 volume, and click **Rebuild to this Disk**.
- 3** You can use your computer while the computer is rebuilding the RAID level 1 volume.

Setting Up Your Computer

Changing Between Tower and Desktop Orientations

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

 **NOTE:** To change your computer to either the tower or the desktop orientation, you must use an optional kit available from Dell. See "Product Information" on page 266 for more details on ordering from Dell.

 **NOTE:** The tower computer supports one more 3.5-inch drive in the front than does the desktop computer.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Remove the drive panel and prepare the drive panel by adding or removing inserts, as needed (see "Drive Panel" on page 212).

Switching From Tower to Desktop Orientation

- 1 Remove all installed floppy drives or media card readers by following the steps in "Removing a Floppy Drive or Media Card Reader (Tower Computer)" on page 220, and then reinstall a single floppy drive or media card reader by following the steps in "Installing a Floppy Drive or Media Card Reader (Desktop Computer)" on page 228.
- 2 Remove all installed optical drives by following the steps in "Removing an Optical Drive (Tower Computer)" on page 231, and then reinstall the drives by following the steps in "Installing an Optical Drive (Desktop Computer)" on page 237.

Switching From Desktop to Tower Orientation

- 1 Remove the floppy drive or media card reader (if installed) by following the steps in "Removing a Floppy Drive or a Media Card Reader (Desktop Computer)" on page 226, and then reinstall the floppy drive or media card reader by following the steps in "Installing a Floppy Drive or Media Card Reader (Tower Computer)" on page 222.
- 2 Remove all installed optical drives by following the steps in "Removing an Optical Drive (Desktop Computer)" on page 236, and reinstall the drives by following the steps in "Installing an Optical Drive (Tower Computer)" on page 233.

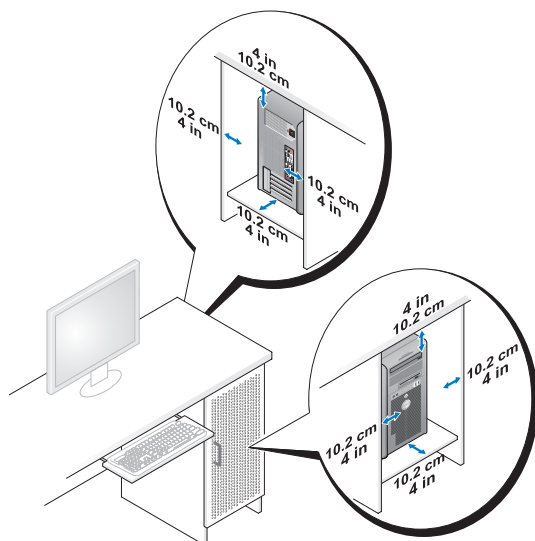
Installing Your Computer in an Enclosure

Installing your computer in an enclosure can restrict airflow, can cause your computer to overheat, and may impact your computer's performance. Follow the guidelines below when installing your computer in an enclosure:



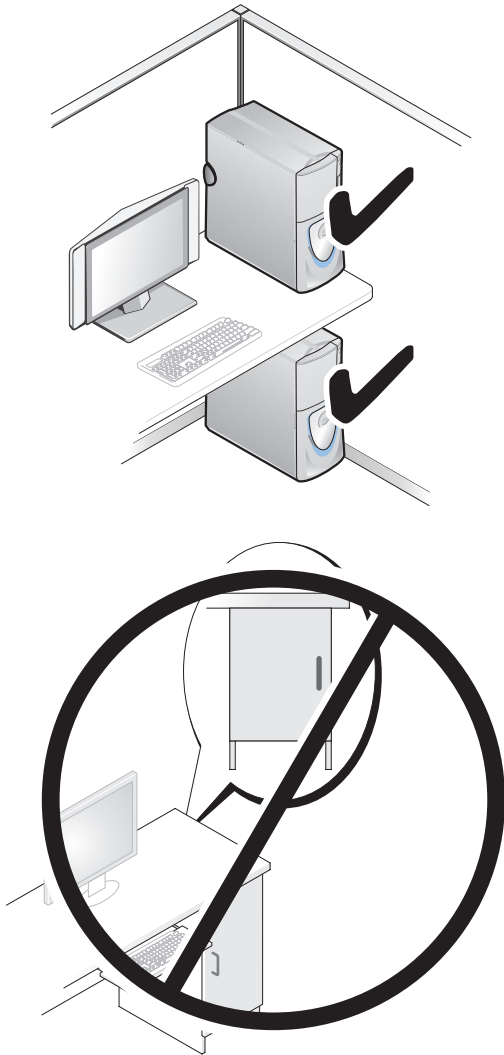
NOTICE: The operating temperature specified in this manual reflects the maximum ambient operating temperature. The ambient room temperature must be a consideration when installing your computer in an enclosure. For details about your computer's specifications, see "Specifications" on page 31.

- Leave 10.2 cm (4 in) minimum clearance on all vented sides of the computer to permit the airflow required for proper ventilation.



- If your computer is installed in a corner on or under a desk, leave 5.1 cm (2 in) minimum clearance from the back of the computer to the wall to permit the airflow required for proper ventilation.
- If your enclosure has doors, ensure that they allow at least thirty percent airflow through the enclosure (front and back).

- Do not install your computer in an enclosure that does not allow airflow. Restricting the airflow can cause your computer to overheat, and may impact your computer's performance.



Transferring Information to a New Computer

You can use your operating system *wizards* to help you transfer files and other data from one computer to another computer.

Microsoft® Windows® XP

The Microsoft Windows XP operating system provides the Files and Settings Transfer Wizard to transfer data, such as:

- E-mail messages
- Toolbar settings
- Window sizes
- Internet bookmarks

You can transfer data from one computer to another computer over a network or serial connection, or by storing the data on removable media, such as a writable CD or DVD.



NOTE: You can transfer information from one computer to another computer by directly connecting a serial cable to the input/output (I/O) ports of the two computers. To transfer data over a serial connection, you must use the Network Connections utility in the Control Panel to perform additional configuration steps, such as setting up an advanced connection and designating the host computer and the guest computer.

For instructions on setting up a direct cable connection between two computers, see Microsoft Knowledge Base Article #305621, titled *How to Set Up a Direct Cable Connection Between Two Computers in Windows XP*. This information may not be available in certain countries.

Using the Files and Settings Transfer Wizard requires the *Operating System* installation media that came with your computer or a wizard disk, which the wizard can create for you.



NOTE: For more information about transferring data, search support.dell.com for document #154781 (*What Are The Different Methods To Transfer Files From My Old Computer To My New Dell™ Computer Using the Microsoft® Windows® XP Operating System?*).



NOTE: Access to the Dell Knowledge Base document may not be available in certain countries.

Files and Settings Transfer Wizard (With the Operating System Media)



NOTE: The Files and Settings Transfer Wizard designates the source computer from which data is to be transferred as the *old* computer, and designates the destination computer to which the data is going to be transferred as the *new* computer.

PREPARE THE DESTINATION COMPUTER FOR THE FILE TRANSFER:

- 1 Click **Start**→ **All Programs**→ **Accessories**→ **System Tools**→ **Files and Settings Transfer Wizard**.
- 2 Under **Which computer is this?**, click **New computer**, then click **Next**.
- 3 Under **Do you have a Windows XP CD?**, click **I will use the wizard from the Windows XP CD**, then click **Next**.
- 4 Review the information under **Now go to your old computer**, and then go to the source computer. Do *not* click **Next**.

COPY DATA FROM THE SOURCE COMPUTER:

- 1 Insert the Windows XP *Operating System* installation media into the source computer.
The **Welcome to Microsoft Windows XP** screen appears.
- 2 Click **Perform additional tasks**.
- 3 Under **What do you want to do?**, click **Transfer files and settings**.
The **Files and Settings Transfer Wizard** window appears.
- 4 Click **Next**.
- 5 Under **Which computer is this?**, click **Old Computer**, then click **Next**.
- 6 Under **Select a transfer method**, click the transfer method of your choice, then click **Next**.
- 7 Under **What do you want to transfer?**, click to select the data you want to transfer, then click **Next**.
The selected data is copied and the **Completing the Collection Phase** screen appears.
- 8 Click **Finish**.

TRANSFER DATA TO THE DESTINATION COMPUTER:

- 1 Go to the destination computer.
- 2 Under **Now go to your old computer**, click **Next**.

- 3 Under **Where are the files and settings?**, click to select the method you chose for transferring your settings and files, then click **Next**.

The wizard reads the collected files and settings and applies them to the destination computer. When the transfer is complete, the **Finished** screen appears.

- 4 Click **Finished**, and then restart the computer.

Files and Settings Transfer Wizard (Without the Operating System Media)

To run the Files and Settings Transfer Wizard without the *Operating System* installation media, you must create a wizard disk. The wizard disk allows you to create a backup image file on removable media.



NOTE: The Files and Settings Transfer Wizard designates the source computer from which data is to be transferred as the *old* computer, and designates the destination computer to which the data is going to be transferred as the *new* computer.

CREATE A WIZARD DISK:

- 1 On the destination computer, click **Start**→ **All Programs**→ **Accessories**→ **System Tools**→ **Files and Settings Transfer Wizard**.
- 2 Under **Which computer is this?**, click **New computer**, then click **Next**.
- 3 Under **Do you have a Windows XP CD?**, click **I want to create a Wizard Disk in the following drive**, then click **Next**.
- 4 Insert removable media, such as a writable CD or DVD, then click **OK**.
- 5 Review the information under **Now go to your old computer**, and then go to the source computer. Do *not* click **Next**.

COPY DATA FROM THE SOURCE COMPUTER:

- 1 Insert the wizard disk into the source computer.
- 2 Click **Start**→ **Run**.
- 3 Click **Browse...** and navigate to **fastwiz** on the wizard disk, then click **OK**.
- 4 Under **Which computer is this?**, click **Old Computer**, then click **Next**.
- 5 Under **Select a transfer method**, click the transfer method of your choice, then click **Next**.

- 6 Under **What do you want to transfer?**, click to select the data you want to transfer, then click **Next**.

The selected data is copied and the **Completing the Collection Phase** screen appears.

- 7 Click **Finish**.


TRANSFER DATA TO THE DESTINATION COMPUTER:

- 1 Go to the destination computer.
- 2 Under **Now go to your old computer**, click **Next**.
- 3 Under **Where are the files and settings?**, click to select the method you chose for transferring your settings and files, then click **Next**.

The wizard reads the collected files and settings and applies them to the destination computer. When the transfer is complete, the **Finished** screen appears.

- 4 Click **Finished**, and then restart the computer.

Microsoft Windows Vista™

- 1 Click the Windows Vista Start button , and then click **Transfer files and settings**→ **Start Windows Easy Transfer**.
- 2 In the **User Account Control** dialog box, click **Continue**.
- 3 Click **Start a new transfer** or **Continue a transfer in progress**.

Follow the instructions provided on the screen by the Windows Easy Transfer wizard.

Power Protection Devices

Several devices are available to protect against power fluctuations and failures:

- Surge protectors
- Line conditioners
- Uninterruptible power supplies (UPS)

Surge Protectors

Surge protectors and power strips equipped with surge protection help prevent damage to your computer from voltage spikes that can occur during electrical storms or after power interruptions. Some surge protector manufacturers include warranty coverage for certain types of damage. Carefully read the device warranty when choosing a surge protector and compare joule ratings to determine the relative effectiveness of different devices. A device with a higher joule rating offers more protection.

- ➔ **NOTICE:** Most surge protectors do not protect against power fluctuations or power interruptions caused by nearby lightning strikes. When lightning occurs in your area, disconnect the telephone line from the telephone wall jack and disconnect your computer from the electrical outlet.

Many surge protectors have a telephone jack for modem protection. See the surge protector documentation for modem connection instructions.

- ➔ **NOTICE:** Not all surge protectors offer network adapter protection. Disconnect the network cable from the network wall jack during electrical storms.

Line Conditioners

- ➔ **NOTICE:** Line conditioners do not protect against power interruptions.

Line conditioners are designed to maintain AC voltage at a fairly constant level.

Uninterruptible Power Supplies


- ➔ **NOTICE:** Loss of power while data is being saved to the hard drive may result in data loss or file damage.

- ✍ **NOTE:** To ensure maximum battery operating time, connect only your computer to a UPS. Connect other devices, such as a printer, to a separate power strip that provides surge protection.

A UPS protects against power fluctuations and interruptions. UPS devices contain a battery that provides temporary power to connected devices when AC power is interrupted. The battery charges while AC power is available. See the UPS manufacturer documentation for information on battery operating time and to ensure that the device is approved by Underwriters Laboratories (UL).


Securing Your Computer

Chassis Intrusion Detection


 **NOTE:** When the administrator password is enabled, you must know the administrator password before you can reset the **Chassis Intrusion** setting.

The Chassis Intrusion Detection feature detects when the computer chassis is or has been opened and alerts the user. The following Chassis Intrusion settings are available in System Setup:


- **Off** — The Chassis Intrusion detection feature is disabled. If the computer cover is opened, no action is taken.
- **On** — The Chassis Intrusion detection feature is enabled. If the computer cover is opened, the setting changes to **Detected**, and an alert message displays during the boot routine at the next computer start up.
- **On-Silent** (default) — The Chassis Intrusion detection feature is enabled. If the computer cover is opened, the setting changes to **Detected**; however, no alert message appears during the boot routine at the next computer start up.

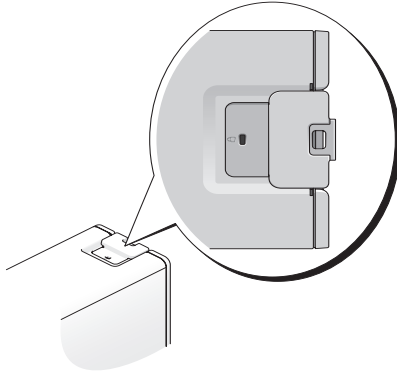
 **NOTE:** For information on changing System Setup options see "System Setup" on page 81.

Security Cable Lock


 **NOTE:** Your computer does not ship with a security cable lock.

A security cable lock is a commercially available antitheft device. To use the lock, attach it to the security cable slot on your Dell computer. For more information, see the instructions included with the device.

 **NOTICE:** Before you purchase an antitheft device, ensure that it will work with the security cable slot on your computer.



Smart Cards and Fingerprint Readers

 **NOTE:** The smart card feature may not be available on your computer.

Smart cards are portable credit-card shaped devices with internal integrated circuits. Using smart cards can improve system security by combining something a user has (the smart card) with something only the user should know (a PIN) to provide more secure user-authentication than passwords alone.

A fingerprint reader is a strip sensor located on a peripheral device for your computer. When you slide your finger over the reader, it uses your unique fingerprint to authenticate your user identity and help keep your Dell computer secure.

Passwords

Passwords prevent unauthorized access to your computer. When using passwords, observe the following guidelines:

- Choose a password that you can remember, but not one that is easy to guess. For example, do not use the names of family members or pets for passwords.
- If possible, do not write down your password. If you do write it down, ensure that the password is stored in a secure location.
- Do not share your password with other people.
- Ensure that people are not watching you when you type your password.

Use the **User Accounts** option in the Control Panel in the Microsoft Windows operating system to create user accounts or to change passwords. Once you create a user password, you must enter it each time you turn on or unlock your computer. If a valid password is not entered within two minutes, the computer returns to its previous operating state.

For more information, see your Windows documentation.

About Passwords



NOTICE: Passwords provide a high level of security for data in your computer or hard drive. However, they are not always reliable. If you require more security, obtain and use additional forms of protection, such as smart cards, data encryption programs, or PC Cards with encryption features.



NOTE: Passwords are disabled when you receive your computer.

The following table identifies types and features of passwords available on your computer.

Type of Password	Features
Primary (system) password	<ul style="list-style-type: none">• Protects your computer from unauthorized access
Administrator password	<ul style="list-style-type: none">• Gives system administrators or service technicians access to computers for repair or reconfiguration• Restricts access to System Setup in the same way a primary password restricts access to the computer• Can be used instead of the primary password
Hard drive password	<ul style="list-style-type: none">• Helps protect your hard drive or external hard drive (if used) from unauthorized access <p>NOTE: Some hard drives do not support hard drive passwords.</p>

If you forget a password, contact Dell (see "Contacting Dell" on page 269). For your protection, Dell support will require verification of your identity to ensure that only an authorized person can use the computer.

Using a Primary (System) Password

The primary password protects your computer from unauthorized access. If a primary password is set, you must enter the password when your computer starts.

If a valid password is not entered within two minutes, the computer returns to its previous operating state.



NOTICE: If you disable the administrator password, the primary password is also disabled.

To add or change passwords, access **User Accounts** from the **Control Panel**.

If you have assigned an administrator password, you can use it instead of the primary password. The computer does not specifically prompt you for the administrator password.

Using an Administrator Password

The administrator password is designed to give system administrators or service technicians access to computers for repair or reconfiguration. The administrators or technicians can assign identical administrator passwords to groups of computers, allowing you to assign a unique primary password.

To set or change administrator passwords, access **User Accounts** from the **Control Panel**.

When you set an administrator password, the **Configure Setup** option becomes available in System Setup. The **Configure Setup** option allows you to restrict access to System Setup in the same way that a primary password restricts access to the computer.

The administrator password can be used instead of the primary password. Whenever you are prompted to enter the primary password, you can enter the administrator password.



NOTICE: If you disable the administrator password, the primary password is also disabled.



NOTE: The administrator password provides access to the computer, but it does not provide access to the hard drive when a hard drive password is assigned.

If you forget the primary password and do not have an administrator password assigned, or if you have both a primary and an administrator password assigned, but forget them both, contact your system administrator or contact Dell (see "Contacting Dell" on page 269).

Using a Hard Drive Password

The hard drive password helps protect the data on your hard drive from unauthorized access. You can also assign a password for an external hard drive (if one is being used) that can be the same as or different from the password for the primary hard drive.

If a hard drive password is assigned, you must enter it each time you turn on the computer and each time you restore the computer to normal operation from standby mode.

If an invalid password is entered three times consecutively, the computer tries to start from another bootable device if the **Boot First Device** option in System Setup is set to allow start-up from another device. If the **Boot First Device** option is not set to allow the computer to start from another device, the computer returns to the operating state it was in when you turned it on.


If a valid password is not entered within two minutes, the computer returns to its previous operating state.

If the hard drive password, the external hard-drive password, and the primary password are the same, the computer prompts you only for the primary password. If the hard drive password is different from the primary password, the computer prompts you for both. Two different passwords provide greater security.




NOTE: The administrator password provides access to the computer, but it does not provide access to the hard drive when a hard drive password is assigned.

Trusted Platform Module (TPM)

 **NOTE:** The TPM feature supports encryption only if the operating system supports TPM. For more information, see the TPM software documentation and the help files that came with the software.


TPM is a hardware-based security feature that can be used to create and manage computer-generated encryption keys. When combined with security software, TPM enhances existing network and computer security by enabling features such as file protection capabilities and protected e-mail. TPM settings are available in System Setup.


 **NOTICE:** To secure your TPM data and encryption keys, follow the backup procedures documented in the Archive and Restore section of the EMBASSY Security Center help file. If the backups are incomplete, lost, or damaged, Dell will be unable to assist in the recovery of encrypted data.

Turning On and Activating TPM


- 1 Enter System Setup (see "Entering System Setup" on page 81).
- 2 Use the up- and down-arrow keys to highlight **Security**, then press <Enter>.
- 3 Use the up- and down-arrow keys to highlight **TPM Security**, then press <Enter>.
- 4 Under **TPM Security**, use the left- and right-arrow keys to select **On**, and then press <Enter>.

The TPM Activation menu appears.


 **NOTE:** Setting TPM Security to **On** does not activate or enable TPM. The operating system recognizes TPM, but TPM remains deactivated and disabled.

 **NOTE:** If you do not wish to activate TPM, press <Esc>, press the left- and right-arrow keys to highlight **Save/Exit**, and then press <Enter> to exit System Setup and restart your computer.

- 5 Use the up- and down-arrow keys to highlight **TPM Activation**, then press <Enter>.

 **NOTE:** The TPM Activation menu appears only if TPM Security is set to **On**.

- 6 Under **TPM Activation**, use the left- and right-arrow keys to select **Activate**, and then press <Enter>.
- 7 Press <Enter> to accept the TPM Acknowledgement.

- 8 Press <Esc>.
- 9 Press the left- and right-arrow keys to highlight **Save/Exit**, and then press <Enter> to exit System Setup and restart your computer.
 -  **NOTE:** If prompted to **IGNORE** or **MODIFY** the changes to the TPM setting, select **MODIFY**, and then press <Enter>.
- 10 Use the Embassy Security Center to manage the TPM security feature.

Security Management Software


Security management software is designed to utilize four different features to help you secure your computer:


- Log-in management
- Pre-boot authentication (using a fingerprint reader, smart card, or password)
- Encryption
- Private information management

For information about how to use the software and the different security features, click **Start**→ **All Programs**→ **Security by Wave Systems**→ **Getting Started with EMBASSY® Trust Suite**.

Computer Tracking Software

Computer tracking software may enable you to locate your computer if it is lost or stolen. The software is optional and may be purchased when you order your Dell computer.

 **NOTE:** Computer tracking software may not be available in certain countries.

 **NOTE:** If you have computer tracking software and your computer is lost or stolen, you must contact the company that provides the tracking service to report the missing computer.

If Your Computer Is Lost or Stolen

- Call a law enforcement agency to report the lost or stolen computer. Include the Service Tag in your description of the computer. Ask that a case number be assigned and write down the number, along with the name, address, and phone number of the law enforcement agency. If possible, obtain the name of the investigating officer.



NOTE: If you know where the computer was lost or stolen, call a law enforcement agency in that area. If you do not know, call a law enforcement agency where you live.


- If the computer belongs to a company, notify the security office of the company.
- Contact Dell customer service to report the missing computer. Provide the computer Service Tag, the case number, and the name, address, and phone number of the law enforcement agency to which you reported the missing computer. If possible, give the name of the investigating officer.

The Dell customer service representative will log your report under the computer Service Tag and record the computer as missing or stolen. If someone calls Dell for technical assistance and gives your Service Tag, the computer is identified automatically as missing or stolen. The representative will attempt to get the phone number and address of the caller. Dell will then contact the law enforcement agency to which you reported the missing computer.

Cleaning Your Computer

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

Computer, Keyboard, and Monitor

 **CAUTION:** Before you clean your computer, disconnect the computer from the electrical outlet. Clean your computer with a soft cloth dampened with water. Do not use liquid or aerosol cleaners, which may contain flammable substances.

- Use a vacuum cleaner with a brush attachment to gently remove dust from the slots and holes on your computer and from between the keys on the keyboard.



NOTICE: Do not wipe the display screen with a soap or alcohol solution. Doing so may damage the antiglare coating.

- To clean your monitor screen, lightly dampen a soft, clean cloth with water. If possible, use a special screen-cleaning tissue or solution suitable for the monitor's antistatic coating.
- Wipe the keyboard, computer, and plastic part of the monitor with a soft cleaning cloth moistened with water.

Do not soak the cloth or let water drip inside your computer or keyboard.

Mouse (Non-Optical)

- 1 Turn the retainer ring on the underside of your mouse counterclockwise, and then remove the ball.
- 2 Wipe the ball with a clean, lint-free cloth.
- 3 Blow carefully into the ball cage to dislodge dust and lint.
- 4 Clean the rollers inside the ball cage with a cotton swab moistened lightly with isopropyl alcohol.

- 5 Recenter the rollers in their channels, as needed. Ensure that fluff from the swab is not left on the rollers.
- 6 Replace the ball and retainer ring, and then turn the retainer ring clockwise until it clicks into place.

Floppy Drive

- ➔ **NOTICE:** Do not attempt to clean drive heads with a swab. The heads may become misaligned and prevent the drive from operating.

Clean your floppy drive using a commercially available cleaning kit. These kits contain pretreated floppy disks to remove contaminants that accumulate during normal operation.

CDs and DVDs

- ➔ **NOTICE:** Always use compressed air to clean the lens in the CD/DVD drive, and follow the instructions that come with the compressed air. Never touch the lens in the drive.

- 1 Hold the disc by its outer edge. You can also touch the inside edge of the center hole.

- ➔ **NOTICE:** To prevent damaging the surface, do not wipe in a circular motion around the disc.

- 2 With a soft, lint-free cloth, gently wipe the bottom of the disc (the unlabeled side) in a straight line from the center to the outer edge of the disc.

For stubborn dirt, try using water or a diluted solution of water and mild soap. You can also purchase commercial products that clean discs and provide some protection from dust, fingerprints, and scratches. Cleaning products for CDs are safe to use on DVDs.

System Setup

Use System Setup as follows:

- To change the system configuration information after you add, change, or remove any hardware in your computer
- To set or change a user-selectable option such as the user password
- To read the current amount of memory or set the type of hard drive installed

Before you use System Setup, it is recommended that you write down the System Setup screen information for future reference.



NOTICE: Do not change the settings in System Setup unless you are an expert computer user. Certain changes can cause your computer to work incorrectly.

Entering System Setup

- 1 Turn on (or restart) your computer.
- 2 When the DELL logo appears, press <F2> immediately.



NOTE: Keyboard failure may result when a key on the keyboard is held down for extended periods of time. To avoid possible keyboard failure, press and release <F2> in even intervals until the System Setup screen appears.


If you wait too long and the operating system logo appears, continue to wait until you see the Microsoft® Windows® desktop, then shut down your computer and try again.

System Setup Screens

The System Setup screen displays current or changeable configuration information for your computer. Information on the screen is divided into three areas: the options list, the active options field, and key functions.

<p>Options List — Appears on the left side of the System Setup window. The field is a scrollable list containing features that define the configuration of your computer, including installed hardware, power conservation, and security features.</p> <p>Scroll up and down the list with the up- and down-arrow keys. As an option is highlighted, the Options Field displays more information about that option and the option's current and available settings.</p>	<p>Options Field — Appears on the right side of the System Setup window and contains information about each option listed in the Options List. In this field you can view information about your computer and make changes to your current settings.</p> <p>Press the left- and right-arrow keys to highlight an option. Press <Enter> to make that selection active and return to the Options List.</p> <p>NOTE: Not all settings listed in the Options Field are changeable.</p>
	<p>Key Functions — Appears below the Options Field and lists keys and their functions within the active System Setup field.</p>

System Setup Options

 **NOTE:** Depending on your computer and installed devices, the items listed in this section may not appear, or may not appear exactly as listed.

System	
System Info	Lists system information, such as the computer name, the BIOS version number and date, the system service tag, express service code, asset tag, and other system-specific information.
Processor Info	Identifies the processor type, clock speed, bus speed, cache, ID, and whether the processor is multiple core capable, supports Hyper-Threading, and supports 64-bit technology.

Memory Info	Identifies the amount of memory installed, the memory speed, channel mode (dual or single), and type by DIMM slot location.
PCI Info	Identifies installed expansion cards by type and slot location.
Date/Time	Displays current date and time settings.
Boot Sequence	<p>Specifies the sequence of devices from which the computer attempts to boot when trying to find an operating system (see "Boot Sequence" on page 92).</p> <p>NOTE: If you insert a boot device and restart the computer, the option to boot to that device appears in the boot sequence. To boot from a USB memory device, for example, select the USB device and move it so that it becomes the first device in the boot sequence.</p>

Drives

Diskette Drive (Internal default)	<p>Enables and disables the floppy drive(s) attached to the computer and sets read permissions for the drive(s).</p> <ul style="list-style-type: none"> • Off — All floppy drives are disabled. • USB — USB floppy drives are enabled. • Internal — The integrated floppy drive is enabled. • Read Only — The integrated floppy drive is enabled with read-only access. <p>NOTE: Operating systems with USB support will recognize USB floppy drives regardless of this setting.</p>
SATA Drives 0 through 5 (On default)	<p>Enables or disables drives attached to the SATA connectors on the system board.</p> <ul style="list-style-type: none"> • Off — The drive attached to the interface is disabled. • On — The drive attached to the interface is enabled.
SATA Operation (RAID Autodetect/AHCI default)	<p>Specifies the operating mode of the integrated hard drive controller.</p> <ul style="list-style-type: none"> • RAID Autodetect/AHCI — RAID if signed drives, otherwise AHCI. • RAID Autodetect/ATA — RAID if signed drives, otherwise ATA. • RAID On — SATA is configured for RAID on every boot.

SMART Reporting (Off default)	<p>Specifies whether hard drive errors for internal drives are reported during system startup.</p> <ul style="list-style-type: none"> • Off — Errors are not reported. • On — Errors are reported.
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Onboard Devices

Integrated NIC (On default)	<p>Enables or disables the integrated network interface controller (NIC).</p> <ul style="list-style-type: none"> • Off — The integrated NIC is disabled. • On — The integrated NIC is enabled. • On w/PXE — The integrated NIC is on (with PXE enabled). • On w/RPL — The integrated NIC is on (with RPL enabled). <p>NOTE: PXE or RPL is required only if you are booting to an operating system located on another computer. If a boot routine is not available from the remote system, the computer attempts to boot from the next device listed in the boot sequence.</p>
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Integrated Audio (Auto default)	<p>Enables or disables the integrated audio controller.</p> <ul style="list-style-type: none"> • Off — Integrated audio is disabled. • Auto — Use the add-in Audio controller. • On — Integrated audio is enabled.
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USB Controller (On default)	<p>Enables or disables the internal USB controller.</p> <ul style="list-style-type: none"> • Off — The USB controller is disabled. • On — The USB controller is enabled. • No Boot — The USB controller is enabled; however, the BIOS will not recognize USB storage devices. <p>NOTE: Operating systems with USB support will recognize USB storage devices regardless of the No Boot setting.</p>
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Rear Quad USB (On default)	<p>Enables or disables the rear quad USB ports.</p> <ul style="list-style-type: none"> • Off — The USB group is disabled. • On — The USB group is enabled.
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Rear Dual USB (On default)	<p>Enables or disables the rear dual USB ports.</p> <ul style="list-style-type: none"> • Off — The USB group is disabled. • On — The USB group is enabled.
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Front USB (On default)	Enables or disables the front USB ports. <ul style="list-style-type: none"> • Off — The USB group is disabled. • On — The USB group is enabled.
LPT Port Mode (PS/2 default)	Specifies the mode of operation for the integrated parallel port. <ul style="list-style-type: none"> • Off — The port is disabled. • AT — The port is configured for IBM AT compatibility. • PS/2 — The port is configured for IBM PS/2 compatibility. • EPP — The port is configured for Enhanced Parallel Port protocol. • ECP — The port is configured for Extended Capability Port protocol.
LPT Port Address (378h default)	Specifies the base I/O address for the integrated parallel port. <ul style="list-style-type: none"> • 378h • 278h • 3BCh
Serial Port #1 (Auto default)	Disables or selects the address for the integrated serial port and determines how the serial port operates. <ul style="list-style-type: none"> • Off — The serial port is disabled. • Auto — The BIOS selects between COM1 and COM3; if both resources are in use, the port is disabled. • COM1 — The port is configured at 3F8h with IRQ 4. • COM3 — The port is configured at 3E8h with IRQ 4.
PS/2 Mouse Port (On default)	Enables or disables the integrated PS/2-compatible mouse controller. <ul style="list-style-type: none"> • Off — The PS/2 legacy mouse port is disabled. • On — The PS/2 legacy mouse port is enabled.

Video

Primary Video (PEG default)	<p>Specifies which video controller is the primary video controller when two controllers are available in the system.</p> <ul style="list-style-type: none">• PCI — Use the PCI video controller.• PEG — Use the PCI Express Graphics video controller. <p>NOTE: This setting applies only when two video controllers present.</p>
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Performance

Multiple CPU Core (On default)	<p>Specifies whether the processor has more than one core enabled.</p> <ul style="list-style-type: none">• Off — Multiple CPU core technology is disabled.• On — Multiple CPU core technology is enabled. <p>NOTE: The performance of some applications may improve with an additional core enabled.</p>
SpeedStep (Off default)	<p>Specifies whether Enhanced SpeedStep Technology is enabled for all supported processor(s) in the system.</p> <ul style="list-style-type: none">• Off — Enhanced SpeedStep Technology is disabled.• On — Enhanced SpeedStep Technology is enabled.
Virtualization (Off default)	<p>Specifies whether a Virtual Machine Monitor (VMM) can utilize the additional hardware capabilities provided by Intel® Virtualization Technology.</p> <ul style="list-style-type: none">• Off — Virtualization Technology is disabled.• On — Virtualization Technology is enabled.
Limit CPUID Value (Off default)	<p>Limits the maximum value the processor Standard CPUID Function will support.</p> <ul style="list-style-type: none">• Off — The CPUID Function will not be limited to 3.• On — The CPUID Function will be limited to 3. <p>NOTE: Some operating systems will not complete installation when the maximum CPUID Function supported is greater than 3.</p>

HDD Acoustic Mode (Bypass default)	<p>Specifies the performance and acoustic noise levels at which the hard drive operates.</p> <ul style="list-style-type: none"> • Bypass — Do nothing (needed for older drives). • Quiet — The hard drive operates at its most quiet setting. • Suggested — Allow the hard drive manufacturer to select the mode. • Performance — The hard drive operates at its maximum speed. <p>NOTE: Switching to performance mode may cause an increase in noise produced by the drive, but does not affect the drive's performance.</p> <p>NOTE: Changing the acoustics setting does not alter your hard drive image.</p>
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Security

Admin Password (Not Set default)	Used to prohibit an unauthorized user from changing any configuration settings in System Setup.
System Password (Not Set default)	Used to prohibit an unauthorized user from booting to the operating system.
Drives 0 through 5 Password (Not Set default)	Used to prohibit an unauthorized user from accessing the hard drive.
Password Changes (Unlocked default)	<p>Controls the interaction between the system password and the administrator password.</p> <ul style="list-style-type: none"> • Unlocked — The system password may be modified or deleted without having knowledge of the administrator password. • Locked — A valid administrator password is required to modify or delete the system password. <p>NOTE: If the system password field is locked, password security cannot be disabled by pressing <Ctrl><Enter> when the computer starts.</p>

Chassis Intrusion (On-Silent default)	<p>Enables or disables the chassis intrusion feature.</p> <ul style="list-style-type: none"> • Off — The intrusion detection feature is disabled. • On — The intrusion detection feature is enabled and reports intrusions during POST. • On-Silent — The intrusion detection feature is enabled, but does not display any detected intrusions during POST.
TPM Security (Off default)	<p>Enables or disables the TPM security device.</p> <ul style="list-style-type: none"> • Off — The TPM security device is disabled. • On — The TPM security device is enabled. <p>NOTE: When TPM Security is set to On, the operating system recognizes TPM, but TPM is not activated/enabled.</p>
TPM Activation (Deactivate default)	<p>Enables or disables the TPM security device.</p> <ul style="list-style-type: none"> • Activate — Enables and activates TPM security. • Deactivate — Deactivates and disables TPM security. • Clear — Clears TPM security ownership data. <p>NOTE: The TPM Activation menu appears only if TPM Security is set to On.</p>
Execute Disable (On default)	<p>Enables or disables Execute Disable Memory Protection technology.</p> <ul style="list-style-type: none"> • Off — Execute Disable Memory Protection technology is disabled. • On — Execute Disable Memory Protection technology is enabled.

Computrace® (Deactivate default)	<p>Activates or disables the BIOS module interface of the optional Computrace® Service from Absolute® Software.</p> <p>The Computrace agent from Absolute Software is a service solution designed to help track assets and provide recovery services in the event the computer is lost or stolen. The Computrace agent communicates with the Absolute Software Monitoring Server at programmed intervals to provide the tracking service.</p> <ul style="list-style-type: none"> • Disable — Permanently block the Computrace module interface. • Deactivate — Block the Computrace module interface. • Activate — Permit the Computrace module interface. <p>NOTE: The Computrace service is available for purchase as an option. By activating the service, you consent to the transmission of information from and to your computer and the Absolute Software Monitoring Server.</p> <p>NOTE: Selecting the Activate or Disable option permanently Activates or Disables the feature and no further changes to this setting are allowed.</p>
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Power Management

AC Recovery (Off default)	<p>Specifies how the computer will behave when AC power is restored after an AC power loss.</p> <ul style="list-style-type: none"> • Off — The computer stays off after AC power is restored. • On — The computer powers on after AC power is restored. • Last — The computer returns to the previous state after AC power is restored.
Auto Power On (Off default)	<p>Specifies when to use the Auto Power Time setting to turn the computer on.</p> <ul style="list-style-type: none"> • Off — Do not use the Auto Power Time. • Everyday — Turn the computer on every day at the time set in Auto Power Time. • Weekdays — Turn the computer on Monday through Friday at the time set in Auto Power Time. <p>NOTE: This feature does not work if you turn off your computer using a power strip or surge protector.</p>

Auto Power Time	<p>Specifies the time to automatically turn on the computer.</p> <p>Set the time to automatically turn on the computer by pressing the up- or down-arrow key to increase or decrease the numbers, or type the numbers in the appropriate time field.</p> <p>NOTE: This feature does not work if you turn off your computer using a power strip or surge protector.</p>
Low Power Mode (Off default)	<p>Specifies how aggressive the system is at conserving power while in Hibernate mode or when turned off.</p> <ul style="list-style-type: none"> • Off — Add more functionality. • On — Conserve more power. <p>NOTE: Setting this option to On disables the integrated NIC when the computer is in Hibernate mode or turned off. Only an add-in NIC can be used to remotely wake the system.</p>
Remote Wake Up (Off default)	<p>Specifies whether the computer can be turned on when a NIC receives a wake up signal.</p> <ul style="list-style-type: none"> • Off — The NIC cannot wake up the system. • On — The NIC can wake up the system • On w/Boot to NIC — The NIC can wake up the system, and the system will boot from the network. <p>NOTE: The system can be powered on remotely from Suspend mode, Hibernate mode, or when turned off.</p> <p>NOTE: When Low Power Mode is set to On, the system can only be powered up from Suspend mode. If Remote Wake Up from Hibernate or Off is required, Low Power Mode must be set to Off.</p>
Suspend Mode (S3 default)	<p>Specifies the power management suspend mode.</p> <ul style="list-style-type: none"> • S1 — The computer resumes more quickly from sleep mode. • S3 — The computer conserves more power when not in use (system memory remains active).

