Dell Precision™ Workstation 390 User's Guide

Notes, Notices, and Cautions

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

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

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

Abbreviations and Acronyms

For a complete list of abbreviations and acronyms, see the Glossary.

If you purchased a Dell™ n Series computer, any references in this document to Microsoft® Windows® operating systems are not applicable.

NOTE: Some features or media may not be available for your computer or in certain countries.

Advanced Features

Dell Precision™ Workstation 390 User's Guide

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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, a parallel connector, a floppy drive, PCI slots, 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

Alert Standard Format

ASF is a DMTF management standard that specifies "pre-operating system" or "operating system-absent" alerting techniques. The standard is designed to generate an alert on potential security and fault conditions when the operating system is in a sleep state or the system is powered down. ASF is designed to supersede previous operating system-absent alerting technologies.

Your computer supports the following ASF alerts:

Alert	Description
BIOS: Corrupt BIOS/Corrupt BIOS Cleared	The BIOS has been corrupted or the BIOS corruption has been resolved.
Boot: No Boot Device	No bootable devices were found when attempting to boot
Boot: Failure to Boot to BIOS	The BIOS did not complete loading upon initiation.
Password: System Password Violation	The system password is invalid (alert occurs after three failed attempts).
Chassis: Chassis Intrusion	A chassis intrusion has been detected
CPU: CPU DOA Alert/CPU DOA Alert Cleared	The microprocessor is not functioning.
Heartbeats: Entity Presence	Periodic heartbeats have been transmitted to verify system presence.
Temperature: Generic Critical Temperature Problem/Generic Critical Temperature Problem Cleared	The computer temperature is out of limits or the computer temperature problem has been resolved.
Cooling Device: Generic Critical Fan Failure/Generic Critical Fan Failure Cleared	The fan speed (rpm) is out of limits or the fan speed (rpm) problem has been resolved.
Connectivity: Ethernet Connectivity Enabled/ Ethernet Connectivity Disabled	The ethernet connectivity is enabled or the ethernet connectivity is disabled.

For more information about Dell's ASF implementation, see the *ASF User's Guide* and the *ASF Administrator's Guide*, which are available on the Dell Support website at **support.dell.com**.

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. It supports instrumentation that conforms to SNMP and CIM industry standards.

Dell OpenManage Client instrumentation, which is based on 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 how many processors it has and what operating system it is running
- 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 its BIOS or shutting it down 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**.

Security

Chassis Intrusion Detection

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

This feature detects that the chassis was opened and alerts the user. To change the **Chassis Intrusion** setting:

1. Enter the System Setup program. See Entering System Setup.
2. Press the down-arrow keys to move to the **System Security** option.
3. Press <Enter> to access the menu.
4. Use the left- and right-arrow key to select an option setting.
5. Exit system setup.

Option Settings

- **Enabled** — If the computer cover is opened, the setting changes to **Detected**, and the following alert message displays during the boot routine at the next computer start-up:

  Alert! Cover was previously removed.

  To reset the **Detected** setting, enter system setup. See Entering System Setup. In the **Chassis Intrusion** option, press the left- or right-arrow key to select **Reset**, and then choose **Enabled**, **Enabled-Silent**, or **Disabled**.

- **Enabled-Silent** (default) — If the computer cover is opened, the setting changes to **Detected**. No alert message appears during the boot sequence at the next computer start-up.

Padlock Ring and Security Cable Slot

Use one of the following methods to secure your computer:

- Use a padlock alone or a padlock and looped security cable with the padlock ring.

  A padlock alone prevents the computer from being opened.

  A security cable looped around a stationary object is used in conjunction with a padlock to prevent unauthorized movement of the computer.

- Attach a commercially available antitheft device to the security cable slot on the back of the computer.

NOTE: Before you purchase an antitheft device, make sure that it works with the security cable slot on your computer.

  Antitheft devices usually include a segment of metal-stranded cable with an attached locking device and key. The documentation that comes with the device contains instructions for installing it.
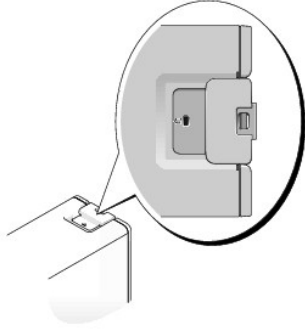
Password Protection

🛑 **NOTICE:** Although passwords provide security for the data on your computer, they are not foolproof. If your data requires more security, it is your responsibility to obtain and use additional forms of protection, such as data encryption programs.

System Password

🛑 **NOTICE:** If you leave your computer running and unattended without having a system password assigned, or if you leave your computer unlocked so that someone can disable the password by changing a jumper setting, anyone can access the data stored on your hard drive.

Option Settings

You cannot change or enter a new system password if either of the following two options is displayed:

- l **Disabled —** The system password is disabled by a jumper setting on the system board.

You can only assign a system password when the following option is displayed:

- l **Set —** A system password is assigned.

- l **Not Enabled —** No system password is assigned and the password jumper on the system board is in the enabled position (the default).

Assigning a System Password

To escape from the field without assigning a system password, press <Tab> or the <Shift><Tab> key combination to move to another field, or press <Esc> at any time before you complete step 5.

1. Enter system setup (see Entering System Setup) and verify that **Password Status** is set to **Unlocked**.

2. Highlight **System Password**, and then press <Enter>.

   The option heading changes to **Enter Password**, followed by an empty 32-character field in square brackets.

3. Type your new system password.

   You can use up to 15 characters. To erase a character when entering your password, press <Backspace> or the left-arrow key. The password is not case sensitive.

   Certain key combinations are not valid. If you enter one of these combinations, the cursor will not move.

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

4. Press <Enter>.

   If the new system password is less than 15 characters, the whole field fills with placeholders. Then the option heading changes to **Confirm Password**, followed by another empty 15-character field in square brackets.

5. To confirm your password, type it a second time and press <Enter>.

   The password setting changes to **Set**.

6. Exit system setup.

   Password protection takes effect when you restart the computer.

Typing Your System Password

When you start or restart your computer, one of the following prompts appears on the screen.

If **Password Status** is set to **Unlocked**:

```
    Type in the password and
    - press <ENTER> to leave password security enabled.
    - press <CTRL><ENTER> to disable password security.
    Enter password:
```

If **Password Status** is set to **Locked**:

```
    Type the system password and press <Enter>.

    Enter password:
```

If you have assigned a setup password, the computer accepts your setup password as an alternate system password.

If you type a wrong or incomplete system password, the following message appears on the screen:

```
    ** Incorrect password. **
```

If you again type an incorrect or incomplete system password, the same message appears on the screen. The third and subsequent times you type an incorrect or incomplete system password, the computer displays the following message:

```
    ** Incorrect password. **
    Number of unsuccessful password attempts: 3
    System halted! Must power down.
```

Even after your computer is turned off and on, the previous message is displayed each time you type an incorrect or incomplete system password.

NOTE: You can use **Password Status** in conjunction with **System Password** and **Admin Password** to further protect your computer from unauthorized changes.

Changing or Deleting an Existing System Password

To change a system password, follow the procedure in Assigning a System Password.

To delete a system password:

1. Enter system setup (see Entering System Setup), highlight **System Password** and press <Enter>.

2. When prompted, type the system password.

3. Press <Enter> twice to clear the existing setup password. The setting changes to Not Set.

4. To assign a new password, follow the procedure in Assigning a System Password.

Admin Password

Option Settings

- l **Set** — Does not allow assignment of setup passwords; users must enter a setup password to make changes to system setup

- l **Not Set** — Allows assignment of setup passwords; password feature is enabled but no password is assigned

- l **Disabled** —The administrator password is disabled by a jumper setting on the system board

Assigning a Setup Password

The setup password can be the same as the system password.

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

1. Enter system setup (see Entering System Setup) and verify that **Admin Password** is set to **Not Enabled.**

2. Highlight **Admin Password** and press the left- or right-arrow key.

The computer prompts you to type and verify the password. If a character is not permitted, the computer emits a beep.

3. Type and verify the password.

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

4. Exit system setup.

   A change to **Admin Password** becomes effective immediately (no need to restart the computer).

Operating Your Computer With an Admin Password Enabled

When you enter system setup (see Entering System Setup), the **Admin Password** option is highlighted, prompting you to type the password.

If you do not type the correct password, the computer lets you view, but not modify, system setup options.

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

Deleting or Changing an Existing Admin Password

To change an existing administrator password, you must know the administrator password.

1. Enter system setup (see Entering System Setup).

2. Type the administrator password at the prompt.

3. Press <Enter> twice to clear the existing administrator password. The setting changes to **Not Set**.

   To assign a new setup password, you can also perform the procedure in Assigning a System Password.

Disabling a Forgotten Password and Setting a New Password

To reset system and/or administrator passwords, see Clearing Forgotten Passwords.

System Setup

Overview

Use system setup as follows:

 l To change the system configuration information after you add, change, or remove any hardware in your computer

 l To set or change a user-selectable option such as the user password

 l 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.

Entering System Setup

1. Turn on (or restart) your computer.

2. **When the blue DELL™ logo appears, press <F2> immediately.**

   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 (see Turn Off 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, active options field, and key functions.

Options List — This field 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.	Scroll up and down the list by using the up and down arrow keys. As an option is highlighted, the **Option Field** displays more information about that option and the option's current and available settings.
Option Field — This field contains information about each option. In this field you can view your current settings and make changes to your settings.	Use the right and left arrow keys to highlight an option. Press <Enter> to make that selection active. **Key Functions** — This field appears below the **Option Field** and lists keys and their functions within the active system setup field.

System Setup Options

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

Info	
System Info	Lists the computer name, version number of the BIOS, date of the BIOS, Asset Tag, Service Tag, and Ownership tag.
Processor Info	Identifies whether the computer's processor supports Hyper-Threading, IA-32e, and identifies the CPU speed, bus speed, clock speed, and L2 cache.
Memory Info	Indicates amount of installed memory, computer memory speed, amount of video memory, size of the display cache, and channel mode (dual or single).
PCI Info	Displays a list of each item that is installed in the PCI card slots.
Date/Time	Displays current date and time settings. You can modify these settings.
Boot Sequence	The computer attempts to boot from the sequence of devices specified in this list.
Drives	
Diskette Drive	Enables and disables the diskette drives and sets read permission for the internal diskette drive. **Off** disables all diskette drives. **Internal** enables the internal diskette drive. **USB** disables the internal diskette drive and enables a USB drive if the USB controller is enabled and a USB drive is connected. **Read Only** enables the internal drive controller and allows the internal diskette drive read-only permission.
Drive 0 through Drive n	Identifies and enables and disables the drives attached to the connectors on the system board and lists the capacities for the hard drives. **NOTE:** The label for drives may display as SATA-0 through SATA-3, PATA-0 through PATA-1 or SAS-0 through SAS-2, depending on your configuration.
SATA Operation	Identifies and enables selection of drive operation modes for SATA drives. Mode options are **AHCI**, **ATA**, and **RAID**.
Smart Reporting	Control whether hard driver errors for internal drives (Drive 0-6) are reported during system startup.
Onboard Devices	
Integrated NIC	You can set the NIC to **On** (default), **Off**, or **On w/ PXE**.
Integrated Audio	Enables or disables the onboard audio controller
USB Controller	Enables or disables the internal USB controller. **All On** enables the front and back ports. **All Off** disables all ports.
Front USB Ports	Selectively enables or disables the front USB ports. **Front On** enables only the front ports and **Front Off** disables only the front ports.
LPT Port Mode	Determines the mode of operating of the internal parallel port. **Off** disables the port. **AT** configures the port for IBM AT compatibility. **PS/2** configures the port for IBM PS/2 compatibility. **EPP** configures the port for the EPP bidirectional protocol. **ECP** configures the port for the ECP bidirectional protocol. **NOTE:** If you set the **LPT Port Mode** to **ECP**, the **LPT Port DMA** appears in the option menu.
LPT Port Address	Determines the address that the built-in parallel port uses.
LPT Port DMA	Determines the address that the parallel port uses when it is in **ECP** mode. **Off** disables the DMA channel. **DMA 1** selects the DMA 1 channel. **DMA 3** selects the DMA 3 channel.
Serial Port #1	Serial Port 1 appears as an option if you have a serial port card installed. **Auto**, the default setting, automatically configures a connector to a particular designation (**COM1** or **COM3**).
PS/2 Mouse Port	Enables or disables the onboard PS/2-compatible mouse controller.
Video	
Primary Video	Determines which video controller will become the primary video controller when two controllers are available in the system. The default is PEG, the PCI Express Graphics video controller.
Performance	
Multiple CPU Core	Determines whether to use all available core processors, or only one core processor in a multiple-core processor computer. This setting is only available for processors that support this technology.
SpeedStep	The Intel SpeedStep® option provides settings for changing the processor power consumption and operating frequency. **NOTE:** This option may not be available with your computer.
Virtualization	Determines whether to have a the Virtual Machine Monitor utilize additional hardware capabilities provided by Intel® Virtualization technology. This setting is only available with processors that support this technology. **On** enables Virtualization. **Off** disables Virtualization.

Limit CPUID Value	Determines whether to limit the number of CPUID functions reported to the operating system. **On** limits CPUID reporting. **Off** disables CPUID report limiting. This feature is only needed for older operating systems.
Hyper-Threading	Determines whether each physical processor appears as one or two logical processors. The performance of some applications improves with additional logical processors. **On** enables Hyper-Threading. **Off** disables Hyper-Threading.
HDD Acoustic Mode	l **Quiet** (default) - the hard drive operates at its most quiet setting. l **Performance** - the hard drive operates at its maximum speed. l **Bypass** - your computer does not test or change the current acoustics mode setting. l **Suggested** - the hard drive operates at the level suggested by the drive manufacturer. **NOTE:** Switching to performance mode may cause the drive to be noisier. **NOTE:** Changing the acoustics setting does not alter your hard drive image.
Security	
Admin Password	This option provides restricted access to the computer's System Setup program in the same way that access to the system can be restricted with the System Password option.
System Password	Displays the current status of the system's password security feature and allows a new system password to be assigned and verified.
Drive 0 Password through Drive n Password	Displays the current status of the hard drive password security feature and allows a new password to be assigned and verified. **NOTICE:** The drive password should not be set if enabling any RAID configuration. For more information, see About RAID Configurations.
Password Changes	This option locks the system password field with the administrator password. When the field is locked, the option to disable password security by pressing <CTRL-ENTER> when the computer starts is no longer available.
Chassis Intrusion	When enabled, this option alerts the user, during the next computer start-up, that the computer cover has been opened.
TPM Security	This field controls the Trusted Platform Module security device.
Execute Disable	When enabled, the processor uses Execute Disable Memory Protection Technology. This option is only available if the processor supports this technology.
Power Management	
AC Recovery	Determines what happens when AC power is restored to the computer.
Auto Power On	Sets time and days of week to automatically turn on the computer. Choices are every day or every Monday through Friday. Time is kept in a 24-hour format (*hours:minutes*). Change the start-up time by pressing the right- or left-arrow key to increase or decrease the numbers, or type numbers in both the date and time fields. The default setting is **Disabled**. This feature does not work if you turn off your computer using a power strip or surge protector.
Auto Power Time	Allows you to specify a particular time when the system will turn off automatically. The default is **Off**.
Low Power Mode	When **Low Power Mode** is selected, remote wakeup events will no longer power up from **Hibernate** or **Off** from onboard network controller.
Remote Wake-Up	This option allows the system to power up when a Network Interface Controller or Remote Wakeup-capable modem receives a wake up signal. **On** is the default setting. **On w/ Boot to NIC** will allow the computer to attempt to boot from a network prior to using the boot sequence. **NOTE:** Normally, the system can be powered up remotely from suspend mode, hibernate mode, or when powered off. When **Low Power Mode** (in the **Power Management** menu) is enabled, the system can only be powered up remotely from **Suspend**.
Suspend Mode	The options are S1, a suspend state where the computer is running in a low-power mode, and S3, a standby state where the power is reduced or turned off for most components, however, system memory remains active.
Maintenance	
Service Tag	Displays the system service tag. If the service tag is corrupted, the system will prompt to enter the correct service tag upon entering the system setup program.
ASF Mode	Determines whether to use Alert Standards Format features. For more information, see Alert Standard Format. The default is **On**
SERR Message	**Controls the SERR message mechanism. By default, this feature is On.** **NOTE: Some graphics cards require that the SERR message mechanism be disabled.**
Load Defaults	This setting will restore the computer's factory-installed default settings.
Event Log	Displays the system event log.
POST Behavior	
Fastboot	When set to **On** (default), your computer will start more quickly since it will skip certain configurations and tests.
Numlock Key	This option involves the rightmost bank of keys on your keyboard. When set to **On** (default), this option activates the numeric and mathematical features shown at the top of each key. When set to Off, this option activates the cursor-control functions labeled on the bottom of each key.
Keyboard Errors	When set to **Report** (enabled) and an error is detected during POST, the BIOS will display the error message and prompt you to

	press <F1> to continue or press <F2> to enter system setup. When set to **Do Not Report** (disabled), if an error is detected during POST, the BIOS will not display the error message and will continue booting the computer.
POST Hotkeys	**Determines whether the sign**-on screen displays a message stating the keystroke sequence that is required to enter system setup or the Quickboot feature. **Setup and Boot Menu** displays both messages (F2=Setup and F12=Boot Menu). **Setup** displays the setup message only (F2=Setup). **Boot Menu** displays the Quickboot message only (F12=Boot Menu). None displays no message.

Boot Sequence

This feature allows you to change the boot sequence for devices.

Option Settings

l **Onboard or USB Floppy Drive —** The computer attempts to boot from the floppy drive. If the floppy disk in the drive is not bootable, or if no floppy disk is in the drive, the computer generates an error message.

l **Onboard Hard Drive —** The computer attempts to boot from the primary hard drive. If no operating system is on the drive, the computer generates an error message.

l **Onboard or USB CD 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 generates an error message.

l **USB Device —** Insert the memory device into a USB port and restart the computer. When F12 = Boot Menu appears in the upper-right corner of the screen, press <F12>. The BIOS detects the device and adds the USB flash option to the boot menu.

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

Changing Boot Sequence for the Current Boot

You can use this feature, for example, to tell the computer to boot from the CD drive so that you can run the Dell Diagnostics (see Dell Diagnostics) on the *Drivers and Utilities* CD, but you want the computer to boot from the hard drive when the diagnostic tests are complete. You can also use this feature to restart your computer to a USB device such as a floppy drive, memory key.

NOTE: If you are booting to a USB floppy drive, you must first set the floppy drive to OFF in system setup.

1. If you are booting to a USB device, connect the USB device to a USB connector.

2. Turn on (or restart) your computer.

3. When F2 = Setup, F12 = Boot Menu appears in the upper-right corner of the screen, press <F12>.

   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 (see Turn Off Your Computer) and try again.

   The **Boot Device Menu** appears, listing all available boot devices. Each device has a number next to it.

4. At the bottom of the menu, enter the number of the device that is to be used for the current boot only.

   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 your device is bootable, check the device documentation.

Changing Boot Sequence for Future Boots

1. Enter system setup (see Entering System Setup).

2. Use the arrow keys to highlight the **Boot Sequence** menu option and press <Enter> to access the pop- up menu.

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

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 (enabled devices have a checkmark).

5. Press plus (+) or minus (–) to move a selected device up or down the list.

Clearing Forgotten Passwords

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

⬤ **NOTICE:** This process erases both the system and setup passwords.

1. Follow the procedures in Before You Begin.
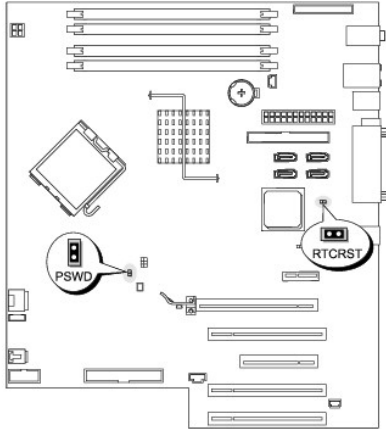
Jumper	Setting	Description
PSWD		Password features are enabled.
		Password features are disabled.
RTCRST		Normal CMOS function.
		Clears the CMOS settings
jumpered *unjumpered*		

2. Remove the computer cover (see Removing the Computer Cover).

3. Locate the 2-pin password jumper (PSWD) on the system board, and remove the jumper to clear the password. For more information see System Board Components.

📝 **NOTE:** When you receive your computer, the password jumper is attached to pins 1 and 2.

4. Replace the computer cover. See Replacing the Computer Cover.

5. Connect your computer and monitor to electrical outlets, and turn them on.

6. After the Microsoft® Windows® desktop appears on your computer, shut down your computer (see Turn Off Your Computer).

7. Turn off the monitor and disconnect it from the electrical outlet.

8. Disconnect the computer power cable from the electrical outlet, and press the power button to ground the system board.

9. Remove the computer cover (see Removing the Computer Cover).

10. Locate the 2-pin password jumper on the system board and attach the jumper to reenable the password feature. For more information see System Board Components.

11. Replace the computer cover. See Replacing the Computer Cover.

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

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

✍ **NOTE:** This procedure enables the password feature. When you enter system setup, both system and administrator password options appear as **Not Set**—meaning that the password feature is enabled but no password is assigned.

13. Assign a new system and/or setup password.

Clearing CMOS Settings

⚠ **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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Reset the current CMOS settings:

     a. Locate the password (PSWD) and (RTCRST) jumpers on the system board (see System Board Components).

     b. Remove the password from its pins.

     c. Place the password jumper plug on the RTCRST pins and wait approximately 5 seconds.

     d. Remove the jumper plug from the RTCRST pins and place it back on the password pins.

4. Replace the computer cover. See Replacing the Computer Cover.

⊘ **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 turn them on.

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. These periods of reduced power are called "sleep states":

l **Standby —** In this sleep state, power is reduced or turned off for most components, including the cooling fans. However, system memory remains active.

✍ **NOTE:** All components installed in the computer must support this feature and have the appropriate drivers loaded to enter standby. For more information, see the manufacturer's documentation for each component.

l **Hibernate —** This sleep state reduces power consumption to a minimum by writing all data in system memory to a hard drive and then removing system power. Waking up from this state restarts the computer, and the memory contents are restored. Operation then resumes where the computer left off when it entered the hibernation state.

✍ **NOTE:** All components installed in the computer must support this feature and have the appropriate drivers loaded to enter hibernation. For more information, see the manufacturer's documentation for each component.

l **Shutdown —** This sleep state 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 allows the computer to automatically start at a specified time. Also, your network administrator can remotely start your computer using a power management event such as Remote Wake Up.

The following table lists the sleep states and the methods you can use to wake the computer from each state.

Sleep State	Wake-Up Methods (Windows XP)
Standby	l Press the power button l Auto power on l Move or click the mouse l Type on the keyboard l USB device activity l Power management event

Hibernate	l Press the power button l Auto power on l Power management event
Shutdown	l Press the power button l Auto power on l Power management event

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

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. It is recommended that you use the Microsoft® Windows® XP Service Pack 1 (SP1) or higher operating system because Windows XP is optimized to take advantage of Hyper-Threading technology. While many programs can benefit from Hyper-Threading, some programs have not been optimized for Hyper-Threading and may require an update from the software manufacturer. Contact the software manufacturer for updates and information about using Hyper-Threading with your software.

To determine if your computer is using Hyper-Threading technology:

1. Click the **Start** button, right-click **My Computer**, and then click **Properties**.

2. Click **Hardware** and click **Device Manager**.

3. In the **Device Manager** window, click the plus (+) sign next to the processor type. If Hyper-Threading is enabled, the processor is listed twice.

You can enable or disable Hyper-Threading through system setup. See System Setup Options.

IEEE 1394

IEEE 1394 is a digital interface that can move large amounts of data between computers and peripheral devices. It is ideal for use with multimedia devices because it speeds the transfer of data and large files, which enables a computer to connect directly to devices such as digital video cameras.

NOTE: The connector can accept 4-pin IEEE 1394 devices with the use of an adapter.

Your computer may have an optional front IEEE 1394 connector (see Information About Your Computer). This connector is only available if you purchased an add-in card that uses IEEE 1394. To purchase a card, contact Dell. See Contacting Dell.