Maintenance

Service Tag	Displays the computer service tag.
ASF Mode (Off default)	Enables or disables the ASF management mechanism. <ul style="list-style-type: none">• Off — All ASF functionality is disabled.• On — Full ASF 2.0 functionality (RMCP) is enabled.• Alert Only — Send ASF messages on event or error.
SERR Message (On default)	Enables or disables the SERR message mechanism. <ul style="list-style-type: none">• Off — The SERR Message Mechanism is disabled.• On — The SERR Message Mechanism is enabled. NOTE: Some graphic cards require that the SERR message mechanism be disabled.
Load Defaults	Restores the computer's factory-installed default settings. <ul style="list-style-type: none">• Cancel — Do not restore factory-installed default settings.• Continue — Restore factory-installed default settings.
Event Log	Displays the system event log. <ul style="list-style-type: none">• Mark all entries — Mark all event log entries as read (R).• Clear log — Clear all event log entries. NOTE: Once an event log entry is marked as read (R) that entry cannot be marked as unread (U).

POST Behavior

Fastboot (On default)	Enables or disables the option to speed up the boot process by skipping some compatibility tests. <ul style="list-style-type: none">• Off — Do not skip any steps in the boot process.• On — Boot quickly.
Numlock Key (On default)	Enables or disables the numerical and mathematical features of the rightmost bank of keys on the keyboard. <ul style="list-style-type: none">• Off — Right keypad keys function as arrows.• On — Right keypad keys function as numbers.

POST Hotkeys (Setup & Boot Menu default)	<p>Specifies the function keys to display on the screen when the computer starts.</p> <ul style="list-style-type: none"> • Setup & Boot Menu — Display both messages (F2=Setup and F12=Boot Menu). • Setup — Display the setup message only (F2=Setup). • Boot Menu — Display the Quickboot message only (F12=Boot Menu). • None — Neither message is displayed.
Keyboard Errors (Report default)	<p>Enables or disables keyboard error reporting when the computer starts.</p> <ul style="list-style-type: none"> • Report — Display any keyboard errors. • Do not report — Do not display any keyboard errors.

Boot Sequence

The boot sequence specifies the sequence of devices from which the computer attempts to boot when trying to find an operating system.




NOTE: An error message is generated only after the computer attempts to boot from every device in the boot sequence and no operating system is found.

The following options are available under the **Boot Sequence** menu in System Setup (see "System Setup Options" on page 82):


- **Onboard or USB Floppy Drive** — The computer attempts to boot from the floppy drive. If the floppy disk in the drive is not bootable, if no floppy disk is in the drive, or if there is no floppy drive installed in the computer, the computer attempts to boot from the next bootable device in the boot sequence.
- **Onboard SATA Hard Drive** — The computer attempts to boot from the primary hard drive. If no operating system is on the drive, the computer attempts to boot from the next bootable device in the boot sequence.
- **Onboard or USB CD-ROM Drive** — The computer attempts to boot from the CD drive. If no CD is in the drive, or if the CD has no operating system, the computer attempts to boot from the next bootable device in the boot sequence.

- **Onboard Network Controller** — The computer attempts to boot from the network. If no network is detected or there is no computer on the network to which to boot, the computer attempts to boot from the next bootable device in the boot sequence.
- **USB Flash Device** — The USB Flash Device option appears only if a bootable USB device is connected to a USB port.


 **NOTE:** To boot to a USB device, the device must be bootable. To make sure that your device is bootable, check the device documentation.

Changing Boot Sequence for the Current Boot

You can change the boot device for the current boot, for example, to tell the computer to boot from the optical drive in order to run the Dell Diagnostics on the *Drivers and Utilities* disc, and then boot from the hard drive when the diagnostic tests are complete. You can also boot your computer to a USB device such as a floppy drive, memory key, or hard drive.

 **NOTE:** If you are booting to a USB floppy drive, you must first set the floppy drive to **OFF** in System Setup (see "System Setup" on page 81).

- 1 If you are booting to a USB device, connect the USB device to a USB connector (see "Back View (Tower Orientation)" on page 24 or "Back View (Desktop Orientation)" on page 28).
- 2 Turn on (or restart) your computer.
- 3 When the DELL logo appears, press <F12> immediately.

 **NOTE:** Keyboard failure may result when a key on the keyboard is held down for extended periods of time. To avoid possible keyboard failure, press and release <F12> in even intervals until the **Boot Device Menu** appears.

If you wait too long and the operating system logo appears, continue to wait until you see the Microsoft Windows desktop, then shut down your computer and try again.

- 4 At the **Boot Device Menu**, use the up- and down-arrow keys or press the appropriate number on the keyboard to highlight the device that is to be used for the current boot only, and then press <Enter>.

For example, if you are booting to a USB memory key, highlight **USB Flash Device** and press <Enter>.



NOTE: To boot to a USB device, the device must be bootable. To make sure that your device is bootable, check the device documentation.

Changing Boot Sequence for Future Boots

- 1 Enter System Setup (see "Entering System Setup" on page 81).
- 2 Use the arrow keys to highlight the **Boot Sequence** menu option and press <Enter> to access the menu.



NOTE: Write down your current boot sequence in case you want to restore it later.

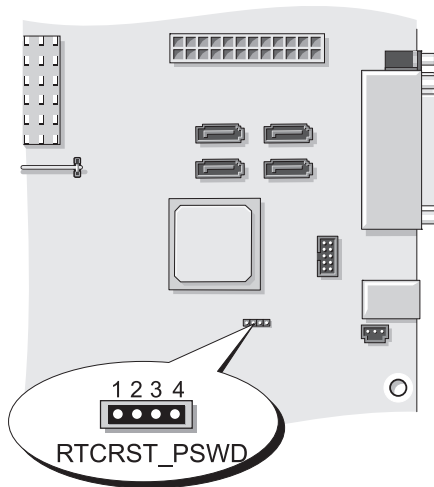
- 3 Press the up- and down-arrow keys to move through the list of devices.
- 4 Press the spacebar to enable or disable a device.
- 5 Press plus (+) or minus (-) to move a selected device up or down the list.

Clearing Passwords and CMOS Settings





Clearing Passwords

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions located in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Locate the 4-pin password connector (RTCRST_PSWD) on the system board.




- 4 Remove the 2-pin jumper plug from pins 3 and 4 and set the jumper plug aside.
- 5 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

- 6 Connect your keyboard and mouse, then connect your computer and monitor to electrical outlets and turn them on.
- 7 After the Microsoft Windows desktop appears on your computer, turn the computer off.
 -  **NOTE:** Ensure that the computer is off and not in a power management mode. If you cannot shut down the computer using the operating system, press and hold the power button for 4 seconds.
- 8 Disconnect the keyboard and mouse, then disconnect the computer and monitor from their electrical outlets.
- 9 Press the power button on the computer to ground the system board.
- 10 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 11 Replace the 2-pin jumper plug onto pins 3 and 4 of the password connector (RTCRST_PSWD) on the system board.
 -  **NOTE:** The password jumper plug must be reinstalled on the password jumper pins in order to enable the password feature.
-  **NOTICE:** To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.
- 12 Connect your computer and devices to electrical outlets, and then turn them on.
 -  **NOTE:** In System Setup (see "System Setup" on page 81), both system and administrator password options appear as **Not Set**. The password feature is enabled, but a password is not assigned.

Clearing CMOS Settings

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions located in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
 -  **NOTE:** The computer must be disconnected from the electrical outlet to clear the CMOS setting.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).

- 3 Locate the 4-pin CMOS jumper (RTCRST_PSWD) on the system board (see "System Board Components" on page 148).
- 4 Move the 2-pin jumper plug from pins 3 and 4 to pins 1 and 2.
- 5 Wait five seconds for the CMOS to clear.
- 6 Move the 2-pin jumper plug back to pins 3 and 4.
- 7 Replace the computer cover (see "Replacing the Computer Cover" on page 262).



NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.

- 8 Connect your computer and devices to electrical outlets, and turn them on.

Flashing the BIOS

The BIOS may require flashing when an update is available or when replacing the system board.

- 1 Turn on the computer.
- 2 Locate the BIOS update file for your computer at the Dell Support website at support.dell.com.
- 3 Click **Download Now** to download the file.
- 4 If the **Export Compliance Disclaimer** window appears, click **Yes, I Accept this Agreement**.

The **File Download** window appears.

- 5 Click **Save this program to disk**, and then click **OK**.
- 6 Click the down arrow to view the **Save As** menu, select **Desktop**, and then click **Save**.

The file downloads to your desktop.

- 7 Click **Close** when the **Download Complete** window appears.
- 8 Double-click the file icon on the desktop and follow the on-screen instructions.

Troubleshooting Tools

Power Lights

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

The power button light located on the front of the computer illuminates and blinks or remains solid to indicate different states:

- If the power light is green and the computer is not responding, see "Diagnostic Lights" on page 100.
- If the power light is blinking green, the computer is in standby mode. Press a key on the keyboard, move the mouse, or press the power button to resume normal operation.
- If the power light is off, the computer is either turned off or is not receiving power.
 - Reseat the power cable into both the power connector on the back of the computer and the electrical outlet.
 - If the computer is plugged into a power strip, ensure that the power strip is plugged into an electrical outlet and that the power strip is turned on.
 - Bypass power protection devices, power strips, and power extension cables to verify that the computer turns on properly.
 - Ensure that the electrical outlet is working by testing it with another device, such as a lamp.
 - Ensure that the main power cable and front panel cable are securely connected to the system board (see "System Board Components" on page 148).
- If the power light is blinking amber, the computer is receiving electrical power, but an internal power problem might exist.
 - Ensure that the voltage selection switch is set to match the AC power at your location, if applicable.

- Ensure that the processor power cable is securely connected to the system board (see "System Board Components" on page 148).
- If the power light is steady amber, a device may be malfunctioning or incorrectly installed.
 - Remove and then reinstall the memory modules (see "Memory" on page 157).
 - Remove and then reinstall any cards (see "Cards" on page 162).
- Eliminate interference. Some possible causes of interference are:
 - Power, keyboard, and mouse extension cables
 - Too many devices on a power strip
 - Multiple power strips connected to the same electrical outlet

Diagnostic Lights



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

To help troubleshoot a problem, your computer has four lights labeled 1, 2, 3, and 4 on the front panel (see "Front View (Tower Orientation)" on page 21 or "Front View (Desktop Orientation)" on page 25). When the computer starts normally, the lights flash, and then turn off. If the computer malfunctions, use the sequence of the lights to help identify the problem.










NOTE: After the computer completes POST, all four lights turn off before booting to the operating system.

Diagnostic Light Codes During POST

Light Pattern	Problem Description	Suggested Resolution
①②③④	The computer is in a normal off condition or a possible pre-BIOS failure has occurred.	Plug the computer into a working electrical outlet and press the power button.

Light Pattern	Problem Description	Suggested Resolution
① ② ③ ④	A possible BIOS failure has occurred; the computer is in the recovery mode.	<ul style="list-style-type: none"> • Run the BIOS Recovery utility, wait for recovery completion, and then restart the computer. • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
① ② ③ ④	A possible processor failure has occurred.	<ul style="list-style-type: none"> • Reseat the processor (see "Processor" on page 243). • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
① ② ③ ④	Memory modules are detected, but a memory failure has occurred.	<ul style="list-style-type: none"> • If two or more memory modules are installed, remove the modules (see "Removing a Memory Module" on page 160), then reinstall one module (see "Installing a Memory Module" on page 160) and restart the computer. If the computer starts normally, continue to install additional memory modules (one at a time) until you have identified a faulty module or reinstalled all modules without error. • If available, install working memory of the same type into your computer (see "Memory" on page 157). • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
① ② ③ ④	A possible graphics card failure has occurred.	<ul style="list-style-type: none"> • Reseat any installed graphics cards (see "Cards" on page 162). • If available, install a working graphics card into your computer. • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
① ② ③ ④	A possible floppy or hard drive failure has occurred.	<ul style="list-style-type: none"> • Reseat all power and data cables and restart the computer. • If the problem persists, contact Dell (see "Contacting Dell" on page 269).

Light Pattern	Problem Description	Suggested Resolution
	A possible USB failure has occurred.	<ul style="list-style-type: none"> • Reinstall all USB devices, check cable connections, and then restart the computer. • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
	No memory modules are detected.	<ul style="list-style-type: none"> • If two or more memory modules are installed, remove the modules (see "Removing a Memory Module" on page 160), then reinstall one module (see "Installing a Memory Module" on page 160) and restart the computer. If the computer starts normally, continue to install additional memory modules (one at a time) until you have identified a faulty module or reinstalled all modules without error. • If available, install working memory of the same type into your computer (see "Memory" on page 157). • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
	System board failure has occurred.	Contact Dell (see "Contacting Dell" on page 269).
	Memory modules are detected, but a memory configuration or compatibility error exists.	<ul style="list-style-type: none"> • Ensure that no special requirements for memory module/connector placement exist (see "Memory" on page 157). • Ensure that the memory you are using is supported by your computer (see "Memory" on page 33). • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
	A possible system board resource and/or hardware failure has occurred.	<ul style="list-style-type: none"> • Perform the procedures in "Restoring Your Operating System" on page 136. • If the problem persists, contact Dell (see "Contacting Dell" on page 269).

Light Pattern	Problem Description	Suggested Resolution
	<p>A possible expansion card failure has occurred.</p>	<ol style="list-style-type: none"> 1 Determine if a conflict exists by removing an expansion card (not a graphics card) and restarting the computer (see "Cards" on page 162). 2 If the problem persists, reinstall the card you removed, then remove a different card and restart the computer. 3 Repeat this process for each expansion card installed. If the computer starts normally, troubleshoot the last card removed from the computer for resource conflicts (see "Restoring Your Operating System" on page 136). 4 If the problem persists, contact Dell (see "Contacting Dell" on page 269).
	<p>Another failure has occurred.</p>	<ul style="list-style-type: none"> • Ensure that all hard drive and CD/DVD drive cables are properly connected to the system board (see "System Board Components" on page 148). • If there is an error message on the screen identifying a problem with a device (such as the floppy drive or hard drive), check the device to make sure it is functioning properly. • If the operating system is attempting to boot from a device (such as the floppy drive or CD/DVD drive), check system setup (see "System Setup" on page 81) to ensure the boot sequence is correct for the devices installed on your computer. • If the problem persists, contact Dell (see "Contacting Dell" on page 269).

Beep Codes

Your computer may emit a series of beeps during start up. The series of beeps is called a beep code and can be used to help identify a problem with your computer.

If your computer emits a series of beeps during start-up:

- 1 Write down the beep code.
- 2 Run the Dell Diagnostics to identify the cause (see "Dell Diagnostics" on page 107).

Code	Cause
2 short, 1 long	BIOS checksum error
1 long, 3 short, 2 short	Memory error
1 short	F12 key pressed

Code (repetitive short beeps)	Description	Suggested Remedy
1	BIOS checksum failure. Possible motherboard failure.	Contact Dell (see "Contacting Dell" on page 269).
2	No memory modules are detected.	<ul style="list-style-type: none">• If two or more memory modules are installed, remove the modules (see "Removing a Memory Module" on page 160), then reinstall one module (see "Installing a Memory Module" on page 160) and restart the computer. If the computer starts normally, continue to install additional memory modules (one at a time) until you have identified a faulty module or reinstalled all modules without error.• If available, install working memory of the same type into your computer (see "Memory" on page 157).• If the problem persists, contact Dell (see "Contacting Dell" on page 269).

Code (repetitive short beeps)	Description	Suggested Remedy
3	Possible motherboard failure.	Contact Dell (see "Contacting Dell" on page 269).
4	RAM Read/Write failure.	<ul style="list-style-type: none"> • Ensure that no special requirements for memory module/connector placement exist (see "Memory" on page 157). • Ensure that the memory you are using is supported by your computer (see "Memory" on page 33). • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
5	Real time clock failure. Possible battery failure or motherboard failure.	<ul style="list-style-type: none"> • Replace the battery (see "Replacing the Battery" on page 251). • If the problem persists, contact Dell (see "Contacting Dell" on page 269).
6	Video BIOS Test Failure.	Contact Dell (see "Contacting Dell" on page 269).

System Messages



NOTE: If the message you received is not listed in the table, see the documentation for either the operating system or the program that was running when the message appeared.

ALERT! PREVIOUS ATTEMPTS AT BOOTING THIS SYSTEM HAVE FAILED AT CHECKPOINT [NNNN]. FOR HELP IN RESOLVING THIS PROBLEM, PLEASE NOTE THIS CHECKPOINT AND CONTACT DELL TECHNICAL SUPPORT — The computer failed to complete the boot routine three consecutive times for the same error (see "Contacting Dell" on page 269 for assistance).

CMOS CHECKSUM ERROR — Possible motherboard failure or RTC battery low. Replace the battery (see "Replacing the Battery" on page 251 or see "Contacting Dell" on page 269 for assistance).

CPU FAN FAILURE — CPU fan failure. Replace the CPU fan (see "Removing the Processor" on page 243).

FLOPPY DISKETTE SEEK FAILURE — A cable may be loose, or the computer configuration information may not match the hardware configuration. Check cable connections (see "Contacting Dell" on page 269 for assistance).

DISKETTE READ FAILURE — The floppy disk may be defective or a cable may be loose. Replace the floppy disk/check for a loose cable connection.

HARD-DISK READ FAILURE — Possible HDD failure during HDD boot test (see "Contacting Dell" on page 269 for assistance).

KEYBOARD FAILURE — Keyboard failure or keyboard cable loose (see "Keyboard Problems" on page 118).

NO BOOT DEVICE AVAILABLE — The system cannot detect a bootable device or partition.

- If the floppy drive is your boot device, ensure that the cables are connected and that a bootable floppy disk is in the drive.
- If the hard drive is your boot device, ensure that the cables are connected and that the drive is installed properly and partitioned as a boot device.
- Enter System Setup and ensure that the boot sequence information is correct (see "Entering System Setup" on page 81).

NO TIMER TICK INTERRUPT — A chip on the system board might be malfunctioning or motherboard failure (see "Contacting Dell" on page 269 for assistance).

NON-SYSTEM DISK OR DISK ERROR — Replace the floppy disk with one that has a bootable operating system or remove the floppy disk from drive A and restart the computer.

NOT A BOOT DISKETTE — Insert a bootable floppy disk and restart your computer.

NOTICE - HARD DRIVE SELF MONITORING SYSTEM HAS REPORTED THAT A PARAMETER HAS EXCEEDED ITS NORMAL OPERATING RANGE. DELL RECOMMENDS THAT YOU BACK UP YOUR DATA REGULARLY. A PARAMETER OUT OF RANGE MAY OR MAY NOT INDICATE A POTENTIAL HARD DRIVE PROBLEM. —

S.M.A.R.T error, possible HDD failure. This feature can be enabled or disabled in BIOS setup.


Hardware Troubleshooter

If a device is either not detected during the operating system setup or is detected, but incorrectly configured, you can use the Hardware Troubleshooter to resolve the incompatibility.

Windows XP:

- 1 Click Start→ **Help and Support**.
- 2 Type `hardware troubleshooter` in the search field and press <Enter> to start the search.
- 3 In the **Fix a Problem** section, click **Hardware Troubleshooter**.
- 4 In the **Hardware Troubleshooter** list, select the option that best describes the problem and click **Next** to follow the remaining troubleshooting steps.

Windows Vista:

- 1 Click the Windows Vista start button , and click **Help and Support**.
- 2 Type `hardware troubleshooter` in the search field and press <Enter> to start the search.
- 3 In the search results, select the option that best describes the problem and follow the remaining troubleshooting steps.

Dell Diagnostics

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

When to Use the Dell Diagnostics

If you experience a problem with your computer, perform the checks in Lockups and Software Problems (see "Troubleshooting" on page 113) and run the Dell Diagnostics before you contact Dell for assistance.

You can run the Dell Diagnostics from your hard drive or from the *Drivers and Utilities* disc.

See "System Setup" on page 81 to review your computer's configuration information, and ensure that the device that you want to test displays in System Setup and is active.



NOTE: The Dell Diagnostics works only on Dell computers.



NOTE: Print the following procedures before you run the Dell diagnostics.

Starting the Dell Diagnostics From Your Hard Drive

The Dell Diagnostics is located on a separate diagnostic utility partition on your hard drive.



NOTE: If your computer cannot display a screen image, see "Contacting Dell" on page 269.

- 1 Turn on (or restart) your computer.
- 2 When the DELL logo appears, press <F12> immediately.



NOTE: Keyboard failure may result when a key is held down for extended periods of time. To avoid possible keyboard failure, press and release <F12> in even intervals to open the **Boot Device Menu**.



NOTE: If at any time a message appears stating that no diagnostics utility partition has been found, run the Dell Diagnostics from your *Drivers and Utilities* disc (see "Starting the Dell Diagnostics From the Drivers and Utilities Disc" on page 109).

If you wait too long and the operating system logo appears, continue to wait until you see the Microsoft® Windows® desktop, then shut down your computer and try again.

- 3 At the **Boot Device Menu**, use the up- and down-arrow keys or press the appropriate number on the keyboard to highlight **Boot to Utility Partition**, and then press <Enter>.



NOTE: The Quickboot feature changes the boot sequence for the current boot only. Upon restart, the computer boots according to the boot sequence specified in **System Setup**.

- 4 At the Dell Diagnostics **Main Menu**, left-click with the mouse, or press <Tab> and then <Enter>, to select the test you want to run (see "Dell Diagnostics Main Menu" on page 110).



NOTE: Write down any error codes and problem descriptions exactly as they appear and follow the instructions on the screen.

- 5 After all tests have completed, close the test window to return to the Dell Diagnostics **Main Menu**.
- 6 Close the **Main Menu** window to exit the Dell Diagnostics and restart the computer.

Starting the Dell Diagnostics From the Drivers and Utilities Disc


- 1 Turn on your computer.
- 2 Press the eject button on the front of the optical drive to open the drive tray.
- 3 Place the *Drivers and Utilities* disc in the center of the drive tray, then press the eject button or gently push on the tray to close it.
- 4 Restart the computer.
- 5 When the DELL logo appears, press <F12> immediately.




NOTE: Keyboard failure may result when a key on the keyboard is held down for extended periods of time. To avoid possible keyboard failure, press and release <F12> in even intervals until the **Boot Device Menu** appears.

If you wait too long and the operating system logo appears, continue to wait until you see the Microsoft Windows desktop, then shut down your computer and try again.

- 6 At the **Boot Device Menu**, use the up- and down-arrow keys or press the appropriate number on the keyboard to highlight **Onboard or USB CD-ROM**, and then press <Enter>.

 **NOTE:** The Quickboot feature changes the boot sequence for the current boot only. Upon restart, the computer boots according to the boot sequence specified in System Setup.

- 7 Press <1> to select the Dell Diagnostics.
- 8 At the **Dell Diagnostics Menu** press <1> to select the Dell Diagnostics for ResourceCD (graphical user interface).
- 9 At the Dell Diagnostics **Main Menu**, left-click with the mouse, or press <Tab> and then <Enter>, to select the test you want to run (see "Dell Diagnostics Main Menu" on page 110).

 **NOTE:** Write down any error codes and problem descriptions exactly as they appear and follow the instructions on the screen.

- 10 After all tests have completed, close the test window to return to the Dell Diagnostics **Main Menu**.
- 11 Remove the *Drivers and Utilities* disc, then close the **Main Menu** window to exit the Dell Diagnostics and restart the computer.

Dell Diagnostics Main Menu

The following tests can be run from the Dell Diagnostics **Main Menu**:

Option	Function
Express Test	Performs a quick test of system devices. The test typically takes 10 to 20 minutes and requires no interaction on your part. Run Express Test first to increase the possibility of tracing the problem quickly.
Extended Test	Performs a thorough check of system devices. The test typically takes an hour or more and periodically requires your input to answer specific questions.
Custom Test	Tests a specific device in the system and can be used to customize the tests you want to run.
Symptom Tree	Lists a number of common symptoms and allows you to select a test based on the symptom of the problem you are having.

For any problem encountered during a test, a message appears with an error code and a description of the problem. Write down the error code and problem description exactly as it appears and follow the instructions on the screen. If you cannot resolve the problem, contact Dell (see "Contacting Dell" on page 269).



NOTE: The Service Tag for your computer is located at the top of each test screen. When contacting Dell support, have your Service Tag ready.

The following tabs provide additional information for tests run from the **Custom Test** or **Symptom Tree** option:

Tab	Function
Results	Displays the results of the test and any error conditions encountered.
Errors	Displays error conditions encountered, error codes, and the problem description.
Help	Describes the test and any requirements for running the test.
Configuration (Custom Test only)	Displays the hardware configuration for the selected device. The Dell Diagnostics obtains configuration information for all devices from system setup, memory, and various internal tests, and it displays the information in the device list in the left pane of the screen. NOTE: The device list may not display the names of all the components installed on your computer or all devices attached to your computer.
Parameters (Custom Test only)	Allows you to customize the test, if applicable, by changing the test settings.

Troubleshooting

Follow these tips when you troubleshoot your computer:

- If you added or removed a part before the problem started, review the installation procedures and ensure that the part is correctly installed.
- If a peripheral device does not work, ensure that the device is properly connected.
- If an error message appears on the screen, write down the exact message. This message may help support personnel diagnose and fix the problem(s).
- If an error message occurs in a program, see the program's documentation.



NOTE: The procedures in this document were written for the Windows default view, so they may not apply if you set your Dell™ computer to the Windows Classic view.

Battery Problems



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.



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

REPLACE THE BATTERY — If you have to repeatedly reset time and date information after turning on the computer, or if an incorrect time or date displays during start-up, replace the battery (see "Replacing the Battery" on page 251). If the battery still does not work properly, contact Dell (see "Contacting Dell" on page 269).

Drive Problems




CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

ENSURE THAT MICROSOFT® WINDOWS® RECOGNIZES THE DRIVE —

Windows XP:

- Click **Start** and click **My Computer**.

Windows Vista™:

- Click the Windows Vista Start button  and click **Computer**.

If the drive is not listed, perform a full scan with your antivirus software to check for and remove viruses. Viruses can sometimes prevent Windows from recognizing the drive.

TEST THE DRIVE —

- Insert another disc to eliminate the possibility that the original drive is defective.
- Insert a bootable floppy disk and restart the computer.

CLEAN THE DRIVE OR DISK — See "Cleaning Your Computer" on page 79.

CHECK THE CABLE CONNECTIONS

RUN THE HARDWARE TROUBLESHOOTER — See "Hardware Troubleshooter" on page 107.

RUN THE DELL DIAGNOSTICS — See "Dell Diagnostics" on page 107.

Optical drive problems



NOTE: High-speed optical drive vibration is normal and may cause noise, which does not indicate a defect in the drive or the media.



NOTE: Because of different regions worldwide and different disc formats, not all DVD titles work in all DVD drives.

ADJUST THE WINDOWS VOLUME CONTROL —

- Click the speaker icon in the lower-right corner of your screen.
- Ensure that the volume is turned up by clicking the sidebar and dragging it up.
- Ensure that the sound is not muted by clicking any boxes that are checked.

CHECK THE SPEAKERS AND SUBWOOFER — See "Sound and Speaker Problems" on page 125.

Problems writing to an optical drive

CLOSE OTHER PROGRAMS — The optical drive must receive a steady stream of data during the writing process. If the stream is interrupted, an error occurs. Try closing all programs before you write to the optical.

TURN OFF STANDBY MODE IN WINDOWS BEFORE WRITING TO A DISC — Search for the keyword standby in Windows Help and Support for information on power management modes.

Hard drive problems

RUN CHECK DISK —

Windows XP:

- 1 Click **Start** and click **My Computer**.
- 2 Right-click **Local Disk C:**.
- 3 Click **Properties**→ **Tools**→ **Check Now**.
- 4 Click **Scan for and attempt recovery of bad sectors** and click **Start**.

Windows Vista:

- 1 Click **Start**  and click **Computer**.
- 2 Right-click **Local Disk C:**.
- 3 Click **Properties**→ **Tools**→ **Check Now**.

The **User Account Control** window may appear. If you are an administrator on the computer, click **Continue**; otherwise, contact your administrator to continue the desired action.

- 4 Follow the instructions on the screen.

E-Mail, Modem, and Internet Problems



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



NOTE: Connect the modem to an analog telephone jack only. The modem does not operate while it is connected to a digital telephone network.



NOTE: Do not plug a telephone cable into the network adapter connector (see "Back Panel Connectors" on page 29).

CHECK THE MICROSOFT OUTLOOK[®] EXPRESS SECURITY SETTINGS — If you cannot open your e-mail attachments:

- 1 In Outlook Express, click **Tools**→ **Options**→ **Security**.
- 2 Click **Do not allow attachments** to remove the checkmark, as needed.

CHECK THE TELEPHONE LINE CONNECTION

CHECK THE TELEPHONE JACK

CONNECT THE MODEM DIRECTLY TO THE TELEPHONE WALL JACK

USE A DIFFERENT TELEPHONE LINE —


- Verify that the telephone line is connected to the jack on the modem (the jack has either a green label or a connector-shaped icon next to it).
- Ensure that you hear a click when you insert the telephone line connector into the modem.
- Disconnect the telephone line from the modem and connect it to a telephone, then listen for a dial tone.
- If you have other telephone devices sharing the line, such as an answering machine, fax machine, surge protector, or line splitter, bypass them and use the telephone to connect the modem directly to the telephone wall jack. If you are using a line that is 3 meters (10 feet) or more in length, try a shorter one.

RUN THE MODEM DIAGNOSTIC TOOL —

Windows XP:

- 1** Click **Start** → **All Programs** → **Modem Helper**.
- 2** Follow the instructions on the screen to identify and resolve modem problems. Modem Helper is not available on certain computers.

Windows Vista:


- 1** Click **Start**  → **All Programs** → **Modem Diagnostic Tool**.
- 2** Follow the instructions on the screen to identify and resolve modem problems. Modem diagnostics are not available on all computers.

VERIFY THAT THE MODEM IS COMMUNICATING WITH WINDOWS —

Windows XP:


- 1** Click **Start** → **Control Panel** → **Printers and Other Hardware** → **Phone and Modem Options** → **Modems**.
- 2** Click the COM port for your modem → **Properties** → **Diagnostics** → **Query Modem** to verify that the modem is communicating with Windows.
If all commands receive responses, the modem is operating properly.

Windows Vista:

- 1** Click **Start**  → **Control Panel** → **Hardware and Sound** → **Phone and Modem Options** → **Modems**.
- 2** Click the COM port for your modem → **Properties** → **Diagnostics** → **Query Modem** to verify that the modem is communicating with Windows.
If all commands receive responses, the modem is operating properly.

ENSURE THAT YOU ARE CONNECTED TO THE INTERNET — Ensure that you have subscribed to an Internet provider. With the Outlook Express e-mail program open, click **File**. If **Work Offline** has a checkmark next to it, click the checkmark to remove it and connect to the Internet. For help, contact your Internet service provider.

Error Messages

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

If the error message is not listed, see the documentation for the operating system or the program that was running when the message appeared.


A FILENAME CANNOT CONTAIN ANY OF THE FOLLOWING CHARACTERS: \ / : * ? " < > | — Do not use these characters in filenames.

A REQUIRED .DLL FILE WAS NOT FOUND — The program that you are trying to open is missing an essential file. To remove and then reinstall the program:

Windows XP:

- 1 Click **Start** → **Control Panel** → **Add or Remove Programs** → **Programs and Features**.
- 2 Select the program you want to remove.
- 3 Click **Uninstall**.
- 4 See the program documentation for installation instructions.

Windows Vista:

- 1 Click **Start**  → **Control Panel** → **Programs** → **Programs and Features**.
- 2 Select the program you want to remove.
- 3 Click **Uninstall**.
- 4 See the program documentation for installation instructions.

drive letter :\ IS NOT ACCESSIBLE. THE DEVICE IS NOT READY — The drive cannot read the disk. Insert a disk into the drive and try again.

INSERT BOOTABLE MEDIA — Insert a bootable floppy disk, CD, or DVD.

NON-SYSTEM DISK ERROR — Remove the floppy disk from the floppy drive and restart your computer.

NOT ENOUGH MEMORY OR RESOURCES. CLOSE SOME PROGRAMS AND TRY AGAIN — Close all windows and open the program that you want to use. In some cases, you may have to restart your computer to restore computer resources. If so, run the program that you want to use first.

OPERATING SYSTEM NOT FOUND — Contact Dell (see "Contacting Dell" on page 269).

IEEE 1394 Device Problems

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

ENSURE THAT THE CABLE FOR THE IEEE 1394 DEVICE IS PROPERLY INSERTED INTO THE DEVICE AND INTO THE CONNECTOR ON THE COMPUTER

ENSURE THAT THE IEEE 1394 DEVICE IS ENABLED IN SYSTEM SETUP — See "System Setup Options" on page 82.

ENSURE THAT THE IEEE 1394 DEVICE IS RECOGNIZED BY WINDOWS —

Windows XP:

- 1 Click Start and click Control Panel.
- 2 Under Pick a Category, click Performance and Maintenance → System → System Properties → Hardware → Device Manager.

Windows Vista:

- 1 Click Start  → Control Panel → Hardware and Sound.
- 2 Click Device Manager.

If your IEEE 1394 device is listed, Windows recognizes the device.

ENSURE THAT THE IEEE 1394 CARD IS PROPERLY SEATED

ENSURE THAT THE IEEE 1394 CABLE IS CONNECTED SECURELY TO THE SYSTEM BOARD CONNECTOR AND THE CONNECTOR ON THE FRONT I/O PANEL

IF YOU HAVE PROBLEMS WITH A DELL IEEE 1394 DEVICE — Contact Dell (see "Contacting Dell" on page 269).

IF YOU HAVE PROBLEMS WITH AN IEEE 1394 DEVICE NOT PROVIDED BY DELL — Contact the IEEE 1394 device manufacturer.

Keyboard Problems

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

CHECK THE KEYBOARD CABLE —

- Ensure that the keyboard cable is firmly connected to the computer.
- Shut down the computer (see "Turning Off Your Computer" on page 143), reconnect the keyboard cable as shown on the setup diagram for your computer, and then restart the computer.

- Ensure that the cable is not damaged or frayed and check cable connectors for bent or broken pins. Straighten any bent pins.
- Remove any keyboard extension cables and connect the keyboard directly to the computer.

TEST THE KEYBOARD — Connect a properly working keyboard to the computer, then try using the keyboard.

RUN THE HARDWARE TROUBLESHOOTER — See "Hardware Troubleshooter" on page 107.

Lockups and Software Problems



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

The computer does not start up

CHECK THE DIAGNOSTIC LIGHTS — See "Diagnostic Lights" on page 100.

ENSURE THAT THE POWER CABLE IS FIRMLY CONNECTED TO THE COMPUTER AND TO THE ELECTRICAL OUTLET

The computer stops responding



NOTICE: You may lose data if you are unable to perform an operating system shutdown.

TURN THE COMPUTER OFF — If you are unable to get a response by pressing a key on your keyboard or moving your mouse, press and hold the power button for at least 8 to 10 seconds (until the computer turns off), and then restart your computer.

A program stops responding

END THE PROGRAM —

- 1 Press <Ctrl><Shift><Esc> simultaneously to access the Task Manager.
- 2 Click the **Applications** tab.
- 3 Click to select the program that is no longer responding.
- 4 Click **End Task**.

A program crashes repeatedly



NOTE: Most software includes installation instructions in its documentation or on a floppy disk, CD, or DVD.

CHECK THE SOFTWARE DOCUMENTATION — If necessary, uninstall and then reinstall the program.

A program is designed for an earlier Windows operating system

RUN THE PROGRAM COMPATIBILITY WIZARD —


Windows XP:

The Program Compatibility Wizard configures a program so that it runs in an environment similar to non-XP operating system environments.

- 1 Click **Start** → **All Programs** → **Accessories** → **Program Compatibility Wizard** → **Next**.
- 2 Follow the instructions on the screen.

Windows Vista:

The Program Compatibility Wizard configures a program so that it runs in an environment similar to non-Windows Vista operating system environments.

- 1 Click **Start**  → **Control Panel** → **Programs** → **Use an older program with this version of Windows**.
- 2 In the welcome screen, click **Next**.
- 3 Follow the instructions on the screen.

A solid blue screen appears

TURN THE COMPUTER OFF — If you are unable to get a response by pressing a key on your keyboard or moving your mouse, press and hold the power button for at least 8 to 10 seconds (until the computer turns off), and then restart your computer.

Other software problems

CHECK THE SOFTWARE DOCUMENTATION OR CONTACT THE SOFTWARE MANUFACTURER FOR TROUBLESHOOTING INFORMATION —

- Ensure that the program is compatible with the operating system installed on your computer.
- Ensure that your computer meets the minimum hardware requirements needed to run the software. See the software documentation for information.
- Ensure that the program is installed and configured properly.
- Verify that the device drivers do not conflict with the program.
- If necessary, uninstall and then reinstall the program.

BACK UP YOUR FILES IMMEDIATELY

USE A VIRUS-SCANNING PROGRAM TO CHECK THE HARD DRIVE, FLOPPY DISKS, CDs, OR DVDs

SAVE AND CLOSE ANY OPEN FILES OR PROGRAMS AND SHUT DOWN YOUR COMPUTER THROUGH THE START MENU

Memory Problems

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.


IF YOU RECEIVE AN INSUFFICIENT MEMORY MESSAGE —

- Save and close any open files and exit any open programs you are not using to see if that resolves the problem.
- See the software documentation for minimum memory requirements. If necessary, install additional memory (see "Installing a Memory Module" on page 160).
- Reseat the memory modules (see "Memory" on page 157) to ensure that your computer is successfully communicating with the memory.
- Run the Dell Diagnostics (see "Dell Diagnostics" on page 107).

IF YOU EXPERIENCE OTHER MEMORY PROBLEMS —

- Reseat the memory modules (see "Memory" on page 157) to ensure that your computer is successfully communicating with the memory.
- Ensure that you are following the memory installation guidelines (see "Installing a Memory Module" on page 160).
- Ensure that the memory you are using is supported by your computer. For more information about the type of memory supported by your computer, see "Memory" on page 157.
- Run the Dell Diagnostics (see "Dell Diagnostics" on page 107).