About RAID Configurations

This section provides an overview of the RAID configuration that you might have selected when you purchased your computer. Although there are several RAID configurations available in the computer industry for different types of uses, Dell offers either RAID level 0, RAID level 1, RAID level 5, or RAID level 10 on your Dell Precision computer. 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 of drive; SAS and SATA drives cannot be mixed in a RAID array. The drives 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 that drive or those drives can be made part of a RAID level 0 configuration using the Intel RAID configuration program, or the drive or drives can be used as a spare drive in a RAID level 1 configuration (see Creating a Spare Hard Drive). The drives should be the same size to ensure that the larger drive does not contain unallocated (and therefore unusable) space.
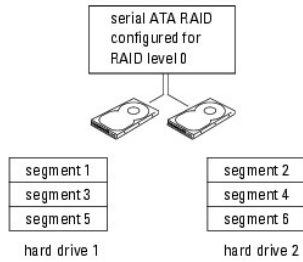
NOTE: RAID levels do not represent a hierarchy. A RAID level 10 configuration is not inherently better or worse than a RAID level 0 configuration.

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

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 drives 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.

serial ATA RAID
configured for
RAID level 0

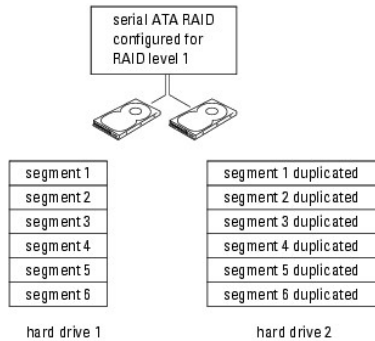| segment 1 | segment 2 |
segment 3	segment 4
segment 5	segment 6
hard drive 1	hard drive 2

Another advantage of a RAID level 0 configuration is that it utilizes the full capacities of the drives. If you have two 120-GB drives installed, you have 240 GB on which to store data.

NOTICE: Because RAID level 0 provides no data redundancy, if one drive fails, then the data on the other drive is also inaccessible. Therefore, ensure that you perform regular backups when you use a RAID level 0 configuration.
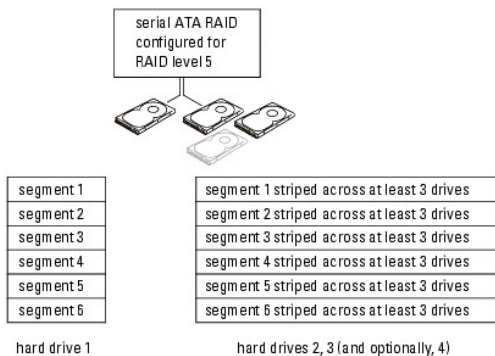
RAID Level 1

RAID level 1 uses a data-redundancy storage technique known as "mirroring." When data is written to the primary drive, the data is then duplicated—or mirrored—on the other drive. A RAID level 1 configuration sacrifices high-data access rates for its data redundancy advantages.

serial ATA RAID
configured for
RAID level 1

segment 1	segment 1 duplicated
segment 2	segment 2 duplicated
segment 3	segment 3 duplicated
segment 4	segment 4 duplicated
segment 5	segment 5 duplicated
segment 6	segment 6 duplicated
hard drive 1	hard drive 2

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. Also, because data is duplicated on both drives, two 120-GB RAID level 1 drives collectively have a maximum of 120-GB on which to store data.

RAID Level 5

RAID level 5 uses a data-staging storage technique known as "data parity." When data is written to the primary drive, it is then duplicated on at least three other drives. As opposed to a RAID level 1 setup which writes to one other volume that acts as a data mirror, a RAID level 5 configuration writes data to each drive in increments which places 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.

serial ATA RAID
configured for
RAID level 5

segment 1	segment 1 striped across at least 3 drives
segment 2	segment 2 striped across at least 3 drives
segment 3	segment 3 striped across at least 3 drives
segment 4	segment 4 striped across at least 3 drives
segment 5	segment 5 striped across at least 3 drives
segment 6	segment 6 striped across at least 3 drives
hard drive 1	hard drives 2, 3 (and optionally, 4)

If a drive failure occurs, subsequent read and write operations are directed to the other surviving drives. A replacement drive can then be rebuilt using the data from the surviving drives. Also, because data is duplicated on the primary and additional drives, four 120-GB RAID level 1 drives collectively have a maximum of 360-GB on which to store data.

RAID Level 10

RAID level 10 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. As opposed to a RAID level 1 setup 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.
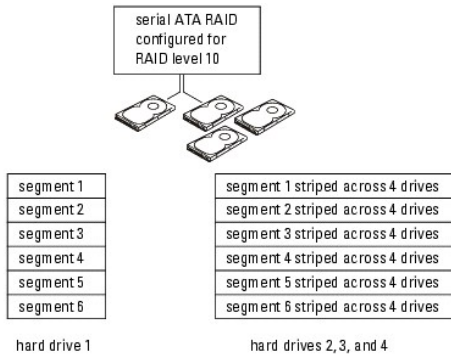
If a drive failure occurs, subsequent read and write operations are directed to the other surviving drives. A replacement drive can then be rebuilt using the data from the surviving drives. Also, because data is duplicated on the primary and additional drives, four 120-GB RAID level 1 drives collectively have a maximum of 240-GB on which to store data.

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 Drives.

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).

2. Press the up- and down-arrow keys to highlight **Drives**, and press <Enter>.

3. Press the up- and down-arrow keys to highlight **SATA Operation**, and 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.

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.

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 Reinstalling Microsoft® Windows® XP.

Creating a RAID Level 1 Configuration

1. Set your computer to RAID-enabled mode. See Setting Your Computer to RAID-Enabled Mode.

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 Reinstalling Microsoft® Windows® XP.

Creating a RAID Level 5 Configuration

1. Set your computer to RAID-enabled mode. See Setting Your Computer to RAID-Enabled Mode.

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 Reinstalling Microsoft® Windows® XP.

Creating a RAID Level 10 Configuration

1. Set your computer to RAID-enabled mode. See Setting Your Computer to RAID-Enabled Mode.

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 Reinstalling Microsoft® Windows® XP.

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) or a RAID level 1 configuration (see RAID Level 1.) Create a RAID level 0 volume or RAID level 1 volume only when:

l   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.

l   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.

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).

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.

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.

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.

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.

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.

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.

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.

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.

FCC Notices (U.S. Only)

Dell Precision™ Workstation 390 User's Guide

● FCC Class B

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 390
Model number:	DCTA
Company name:	Dell Inc. Worldwide Regulatory Compliance & Environmental Affairs One Dell Way Round Rock, TX 78682 USA 512-338-4400

Information About Your Computer

Dell Precision™ Workstation 390 User's Guide

- Finding Information
- Front View (Tower Orientation)
- Back View (Tower Orientation)
- Front View (Desktop Orientation)
- Back View (Desktop Orientation)
- Back Panel Connectors
- Inside View

- System Board Components
- Specifications
- Caring for Your Computer
- Cleaning Your Computer
- Floppy Drive
- CDs and DVDs

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?	Find It Here
- A diagnostic program for my computer - Drivers for my computer - My computer documentation - My device documentation - Desktop System Software (DSS)	**Drivers and Utilities CD (also known as ResourceCD)** Documentation and drivers are already installed on your computer. You can use the CD to reinstall drivers (see Reinstalling Drivers and Utilities) or run the Dell Diagnostics (see Dell Diagnostics). Readme files may be included on your CD to provide last-minute updates about technical changes to your computer or advanced technical-reference material for technicians or experienced users. **NOTE:** The *Drivers and Utilities* CD is optional and may not ship with all computers. **NOTE:** Drivers and documentation updates can be found at **support.dell.com**.
- How to set up my computer - How to care for my computer - Basic troubleshooting information - How to run the Dell Diagnostics - Error codes and diagnostic lights - How to remove and install parts - How to remove and replace my computer cover	**Quick Reference Guide** **NOTE:** This document is available as a PDF at **support.dell.com**.
- Warranty information - Terms and Conditions (U.S. only)	**Dell™ Product Information Guide**

l Safety instructions l Regulatory information l Ergonomics information l End User License Agreement	
l How to remove and replace parts l Specifications l How to configure system settings l How to troubleshoot and solve problems	**User's Guide** *Microsoft® Windows® XP Help and Support Center* 1. Click the **Start** button and click **Help and Support**. 2. Click **User's and system guides** and click **User's guides**.
l Service Tag and Express Service Code l Microsoft Windows License Label	**Service Tag and Microsoft® Windows® License** These labels are located on your computer. l Use the Service Tag to identify your computer when you use **support.dell.com** or contact technical support. l Enter the Express Service Code to direct your call when contacting technical support.
l Solutions — Troubleshooting hints and tips, articles from technicians, online courses, frequently asked questions l Community — Online discussion with other Dell customers l Upgrades — Upgrade information for components, such as memory, the hard drive, and the operating system l Customer Care — Contact information, service call and order status, warranty, and repair information l Service and support — Service call status and support history, service contract, online discussions with technical support l Reference — Computer documentation, details on my computer configuration, product specifications, and white papers l Downloads — Certified drivers, patches, and software updates l Desktop System Software (DSS) — If you reinstall the operating system for your computer, you should also reinstall the DSS utility. DSS provides critical updates for your operating system and support for Dell™ 3.5-inch USB floppy drives, Intel® Pentium® M processors, optical drives, and USB devices. DSS is necessary for correct operation of your Dell computer. The software automatically detects your computer and operating system and installs the updates appropriate for your configuration. To download Desktop System Software: 1. Go to **support.dell.com** and click **Downloads**. 2. Enter your Service Tag or product model. 3. In the **Download Category** drop-down menu, click **All**. 4. Select the operating system and operating system language for your computer, and click **Submit**. 5. Under **Select a Device**, scroll to **System and Configuration Utilities**, and click **Dell Desktop System Software**.	**Dell Support Website — support.dell.com** **NOTE:** Select your region to view the appropriate support site. **NOTE:** Corporate, government, and education customers can also use the customized Dell Premier Support website at **premier.support.dell.com**. The website may not be available in all regions.
l How to use Windows XP l Documentation for my computer l Documentation for devices (such as a modem)	**Windows Help and Support Center** 1. Click the **Start** button and click **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.
l How to reinstall my operating system	**Operating System CD** The operating system is already installed on your computer. To reinstall your operating system, use the *Operating System* CD. See Reinstalling Microsoft® Windows® XP for instructions. After you reinstall your operating system, use the optional *Drivers and Utilities* CD to reinstall drivers for the devices that came with your computer.

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

NOTE: The *Operating System* CD and the *Drivers and Utilities* CD are optional and may not ship with all computers.
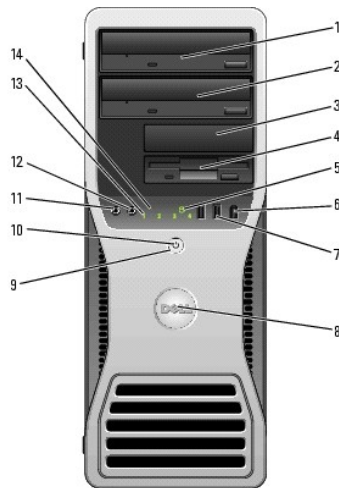
NOTE: The color of your CD varies based on the operating system you ordered.

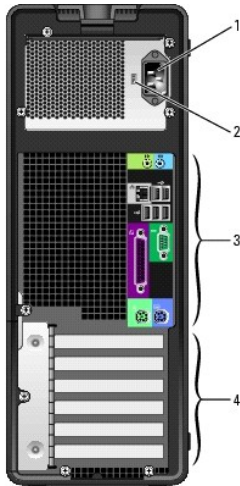|	
l How to use Linux l E-mail discussions with users of Dell Precision™ products and the Linux operating system l Additional information regarding Linux and my Dell Precision computer	**Dell Supported Linux Sites** l Linux.dell.com l Lists.us.dell.com/mailman/listinfo/linux-precision

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Front View (Tower Orientation)

1	upper 5.25-inch drive bay	Holds a CD/DVD drive.
2	lower 5.25-inch drive bay	You can use the bay for an optional CD/DVD drive or a fourth (SATA only) hard drive.
3	upper 3.5-inch drive bay	You can use the bay for an optional third hard drive (SATA or SAS), floppy drive or Media Card Reader.
4	lower 3.5-inch drive bay	You can use the bay for an optional floppy drive or Media Card Reader.
5	hard-drive activity light	The hard drive light is on when the computer reads data from or writes data to the hard drive. The light might also be on when a device such as your CD player is operating.
6	IEEE 1394 connector (optional)	Use the optional IEEE 1394 connectors 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 for more information on booting to a USB device). It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.
8	Dell™ rotatable badge	To rotate the Dell badge for tower-to-desktop conversion; remove the front panel (see Removing the Front Panel), turn it over, and rotate the

		plastic handle behind the badge.
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. **NOTE:** The power button can also be used to wake the system or to place it into a power-saving state. See Power Management for more information.

10	power light	The power light illuminates and blinks or remains solid to indicate different states:
		
		      o No light — The computer is turned off.
		      o Steady green — The computer is in a normal operating state.
		      o Blinking green — The computer is in a power-saving state.
		      o Blinking or solid amber — See Power Problems.
		
		To exit from a power-saving state, press the power button or use the keyboard or the 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.
		
		See Diagnostic Lights for a description of light codes that can help you troubleshoot problems with your computer.

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 these lights to help you troubleshoot a computer problem based on the diagnostic code. For more information, see Diagnostic Lights.
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 *Product Information Guide* for more information.
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	Holds a CD/DVD drive.
2	lower 5.25-inch drive bay	Holds an optional CD/DVD drive or an optional third hard drive (SATA only).
3	3.5-inch drive bay	You can use the bay for a floppy drive or an optional 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 might also be on when a device such as your CD player is operating.
5	IEEE 1394 connector (optional)	Use the optional IEEE 1394 connectors for high-speed data devices such as digital video cameras and external storage devices.
6	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 for more information on booting to a USB device). It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.
7	power button	Press to turn on the computer. **NOTE:** The power button can also be used to wake the system or to place it into a power-saving state. See Power Management for more information. **NOTICE:** To avoid losing data, do not use the power button to turn off the computer. Instead, perform an operating system shutdown.

8	power light	The power light illuminates and blinks or remains solid to indicate different states:
		
		   o No light — The computer is turned off.
		   o Steady green — The computer is in a normal operating state.
		   o Blinking green — The computer is in a power-saving state.
		   o Blinking or solid amber — See Power Problems.
		
		To exit from a power-saving state, press the power button or use the keyboard or the 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.
		
		See Diagnostic Lights for a description of light codes that can help you troubleshoot problems with your computer.

9	diagnostic lights (4)	Use the lights to help you troubleshoot a computer problem based on the diagnostic code. For more information, see Diagnostic Lights.
10	microphone connector	Use the microphone connector to attach a personal computer microphone for voice or musical input into a sound or telephony program.
11	headphone connector	Use the headphone connector to attach headphones.
12	network link	The network link light is on when a good connection exists between a

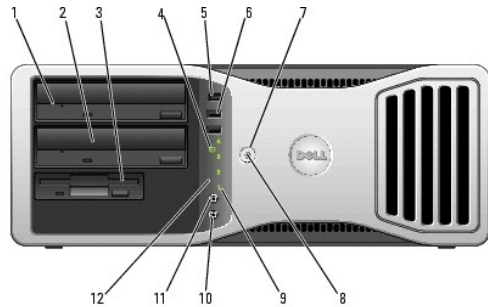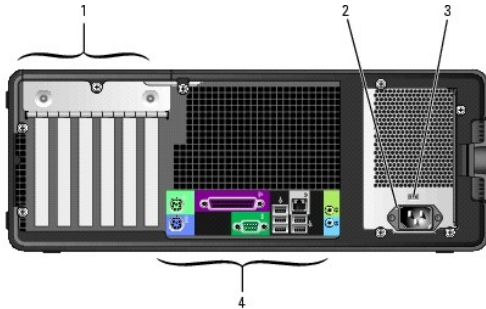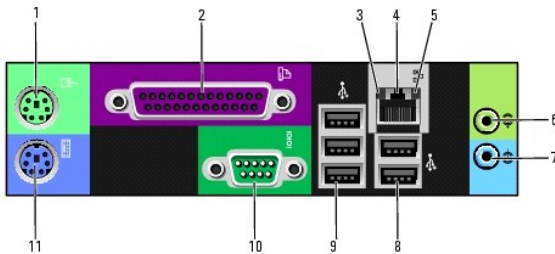| | light | 10-Mbps, 100-Mbps, or 1000-Mbps (or 1-Gbps) network and the computer. |

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 *Product Information Guide* for more information.
4	back panel connectors	Plug serial, USB, and other devices into the appropriate connector.

Back Panel Connectors

1	mouse connector	Plug a standard 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. If your computer is running the Microsoft® Windows XP operating system, the necessary mouse drivers have been installed on your hard drive.
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.
3	link integrity light	l Green — A good connection exists between a 10-Mbps network and the computer. l Orange — A good connection exists between a 100-Mbps network and the computer. l Yellow — A good connection exists between a 1000-Mbps (or 1-Gbps) network and the computer. l Off — The computer is not detecting a physical connection to the

|		
		network.
4	network adapter connector	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. **NOTE:** Do not plug a telephone cable into the network connector. 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). 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.
5	network activity light	Flashes a yellow light 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 "on" state.
6	line-out connector	Use the green line-out connector to attach headphones and most speakers with integrated amplifiers. On computers with a sound card, use the connector on the card.
7	line-in connector	Use the blue line-in connector to attach a record/playback device such as a cassette player, CD player, or VCR.
8	USB 2.0 connectors (2)	Use the back USB connectors for devices that typically remain connected, such as printers and keyboards. 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.
9	USB 2.0 connectors (3)	Use the back USB connectors for devices that typically remain connected, such as printers and keyboards. 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.
11	keyboard connector	If you have a standard keyboard, plug it into the purple keyboard connector. If you have a USB keyboard, plug it into a USB connector.

Inside View

⚠ CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.
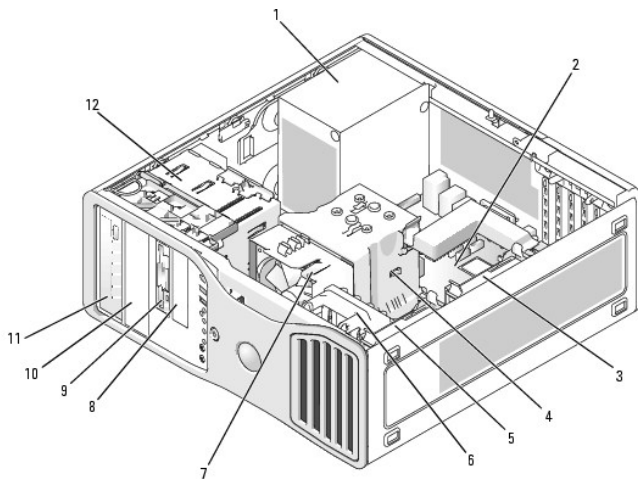
1	power supply	2	system board	3	secondary hard drive bay

4	processor airflow shroud	5	primary hard drive bay	6	card fan
7	processor fan	8	lower 3.5-inch drive bay	9	upper 3.5-inch drive bay
10	lower 5.25-inch drive bay	11	upper 5.25-inch drive bay	12	drive cage

System Board Components
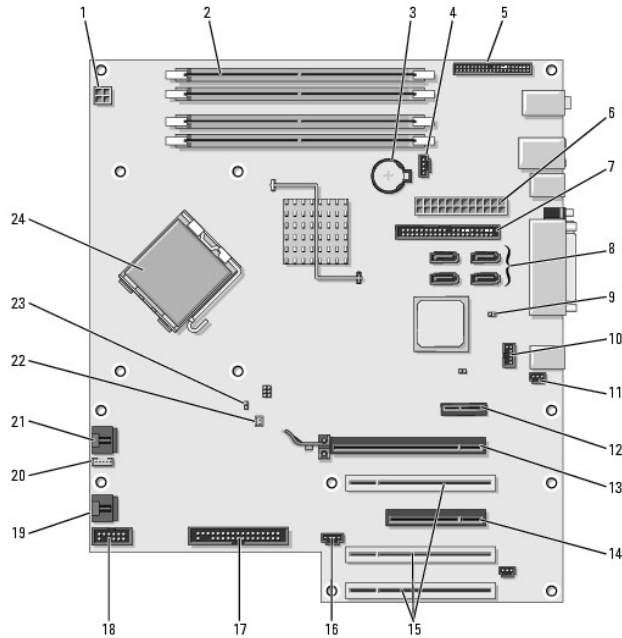
1	power connector (12VPOWER)	2	memory module connectors
3	battery socket (BATTERY)	4	memory fan connector (FAN_MEM)
5	front panel connector	6	main power connector (POWER)
7	IDE drive connector (IDE)	8	SATA connectors (SATA-1, SATA-3, SATA-0, SATA-2)
9	RTC reset jumper (RTCRST)	10	Flexbay connector (FLEXBAY)
11	chassis intrusion header	12	PCI-Express x1 card slot
13	PCI-Express x16 up to 150 W card slot	14	PCI-Express x8 card slot (wired as x4)
15	PCI card slots (1–3)	16	external LED connector (AUX LED)
17	floppy drive (FLOPPY)	18	serial connector (SERIAL2)
19	card cage fan (FAN_CARD_CAGE)	20	internal speaker connector (INT_SPKR 1)
21	processor fan connector (FAN_CPU)	22	processor fan thermal sensor connector (THRM)
23	password jumper (PSWD)	24	processor connector (CPU)

Specifications

Microprocessor	
Microprocessor types	Select Intel® Core™ (dual core) processors
	Intel® Pentium® 4 (single core) (with Hyper-Threading technology)
	Intel® Pentium® D (dual core) (no Hyper-Threading technology)
	Select Intel® Pentium® Extreme Edition processors (single or dual core) (with Hyper-Threading

	technology)
Cache	2MB or 4MB (depending on your configuration)

Memory	
Type	533-MHz and 667-MHz ECC and non-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	8 GB
BIOS address	F0000h

Computer Information	
Chipset	Intel 975X
Data bus width	64 bits
Address bus width	32 bits
DMA channels	eight
Interrupt levels	24
BIOS chip (NVRAM)	8 Mb
Memory speed	533/667MHz
NIC	Integrated network interface with ASF 2.0 support as defined by DMTF Capable of 10/100/1000-Mbps communication: l Green — A good connection exists between a 10-Mbps network and the computer. l Orange — A good connection exists between a 100-Mbps network and the computer. l Yellow — A good connection exists between a 1000-Mbps (1-Gb) network and the computer. l Off — The computer is not detecting a physical connection to the network.
SAS controller	add-in SAS 5iR card
System clock	800-MHz or 1066-MHz data rate (depending on your processor)

Video	
Type	PCI Express x16 up to 150 W

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

Controllers	

Hard drive	integrated serial ATA (4), with RAID 0/1/5/10 and command queuing
	integrated ATA-100 (1 channel)

Expansion Bus	
Bus type	three PCI 2.2 one PCI Express x16 up to 150 W one PCI Express x8, wired as x4 one PCI Express x1 eight USB 2.0 (2 front, 5 back, 1 internal)
Bus speed	PCI: 33 MHz PCI Express: x1 slot bidirectional speed - 500 MB/s x 4 slot bidirectional speed - 2 GB/s x16 slot bidirectional speed - 8 GB/s
Card slots	The upper five connector slots support full-length cards, and 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.
PCI:	
connectors	three
connector size	120 pins
connector data width (maximum)	32 bits
PCI Express:	
connectors	one x1
connector size	36 pins
connector data width (maximum)	1 PCI Express lane
PCI Express:	
connectors	one x4 full-length slot (supports x8, x4, and x1)
connector size	98 pins
connector data width (maximum)	4 PCI Express lanes
PCI Express:	
connectors	one x16 slot (supports x16 and x1 modes/cards; x8 and x4 modes/cards are not supported)
connector size	164 pins
connector data width (maximum)	16 PCI Express lanes

Drives	
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
Available devices	serial ATA drive, SAS drive, floppy drive, Media Card Reader, USB memory devices, CD drive, CD-RW drive, DVD drive, DVD+RW drive, and DVD and CD-RW combo drive
Internally accessible:	two 3.5-inch hard drive bays

Connectors	
External connectors:	
Serial	one 9-pin connector (optional 2nd connector); 16550C-compatible
Parallel	one 25-hole connector (bidirectional)
IEEE 1394a	one front-panel 6-pin serial connector (with optional card)

Video	VGA or DVI connector on graphic card
Network adapter	RJ45 connector
PS/2 (keyboard and mouse)	two 6-pin mini-DIN
USB	two front-panel, one internal, and five 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

System board connectors:	
Primary IDE drive	40-pin connector on PCI local bus
Serial ATA (4)	7-pin connector

Key Combinations	
<Ctrl><Alt><Del>	launches the task manager
<F2>	starts embedded system setup (during start-up only)
<F12> or <Ctrl><Alt><F8>	boots from the network (during start-up only)
<Ctrl><Alt><F10>	launches the utility partition (if installed) during computer start-up
<Ctrl><Alt><d>	launches the hard-drive diagnostics utility during computer start-up

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)
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)
Standby power light	AUXPWR on the system board

Power	
DC power supply:	
Wattage	375 W
Heat dissipation	1280 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
Backup battery	3-V CR2032 lithium coin cell

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)
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
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)

Caring for Your Computer

To help maintain your computer, follow these suggestions:

- To avoid losing or corrupting data, never turn off your computer when the hard drive light is on.
- Schedule regular virus scans using virus software.
- Manage hard drive space by periodically deleting unnecessary files and defragmenting the drive.
- Back up files on a regular basis.