Mouse Problems

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

CHECK THE MOUSE CABLE —

- Ensure that the cable is not damaged or frayed and check cable connectors for bent or broken pins. Straighten any bent pins.
- Remove any mouse extension cables, and connect the mouse directly to the computer.

- Verify that the mouse cable is connected as shown on the setup diagram for your computer.

RESTART THE COMPUTER —

- 1 Simultaneously press <Ctrl><Esc> to display the **Start** menu.
- 2 Press <u>, press the up- and down-arrow keys to highlight **Shut down** or **Turn Off**, and then press <Enter>.
- 3 After the computer turns off, reconnect the mouse cable as shown on the setup diagram.
- 4 Turn on the computer.


TEST THE MOUSE — Connect a properly working mouse to the computer, then try using the mouse.

CHECK THE MOUSE SETTINGS —

Windows XP:

- 1 Click **Start** → **Control Panel** → **Mouse**.
- 2 Adjust the settings as needed.

Windows Vista:

- 1 Click **Start**  → **Control Panel** → **Hardware and Sound** → **Mouse**.
- 2 Adjust the settings as needed.

REINSTALL THE MOUSE DRIVER — See "Drivers" on page 131.

RUN THE HARDWARE TROUBLESHOOTER — See "Hardware Troubleshooter" on page 107.

Network Problems



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

CHECK THE NETWORK LIGHT ON THE FRONT OF THE COMPUTER — If the link integrity light is off (see "Controls and Lights" on page 35), no network communication is occurring. Replace the network cable.

CHECK THE NETWORK CABLE CONNECTOR — Ensure that the network cable is firmly inserted into the network connector on the back of the computer and the network jack.

RESTART THE COMPUTER AND ATTEMPT TO LOG ON TO THE NETWORK AGAIN

CHECK YOUR NETWORK SETTINGS — Contact your network administrator or the person who set up your network to verify that your network settings are correct and that the network is functioning.

RUN THE HARDWARE TROUBLESHOOTER — See "Hardware Troubleshooter" on page 107.

Power Problems

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

IF THE POWER LIGHT IS GREEN AND THE COMPUTER IS NOT RESPONDING — See "Diagnostic Lights" on page 100.

IF THE POWER LIGHT IS BLINKING GREEN — The computer is in standby mode. Press a key on the keyboard, move the mouse, or press the power button to resume normal operation.

IF THE POWER LIGHT IS OFF — The computer is either turned off or is not receiving power.

- Reseat the power cable in the power connector on the back of the computer and the electrical outlet.
- Bypass power strips, power extension cables, and other power protection devices to verify that the computer turns on properly.
- Ensure that any power strips being used are plugged into an electrical outlet and are turned on.
- Ensure that the electrical outlet is working by testing it with another device, such as a lamp.
- Ensure that the main power cable and front panel cable are securely connected to the system board (see "System Board Components" on page 148).

IF THE POWER LIGHT IS BLINKING AMBER — The computer is receiving electrical power, but an internal power problem may exist.

- Ensure that the voltage selection switch is set to match the AC power at your location (if applicable).
- Ensure that all components and cables are properly installed and securely connected to the system board (see "System Board Components" on page 148).


IF THE POWER LIGHT IS STEADY AMBER — A device may be malfunctioning or incorrectly installed.


- Remove and then reinstall all memory modules (see "Memory" on page 157).
- Remove and then reinstall any expansion cards, including graphics cards (see "Cards" on page 162).

ELIMINATE INTERFERENCE — Some possible causes of interference are:

- Power, keyboard, and mouse extension cables
- Too many devices connected to the same power strip
- Multiple power strips connected to the same electrical outlet

Printer Problems

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

 **NOTE:** If you need technical assistance for your printer, contact the printer's manufacturer.

CHECK THE PRINTER DOCUMENTATION — See the printer documentation for setup and troubleshooting information.

ENSURE THAT THE PRINTER IS TURNED ON

CHECK THE PRINTER CABLE CONNECTIONS —

- See the printer documentation for cable connection information.
- Ensure that the printer cables are securely connected to the printer and the computer.


TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

VERIFY THAT THE PRINTER IS RECOGNIZED BY WINDOWS —

Windows XP:

- 1 Click **Start** → **Control Panel** → **Printers and Other Hardware** → **View installed printers or fax printers**.
- 2 If the printer is listed, right-click the printer icon.
- 3 Click **Properties** → **Ports**. For a parallel printer, ensure that the **Print to the following port(s):** setting is **LPT1 (Printer Port)**. For a USB printer, ensure that the **Print to the following port(s):** setting is **USB**.

Windows Vista:

- 1 Click **Start**  → **Control Panel** → **Hardware and Sound** → **Printer**.
- 2 If the printer is listed, right-click the printer icon.
- 3 Click **Properties**, and then click **Ports**.
- 4 Adjust the settings, as needed.

REINSTALL THE PRINTER DRIVER — See the printer documentation for information on reinstalling the printer driver.

Scanner Problems



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



NOTE: If you need technical assistance for your scanner, contact the scanner's manufacturer.

CHECK THE SCANNER DOCUMENTATION — See the scanner documentation for setup and troubleshooting information.

UNLOCK THE SCANNER — Ensure that your scanner is unlocked (if the scanner has a locking tab or button).

RESTART THE COMPUTER AND TRY THE SCANNER AGAIN

CHECK THE CABLE CONNECTIONS —


- See the scanner documentation for information on cable connections.
- Ensure that the scanner cables are securely connected to the scanner and the computer.

VERIFY THAT THE SCANNER IS RECOGNIZED BY MICROSOFT WINDOWS —

Windows XP:

- 1 Click **Start** → **Control Panel** → **Printers and Other Hardware** → **Scanners and Cameras**.
- 2 If your scanner is listed, Windows recognizes the scanner.

Windows Vista:

- 1 Click **Start**  → **Control Panel** → **Hardware and Sound** → **Scanners and Cameras**.
- 2 If the scanner is listed, Windows recognizes the scanner.

REINSTALL THE SCANNER DRIVER — See the scanner documentation for instructions.

Sound and Speaker Problems



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

No sound from speakers



NOTE: The volume control in MP3 and other media players may override the Windows volume setting. Always check to ensure that the volume on the media player(s) has not been turned down or off.

CHECK THE SPEAKER CABLE CONNECTIONS — Ensure that the speakers are connected as shown on the setup diagram supplied with the speakers. If you purchased a sound card, ensure that the speakers are connected to the card.

ENSURE THAT THE SUBWOOFER AND THE SPEAKERS ARE TURNED ON — See the setup diagram supplied with the speakers. If your speakers have volume controls, adjust the volume, bass, or treble to eliminate distortion.

ADJUST THE WINDOWS VOLUME CONTROL — Click or double-click the speaker icon in the lower-right corner of your screen. Ensure that the volume is turned up and that the sound is not muted.

DISCONNECT HEADPHONES FROM THE HEADPHONE CONNECTOR — Sound from the speakers is automatically disabled when headphones are connected to the computer's front-panel headphone connector.

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

ELIMINATE POSSIBLE INTERFERENCE — Turn off nearby fans, fluorescent lights, or halogen lamps to check for interference.

RUN THE SPEAKER DIAGNOSTICS

REINSTALL THE SOUND DRIVER — See "Drivers" on page 131.

RUN THE HARDWARE TROUBLESHOOTER — See "Hardware Troubleshooter" on page 107.

No sound from headphones


CHECK THE HEADPHONE CABLE CONNECTION — Ensure that the headphone cable is securely inserted into the headphone connector (see "About Your Computer" on page 21).

ADJUST THE WINDOWS VOLUME CONTROL — Click or double-click the speaker icon in the lower-right corner of your screen. Ensure that the volume is turned up and that the sound is not muted.

Video and Monitor Problems



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

-  **NOTICE:** If your computer came with a PCI Express graphics card installed, removal of the card is not necessary when installing additional graphics cards; however, the card is required for troubleshooting purposes. If you remove the card, store it in a safe and secure location. For information about your graphics card, go to support.dell.com.

The screen is blank

-  **NOTE:** For troubleshooting procedures, see the monitor's documentation.

CHECK THE MONITOR CABLE CONNECTION —

- Ensure that the monitor cable is connected to the correct graphics card (for dual graphics card configurations).
- If you are using a DVI-to-VGA adapter, ensure that the adapter is correctly attached to the graphics card and monitor.
- Ensure that the monitor cable is connected as shown on the setup diagram for your computer.
- Remove any video extension cables and connect the monitor directly to the computer.
- Swap the computer and monitor power cables to determine if the monitor's power cable is defective.
- Check the connectors for bent or broken pins (it is normal for monitor cable connectors to have missing pins).

CHECK THE MONITOR POWER LIGHT —

- If the power light is lit or blinking, the monitor has power.
- If the power light is off, firmly press the button to ensure that the monitor is turned on.
- If the power light is blinking, press a key on the keyboard or move the mouse to resume normal operation.

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

CHECK THE DIAGNOSTIC LIGHTS — See “Diagnostic Lights” on page 61.

The screen is difficult to read

CHECK THE MONITOR CABLE CONNECTION —

- Ensure that the monitor cable is connected to the correct graphics card (for dual graphics card configurations).

- If you are using the optional DVI-to-VGA adapter, ensure that the adapter is correctly attached to the graphics card and monitor.
- Ensure that the monitor cable is connected as shown on the setup diagram for your computer.
- Remove any video extension cables and connect the monitor directly to the computer.
- Swap the computer and monitor power cables to determine if the monitor's power cable is defective.
- Check the connectors for bent or broken pins (it is normal for monitor cable connectors to have missing pins).

CHECK THE MONITOR POWER LIGHT —

- If the power light is lit or blinking, the monitor has power.
- If the power light is off, firmly press the button to ensure that the monitor is turned on.
- If the power light is blinking, press a key on the keyboard or move the mouse to resume normal operation.

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

CHECK THE DIAGNOSTIC LIGHTS — See "Diagnostic Lights" on page 100.

CHECK THE MONITOR SETTINGS — See the monitor documentation for instructions on adjusting the contrast and brightness, demagnetizing (degaussing) the monitor, and running the monitor self-test.

MOVE THE SUBWOOFER AWAY FROM THE MONITOR — If your speaker system includes a subwoofer, ensure that the subwoofer is positioned at least 60 centimeters (2 feet) away from the monitor.

MOVE THE MONITOR AWAY FROM EXTERNAL POWER SOURCES — Fans, fluorescent lights, halogen lamps, and other electrical devices can cause the screen image to appear *shaky*. Turn off nearby devices to check for interference.


ROTATE THE MONITOR TO ELIMINATE SUNLIGHT GLARE AND POSSIBLE INTERFERENCE

ADJUST THE WINDOWS DISPLAY SETTINGS —

Windows XP:

- 1 Click Start→ Control Panel→ Appearance and Themes.
- 2 Click the area you want to change or click the Display icon.
- 3 Try different settings for Color quality and Screen resolution.

Windows Vista:

- 1 Click **Start**  → **Control Panel** → **Hardware and Sound** → **Personalization** → **Display Settings**.
- 2 Adjust **Resolution** and **Colors settings**, as needed.

3D image quality is poor

CHECK THE GRAPHICS CARD POWER CABLE CONNECTION — Ensure that the power cable for the graphics card(s) is correctly attached to the card.

CHECK THE MONITOR SETTINGS — See the monitor documentation for instructions on adjusting the contrast and brightness, demagnetizing (degaussing) the monitor, and running the monitor self-test.

Only part of the screen is readable

TURN ON THE COMPUTER AND THE MONITOR AND ADJUST THE MONITOR BRIGHTNESS AND CONTRAST CONTROLS — If the monitor works, the graphics card(s) may be defective. Contact Dell (see "Contacting Dell" on page 269).

Reinstalling Software


Drivers

What Is a Driver?

A driver is a program that controls a device such as a printer, mouse, or keyboard. All devices require a driver program.

A driver acts as a translator between the device and any programs that use the device. Each device has a set of specialized commands that only the driver for that device recognizes.

Required drivers are already installed on your computer—no further installation or configuration is needed.

 **NOTICE:** The *Drivers and Utilities* disc may contain drivers for operating systems that are not on your computer. Ensure that you are installing software appropriate for your operating system.

Many drivers, such as the keyboard driver, come with your Microsoft® Windows® operating system. You may need to install drivers if you:

- Upgrade your operating system.
- Reinstall your operating system.
- Connect or install a new device.

Identifying Drivers

If you experience a problem with any device, identify whether the driver is the source of your problem and, if necessary, update the driver.

Microsoft Windows XP

- 1 Click **Start**, then click **Control Panel**.
- 2 Under **Pick a Category**, click **Performance and Maintenance**.

- 3 Click **System**.
- 4 In the **System Properties** window, click the **Hardware** tab.
- 5 Click **Device Manager**.
- 6 Scroll down the list of devices and check for an exclamation point (a circle with a [!]) next to the device name.

If an exclamation point appears next to the device name, you may need to reinstall the driver or install a new driver (see "Reinstalling Drivers and Utilities" on page 132).

Microsoft Windows Vista™

- 1 Click the Windows Vista start button , then right-click **Computer**.
- 2 Click **Properties**, then click **Device Manager**.



NOTE: The **User Account Control** window may appear. If you are an administrator on the computer, click **Continue**; otherwise, contact your administrator to continue.

- 3 Scroll down the list of devices and check for an exclamation point (a circle with a [!]) next to the device name.

If an exclamation point appears next to the device name, you may need to reinstall the driver or install a new driver (see "Reinstalling Drivers and Utilities" on page 132).

Reinstalling Drivers and Utilities



NOTICE: The Dell Support website at support.dell.com and your *Drivers and Utilities* disc provide approved drivers for your Dell computer. If you install drivers obtained from other sources, your computer may not function properly.

Using Windows Device Driver Rollback

If a problem occurs on your computer after you install or update a driver, use Windows Device Driver Rollback to replace the driver with the previously installed version.



Windows XP:

- 1 Click **Start**, then click **Control Panel**.
- 2 Under **Pick a Category**, click **Performance and Maintenance**.
- 3 Click **System**.

- 4 In the **System Properties** window, click the **Hardware** tab.
- 5 Click **Device Manager**.
- 6 Right-click the device for which the new driver was installed, then click **Properties**.
- 7 Click the **Driver** tab.
- 8 Click **Roll Back Driver**.

If Device Driver Rollback does not resolve the problem, reinstall the driver from the *Drivers and Utilities* disc.

Windows Vista:

- 1 Click the Windows Vista start button , then right-click **Computer**.
- 2 Click **Properties**, then click **Device Manager**.
 **NOTE:** The **User Account Control** window may appear. If you are an administrator on the computer, click **Continue**; otherwise, contact your administrator to continue.
- 3 Right-click the device for which the new driver was installed, then click **Properties**.
- 4 Click the **Driver** tab.
- 5 Click **Roll Back Driver**.

If Device Driver Rollback does not resolve the problem, reinstall the driver from the *Drivers and Utilities* disc.

Using the Drivers and Utilities Disc

If a problem occurs on your computer after you install or update a driver and Device Driver Rollback does not resolve the problem, reinstall the driver from the *Drivers and Utilities* disc.

- 1 Save and close any open files, and exit any open programs.
- 2 Insert the *Drivers and Utilities* disc.

In most cases, the CD/DVD starts running automatically. If it does not, start Windows Explorer, click your CD/DVD drive directory to display the CD/DVD contents, and then double-click the **autorcd.exe** file. The first time that you run the CD/DVD, it may prompt you to install setup files. Click **OK**, and then follow the instructions on the screen.

- 3 From the **Language** drop-down menu in the toolbar, select your preferred language for the driver or utility (if available).
- 4 At the welcome screen, click **Next** and wait for the CD/DVD to complete the hardware scan.
- 5 To detect other drivers and utilities, under **Search Criteria**, select the appropriate categories from the **System Model**, **Operating System**, and **Topic** drop-down menus.

A link or links appear(s) for the specific drivers and utilities used by your computer.

- 6 Click the link of a specific driver or utility to display information about the driver or utility that you want to install.
- 7 Click the **Install** button (if present) to begin installing the driver or utility. At the welcome screen, follow the screen prompts to complete the installation.

If no **Install** button is present, automatic installation is not an option. For installation instructions, either see the appropriate instructions in the following subsections, or click **Extract**, follow the extracting instructions, and then read the readme file.

If instructed to navigate to the driver files, click the CD/DVD directory on the driver information window to display the files associated with that driver.

Manually Reinstalling Drivers

After extracting the driver files to your hard drive as described in the previous section you may be required to update the driver manually.

Windows XP:





NOTE: Drivers can be manually updated for any hardware device installed in your computer.

- 1 Click **Start**, then click **Control Panel**.
- 2 Under **Pick a Category**, click **Performance and Maintenance**.
- 3 Click **System**.
- 4 In the **System Properties** window, click the **Hardware** tab.
- 5 Click **Device Manager**.

- 6 Double-click the type of device for which you are installing the driver.
- 7 Right-click the device for which the driver is being reinstalled, then click **Properties**.
- 8 Click the **Driver** tab.
- 9 Click **Update Driver**.
- 10 Click **Install from a list or specific location (Advanced)**, then click **Next**.
- 11 Click to check **Include this location in the search**, then click **Browse** and navigate to where the driver files are located on your hard drive.
- 12 When the name of the appropriate driver appears, click **OK**.
- 13 Click **Next**.
- 14 Click **Finish** and restart your computer.

Windows Vista:

- 1 Click the Windows Vista start button , then right-click **Computer**.
- 2 Click **Properties**, then click **Device Manager**.
 **NOTE:** The **User Account Control** window may appear. If you are an administrator on the computer, click **Continue**; otherwise, contact your administrator to continue.
- 3 Double-click the type of device for which you are installing the driver.
- 4 Double-click the name of the device for which you are installing the driver.
- 5 Click the **Driver** tab.
- 6 Click **Update Driver**.
- 7 Click **Browse my computer for driver software**.
- 8 Click **Browse** and navigate to where the driver files are located on your hard drive.
- 9 When the name of the appropriate driver appears, click the name of the driver, then click **OK**.
- 10 Click **Next**.
- 11 Click **Finish** and restart your computer.

Restoring Your Operating System

You can restore your operating system in the following ways:

- System Restore returns your computer to an earlier operating state without affecting data files. Use System Restore as the first solution for restoring your operating system and preserving data files.
- Dell PC Restore by Symantec (available in Windows XP) and Dell Factory Image Restore (available in Windows Vista) returns your hard drive to the operating state it was in when you purchased the computer. Both permanently delete all data on the hard drive and remove any programs installed after you received the computer. Use Dell PC Restore or Dell Factory Image Restore only if System Restore did not resolve your operating system problem.
- *Operating System* installation media can be used to perform a reinstall of your operating system. However, using the *Operating System* installation media also deletes all data on the hard drive. Use the media *only* if System Restore did not resolve your operating system problem.

Using Microsoft Windows System Restore

The Windows operating systems provide a System Restore option which allows you to return your computer to an earlier operating state (without affecting data files). Using System Restore can be helpful if changes to the system hardware, software, or settings have left the computer in an undesirable operating state. For information on using System Restore, see the Windows Help and Support Center (click **Start**, then click **Help and Support**).



NOTICE: System Restore does not monitor your data files or recover them. Make regular backups of your data files.

Starting System Restore

Windows XP:




NOTICE: Before you restore the computer to an earlier operating state, save and close any open files and exit any open programs. Do not alter, open, or delete any files or programs until the system restoration process is complete.



NOTE: If a problem occurs after you install a device driver, first try to resolve the problem by using Windows XP Device Driver Rollback (see "Using Windows Device Driver Rollback" on page 132), or reinstall the driver with the Drivers and Utilities disc (see "Using the Drivers and Utilities Disc" on page 133).

- 1 Click **Start**→ **All Programs**→ **Accessories**→ **System Tools**→ **System Restore**.
- 2 Click either **Restore my computer to an earlier time** or **Create a restore point**.
- 3 Click **Next** and follow the instructions on the screen.

Windows Vista:

- 1 Click **Start** .
- 2 In the Start Search box, type **System Restore** and press <Enter>.



NOTE: The **User Account Control** window may appear. If you are an administrator on the computer, click **Continue**; otherwise, contact your administrator to continue.

- 3 Click **Next** and follow the instructions on the screen.

Undoing the Last System Restore




NOTICE: Before you undo the last system restore, save and close all open files and exit any open programs. Do not alter, open, or delete any files or programs until the system restoration process is complete.

Windows XP:

- 1 Click **Start**→ **All Programs**→ **Accessories**→ **System Tools**→ **System Restore**.
- 2 Click **Undo my last restoration** and click **Next**.

Windows Vista:

- 1 Click **Start** .
- 2 In the Start Search box, type **System Restore** and press <Enter>.
- 3 Click **Undo my last restoration** and click **Next**.

Enabling System Restore



NOTE: Windows Vista does not disable System Restore; regardless of low disk space. Therefore, the steps below apply only to Windows XP.

If you reinstall Windows XP with less than 200 MB of free hard-disk space available, System Restore is automatically disabled.

To see if System Restore is enabled:

- 1 Click **Start**→ **Control Panel**→ **Performance and Maintenance**→ **System**.
- 2 Click the **System Restore** tab and ensure that **Turn off System Restore** is unchecked.

Using Dell PC Restore and Dell Factory Image Restore



NOTE: Using Dell PC Restore or Dell Factory Image Restore permanently deletes all data on the hard drive and removes any programs or drivers installed after you received your computer. If possible, back up the data before using these options. Use PC Restore or Dell Factory Image Restore only if System Restore did not resolve your operating system problem.



NOTE: Dell PC Restore by Symantec and Dell Factory Image Restore may not be available in certain countries or on certain computers.

Use Dell PC Restore (Windows XP) or Dell Factory Image Restore (Windows Vista) only as the last method to restore your operating system. These options restore your hard drive to the operating state it was in when you purchased the computer. Any programs or files added since you received your computer—including data files—are permanently deleted from the hard drive. Data files include documents, spreadsheets, e-mail messages, digital photos, music files, and so on. If possible, back up all data before using PC Restore or Factory Image Restore.

Windows XP: Dell PC Restore

Using PC Restore:

- 1 Turn on the computer.

During the boot process, a blue bar with www.dell.com appears at the top of the screen.

- 2 Immediately upon seeing the blue bar, press <Ctrl><F11>.

If you do not press <Ctrl><F11> in time, let the computer finish starting, and then restart the computer again.



NOTICE: If you do not want to proceed with PC Restore, click **Reboot**.

- 3 Click **Restore** and click **Confirm**.

The restore process takes approximately 6 to 10 minutes to complete.

- 4 When prompted, click **Finish** to reboot the computer.



NOTE: Do not manually shut down the computer. Click **Finish** and let the computer completely reboot.

- 5 When prompted, click **Yes**.

The computer restarts. Because the computer is restored to its original operating state, the screens that appear, such as the End User License Agreement, are the same ones that appeared the first time the computer was turned on.

- 6 Click **Next**.

The **System Restore** screen appears and the computer restarts.

- 7 After the computer restarts, click **OK**.

Removing PC Restore:



NOTICE: Removing Dell PC Restore from the hard drive permanently deletes the PC Restore utility from your computer. After you have removed Dell PC Restore, you will not be able to use it to restore your computer operating system.

Dell PC Restore enables you to restore your hard drive to the operating state it was in when you purchased your computer. It is recommended that you *do not* remove PC Restore from your computer, even to gain additional hard-drive space. If you remove PC Restore from the hard drive, you cannot ever recall it, and you will never be able to use PC Restore to return your computer operating system to its original state.

- 1 Log on to the computer as a local administrator.
- 2 In Microsoft Windows Explorer, go to `c:\dell\utilities\DSR`.

- 3 Double-click the filename **DSRIRRemv2.exe**.



NOTE: If you do not log on as a local administrator, a message appears stating that you that you must log on as administrator. Click **Quit**, and then log on as a local administrator.



NOTE: If the partition for PC Restore does not exist on your computer hard drive, a message appears stating that the partition was not found. Click **Quit**; there is no partition to delete.

- 4 Click **OK** to remove the PC Restore partition on the hard drive.
- 5 Click **Yes** when a confirmation message appears.
The PC Restore partition is deleted and the newly available disk space is added to the free space allocation on the hard drive.
- 6 Right-click **Local Disk (C)** in Windows Explorer, click **Properties**, and verify that the additional disk space is available as indicated by the increased value for **Free Space**.
- 7 Click **Finish** to close the **PC Restore Removal** window and restart the computer.

Windows Vista: Dell Factory Image Restore

- 1 Turn on the computer. When the Dell logo appears, press <F8> several times to access the Vista Advanced Boot Options window.
- 2 Select **Repair Your Computer**.
The System Recovery Options window appears.
- 3 Select a keyboard layout and click **Next**.
- 4 To access the recovery options, log on as a local user. To access the command prompt, type **administrator** in the User name field, then click **OK**.
- 5 Click **Dell Factory Image Restore**.




NOTE: Depending upon your configuration, you may need to select **Dell Factory Tools**, then **Dell Factory Image Restore**.

The Dell Factory Image Restore welcome screen appears.

- 6 Click **Next**.

The Confirm Data Deletion screen appears.

 **NOTICE:** If you do not want to proceed with Factory Image Restore, click **Cancel**.

- 7 Click the check box to confirm that you want to continue reformatting the hard drive and restoring the system software to the factory condition, then click **Next**.


The restore process begins and may take five or more minutes to complete. A message appears when the operating system and factory-installed applications have been restored to factory condition.

- 8 Click **Finish** to reboot the system.

Using the Operating System Media


Before you Begin

If you are considering reinstalling the Windows operating system to correct a problem with a newly installed driver, first try using Windows Device Driver Rollback (see "Using Windows Device Driver Rollback" on page 132). If Device Driver Rollback does not resolve the problem, then use System Restore to return your operating system to the operating state it was in before you installed the new device driver (see "Using Microsoft Windows System Restore" on page 136).

 **NOTICE:** Before performing the installation, back up all data files on your primary hard drive. For conventional hard drive configurations, the primary hard drive is the first drive detected by the computer.


To reinstall Windows, you need the following items:

- Dell *Operating System* media
- Dell *Drivers and Utilities* disc

 **NOTE:** The Dell *Drivers and Utilities* disc contains drivers that were installed during the assembly of the computer. Use the Dell *Drivers and Utilities* disc to load any required drivers. Depending on the region from which you ordered your computer, or whether you requested the media, the Dell *Drivers and Utilities* disc and *Operating System* media may not ship with your computer.


Reinstalling Windows XP or Windows Vista


The reinstallation process can take 1 to 2 hours to complete. After you reinstall the operating system, you must also reinstall the device drivers, virus protection program, and other software.

 **NOTICE:** The *Operating System* media provides options for reinstalling Windows XP. The options can overwrite files and possibly affect programs that are installed on your hard drive. Therefore, do not reinstall Windows XP unless a Dell technical support representative instructs you to do so.

- 1 Save and close any open files and exit any open programs.
- 2 Insert the *Operating System* disc.
- 3 Click **Exit** if the **Install Windows** message appears.
- 4 Restart the computer.

When the DELL logo appears, press <F12> immediately.

 **NOTE:** If you wait too long and the operating system logo appears, continue to wait until you see the Microsoft® Windows® desktop; then, shut down your computer and try again.

 **NOTE:** The next steps change the boot sequence for one time only. On the next start-up, the computer boots according to the devices specified in System Setup.

- 5 When the boot device list appears, highlight **CD/DVD/CD-RW Drive** and press <Enter>.
- 6 Press any key to **Boot from CD-ROM**.
- 7 Follow the instructions on the screen to complete the installation.

Adding and Replacing Parts

Before You Begin

This chapter provides procedures for removing and installing the components in your computer. Unless otherwise noted, each procedure assumes that the following conditions exist:

- You have performed the steps in "Turning Off Your Computer" on page 143 and "Before Working Inside Your Computer" on page 144.
- You have read the safety information in the Dell™ *Product Information Guide*.
- A component can be replaced or—if purchased separately—installed by performing the removal procedure in reverse order.

Recommended Tools

The procedures in this document may require the following tools:


- Small flat-blade screwdriver
- Small Phillips screwdriver
- Small plastic scribe
- Flash BIOS update program

Turning Off Your Computer



NOTICE: To avoid losing data, save and close all open files and exit all open programs before you turn off your computer.

- 1 Shut down the operating system:
 - a Save and close all open files and exit all open programs.
 - b *In the Microsoft® Windows® XP operating system*, click **Start**→**Shut Down**→**Shut down**.

In Microsoft Windows Vista™, click the Windows Vista Start button  in the lower-left corner of the desktop, click the arrow in the

lower-right corner of the Start menu as shown below, and then click **Shut Down**.

The computer turns off after the operating system shutdown process is complete.

- 2 Ensure that the computer and all attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your operating system, press and hold the power button for about 4 seconds to turn them off.

Before Working Inside Your Computer

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



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



NOTICE: Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a processor by its edges, not by its pins.



NOTICE: Only a certified service technician should perform repairs on your computer. Damage due to servicing that is not authorized by Dell is not covered by your warranty.



NOTICE: When you disconnect a cable, pull on its connector or on its pull-tab, not on the cable itself. Some cables have connectors with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before you disconnect the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, ensure that both connectors are correctly oriented and aligned.






NOTICE: To avoid damaging the computer, perform the following steps before you begin working inside the computer.




- 1 Ensure that the work surface is flat and clean to prevent the computer cover from being scratched.
- 2 Turn off your computer (see "Turning Off Your Computer" on page 143).

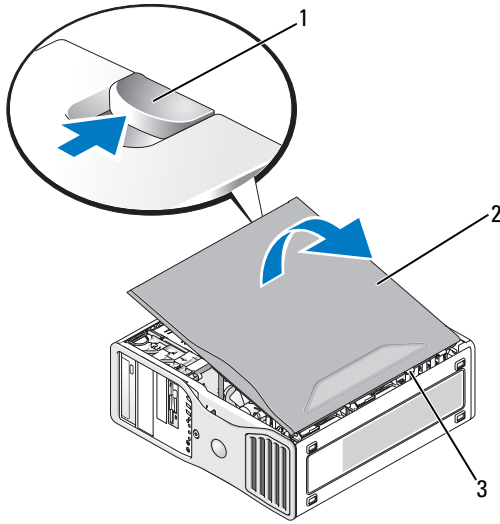


NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug the cable from the network device.

- 3 Disconnect all telephone or network cables from the computer.
-  **NOTICE:** To avoid damaging the system board, you must remove the main battery before you service the computer.
- 4 Disconnect your computer and all attached devices from their electrical outlets.
- 5 Press the power button to ground the system board.
-  **CAUTION:** To guard against electrical shock, always unplug your computer from the electrical outlet before opening the display.
-  **NOTICE:** Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate static electricity, which could harm internal components.

Removing the Computer Cover

-  **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
-  **CAUTION:** To guard against electrical shock, always unplug your computer from the electrical outlet before removing the cover.
- 1 Follow the procedures in "Before You Begin" on page 143.
-  **NOTE:** Ensure that sufficient space exists to support the removed cover.
- 2 Remove the security cable from the security cable slot (if installed).
- 3 Lay your computer on its side with the computer cover facing up.
- 4 Pull back on the cover release latch.
- 5 With the cover release latch pulled back, lift the top of the cover up and away from the computer.
- 6 Slide the cover forward to remove it from the hinge slots, then set the cover aside in a secure and protected location.



1 cover release latch

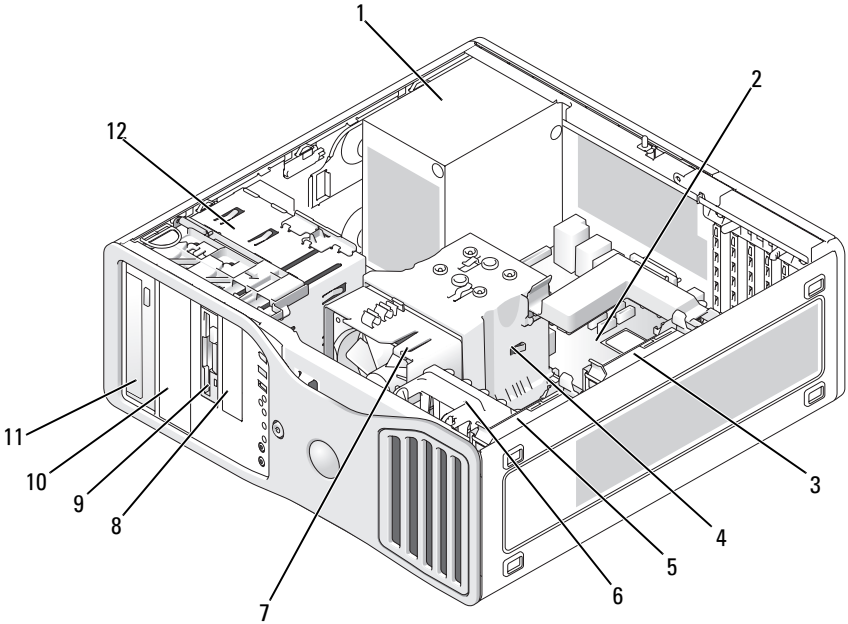
2 computer cover

3 cover hinges

Inside View of Your Computer

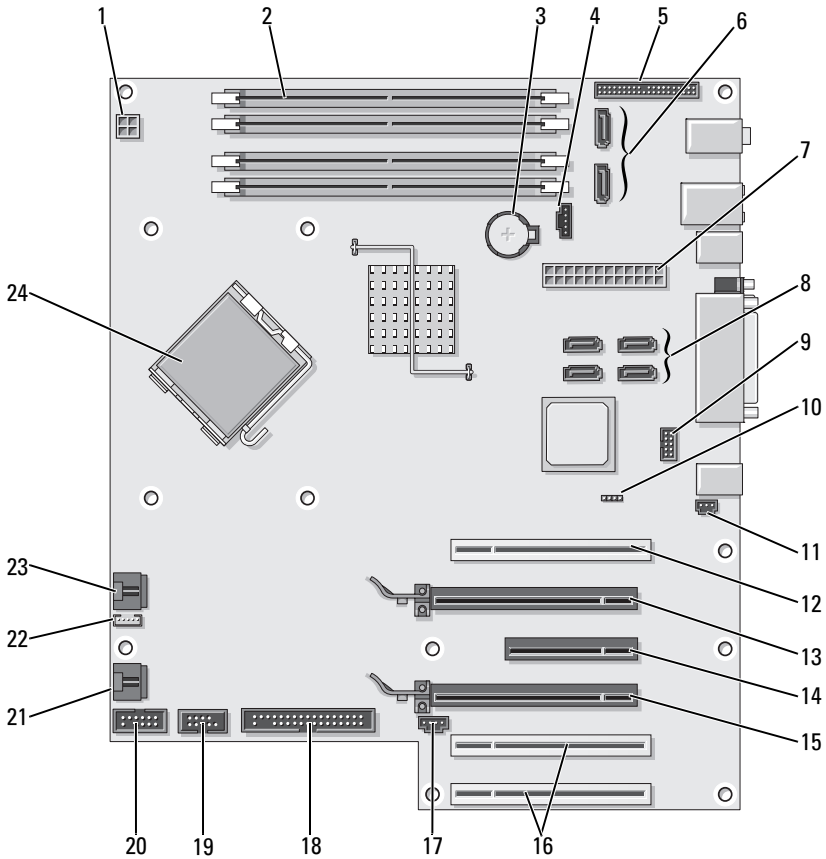


NOTE: If your computer is configured as a desktop computer, the drives will appear differently.