Periodically clean your monitor screen, mouse, and keyboard.

Cleaning Your Computer

Before You Clean 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 any 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 a solution of three parts water and one part dishwashing detergent.

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

Non-Optical Mouse

If your screen cursor skips or moves abnormally, clean the mouse. To clean a non-optical mouse:

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. If the rollers inside the ball cage are dirty, clean the rollers with a cotton swab moistened lightly with isopropyl alcohol.

5. Recenter the rollers in their channels if they are misaligned. Ensure that fluff from the swab is not left on the rollers.

6. Replace the ball and retainer ring, and turn the retainer ring clockwise until it clicks into place.

Floppy Drive

NOTICE: Do not attempt to clean drive heads with a swab. You might accidentally misalign the heads, which prevents 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.

If you notice problems, such as skipping, with the playback quality of your CDs or DVDs, try cleaning the discs.

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.

Obtaining Assistance

Dell Precision™ Workstation 390 User's Guide

- Online Services
- AutoTech Service
- Automated Order-Status Service
- Support Service
- Problems With Your Order
- Product Information
- Returning Items for Warranty Repair or Credit
- Before You Call
- Contacting Dell

⚠ **CAUTION: If you need to remove the computer covers, first disconnect the computer power and modem cables from all electrical outlets.**

1. Complete the procedures in Solving Problems.

2. Run the Dell Diagnostics (see Dell Diagnostics).

3. Make a copy of the Diagnostics Checklist (see Diagnostics Checklist) and fill it out.

4. Use Dell's extensive suite of online services available at Dell Support (**support.dell.com**) for help with installation and troubleshooting procedures.

5. If the preceding steps have not resolved the problem, contact Dell (see Contacting Dell).

NOTE: Call the support service 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 support service, see Support Service.

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

Online Services

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

You can contact Dell electronically using the following addresses:

- World Wide Web

  www.dell.com/

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

  www.dell.com/jp (Japan only)

  www.euro.dell.com (Europe only)

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

  www.dell.ca (Canada only)

- Anonymous file transfer protocol (FTP)

  ftp.dell.com/

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

- Electronic Support Service

  mobile_support@us.dell.com

  support@us.dell.com

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

support.jp.dell.com (Japan only)

support.euro.dell.com (Europe only)

ı Electronic Quote Service

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

sales_canada@dell.com (Canada only)

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.

The AutoTech service is available 24 hours a day, 7 days a week. You can also access this service through the support service. For the telephone number to call for your region, see

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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.

Support Service

Dell's support service is available 24 hours a day, 7 days a week, 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, and then call the number for your country as listed in Contacting Dell.

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.

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.

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.

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), indicating the tests that you have run and any error messages reported by the Dell Diagnostics (see Dell Diagnostics).

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). 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

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

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

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

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

NOTE: In certain countries, support specific to Dell XPS™ portable computers is available at a separate telephone number listed for participating countries. If you do not see a telephone number listed that is specific for XPS portable computers, you may contact Dell through the support number listed and your call will be routed appropriately.

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

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Anguilla	General Support	toll-free: **800**-335-0031
Antigua and Barbuda	General Support	1-**800**-805-5924
Argentina (Buenos Aires) International Access Code: **00** Country Code: **54** City Code: **11**	Website: **www.dell.com.ar**	
	E-mail: us_latin_services@dell.com	
	E-mail for desktop and portable computers: la-techsupport@dell.com	
	E-mail for servers and EMC® storage products: la_enterprise@dell.com	
	Customer Care	toll-**free: 0**-800-444-0730
	Technical Support	toll-**free: 0**-800-444-0733

	Technical Support Services	toll-free: 0-800-444-0724
	Sales	0-810-444-3355
Aruba	General Support	toll-free: 800-1578
Australia (Sydney) International Access Code: **0011** Country Code: **61** City Code: **2**	Website: support.ap.dell.com	
	E-mail: support.ap.dell.com/contactus	
	General Support	13DELL-133355
Austria (Vienna) International Access Code: **900** Country Code: **43** City Code: **1**	Website: **support.euro.dell.com**	
	E-mail: tech_support_central_europe@dell.com	
	Home/Small Business Sales	0820 240 530 00
	Home/Small Business Fax	0820 240 530 49
	Home/Small Business Customer Care	0820 240 530 14
	Preferred Accounts/Corporate Customer Care	0820 240 530 16
	Support for XPS portable computers only	0820 240 530 81
	Home/Small Business Support for all other Dell computers	0820 240 530 14
	Preferred Accounts/Corporate Support	0660 8779
	Switchboard	0820 240 530 00
Bahamas	General Support	toll-free: 1-866-278-6818
Barbados	General Support	1-800-534-3066
Belgium (Brussels) International Access Code: **00** Country Code: **32** City Code: **2**	Website: **support.euro.dell.com**	
	Tech Support for XPS portable computers only	02 481 92 96
	Tech Support for all other Dell computers	02 481 92 88
	Tech Support Fax	02 481 92 95
	Customer Care	02 713 15 65
	Corporate Sales	02 481 91 00
	Fax	02 481 92 99
	Switchboard	02 481 91 00
Bermuda	General Support	1-800-342-0671
Bolivia	General Support	toll-free: 800-10-0238
Brazil International Access Code: **00** Country Code: **55** City Code: **51**	Website: **www.dell.com/br**	
	Customer Support, Tech Support	0800 90 3355
	Technical Support Fax	51 481 5470
	Customer Care Fax	51 481 5480
	Sales	0800 90 3390
British Virgin Islands	General Support	toll-free: 1-866-278-6820
Brunei Country Code: **673**	Technical Support (Penang, Malaysia)	604 633 4966
	Customer Care (Penang, Malaysia)	604 633 4888
	Transaction Sales (Penang, Malaysia)	604 633 4955
Canada (North York, Ontario) International Access Code: **011**	Online Order Status: **www.dell.ca/ostatus**	
	AutoTech (automated Hardware and Warranty Support)	toll-free: 1-800-247-9362
	Customer Service (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Customer Service (med./large business, government)	toll-free: 1-800-326-9463
	Customer Service (printers, projectors, televisions, handhelds, digital jukebox, and wireless)	toll-free: 1-800-847-4096
	Hardware Warranty Support (Home Sales/Small Business)	toll-free: 1-800-906-3355
	Hardware Warranty Support (med./large bus., government)	toll-free: 1-800-387-5757
	Hardware Warranty Support (printers, projectors, televisions, handhelds, digital jukebox, and wireless)	1-877-335-5767
	Sales (Home Sales/Small Business)	toll-free: 1-800-387-5752
	Sales (med./large bus., government)	toll-free: 1-800-387-5755
	Spare Parts Sales & Extended Service Sales	1 866 440 3355
Cayman Islands	General Support	1-800-805-7541
Chile (Santiago) Country Code: **56** City Code: **2**	Sales and Customer Support	toll-free: 1230-020-4823
	Technical Support website: **support.dell.com.cn**	

	Technical Support E-mail: cn_support@dell.com	
	Customer Care E-mail: customer_cn@dell.com	
	Technical Support Fax	592 818 1350
	Technical Support (Dell™ Dimension™ and Inspiron)	toll-free: 800 858 2968
	Technical Support (OptiPlex™, Latitude™, and Dell Precision™)	toll-free: 800 858 0950
	Technical Support (servers and storage)	toll-free: 800 858 0960
	Technical Support (projectors, PDAs, switches, routers, and so on)	toll-free: 800 858 2920
	Technical Support (printers)	toll-free: 800 858 2311
China (Xiamen)	Customer Care	toll-free: 800 858 2060
Country Code: **86**	Customer Care Fax	592 818 1308
City Code: **592**	Home and Small Business	toll-free: 800 858 2222
	Preferred Accounts Division	toll-free: 800 858 2557
	Large Corporate Accounts GCP	toll-free: 800 858 2055
	Large Corporate Accounts Key Accounts	toll-free: 800 858 2628
	Large Corporate Accounts North	toll-free: 800 858 2999
	Large Corporate Accounts North Government and Education	toll-free: 800 858 2955
	Large Corporate Accounts East	toll-free: 800 858 2020
	Large Corporate Accounts East Government and Education	toll-free: 800 858 2669
	Large Corporate Accounts Queue Team	toll-free: 800 858 2572
	Large Corporate Accounts South	toll-free: 800 858 2355
	Large Corporate Accounts West	toll-free: 800 858 2811
	Large Corporate Accounts Spare Parts	toll-free: 800 858 2621
Colombia	General Support	980-9-15-3978
Costa Rica	General Support	0800-012-0435
	Website: **support.euro.dell.com**	
	E-mail: czech_dell@dell.com	
Czech Republic (Prague)	Technical Support	22537 2727
International Access Code: **00**	Customer Care	22537 2707
Country Code: **420**	Fax	22537 2714
	Technical Fax	22537 2728
	Switchboard	22537 2711
	Website: **support.euro.dell.com**	
	Technical Support for XPS portable computers only	7010 0074
	Technical Support for all other Dell computers	7023 0182
Denmark (Copenhagen)	Customer Care (Relational)	7023 0184
International Access Code: **00**	Home/Small Business Customer Care	3287 5505
Country Code: **45**	Switchboard (Relational)	3287 1200
	Switchboard Fax (Relational)	3287 1201
	Switchboard (Home/Small Business)	3287 5000
	Switchboard Fax (Home/Small Business)	3287 5001
Dominica	General Support	toll-free: 1-866-278-6821
Dominican Republic	General Support	1-800-148-0530
Ecuador	General Support	toll-free: 999-119
El Salvador	General Support	01-899-753-0777
Finland (Helsinki)	Website: **support.euro.dell.com**	
International Access Code: **990**	Technical Support	09 253 313 60
	Customer Care	09 253 313 38
Country Code: **358**	Fax	09 253 313 99
City Code: **9**	Switchboard	09 253 313 00
	Website: **support.euro.dell.com**	
	Home and Small Business	
	Technical Support for XPS portable computers only	0825 387 129
	Technical Support for all other Dell computers	0825 387 270
	Customer Care	0825 823 833
France (Paris) (Montpellier)	Switchboard	0825 004 700
	Switchboard (calls from outside of France)	04 99 75 40 00
International Access Code: **00**	Sales	0825 004 700

Country Code: **33**	Fax	0825 004 701
	Fax (calls from outside of France)	04 99 75 40 01
City Codes: **(1) (4)**	**Corporate**	
	Technical Support	0825 004 719
	Customer Care	0825 338 339
	Switchboard	01 55 94 71 00
	Sales	01 55 94 71 00
	Fax	01 55 94 71 01
Germany (Langen) International Access Code: **00** Country Code: **49** City Code: **6103**	Website: **support.euro.dell.com**	
	E-mail: tech_support_central_europe@dell.com	
	Technical Support for XPS portable computers only	06103 766-7222
	Technical Support for all other Dell computers	06103 766-7200
	Home/Small Business Customer Care	0180-5-224400
	Global Segment Customer Care	06103 766-9570
	Preferred Accounts Customer Care	06103 766-9420
	Large Accounts Customer Care	06103 766-9560
	Public Accounts Customer Care	06103 766-9555
	Switchboard	06103 766-7000
Greece International Access Code: **00** Country Code: **30**	Website: **support.euro.dell.com**	
	Technical Support	00800-44 14 95 18
	Gold Service Technical Support	00800-44 14 00 83
	Switchboard	2108129810
	Gold Service Switchboard	2108129811
	Sales	2108129800
	Fax	2108129812
Grenada	General Support	toll-**free:** 1-866-540-3355
Guatemala	General Support	1-800-999-0136
Guyana	General Support	toll-**free:** 1-877-270-4609
Hong Kong International Access Code: **001** Country Code: **852**	Website: support.ap.dell.com	
	Technical Support E-mail: HK_support@Dell.com	
	Technical Support (Dimension and Inspiron)	2969 3188
	Technical Support (OptiPlex, Latitude, and Dell Precision)	2969 3191
	Technical Support (PowerApp™, PowerEdge™, PowerConnect™, and PowerVault™)	2969 3196
	Customer Care	3416 0910
	Large Corporate Accounts	3416 0907
	Global Customer Programs	3416 0908
	Medium Business Division	3416 0912
	Home and Small Business Division	2969 3105
India	E-mail: india_support_desktop@dell.com india_support_notebook@dell.com india_support_Server@dell.com	
	Technical Support	1600338045 and 1600448046
	Sales (Large Corporate Accounts)	1600 33 8044
	Sales (Home and Small Business)	1600 33 8046
Ireland (Cherrywood) International Access Code: **00** Country Code: **353** City Code: **1**	Website: **support.euro.dell.com**	
	E-mail: dell_direct_support@dell.com	
	Technical Support for XPS portable computers only	1850 200 722
	Technical Support for all other Dell computers	1850 543 543
	U.K. Technical Support (dial within U.K. only)	0870 908 0800
	Home User Customer Care	01 204 4014
	Small Business Customer Care	01 204 4014
	U.K. Customer Care (dial within U.K. only)	0870 906 0010
	Corporate Customer Care	1850 200 982
	Corporate Customer Care (dial within U.K. only)	0870 907 4499
	Ireland Sales	01 204 4444
	U.K. Sales (dial within U.K. only)	0870 907 4000
	Fax/Sales Fax	01 204 0103
	Switchboard	01 204 4444

Italy (Milan) International Access Code: **00** Country Code: **39** City Code: **02**	Website: **support.euro.dell.com**	
	Home and Small Business	
	Technical Support	02 577 826 90
	Customer Care	02 696 821 14
	Fax	02 696 821 13
	Switchboard	02 696 821 12
	Corporate	
	Technical Support	02 577 826 90
	Customer Care	02 577 825 55
	Fax	02 575 035 30
	Switchboard	02 577 821
Jamaica	General Support (dial from within Jamaica only)	1-800-682-3639
Japan (Kawasaki) International Access Code: **001** Country Code: **81** City Code: **44**	Website: **support.jp.dell.com**	
	Technical Support (servers)	toll-free: 0120-198-498
	Technical Support outside of Japan (servers)	81-44-556-4162
	Technical Support (Dimension and Inspiron)	toll-free: 0120-198-226
	Technical Support outside of Japan (Dimension and Inspiron)	81-44-520-1435
	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free:0120-198-433
	Technical Support outside of Japan (Dell Precision, OptiPlex, and Latitude)	81-44-556-3894
	Technical Support (PDAs, projectors, printers, routers)	toll-free: 0120-981-690
	Technical Support outside of Japan (PDAs, projectors, printers, routers)	81-44-556-3468
	Faxbox Service	044-556-3490
	24-Hour Automated Order Service	044-556-3801
	Customer Care	044-556-4240
	Business Sales Division (up to 400 employees)	044-556-1465
	Preferred Accounts Division Sales (over 400 employees)	044-556-3433
	Large Corporate Accounts Sales (over 3500 employees)	044-556-3430
	Public Sales (government agencies, educational institutions, and medical institutions)	044-556-1469
	Global Segment Japan	044-556-3469
	Individual User	044-556-1760
	Switchboard	044-556-4300
Korea (Seoul) International Access Code: **001** Country Code: **82** City Code: **2**	E-mail: krsupport@dell.com	
	Support	toll-free: 080-200-3800
	Support (Dimension, PDA, Electronics and Accessories)	toll-free: 080-200-3801
	Sales	toll-free: 080-200-3600
	Fax	2194-6202
	Switchboard	2194-6000
Latin America	Customer Technical Support (Austin, Texas, U.S.A.)	512 728-4093
	Customer Service (Austin, Texas, U.S.A.)	512 728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512 728-3883
	Sales (Austin, Texas, U.S.A.)	512 728-4397
	SalesFax (Austin, Texas, U.S.A.)	512 728-4600 or 512 728-3772
Luxembourg International Access Code: **00** Country Code: **352**	Website: **support.euro.dell.com**	
	Support	342 08 08 075
	Home/Small Business Sales	+32 (0)2 713 15 96
	Corporate Sales	26 25 77 81
	Customer Care	+32 (0)2 481 91 19
	Fax	26 25 77 82
Macao Country Code: **853**	Technical Support	toll-free: 0800 105
	Customer Service (Xiamen, China)	34 160 910
	Transaction Sales (Xiamen, China)	29 693 115
Malaysia (Penang) International Access Code: **00** Country Code: **60** City Code: **4**	Website: **support.ap.dell.com**	
	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free: 1 800 880 193
	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1 800 881 306
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 881 386
	Customer Care	toll-free: 1800 881 306 (option 6)
	Transaction Sales	toll-free: 1 800 888 202

	Corporate Sales	toll-free: 1 800 888 213
Mexico International Access Code: **00** Country Code: **52**	Customer Technical Support	001-877-384-8979 or 001-877-269-3383
	Sales	50-81-8800 or 01-800-888-3355
	Customer Service	001-877-384-8979 or 001-877-269-3383
	Main	50-81-8800 or 01-800-888-3355
Montserrat	General Support	toll-free: 1-866-278-6822
Netherlands Antilles	General Support	001-800-882-1519
Netherlands (Amsterdam) International Access Code: **00** Country Code: **31** City Code: **20**	Website: **support.euro.dell.com**	
	Technical Support for XPS portable computers only	020 674 45 94
	Technical Support for all other Dell computers	020 674 45 00
	Technical Support Fax	020 674 47 66
	Home/Small Business Customer Care	020 674 42 00
	Relational Customer Care	020 674 4325
	Home/Small Business Sales	020 674 55 00
	Relational Sales	020 674 50 00
	Home/Small Business Sales Fax	020 674 47 75
	Relational Sales Fax	020 674 47 50
	Switchboard	020 674 50 00
	Switchboard Fax	020 674 47 50
New Zealand International Access Code: **00** Country Code: **64**	Website: **support.ap.dell.com**	
	E-mail: support.ap.dell.com/contactus	
	General Support	0800 441 567
Nicaragua	General Support	001-800-220-1006
Norway (Lysaker) International Access Code: **00** Country Code: **47**	Website: **support.euro.dell.com**	
	Technical Support for XPS portable computers only	815 35 043
	Technical Support for all other Dell products	671 16882
	Relational Customer Care	671 17575
	Home/Small Business Customer Care	23162298
	Switchboard	671 16800
	Fax Switchboard	671 16865
Panama	General Support	001-800-507-0962
Peru	General Support	0800-50-669
Poland (Warsaw) International Access Code: **011** Country Code: **48** City Code: **22**	Website: **support.euro.dell.com**	
	E-mail: pl_support_tech@dell.com	
	Customer Service Phone	57 95 700
	Customer Care	57 95 999
	Sales	57 95 999
	Customer Service Fax	57 95 806
	Reception Desk Fax	57 95 998
	Switchboard	57 95 999
Portugal International Access Code: **00** Country Code: **351**	Website: **support.euro.dell.com**	
	Technical Support	707200149
	Customer Care	800 300 413
	Sales	800 300 410 or 800 300 411 or 800 300 412 or 21 422 07 10
	Fax	21 424 01 12
Puerto Rico	General Support	1-800-805-7545
St. Kitts and Nevis	General Support	toll-free: 1-877-441-4731
St. Lucia	General Support	1-800-882-1521
St. Vincent and the Grenadines	General Support	toll-free: 1-877-270-4609
	Website: **support.ap.dell.com**	

Singapore (Singapore)	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1800 394 7430
International Access Code: **005**	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 394 7488
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 394 7478
Country Code: **65**	Customer Care	toll-free: 1 800 394 7430 (option 6)
	Transaction Sales	toll-free: 1 800 394 7412
	Corporate Sales	toll-free: 1 800 394 7419
	Website: **support.euro.dell.com**	
	E-mail: czech_dell@dell.com	
Slovakia (Prague)	Technical Support	02 5441 5727
International Access Code: **00**	Customer Care	420 22537 2707
	Fax	02 5441 8328
Country Code: **421**	Tech Fax	02 5441 8328
	Switchboard (Sales)	02 5441 7585
	Website: **support.euro.dell.com**	
South Africa (Johannesburg)	E-mail: dell_za_support@dell.com	
International Access Code:	Gold Queue	011 709 7713
09/091	Technical Support	011 709 7710
	Customer Care	011 709 7707
Country Code: **27**	Sales	011 709 7700
City Code: **11**	Fax	011 706 0495
	Switchboard	011 709 7700
Southeast Asian and Pacific Countries	Technical Support, Customer Service, and Sales (Penang, Malaysia)	604 633 4810
	Website: **support.euro.dell.com**	
	Home and Small Business	
	Technical Support	902 100 130
	Customer Care	902 118 540
Spain (Madrid)	Sales	902 118 541
International Access Code: **00**	Switchboard	902 118 541
Country Code: **34**	Fax	902 118 539
City Code: **91**	**Corporate**	
	Technical Support	902 100 130
	Customer Care	902 115 236
	Switchboard	91 722 92 00
	Fax	91 722 95 83
	Website: **support.euro.dell.com**	
Sweden (Upplands Vasby)	Technical Support for XPS portable computers only	0771 340 340
	Technical Support for all other Dell products	08 590 05 199
International Access Code: **00**	Relational Customer Care	08 590 05 642
Country Code: **46**	Home/Small Business Customer Care	08 587 70 527
	Employee Purchase Program (EPP) Support	20 140 14 44
City Code: **8**	Technical Support Fax	08 590 05 594
	Sales	08 590 05 185
	Website: **support.euro.dell.com**	
	E-mail: Tech_support_central_Europe@dell.com	
Switzerland (Geneva)	Technical Support for XPS portable computers only	0848 33 88 57
International Access Code: **00**	Technical Support (Home and Small Business) for all other Dell products	0844 811 411
	Technical Support (Corporate)	0844 822 844
Country Code: **41**	Customer Care (Home and Small Business)	0848 802 202
City Code: **22**	Customer Care (Corporate)	0848 821 721
	Fax	022 799 01 90
	Switchboard	022 799 01 01
	Website: **support.ap.dell.com**	
Taiwan	E-mail: ap_support@dell.com	
International Access Code: **002**	Technical Support (OptiPlex, Latitude, Inspiron, Dimension, and Electronics and Accessories)	toll-free: 00801 86 1011
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 00801 60 1256
Country Code: **886**	Customer Care	toll-free: 00801 60 1250 (option 5)
	Transaction Sales	toll-free: 00801 65 1228

	Corporate Sales	toll-free: 00801 651 227
Thailand International Access Code: **001** Country Code: **66**	Website: **support.ap.dell.com**	
	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 0060 07
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 0600 09
	Customer Care	toll-free: 1800 006 007 (option 7)
	Corporate Sales	toll-free: 1800 006 009
	Transaction Sales	toll-free: 1800 006 006
Trinidad/Tobago	General Support	1-800-805-8035
Turks and Caicos Islands	General Support	toll-free: 1-866-540-3355
U.K. (Bracknell) International Access Code: **00** Country Code: **44** City Code: **1344**	Website: **support.euro.dell.com**	
	Customer Care website: **support.euro.dell.com/uk/en/ECare/Form/Home.asp**	
	E-mail: dell_direct_support@dell.com	
	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870 908 0500
	Technical Support for XPS portable computers only	0870 366 4180
	Technical Support (direct and general) for all other products	0870 908 0800
	Global Accounts Customer Care	01344 373 186
	Home and Small Business Customer Care	0870 906 0010
	Corporate Customer Care	01344 373 185
	Preferred Accounts (500–5000 employees) Customer Care	0870 906 0010
	Central Government Customer Care	01344 373 193
	Local Government & Education Customer Care	01344 373 199
	Health Customer Care	01344 373 194
	Home and Small Business Sales	0870 907 4000
	Corporate/Public Sector Sales	01344 860 456
	Home and Small Business Fax	0870 907 4006
Uruguay	General Support	toll-free: 000-413-598-2521
U.S.A. (Austin, Texas) International Access Code: **011** Country Code: **1**	Automated Order-Status Service	toll-free: 1-800-433-9014
	AutoTech (portable and desktop computers)	toll-free: 1-800-247-9362
	Hardware and Warranty Support (Dell TV, Printers, and Projectors) for Relationship customers	toll-free 1-877-459-7298
	Americas Consumer XPS support	toll-free: 1-800-232-8544
	Consumer (Home and Home Office) Support for all other Dell products	toll-free: 1-800-624-9896
	Customer Service	toll-free: 1-800-624-9897
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Financial Services website: **www.dellfinancialservices.com**	
	Financial Services (lease/loans)	toll-free: 1-877-577-3355
	Financial Services (Dell Preferred Accounts [DPA])	toll-free: 1-800-283-2210
	Business	
	Customer Service and Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Support for printers, projectors, PDAs, and MP3 players	toll-free: 1-877-459-7298
	Public (government, education, and healthcare)	
	Customer Service and Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Dell Sales	toll-free: 1-800-289-3355 or toll-free: 1-800-879-3355
	Dell Outlet Store (Dell refurbished computers)	toll-free: 1-888-798-7561
	Software and Peripherals Sales	toll-free: 1-800-671-3355
	Spare Parts Sales	toll-free: 1-800-357-3355
	Extended Service and Warranty Sales	toll-free: 1-800-247-4618
	Fax	toll-free: 1-800-727-8320
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired	toll-free: 1-877-DELLTTY (1-877-335-5889)
U.S. Virgin Islands	General Support	1-877-673-3355
Venezuela	General Support	8001-3605

Glossary
Dell Precision™ Workstation 390 User's Guide

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.

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 CD — A CD 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 or floppy disk available. Your *Drivers and Utilities* (or *ResourceCD*) is a bootable CD.

bootable disk — A 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 or floppy disk available.

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.

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 — See *APR.*

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 — An Intel® 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.*

ms — millisecond — A measure of time that equals one thousandth of a second. Access times of storage devices are often measured in ms.

MP — megapixel — A measure of image resolution used for digital cameras.

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.

RTCRST — 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

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.

Copying CDs and DVDs
Dell Precision™ Workstation 390 User's Guide

- How to Copy a CD or DVD
- Using Blank CDs and DVDs
- Helpful Tips

NOTE: Ensure that you observe all copyright laws when creating CDs or DVDs.

This section applies only to computers that have a CD-RW, DVD+/-RW, or CD-RW/DVD (combo) drive.

NOTE: The types of CD or DVD drives offered by Dell may vary by country.

The following instructions explain how to make an exact copy of a CD or DVD using Roxio Creator Plus - Dell Edition. You can also use Roxio Creator Plus for other purposes, such as creating music CDs from audio files stored on your computer or backing up important data. For help, open Roxio Creator Plus, and then click the question mark icon in the upper-right corner of the window.

How to Copy a CD or DVD

NOTE: CD-RW/DVD combo drives cannot write to DVD media. If you have a CD-RW/DVD combo drive and you experience recording problems, check for available software patches on the Sonic support website at **www.sonic.com**.

The DVD-writable drives installed in Dell computers can write to and read DVD+/-R, DVD+/-RW and DVD+R DL (dual layer) media, but cannot write to and may not read DVD-RAM or DVD-R DL media.

NOTE: Most commercial DVDs have copyright protection and cannot be copied using Roxio Creator Plus.

1. Click **Start**, point to **All Programs**→ **Roxio**→ **Creator Projects**, and then click **RecordNow Copy**.

2. Under the **Copy** tab, click **Disc Copy**.

3. To copy the CD or DVD:

   l *If you have one CD/DVD drive*, ensure that the settings are correct, and then click **Disc Copy**. The computer reads your source CD or DVD and copies the data to a temporary folder on your computer hard drive.

   When prompted, insert a blank CD or DVD into the drive and click **OK**.

   l *If you have two CD/DVD drives*, select the drive into which you have inserted your source CD or DVD, and then click **Disc Copy**. The computer copies the data from the source CD or DVD to the blank CD or DVD.

   Once you have finished copying the source CD or DVD, the CD or DVD that you have created automatically ejects.

Using Blank CDs and DVDs

CD-RW drives can write to CD recording media only (including high-speed CD-RW media) while DVD-writable drives can write to both CD and DVD recording media.

Use blank CD-Rs to record music or permanently store data files. After the maximum storage capacity of a CD-R is reached, you cannot write to that CD-R again (see the Sonic documentation for more information). Use blank CD-RWs if you plan to erase, rewrite, or update information on the CD later.

Blank DVD+/-Rs can be used to permanently store large amounts of data. After you create a DVD+/-R disc, you may not be able to write to that disc again if the disc is *finalized* or *closed* during the final stage of the disc creation process. Use blank DVD+/-RWs if you plan to erase, rewrite, or update information on the disc later.

CD-Writable Drives

Media Type	Read	Write	Rewritable
CD-R	Yes	Yes	No
CD-RW	Yes	Yes	Yes

DVD-Writable Drives

Media Type	Read	Write	Rewritable

CD-R	Yes	Yes	No
CD-RW	Yes	Yes	Yes
DVD+R	Yes	Yes	No
DVD-R	Yes	Yes	No
DVD+RW	Yes	Yes	Yes
DVD-RW	Yes	Yes	Yes
DVD+R DL	Yes	Yes	No
DVD-R DL	Maybe	No	No
DVD-RAM	Maybe	No	No

Helpful Tips

- Use Microsoft® Windows® Explorer to drag and drop files to a CD-R or CD-RW only after you start Roxio Creator Plus and open a Creator project.

- Use CD-Rs to burn music CDs that you want to play in regular stereos. CD-RWs may not play in many home or car stereos.

- You cannot create audio DVDs with Roxio Creator Plus.

- Music MP3 files can be played only on MP3 players or on computers that have MP3 software installed.

- Commercially available DVD players used in home theater systems may not support all available DVD formats. For a list of formats supported by your DVD player, see the documentation provided with your DVD player or contact the manufacturer.

- Do not burn a blank CD-R or CD-RW to its maximum capacity; for example, do not copy a 650-MB file to a blank 650-MB CD. The CD-RW drive needs 1–2 MB of blank space to finalize the recording.

- Use a blank CD-RW to practice CD recording until you are familiar with CD recording techniques. If you make a mistake, you can erase the data on the CD-RW and try again. You can also use blank CD-RWs to test music file projects before you record the project permanently to a blank CD-R.

- See the Sonic website at **www.sonic.com** for additional information.

Removing and Installing Parts

Dell Precision™ Workstation 390 User's Guide

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 Turn Off Your Computer and Before Working Inside Your Computer.

- You have read the safety information in your Dell™ *Product Information Guide.*

- A component can be replaced by performing the removal procedure in reverse order.

Recommended Tools

The procedures in this document may require the following tools:

- Small flat-blade screwdriver

- Phillips screwdriver

- Flash BIOS update program floppy disk or CD

Turn Off Your Computer

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

1. Shut down the operating system:

    a. Save and close any open files, exit any open programs, click the **Start** button, and then click **Turn Off Computer**.

    b. In the **Turn off computer** window, click **Turn off**.

    The computer turns off after the operating system shutdown process finishes.

2. Ensure that the computer and any attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your operating system, turn them off now.

Before Working Inside Your Computer

Use the following safety guidelines to help protect your computer from potential damage and to help ensure your own personal safety.
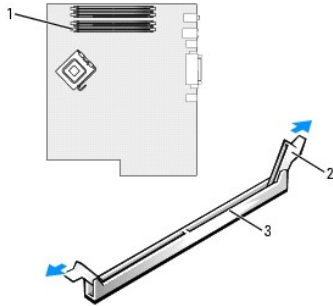
CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *Product Information Guide*.

CAUTION: 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 strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before 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. Turn off your computer.

⊘ **NOTICE:** To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network port or device.

2. Disconnect any telephone or telecommunication lines from the computer.

3. Disconnect your computer and all attached devices from their electrical outlets, and then press the power button to ground the system board.

Removing the Computer Cover and Front Panel

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.**

⊘ **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.

2. If you have installed a security cable, remove it from the security cable slot.

⊘ **NOTICE:** Ensure that sufficient space exists to support the removed cover—at least 30 cm (1 ft) of desk top space.

⊘ **NOTICE:** Ensure that you are working on a level, protected surface to avoid scratching either the computer or the surface on which it is resting.

3. Lay your computer on a flat surface with the cover facing up.

4. Pull back the cover latch release.

✎ **NOTE:** If you have a desktop computer, the drives will appear differently.
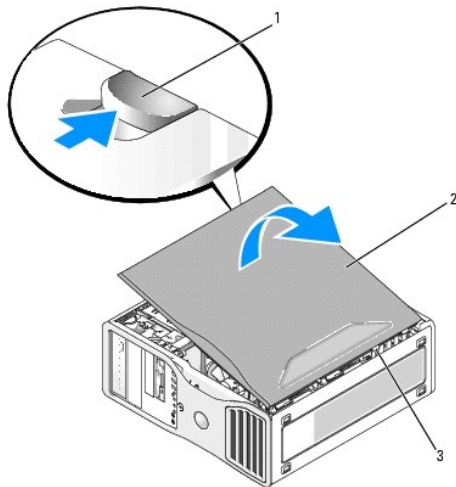
| 1 | cover latch release | 2 | computer cover | 3 | cover hinges |

5. Locate the three hinge tabs on the edge of the computer.

6. Grip the sides of the computer cover and pivot the cover up, using the hinges as leverage points.

7. Release the cover from the hinge tabs and set it aside in a secure location.

Removing 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 removing 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.

2. Remove the computer cover (see Removing the Computer Cover).

📝 **NOTE:** If you have a desktop computer, the drives will appear differently.
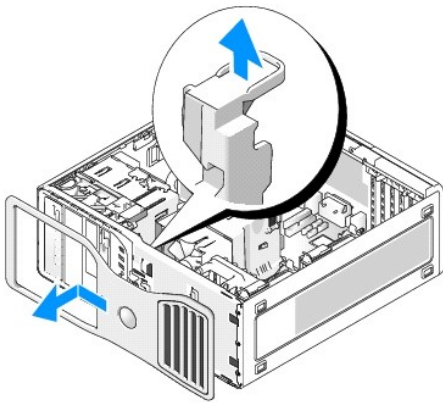
3. Lift the front-panel release lever and slide the panel to the left to disengage and remove the front panel.

Chassis Intrusion Switch

⚠ **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 Chassis Intrusion Switch

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Disconnect the chassis intrusion switch cable from the system board.

   Note the routing of the chassis intrusion switch cable as you remove it from the chassis. Chassis hooks may hold the cable in place inside the chassis.

4. Using a flat blade screwdriver, gently slide the chassis intrusion switch out of its slot, and remove the switch and its attached cable from the computer.
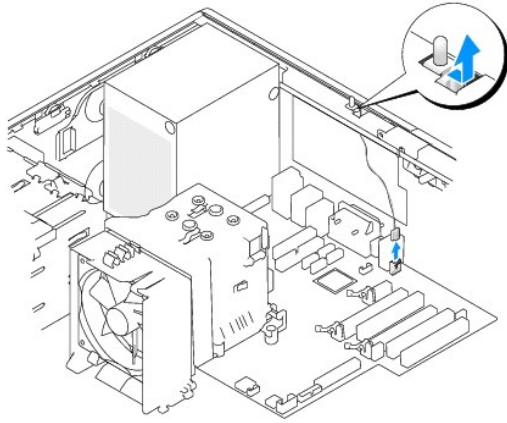
Replacing the Chassis Intrusion Switch

1. Gently slide the chassis intrusion switch into its slot and reconnect the cable to the system board.

2. Replace the computer cover. See Replacing the Computer Cover.

3. Attach the computer stand, if it is used.

⊘ **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.

Resetting the Chassis Intrusion Detector

1. Turn on (or restart) your computer.

2. **When the blue DELL™ logo appears, press <F2> immediately.**

   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 (see Turn Off Your Computer) and try again.

3. Enter System Setup (see Entering System Setup), select the **Chassis Intrusion** option, and then press the left- or right-arrow key to select **Reset**. Change the setting to **On**, **On-Silent**, or **Disabled**.

📝 **NOTE:** The default setting is **On-Silent**.

4. Press <Alt><b> to restart the computer and implement your changes.

Memory

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

⊘ **NOTICE:** Before you install new memory modules, download the most recent BIOS for your computer from the Dell™ Support website at **support.dell.com**.

Memory Overview

l 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.

The 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 matched pair installed in connectors DIMM_3 and DIMM_4

l If you install mixed pairs of DDR2 memory that run at different speeds, the modules function at the slowest speed installed.

l Be sure to install a single memory module in the DIMM_1 connector, the connector closest to the processor, before you install modules in the other connectors.

l While installing memory modules, ensure that you do not mix ECC and non-ECC memory.
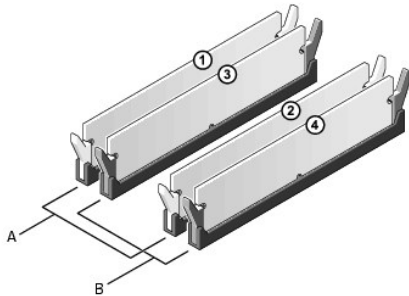
A	matched pair of memory modules in connectors DIMM_1 and DIMM_2 (white securing clips)
B	matched pair of memory modules in connectors DIMM_3 and DIMM_4 (black securing clips)

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

> **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 you purchased the new modules from Dell. If possible, *do not* pair an original memory module with a new memory module. Otherwise, your computer may not start properly. You should install your original memory modules in pairs either in connectors DIMM_1 and DIMM_2 or connectors DIMM_3 and DIMM_4.

Addressing Memory With 4-GB Configurations

Your computer supports a maximum of 8 GB of memory when you use four 2-GB DIMMs. Current operating systems, such as Microsoft® Windows® XP, can only use a maximum of 4 GB of address space; however, the amount of memory available to the operating system is less than 4 GB. 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.

> **NOTE:** If you use a 64-bit version operating system, the entire memory range is available to the operating system.

The following components require memory address space:

l System ROM

l APIC(s)

l Integrated PCI devices, such as network connectors, SAS controllers, and IEEE 1394 controllers

l 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. The BIOS then subtracts the reserved address space from 4 GB to determine the amount of usable space.

l 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.

l 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.

Installing Memory

⚠ **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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Press out the securing clip at each end of the memory module connector.

| 1 | memory module connector closest to processor | 2 | securing clips (2) | 3 | connector |

4. Align the notch on the bottom of the module with the crossbar in the connector.
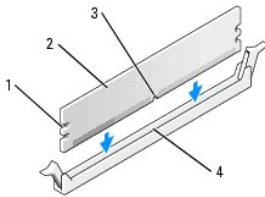
| 1 | cutouts (2) | 2 | memory module | 3 | notch |
| 4 | crossbar | | | | |

🛇 **NOTICE:** To avoid damage to the memory module, press the module straight down into the connector while you apply 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.
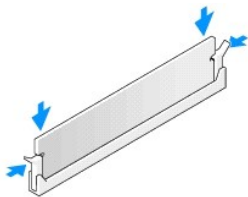
6. Replace the computer cover. See Replacing the Computer Cover.

🛇 **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.

8. Press <F2> to enter system setup and check the value for **System Memory**.

The computer should have changed the value of **System Memory** to reflect the newly installed memory. Verify the new total. If it is correct, skip to step 10.

9. If the memory total is incorrect, turn off and disconnect your computer and devices from their electrical outlets, remove the computer cover (see Removing the Computer Cover), and check the installed memory modules to ensure that they are seated properly in their sockets. Then repeat steps 6, 7, and 8.

10. When the **System Memory** total is correct, press <Esc> to exit system setup.

11. Run the Dell Diagnostics (see Dell Diagnostics) to verify that the memory modules are operating properly.

Removing Memory

⚠ **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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Press out the securing clip at each end of the memory module connector.

4. Grasp the module and pull up.

   If the module is difficult to remove, gently ease the module back and forth to remove it from the connector.

Drives

Tower Computer Drives

Possible fully-populated computer configurations:

l   Four serial ATA (SATA) hard drives, one optical drive, and one floppy drive or one Media Card Reader

l   Three (SAS or SATA) hard drives, one optical drive, and one floppy drive or one Media Card Reader

l   One or two (SAS or SATA) hard drives with up to two optical drives and one floppy drive or one Media Card Reader
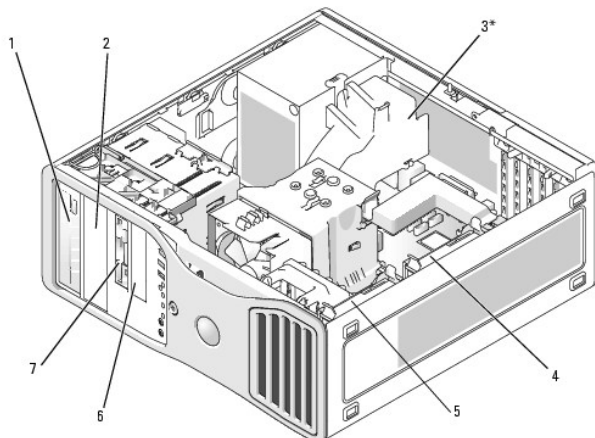
*an additional fan may be located here in computers with configurations with three SAS hard drives

| 1 | upper 5.25-inch drive bay (holds CD/DVD drive) | 2 | lower 5.25-inch drive bay (holds optional CD/DVD drive or optional fourth | 3* | additional fan space |

			serial ATA hard drive)		
4	secondary hard drive	5	primary hard drive	6	lower 3.5-inch drive bay (holds floppy drive or optional Media Card Reader)
7	upper 3.5-inch drive bay (holds optional third serial ATA or SAS hard drive, floppy drive, or Media Card Reader)				

Desktop Computer Drives

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 and one floppy drive or Media Card Reader
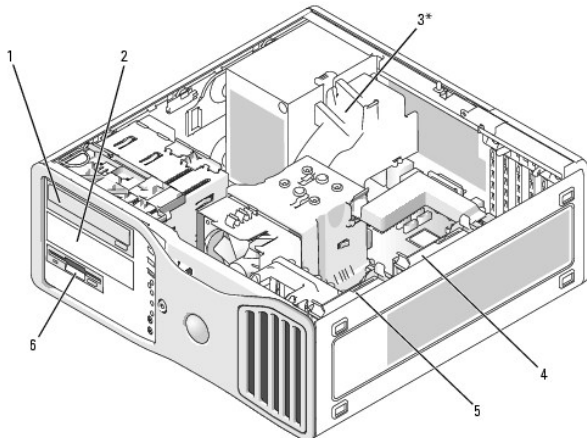
*an additional fan may be located here in computers with configurations with three SAS hard drives

1	upper 5.25-inch drive bay (holds CD/DVD drive)	2	lower 5.25-inch drive bay (holds CD/DVD drive or optional third serial ATA hard drive	3*	additional fan location (not present in this image)
4	second hard drive in secondary hard-drive bay	5	first hard drive in primary hard-drive bay	6	3.5-inch drive bay (holds floppy drive or optional Media Card Reader)

About the Metal Shields Present in Some Drive Configurations

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.

⊘ **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.

Note that if a metal shield is installed over a hard drive, and you install an optical drive in its place, a shield is not needed in that bay. In this situation, 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, you will need to 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).

Removing and Replacing the FlexBay Metal Shield

To remove a metal shield from the lower Flexbay:

Slide the sliding-plate lever to the right and hold it in place as you pull to remove the vented metal insert from the FlexBay.

To replace a metal shield over the lower drive bays:

a. Align the metal insert's two upper screws and its two lower screws with the corresponding slots inside the FlexBay.

b. Push the vented metal insert until it clicks into place and its metal tabs rest flush against the chassis surface.

Removing and Replacing an Upper Drive Bay Metal Shield

To remove a metal shield from one of the upper drive bays:

    c.   Grasp the metal shield by it's tab located in the center of the front surface.

    d.   Pull the shield out by the tab in a straight motion to avoid tearing the tab from the shield.

To replace a metal shield from one of the upper drive bays, align the shield so that it fits snugly with the drive bay and press in gently until it is flush with the surface of the bay.

General Installation Guidelines

When you install a drive, you connect two cables—a DC power cable from the power supply and a data cable—to the back of the drive. The other end of the data cable will connect to either an expansion card or to the system board. Most connectors are keyed for correct insertion; that is, a notch or a missing pin on one connector matches a tab or a filled-in hole on the other connector.

Power Cable Connectors
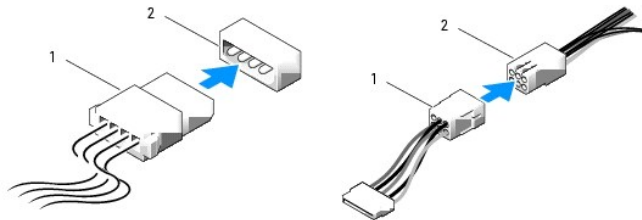
1	power cable	2	power input connector

When connecting an IDE data cable, align the tab on one connector with the notch on the other. When disconnecting an IDE data cable, grasp the colored pull-tab and pull until the connector detaches.

When you connect two IDE devices to a single IDE data cable and configure the devices for the cable select setting, the device attached to the last connector on the data cable is primary or the boot device, and the device attached to the middle connector on the data cable is the secondary device. See the drive documentation in your upgrade kit for information on configuring devices for the cable select setting.

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.

SATA Data Cable Connectors
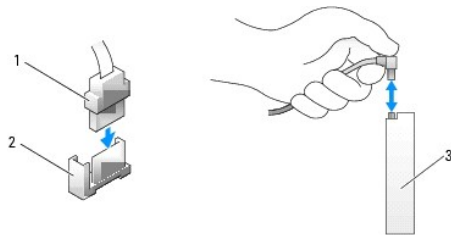
1	SATA data cable	2	SATA data connector (on the system board	3	SATA drive

SAS Data Cable Connectors
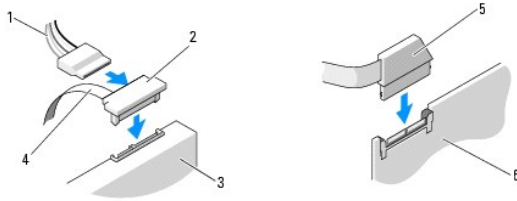
1	power cable	2	SAS connector	3	SAS drive
4	SAS data cable	5	SAS connector	6	optional PCI Express SAS controller card

Drive Cable Colors

Device	Color
Hard drive	blue cable
Floppy drive	black pull-tab
CD/DVD drive	orange pull-tab

Hard 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.**

⚠ **CAUTION: For configurations with three SAS hard drives, you must install an additional fan. See Installing an Additional Fan.**

🚫 **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 set it on a hard surface. Instead, set the drive on a surface, such as a foam pad, that will sufficiently cushion it.

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.