- | | | | |
|----|--------------------------|----|--------------------------|
| 1 | power supply | 2 | system board |
| 3 | secondary hard drive bay | 4 | processor airflow shroud |
| 5 | primary hard drive bay | 6 | card fan |
| 7 | processor fan | 8 | 3.5-inch drive bay |
| 9 | 3.5-inch drive bay | 10 | 5.25-inch drive bay |
| 11 | 5.25-inch drive bay | 12 | drive cage |

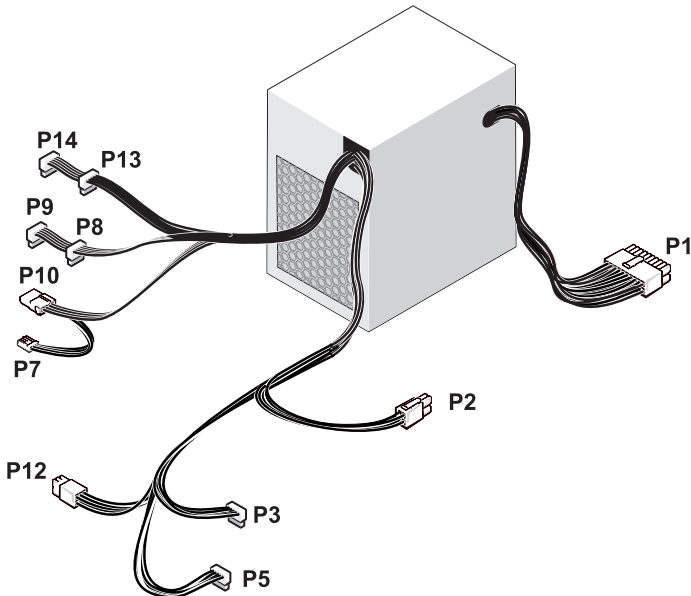
System Board Components



- | | | | | | |
|---|---------------------------------|---|---|---|--------------------------------|
| 1 | power connector (12VPOWER) | 2 | memory module connectors (DIMM_1, DIMM_2, DIMM_3, DIMM_4) | 3 | battery socket (BATTERY) |
| 4 | memory fan connector (FAN_MEM1) | 5 | front panel connector | 6 | SATA connectors (SATA0, SATA1) |

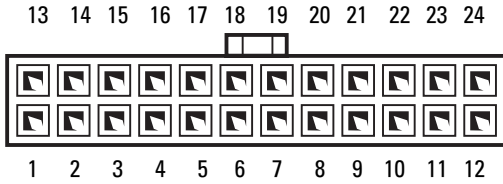
7	main power connector (POWER)	8	SATA connectors (SATA2, SATA3, SATA4, SATA5)	9	FlexBay connector (USB1)
10	password reset jumper (RTCST_PSWD)	11	chassis intrusion header (INTRUDER)	12	PCI card slot (SLOT1)
13	PCI Express x16 card slot (SLOT2)	14	PCI Express x8 card slot wired as x4 (SLOT3)	15	PCI Express x16 card slot (SLOT4)
16	PCI card slots (SLOT5, SLOT6)	17	SAS Card Activity LED (AUX_LED)	18	floppy drive (FLOPPY)
19	uDOC connector (UDOC1)	20	serial connector (SERIAL2)	21	card cage fan (FAN_CARD_CAGE)
22	internal speaker connector (INT_SPKR)	23	processor fan connector (FAN_CPU)	24	processor connector (CPU)

Power Supply DC Connector Pin Assignments



* 375-W PSU shown

DC Power Connector P1



Pin Number	Signal name	Wire Color	Wire Size
1	+3.3 VDC	Orange	18 AWG
2	+3.3 VDC	Orange	18 AWG
3	COM	Black	18 AWG
4	+5 VDC	Red	18 AWG
5	COM	Black	18 AWG
6	+5 VDC	Red	18 AWG
7	COM	Black	18 AWG
8	POK	Gray	22 AWG
9	+5 VFP	Purple	18 AWG
10	+12 VBDC	White	18 AWG
11	+12 VBDC	White	18 AWG
12	+3.3 VDC	Orange	18 AWG
13	+3.3 VDC/SE4	Orange	18 AWG
14	-12 VDC	Blue	22 AWG
15	COM	Black	18 AWG
16	PS_ON	Green	22 AWG
17	COM	Black	18 AWG
18	COM	Black	18 AWG
19	COM	Black	18 AWG
20	OPEN		
21	+5 VDC	Red	18 AWG

Pin Number	Signal name	Wire Color	Wire Size
22	+5 VDC	Red	18 AWG
23	+5 VDC	Red	18 AWG
24	COM	Black	18 AWG

DC Power Connector P2



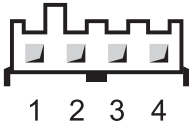
Pin Number	Signal Name	18-AWG Wire
1	COM	Black
2	COM	Black
3	+12 VADC	Yellow
4	+12 VADC	Yellow

DC Power Connectors P3 and P5



Pin Number	Signal name	18-AWG Wire
1	+3.3 VDC	Orange
2	COM	Black
3	+5 VDC	Red
4	COM	Black
5	+12 VADC	Yellow

DC Power Connector P7



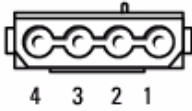
Pin Number	Signal name	22-AWG Wire
1	+5 VDC	Red
2	COM	Black
3	COM	Black
4	+12 VADC	Yellow

DC Power Connectors P8, P9, P13, and P14



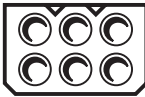
Pin Number	Signal name	18-AWG Wire
1	+3.3 VDC	Orange
2	COM	Black
3	+5 VDC	Red
4	COM	Black
5	+12 VBDC	White

DC Power Connector P10



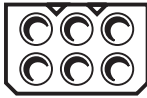
Pin Number	Signal Name	18-AWG Wire
1	+12 VADC	Yellow
2	COM	Black
3	COM	Black
4	+5 VDC	Red

DC Power Connector P12



Pin Number	Signal Name	18-AWG Wire
1	+12 VBDC	White
2	+12 VBDC	White
3	+12 VBDC	White
4	COM	Black
5	COM	Black
6	COM	Black

DC Power Connector P15 (525-W PSU Only)

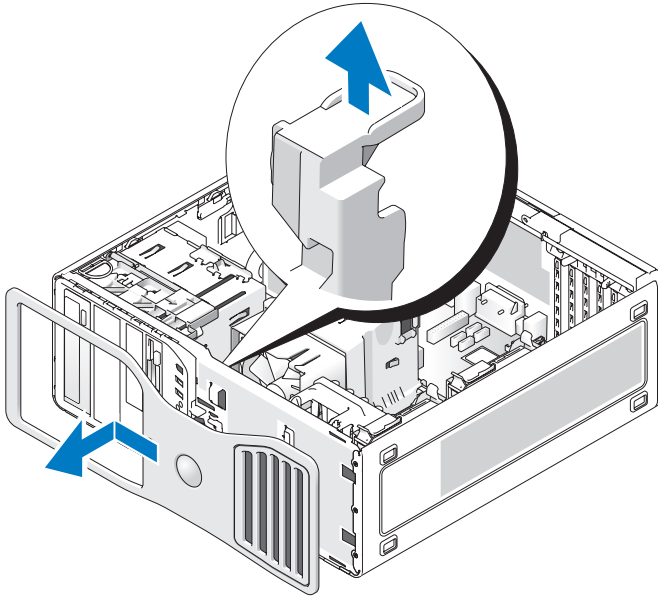


Pin Number	Signal Name	18-AWG Wire
1	+12 VCDC	Blue/White
2	+12 VCDC	Blue/White
3	+12 VCDC	Blue/White
4	COM	Black
5	COM	Black
6	COM	Black

Removing the Front Panel

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).



- 3 Lift the front panel release lever, and then slide the front panel towards the top of the computer to disengage and remove it.

Chassis Intrusion Switch

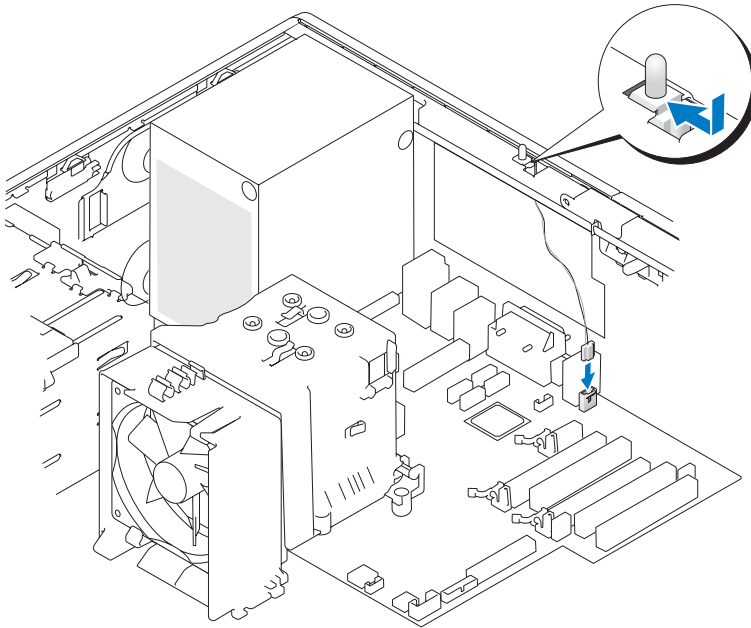
Removing the Chassis Intrusion Switch

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Disconnect the chassis intrusion switch cable from the system board (see "System Board Components" on page 148).

Note the routing of the chassis intrusion switch cable. Chassis hooks may hold the cable in place inside the chassis.

- Using a flat blade screwdriver, slide the chassis intrusion switch out of its slot, then remove the switch and its attached cable from the computer.



Replacing the Chassis Intrusion Switch


⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- Follow the procedures in "Before You Begin" on page 143.
- Remove the computer cover (see "Removing the Computer Cover" on page 145).
- Gently slide the chassis intrusion switch into its slot, then connect the chassis intrusion switch cable to the system board (see "System Board Components" on page 148).
- Replace the computer cover (see "Replacing the Computer Cover" on page 262).

➡ NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.


- 5 Connect your computer and devices to electrical outlets, and then turn them on.

Resetting the Chassis Intrusion Detector

- 1 Enter System Setup (see "Entering System Setup" on page 81).
- 2 Use the up- or down-arrow keys to highlight the **Chassis Intrusion** menu option, then press <Enter>.
- 3 Use the left- or right-arrow keys to select **Reset**.
- 4 Change the setting to **On**, **On-Silent**, or **Off**.
 **NOTE:** The default setting is **On-Silent**.
- 5 Press <Esc>.
- 6 Press the left- and right-arrow keys to highlight **Save/Exit**, and then press <Enter> to exit System Setup and restart your computer.

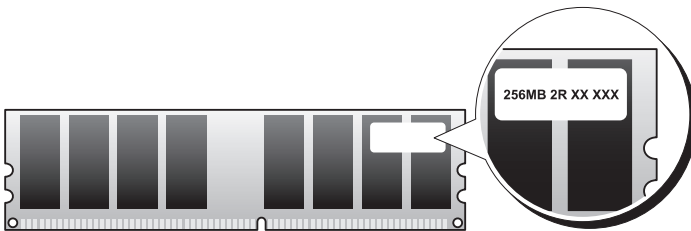
Memory


For information on the type of memory supported by your computer, see "Specifications" on page 31.

-  **NOTICE:** Before you install new memory modules, download the most recent BIOS for your computer from support.dell.com.

Memory Overview

- Memory modules should be installed in *pairs of matched memory size, speed, and technology*. If the memory modules are not installed in matched pairs, the computer will continue to operate, but with a slight reduction in performance. See the label in the upper-right corner of the module to determine the module's capacity.



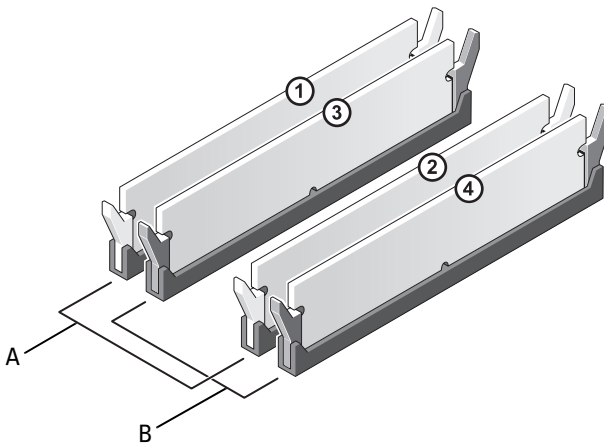
 **NOTE:** Always install memory modules in the order indicated on the system board (see "System Board Components" on page 148).

Recommended memory configurations are:

- A pair of matched memory modules installed in connectors DIMM_1 and DIMM_2


or


- A pair of matched memory modules installed in connectors DIMM_1 and DIMM_2 and another pair of matched memory modules installed in connectors DIMM_3 and DIMM_4
- If mixed pairs of memory modules are installed, the modules function at the speed of the slowest module.
- Install a single memory module in the DIMM_1 connector (see "System Board Components" on page 148) before installing modules in the other connectors.
- When installing memory modules, do not mix ECC and non-ECC memory.



A matched pair of memory modules in connectors DIMM_1 and DIMM_2 (white securing clips)

B matched pair of memory modules in connectors DIMM_3 and DIMM_4 (black securing clips)

 **NOTICE:** If you remove your original memory modules from the computer during a memory upgrade, keep them separate from any new modules that you may have, even if the new modules were purchased from Dell. If possible, *do not* pair an original memory module with a new memory module; otherwise, your computer may not start properly. Install your original memory modules in pairs either in connectors DIMM_1 and DIMM_2 or connectors DIMM_3 and DIMM_4.

 **NOTE:** Memory purchased from Dell is covered under your computer warranty.

Addressing Memory With 4-GB Configurations

Your computer supports a maximum of 8 GB of memory when you use four 2-GB DIMMs; however, 32-bit operating systems, such as the 32-bit version of Microsoft® Windows® XP, can only use a maximum of 4 GB of address space. Moreover, certain components within the computer require address space in the 4-GB range. Any address space reserved for these components cannot be used by computer memory; therefore, the amount of memory available to the operating system is less than 4 GB.

 **NOTE:** The entire 8-GB memory range is available to 64-bit operating systems.

The following components require memory address space:

- System ROM
- APIC(s)
- Integrated PCI devices, such as network connectors, SAS controllers, and IEEE 1394 controllers
- PCI or PCI Express devices/cards

At start up, the BIOS identifies the components that require address space. The BIOS dynamically calculates the amount of reserved address space required, then subtracts the reserved address space from 4 GB to determine the amount of usable space.

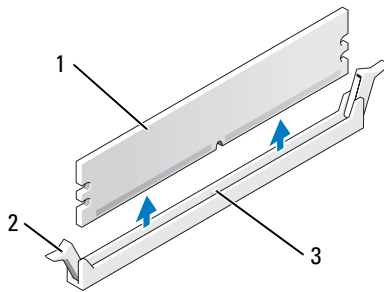
- If the total installed computer memory is less than the usable space, all installed computer memory is available for use only by the operating system.
- If the total installed computer memory is equal to or greater than the usable address space, a small portion of installed memory is available for use by the operating system.

Removing a Memory Module

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Press out the securing clip at each end of the memory module connector.
- 4 Grasp the memory module and lift the module straight up and out of the connector.

If the memory module is difficult to remove, gently ease the module back and forth while pulling up.

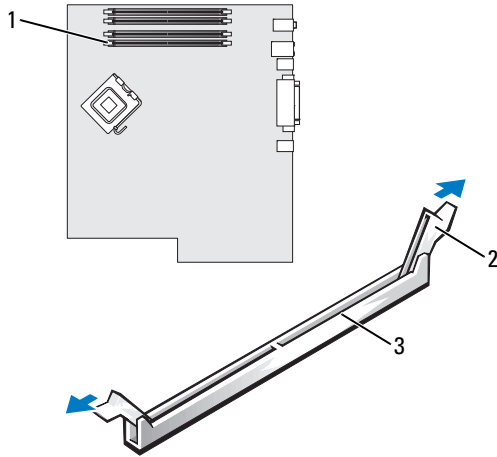


- | | | | |
|---|-------------------------|---|--------------------|
| 1 | memory module | 2 | securing clips (2) |
| 3 | memory module connector | | |

Installing a Memory Module

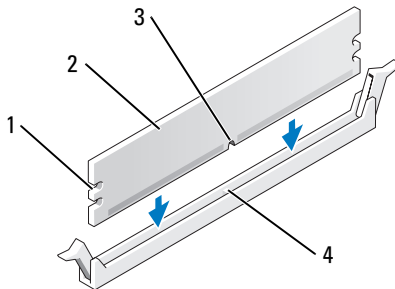
⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Press out the securing clip at each end of the memory module connector.



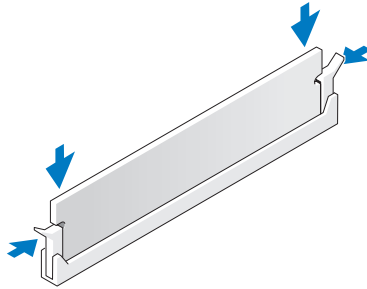
- 1 memory module connector (DIMM_1)
- 2 securing clips (2)
- 3 memory module connector

4 Align the notch on the bottom of the memory module with the crossbar in the memory module connector.



- 1 cutouts (2)
- 2 memory module
- 3 notch
- 4 crossbar

- ➔ **NOTICE:** To avoid damage to the memory module, press the module straight down into the connector while applying equal force to each end of the module.
- 5 Insert the module into the connector until the module snaps into position. If you insert the module correctly, the securing clips snap into the cutouts at each end of the module.



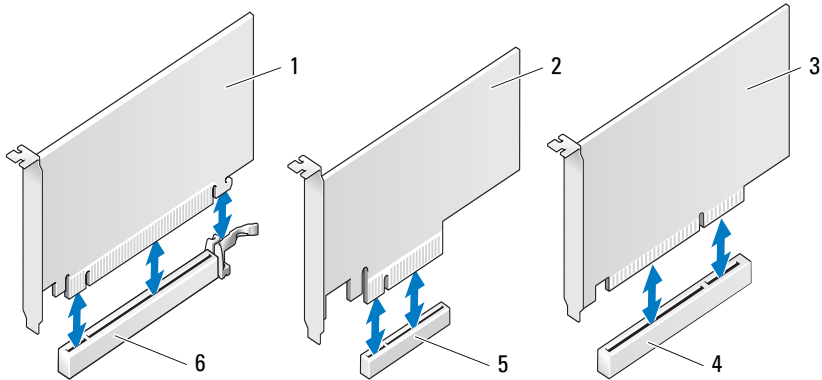
- 6 Replace the computer cover (see "Replacing the Computer Cover" on page 262).
- ➔ **NOTICE:** To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.
- 7 Connect your computer and devices to electrical outlets, and then turn them on.
- 8 Enter System Setup (see "Entering System Setup" on page 81) and verify the value for **System Memory**.
The amount of **System Memory** reflects the newly installed memory.
- 🔗 **NOTE:** If the amount of memory is incorrect, check the installed memory modules to ensure that they are seated properly in their connectors.
- 9 Press <Esc> to exit System Setup.

Cards

- 🔗 **NOTE:** Check the documentation for cards to ensure that you can accommodate them in your configuration. Some cards that require more physical space and power (such as PCI Express graphics cards) may restrict the use of other cards.

Your Dell computer provides the following slots for PCI and PCI Express cards:

- Three PCI card slots
- Two PCI Express x16 card slots
- One PCI Express x8 card slot (wired as x4)



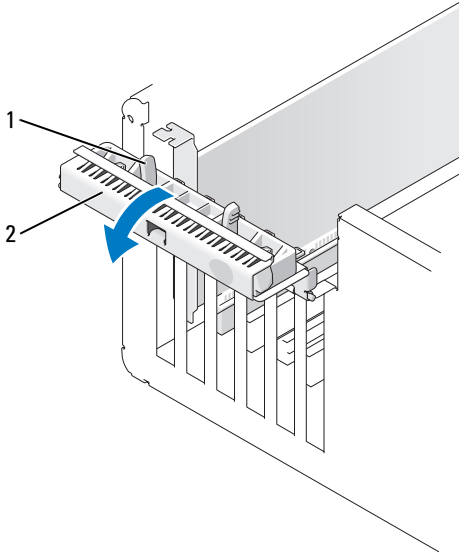
- | | | | |
|---|--------------------------|---|---------------------------|
| 1 | PCI Express x16 card | 2 | PCI Express x8 card |
| 3 | PCI card | 4 | PCI card slot |
| 5 | PCI Express x8 card slot | 6 | PCI Express x16 card slot |

PCI Cards

Removing a PCI Card


⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

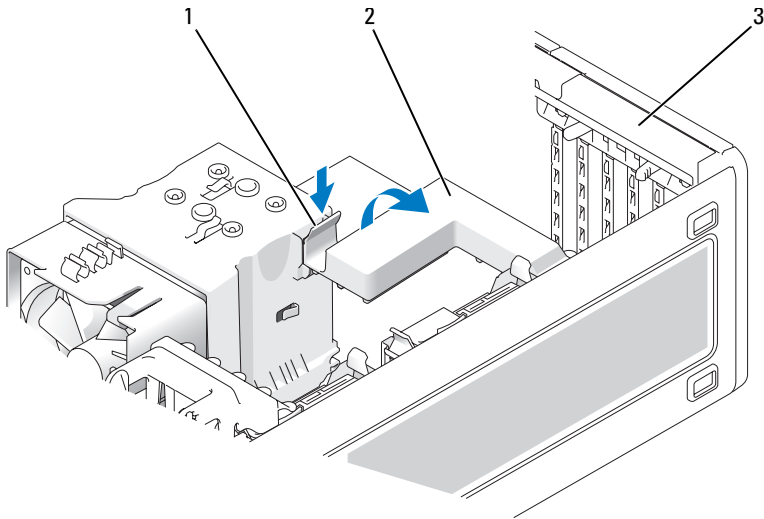
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Press the release tabs on the card retention door and pivot the door open.



1 release tabs (2) 2 card retention door


4 Press the release tab on the card retention cover and pivot the cover open.


 **NOTE:** You can remove the card retention cover, if desired, and set it aside.

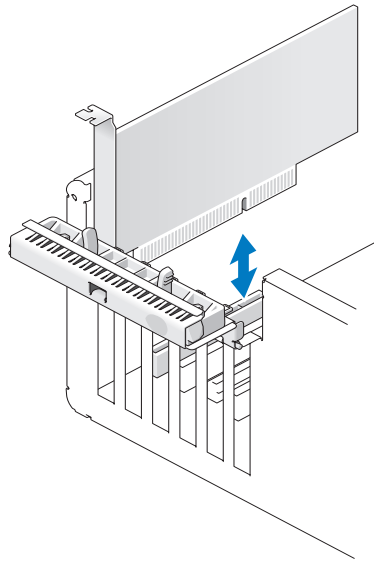


- 1 release tab
- 2 card retention cover
- 3 card retention door

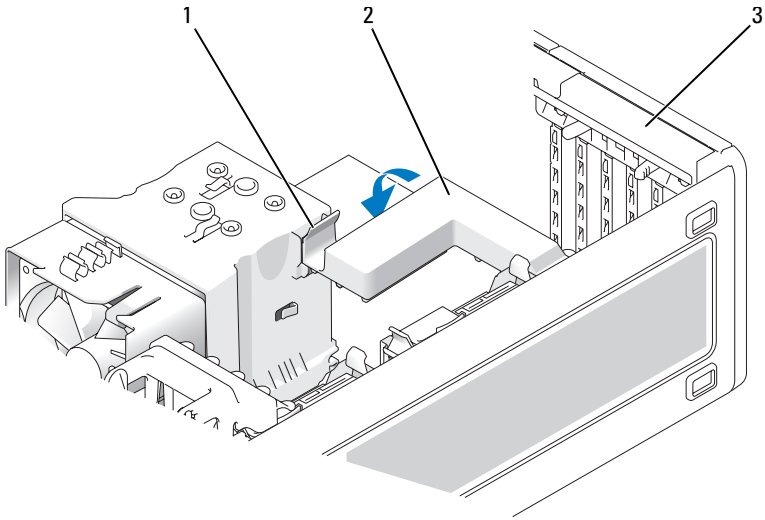
5 If necessary, disconnect any cables connected to the card. Grasp the card by its top corners, and ease it out of its connector.

 **NOTE:** If you are removing the card permanently, install a filler bracket in the empty card-slot opening.

 **NOTE:** Installing filler brackets over empty card-slot openings is necessary to maintain FCC certification of the computer. The brackets also keep dust and dirt out of your computer.



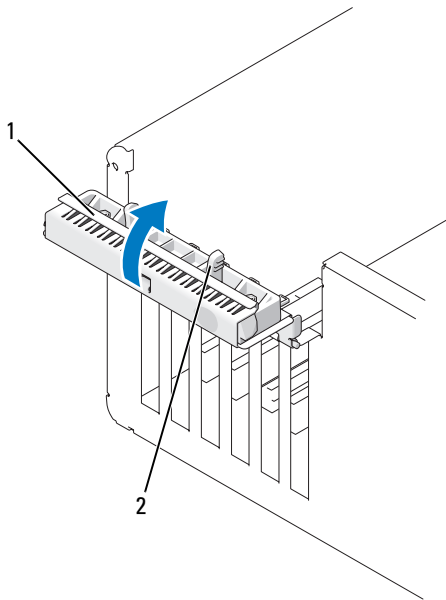
- 6** Reinstall the card retention cover, if removed.
- 7** Close the card retention cover by snapping it into place to secure the card(s).



- 1 release tab
- 3 card retention door

- 2 card retention cover

8 Close the card retention door by snapping it into place to secure the card(s).



1 card retention door

2 release tab

9 Replace the computer cover, (see "Replacing the Computer Cover" on page 262).

➔ NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.


10 Connect your computer and devices to electrical outlets, and then turn them on.

11 Uninstall the driver for the removed card. See the documentation that came with the card.


12 Update System Setup settings, as needed.


If you removed a sound card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated Audio**, and then change the setting to **On**.

If you removed a network adapter card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated NIC**, and then change the setting to **On**.

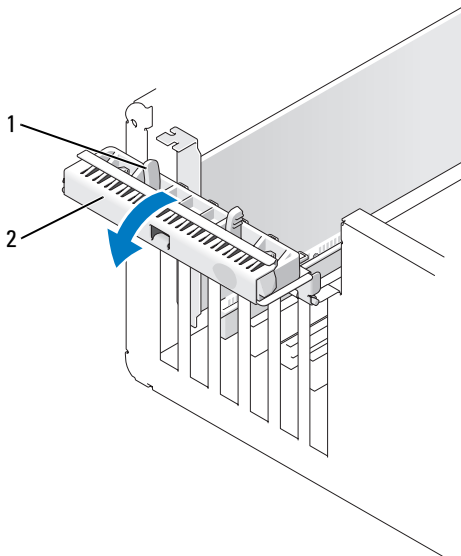
 **NOTE:** Connect your external audio devices or your network cable to the audio and network connectors on the back panel of the computer.

Installing a PCI Card

 **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

 **NOTE:** Dell offers a customer kit for Audigy II and IEEE 1394 PCI cards that includes a front-mounted IEEE 1394 connector. For more information about connecting the card cable to the I/O panel, see "I/O Panel" on page 251.


- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Press the release tabs on the card retention door and pivot the door open.

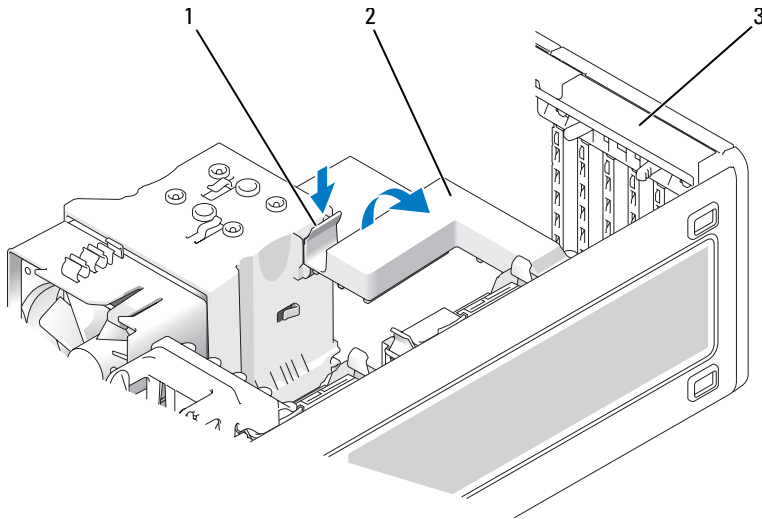


1 release tab

2 card retention door

- 4 Press the release tab on the card retention cover and pivot the cover open.

 **NOTE:** You can remove the card retention cover, if desired, and set it aside.




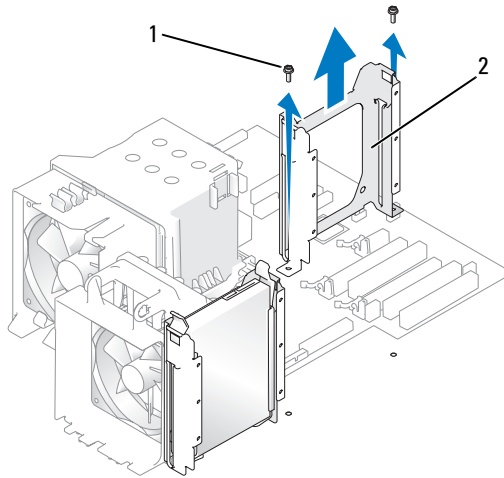
- | | | | |
|---|---------------------|---|----------------------|
| 1 | release tab | 2 | card retention cover |
| 3 | card retention door | | |

- 5 Remove the filler bracket to create a card-slot opening, if necessary.
- 6 Prepare the card for installation.

See the documentation that came with the card for information on configuring the card, making internal connections, or otherwise customizing it for your computer.

 **CAUTION:** Some network adapters automatically start the computer when they are connected to a network. To guard against electrical shock, be sure to unplug your computer from its electrical outlet before installing any cards.

 **NOTE:** The standard length for a PCI card in the last PCI slot (Slot6) is 5.5 in; however, you can install a 3/4-length PCI card (up to 10.5 in) by removing the second hard drive bay bracket.

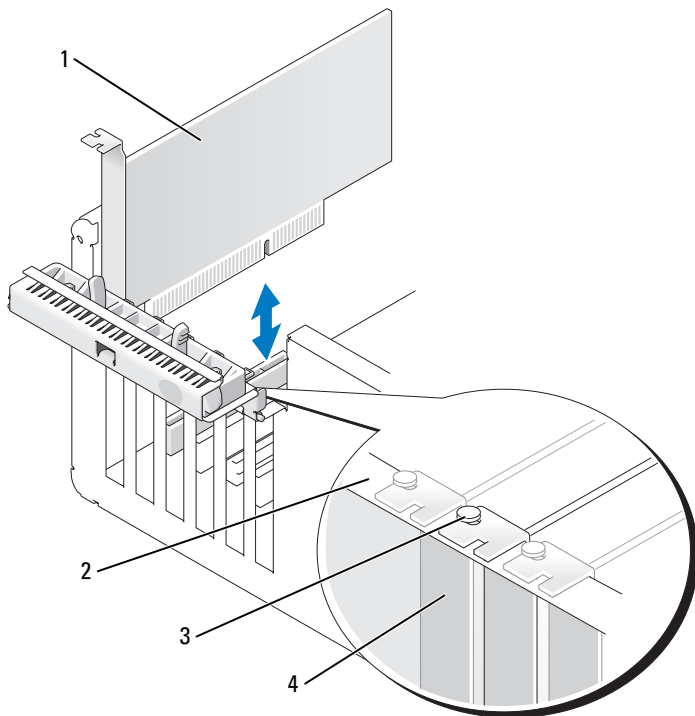


1 screws (2)

2 second hard drive bracket

7 Place the card in the connector and press down firmly.

Ensure that the card is fully seated in the slot, the top of the card is flush with the alignment bar, and the notch in the top of the card fits around the alignment guide.

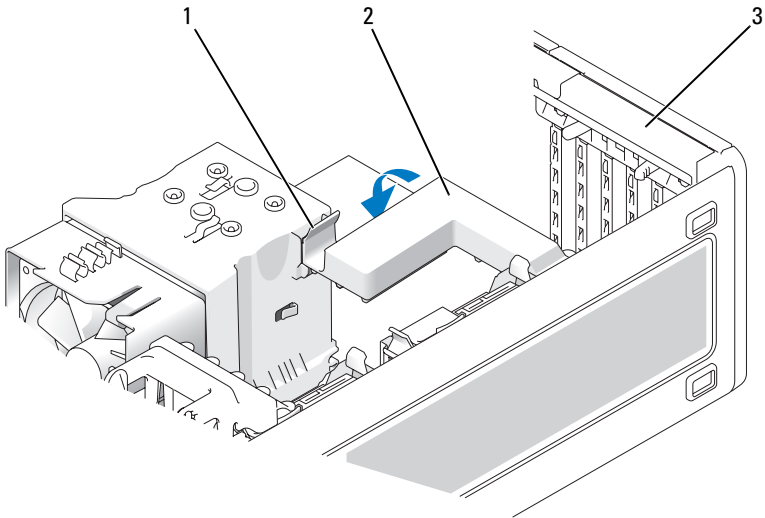


- | | | | |
|---|-----------------|---|----------------|
| 1 | PCI card | 2 | alignment bar |
| 3 | alignment guide | 4 | filler bracket |

➔ NOTICE: Do not route card cables over or behind the cards. Cables routed over the cards can prevent the computer cover from closing properly or cause damage to the equipment.

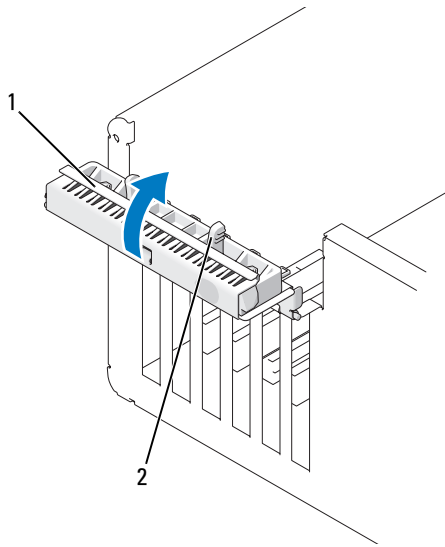
- 8 Connect any cables that should be attached to the card.
See the documentation for the card for information about the card's cable connections.
- 9 Ensure that the tops of all cards and filler brackets are flush with the alignment bar and that the notch in the top of the card or filler bracket fits around the alignment guide.

- 10** Reinstall the card retention cover, if removed.
- 11** Close the card retention cover by snapping it into place to secure the card(s).



- 1 release tab
- 2 card retention cover
- 3 card retention door

- 12** Close the card retention door by snapping it into place to secure the card(s).



1 card retention door

2 release tab

13 Replace the computer cover, (see "Replacing the Computer Cover" on page 262).

➔ NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.

14 Connect your computer and devices to electrical outlets, and then turn them on.

15 Update System Setup settings, as needed.

If you installed a sound card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated Audio**, and then change the setting to **Off**.

If you installed a network adapter card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated NIC**, and then change the setting to **Off**.

🔧 NOTE: Connect your external audio devices or your network cable to the connectors on the card. Do not use the connectors on the back panel of the computer.

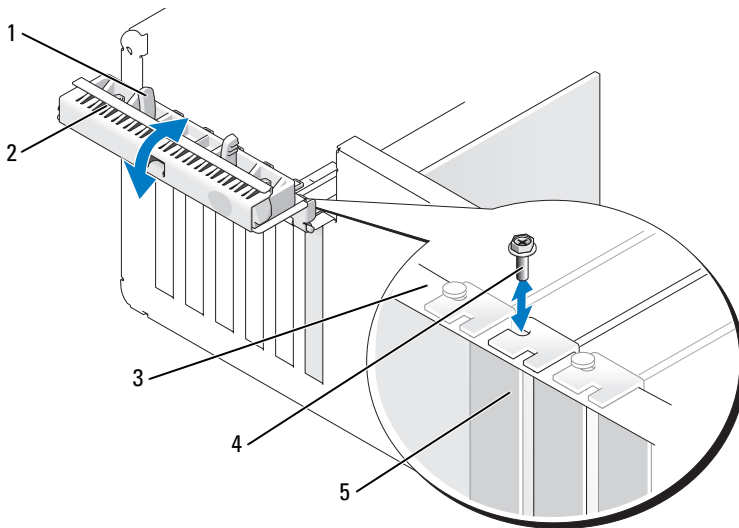
- 16 Install any drivers required for the card, as described in the card documentation.

PCI Express Cards

Removing a PCI Express Card


⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

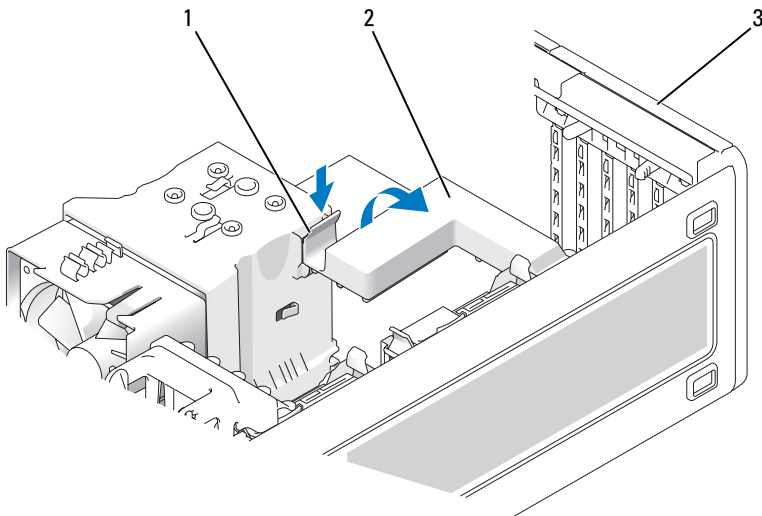
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Press the release tabs on the card retention door and pivot the door open.
- 4 Remove the screw that secures the PCI Express Card.



- | | | | |
|---|----------------|---|---------------------|
| 1 | release tab | 2 | card retention door |
| 3 | alignment bar | 4 | screw |
| 5 | filler bracket | | |

- 5 Press the release tab on the card retention cover and pivot the cover open.

 **NOTE:** You can remove the card retention cover, if desired, and set it aside.





1 release tab

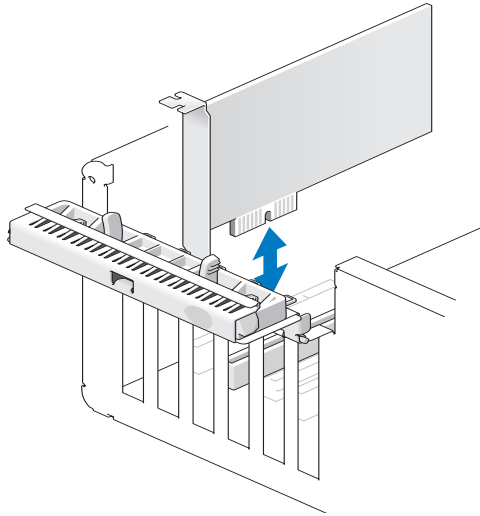
2 card retention cover

3 card retention door

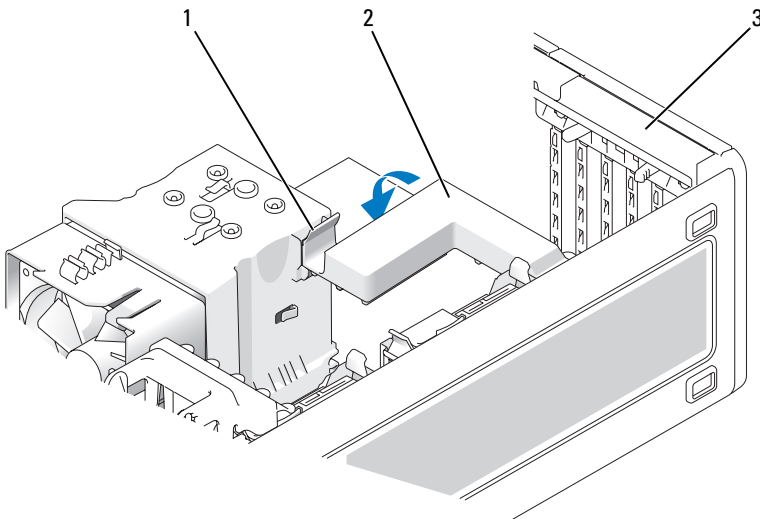
- 6 If necessary, disconnect any cables connected to the card. Grasp the card by its top corners, and ease it out of its connector.

 **NOTE:** If you are removing the card permanently, install a filler bracket in the empty card-slot opening.

 **NOTE:** Installing filler brackets over empty card-slot openings is necessary to maintain FCC certification of the computer. The brackets also keep dust and dirt out of your computer.