3. Remove the computer cover (see Removing the Computer Cover).

Removing a Hard Drive (Tower or Desktop Computer)

1. Disconnect the power cable from the hard drive.

2. *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.
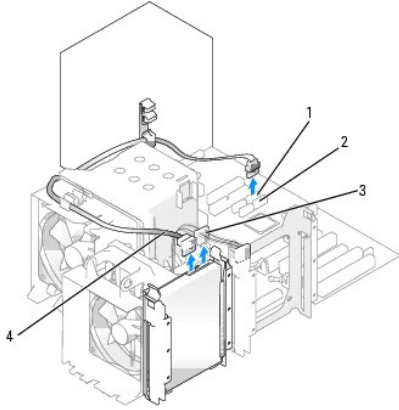
1	SATA0 connector	2	SATA1 connector	3	power cable
4	serial ATA cable				

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.
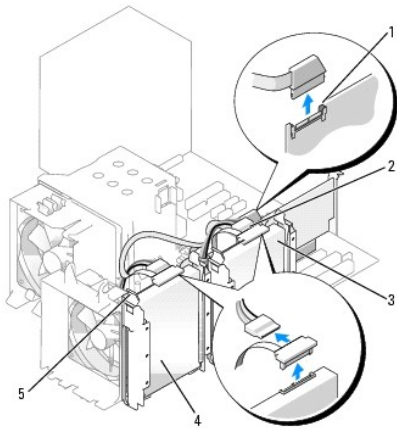
1	SAS connector on SAS controller card	2	SAS connector on SAS controller card	3	hard drive in secondary hard-drive bay
4	hard drive in primary hard-drive bay	5	blue tabs (2 on each hard-drive bracket)		

3. 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.
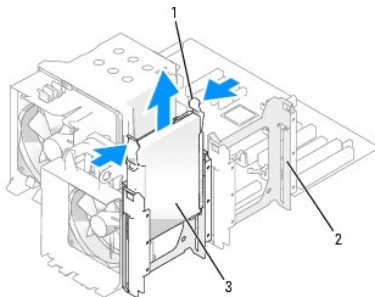
1	blue tabs (2)	2	secondary hard-drive bay	3	hard drive in primary hard-drive bay

Installing a Hard Drive or Adding a Second Optional Hard Drive (Tower or Desktop Computer)

1. Unpack the replacement hard drive, and prepare it for installation.

2. 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.

3. 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.
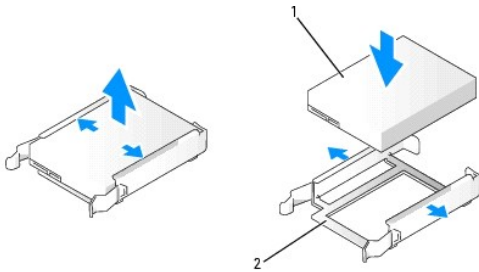
1	drive	2	hard-drive bracket

   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.

4. Slide the hard drive into the primary or secondary hard-drive bay until it clicks securely into place.

5. Connect the power cable to the drive.

6. 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.
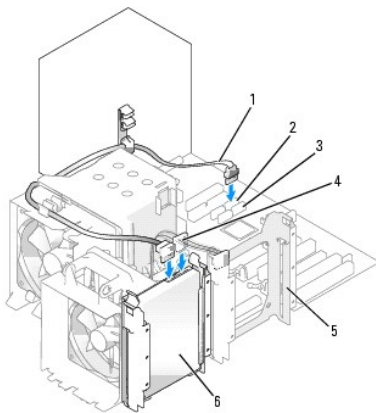
1	serial ATA cable	2	SATA0 connector	3	SATA1 connector
4	power cable	5	secondary hard-drive bay	6	hard drive in lower hard-drive bay

   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.

g. Ensure that all connectors are properly cabled and firmly seated.

h. Replace the computer cover. See Replacing the Computer Cover.

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

9. 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.

10. If the drive you just installed is the primary drive, insert a bootable floppy disk into drive A.

11. Turn on the computer.

12. Enter system setup (see Entering System Setup), and update the appropriate **Primary Drive** option (**0** or **1**).

13. Exit system setup, and reboot the computer.

14. Partition and logically format your drive before you proceed to the next step.

   See the documentation for your operating system for instructions.

15. Test the hard drive by running the Dell Diagnostics (see Dell Diagnostics).

16. 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. Remove the front panel. See Removing the Front Panel.

2. Disconnect the power cable from the back of the hard drive and from the power supply.

3. *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.
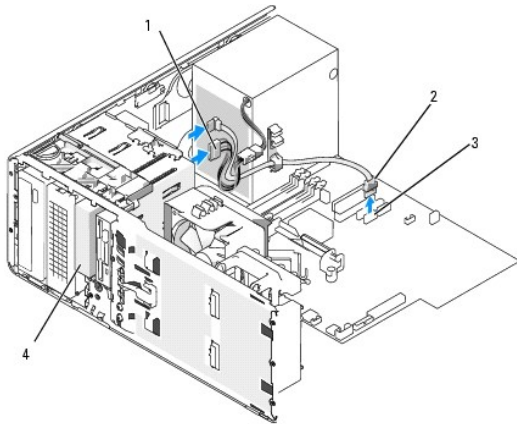
1	power cable	2	serial ATA cable	3	SATA connector
4	optional third serial ATA/SAS hard drive				

4. If you are removing a SAS drive:

   a. Disconnect the power cable form the SAS connector.

   b. Disconnect the SAS connector from the hard drive.

   c. Disconnect the SAS connector from the SAS controller card.

5. 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.

6. Set the drive aside in a secure location.

7. 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 the Metal Shields Present in Some Drive Configurations). Then, install a drive-panel insert (see Replacing a Drive-Panel Insert).

Installing an Optional Third Hard Drive (Tower Computer)

🚫 **NOTICE: Do not** attempt to install an 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. 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

2. *If you are installing a new drive*, remove the drive panel (see Drive Panel) and the drive-panel insert (see Drive-Panel Inserts) from the upper 3.5-inch drive bay. Use the screws provided with the new drive to install the drive into the drive bay.

3. If the FlexBay is not populated and metal shields are present in your computer (see About the Metal Shields Present in Some Drive Configurations), 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.
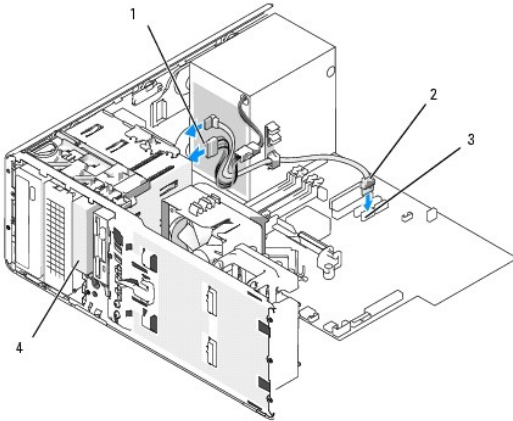
1	power cable	2	serial ATA cable	3	SATA connector
4	optional third serial ATA/SAS hard drive				

4. 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 SATA2 connector on the system board.

5. 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. Remove the front panel. See Removing the Front Panel.

2. Disconnect the power cable from the back of the hard drive.

3. *Di*sconnect the serial ATA cable from the back of the hard drive and from the SATA connector on the system board.
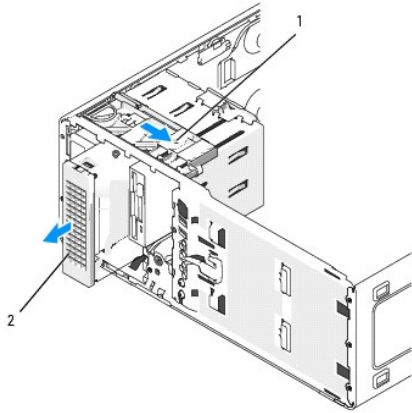
1	sliding-plate lever	2	optional fourth hard drive		

4. Slide the sliding-plate lever to release the shoulder screw and slide the drive out of the lower 5.25-inch drive bay.

5. 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 3rd 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. 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

2. *If you are installing a new drive,* remove the drive panel (see Drive Panel) and the drive-panel insert (see Drive-Panel Inserts) from the lower 5.25-inch drive bay. Use the screws provided with the new drive to install the drive into the drive bay.

3. 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.
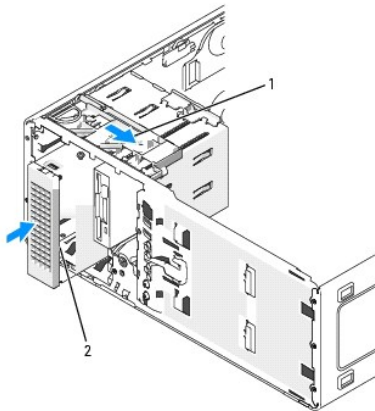
1	sliding-plate lever	2	optional fourth hard drive

4. Connect a power cable to the hard drive and to the power supply.

5. *Co*nnect the serial ATA cable to the back of the drive and to the SATA3 connector on the system board.

Removing an Optional Third Hard Drive (Desktop Computer)

1. Remove the front panel. See Removing the Front Panel.

2. Disconnect the power cable from the back of the hard drive and from the power supply.

3. *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.
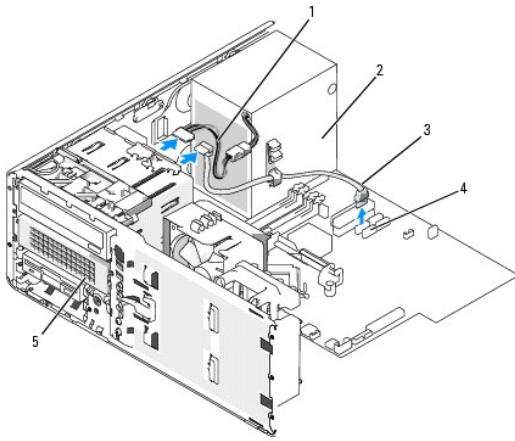
1	power cable	2	power supply	3	serial ATA cable
4	SATA2 connector	5	optional serial ATA hard drive in lower 5.25-inch drive bay		

4. If you are removing a SAS drive:

   a. Disconnect the power cable form the SAS connector.

   b. Disconnect the SAS connector from the hard drive.

   c. Disconnect the SAS connector from the SAS controller card.

5. 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.
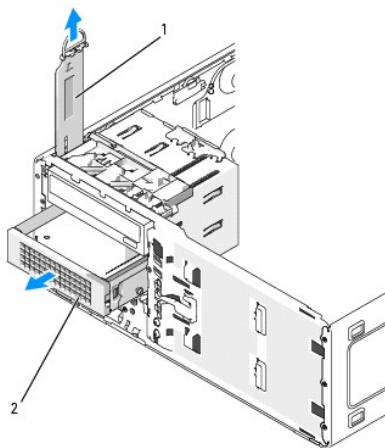
1	sliding-plate lever	2	optional third hard drive in lower 5.25-inch drive bay

6. Set the drive aside in a secure location.

7. 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 <u>About the Metal Shields Present in Some Drive Configurations</u>). 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 <u>Installing an Additional Fan</u>.**

1. 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.

2. *If you are installing a new drive*, remove the drive panel (see <u>Drive Panel</u>) and the drive-panel insert (see <u>Drive-Panel Inserts</u>) 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.

3. Place the hard drive in the hard-drive bracket and press the drive down until it snaps securely into place.
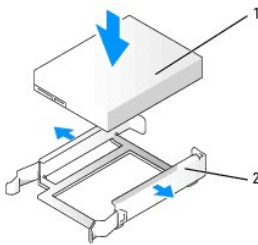
| 1 | hard drive | 2 | hard-drive bracket |

4. Slide the hard drive in the hard-drive bracket into the hard-drive holder.
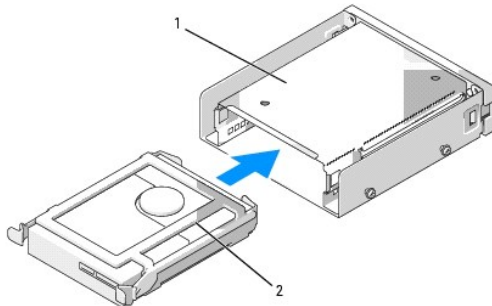
| 1 | hard-drive holder | 2 | hard drive in hard-drive bracket |

5. Slide the hard-drive holder into the lower 5.25-inch drive bay until it is securely seated.
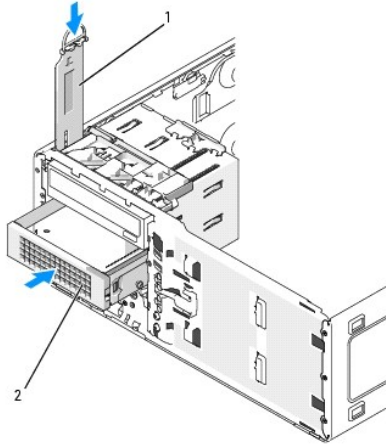
1	sliding-plate lever	2	hard-drive holder with hard drive
			NOTE: The optional third hard drive is located in the lower 5.25-inch drive bay for desktop computers.

6. Connect a power cable to the hard drive and to the power supply.

7. *Co*nnect the serial ATA cable to the back of the drive and to the SATA3 connector on the system board.

1	power cable	2	power supply	3	serial ATA cable
4	SATA3 connector	5	optional serial ATA hard drive (desktop illustrated)		
			NOTE: 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. See Installing 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.

2. Remove the computer cover (see Removing the Computer Cover).

🚫 **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.
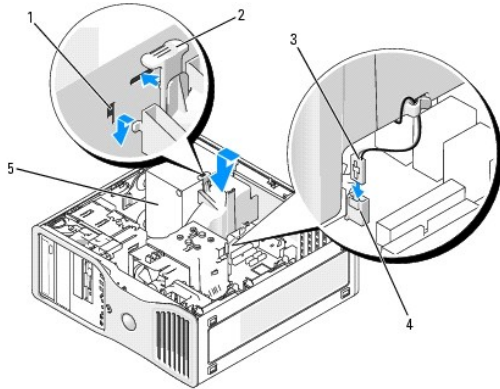
1	fan slots (3)	2	fan release tab	3	fan cable
4	fan connector on system board	5	power supply		

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.
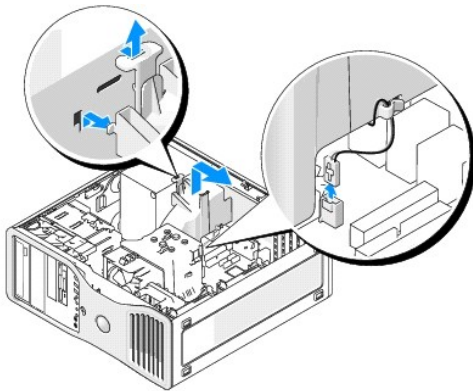
To remove the fan:

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.

3. Replace the computer cover. See Replacing the Computer Cover.

Drive-Panel Inserts

⚠ **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.**

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 Drive Panel (Tower Computer)

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

NOTE: If you have a desktop computer, the drives and drive panel will appear differently.
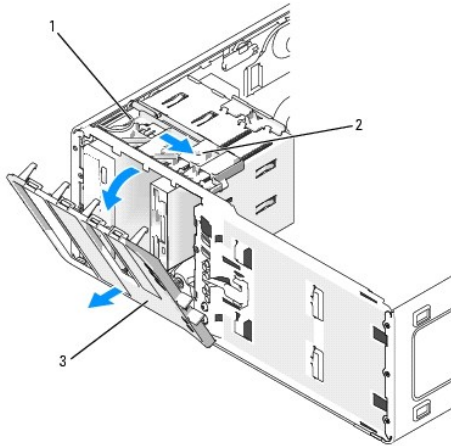
1	sliding plate	2	sliding-plate lever	3	drive panel

NOTE: This sliding plate secures and releases the drive panel and helps to secure the drives.

4. Grasping the lever on the sliding plate, pull the sliding plate to the right until it releases the drive panel from its side hinges.

5. Set the drive panel aside in a secure location.

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.

Replacing 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.
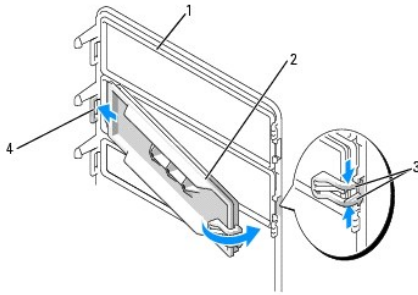
1	drive panel	2	drive-panel insert	3	drive-panel insert release tabs (2)
4	drive-panel insert tab in tab slot				

3. Ensure that the drive-panel insert is correctly seated in the drive panel.

Replacing the Drive Panel

1. Align the drive-panel tabs with the side-door hinges.
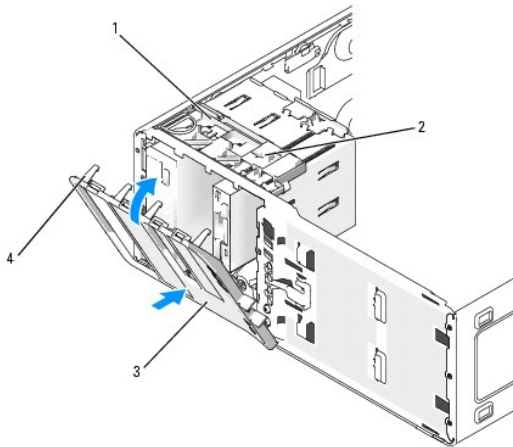
1	sliding plate	2	sliding-plate lever	3	drive panel
4	drive-panel tabs				

2. Rotate the drive panel toward the computer until it snaps into place on the front 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).

📝 **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).

Removing a Floppy Drive or Media Card Reader (Tower Computer)

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

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 "FLEXBAY" (for a Media Card Reader). To locate system board connectors, see System Board Components.
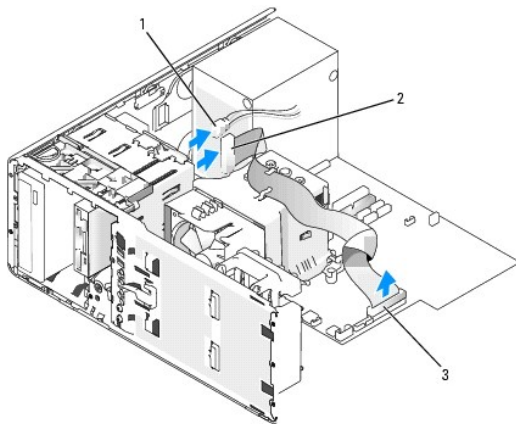
1	power cable	2	floppy-drive cable	3	floppy-drive connector (FLOPPY)

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.
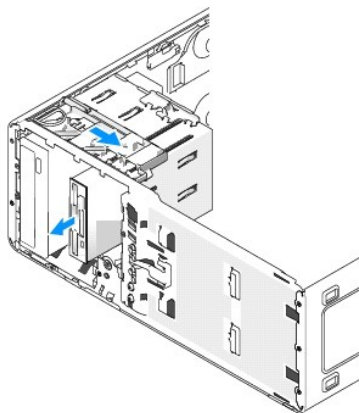
Installing a Floppy Drive or Media Card Reader (Tower Computer)

⊖ **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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

4. If you are installing a new floppy drive or Media Card Reader, remove the drive-panel insert (see Removing a Drive-Panel Insert) and remove the shoulder screws from the inside of the drive-panel insert. Attach the screws to the new drive.
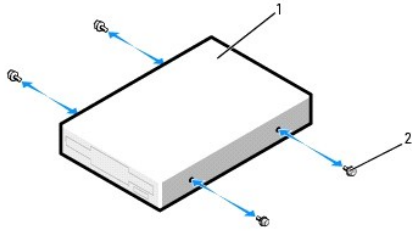
1	floppy drive	2	screws (4)

5. Gently slide the drive into place in the 3.5-inch bay until you hear a click or feel the drive securely installed.
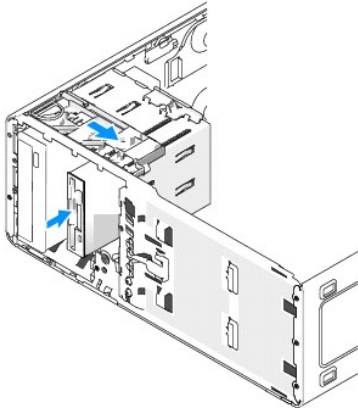
6. If you are installing a floppy drive:

   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 "FLEXBAY" (for a Media Card Reader). To locate system board connectors, see System Board Components.
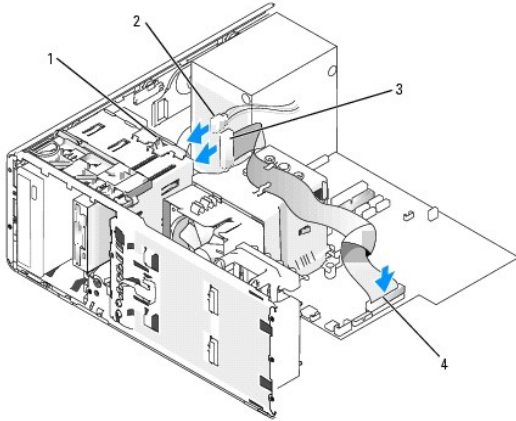
1	drive-conversion latch	2	power cable	3	floppy-drive cable
4	floppy-drive connector (FLOPPY)				

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.

11. Replace the computer cover. See Replacing the Computer Cover.

◯ **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) 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).

Removing a Floppy Drive or a Media Card Reader (Desktop Computer)

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

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 "FLEXBAY" (for a Media Card Reader). To locate system board connectors, see System Board Components.
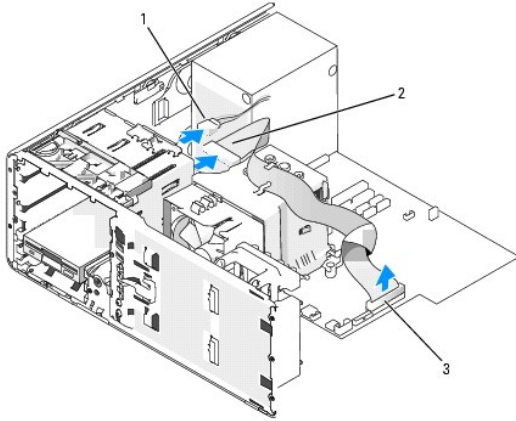
| 1 | power cable | 2 | floppy-drive cable | 3 | floppy-drive connector (FLOPPY) |

6. Pull the desktop drive retention insert by the handle and set it aside in a safe place.

7. Slide the sliding-plate lever to the right to release the shoulder screw and slide the drive out of the 3.5- inch drive bay.
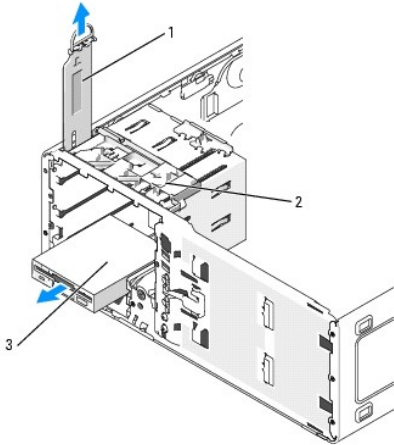
| 1 | drive retention insert | 2 | sliding-plate lever | 3 | floppy drive |

Installing a Floppy Drive or Media Card Reader (Desktop Computer)

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

4. If you are installing a new floppy drive or Media Card Reader, remove the drive-panel insert (see Removing a Drive-Panel Insert) and remove the shoulder screws from the inside of the drive-panel insert and attach the screws to the new drive.
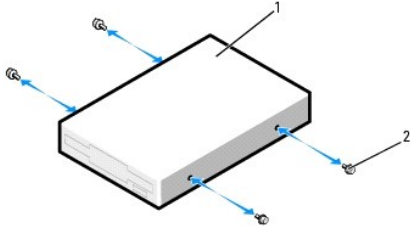
| 1 | drive | 2 | screws (2) |

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 "FLEXBAY" (for a Media Card Reader). To locate system board connectors, see System Board Components.
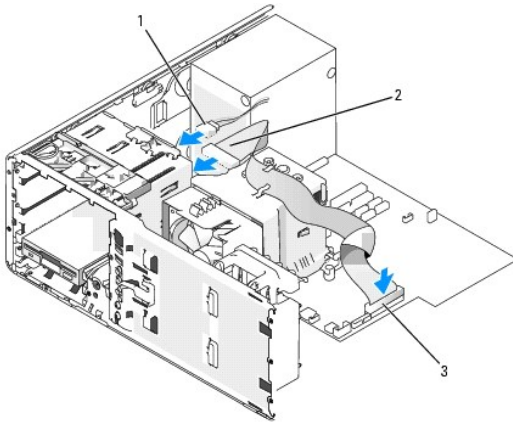
| 1 | power cable | 2 | floppy-drive cable | 3 | floppy-drive connector (FLOPPY) |

8. Replace the desktop drive retainer insert and fold the handle down.

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.

11. Replace the computer cover. See Replacing the Computer Cover.

🚫 **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) 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).