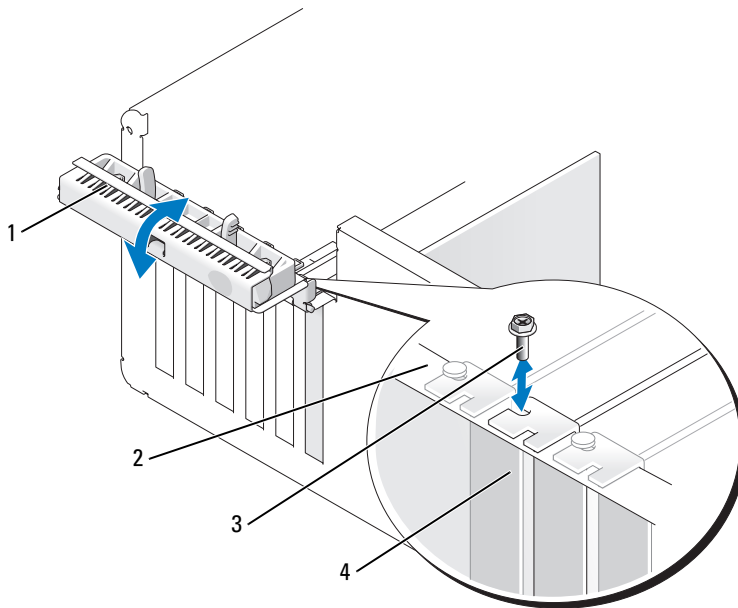
7 Close the card retention cover by snapping it into place to secure the card(s).



- 1 release tab
- 3 card retention door

- 2 card retention cover

- 8 Replace the screw in the alignment bar.
- 9 Close the card retention door.



- | | | | |
|---|---------------------|---|------------------|
| 1 | card retention door | 2 | alignment bar |
| 3 | screw | 4 | PCI Express Card |

10 Replace the computer cover, (see "Replacing the Computer Cover" on page 262).

➔ NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.


11 Connect your computer and devices to electrical outlets, and then turn them on.

12 Uninstall the driver for the removed card. See the documentation that came with the card.

- 13 Update System Setup settings, as needed.

If you removed a sound card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated Controller**, and then change the setting to **On**.

If you removed a network adapter card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated NIC**, and then change the setting to **On**.

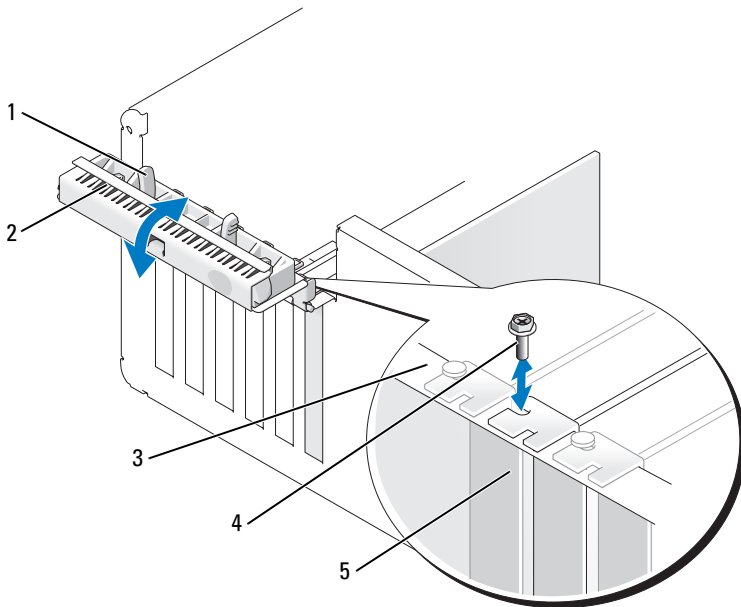
 **NOTE:** Connect your external audio devices or your network cable to the audio and network connectors on the back panel of the computer.

Installing a PCI Express Card



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Press the release tabs on the card retention door and pivot the door open.
- 4 Remove the screw in the alignment bar.

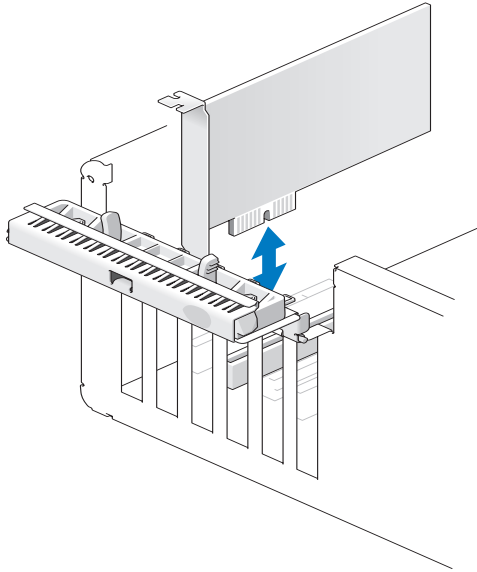


- | | | | |
|---|----------------|---|---------------------|
| 1 | release tab | 2 | card retention door |
| 3 | alignment bar | 4 | alignment guide |
| 5 | filler bracket | | |

5 Press the release tab on the card retention cover and pivot the cover open.

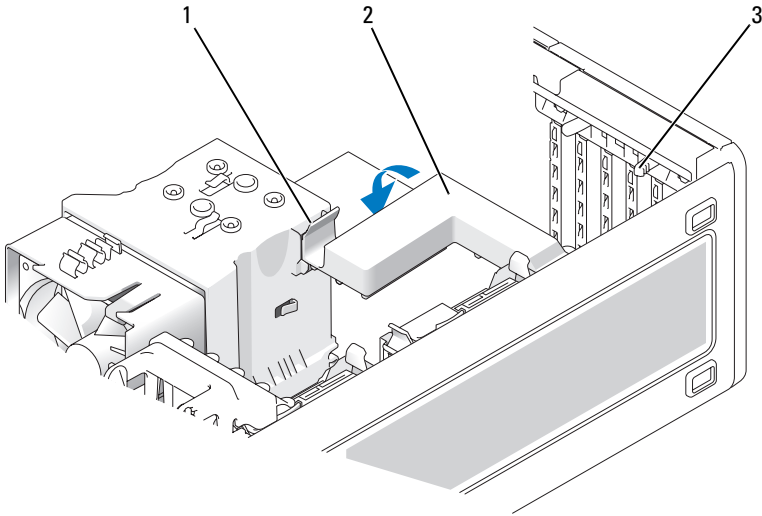


NOTE: You can remove the card retention cover, if desired, and set it aside.



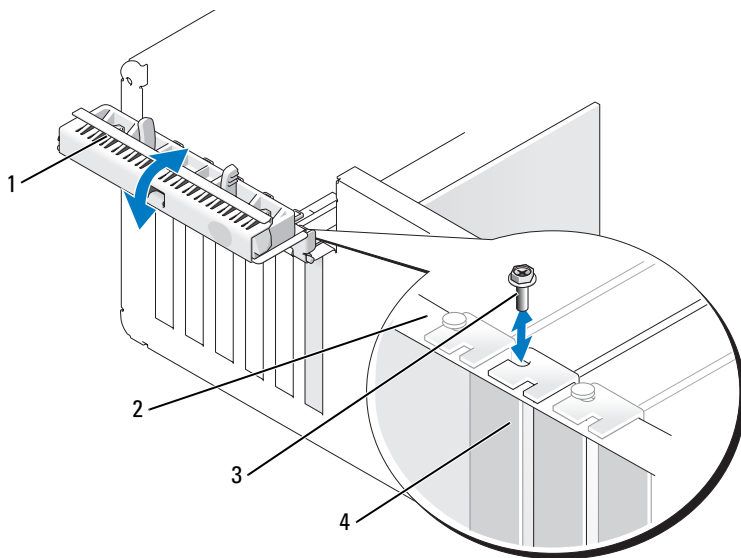
➔ NOTICE: Do not route card cables over or behind the cards. Cables routed over the cards can prevent the computer cover from closing properly or cause damage to the equipment.

- 9** Connect any cables that should be attached to the card.
See the documentation for the card for information about the card's cable connections.
- 10** Ensure that the tops of all cards and filler brackets are flush with the alignment bar and that the notch in the top of the card or filler bracket fits around the alignment guide.
- 11** Reinstall the card retention cover, if removed.
- 12** Close the card retention cover by snapping it into place to secure the card(s).



- 1 release tab
- 2 card retention cover
- 3 release tabs (2)

- 13** Replace the screw to secure the PCI Express Card.
- 14** Close the card retention door by snapping it into place to secure the card(s).



- | | | | |
|---|---------------------|---|------------------|
| 1 | card retention door | 2 | alignment bar |
| 3 | alignment guide | 4 | PCI Express card |

15 Replace the computer cover, (see "Replacing the Computer Cover" on page 262).

➔ NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.

16 Connect your computer and devices to electrical outlets, and then turn them on.

17 Update System Setup settings, as needed.

If you installed a sound card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated Audio**, and then change the setting to **Off**.

If you installed a network adapter card, enter System Setup (see "Entering System Setup" on page 81), select **Integrated NIC**, and then change the setting to **Off**.



NOTE: Connect your external audio devices or your network cable to the connectors on the card. Do not use the connectors on the back panel of the computer.

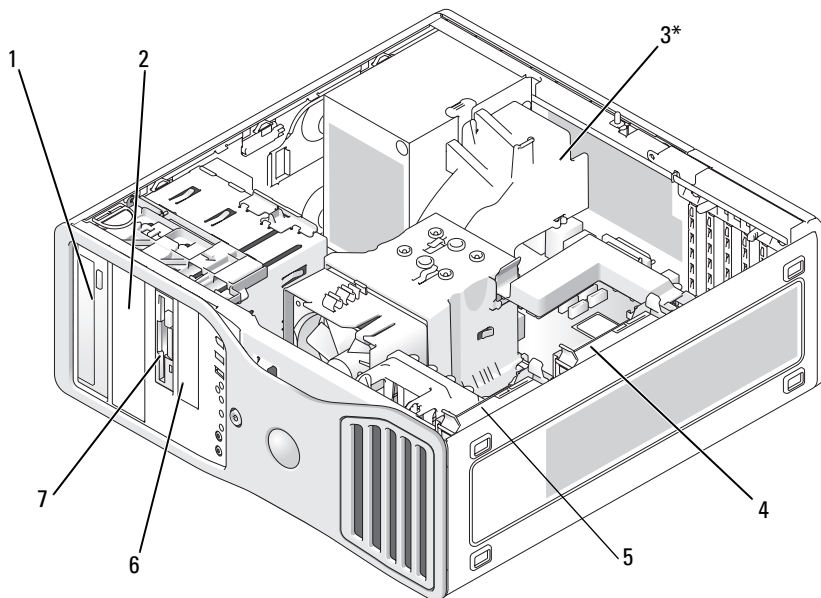
- 18 Install any drivers required for the card, as described in the card documentation.

Drives

Tower Computer Drive Configurations

Possible fully-populated computer configurations:

- Four serial ATA (SATA) hard drives, one optical drive, and one floppy drive or one Media Card Reader
- Three (SAS or SATA) hard drives, one optical drive, and one floppy drive or one Media Card Reader
- One or two (SAS or SATA) hard drives with up to two optical drives, one floppy drive, and one Media Card Reader



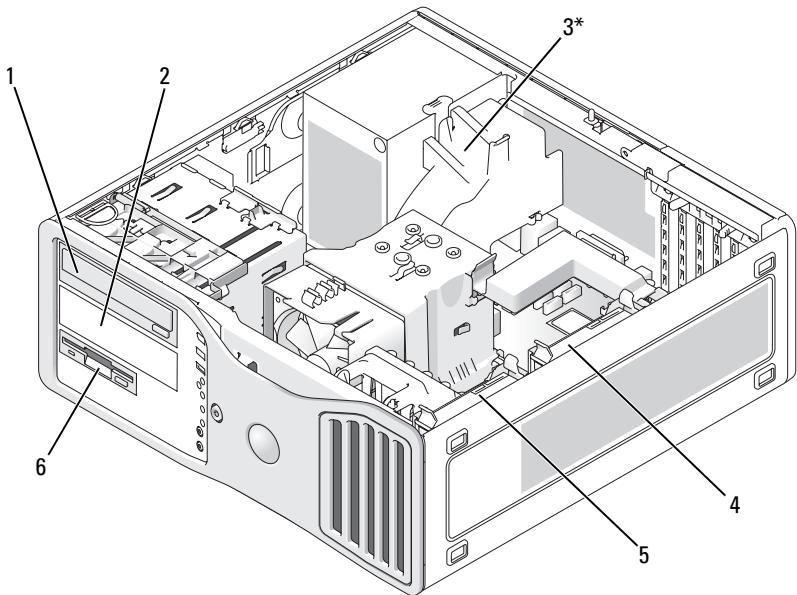
*an additional fan may be located here in computers with configurations with three SAS hard drives

- | | | | |
|----|---|---|---|
| 1 | upper 5.25-inch drive bay
(supports an optical drive) | 2 | lower 5.25-inch drive bay
(supports an optical drive or an additional SATA hard drive) |
| 3* | additional fan (not shown) | 4 | secondary hard drive bay |
| 5 | primary hard drive bay | 6 | lower 3.5-inch drive bay
(supports a floppy drive or a Media Card Reader) |
| 7 | upper 3.5-inch drive bay
(supports a floppy drive, a Media Card Reader, or an additional SATA or SAS hard drive) | | |

Desktop Computer Drive Configurations

Possible fully-populated computer configurations:


- Three hard drives (two SAS and one SATA, one SAS and two SATA, or three SATA drives), one optical drive, and one floppy drive or one Media Card Reader
- One or two (SAS or SATA) hard drives with up to two optical drives, one floppy drive, and one Media Card Reader




*an additional fan may be located here in computers with configurations with three SAS hard drives

- | | | | |
|----|---|---|--|
| 1 | upper 5.25-inch drive bay (supports an optical drive) | 2 | lower 5.25-inch drive bay (supports an optical drive or an additional SATA hard drive) |
| 3* | additional fan location (not shown) | 4 | secondary hard drive bay |
| 5 | primary hard drive bay | 6 | 3.5-inch drive bay (supports a floppy drive or a Media Card Reader) |

About Metal Shields (Present in Some Drive Configurations)

-  **NOTICE:** If metal shields are present in your computer configuration, they must be installed at all times while your computer is in use or your computer may not function properly.

In certain computer configurations, metal shields are present in the drive bays of your computer. If metal shields are present in your computer configuration, they are essential and must be installed in the appropriate bays at all times.

-  **NOTE:** If a metal shield is installed over a hard drive in the lower 5.25-inch drive bay, and you install an optical drive in its place, a shield is not needed in that bay; however, the metal shield should be kept in case it is needed later.

If you remove a hard drive, optical drive, media card reader, or floppy drive from your computer, install a metal shield in its place. If a metal shield is not installed in any of these cases, your computer may not function properly. Contact Dell if you need an extra shield (see "Contacting Dell" on page 269).

Removing and Replacing the Metal Shield (Lower Drive Bays)

TO REMOVE A METAL SHIELD FROM A LOWER DRIVE BAY:

Slide the sliding-plate lever to the right and hold it in place as you pull to remove the vented metal insert from the drive bay.

TO REPLACE A METAL SHIELD OVER A LOWER DRIVE BAY:

- 1 Align the metal insert's two upper screws and two lower screws with the corresponding slots inside the FlexBay.
- 2 Push the vented metal insert until it clicks into place and its metal tabs rest flush against the chassis surface.

Removing and Replacing the Metal Shield (Upper Drive Bays)

TO REMOVE A METAL SHIELD FROM AN UPPER DRIVE BAY:

- 1 Grasp tab located in the front-center of the metal shield.
- 2 Pull the shield out by the tab in a straight motion to avoid tearing the tab from the shield.

TO REPLACE A METAL SHIELD OVER AN UPPER DRIVE BAY:

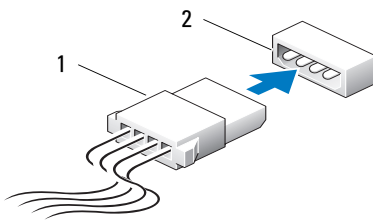
Align the shield so that it fits snugly with the drive bay and press in gently until the shield is flush with the surface of the bay.

General Installation Guidelines

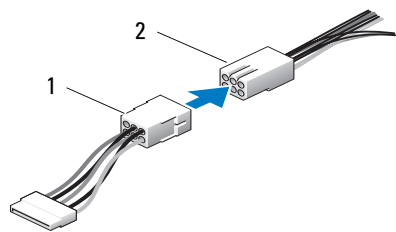
When you install a drive, you connect two cables—a DC power cable and a data cable—to the back of the drive. The DC power cable is connected to the power supply while the other end of the data cable connects an expansion card or the system board. Most connectors are keyed for correct insertion (a notch or a missing pin on one connector corresponds to a tab or a filled-in hole on another connector).

When connecting a SAS or SATA cable, hold the cable by the connector at each end and press firmly into the connector. When disconnecting a SAS or SATA cable, hold the cable by the connector at each end and pull until the connector detaches.

Power Cable Connectors

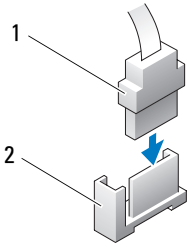


1 power cable



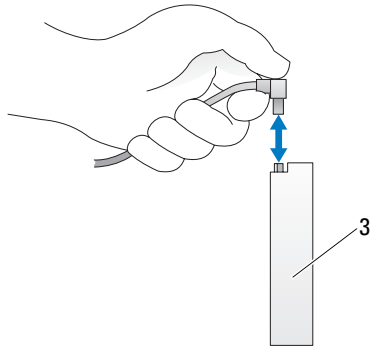
2 power input connector

SATA Data Cable Connectors



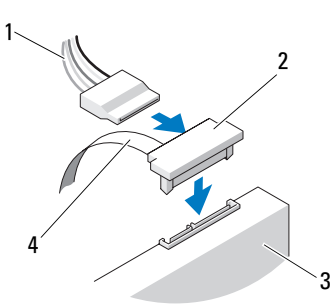
1 SATA data cable

3 SATA drive



2 SATA data connector on the system board

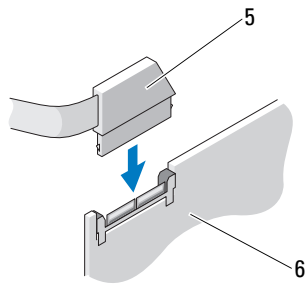
SAS Data Cable Connectors



1 power cable

3 SAS drive

5 SAS connector



2 SAS connector






4 SAS data cable

6 optional PCI Express SAS controller card

Drive Cable Colors

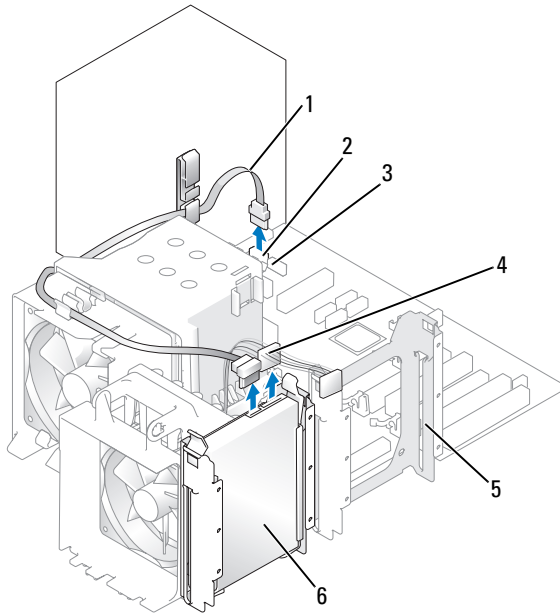
Device	Color
Hard drive	blue cable
Floppy drive	black pull-tab
optical drive	orange cable

Hard Drive

-  **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
-  **CAUTION:** For configurations with three SAS hard drives, you must install an additional fan (see "Installing an Additional Fan" on page 210).
-  **NOTICE:** To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.
-  **NOTICE:** To avoid damage to the hard drive, do not place the drive on a hard surface. Instead, place the drive on a sufficiently cushioned surface, such as a foam pad.
-  **NOTICE:** Mixing SATA and SAS hard drives in the same RAID configuration may cause your computer to not function properly.

Removing a Hard Drive (Tower or Desktop Computer)

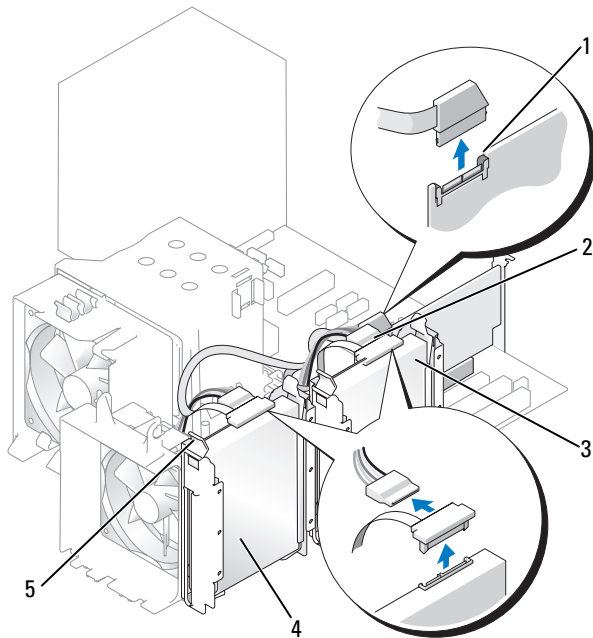
- 1 If you are replacing a hard drive that contains data that you want to keep, back up your files before you begin this procedure.
- 2 Follow the procedures in "Before You Begin" on page 143.
- 3 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 4 Disconnect the power cable from the hard drive.
- 5 *To remove a serial ATA hard drive:*
 - a Disconnect the serial ATA cable from the hard drive.
 - b Disconnect the serial ATA cable from the SATA0 or SATA1 connector on the system board, depending on whether you are removing the hard drive from the secondary or primary hard drive bay.



- | | | | |
|---|--------------------------|---|--------------------------------------|
| 1 | serial ATA cable | 2 | SATA0 connector |
| 3 | SATA1 connector | 4 | power cable |
| 5 | secondary hard drive bay | 6 | hard drive in primary hard drive bay |

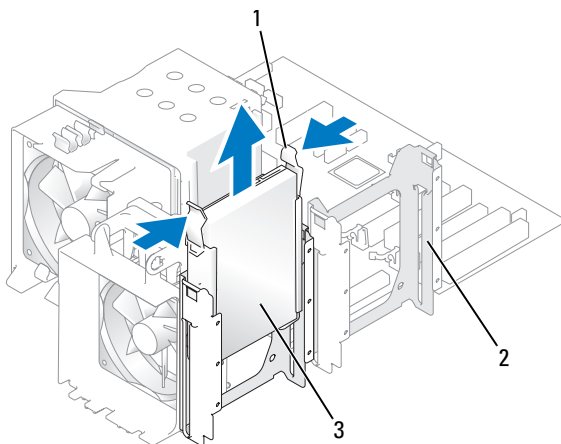
To remove a SAS hard drive:

- a** Disconnect the power cable from the SAS drive.
- b** Remove the SAS connector from the hard drive.
- c** Disconnect the SAS cable from the SAS controller card.



- | | | | |
|---|--|---|--------------------------------------|
| 1 | SAS connector on SAS controller card | 2 | SAS connector on SAS controller card |
| 3 | hard drive in secondary hard drive bay | 4 | hard drive in primary hard drive bay |
| 5 | blue tabs (2 on each hard drive bracket) | | |

- 6** Press in on the blue tabs on each side of the hard drive bracket and slide the drive up and out of the primary or secondary hard drive bay.



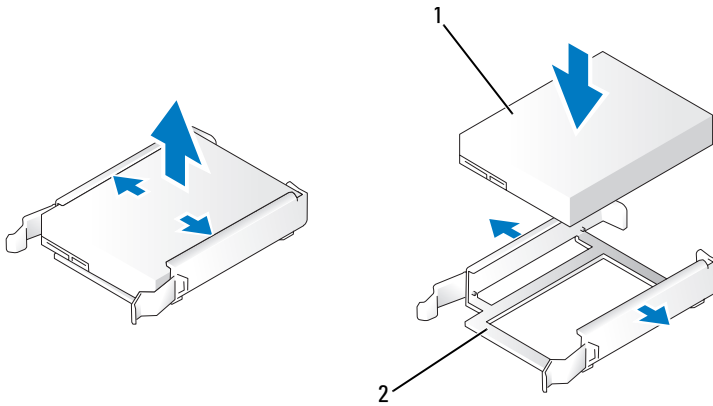
- 1 blue tabs (2)
- 2 secondary hard drive bay
- 3 hard drive in primary hard drive bay

Installing a Hard Drive *or* Adding a Second Optional Hard Drive (Tower or Desktop Computer)

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Unpack the replacement hard drive, and prepare it for installation.
- 4 Check the documentation for the hard drive to verify that the drive is configured for your computer.

NOTE: If a hard drive bracket is still installed in the inside of the hard drive bay, remove the bracket before you install the new hard drive *with* the new or old hard drive bracket.

- 5 If your replacement hard drive does not have the hard drive bracket attached, remove the bracket from the old drive by unsnapping it from the drive. Snap the bracket onto the new drive.



1 drive

2 hard-drive bracket

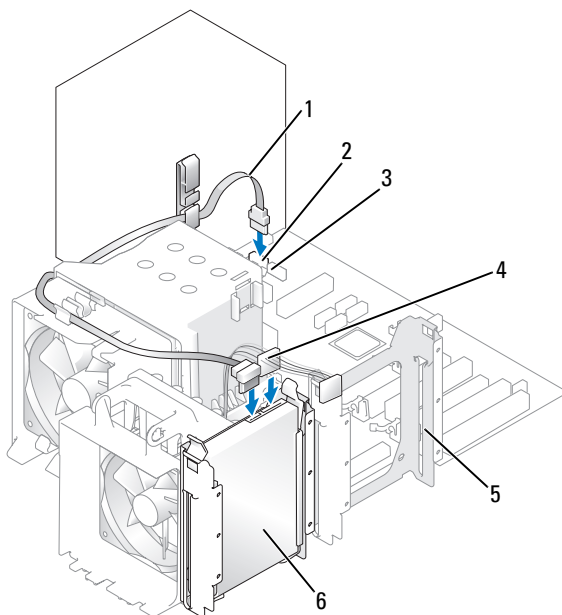
➔ **NOTICE:** *If you are installing only one hard drive, install it in the primary hard-drive bay. If you are adding a second hard drive, install it in the secondary hard-drive bay.*

- 6 Slide the hard drive into the primary or secondary hard drive bay until it clicks securely into place.
- 7 Connect the power cable to the drive.
- 8 Install the hard drive.

To install a serial ATA hard drive:

- a Connect one end of the serial ATA cable to the hard drive.
- b *If you are installing a serial ATA hard drive in the primary hard-drive bay, connect the other end of the serial ATA cable to the SATA0 connector on the system board.*

If you are installing a serial ATA hard drive in the secondary hard-drive bay, connect the other end of the serial ATA cable to the SATA1 connector on the system board.



- | | | | |
|---|--------------------------|---|--------------------------------------|
| 1 | serial ATA cable | 2 | SATA0 connector |
| 3 | SATA1 connector | 4 | power cable |
| 5 | secondary hard drive bay | 6 | hard drive in primary hard drive bay |

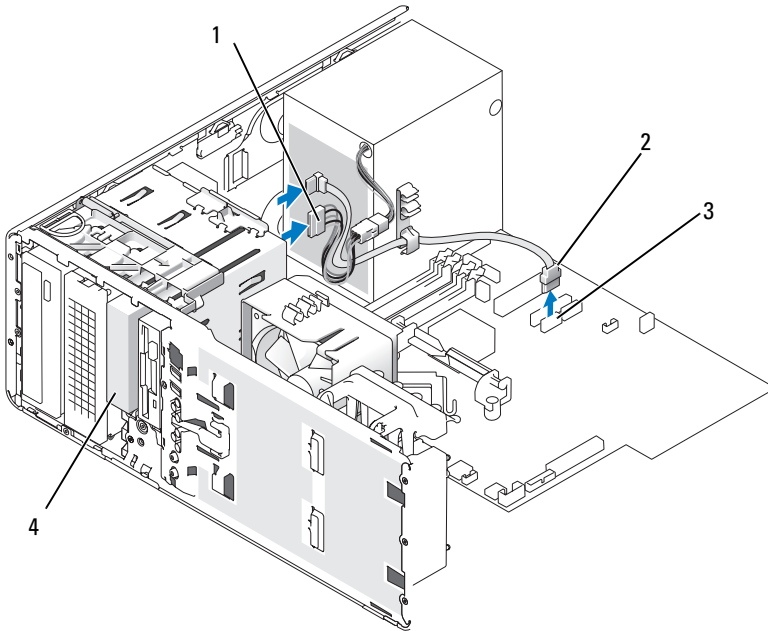
To install a SAS hard drive:

- a** Connect the power cable to the SAS connector.
 - b** Connect the SAS connector to the hard drive.
 - c** Connect the other end of the SAS cable to the SAS controller card.
- 9** Ensure that all connectors are properly cabled and firmly seated.
 - 10** Replace the computer cover (see "Replacing the Computer Cover" on page 262).
- ➔ NOTICE:** To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.

- 11 Connect the computer and devices to electrical outlets, and turn them on. See the documentation that came with the drive for instructions on installing any software required for drive operation.
- 12 If the drive you just installed is the primary drive, insert a bootable floppy disk into drive A.
- 13 Turn on the computer.
- 14 Enter System Setup (see "Entering System Setup" on page 81), and update the appropriate **Primary Drive** option (0 or 1).
- 15 Exit System Setup, and reboot the computer.
- 16 Partition and logically format your drive before you proceed to the next step.
See the documentation for your operating system for instructions.
- 17 Test the hard drive by running the Dell Diagnostics (see "Dell Diagnostics" on page 107).
- 18 If the drive you just installed is the primary drive, install your operating system on the hard drive.

Removing an Optional Third Hard Drive (Tower Computer)

- 1 If you are replacing a hard drive that contains data that you want to keep, back up your files before you begin this procedure.
- 2 Follow the procedures in "Before You Begin" on page 143.
- 3 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 4 Remove the front panel (see "Removing the Front Panel" on page 154).
- 5 Disconnect the power cable from the back of the hard drive and from the power supply.
- 6 *If you are removing a SATA drive*, disconnect the serial ATA cable from the back of the hard drive and from the SATA connector on the system board.




- | | | | |
|---|----------------|---|--|
| 1 | power cable | 2 | serial ATA cable |
| 3 | SATA connector | 4 | optional third serial ATA/SAS hard drive |

7 *If you are removing a SAS drive:*

- a** Disconnect the power cable from the SAS connector.
 - b** Disconnect the SAS connector from the hard drive.
 - c** Disconnect the SAS connector from the SAS controller card.
- 8** Slide the sliding-plate lever to the right to release the shoulder screw and slide the drive out of the lower 3.5-inch drive bay.
- 9** Set the drive aside in a secure location.


- 10 If you are removing a hard drive that has a metal shield, and are not going to install a replacement drive in the drive bay, reinstall the shield in the empty bay (see "About Metal Shields (Present in Some Drive Configurations)" on page 188). Then, install a drive-panel insert (see "Installing a Drive-Panel Insert" on page 218).

Installing an Optional Third Hard Drive (Tower Computer)

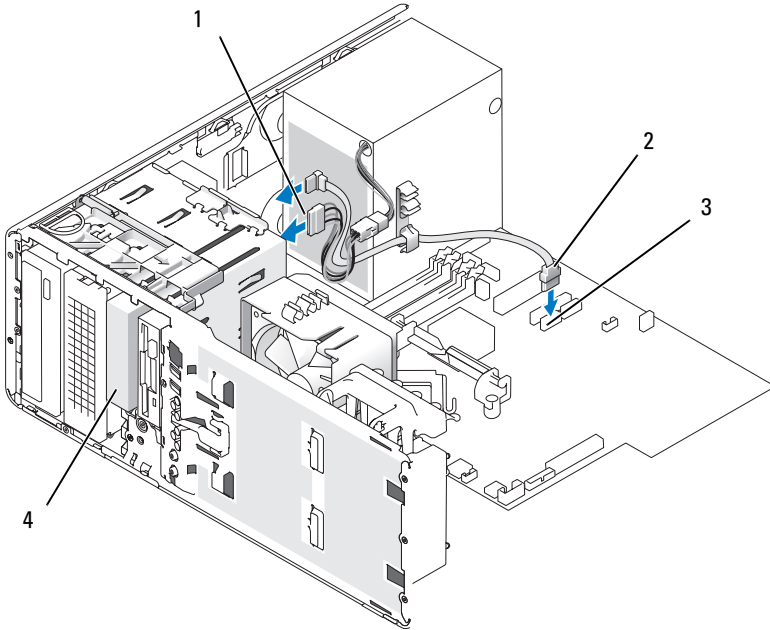
 **NOTICE:** Do not attempt to install a SAS hard drive in the lower 3.5-inch drive bay. This drive bay will only support a floppy drive or a Media Card Reader.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 If you are installing a new drive, unpack the drive and prepare it for installation.

Check the documentation for the drive to verify that it is configured for your computer.

 **NOTE:** Drive-panel inserts may contain screws on the inside. You can attach the screws to new drives that do not have any screws.

- 4 *If you are installing a new drive*, remove the drive panel (see "Removing the Drive Panel (Tower Computer)" on page 213) and the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) from the upper 3.5-inch drive bay. Use the screws provided with the new drive to install the drive into the drive bay.
- 5 If the FlexBay is not populated and metal shields are present in your computer (see "About Metal Shields (Present in Some Drive Configurations)" on page 188), remove the vented metal insert:
 - a Pull the vented metal insert forward until its surface is flush with that of the surrounding chassis.
 - b Rotate the bottom of the metal insert up towards you, disengaging its lower screws from the surrounding metal.
 - c Lift the metal insert from the computer, disengaging its top screws and metal tabs from the surrounding metal.



- | | | | |
|---|----------------|---|--|
| 1 | power cable | 2 | serial ATA cable |
| 3 | SATA connector | 4 | optional third serial ATA/SAS hard drive |

6 *If you are installing a serial ATA drive:*

- a** Connect a power cable to the back of the hard drive and to the power supply.
- b** Connect the serial ATA cable to the back of the hard drive and to the SATA connector on the system board.

7 *If you are installing a SAS drive:*

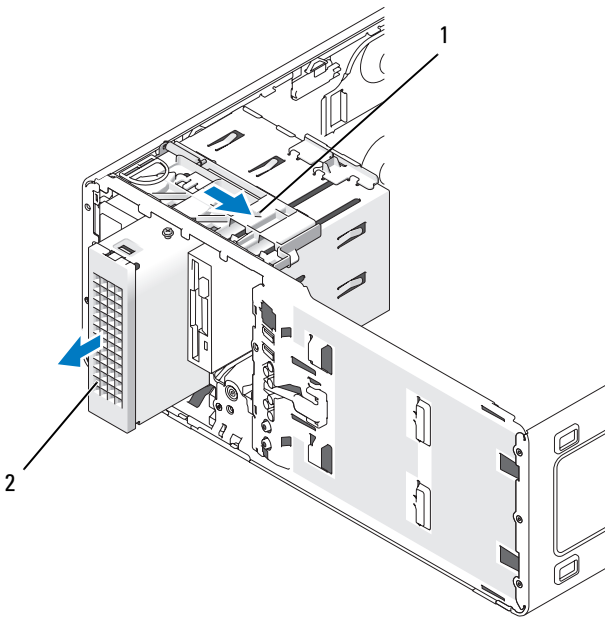
- a** Connect the power cable to the SAS connector.
- b** Connect the SAS connector to the back of the drive.
- c** Connect the SAS cable to the SAS controller card.

Removing an Optional Fourth SATA Hard Drive (Tower Computer)



NOTE: A tower configuration is illustrated.

- 1 If you are replacing a hard drive that contains data that you want to keep, back up your files before you begin this procedure.
- 2 Follow the procedures in "Before You Begin" on page 143.
- 3 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 4 Remove the front panel (see "Removing the Front Panel" on page 154).
- 5 Disconnect the power cable from the back of the hard drive.
- 6 Disconnect the serial ATA cable from the back of the hard drive and from the SATA connector on the system board.



1 sliding-plate lever

2 optional fourth hard drive

- 7 Slide the sliding-plate lever to release the shoulder screw and slide the drive out of the lower 5.25-inch drive bay.
- 8 Set the drive aside in a secure location.

Installing an Optional Fourth Hard Drive (Tower Computer)



NOTICE: In a tower configuration with multiple optional drives, there can only be one floppy drive or Media Card Reader, which must be installed in the *lower* 3.5-inch drive bay. The third hard drive must occupy the *upper* 3.5-inch drive bay. The fourth hard drive must occupy the lower 5.25-inch drive bay.

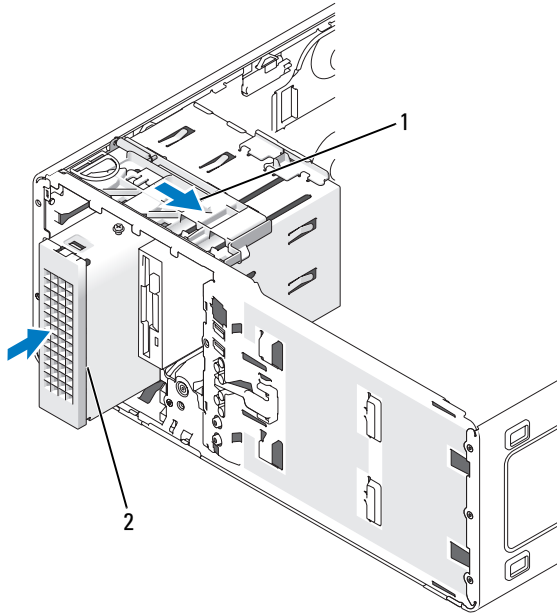
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 If you are installing a new drive, unpack the drive and prepare it for installation.

Check the documentation for the drive to verify that it is configured for your computer.