CD/DVD 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 a CD/DVD Drive (Tower Computer)

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

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.
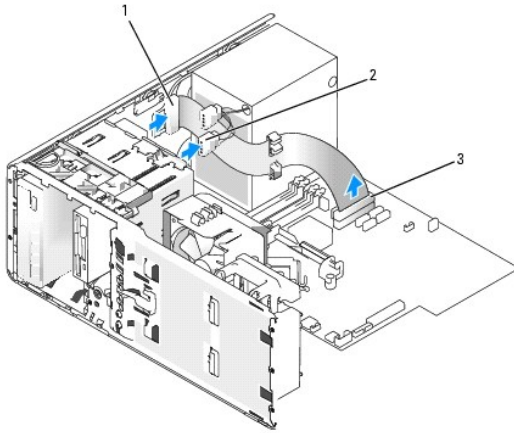
| 1 | CD/DVD-drive cable | 2 | power cable | 3 | system board CD/DVD connector |

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.
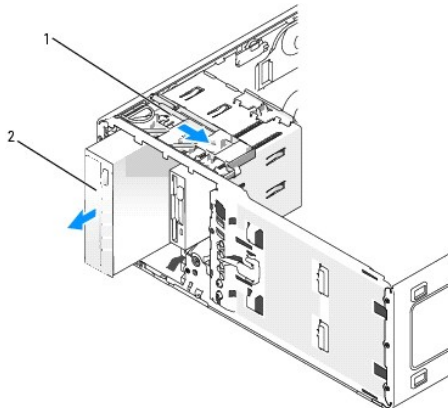
| 1 | sliding-plate lever | 2 | CD/DVD drive |

Installing a CD/DVD 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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

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) and remove the shoulder screws from the inside of the drive-panel insert and attach the screws to the new drive.
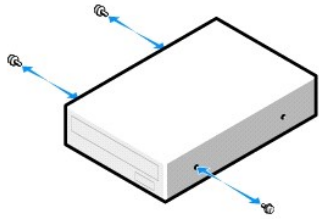
6. Gently slide the drive into place until the drive securely clicks into position.

7. Connect the power cable to the drive, and connect the CD/DVD-drive cable to the drive and to the system board.
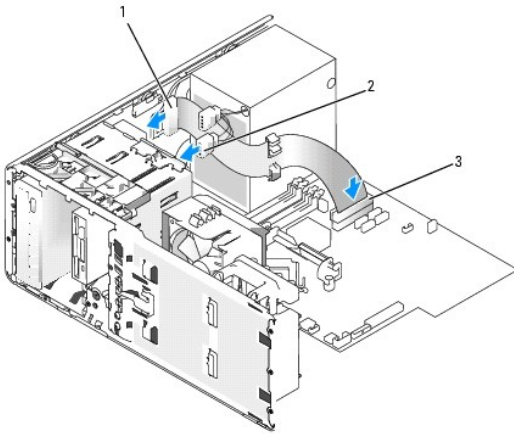
| 1 | CD/DVD-drive cable | 2 | power cable | 3 | system-board CD/DVD-drive connector |

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.

10. Replace the computer cover. See Replacing the Computer Cover.

   ⊝ 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) and select the appropriate **Drive** option.

13. Verify that your computer works correctly by running the Dell Diagnostics (see Dell Diagnostics).

Removing a CD/DVD Drive (Desktop Computer)

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

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.
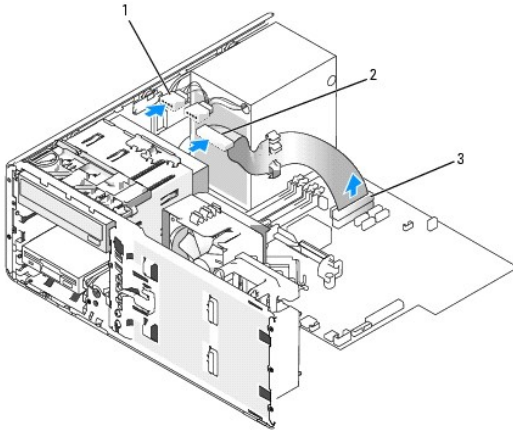
1	CD/DVD-drive cable	2	power cable	3	system-board CD/DVD- drive connector

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.
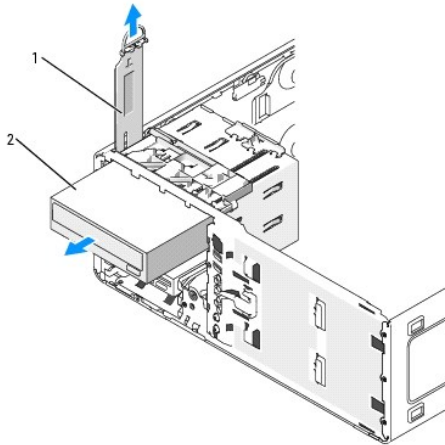
1	drive retention insert	2	CD/DVD drive

Installing a CD/DVD 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) and remove the shoulder screws from the inside of the drive-panel insert and attach the screws to the new drive.
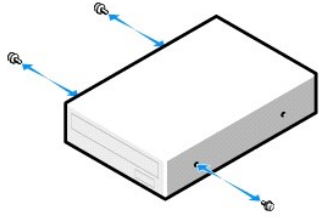
3. Gently slide the drive into place until the drive securely clicks into position.

4. Connect the power cable to the drive, and connect the CD/DVD-drive cable to the drive and to the system board.
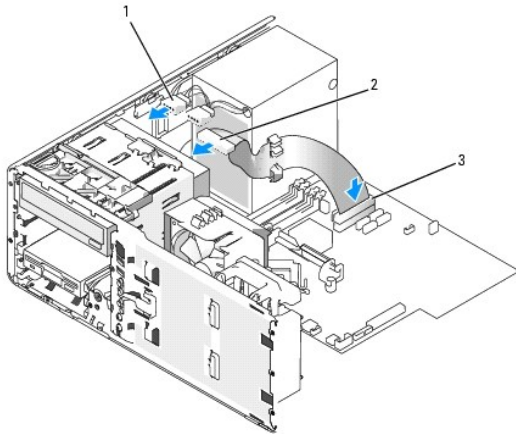
| 1 | CD/DVD-drive cable | 2 | power cable | 3 | system-board CD/DVD-drive connector |

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.

7. Replace the computer cover. See Replacing the Computer Cover.

⊘ 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) and select the appropriate **Drive** option.

10. Verify that your computer works correctly by running the Dell Diagnostics (see Dell Diagnostics).

Cards

⚠ 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: 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:

l   Three PCI card slots

l   One PCI Express x16 card slot

l   One PCI Express x8 card slot (wired as x4)

l   One PCI Express x1 card slot

PCI Cards
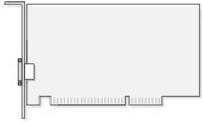
If you are installing or replacing a PCI card, see Installing a PCI Card. If you are removing but not replacing a PCI card, see Removing a PCI Card.

If you are replacing a card, remove the current driver for the card from the operating system.

Installing a PCI Card

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.

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

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

3. Gently push the release tab on the card retention door from the inside to pivot the door open. Because the door is captive, it will remain in the open position.

| 1	release tab	2	card retention mechanism	3	card retention door

4. If your computer includes a card retention mechanism to secure the card in place from the top:

    a. Pivot the mechanism upward and gently press the release tab downward to release the mechanism from the two tab slots holding it in place.

    b. Set the retention mechanism aside in a secure location.
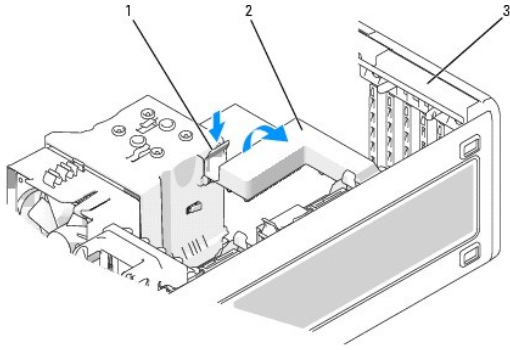
5. If you are installing a long card, repeat step 4 for the card retention mechanism near the system fan.

6. If you are installing a new card, remove the filler bracket to create a card-slot opening. Then continue with step 8.

7. If you are replacing a card that is already installed in the computer, remove the card.

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

8. 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.**

9. Place the card in the connector and press down firmly. Ensure that the card is fully seated in the slot.
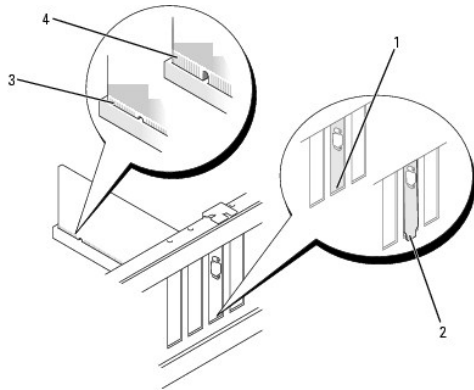
1	bracket within slot	2	bracket caught outside of slot	3	card fully seated
4	card not fully seated				

10. Before you close the card retention door, ensure that:

    l The tops of all cards and filler brackets are flush with the alignment bar.

    l The notch in the top of the card or filler bracket fits around the alignment guide.
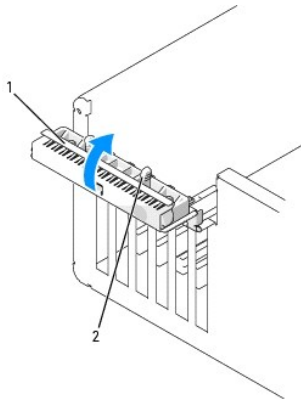
| 1 | card retention door | 2 | release tab |

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

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.

12. Connect any cables that should be attached to the card.

    See the documentation for the card for information about the card's cable connections.

13. If you replaced a card that was already installed in the computer and you removed one or both retention mechanisms, you may reinstall the retention mechanisms.

14. Before replacing a card retention mechanism, ensure that:

    l   The tops of all cards and filler brackets are flush with the alignment bar.

    l   The notch in the top of the card or filler bracket fits around the alignment guide.

15. Snap the card retention mechanism into place, securing the card. Repeat if the card retention mechanism near the system fan was also removed.
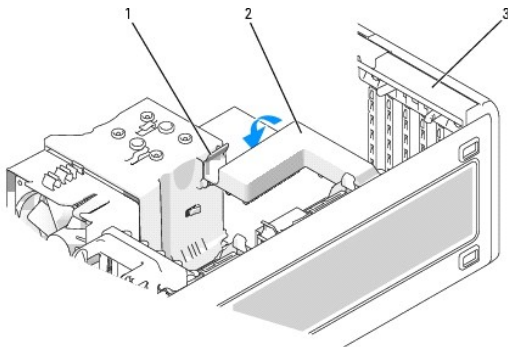
| 1 | release tab | 2 | card retention mechanism | 3 | card retention door |

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

16. Replace the computer cover (see Replacing the Computer Cover), reconnect the computer and devices to electrical outlets, and then turn them on.

17. If you installed a sound card:

    a.   Enter system setup (see Entering System Setup), select **Audio Controller**, and then change the setting to **Off**.

    b.   Connect external audio devices to the sound card's connectors. Do not connect external audio devices to the microphone, speaker/headphone, or line-in connectors on the back panel.
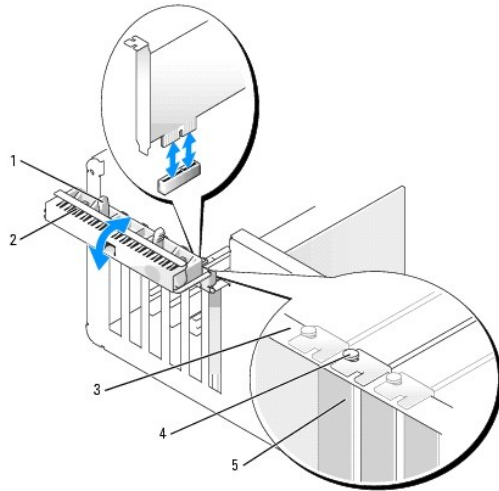
18. If you installed a network adapter card and want to disable the integrated network adapter:

    a.   Enter system setup (see Entering System Setup), select **Network Controller,** and then change the setting to **Off**.

b.   Connect the network cable to the network adapter cards connectors. Do not connect the network cable to the network connector on the back panel.

19. Install any drivers required for the card as described in the card documentation.

Removing a PCI Card

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

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

3. Gently push the release tab on the card retention door from the inside to pivot the door open. Because the door is captive, it will remain in the open position.

1	release tab	2	card retention mechanism	3	card retention door

4. If your computer includes a card retention mechanism to secure the card in place from the top:

a.   Pivot the mechanism upward and gently press the release tab downward to release the mechanism from the two tab slots holding it in place.

b.   Set the retention mechanism aside in a secure location.

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

6. 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.

NOTICE: To connect a network cable, first plug the cable into the network adapter and then plug the cable into the computer.

7. Replace the computer cover, (see Replacing the Computer Cover), reconnect the computer and devices to electrical outlets, and then turn them on.

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

9. If you removed a sound card:

    a. Enter system setup (see Entering System Setup), select **Audio Controller**, and then change the setting to **On**.

    b. Connect external audio devices to the audio connectors on the back panel of the computer.

10. If you removed a network adapter card:

    a. Enter system setup (see Entering System Setup), select **Network Controller**, and then change the setting to **On**.

    b. Connect the network cable to the network connector on the back panel of the computer.

PCI Express Cards

Your computer supports:

- one PCI Express x16 card or x1 card in a x16 slot
- one PCI Express x8, x4, or x1 card in a x8 slot (wired as x4)
- one PCI Express x1 card in a x1 slot

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.

If you are installing or replacing a PCI Express card, follow the procedures in the next section. If you are removing, but not replacing a card, see Removing a PCI Express Card.

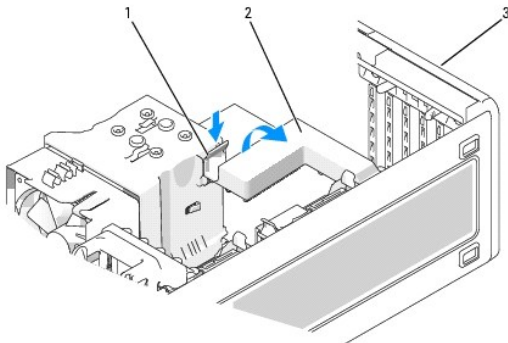If you are replacing a card, remove the current driver for the card.

Installing a PCI Express Card

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

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

3. Gently push the release tab on the card retention door from the inside to pivot the door open. Because the door is captive, it will remain in the open position.

1	release tab	2	card retention mechanism	3	card retention door

4. If your computer includes a card retention mechanism to secure the card in place from the top:

    a. Pivot the mechanism upward and gently press the release tab downward to release the mechanism from the two tab slots holding it in place.

    b. Set the retention mechanism aside in a secure location.

5. If you are installing a new card, remove the filler bracket to create a card-slot opening. Then, continue with step 7.

6. If you are replacing a card that is already installed in the computer, remove the card.

   If necessary, disconnect any cables connected to the card. If your card includes a retention mechanism, remove the top of the retention mechanism by pressing the tab and pulling up on the top. Gently pull the securing tab, grasp the card by its top corners, and then ease it out of its connector.
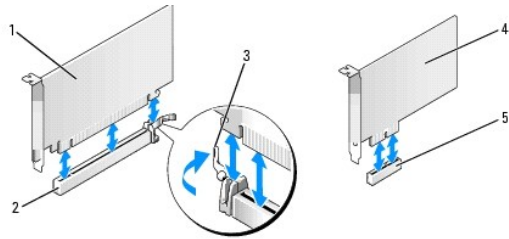
1	PCI Express x16 card	2	PCI Express x16 card slot	3	securing tab
4	PCI Express x1 card	58	PCI Express x1 card slot		

7. 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.**

8. If you are installing the card into the card connector, position the card so that the securing slot is aligned with the securing tab, and gently pull the securing tab.

⊘ **NOTICE:** Ensure that you release the securing tab to unseat the card. If the card is not removed correctly, the system board may be damaged.

9. Place the card in the connector and press down firmly. Ensure that the card is fully seated in the slot.
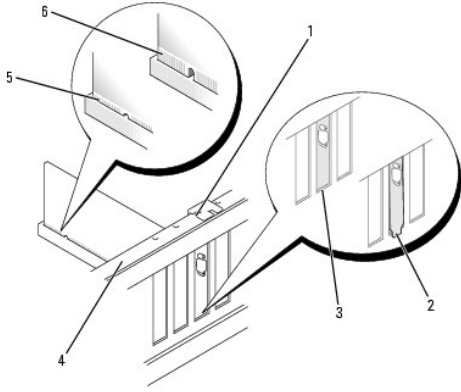
1	alignment guide	2	bracket caught outside of slot	3	bracket within slot
4	alignment bar	5	fully seated card	6	not fully seated card

10. If you replaced a card that was already installed in the computer and you removed the retention mechanism, you may reinstall the retention mechanism.

11. Before replacing the card retention mechanism, ensure that:

   l   The tops of all cards and filler brackets are flush with the alignment bar.

   l   The notch in the top of the card or filler bracket fits around the alignment guide.

12. Snap the card retention mechanism into place, securing the card.
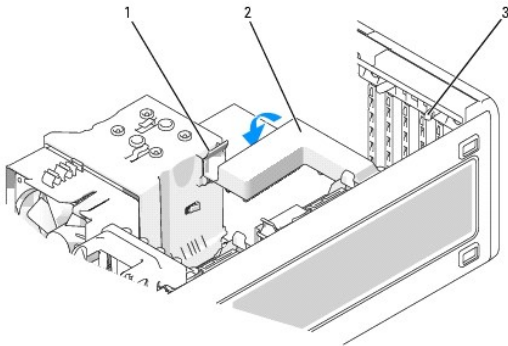
1	release tab	2	card retention mechanism	3	release tabs (2)

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.

NOTICE: To connect a network cable, first plug the cable into the network adapter and then plug the cable into the computer.

13. Replace the computer cover, (see Replacing the Computer Cover), reconnect the computer and devices to electrical outlets, and then turn them on.

14. If you installed a sound card:

   a.   Enter system setup (see Entering System Setup), select **Audio Controller**, and then change the setting to **Off**.

   b.   Connect external audio devices to the sound card's connectors. Do not connect external audio devices to the microphone, speaker/headphone, or line-in connectors on the back panel.

15. If you installed a network adapter card and want to disable the integrated network adapter:

   a.   Enter system setup (see Entering System Setup), select **Network Controller,** and then change the setting to **Off**.

   b.   Connect the network cable to the network adapter card. Do not connect the network cable to the integrated connector on the back panel.

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

Removing a PCI Express Card

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

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

3. Gently push the release tab on the card retention door from the inside to pivot the door open. Because the door is captive, it will remain in the open position.

1	release tab	2	card retention mechanism	3	card retention door

4. If your computer includes a card retention mechanism to secure the card in place from the top:

   a. Pivot the mechanism upward and gently press the release tab downward to release the mechanism from the two tab slots holding it in place.

   b. Set the retention mechanism aside in a secure location.

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

6. 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. Reseat the card retention mechanism in the tabs and pivot downward to snap it into place.

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

NOTICE: To connect a network cable, first plug the cable into the network adapter and then plug the cable into the computer.

9. Replace the computer cover, (see Replacing the Computer Cover), reconnect the computer and devices to electrical outlets, and then turn them on.

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

11. If you removed a sound card:

     a. Enter system setup (see Entering System Setup), select **Audio Controller**, and then change the setting to **On**.

     b. Connect external audio devices to the audio connectors on the back panel of the computer.

12. If you removed a network connector card:

     a. Enter system setup (see Entering System Setup), select **Network Controller**, and then change the setting to **On**.

     b. Connect the network cable to the network connector on the back panel of the computer.

NOTE: Install any drivers required for the card as described in the card documentation.

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.

2. Remove the computer cover (see Removing the Computer Cover).
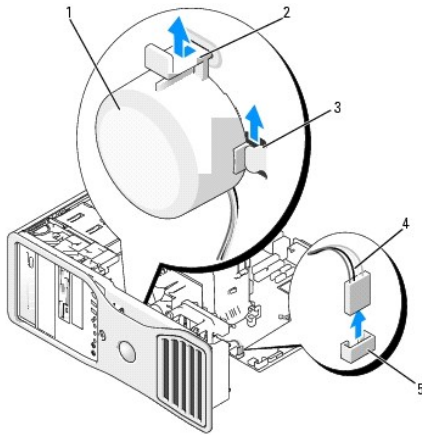
1	speaker (optional)	2	late release tab	3	speaker slots (3)
4	speaker cable	5	speaker connector on system board		

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.
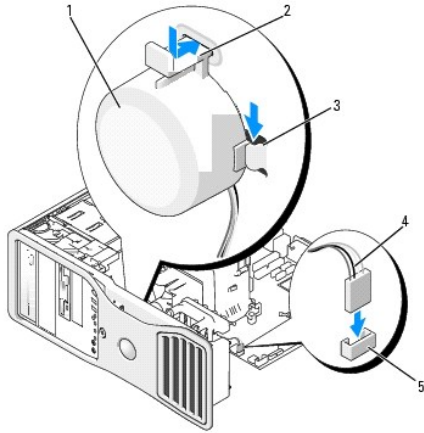
1	speaker (optional)	2	latch release tab	3	speaker slots with tabs (3)
4	speaker cable	5	speaker connector on system board		

5. Replace the computer cover. See Replacing the Computer Cover.

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.

2. Remove the computer cover (see Removing the Computer Cover).

📝 **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.
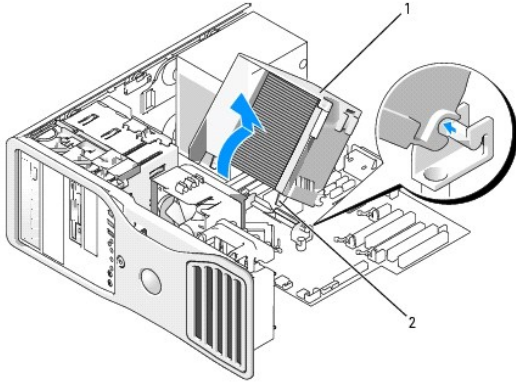
1	heat-sink assembly	2	captive screw housing (2)

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.
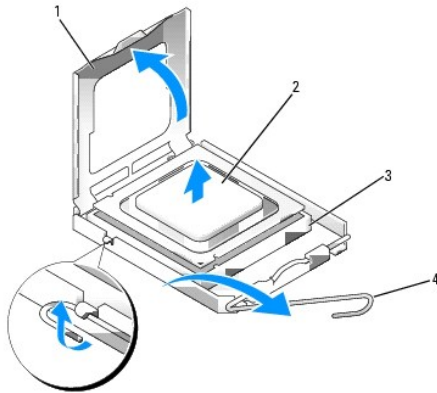
1	processor cover	2	processor	3	socket
4	release lever				

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.

2. Remove the computer cover (see Removing the Computer Cover).

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.
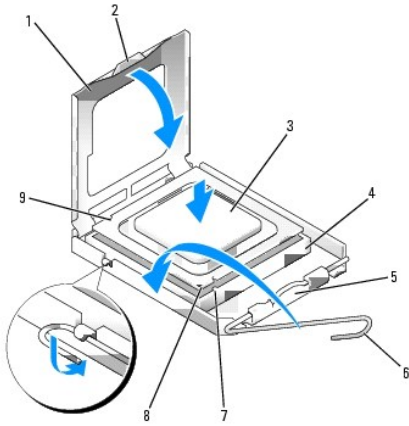
1	processor cover	2	tab	3	processor
4	processor socket	5	center cover latch	6	release lever
7	front alignment notch	8	socket and processor pin-1 indicator	9	rear alignment notch

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.
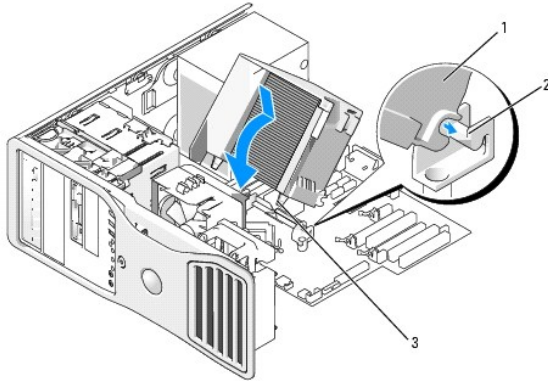
| 1 | heat-sink assembly | 2 | heat-sink assembly bracket | 3 | captive screw housing (2) |

11. Replace the computer cover. See Replacing the Computer Cover.

⬤ **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). 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) and reset the configuration options.

Removing the Battery

1. If you have not already done so, make a copy of your configuration information found in system setup (see System Setup).

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

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.
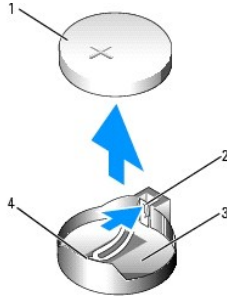
1	system battery	2	battery socket tab	3	battery socket
4	positive side of battery connector				

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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Locate the battery socket.

4. Remove the existing battery. See Removing the Battery.

⊘ **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.

⊘ **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) 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
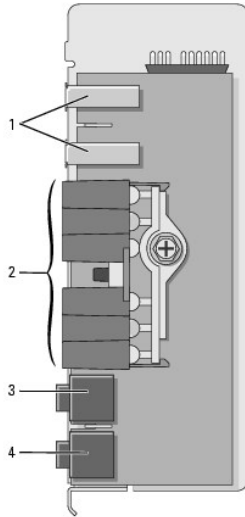
1	USB port	2	diagnostic, hard-drive access, and network integrity lights	3	headphone connector
4	microphone connector				

Removing the I/O Panel

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

📝 **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.
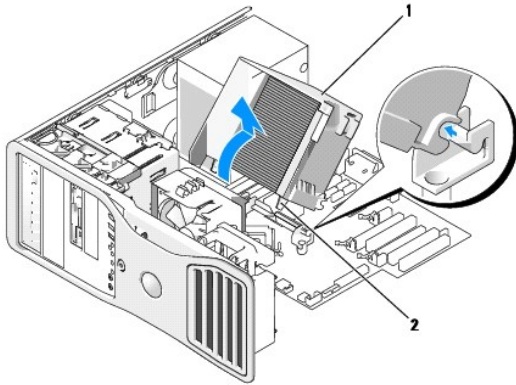
| 1 | heat-sink assembly | 2 | captive screw housing (2) |

5. Place the heat-sink assembly on its side in a safe place.

6. Disconnect the system fan cable from the system board.
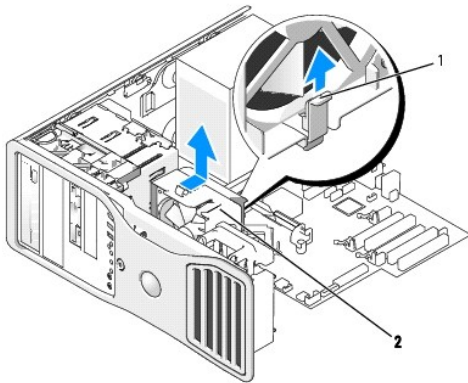
| 1 | fan release lever | 2 | fan |

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.

10. Remove the drive panel. See Removing the Drive Panel (Tower Computer) or Removing the Drive Panel (Desktop Computer).

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. If an optional thermal sensor cable is installed (the other end of the cable will be attached to the system board connector labeled "THRM" as found in System Board Components), disconnect the cable from the edge of the I/O panel.
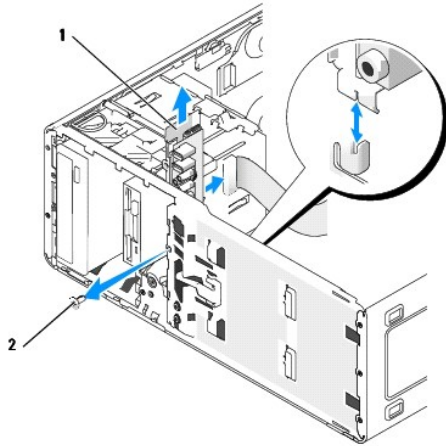
1	I/O panel	2	mounting screw

14. Remove the mounting screw from the I/O panel.

15. Remove the I/O panel from the computer.

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.

2. Remove the computer cover (see Removing the Computer Cover).

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.
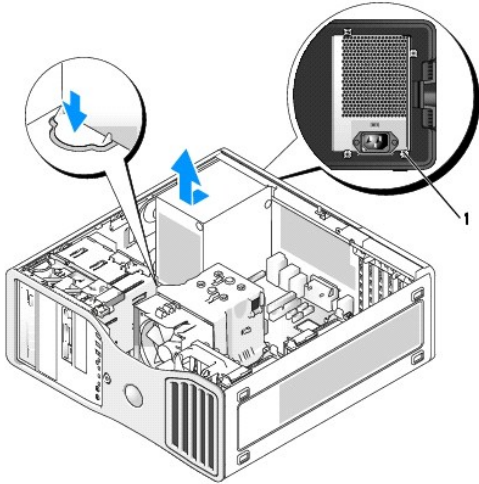
| 1 | power supply screws (4) |

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.

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

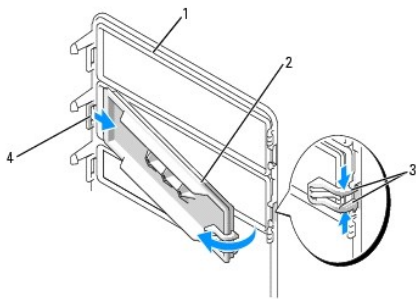7. Connect your computer and devices to electrical outlets, and turn them on.

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.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

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.
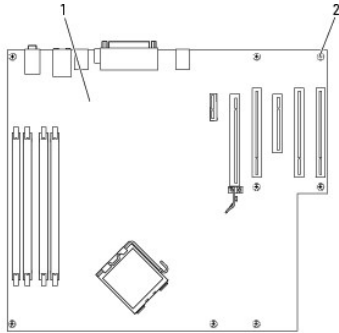
1	system board	2	screws

8. 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.
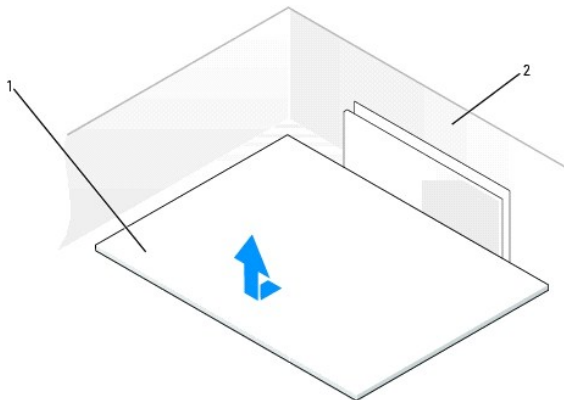
1	system board	2	back of computer

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 for more information.

⚠ 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 for more information.

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).

✎ 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.

⊖ **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 and 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.

Replacing the Front Panel

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

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.

Back to Contents Page

Changing Between Tower and Desktop Orientations
Dell Precision™ Workstation 390 User's Guide

- Drive-Panel Inserts
- Switching Drive Orientations
- Drive 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.

🚫 **NOTICE:** To avoid damage to a 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.

📝 **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 for more details on ordering from Dell.

1. Follow the procedures in Before You Begin.

2. Remove the computer cover (see Removing the Computer Cover).

3. Remove the front panel. See Removing the Front Panel.

4. Remove the drive panel. See Removing the Drive Panel (Tower Computer).

5. Prepare the desktop computer's drive panel by adding or removing inserts as needed.

Drive-Panel Inserts

Removing Drive-Panel Inserts From the Desktop Computer Drive Panel

🚫 **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 Drive-Panel Inserts in the Desktop Computer Drive Panel

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.
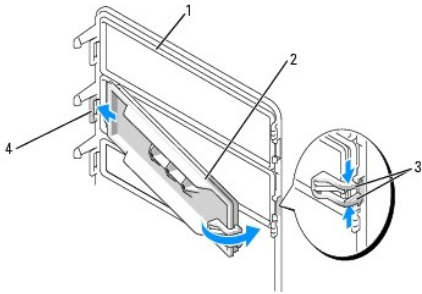
1	drive panel	2	drive-panel insert	3	drive-panel insert release tabs (2)
4	drive-panel insert tab in tab slot				

3. Ensure that the drive-panel insert is correctly seated in the drive panel.

Switching Drive Orientations

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

1. If installed, remove the floppy drive by following the steps in <u>Removing a Floppy Drive or Media Card Reader (Tower Computer)</u>, and reinstall it by following the steps in <u>Installing a Floppy Drive or Media Card Reader (Desktop Computer)</u>.

2. If installed, remove optical drives by following the steps in <u>Removing a CD/DVD Drive (Tower Computer)</u>, and reinstall them by following the steps in <u>Installing a CD/DVD Drive (Desktop Computer)</u>.

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)

1. Slide the sliding-plate lever to the right, pivot the drive panel outward, and lift to remove the panel.
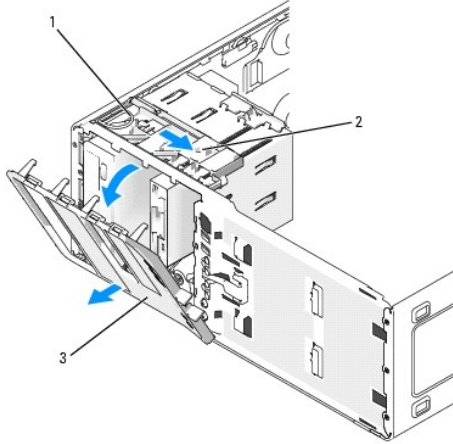
| 1 | sliding plate | 2 | sliding-plate lever | 3 | drive panel |

Replacing the Drive Panel (Tower Computer)

1. Align the drive-panel tabs with the side-door hinges.

| 1 | sliding plate | 2 | sliding-plate lever | 3 | drive panel |
| 4 | drive panel tabs | | | | |

2. Rotate the drive panel toward the computer until it snaps into place on the front panel.

3. To rotate the Dell™ badge on the front panel, place fingers around the outside of the badge, press in, and turn the badge. You can also rotate the badge using the slot provided near the bottom of the badge.

4. Replace the front panel. See Removing the Front Panel.

5. Replace the computer cover. See Replacing the Computer Cover.

   See the documentation that came with the drive for instructions on installing any software required for drive operation.

6. Enter system setup (see Entering System Setup) and select the appropriate **Diskette Drive** option.

7. Verify that your computer works correctly by running the Dell Diagnostics (see Dell Diagnostics).

Removing the Drive Panel (Desktop Computer)

NOTE: The desktop drive panel is an optional item that can be purchased separately if your original system is a tower computer.

1. Slide the sliding-plate lever to the right, pivot the drive panel outward, and lift to remove the panel.
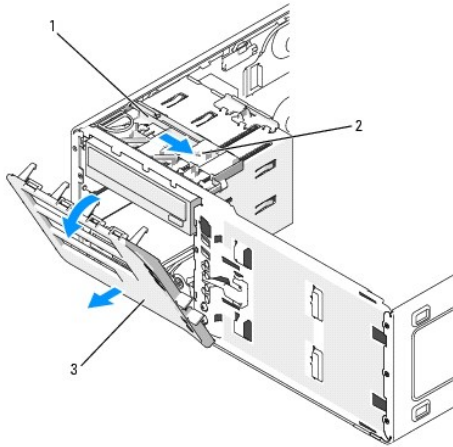
1	sliding plate	2	sliding-plate lever	3	drive panel

Replacing the Drive Panel (Desktop Computer)

1. Align the drive-panel tabs with the side-door hinges.

1	sliding plate	2	sliding-plate lever	3	drive panel
4	drive-panel tabs				

2. Rotate the drive panel toward the computer until it snaps into place on the front panel.

3. To rotate the Dell™ badge on the front panel, place fingers around the outside of the badge, press in, and turn the badge. You can also rotate the badge using the slot provided near the bottom of the badge.

4. Replace the front panel. See Replacing the Front Panel.

5. Replace the computer cover. See Replacing the Computer Cover.

   See the documentation that came with the drive for instructions on installing drive operation software.

6. Enter system setup (see Entering System Setup) and select the appropriate Diskette Drive option.

7. Verify that your computer works correctly by running the Dell Diagnostics (see Dell Diagnostics).

Solving Problems

Dell Precision™ Workstation 390 User's Guide

- Troubleshooting Tips
- Battery Problems
- Card Problems
- Card Fan Problems
- Drive Problems
- E-Mail, Modem, and Internet Problems
- IEEE 1394 Device Problems
- Keyboard Problems
- Lockups and Software Problems

- Memory Problems
- Mouse Problems
- Network Problems
- Power Problems
- Printer Problems
- Serial or Parallel Device Problems
- Sound and Speaker Problems
- Video and Monitor Problems

Troubleshooting Tips

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 technical support personnel diagnose and fix the problem(s).

- If an error message occurs in a program, see the program's documentation.

Battery Problems

Fill out the Diagnostics Checklist as you complete these checks.

⚠ **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 Battery). If the battery still does not work properly, contact Dell (see Contacting Dell).

Card Problems

Fill out the Diagnostics Checklist as you complete these checks.

⚠ **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.

Check the card seating and cable —

1. Turn off the computer and devices, disconnect them from their electrical outlets, wait 10 to 20 seconds, and then remove the computer cover (see Removing the Computer Cover).
2. Ensure that each card is firmly seated in its connector. Reseat any loose cards.
3. Ensure that all cables are firmly connected to their corresponding connectors on the cards. If any cables appear loose, reconnect them.

   For instructions on which cables should be attached to specific connectors on a card, see the card's documentation.

4. Close the computer cover reconnect the computer and devices to electrical outlets, and then turn them on.

Test the graphics card —

1. Turn off the computer and devices, disconnect them from their electrical outlets, wait 10 to 20 seconds, and then remove the remove the computer cover (see Removing the Computer Cover).
2. Remove all cards except the graphics card. See Removing a PCI Card.

   If your primary hard drive is connected to a drive controller card and not to one of the system board IDE connectors, leave the drive controller card installed in the computer.

3. Close the computer cover, reconnect the computer and devices to electrical outlets, and then turn them on.
4. Run the Dell Diagnostics (see Dell Diagnostics).

Test the cards —

1. Turn off the computer and devices, disconnect them from their electrical outlets, wait 10 to 20 seconds, and then remove the computer cover (see Removing the Computer Cover).
2. Reinstall one of the cards that you removed previously. See Installing a PCI Card.
3. Close the computer cover, reconnect the computer and devices to electrical outlets, and then turn them on.
4. Run the Dell Diagnostics (see Dell Diagnostics).

   If any of the tests fail, the card you just reinstalled is faulty and needs to be replaced.

5. Repeat this process until you have reinstalled all cards.

Card Fan Problems

⚠️ **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.

Check the cable connections — Make sure the card fan cable is connected firmly to the card fan connector on the system board (see System Board Components).

Drive Problems

⚠️ **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.

Fill out the Diagnostics Checklist as you complete these checks.

Ensure that Microsoft® Windows® recognizes the drive — Click the **Start** button and click **My Computer**. If the floppy, CD, or DVD 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 —

l Insert another floppy disk, CD, or DVD to eliminate the possibility that the original one is defective.
l Insert a bootable floppy disk and restart the computer.

Clean the drive or disk — See Cleaning Your Computer.

Check the cable connections

Check for Software and Hardware Conflicts

Run the Dell Diagnostics (see **Dell Diagnostics**)

CD and DVD drive problems

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

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

Adjust the Windows volume control —

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

Check the speakers and subwoofer — See *Sound and Speaker Problems*.

Problems writing to a CD/DVD-RW drive

Close other programs — The CD/DVD-RW drive must receive a steady stream of data when writing. If the stream is interrupted, an error occurs. Try closing all programs before you write to the CD/DVD-RW.

Turn off Standby mode in Windows before writing to a CD/DVD-RW disc — See *Power Management* for information on Power Management modes.

Hard drive problems

Running the Dell™ IDE Hard Drive Diagnostics —

The Dell IDE Hard Drive Diagnostics is a utility that tests the hard drive to troubleshoot or confirm a hard drive failure.

1. Turn on your computer (if your computer is already on, restart it).
2.   When F2 = Setup appears in the upper-right corner of the screen, press <Ctrl><Alt><d>.
3. Follow the instructions on the screen.

Run Check Disk —

1. Click the **Start** button and click **My Computer**.
2. Right-click **Local Disk C:**.
3. Click **Properties**.
4. Click the **Tools** tab.
5. Under **Error-checking**, click **Check Now**.
6. Click **Scan for and attempt recovery of bad sectors**.
7. Click **Start**.

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*.

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

Check the Microsoft Outlook® Express Security Settings — If you cannot open your e-mail attachments:

1. In Outlook Express, click **Tools**, click **Options**, and then click **Security**.
2. Click **Do not allow attachments** to remove the checkmark.

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. 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, then 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 m (10 ft) or more in length, try a shorter one.

Run the Modem Helper diagnostics — Click the **Start** button, point to **All Programs**, and then click **Modem Helper**. Follow the instructions on the screen to identify and resolve modem problems. (Modem Helper is not available on all computers.)

Verify that the modem is communicating with Windows —

1. Click the **Start** button and click **Control Panel**.
2. Click **Printers and Other Hardware**.
3. Click **Phone and Modem Options**.
4. Click the **Modems** tab.
5. Click the COM port for your modem.
6. Click **Properties**, click the **Diagnostics** tab, and then click **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.

IEEE 1394 Device Problems

⚠ **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: The front IEEE 1394 connector is optional and only available if you purchased an IEEE 1394 card. To order a card, contact Dell (see Contacting Dell).

Ensure that the IEEE 1394 device is properly connected —

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 recognized by Windows —

1. Click the **Start** button and click **Control Panel**.
2. Click **Printers and Other Hardware**.
   If your IEEE 1394 device is listed, Windows recognizes the device.

If you have problems with a Dell-provided IEEE 1394 device —

If you have problems with an IEEE 1394 device not provided by Dell —

Contact Dell (see Contacting Dell) or 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 —

l   Ensure that the keyboard cable is firmly connected to the computer.
l   Shut down the computer (see Turn Off Your Computer), reconnect the keyboard cable as shown in the Quick Reference Guide for your computer, and then restart the computer.
l   Check the cable connector for bent or broken pins and for damaged or frayed cables. Straighten bent pins.
l   Remove keyboard extension cables and connect the keyboard directly to the computer.

Test the keyboard — Connect a properly working keyboard to the computer, and try using the keyboard. If the new keyboard works, the original keyboard is faulty.

Check for Software and Hardware Conflicts — See Resolving Software and Hardware Incompatibilities.

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

Ensure that the power cable is firmly connected to the computer and to the electrical outlet

The computer stops responding

⬤ **NOTICE:** You might 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. Then restart your computer.

A program stops responding

End the program —

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

A program crashes repeatedly

NOTE: Software usually includes installation instructions in its documentation or on a floppy disk or CD.

Check the software documentation — If necessary, uninstall and then reinstall the program.

A program is for an earlier Microsoft® Windows® operating system

If You Are Using Windows XP, Run the Program Compatibility Wizard —

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

   1. Click the **Start** button, point to **All Programs**→ **Accessories**, and then click **Program Compatibility Wizard**.
   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. Then restart your computer.

Other software problems

Check the software documentation or contact the software manufacturer for troubleshooting information —

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

Save and close any open files or programs and shut down your computer through the Start menu —

(See Turn Off Your Computer.

Run the Dell Diagnostics — (See Dell Diagnostics)

If all tests run successfully, the error condition is related to a software problem.

Memory Problems

Fill out the Diagnostics Checklist as you complete these checks.

⚠ **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.

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 Memory.
- Reseat the memory modules to ensure that your computer is successfully communicating with the memory. See Memory.
- Run the Dell Diagnostics (see Dell Diagnostics).

If you experience other memory problems —

- Reseat the memory modules to ensure that your computer is successfully communicating with the memory. See Memory.
- Ensure that you are following the memory installation guidelines. See Installing Memory.
- Run the Dell Diagnostics (see Dell Diagnostics).

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 —

1. Check the cable connector for bent or broken pins and for damaged or frayed cables. Straighten bent pins.
2. Remove mouse extension cables, if used, and connect the mouse directly to the computer.
3. Shut down your computer (see Turn Off Your Computer), reconnect the mouse cable as shown in the *Quick Reference Guide* for your computer, and then restart the computer.

Restart the computer —

1. Simultaneously press <Ctrl><Esc> to display the **Start** menu.
2. Type u, press the keyboard 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 in the *Quick Reference Guide* for your computer.
4. Start the computer.

Test the mouse — Connect a properly working mouse to the computer, and try using the mouse. If the new mouse works, the original mouse is faulty.

Check the mouse settings —

1. Click the **Start** button, click **Control Panel**, and then click **Printers and Other Hardware**.
2. Click **Mouse**.
3. Try adjusting the settings.

Reinstall the mouse driver — See Using Microsoft® Windows® XP System Restore.

Check for Software and Hardware Conflicts — See Resolving Software and Hardware Incompatibilities.

Network Problems

Fill out the [Diagnostics Checklist](#) as you complete these checks.

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

Check the network cable connector — Ensure that the network cable is firmly inserted into both the network connector on the back of the computer and the network jack.

Check the network lights on the back of the computer — No light indicates that no network communication exists. Replace the network cable. For a description of network lights, see [Controls and Lights](#).

Restart the computer and 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.

[Check for Software and Hardware Conflicts](#)

Power Problems

Fill out the [Diagnostics Checklist](#) as you complete these checks.

⚠️ **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.

If the power light is green and the computer is not responding — See [Diagnostic Lights](#).

If the power light is blinking green — The computer is in standby mode. Press a key on the keyboard or move the mouse 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. Also 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.

If the power light is amber and green or steady amber — A device might be malfunctioning or incorrectly installed.

- Remove and then reinstall the memory modules. See [Memory](#).
- Remove and then reinstall any cards. See [Cards](#).
- Remove and then reinstall the graphics card, if applicable. See [Cards](#).

If the power light is blinking amber —

The computer is receiving electrical power, but an internal power problem might exist.

- Ensure that the voltage is set (see [voltage selection switch](#)) to match the AC power at your location (if applicable).
- Ensure that the processor power cable is securely connected to the system board.

Eliminate interference — Some possible causes of interference are:

- Power, keyboard, and mouse extension cables
- Too many devices on a power strip

l Multiple power strips connected to the same electrical outlet

Printer Problems

Fill out the Diagnostics Checklist as you complete these checks.

⚠ 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 —

l See the printer documentation for cable connection information.
l 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 —

1. Click the **Start** button, click **Control Panel**, and then click **Printers and Other Hardware**.
2. Click **View installed printers or fax printers**.

   If the printer is listed, right-click the printer icon.

3. Click **Properties** and click the **Ports** tab. 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**.

Reinstall the printer driver — See the printer documentation for instructions

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Serial or Parallel Device Problems

Fill out the Diagnostics Checklist as you complete these checks.

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

📝 NOTE: If you are having a problem with a printer, see Printer Problems.

Check the option setting — See the device's documentation for the recommended settings. Then enter system setup (see Entering System Setup) and go to the **Integrated Devices** option settings. Ensure that the **Serial Port** setting or the **Parallel Port** setting matches the recommended settings.

Run the Dell Diagnostics (see **Dell Diagnostics**)

Sound and Speaker Problems

Fill out the Diagnostics Checklist as you complete these checks.

⚠ 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 some MP3 players overrides the Windows volume setting. If you have been listening to MP3 songs, ensure that you did not turn the player volume 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.

Enable digital mode — Your speakers do not work if the CD drive is operating in analog mode.

1. Click the **Start** button, click **Control Panel**, and then click **Sounds, Speech, and Audio Devices**.
2. Click **Sounds and Audio Devices**.
3. Click the **Hardware** tab.
4. Double-click the name of your CD drive.
5. Click the **Properties** tab
6. Check the **Enable digital CD audio for this CD-ROM device** box.

Eliminate possible interference — Turn off nearby fans, fluorescent lights, or halogen lamps to check for interference.

Run the speaker diagnostics

Reinstall the audio driver —

See Reinstalling Drivers and Utilities.

Check the device option setting — Enter system setup (see Entering System Setup) and ensure that **Sound** under the **Integrated Devices** option is set to **On**. Exit system setup and restart your computer.

Run Dell Diagnostics (see **Dell Diagnostics**)

Check for Software and Hardware Conflicts

No sound from headphones

Check the headphone cable connection — Ensure that the headphone cable is securely inserted into the headphone connector. See Information About Your Computer.

Disable digital mode — Your headphones do not work if the CD drive is operating in digital mode.

1. Click the **Start** button, click **Control Panel**, and then click **Sounds, Speech, and Audio Devices**.
2. Click **Sounds and Audio Devices**.
3. Click the **Hardware** tab.
4. Double-click the name of your CD drive.
5. Click the **Properties** tab.
6. Uncheck the **Enable digital CD audio for this CD-ROM device** box.