NOTE: Drive-panel inserts may contain screws on the inside. You can attach the screws to new drives that do not have any screws.

- 4 *If you are installing a new drive*, remove the drive panel (see "Removing the Drive Panel (Tower Computer)" on page 213) and the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) from the lower 5.25-inch drive bay. Use the screws provided with the new drive to install the drive into the drive bay.
- 5 Slide the sliding-plate lever and hold it in place as you guide the drive into the lower 5.25-inch drive bay and gently slide it in until it is securely seated.



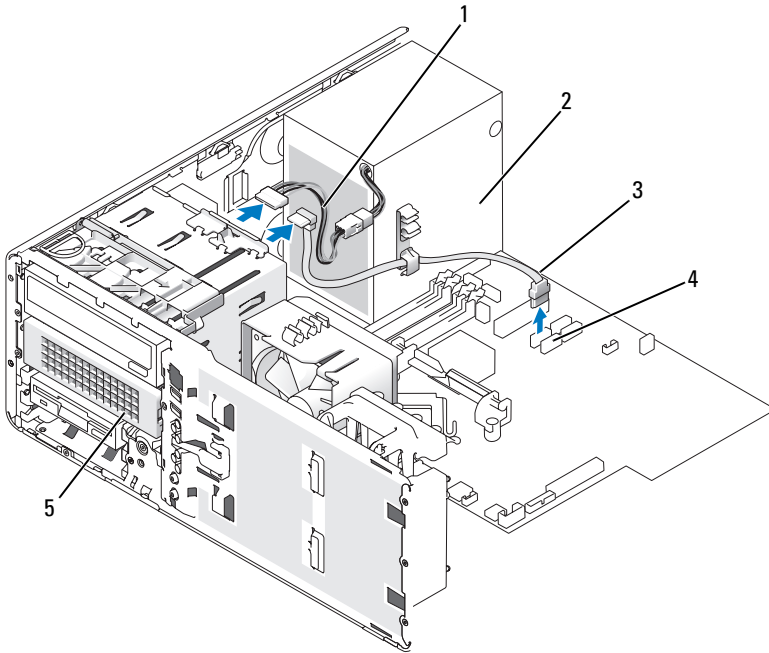
- 1 sliding-plate lever 2 optional fourth hard drive

- 6 Connect a power cable to the hard drive and to the power supply.
- 7 Connect the serial ATA cable to the back of the drive and to the SATA connector on the system board.

Removing an Optional Third Hard Drive (Desktop Computer)

- 1 If you are replacing a hard drive that contains data that you want to keep, back up your files before you begin this procedure.
- 2 Follow the procedures in "Before You Begin" on page 143.
- 3 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 4 Remove the front panel (see "Removing the Front Panel" on page 154).
- 5 Disconnect the power cable from the back of the hard drive and from the power supply.

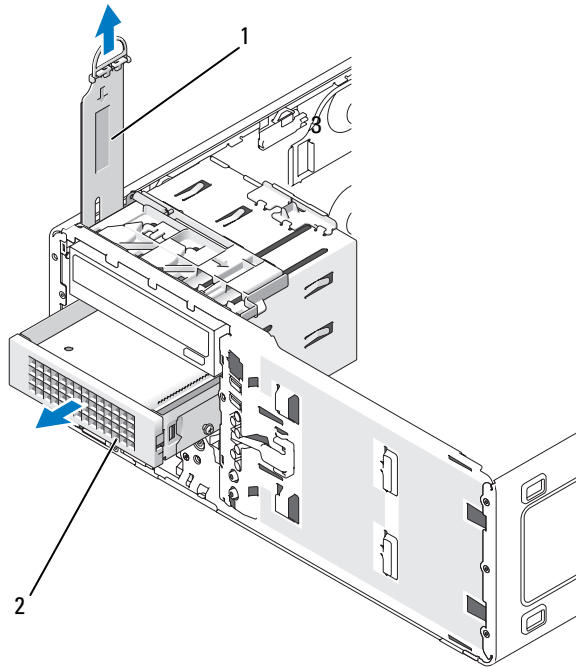
- 6** *If you are removing a SATA drive, disconnect the serial ATA cable from the back of the hard drive and from the SATA connector on the system board.*



- | | | | |
|---|---|---|----------------|
| 1 | power cable | 2 | power supply |
| 3 | serial ATA cable | 4 | SATA connector |
| 5 | optional serial ATA hard drive in lower 5.25-inch drive bay | | |

- 7** *If you are removing a SAS drive:*

- a** Disconnect the power cable from the SAS connector.
 - b** Disconnect the SAS connector from the hard drive.
 - c** Disconnect the SAS connector from the SAS controller card.
- 8** Slide the sliding-plate lever to the right to release the shoulder screw and slide the drive out of the lower 5.25-inch drive bay.



- 1 sliding-plate lever
- 2 optional third hard drive in lower 5.25-inch drive bay

- 9 Set the drive aside in a secure location.
- 10 If you are removing a hard drive that has a metal shield, and are not going to install a replacement drive in the drive bay, reinstall the shield in the empty bay (see "About Metal Shields (Present in Some Drive Configurations)" on page 188). Then, install a drive-panel insert (see Replacing a Drive-Panel Insert).

Installing an Optional Third Hard Drive (Desktop Computer)

⚠ CAUTION: For configurations with three SAS hard drives, you must install an additional fan (see "Installing an Additional Fan" on page 210).

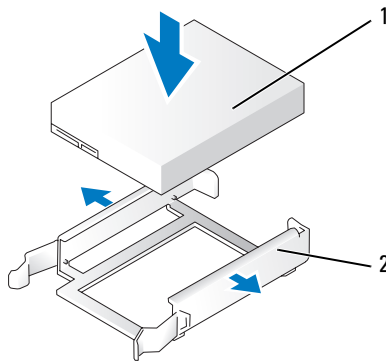
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 If you are installing a new drive, unpack the drive and prepare it for installation.

Check the documentation for the drive to verify that it is configured for your computer.

- 4 *If you are installing a new drive*, remove the drive panel (see "Removing the Drive Panel (Desktop Computer)" on page 215) and the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) from the lower 5.25-inch drive bay.

If you already have a drive installed in the lower 5.25-inch drive bay, remove the optical or hard drive.

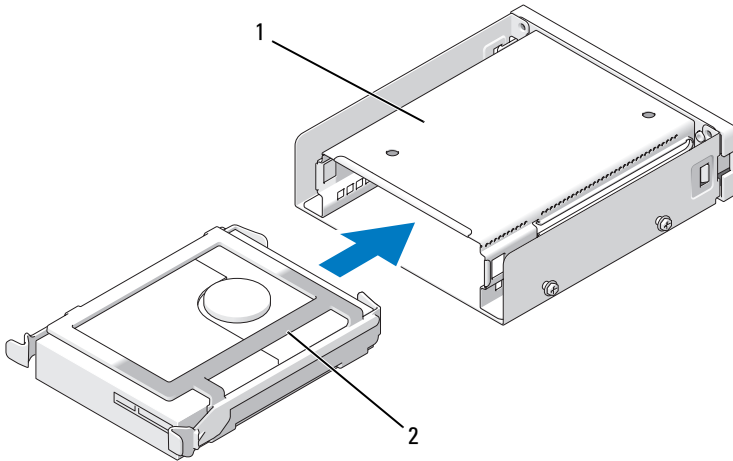
- 5 Place the hard drive in the hard-drive bracket and press the drive down until it snaps securely into place.



1 hard drive

2 hard-drive bracket

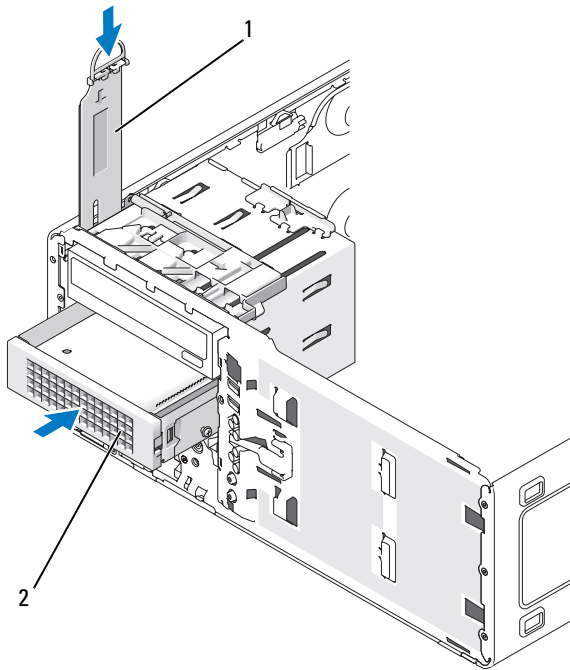
- 6 Slide the hard drive in the hard-drive bracket into the hard-drive holder.



1 hard-drive holder

2 hard drive in hard-drive bracket

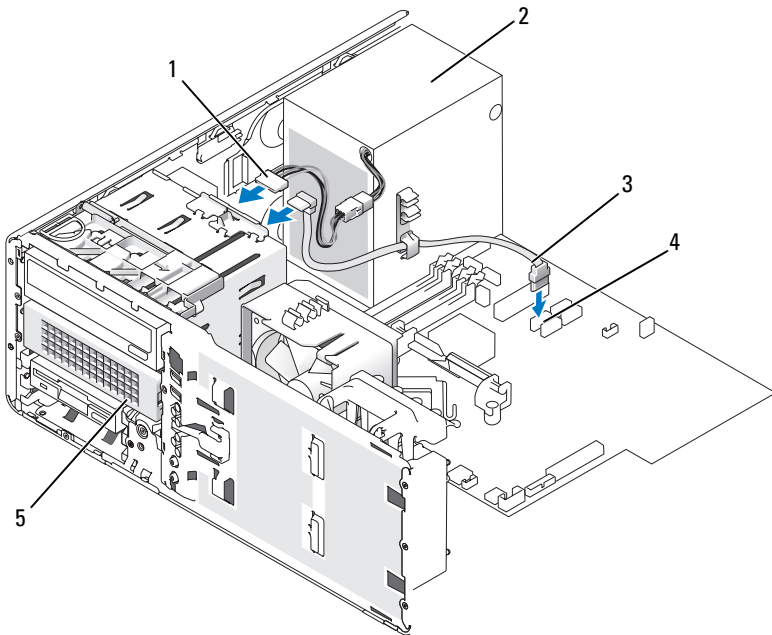
- 7** Slide the hard-drive holder into the lower 5.25-inch drive bay until it is securely seated.



1 sliding-plate lever

2 hard-drive holder with hard drive
The optional third hard drive is located in the lower 5.25-inch drive bay for desktop computers.






- 8 Connect a power cable to the hard drive and to the power supply.
- 9 Connect the serial ATA cable to the back of the drive and to the SATA connector on the system board.

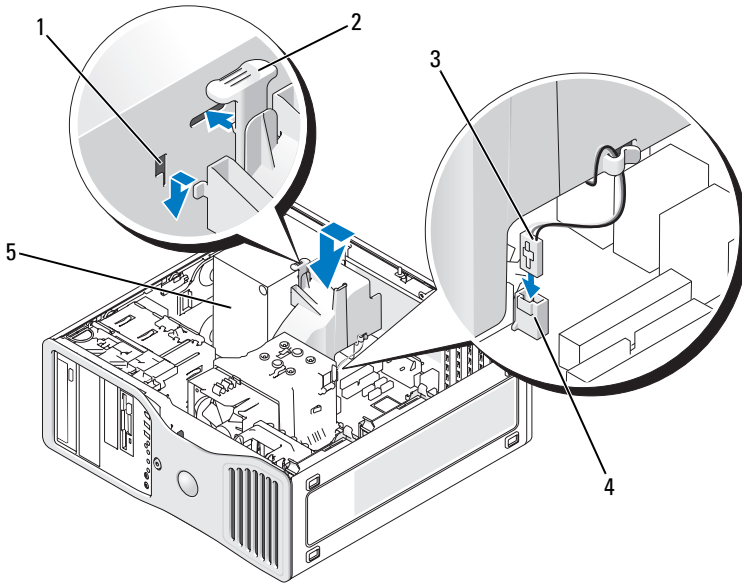


- | | | | |
|---|---|---|----------------|
| 1 | power cable | 2 | power supply |
| 3 | serial ATA cable | 4 | SATA connector |
| 5 | optional serial ATA hard drive
(desktop illustrated) | | |

The optional third hard drive is located in the lower 5.25-inch drive bay for desktop computers.

Installing an Additional Fan

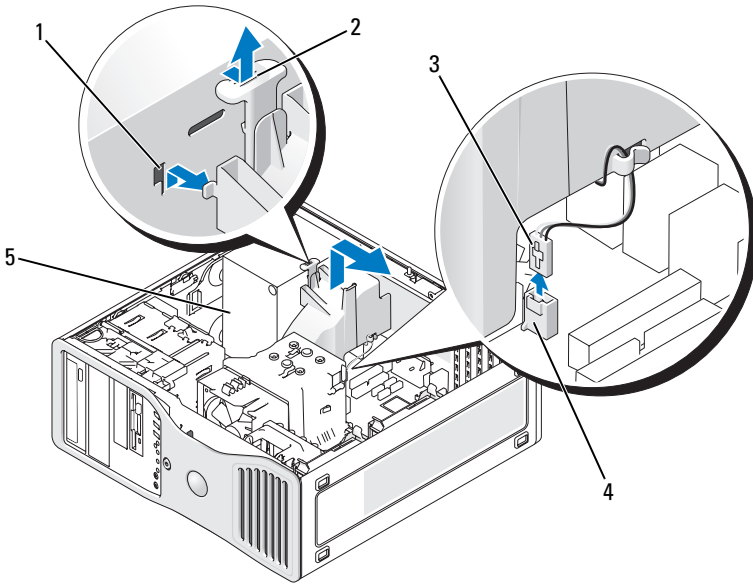
-  **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
-  **CAUTION:** To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.
-  **CAUTION:** For configurations with three SAS hard drives, you must install an additional fan.
-  **NOTICE:** To avoid damage to the drive, do not set it on a hard surface. Instead, set the drive on a surface, such as a foam pad, that will sufficiently cushion it.
 - 1 Follow the procedures in "Before You Begin" on page 143.
 - 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
-  **NOTICE:** When placing the fan in the computer, ensure that the cables of other components, such as the power supply, remain in their proper position.
 - 3 Place the fan flush with the side of the power supply and engage the fan hooks in the three fan slots in the side of the power supply.
 - 4 Slide the fan down until it clicks into place.
 - 5 Connect the fan cable to the fan connector on the system board.



- | | | | |
|---|---------------|---|-------------------------------|
| 1 | fan slots (3) | 2 | fan release tab |
| 3 | fan cable | 4 | fan connector on system board |
| 5 | power supply | | |

To remove the fan:

- 1 Disconnect the fan cable from the fan and from the fan connector on the system board.
- 2 Press in on the fan release tab and lift to remove the fan.



- | | | | |
|---|---------------|---|-------------------------------|
| 1 | fan slots (3) | 2 | fan release tab |
| 3 | fan cable | 4 | fan connector on system board |
| 5 | power supply | | |

3 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

Drive Panel

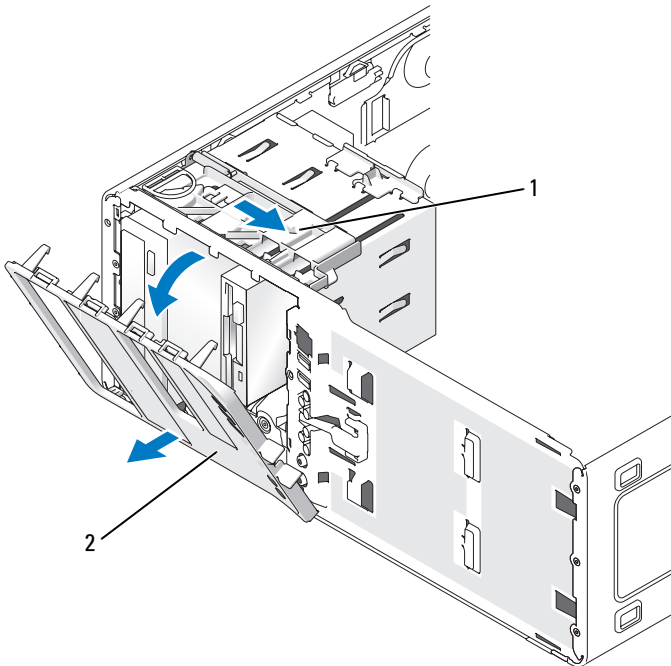


NOTE: For both tower computers and desktop computers, your drive panel may or may not have a slot for the IEEE 1394 connector.

Removing the Drive Panel (Tower Computer)

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Grasp the drive release latch and slide it towards the base of the computer until the drive panel snaps open.
- 5 Pivot the drive panel outward, and lift to remove it.



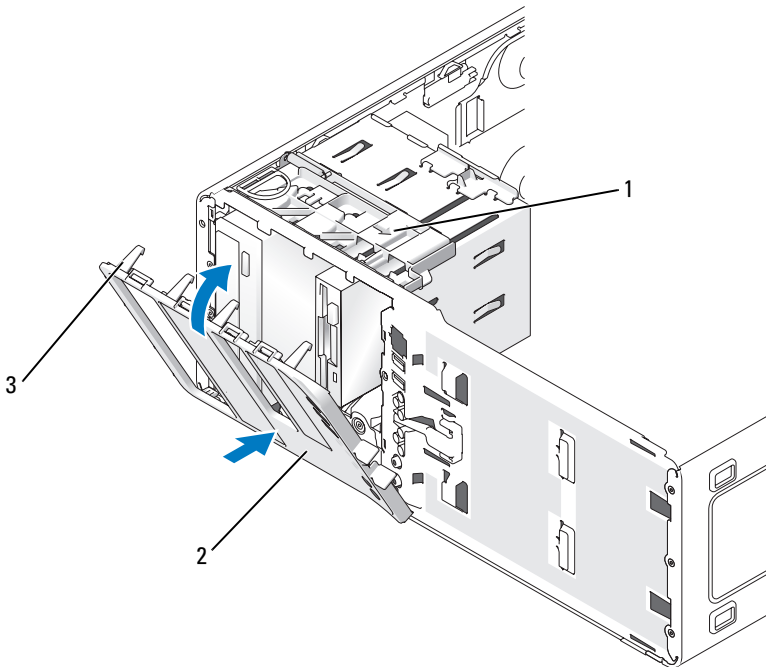
1 drive release latch

2 drive panel

Replacing the Drive Panel (Tower Computer)


⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Align the drive-panel tabs with the side-door hinges.
- 5 Rotate the drive panel toward the computer until it snaps into place.



- 1 drive release latch
- 3 drive panel tabs

2 drive panel

 **NOTE:** If you are changing from a desktop orientation to a tower orientation, use the tab on the back of the front panel to rotate the Dell badge, as desired.

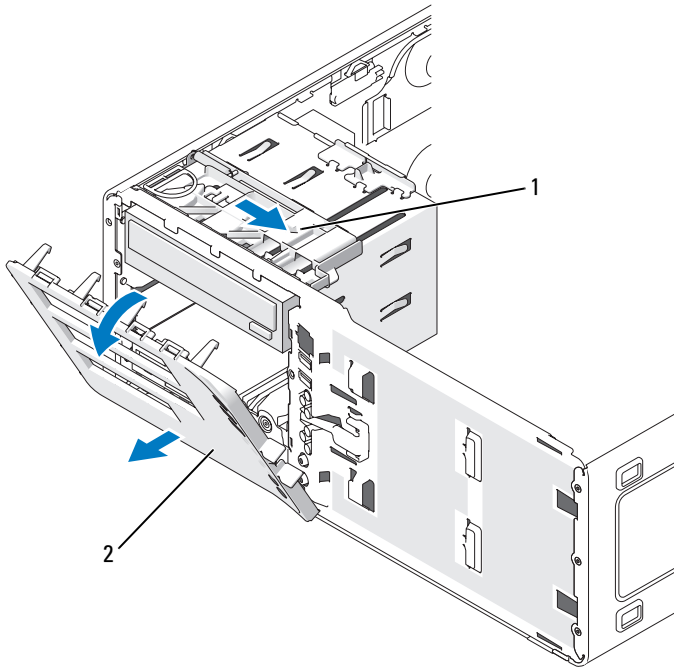
- 6 Replace the front panel (see "Replacing the Front Panel" on page 261).
- 7 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

Removing the Drive Panel (Desktop Computer)



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Grasp the drive release latch and slide it towards the base of the computer until the drive panel snaps open.
- 5 Pivot the drive panel outward, and lift to remove it.



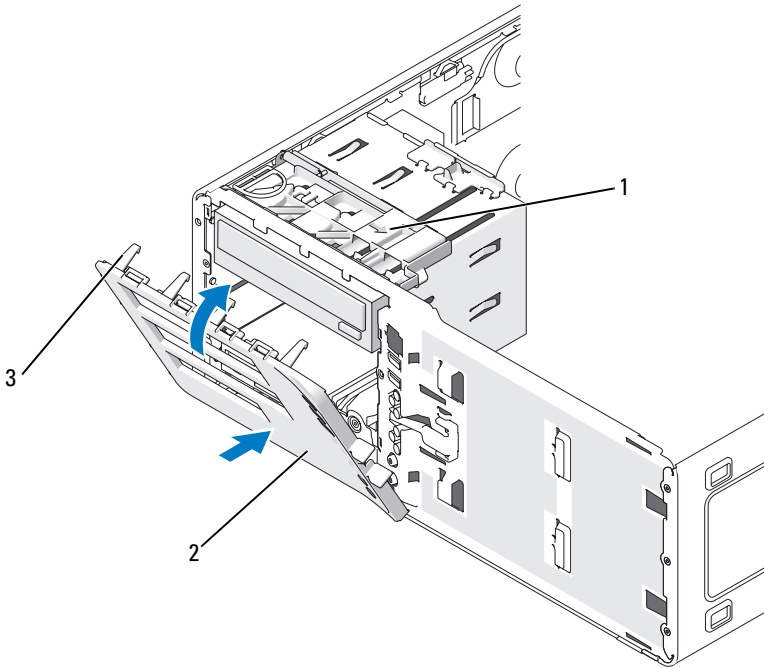
1 drive release latch

2 drive panel

Replacing the Drive Panel (Desktop Computer)

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Align the drive-panel tabs with the side-door hinges.
- 5 Rotate the drive panel toward the computer until it snaps into place.



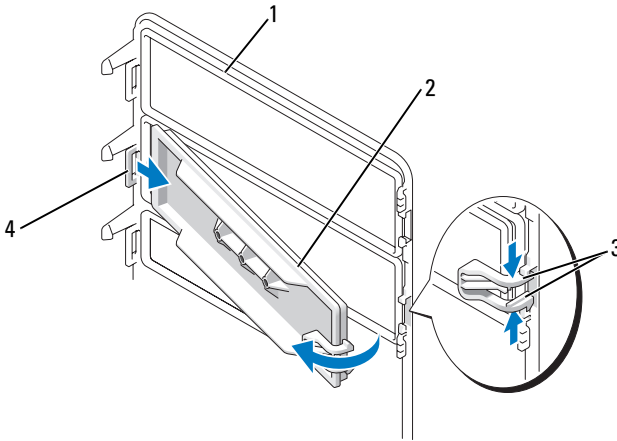
- 1 drive release latch
- 2 drive panel
- 3 drive panel tabs

NOTE: If you are changing from a tower orientation to a desktop orientation, use the tab on the back of the front panel to rotate the Dell badge, as desired.

- 6 Replace the front panel (see "Replacing the Front Panel" on page 261).
- 7 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

Removing a Drive-Panel Insert

- ➔ **NOTICE:** Drive-panel inserts may contain screws on the inside. You can attach the screws to new drives that do not have any screws.



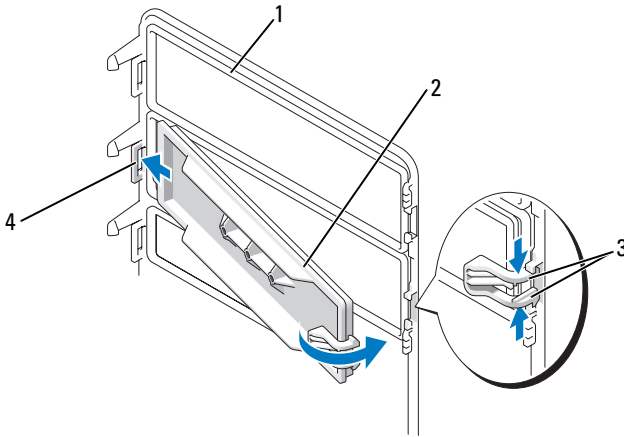
- | | | | |
|---|-------------------------------------|---|------------------------------------|
| 1 | drive panel | 2 | drive-panel insert |
| 3 | drive-panel insert release tabs (2) | 4 | drive-panel insert tab in tab slot |

- ➔ **NOTICE:** To avoid breaking the drive-panel insert tab, do not pull the insert more than approximately 1 cm (½ inch) away from the drive panel before sliding the tab out of the slot.

- 1 On the inside of the drive panel, pinch the two drive-panel insert release tabs together and pull the insert out and to the right just enough to release it from the drive panel.
- 2 Set the drive-panel insert aside in a secure location.

Installing a Drive-Panel Insert

- 1 Place the drive-panel insert tab into the drive-panel slot.
- 2 Pinch the drive-panel insert release tabs and press the drive panel insert into place.



- | | | | |
|---|-------------------------------------|---|---|
| 1 | drive panel | 2 | drive-panel insert |
| 3 | drive-panel insert release tabs (2) | 4 | drive-panel insert tab in tab slot tabs (2) |

3 Ensure that the drive-panel insert is correctly seated in the drive panel.

Floppy Drive or Media Card Reader

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

⚠ CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

➡ NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

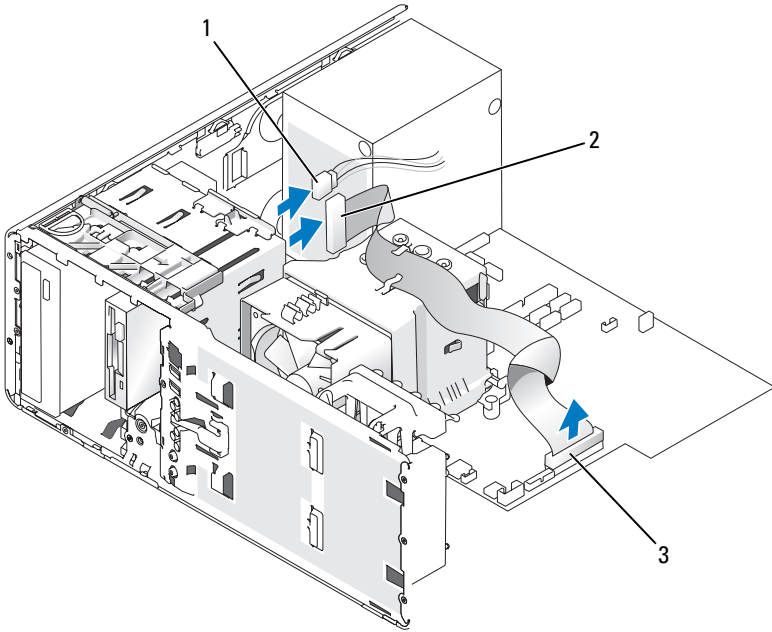
🔧 NOTE: If you are adding a floppy drive or Media Card Reader to your *tower* computer, see "Installing a Floppy Drive or Media Card Reader (Tower Computer)" on page 222.



NOTE: If you are adding a floppy drive or Media Card Reader to your *desktop* computer, see "Installing a Floppy Drive or Media Card Reader (Desktop Computer)" on page 228.

Removing a Floppy Drive or Media Card Reader (Tower Computer)

- 1** Follow the procedures in "Before You Begin" on page 143.
- 2** Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3** Remove the front panel (see "Removing the Front Panel" on page 154).
- 4** *If you are removing a floppy drive:*
 - a** Disconnect the power cable from the back of the floppy drive.
 - b** Disconnect the data cable from the back of the floppy drive.
- 5** *If you are removing a Media Card Reader,* disconnect the data cable from the back of the Media Card Reader.
- 6** Disconnect the other end of the data cable from the system board connector labeled "FLOPPY" (for a floppy drive) or "USB1" (for a Media Card Reader). To locate system board connectors, see "System Board Components" on page 148.

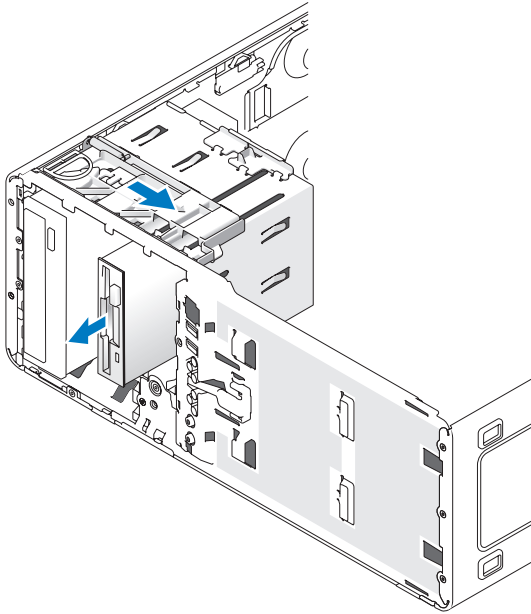


1 power cable

2 floppy drive cable

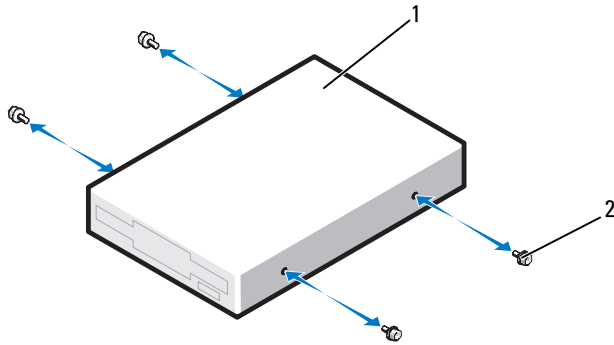
3 floppy drive connector (FLOPPY)

- 7 Slide the sliding-plate lever to the right to release the shoulder screw and slide the drive or Media Card Reader out of the 3.5-inch drive bay.



Installing a Floppy Drive or Media Card Reader (Tower Computer)

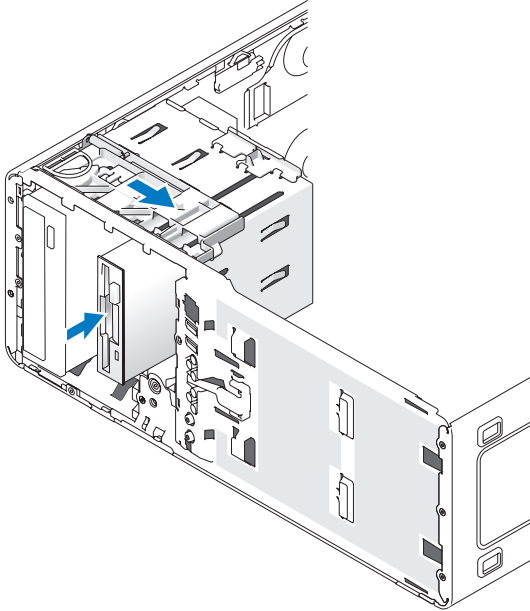
- ➔ NOTICE:** In a tower configuration with 4 hard drives, there can only be one floppy drive or Media Card Reader which must be installed in the *lower* 3.5-inch drive bay. In this case, the 4th hard drive (which must be a SATA drive) will occupy the *upper* 3.5-inch drive bay.
- 1 Follow the procedures in "Before You Begin" on page 143.
 - 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
 - 3 Remove the front panel (see "Removing the Front Panel" on page 154).
 - 4 If you are installing a new floppy drive or Media Card Reader, remove the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) and remove the shoulder screws from the inside of the drive-panel insert. Attach the screws to the new drive.



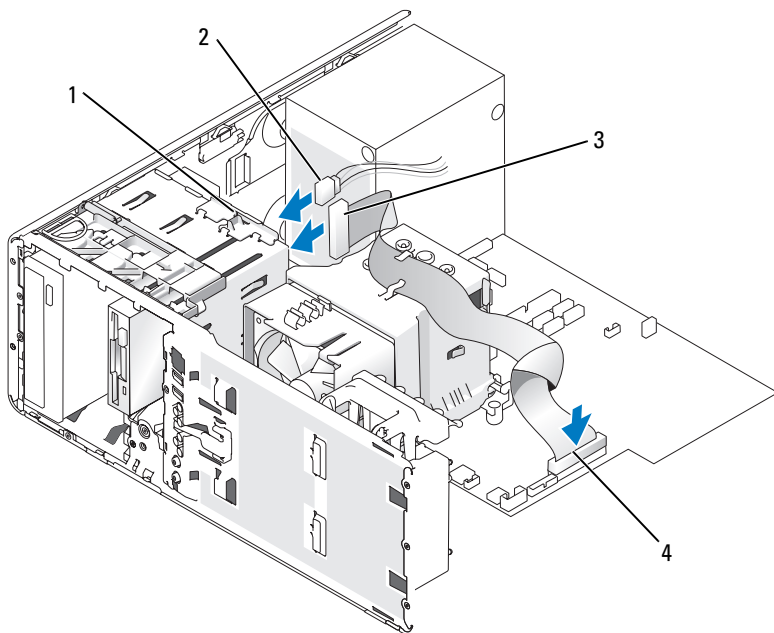
1 floppy drive

2 screws (4)

- 5 Gently slide the drive into place in the 3.5-inch bay until you hear a click or feel the drive securely installed.



- 6** *If you are installing a floppy drive:*
 - a** Connect the power cable from to the back of the floppy drive.
 - b** Connect the data cable to the back of the floppy drive.
- 7** *If you are installing a Media Card Reader, connect the data cable to the back of the Media Card Reader.*
- 8** Connect the other end of the data cable to the system board connector labeled "FLOPPY" (for a floppy drive) or "USB1" (for a Media Card Reader). To locate system board connectors, see "System Board Components" on page 148.



- | | | | |
|---|------------------------|---|---------------------------------|
| 1 | drive-conversion latch | 2 | power cable |
| 3 | floppy drive cable | 4 | floppy drive connector (FLOPPY) |

- 9 Check all cable connections, and fold cables out of the way to provide airflow for the fan and cooling vents.
- 10 Replace the front panel (see "Replacing the Front Panel" on page 261).
- 11 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

➡ NOTICE: To connect a network cable, first plug the cable in to the network port or device and then plug it in to the computer.

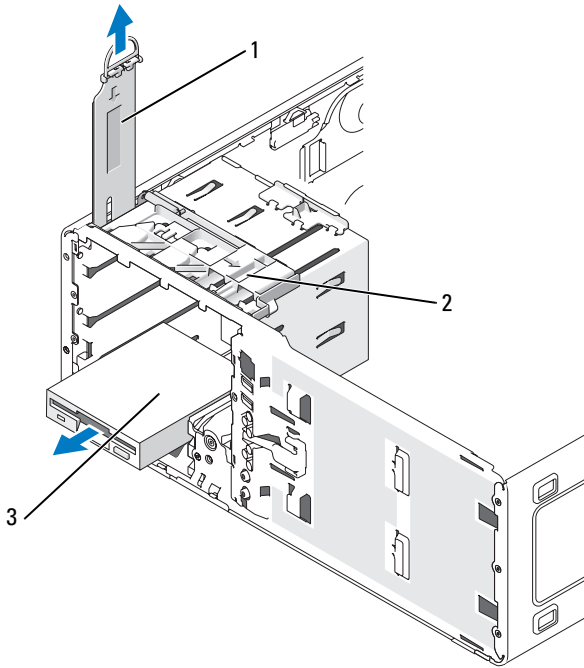
- 12 Connect your computer and devices to their electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

- 13 Enter System Setup (see "Entering System Setup" on page 81) and select the appropriate **Diskette Drive** option (for a floppy drive) or a **USB** option (for a Media Card Reader).
- 14 Verify that your computer works correctly by running the Dell Diagnostics (see "Dell Diagnostics" on page 107).

Removing a Floppy Drive or a Media Card Reader (Desktop Computer)

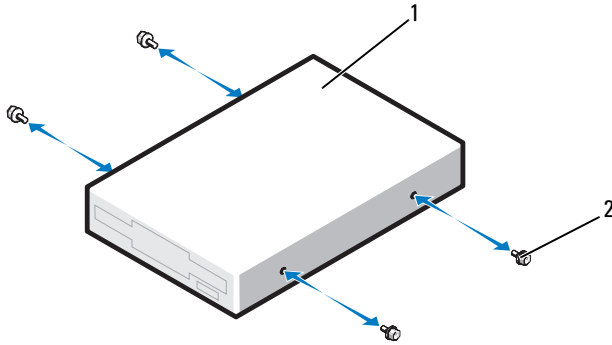
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Disconnect the power and data cables from the back of the floppy drive or Media Card Reader.
- 5 Disconnect the other end of the floppy-drive cable from the system board connector labeled "FLOPPY" (for a floppy drive) or "USB1" (for a Media Card Reader). To locate system board connectors, see "System Board Components" on page 148.



- 1 drive retention insert 2 sliding-plate lever
3 floppy drive

Installing a Floppy Drive or Media Card Reader (Desktop Computer)

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 If you are installing a new floppy drive or Media Card Reader, remove the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) and remove the shoulder screws from the inside of the drive-panel insert and attach the screws to the new drive.



1 drive

2 screws (2)

- 5 Gently slide the drive into place until you hear a click or feel the drive securely installed.
- 6 Attach the power and data cables to the floppy drive or Media Card Reader.
- 7 Connect the other end of the data cable to the system board connector labeled "FLOPPY" (for a floppy drive) or "USB1" (for a Media Card Reader). To locate system board connectors, see "System Board Components" on page 148.

- 12 Connect your computer and devices to their electrical outlets, and turn them on.
See the documentation that came with the drive for instructions on installing any software required for drive operation.
- 13 Enter System Setup (see "Entering System Setup" on page 81) and select the appropriate **Diskette Drive** (for a floppy drive) or **USB** (for a Media Card Reader) option.
- 14 Verify that your computer works correctly by running the Dell Diagnostics (see "Dell Diagnostics" on page 107).

Optical Drive



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



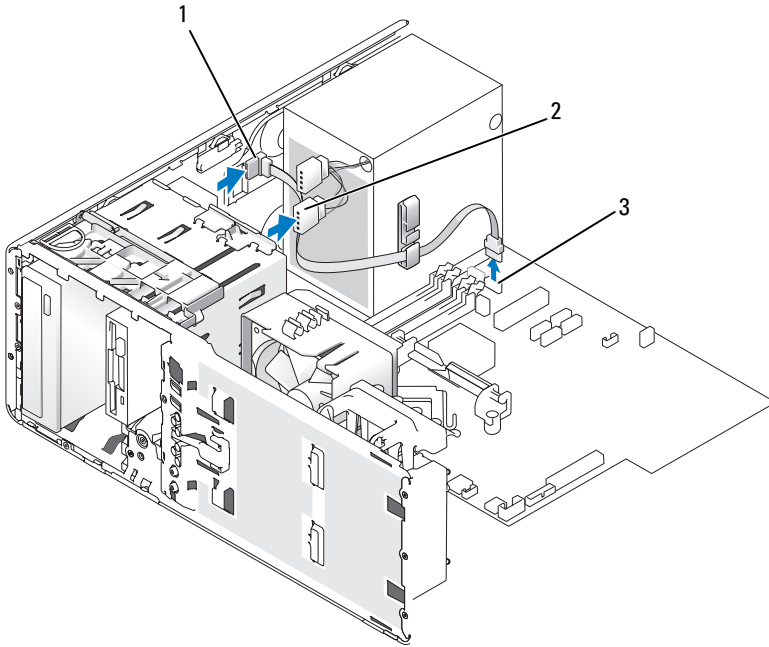
CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.



NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

Removing an Optical Drive (Tower Computer)

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Disconnect the power cable from the back of the drive and the CD/DVD drive cable from the back of the drive and the system board.

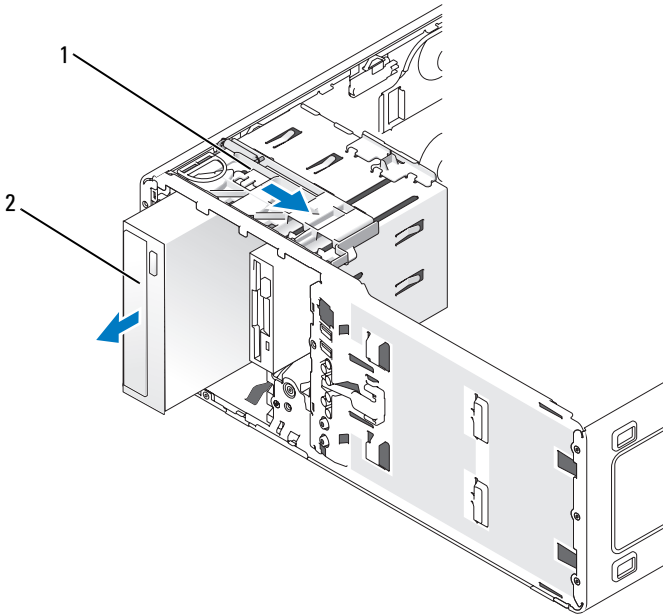


1 CD/DVD drive cable

2 power cable

3 SATA connector

- 5 Slide the sliding-plate lever to the right to release the shoulder screw and slide the drive out to remove it from the drive bay.



1 sliding-plate lever

2 CD/DVD drive

Installing an Optical Drive (Tower Computer)

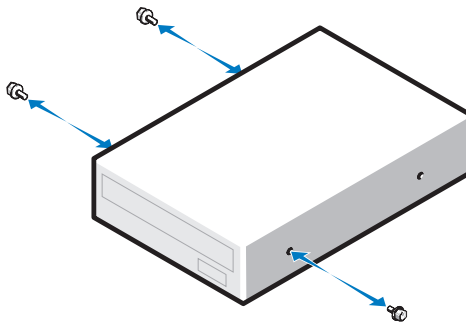
➡ NOTICE: In a tower configuration with 4 hard drives, there can only be one optical drive which must be installed in the upper 5.25-inch drive bay. In this case, the 3rd hard drive will occupy the upper 3.5-inch drive bay. The fourth hard drive will occupy the lower 5.25-inch drive bay.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).

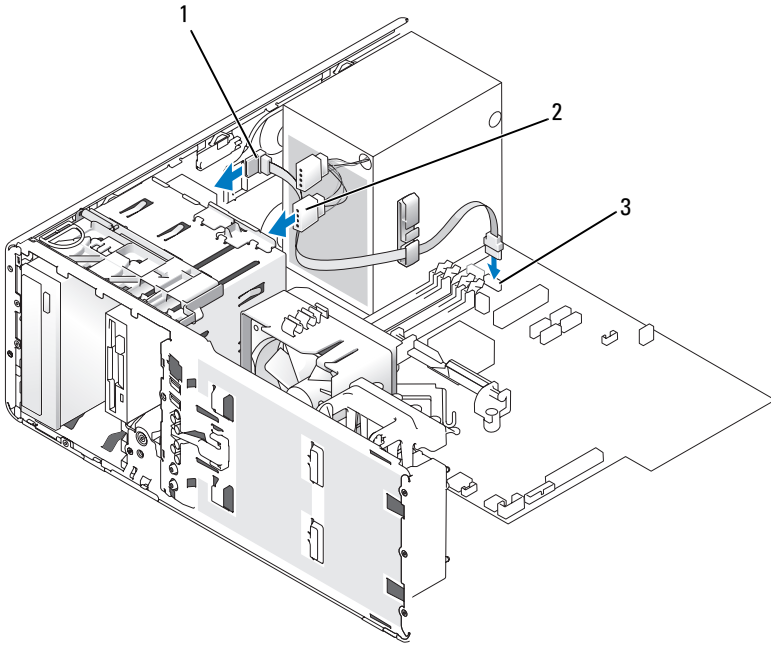
- 4 If you are installing a new drive, unpack the drive and prepare it for installation.

Check the documentation that accompanied the drive to verify that the drive is configured for your computer. If you are installing an IDE drive, configure the drive for the cable select setting.

- 5 If you are installing a new drive, remove the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) and remove the shoulder screws from the inside of the drive-panel insert and attach the screws to the new drive.



- 6 Gently slide the drive into place until the drive securely clicks into position.
- 7 Connect the power cable to the drive, and connect the CD/DVD-drive cable to the drive and to the system board.



- 1 CD/DVD-drive cable
- 3 SATA connector

- 2 power cable

- 8 Check all cable connections, and fold cables out of the way to provide airflow for the fan and cooling vents.
- 9 Replace the front panel (see "Replacing the Front Panel" on page 261).
- 10 Replace the computer cover (see "Replacing the Computer Cover" on page 262).



NOTICE: To connect a network cable, first plug the cable in to the network port or device and then plug it in to the computer.

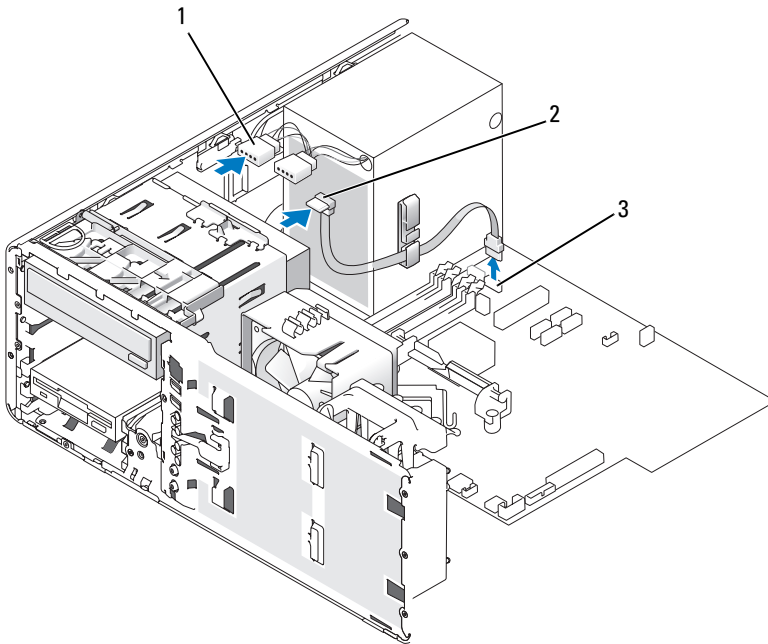
- 11 Connect your computer and devices to their electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

- 12 Enter System Setup (see "Entering System Setup" on page 81) and enable the drive.
- 13 Verify that your computer works correctly by running the Dell Diagnostics (see "Dell Diagnostics" on page 107).

Removing an Optical Drive (Desktop Computer)

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Disconnect the power cable from the back of the drive and the CD/DVD drive cable from the back of the drive and the system board.

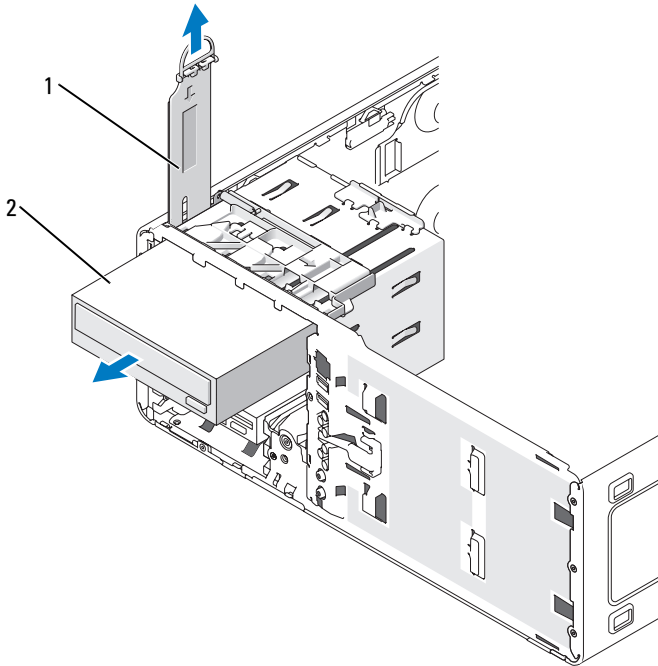


1 power cable

2 CD/DVD-drive cable

3 SATA connector

- 5 Pull the drive retention insert out by the handle and set it aside in a safe place.
- 6 Slide the drive out and remove it from the drive bay.



1 drive retention insert

2 CD/DVD drive

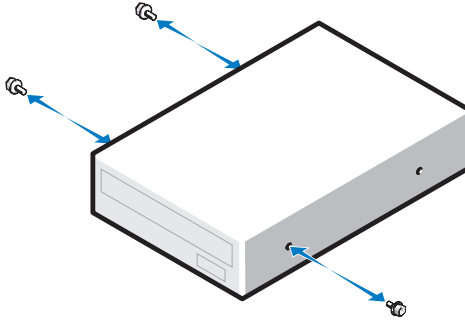
Installing an Optical Drive (Desktop Computer)

➔ **NOTICE:** In a desktop configuration with 3 hard drives, there can only be one optical drive which must be installed in the upper 5.25-inch drive bay. In this case, the 3rd hard drive will occupy the lower 5.25-inch drive bay.

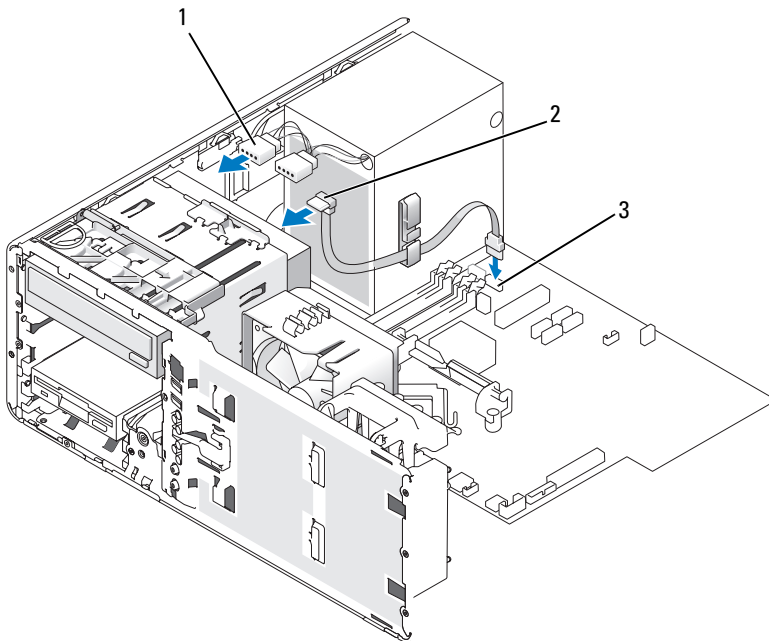
- 1 If you are installing a new drive, unpack the drive and prepare it for installation.

Check the documentation that accompanied the drive to verify that the drive is configured for your computer. If you are installing an IDE drive, configure the drive for the cable select setting.

- 2 If you are installing a new drive, remove the drive-panel insert (see "Removing a Drive-Panel Insert" on page 218) and remove the shoulder screws from the inside of the drive-panel insert and attach the screws to the new drive.



- 3 Gently slide the drive into place until the drive securely clicks into position.
- 4 Connect the power cable to the drive, and connect the CD/DVD-drive cable to the drive and to the system board.



- 1 power cable
- 2 CD/DVD-drive cable
- 3 SATA connector

- 5 Check all cable connections, and fold cables out of the way to avoid blocking the fan and cooling vents.
- 6 Replace the front panel (see "Replacing the Front Panel" on page 261).
- 7 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

➔ NOTICE: To connect a network cable, first plug the cable in to the network port or device and then plug it in to the computer.

- 8 Connect your computer and devices to their electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

- 9 Enter System Setup (see "Entering System Setup" on page 81) and enable the drive.
- 10 Verify that your computer works correctly by running the Dell Diagnostics (see "Dell Diagnostics" on page 107).

Installing the Optional Speaker



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

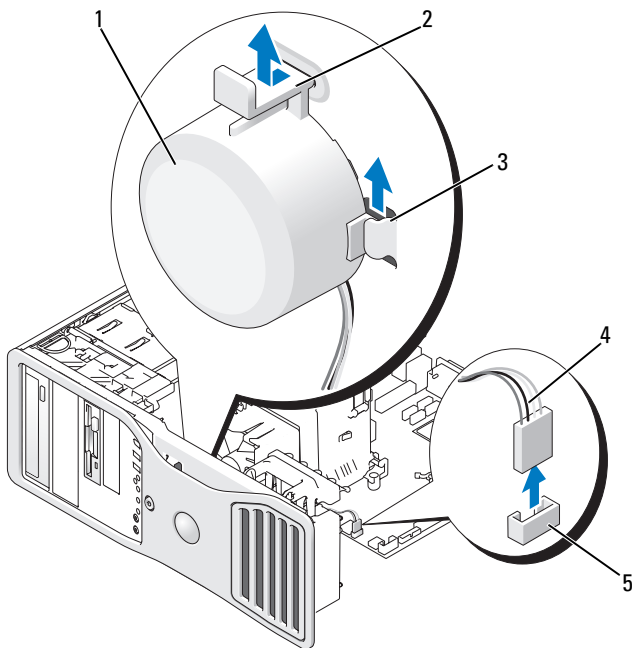


CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.



NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

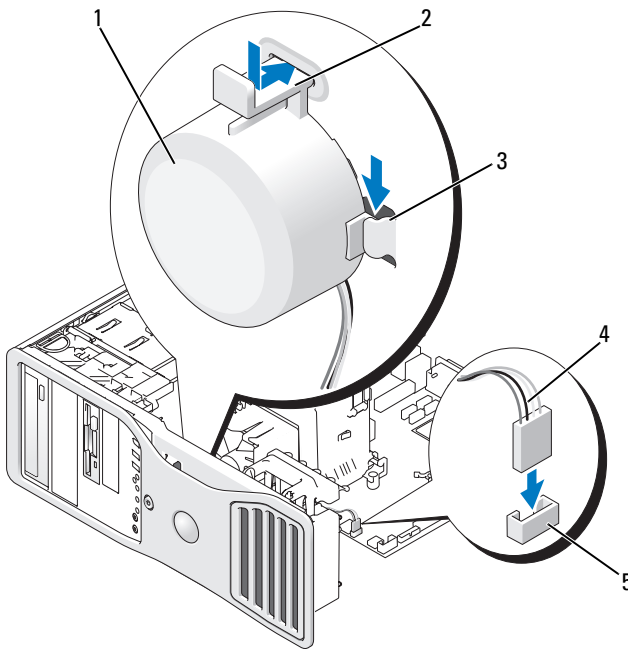
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).



- | | | | |
|---|-----------------------------------|---|-------------------|
| 1 | speaker (optional) | 2 | latch release tab |
| 3 | speaker slots (3) | 4 | speaker cable |
| 5 | speaker connector on system board | | |

- 3** If you already have a speaker installed, remove the old speaker:
- a** Disconnect the speaker cable from the speaker connector on the system board.
 - b** Simultaneously grasp the bottom of the speaker with your index finger and press down on the latch release tab with your thumb.
 - c** Slide the speaker up and out of the three speaker slots.




- 4** To install the speaker:
- a** Align the speaker behind the tabs on the three speaker slots.
 - b** Slide down the speaker until the speaker and the latch release tab click into place.
 - c** Connect the speaker cable to the speaker connector on the system board.





- | | | | |
|---|-----------------------------------|---|-------------------|
| 1 | speaker (optional) | 2 | latch release tab |
| 3 | speaker slots with tabs (3) | 4 | speaker cable |
| 5 | speaker connector on system board | | |

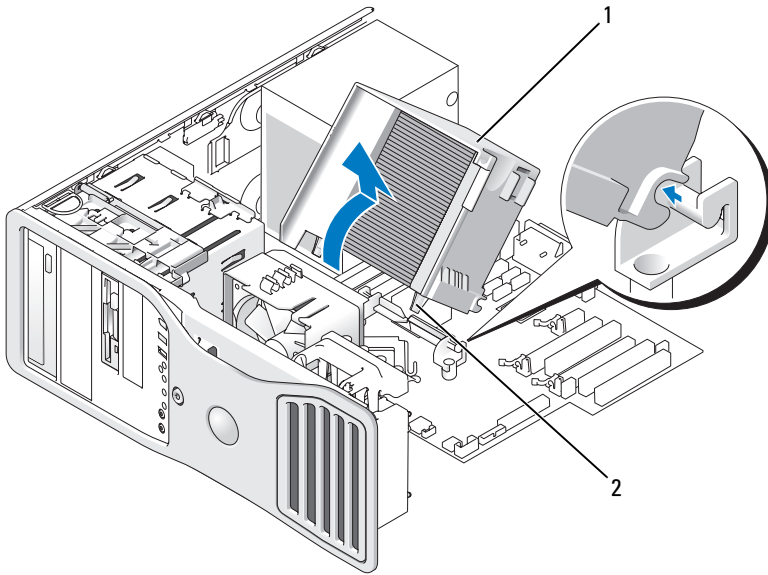
- 5** Replace the computer cover (see "Replacing the Computer Cover" on page 262).

Processor

-  **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
-  **CAUTION:** To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.
-  **NOTICE:** To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

Removing the Processor

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
-  **NOTE:** To loosen the two captive screws on each side of the heat-sink assembly, you need a long Phillips screwdriver.
- 3 Loosen the two captive screws on each side of the heat-sink assembly.
-  **CAUTION:** Despite having a plastic shield, the heat-sink assembly may be very hot during normal operation. Ensure that it has had sufficient time to cool before you touch it.
- 4 Rotate the heat-sink assembly upward, and remove it from the computer.

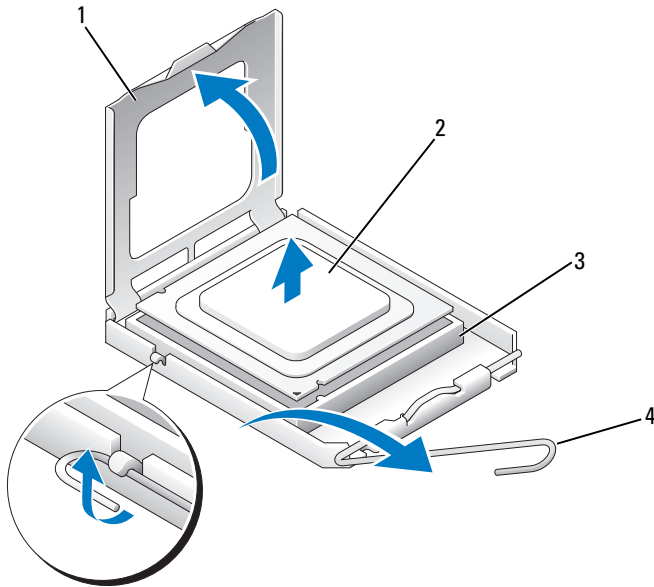


1 heat-sink assembly

2 captive screw housing (2)

➔ NOTICE: If you are installing a processor upgrade kit from Dell, discard the original heat-sink assembly. If you are not installing a processor upgrade kit from Dell, reuse the original heat-sink assembly when you install your new processor.

- 5 Open the processor cover by sliding the release lever from under the center cover latch on the socket. Then, pull the lever back to release the processor.



- | | | | |
|---|-----------------|---|---------------|
| 1 | processor cover | 2 | processor |
| 3 | socket | 4 | release lever |

➡ **NOTICE:** When replacing the processor, do not touch any of the pins inside the socket or allow any objects to fall on the pins in the socket.

- 6 Gently remove the processor from the socket.

Leave the release lever extended in the release position so that the socket is ready for the new processor.

Replacing the Processor

➡ **NOTICE:** Ground yourself by touching an unpainted metal surface on the back of the computer.

➡ **NOTICE:** When replacing the processor, do not touch any of the pins inside the socket or allow any objects to fall on the pins in the socket.

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).

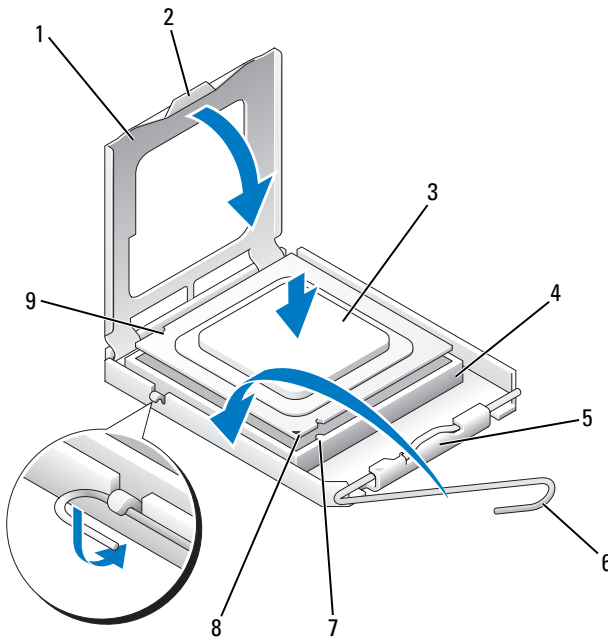
3 Unpack the new processor, being careful not to touch the underside of the processor.

➔ **NOTICE:** You must position the processor correctly in the socket to avoid permanent damage to the processor and the computer when you turn on the computer.

4 If the release lever on the socket is not fully extended, move it to that position.

5 Orient the front and rear alignment notches on the processor with the front and rear alignment notches on the socket.

6 Align the pin-1 corners of the processor and socket.



- 1 processor cover
- 3 processor
- 5 center cover latch

- 2 tab
- 4 processor socket
- 6 release lever

7 front alignment notch

8 socket and processor pin-1 indicator

9 rear alignment notch

➡ **NOTICE:** To avoid damage, ensure that the processor aligns properly with the socket, and do not use excessive force when you install the processor.

7 Set the processor lightly in the socket and ensure that the processor is positioned correctly.

8 When the processor is fully seated in the socket, close the processor cover. Ensure that the tab on the processor cover is positioned underneath the center cover latch on the socket.

9 Pivot the socket release lever back toward the socket and snap it into place to secure the processor.

➡ **NOTICE:** If you are *not* installing a processor upgrade kit from Dell, reuse the original heat-sink assembly when you replace the processor.

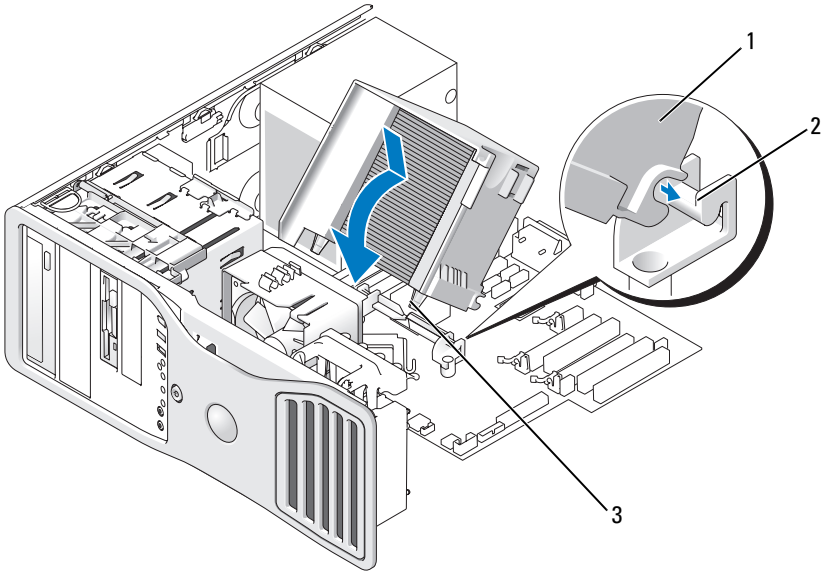
If you installed a processor replacement kit from Dell, return the original heat-sink assembly and processor to Dell in the same package in which your replacement kit was sent.

10 Install the heat-sink assembly:

a Place the heat-sink assembly back onto the heat-sink assembly bracket.

b Rotate the heat-sink assembly down towards the computer base and tighten the two capture screws.

➡ **NOTICE:** Ensure that the heat-sink assembly is correctly seated and secure.



- 1 heat-sink assembly
- 2 heat-sink assembly bracket
- 3 captive screw housing (2)

11 Replace the computer cover (see "Replacing the Computer Cover" on page 262).

➔ NOTICE: To connect a network cable, first plug the cable into the network port or device and then plug the cable into the computer.

12 Connect your computer and devices to electrical outlets, and turn them on.

Battery

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

⚠ CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.



CAUTION: A new battery can explode 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.



NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

About the Battery

A coin-cell battery maintains computer configuration, date, and time information. The battery can last several years.

The battery may need replacing if you have repeatedly reset the time and date information after turning on the computer or if one of the following messages appear:

```
Time-of-day not set - please run SETUP program
```

or

```
Invalid configuration information -  
please run SETUP program
```

or

```
Strike the F1 key to continue,  
F2 to run the setup utility
```

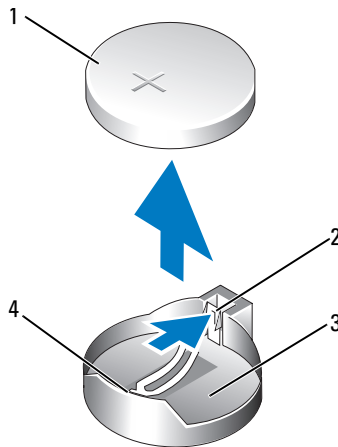
To determine whether you need to replace the battery, re-enter the time and date in System Setup and exit the program to save the information. Turn off your computer and disconnect it from the electrical outlet for a few hours; then reconnect the computer, turn it on, and enter System Setup (see "Entering System Setup" on page 81). If the date and time are not correct in System Setup, replace the battery.

You can operate your computer without a battery; however, without a battery, the configuration information is erased if the computer is turned off or unplugged from the electrical outlet. In this case, you must enter System Setup (see "Entering System Setup" on page 81) and reset the configuration options.

Removing the Battery

If you have not already done so, make a copy of your configuration information found in System Setup (see "System Setup" on page 81).



- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Locate the battery socket.
- ➔ **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 removing the battery.
- 4 Support the battery connector by pressing down firmly on the positive side of the connector.
- 5 While supporting the battery connector, press the battery tab away from the positive side of the connector and pry the battery it up out of the securing tabs at the negative side of the connector.






- | | | | |
|---|----------------|---|------------------------------------|
| 1 | system battery | 2 | battery socket tab |
| 3 | battery socket | 4 | positive side of battery connector |

- 6 Properly dispose of the old battery. For more information, see your *Product Information Guide*.

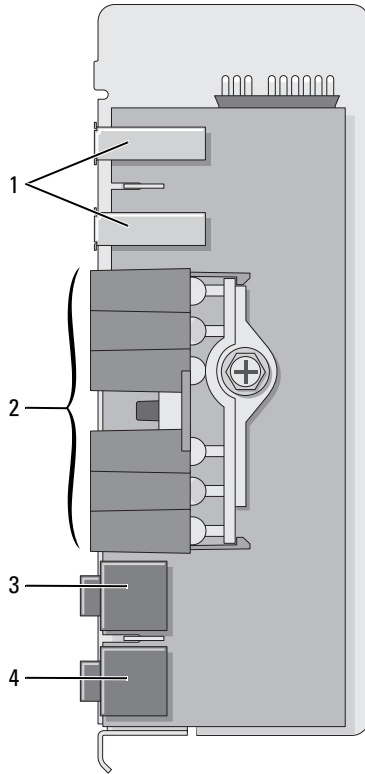
Replacing the Battery

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Locate the battery socket.
- 4 Remove the existing battery (see "Removing the Battery" on page 249).
-  **NOTICE:** To avoid damage to the battery connector, you must firmly support the connector while replacing the battery.
- 5 Support the battery connector by pressing down firmly on the positive side of the connector.
- 6 Hold the battery with the "+" facing up, and slide it under the securing tabs at the positive side of the connector.
- 7 Press the battery straight down into the connector until it snaps into place.
- 8 Replace the computer cover (see "Replacing the Computer Cover" on page 262).
-  **NOTICE:** To connect a network cable, first plug the cable into the network device and then plug it into the computer.
- 9 Connect your computer and devices to electrical outlets, and turn them on.
- 10 Enter System Setup (see "Entering System Setup" on page 81) and restore the settings that you recorded when you removed the existing battery.

I/O Panel

-  **CAUTION:** Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
-  **CAUTION:** To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.
-  **NOTICE:** To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.


I/O-Panel Components



- | | | | |
|---|---------------------|---|--|
| 1 | USB port | 2 | diagnostic, hard-drive access,
and network integrity lights |
| 3 | headphone connector | 4 | microphone connector |

Removing the I/O Panel

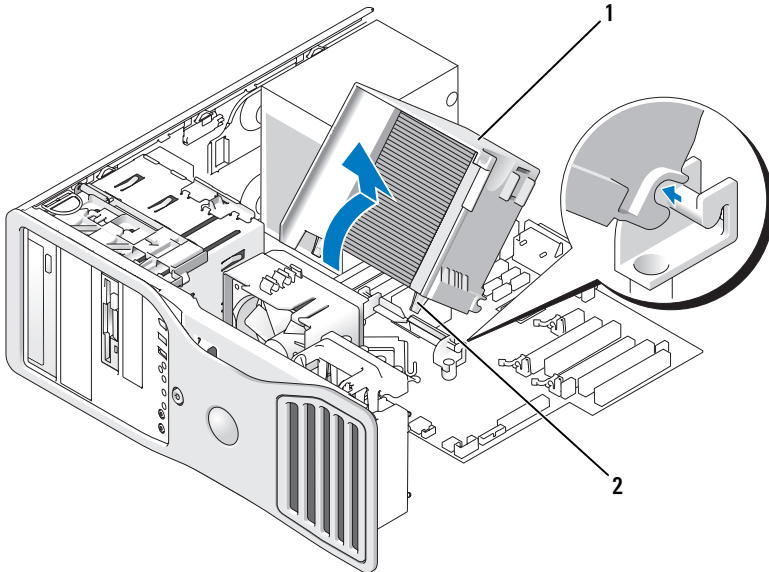
- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).

 **NOTE:** To loosen the two captive screws on each side of the heat-sink assembly, you need a long Phillips screwdriver.

3 Loosen the two captive screws on each side of the heat-sink assembly.

⚠ CAUTION: Despite having a plastic shield, the heat-sink assembly may be very hot during normal operation. Ensure that the assembly has had sufficient time to cool before you touch it.

4 Rotate the heat-sink assembly upward, and remove it from the computer.

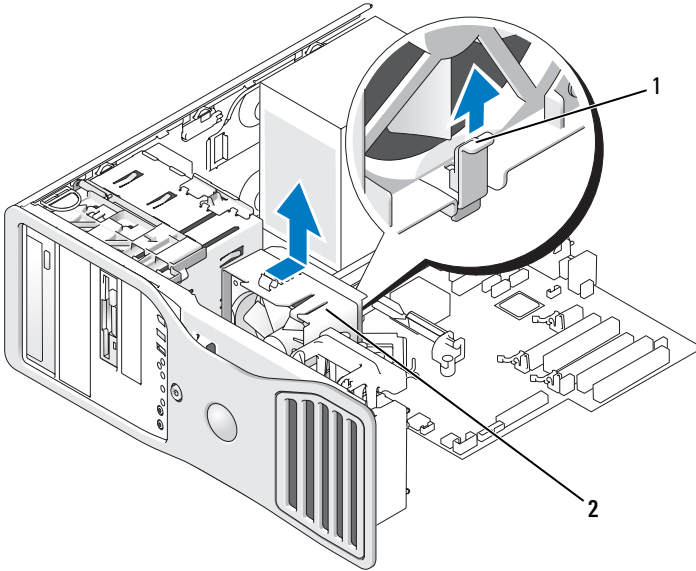


1 heat-sink assembly

2 captive screw housing (2)

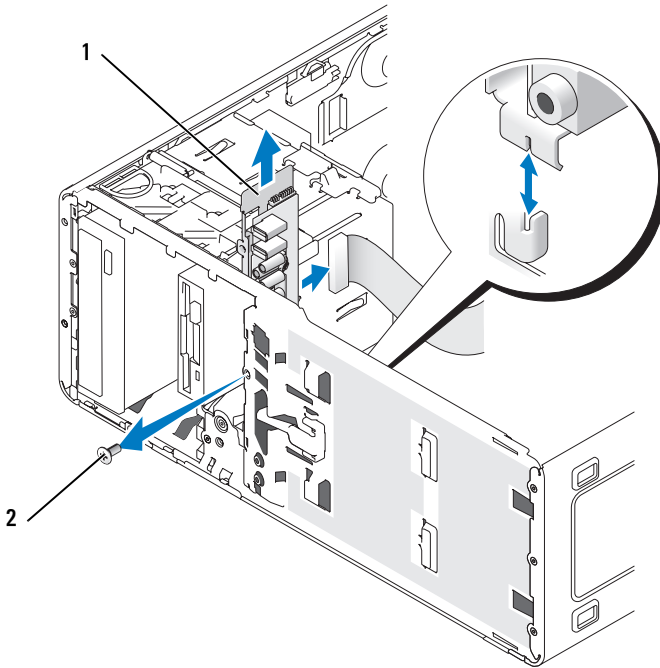
5 Place the heat-sink assembly on its side in a safe place.

6 Disconnect the system fan cable from the system board.



1 fan release lever **2** fan

- 7** Lift the fan release lever and slide the fan toward the back of the computer to release it from the bottom and remove it from the computer.
- 8** Disconnect the control-panel cable from the I/O panel connector by pulling with the cable loop.
- 9** Remove the front panel (see "Removing the Front Panel" on page 154).
- 10** Remove the drive panel (see "Drive Panel" on page 212).
- 11** If an optional sound card is installed, disconnect the cable from the edge of the I/O panel.
- 12** If an optional IEEE 1394 cable is installed in the front port, remove the cable from the front of the computer by following the instructions that came with the connector.
- 13** Remove the mounting screw from the I/O panel.
- 14** Remove the I/O panel from the computer.






1 I/O panel

2 mounting screw

Replacing the I/O Panel

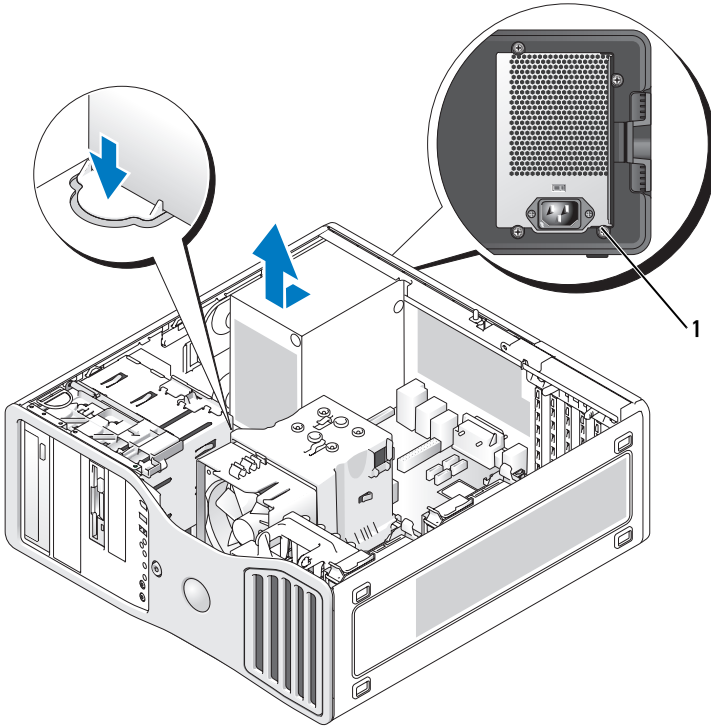
Follow the removal procedure in reverse order, ensuring that the tabs on the top panel, bottom panel, and front panel are secure.

Power Supply

-  **CAUTION:** Before performing any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
-  **CAUTION:** To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.
-  **NOTICE:** To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

Removing the Power Supply

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Disconnect the DC power cables from the system board and the drives.
Note the routing of the DC power cables underneath the tabs in the computer frame as you release the tabs and remove the cables from the system board and drives. You must route these cables properly when you replace them to prevent their being pinched or crimped.
- 4 Remove the four screws that attach the power supply to the back of the computer chassis.




1 power supply screws (4)

- 5 Slide the power supply toward the front of the computer by approximately one inch.
- 6 Lift the power supply out of the computer.

Replacing the Power Supply

- 1 Slide the power supply into place.
- 2 Replace the four screws that secure the power supply to the back of the computer chassis.
- 3 Reconnect the DC power cables.

- 4 On the desktop computer, reattach the power cables to the side of the hard drive.
 - 5 Run the cables underneath the tabs, and press the tabs to close them over the cables.
 - 6 Replace the computer cover (see "Replacing the Computer Cover" on page 262).
-  **NOTICE:** To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.
- 7 Connect your computer and devices to electrical outlets, and turn them on.

System Board



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.



NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

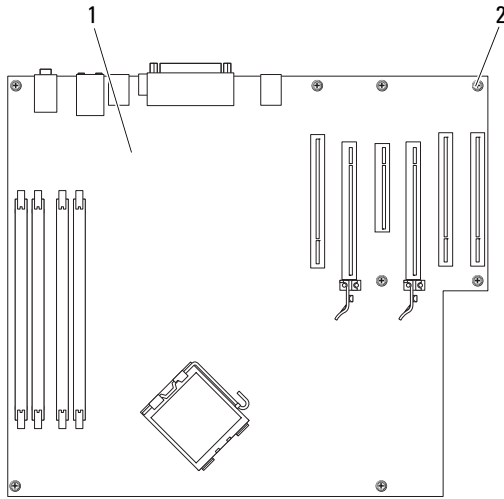


NOTICE: The system board and metal tray are connected and are removed as one piece.

Removing the System Board

- 1 Follow the procedures in "Before You Begin" on page 143.
- 2 Remove the computer cover (see "Removing the Computer Cover" on page 145).
- 3 Remove the front panel (see "Removing the Front Panel" on page 154).
- 4 Remove any components that restrict access to the system board.
- 5 Disconnect all cables from the system board.
- 6 Before you remove the existing system board assembly, visually compare the replacement system board to the existing system board to make sure that you have the correct part.

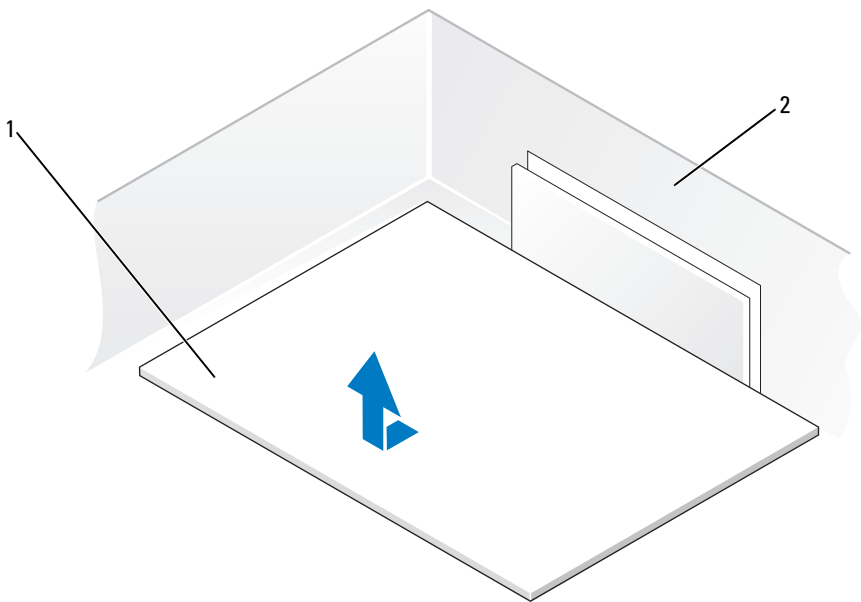
7 Remove the system board screws.



1 system board

2 screws (8)

- 8** Pull up on the two tabs, slide the system board assembly toward the front of the computer, and then lift the assembly up and away.
- 9** Place the system board assembly that you just removed next to the replacement system board.



1 system board

2 back of computer

Replacing the System Board

- 1 Transfer components from the existing system board to the replacement system board:
 - a Remove the memory modules and install them on the replacement board (see "Memory" on page 157).




CAUTION: The processor package and heat-sink assembly can get hot. To avoid burns, ensure that the package and assembly have had sufficient time to cool before you touch them.

- b Remove the heat-sink assembly and processor from the existing system board and transfer them to the replacement system board (see "Processor" on page 243).

- 2 Set the jumpers on the replacement system board so that they are identical to the ones on the existing board (see "System Board Components" on page 148).



NOTE: Some components and connectors on the replacement system board may be in different locations than the corresponding connectors on the existing system board.

- 3 Orient the replacement board by aligning the notches on the bottom of the board with the tabs on the computer.
 - 4 Slide the system board assembly toward the back of the computer until the assembly clicks into position.
 - 5 Replace any components and cables that you removed from the system board.
 - 6 Reconnect all cables to their connectors at the back of the computer.
 - 7 Replace the computer cover (see "Replacing the Computer Cover" on page 262).
-  **NOTICE:** To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.
- 8 Connect your computer and devices to electrical outlets, and turn them on.

Replacing the Front Panel



CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.



NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

- 1 Align the notches on the front panel with the corresponding holes on the front of the computer.
- 2 Pull the front-panel release lever, and slide the panel to the right to engage and secure the front panel.

Replacing the Computer Cover




CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.



CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.




NOTICE: To prevent static damage to components inside your computer, discharge static electricity from your body before you touch any of your computer's electronic components. You can do so by touching an unpainted metal surface on the computer.

- 1 Ensure that all cables are connected, and fold cables out of the way.
Gently pull the power cables toward you so that they do not get caught underneath the drives.
- 2 Ensure that no tools or extra parts are left inside the computer.
- 3 Replace the cover:
 - a Align the computer cover with the tabs on the side of the computer that has the hard drive bays.
 - b Pivot the cover down and gently press the cover until it clicks into place.
 - c Ensure that the cover is locked. If not, repeat all of step 3.
-  **NOTICE:** To connect a network cable, first plug the cable into the network port or device and then plug it into the computer.
- 4 Connect your computer and devices to electrical outlets, and turn them on.


Getting Help


Obtaining Assistance

 **CAUTION:** If you need to remove the computer cover, first disconnect the computer power and modem cables from all electrical outlets.

If you experience a problem with your computer, you can complete the following steps to diagnose and troubleshoot the problem:

- 1 See "Troubleshooting" on page 113 for information and procedures that pertain to the problem your computer is experiencing.
- 2 See "Dell Diagnostics" on page 107 for procedures on how to run Dell Diagnostics.
- 3 Fill out the "Diagnostics Checklist" on page 268.
- 4 Use Dell's extensive suite of online services available at Dell Support (support.dell.com) for help with installation and troubleshooting procedures. See "Online Services" on page 264 for a more extensive list of Dell Support online.
- 5 If the preceding steps have not resolved the problem, see "Contacting Dell" on page 269.

 **NOTE:** Call Dell Support from a telephone near or at the computer so that the support staff can assist you with any necessary procedures.

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

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

For instructions on using the Dell Support, see "Technical Support and Customer Service" on page 264.



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

Technical Support and Customer Service

Dell's support service is available to answer your questions about Dell™ hardware. Our support staff uses computer-based diagnostics to provide fast, accurate answers.

To contact Dell's support service, see "Before You Call" on page 267, and then see the contact information for your region or go to support.dell.com.

DellConnect

DellConnect is a simple online access tool that allows a Dell service and support associate to access your computer through a broadband connection, diagnose your problem and repair it all under your supervision. For more information, go to support.dell.com and click DellConnect.

Online Services

You can learn about Dell products and services on the following websites:

www.dell.com

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

www.dell.com/jp (Japan only)

www.euro.dell.com (Europe only)

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

www.dell.ca (Canada only)

You can access Dell Support through the following websites and e-mail addresses:

- Dell Support websites
support.dell.com
support.jp.dell.com (Japan only)
support.euro.dell.com (Europe only)

- Dell Support e-mail addresses
mobile_support@us.dell.com
support@us.dell.com
la-techsupport@dell.com (Latin America and Caribbean countries only)
apsupport@dell.com (Asian/Pacific countries only)
- Dell Marketing and Sales e-mail addresses
apmarketing@dell.com (Asian/Pacific countries only)
sales_canada@dell.com (Canada only)
- Anonymous file transfer protocol (FTP)
ftp.dell.com
Log in as user: anonymous, and use your e-mail address as your password.

AutoTech Service

Dell's automated support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers about their portable and desktop computers.

When you call AutoTech, use your touch-tone telephone to select the subjects that correspond to your questions. For the telephone number to call for your region, see "Contacting Dell" on page 269.

Automated Order-Status Service

To check on the status of any Dell products that you have ordered, you can go to support.dell.com, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. For the telephone number to call for your region, see "Contacting Dell" on page 269.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip handy when you call. For the telephone number to call for your region, see "Contacting Dell" on page 269.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at www.dell.com. For the telephone number to call for your region or to speak to a sales specialist, see "Contacting Dell" on page 269.

Returning Items for Warranty Repair or Credit

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

- 1** Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.
For the telephone number to call for your region, see "Contacting Dell" on page 269.
- 2** Include a copy of the invoice and a letter describing the reason for the return.
- 3** Include a copy of the Diagnostics Checklist (see "Diagnostics Checklist" on page 268), indicating the tests that you have run and any error messages reported by the Dell Diagnostics (see "Dell Diagnostics" on page 107).
- 4** Include any accessories that belong with the item(s) being returned (power cables, software floppy disks, guides, and so on) if the return is for credit.
- 5** Pack the equipment to be returned in the original (or equivalent) packing materials.

You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect On Delivery (C.O.D.) packages are not accepted.

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

Before You Call



NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently. You may also be asked for your Service Tag (located on the back or bottom of your computer).

Remember to fill out the Diagnostics Checklist (see "Diagnostics Checklist" on page 268). If possible, turn on your computer before you call Dell for assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer itself. Ensure that the computer documentation is available.



CAUTION: Before working inside your computer, follow the safety instructions in your *Product Information Guide*.

Diagnostics Checklist

Name:

Date:

Address:

Phone number:

Service Tag (bar code on the back or bottom of the computer):

Express Service Code:

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

Operating system and version:

Devices:

Expansion cards:

Are you connected to a network? Yes No

Network, version, and network adapter:

Programs and versions:

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

Error message, beep code, or diagnostic code:

Description of problem and troubleshooting procedures you performed:

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.

Appendix

FCC Notice (U.S. Only)

FCC Class B

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause interference with radio and television reception. This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules.

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

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



NOTICE: The FCC regulations provide that changes or modifications not expressly approved by Dell Inc. could void your authority to operate this equipment.

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

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

If necessary, consult a representative of Dell Inc. or an experienced radio/television technician for additional suggestions.

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

- Product name: Dell Precision™ Workstation T3400
- Model number: DCTA
- Company name:
Dell Inc.
Worldwide Regulatory Compliance & Environmental Affairs
One Dell Way
Round Rock, TX 78682 USA
512-338-4400



NOTE: For further regulatory information, see your *Product Information Guide*.

Macrovision Product Notice

This product incorporates copyright protection technology that is protected by method claims of certain U.S. patents and other intellectual property rights owned by Macrovision Corporation and other rights owners. Use of this copyright protection technology must be authorized by Macrovision Corporation, and is intended for home and other limited viewing uses only unless otherwise authorized by Macrovision Corporation. Reverse engineering or disassembly is prohibited.

Glossary

Terms in this Glossary are provided for informational purposes only and may or may not describe features included with your particular computer.

A

AC — alternating current — The form of electricity that powers your computer when you plug the AC adapter power cable in to an electrical outlet.

ACPI — advanced configuration and power interface — A power management specification that enables Microsoft® Windows® operating systems to put a computer in standby or hibernate mode to conserve the amount of electrical power allocated to each device attached to the computer.

AGP — accelerated graphics port — A dedicated graphics port that allows system memory to be used for video-related tasks. AGP delivers a smooth, true-color video image because of the faster interface between the video circuitry and the computer memory.

AHCI — Advanced Host Controller Interface — An interface for a SATA hard drive Host Controller which allows the storage driver to enable technologies such as Native Command Queuing (NCQ) and hot plug.

ALS — ambient light sensor — A feature that helps to control display brightness.

antivirus software — A program designed to identify, quarantine, and/or delete viruses from your computer.

ASF — alert standards format — A standard to define a mechanism for reporting hardware and software alerts to a management console. ASF is designed to be platform- and operating system-independent.

B

battery life span — The length of time (years) during which a portable computer battery is able to be depleted and recharged.

battery operating time — The length of time (minutes or hours) that a portable computer battery powers the computer.

BIOS — basic input/output system — A program (or utility) that serves as an interface between the computer hardware and the operating system. Unless you understand what effect these settings have on the computer, do not change them. Also referred to as *System Setup*.

bit — The smallest unit of data interpreted by your computer.

Blu-ray Disc™ (BD)— An optical storage technology offering storage capacity of up to 50 GB, full 1080p video resolution (HDTV required), and as many as 7.1 channels of native, uncompressed surround sound.

Bluetooth® wireless technology — A wireless technology standard for short-range (9 m [29 feet]) networking devices that allows for enabled devices to automatically recognize each other.

boot sequence — Specifies the order of the devices from which the computer attempts to boot.

bootable media — A CD, DVD, or floppy disk that you can use to start your computer. In case your hard drive is damaged or your computer has a virus, ensure that you always have a bootable CD, DVD, or floppy disk available. Your *Drivers and Utilities* disc is an example of bootable media.

bps — bits per second — The standard unit for measuring data transmission speed.

BTU — British thermal unit — A measurement of heat output.

bus — A communication pathway between the components in your computer.

bus speed — The speed, given in MHz, that indicates how fast a bus can transfer information.

byte — The basic data unit used by your computer. A byte is usually equal to 8 bits.

C

C — Celsius — A temperature measurement scale where 0° is the freezing point and 100° is the boiling point of water.

cache — A special high-speed storage mechanism which can be either a reserved section of main memory or an independent high-speed storage device. The cache enhances the efficiency of many processor operations.

L1 cache — Primary cache stored inside the processor.

L2 cache — Secondary cache which can either be external to the processor or incorporated into the processor architecture.

carnet — An international customs document that facilitates temporary imports into foreign countries. Also known as a *merchandise passport*.

CD-R — CD recordable — A recordable version of a CD. Data can be recorded only once onto a CD-R. Once recorded, the data cannot be erased or written over.

CD-RW — CD rewritable — A rewritable version of a CD. Data can be written to a CD-RW disc, and then erased and written over (rewritten).

CD-RW drive — A drive that can read CDs and write to CD-RW (rewritable CDs) and CD-R (recordable CDs) discs. You can write to CD-RW discs multiple times, but you can write to CD-R discs only once.

CD-RW/DVD drive — A drive, sometimes referred to as a combo drive, that can read CDs and DVDs and write to CD-RW (rewritable CDs) and CD-R (recordable CDs) discs. You can write to CD-RW discs multiple times, but you can write to CD-R discs only once.

clock speed — The speed, given in MHz, that indicates how fast computer components that are connected to the system bus operate.

CMOS — A type of electronic circuit. Computers use a small amount of battery-powered CMOS memory to hold date, time, and System Setup options.

COA — Certificate of Authenticity — The Windows alpha-numeric code located on a sticker on your computer. Also referred to as the *Product Key* or *Product ID*.

Control Panel — A Windows utility that allows you to modify operating system and hardware settings, such as display settings.

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

CRIMM — continuity rambus in-line memory module — A special module that has no memory chips and is used to fill unused RIMM slots.

cursor — The marker on a display or screen that shows where the next keyboard, touch pad, or mouse action will occur. It often is a blinking solid line, an underline character, or a small arrow.

D

DDR SDRAM — double-data-rate SDRAM — A type of SDRAM that doubles the data burst cycle, improving system performance.

DDR2 SDRAM — double-data-rate 2 SDRAM — A type of DDR SDRAM that uses a 4-bit prefetch and other architectural changes to boost memory speed to over 400 MHz.

device — Hardware such as a disk drive, printer, or keyboard that is installed in or connected to your computer.

device driver — See *driver*.

DIMM — dual in-line memory module — A circuit board with memory chips that connects to a memory module on the system board.

DIN connector — A round, six-pin connector that conforms to DIN (Deutsche Industrie-Norm) standards; it is typically used to connect PS/2 keyboard or mouse cable connectors.

disk striping — A technique for spreading data over multiple disk drives. Disk striping can speed up operations that retrieve data from disk storage. Computers that use disk striping generally allow the user to select the data unit size or stripe width.

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

docking device — provides port replication, cable management, and security features to adapt your notebook to a desktop workspace.

DMTF — Distributed Management Task Force — A consortium of hardware and software companies who develop management standards for distributed desktop, network, enterprise, and Internet environments.

domain — A group of computers, programs, and devices on a network that are administered as a unit with common rules and procedures for use by a specific group of users. A user logs on to the domain to gain access to the resources.

DRAM — dynamic random-access memory — Memory that stores information in integrated circuits containing capacitors.

driver — Software that allows the operating system to control a device such as a printer. Many devices do not work properly if the correct driver is not installed in the computer.

DSL — Digital Subscriber Line — A technology that provides a constant, high-speed Internet connection through an analog telephone line.

dual-core — A technology in which two physical computational units exist inside a single processor package, thereby increasing computing efficiency and multi-tasking ability.

dual display mode — A display setting that allows you to use a second monitor as an extension of your display. Also referred to as *extended display mode*.

DVD-R — DVD recordable — A recordable version of a DVD. Data can be recorded only once onto a DVD-R. Once recorded, the data cannot be erased or written over.

DVD+RW — DVD rewritable — A rewritable version of a DVD. Data can be written to a DVD+RW disc, and then erased and written over (rewritten). (DVD+RW technology is different from DVD-RW technology.)

DVD+RW drive — drive that can read DVDs and most CD media and write to DVD+RW (rewritable DVDs) discs.

DVI — digital video interface — A standard for digital transmission between a computer and a digital video display.

E

ECC — error checking and correction — A type of memory that includes special circuitry for testing the accuracy of data as it passes in and out of memory.

ECP — extended capabilities port — A parallel connector design that provides improved bidirectional data transmission. Similar to EPP, ECP uses direct memory access to transfer data and often improves performance.

EIDE — enhanced integrated device electronics — An improved version of the IDE interface for hard drives and CD drives.

EMI — electromagnetic interference — Electrical interference caused by electromagnetic radiation.

ENERGY STAR® — Environmental Protection Agency requirements that decrease the overall consumption of electricity.

EPP — enhanced parallel port — A parallel connector design that provides bidirectional data transmission.

ESD — electrostatic discharge — A rapid discharge of static electricity. ESD can damage integrated circuits found in computer and communications equipment.

expansion card — A circuit board that installs in an expansion slot on the system board in some computers, expanding the capabilities of the computer. Examples include video, modem, and sound cards.

expansion slot — A connector on the system board (in some computers) where you insert an expansion card, connecting it to the system bus.

ExpressCard — A removable I/O card adhering to the PCMCIA standard. Modems and network adapters are common types of ExpressCards. ExpressCards support both the PCI Express and USB 2.0 standard.

Express Service Code — A numeric code located on a sticker on your Dell™ computer. Use the Express Service Code when contacting Dell for assistance. Express Service Code service may not be available in some countries.

extended display mode — A display setting that allows you to use a second monitor as an extension of your display. Also referred to as *dual display mode*.

extended PC Card — A PC Card that extends beyond the edge of the PC Card slot when installed.

F

Fahrenheit — A temperature measurement scale where 32° is the freezing point and 212° is the boiling point of water.

FBD — fully-buffered DIMM — A DIMM with DDR2 DRAM chips and an Advanced Memory Buffer (AMB) that speeds communication between the DDR2 SDRAM chips and the system.

FCC — Federal Communications Commission — A U.S. agency responsible for enforcing communications-related regulations that state how much radiation computers and other electronic equipment can emit.

fingerprint reader — A strip sensor that uses your unique fingerprint to authenticate your user identity to help secure your computer.

folder — A term used to describe space on a disk or drive where files are organized and grouped. Files in a folder can be viewed and ordered in various ways, such as alphabetically, by date, and by size.

format — The process that prepares a drive or disk for file storage. When a drive or disk is formatted, the existing information on it is lost.

FSB — front side bus — The data path and physical interface between the processor and RAM.

FTP — file transfer protocol — A standard Internet protocol used to exchange files between computers connected to the Internet.

G

G — gravity — A measurement of weight and force.

GB — gigabyte — A measurement of data storage that equals 1024 MB (1,073,741,824 bytes). When used to refer to hard drive storage, the term is often rounded to 1,000,000,000 bytes.

GHz — gigahertz — A measurement of frequency that equals one thousand million Hz, or one thousand MHz. The speeds for computer processors, buses, and interfaces are often measured in GHz.

graphics mode — A video mode that can be defined as x horizontal pixels by y vertical pixels by z colors. Graphics modes can display an unlimited variety of shapes and fonts.

GUI — graphical user interface — Software that interacts with the user by means of menus, windows, and icons. Most programs that operate on the Windows operating systems are GUIs.

H

hard drive — A drive that reads and writes data on a hard disk. The terms hard drive and hard disk are often used interchangeably.

heat sink — A metal plate on some processors that helps dissipate heat.

hibernate mode — A power management mode that saves everything in memory to a reserved space on the hard drive and then turns off the computer. When you restart the computer, the memory information that was saved to the hard drive is automatically restored.

HTTP — hypertext transfer protocol — A protocol for exchanging files between computers connected to the Internet.

Hyper-Threading — Hyper-Threading is an Intel technology that can enhance overall computer performance by allowing one physical processor to function as two logical processors, capable of performing certain tasks simultaneously.

Hz — hertz — A unit of frequency measurement that equals 1 cycle per second. Computers and electronic devices are often measured in kilohertz (kHz), megahertz (MHz), gigahertz (GHz), or terahertz (THz).

I

IC — integrated circuit — A semiconductor wafer, or chip, on which thousands or millions of tiny electronic components are fabricated for use in computer, audio, and video equipment.

IDE — integrated device electronics — An interface for mass storage devices in which the controller is integrated into the hard drive or CD drive.

IEEE 1394 — Institute of Electrical and Electronics Engineers, Inc. — A high-performance serial bus used to connect IEEE 1394-compatible devices, such as digital cameras and DVD players, to the computer.

infrared sensor — A port that allows you to transfer data between the computer and infrared-compatible devices without using a cable connection.

integrated — Usually refers to components that are physically located on the computer's system board. Also referred to as *built-in*.

I/O — input/output — An operation or device that enters and extracts data from your computer. Keyboards and printers are I/O devices.

I/O address — An address in RAM that is associated with a specific device (such as a serial connector, parallel connector, or expansion slot) and allows the processor to communicate with that device.

IrDA — Infrared Data Association — The organization that creates international standards for infrared communications.

IRQ — interrupt request — An electronic pathway assigned to a specific device so that the device can communicate with the processor. Each device connection must be assigned an **IRQ**. Although two devices can share the same **IRQ** assignment, you cannot operate both devices simultaneously.

ISP — Internet service provider — A company that allows you to access its host server to connect directly to the Internet, send and receive e-mail, and access websites. The ISP typically provides you with a software package, user name, and access phone numbers for a fee.

K

Kb — kilobit — A unit of data that equals 1024 bits. A measurement of the capacity of memory integrated circuits.

KB — kilobyte — A unit of data that equals 1024 bytes but is often referred to as 1000 bytes.

key combination — A command requiring you to press multiple keys at the same time.

kHz — kilohertz — A measurement of frequency that equals 1000 Hz.

L

LAN — local area network — A computer network covering a small area. A LAN usually is confined to a building or a few nearby buildings. A LAN can be connected to another LAN over any distance through telephone lines and radio waves to form a wide area network (WAN).

LCD — liquid crystal display — The technology used by portable computer and flat-panel displays.

LED — light-emitting diode — An electronic component that emits light to indicate the status of the computer.

local bus — A data bus that provides a fast throughput for devices to the processor.

LPT — line print terminal — The designation for a parallel connection to a printer or other parallel device.

M

Mb — megabit — A measurement of memory chip capacity that equals 1024 Kb.

Mbps — megabits per second — One million bits per second. This measurement is typically used for transmission speeds for networks and modems.

MB — megabyte — A measurement of data storage that equals 1,048,576 bytes. 1 MB equals 1024 KB. When used to refer to hard drive storage, the term is often rounded to 1,000,000 bytes.

MB/sec — megabytes per second — One million bytes per second. This measurement is typically used for data transfer ratings.

media bay — A bay that supports devices such as optical drives, a second battery, or a Dell TravelLite™ module.

memory — A temporary data storage area inside your computer. Because the data in memory is not permanent, it is recommended that you frequently save your files while you are working on them, and always save your files before you shut down the computer. Your computer can contain several different forms of memory, such as RAM, ROM, and video memory. Frequently, the word memory is used as a synonym for RAM.

memory address — A specific location where data is temporarily stored in RAM.

memory mapping — The process by which the computer assigns memory addresses to physical locations at start-up. Devices and software can then identify information that the processor can access.

memory module — A small circuit board containing memory chips, which connects to the system board.

MHz — megahertz — A measure of frequency that equals 1 million cycles per second. The speeds for computer processors, buses, and interfaces are often measured in MHz.

Mini PCI — A standard for integrated peripheral devices with an emphasis on communications such as modems and NICs. A Mini PCI card is a small external card that is functionally equivalent to a standard PCI expansion card.

Mini-Card — A small card designed for integrated peripherals, such as communication NICs. The Mini-Card is functionally equivalent to a standard PCI expansion card.

modem — A device that allows your computer to communicate with other computers over analog telephone lines. Three types of modems include: external, PC Card, and internal. You typically use your modem to connect to the Internet and exchange e-mail.

module bay — See *media bay*.

MP — megapixel — A measure of image resolution used for digital cameras.

ms — millisecond — A measure of time that equals one thousandth of a second. Access times of storage devices are often measured in ms.

N

network adapter — A chip that provides network capabilities. A computer may include a network adapter on its system board, or it may contain a PC Card with an adapter on it. A network adapter is also referred to as a *NIC* (network interface controller).

NIC — See *network adapter*.

notification area — The section of the Windows taskbar that contains icons for providing quick access to programs and computer functions, such as the clock, volume control, and print status. Also referred to as *system tray*.

ns — nanosecond — A measure of time that equals one billionth of a second.

NVRAM — nonvolatile random access memory — A type of memory that stores data when the computer is turned off or loses its external power source. NVRAM is used for maintaining computer configuration information such as date, time, and other System Setup options that you can set.

O

optical drive — A drive that uses optical technology to read or write data from CDs, DVDs, or DVD+RWs. Example of optical drives include CD drives, DVD drives, CD-RW drives, and CD-RW/DVD combo drives.

P

parallel connector — An I/O port often used to connect a parallel printer to your computer. Also referred to as an *LPT port*.

partition — A physical storage area on a hard drive that is assigned to one or more logical storage areas known as logical drives. Each partition can contain multiple logical drives.

PC Card — A removable I/O card adhering to the PCMCIA standard. Modems and network adapters are common types of PC Cards.

PCI — peripheral component interconnect — PCI is a local bus that supports 32- and 64-bit data paths, providing a high-speed data path between the processor and devices such as video, drives, and networks.

PCI Express — A modification to the PCI interface that boosts the data transfer rate between the processor and the devices attached to it. PCI Express can transfer data at speeds from 250 MB/sec to 4 GB/sec. If the PCI Express chip set and the device are capable of different speeds, they will operate at the slower speed.

PCMCIA — Personal Computer Memory Card International Association — The organization that establishes standards for PC Cards.

PIO — programmed input/output — A method of transferring data between two devices through the processor as part of the data path.

pixel — A single point on a display screen. Pixels are arranged in rows and columns to create an image. A video resolution, such as 800 x 600, is expressed as the number of pixels across by the number of pixels up and down.

Plug-and-Play — The ability of the computer to automatically configure devices. Plug and Play provides automatic installation, configuration, and compatibility with existing hardware if the BIOS, operating system, and all devices are Plug and Play compliant.

POST — power-on self-test — Diagnostics programs, loaded automatically by the BIOS, that perform basic tests on the major computer components, such as memory, hard drives, and video. If no problems are detected during POST, the computer continues the start-up.

processor — A computer chip that interprets and executes program instructions. Sometimes the processor is referred to as the CPU (central processing unit).

PS/2 — personal system/2 — A type of connector for attaching a PS/2-compatible keyboard, mouse, or keypad.

PXE — pre-boot execution environment — A WfM (Wired for Management) standard that allows networked computers that do not have an operating system to be configured and started remotely.

R

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.

RAM — random-access memory — The primary temporary storage area for program instructions and data. Any information stored in RAM is lost when you shut down your computer.

readme file — A text file included with a software package or hardware product. Typically, readme files provide installation information and describe new product enhancements or corrections that have not yet been documented.

read-only — Data and/or files you can view but cannot edit or delete. A file can have read-only status if:

- It resides on a physically write-protected floppy disk, CD, or DVD.
- It is located on a network in a directory and the system administrator has assigned rights only to specific individuals.

refresh rate — The frequency, measured in Hz, at which your screen's horizontal lines are recharged (sometimes also referred to as its *vertical frequency*). The higher the refresh rate, the less video flicker can be seen by the human eye.

resolution — The sharpness and clarity of an image produced by a printer or displayed on a monitor. The higher the resolution, the sharper the image.

RFI — radio frequency interference — Interference that is generated at typical radio frequencies, in the range of 10 kHz to 100,000 MHz. Radio frequencies are at the lower end of the electromagnetic frequency spectrum and are more likely to have interference than the higher frequency radiations, such as infrared and light.

ROM — read-only memory — Memory that stores data and programs that cannot be deleted or written to by the computer. ROM, unlike RAM, retains its contents after you shut down your computer. Some programs essential to the operation of your computer reside in ROM.

RPM — revolutions per minute — The number of rotations that occur per minute. Hard drive speed is often measured in rpm.

RTC — real time clock — Battery-powered clock on the system board that keeps the date and time after you shut down the computer.

RTCST — real-time clock reset — A jumper on the system board of some computers that can often be used for troubleshooting problems.

S

SAS — serial attached SCSI — A faster, serial version of the SCSI interface (as opposed to the original SCSI parallel architecture).

SATA — serial ATA — A faster, serial version of the ATA (IDE) interface.

ScanDisk — A Microsoft utility that checks files, folders, and the hard disk's surface for errors. ScanDisk often runs when you restart the computer after it has stopped responding.

SCSI — small computer system interface — A high-speed interface used to connect devices to a computer, such as hard drives, CD drives, printers, and scanners. The SCSI can connect many devices using a single controller. Each device is accessed by an individual identification number on the SCSI controller bus.

SDRAM — synchronous dynamic random-access memory — A type of DRAM that is synchronized with the optimal clock speed of the processor.

serial connector — An I/O port often used to connect devices such as a handheld digital device or digital camera to your computer.

Service Tag — A bar code label on your computer that identifies your computer when you access Dell Support at support.dell.com or when you call Dell for customer service or technical support.

setup program — A program that is used to install and configure hardware and software. The **setup.exe** or **install.exe** program comes with most Windows software packages. *Setup program* differs from *System Setup*.

shortcut — An icon that provides quick access to frequently used programs, files, folders, and drives. When you place a shortcut on your Windows desktop and double-click the icon, you can open its corresponding folder or file without having to find it first. Shortcut icons do not change the location of files. If you delete a shortcut, the original file is not affected. Also, you can rename a shortcut icon.

SIM — Subscriber Identity Module — A SIM card contains a microchip that encrypts voice and data transmissions. SIM cards can be used in phones or portable computers.

smart card — A card that is embedded with a processor and a memory chip. Smart cards can be used to authenticate a user on computers equipped for smart cards.

S/PDIF — Sony/Philips Digital Interface — An audio transfer file format that allows the transfer of audio from one file to another without converting it to and from an analog format, which could degrade the quality of the file.

standby mode — A power management mode that shuts down all unnecessary computer operations to save energy.

Strike Zone™ — Reinforced area of the platform base that protects the hard drive by acting as a dampening device when a computer experiences resonating shock or is dropped (whether the computer is on or off).

surge protectors — Prevent voltage spikes, such as those that may occur during an electrical storm, from entering the computer through the electrical outlet. Surge protectors do not protect against lightning strikes or against brownouts, which occur when the voltage drops more than 20 percent below the normal AC-line voltage level.

Network connections cannot be protected by surge protectors. Always disconnect the network cable from the network connector during electrical storms.

SVGA — super-video graphics array — A video standard for video cards and controllers. Typical SVGA resolutions are 800 x 600 and 1024 x 768.

The number of colors and resolution that a program displays depends on the capabilities of the monitor, the video controller and its drivers, and the amount of video memory installed in the computer.

S-video TV-out — A connector used to attach a TV or digital audio device to the computer.

SXGA — super-extended graphics array — A video standard for video cards and controllers that supports resolutions up to 1280 x 1024.

SXGA+ — super-extended graphics array plus — A video standard for video cards and controllers that supports resolutions up to 1400 x 1050.

system board — The main circuit board in your computer. Also known as the *motherboard*.

System Setup — A utility that serves as an interface between the computer hardware and the operating system. System Setup allows you to configure user-selectable options in the BIOS, such as date and time or system password. Unless you understand what effect the settings have on the computer, do not change the settings for this program.

T

TAPI — telephony application programming interface — Enables Windows programs to operate with a wide variety of telephony devices, including voice, data, fax, and video.

text editor — A program used to create and edit files that contain only text; for example, Windows Notepad uses a text editor. Text editors do not usually provide word wrap or formatting functionality (the option to underline, change fonts, and so on).

TPM — trusted platform module — A hardware-based security feature that when combined with security software enhances network and computer security by enabling features such as file and e-mail protection.

travel module — A plastic device designed to fit inside the module bay of a portable computer to reduce the weight of the computer.

U

UAC — user account control— Microsoft Windows Vista™ security feature that, when enabled, provides an added layer of security between user accounts and access to operating system settings.

UMA — unified memory allocation — System memory dynamically allocated to video.

UPS — uninterruptible power supply — A backup power source used when the electrical power fails or drops to an unacceptable voltage level. A UPS keeps a computer running for a limited amount of time when there is no electrical power. UPS systems typically provide surge suppression and may also provide voltage regulation. Small UPS systems provide battery power for a few minutes to enable you to shut down your computer.

USB — universal serial bus — A hardware interface for a low-speed device such as a USB-compatible keyboard, mouse, joystick, scanner, set of speakers, printer, broadband devices (DSL and cable modems), imaging devices, or storage devices. Devices are plugged directly in to a 4-pin socket on your computer or in to a multi-port hub that plugs in to your computer. USB devices can be connected and disconnected while the computer is turned on, and they can also be daisy-chained together.

UTP — unshielded twisted pair — Describes a type of cable used in most telephone networks and some computer networks. Pairs of unshielded wires are twisted to protect against electromagnetic interference, rather than relying on a metal sheath around each pair of wires to protect against interference.

UXGA — ultra extended graphics array — A video standard for video cards and controllers that supports resolutions up to 1600 x 1200.

V

video controller — The circuitry on a video card or on the system board (in computers with an integrated video controller) that provides the video capabilities—in combination with the monitor—for your computer.

video memory — Memory that consists of memory chips dedicated to video functions. Video memory is usually faster than system memory. The amount of video memory installed primarily influences the number of colors that a program can display.

video mode — A mode that describes how text and graphics are displayed on a monitor. Graphics-based software, such as Windows operating systems, displays in video modes that can be defined as x horizontal pixels by y vertical pixels by z colors. Character-based software, such as text editors, displays in video modes that can be defined as x columns by y rows of characters.

video resolution — See *resolution*.

virus — A program that is designed to inconvenience you or to destroy data stored on your computer. A virus program moves from one computer to another through an infected disk, software downloaded from the Internet, or e-mail attachments. When an infected program starts, its embedded virus also starts.

A common type of virus is a boot virus, which is stored in the boot sectors of a floppy disk. If the floppy disk is left in the drive when the computer is shut down and then turned on, the computer is infected when it reads the boot sectors of the floppy disk expecting to find the operating system. If the computer is infected, the boot virus may replicate itself onto all the floppy disks that are read or written in that computer until the virus is eradicated.

V — volt — The measurement of electric potential or electromotive force. One V appears across a resistance of 1 ohm when a current of 1 ampere flows through that resistance.

W

W — watt — The measurement of electrical power. One W is 1 ampere of current flowing at 1 volt.

WHr — watt-hour — A unit of measure commonly used to indicate the approximate capacity of a battery. For example, a 66-WHr battery can supply 66 W of power for 1 hour or 33 W for 2 hours.

wallpaper — The background pattern or picture on the Windows desktop. Change your wallpaper through the Windows Control Panel. You can also scan in your favorite picture and make it wallpaper.

WLAN — wireless local area network. A series of interconnected computers that communicate with each other over the air waves using access points or wireless routers to provide Internet access.

write-protected — Files or media that cannot be changed. Use write-protection when you want to protect data from being changed or destroyed. To write-protect a 3.5-inch floppy disk, slide its write-protect tab to the open position.

WWAN — wireless wide area network. A wireless high-speed data network using cellular technology and covering a much larger geographic area than WLAN.

WXGA — wide-aspect extended graphics array — A video standard for video cards and controllers that supports resolutions up to 1280 x 800.

X

XGA — extended graphics array — A video standard for video cards and controllers that supports resolutions up to 1024 x 768.

Z

ZIF — zero insertion force — A type of socket or connector that allows a computer chip to be installed or removed with no stress applied to either the chip or its socket.

Zip — A popular data compression format. Files that have been compressed with the Zip format are called Zip files and usually have a filename extension of **.zip**. A special kind of zipped file is a self-extracting file, which has a filename extension of **.exe**. You can unzip a self-extracting file by double-clicking it.

Zip drive — A high-capacity floppy drive developed by Iomega Corporation that uses 3.5-inch removable disks called Zip disks. Zip disks are slightly larger than regular floppy disks, about twice as thick, and hold up to 100 MB of data.