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

Fill out the Diagnostics Checklist as you complete these checks.

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

If the screen is blank

📝 **NOTE:** See the monitor documentation for troubleshooting procedures.

Check the monitor cable connection —

- If you purchased a graphics card, ensure that the monitor is connected to the card.
- Ensure that your monitor is properly connected (see the *Quick Reference Guide* that came with your computer).
- If you are using a graphics extension cable and removing the cable solves the problem, the cable is defective.
- Swap the computer and monitor power cables to determine if the power cable is defective.
- Check the connector 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 off, firmly press the button to ensure that the monitor is turned on. If the power light is lit or blinking, the monitor has power. If the power light is blinking, press a key on the keyboard or move the mouse.

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

Test the monitor — Connect a properly working monitor to the computer, and try using the monitor. If the new monitor works, the original monitor is faulty.

Check the Diagnostic Lights — See Diagnostic Lights.

Check the card setting — Enter system setup (see Entering System Setup) and ensure that **Primary Video Controller** under the **Integrated Devices** option is set correctly. For an AGP card, set **Primary Video Controller** to **AGP**. For a PCI card, set **Primary Video Controller** to **Auto**. Exit system setup and restart your computer.

Run the Dell Diagnostics — See Dell Diagnostics

If the screen is difficult to read

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 at least 60 cm (2 ft) 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.

Adjust the Windows display settings —

1. Click the **Start** button, click **Control Panel**, and then click **Appearance and Themes**.
2. Click **Display** and click the **Settings** tab.
3. Try different settings for **Screen resolution** and **Color quality.**

Dell Precision™ Workstation 390 User's Guide

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

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

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

For a complete list of abbreviations and acronyms, see the Glossary.

If you purchased a Dell™ n Series computer, any references in this document to Microsoft® Windows® operating systems are not applicable.

NOTE: Some features or media may not be available for your computer or in certain countries.

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Model DCTA

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Tools to Help Solve Problems
Dell Precision™ Workstation 390 User's Guide

- Diagnostic Lights
- Beep Codes
- Error Messages
- Dell Diagnostics
- Drivers
- Using Microsoft® Windows® XP System Restore
- Resolving Software and Hardware Incompatibilities
- Reinstalling Microsoft® Windows® XP

Diagnostic Lights

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

To help you troubleshoot a problem, your computer has four lights labeled "1," "2," "3," and "4" on the front. The lights can be "off" or green. When the computer starts normally, the lights flash. After the computer starts, all four lights display solid green. If the computer malfunctions, the pattern of the lights identify the problem.

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. The diagnostic lights are not lit after the system successfully boots to the operating system.	Plug the computer into a working electrical outlet and press the power button.
①②③④	A possible BIOS failure has occurred; the computer is in the recovery mode.	Run the BIOS Recovery utility, wait for recovery completion, and then restart the computer.
①②③④	A possible processor failure has occurred.	Reinstall the processor and restart the computer.
①②③④	Memory modules are detected, but a memory failure has occurred.	1. Reseat the memory modules to ensure that your computer is successfully communicating with the memory. 2. Restart the computer. 3. If the problem still exists, remove all the memory modules and install one memory module in memory module connector 4. 4. Restart the computer. The following message appears: Alert! Operating in Debug Mode. Please Populate Memory in Pairs for Normal Operation. 5. Press <F1> to boot to the operating system. 6. Run the Dell Diagnostics (see Dell Diagnostics). 7. If the memory module passes, shut down the computer (see Turn Off Your Computer), remove the memory module, and then repeat the process with the remaining memory modules until a memory error occurs during start-up or diagnostic testing. If the first memory module tested is defective, repeat the process with the remaining modules to ensure that the remaining modules are not defective. 8. When the defective memory module is identified, contact Dell (see Contacting Dell) for a replacement. **NOTE:** If necessary, the computer can operate in debug mode until new memory modules are installed.
①②③④	A possible expansion card failure has occurred.	1. Determine if a conflict exists by removing a card (not the graphics card) and then restarting the computer. 2. If the problem persists, reinstall the card that you removed, remove a different card, and then restart the computer. 3. Repeat this process for each card. If the computer starts normally, troubleshoot the last card removed from the computer for resource conflicts (see Resolving Software and Hardware Incompatibilities).

Diagnostic Lights	Problem Description	Suggested Resolution
		NOTE: If the problem persists, contact Dell (see Contacting Dell).
①②③④ (2,3,4 on)	A possible graphics card failure has occurred.	1. If the computer has a graphics card, remove the card, reinstall it, and then restart the computer. 2. If the problem still exists, install a graphics card that you know works and restart the computer. 3. If the problem persists or the computer has integrated graphics, contact Dell (see Contacting Dell).
①②③④ (2,3 on)	A possible floppy or hard drive failure has occurred.	Reseat all power and data cables and restart the computer.
①②③④ (2 on)	A possible USB failure has occurred.	Reinstall all USB devices, check cable connections, and then restart the computer.
①②③④ (1 on)	No memory modules are detected.	1. Reseat the memory modules to ensure that your computer is successfully communicating with the memory. 2. Restart the computer. 3. If the problem still exists, remove all the memory modules and install one memory module in memory module connector 4. 4. Restart the computer. The following message appears: Alert! Operating in Debug Mode. Please Populate Memory in Pairs for Normal Operation. 5. Press <F1> to boot to the operating system. 6. Run the Dell Diagnostics (see Dell Diagnostics). 7. If the memory module passes, shut down the computer (see Turn Off Your Computer), remove the memory module, and then repeat the process with the remaining memory modules until a memory error occurs during start-up or diagnostic testing. If the first memory module tested is defective, repeat the process with the remaining modules to ensure that the remaining modules are not defective. 8. When the defective memory module is identified, contact Dell (see Contacting Dell) for a replacement. **NOTE:** If necessary, the computer can operate in debug mode until new memory modules are installed.
①②③④ (1 on)	No memory modules are detected.	l If you have one memory module installed, reinstall it and restart the computer. l If you have two or more memory modules installed, remove the modules, reinstall one module, and then restart the computer. If the computer starts normally, reinstall an additional module. Continue until you have identified a faulty module or reinstalled all modules without error. l If available, install properly working memory (see Memory) of the same type into your computer. l If the problem persists, contact Dell (see Contacting Dell).
①②③④ (1,2 on)	System board failure has occurred.	Contact Dell (see Contacting Dell) for technical assistance.
①②③④ (1,2,3 on)	Memory modules are detected, but a memory configuration or compatibility error exists.	l Ensure that no special memory module/memory connector placement requirements exist (see Memory). l Verify that the memory modules that you are installing are compatible with your computer. l Reinstall the memory modules and restart the computer. l If the problem persists, contact Dell (see Contacting Dell).
①②③④ (1,2,3 on)	A possible system board resource and/or hardware failure has occurred.	Perform the procedures in Resolving Software and Hardware Incompatibilities. If the problem persists, contact Dell (see Contacting Dell).
①②③④ (1,2 on)	A possible expansion card failure has occurred.	1. Determine if a conflict exists by removing a card (not a graphics card) and restarting the computer. 2. If the problem persists, reinstall the card that you removed, remove a different card, and then restart the computer. 3. Repeat this process for each card. If the computer starts normally, troubleshoot the last card removed from the computer for resource conflicts (see Resolving Software and Hardware Incompatibilities). 4. If the problem persists, contact Dell (see Contacting Dell).
①②③④ (1,2,3 on)	Another failure has occurred.	l Ensure that the cables are properly connected to the system board from the hard drive, CD drive, and DVD drive. l If the problem persists, contact Dell (see Contacting Dell).
①②③④ (1,2,3 on)	The computer is in a normal operating condition after POST. **NOTE:** After a short time, the diagnostic lights turn off after the computer successfully boots to the operating system.	None.

Beep Codes

Your computer might emit a series of beeps during start-up if the monitor cannot display errors or problems. This series of beeps, called a beep code, identifies a problem. One possible beep code (code 1-3-1) consists of one beep, a burst of three beeps, and then one beep. This beep code tells you that the computer encountered a memory problem.

If your computer beeps during start-up:

1. Write down the beep code on the Diagnostics Checklist.

2. Run the Dell Diagnostics (see Dell Diagnostics) to identify a more serious cause.

3. Contact Dell (see Contacting Dell) for technical assistance.

Code	Cause
1-1-2	Microprocessor register failure
1-1-3	NVRAM read/write failure
1-1-4	ROM BIOS checksum failure
1-2-1	Programmable interval timer failure
1-2-2	DMA initialization failure
1-2-3	DMA page register read/write failure
1-3	Video Memory Test failure
1-3-1 through 2-4-4	Memory not being properly identified or used
1-3-2	Memory problem
3-1-1	Slave DMA register failure
3-1-2	Master DMA register failure
3-1-3	Master interrupt mask register failure
3-1-4	Slave interrupt mask register failure
3-2-2	Interrupt vector loading failure
3-2-4	Keyboard Controller Test failure
3-3-1	NVRAM power loss
3-3-2	Invalid NVRAM configuration
3-3-4	Video Memory Test failure
3-4-1	Screen initialization failure
3-4-2	Screen retrace failure
3-4-3	Search for video ROM failure
4-2-1	No timer tick
4-2-2	Shutdown failure
4-2-3	Gate A20 failure
4-2-4	Unexpected interrupt in protected mode
4-3-1	Memory failure above address 0FFFFh
4-3-3	Timer-chip counter 2 failure
4-3-4	Time-of-day clock stopped
4-4-1	Serial or parallel port test failure
4-4-2	Failure to decompress code to shadowed memory
4-4-3	Math-coprocessor test failure
4-4-4	Cache test failure

Error Messages

Fill out the Diagnostics Checklist as you complete these checks.

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

If the 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:
 	
  1. Click the **Start** button, click **Control Panel**, and then click **Add or Remove Programs**.
  2. Select the program you want to remove.
  3. Click the **Change or Remove Program** icon.
  4. See the program documentation for installation instructions.

Alert! CPU Fan Not Detected — Ensure that the cooling fan and airflow shroud are properly installed and working.
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 — Contact Dell (see Contacting Dell) and report the checkpoint code (*nnnn*) to the support technician.
Alert! Previous Fan Failures — **Alert! Previous Processor Thermal Failure** — **Alert! Previous Shutdown Due to Thermal Event** — Ensure that nothing is blocking the airflow vents and that all the fans are properly installed and operating correctly. Also, ensure that the processor heat-sink assembly is properly installed.
Alert! Previous Reboot Was Due to Voltage Regulator Failure — Contact Dell (see Contacting Dell)for assistance.
Alert! System Battery Voltage is Low — Replace the battery (see Battery).
Alert! Unable to Initialize all Installed Memory — **Alert! Uncorrectable Memory Error Previously Detected... Address *xxxxxxxx*h, Device DIMM_Y** — See Memory Problems.
Attachment failed to respond — See Drive Problems.
Bad command or file name — Ensure that you spelled the command correctly, put spaces in the proper place, and used the correct path name.
Bad error-correction code (ECC) on disk read — See Drive Problems.
Controller has failed — See Drive Problems.
Data error — See Drive Problems.
Decreasing available memory — See Lockups and Software Problems.
Diskette drive 0 seek failure — See Drive Problems.
Diskette read failure — See Drive Problems.

Diskette subsystem reset failed — Dell Diagnostics (see Dell Diagnostics).

Diskette write protected — Slide the write-protect notch to the open position.

Drive not ready — Put a floppy disk in the drive.

Gate A20 failure — See Lockups and Software Problems.

Hard-**disk configuration error** —

Hard-**disk controller failure** —

Hard-**disk drive failure** —

Hard-**disk drive failure** —

See Drive Problems.

Insert bootable media — Insert a bootable floppy disk or CD.

Invalid configuration information - please run SETUP program — Enter system setup (see Entering System Setup) and correct the computer configuration information.

Keyboard failure — See Keyboard Problems.

Memory address line failure at *address*, **read** *value* **expecting** *value* — See Lockups and Software Problems.

Memory allocation error —

1. Turn off the computer, wait 30 seconds, and then restart the computer.
2. Try to run the program again.
3. If the error message appears again, see the software documentation for additional troubleshooting suggestions.

Memory data line failure at *address*, **read** *value* **expecting** *value* —

Memory double word logic failure at *address*, **read** *value* **expecting** *value* —

Memory odd/even logic failure at *address*, **read** *value* **expecting** *value* —

Memory write/read failure at *address*, **read** *value* **expecting** *value* —

Memory size in CMOS invalid —

See Lockups and Software Problems.

No boot device available —

l   If the floppy drive is your boot device, ensure that a bootable floppy disk is in the drive.
l   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.
l   Enter system setup (see Entering System Setup) and ensure that the boot sequence information is correct.

No boot sector on hard-disk drive — Enter system setup (see Entering System Setup) and ensure that the computer configuration information for the hard drive is correct.

If the message continues to appear after you ensure that the information in system setup is correct, see your operating system documentation for reinstallation information.

No timer tick interrupt — Run the Dell Diagnostics (see Dell Diagnostics).

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.

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 might 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).

Please Connect USB Keyboard/Mouse to USB Ports on the Back of the Computer — Turn your computer off, connect the USB keyboard and/or mouse to the USB connectors on the back of the computer, and then restart your computer.

Plug and Play Configuration Error —

1. Turn your computer off, unplug it from the electrical outlet, and then remove all but one of the cards.
2. Plug in your computer and reboot it.
3. If the message reappears, the installed card might be malfunctioning. If the message does not reappear, turn off the computer and reinsert one of the other cards.
4. Repeat this process until you identify which card is malfunctioning.

Read fault —

Requested sector not found —

Reset failed —

See Drive Problems.

Sector not found —

l Run the Windows error-checking utility to check the file structure on the floppy disk or hard drive. See Windows Help for instructions.
l If a large number of sectors are defective, back up the data (if possible), and then reformat the floppy disk or hard drive.

Seek error — See Drive Problems.

Shutdown failure — Run the Dell Diagnostics (see Dell Diagnostics).

Time-of-day clock stopped —

Time-of-day not set —

Enter system setup (see Entering System Setup) and correct the date or time. If the problem persists, replace the battery (see Replacing the Battery).

Timer chip counter 2 failed — Run the Dell Diagnostics (see Dell Diagnostics).

Unexpected interrupt in protected mode — Run the Dell Diagnostics (see Dell Diagnostics).
WARNING: Dell's Disk Monitoring System has detected that drive [0/1] on the [primary/secondary] IDE controller is operating outside of normal specifications. It is advisable to immediately back up your data and replace your hard drive by calling your support desk or Dell —   If no replacement drive is immediately available and the drive is not the only bootable drive, Enter system setup (see Entering System Setup) and change the appropriate drive setting to **None**. Then remove the drive from the computer.
Write fault —   **Write fault on selected drive** —   See Drive Problems.
*<drive letter>***:\ is not accessible. The device is not ready** — The floppy drive cannot read the disk. Insert a floppy disk into the drive and try again.

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 Solving Problems and run the Dell Diagnostics before you contact Dell (see Contacting Dell) for technical assistance.

It is recommended that you print these procedures before you begin.

⊘ **NOTICE:** The Dell Diagnostics works only on Dell™ computers.

Enter system setup (see Entering System Setup), review your computer's configuration information, and ensure that the device you want to test displays in system setup and is active.

Start the Dell Diagnostics from either your hard drive or from the Drivers and Utilities CD (also known as the *ResourceCD*).

📝 **NOTE:** The *Drivers and Utilities* CD is optional and may not ship with all computers.

Starting the Dell Diagnostics From Your Hard Drive

1. Turn on (or restart) your computer.

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

📝 **NOTE:** If you see a message stating that no diagnostics utility partition has been found, run the Dell Diagnostics (see Dell Diagnostics) from your *Drivers and Utilities* CD.

   If you wait too long and the operating system logo appears, continue to wait until you see the Microsoft® Windows® desktop. Then shut down the computer (see Turn Off Your Computer), and try again.

3. When the boot device list appears, highlight **Boot to Utility Partition** and press <Enter>.

4. When the Dell Diagnostics **Main Menu** appears, select the test that you want to run (see Dell Diagnostics Main Menu for a list of tests).

Starting the Dell Diagnostics From the Drivers and Utilities CD

📝 **NOTE:** The *Drivers and Utilities* CD is optional and may not ship with all computers.

1. Insert the *Drivers and Utilities* CD.

2. Shut down the computer (see Turn Off Your Computer).

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

   If you wait too long and the Windows logo appears, continue to wait until you see the Windows desktop. Then shut down the computer (see Turn Off 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.

3. When the boot device list appears, highlight **IDE CD-ROM Device** and press <Enter>.

4. Select the **IDE CD-ROM Device** option from the CD boot menu.

5. Select the **Boot from CD-ROM** option from the menu that appears.

6. Type 1 to start the ResourceCD menu.

7. Select the option to start the Dell Diagnostics and press <Enter>.

8. Select **Run the 32 Bit Dell Diagnostics** from the numbered list. If multiple versions are listed, select the version appropriate for your computer.

9. When the Dell Diagnostics **Main Menu** appears, select the test that you want to run.

Dell Diagnostics Main Menu

1. After the Dell Diagnostics loads and the **Main Menu** screen appears, click the button for the option you want.

Option	Function
Express Test	Performs a quick test of devices. This 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 devices. This test typically takes 1 hour or more and requires you to answer questions periodically.
Custom Test	Tests a specific device. You can customize the tests you want to run.
Symptom Tree	Lists the most common symptoms encountered and allows you to select a test based on the symptom of the problem you are having.

2. If a problem is 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 and follow the instructions on the screen.

   If you cannot resolve the error condition, contact Dell (see Contacting Dell).

NOTE: The Service Tag for your computer is located at the top of each test screen. If you contact Dell, technical support will ask for your Service Tag.

3. If you run a test from the **Custom Test** or **Symptom Tree** option, click the applicable tab described in the following table for more information.

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 may indicate requirements for running the test.
Configuration	Displays your 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. The device list may not display the names of all the components installed on your computer or all devices attached to your computer.
Parameters	Allows you to customize the test by changing the test settings.

4. When the tests are completed, if you are running the Dell Diagnostics (see Dell Diagnostics) from the *Drivers and Utilities* CD, remove the CD.

5. Close the test screen to return to the **Main Menu** screen. To exit the Dell Diagnostics and restart the computer, close the **Main Menu** screen.

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 like a translator between the device and any other programs that use the device. Each device has its own set of specialized commands that only its driver recognizes.

Dell ships your computer to you with required drivers already installed—no further installation or configuration is needed.

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

✍ **NOTE:** The *Drivers and Utilities* CD is optional and may not ship with all computers.

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

- l   Upgrade your operating system.
- l   Reinstall your operating system.
- l   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.

Windows XP

1. Click the **Start** button and 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 to see if any device has an exclamation point (a yellow circle with a [**!**]) on the device icon.

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

Reinstalling Drivers and Utilities

⊙ **NOTICE:** The Dell Support website at **support.dell.com** and your *Drivers and Utilities* CD provide approved drivers for Dell™ computers. If you install drivers obtained from other sources, your computer might not work correctly.

✍ **NOTE:** The *Drivers and Utilities* CD is optional and may not ship with all computers.

Using Windows XP Device Driver Rollback

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

1. Click the **Start** button and 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 and click **Properties**.

7. Click the **Drivers** tab.

8. Click **Roll Back Driver**.

If Device Driver Rollback does not resolve the problem, then use System Restore (see Restoring the Computer to an Earlier Operating State)to return your computer to the operating state that existed before you installed the new driver.

Using the Drivers and Utilities CD

If using Device Driver Rollback or System Restore does not resolve the problem, then reinstall the driver from the *Drivers and Utilities* CD (also known as the Resource CD).

NOTE: The *Drivers and Utilities* CD is optional and may not ship with all computers.

Manually Reinstalling Drivers

1. After extracting the driver files to your hard drive as described in the previous section, click the **Start** button and right-click **My Computer**.

2. Click **Properties**.

3. Click the **Hardware** tab and click **Device Manager**.

4. Double-click the type of device for which you are installing the driver.

5. Double-click the name of the device for which you are installing the driver.

6. Click the **Driver** tab and click **Update Driver**.

7. Click **Install from a list or specific location (Advanced)** and click **Next**.

8. Click **Browse** and browse to the location to which you previously copied the driver files.

9. When the name of the appropriate driver appears, click **Next**.

10. Click **Finish** and restart your computer.

Using Microsoft® Windows® XP System Restore

The Microsoft® Windows® XP operating system provides System Restore to allow you to return your computer to an earlier operating state (without affecting data files) if changes to the hardware, software, or other system settings have left the computer in an undesirable operating state. See the Microsoft® Windows® XP Help and Support Center for information on using System Restore.

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

Creating a Restore Point

1. Click the **Start** button and click **Help and Support**.

2. Click **System Restore**.

3. Follow the instructions on the screen.

Restoring the Computer to an Earlier Operating State

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 is complete.

1. Click the **Start** button, point to **All Programs**→ **Accessories**→ **System Tools**, and then click **System Restore**.

2. Ensure that **Restore my computer to an earlier time** is selected and click **Next**.

3. Click a calendar date to which you want to restore your computer.

The **Select a Restore Point** screen provides a calendar that allows you to see and select restore points. All calendar dates with available restore points appear in boldface type.

4. Select a restore point and click **Next**.

   If a calendar date has only one restore point, then that restore point is automatically selected. If two or more restore points are available, click the restore point that you prefer.

5. Click **Next**.

   The **Restoration Complete** screen appears after System Restore finishes collecting data and then the computer restarts.

6. After the computer restarts, click **OK**.

To change the restore point, you can either repeat the steps using a different restore point, or you can undo the restoration.

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 is complete.

1. Click the **Start** button, point to **All Programs**→ **Accessories**→ **System Tools**, and then click **System Restore**.

2. Click **Undo my last restoration** and click **Next**.

3. Click **Next**.

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

4. After the computer restarts, click **OK**.

Enabling System Restore

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 the **Start** button and click **Control Panel**.

2. Click **Performance and Maintenance**.

3. Click **System**.

4. Click the **System Restore** tab.

5. Ensure that **Turn off System Restore** is unchecked.

Resolving Software and Hardware Incompatibilities

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.

To resolve incompatibilities using the Hardware Troubleshooter:

1. Click the **Start** button and click **Help and Support**.

2. Type `hardware troubleshooter` in the **Search** field and click the arrow to start the search.

3. Click **Hardware Troubleshooter** in the **Search Results** list.

4. In the **Hardware Troubleshooter** list, click **I need to resolve a hardware conflict on my computer**, and click **Next**.

Reinstalling Microsoft® Windows® XP

⊖ **NOTICE:** You must use Windows XP Service Pack 1 (SP1) or later when you reinstall Windows XP.

Before You Begin

If you are considering reinstalling the Windows XP operating system to correct a problem with a newly installed driver, first try using Windows XP Device Driver Rollback (see Using Windows XP Device Driver Rollback). If Device Driver Rollback does not resolve the problem, then use System Restore (see Restoring the Computer to an Earlier Operating State) to return your operating system to the operating state it was in before you installed the new device driver.

To avoid critical setup issues when you reinstall the Microsoft Windows XP operating system on your computer, you must also reinstall the device drivers located on the *ResourceCD* that was shipped with your computer.

⊖ **NOTICE:** Before you reinstall the device drivers and the Windows XP operating system, 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 the drivers and Windows XP, you need the following items:

- ⌐ One blank floppy disk
- ⌐ Dell *Operating System* CD (optional)
- ⌐ Dell *Drivers and Utilities* CD

▨ **NOTE:** The *Drivers and Utilities* CD contains drivers that were installed during assembly of the computer. Use the *Drivers and Utilities* CD to load additional required drivers, including the drivers required if your computer has a RAID controller.

▨ **NOTE:** The *Drivers and Utilities* CD is optional and may not ship with all computers.

Reinstalling Windows XP

To reinstall Windows XP, perform all the steps in the following sections in the order in which they are listed.

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

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

⊖ **NOTICE:** To prevent conflicts with Windows XP, disable any virus protection software installed on your computer before you reinstall Windows XP. See the documentation that came with the software for instructions.

Booting From the Optional Operating System CD

1. Save and close any open files and exit any open programs.

2. Insert the *Operating System* CD. Click **Exit** if `Install Windows XP` message appears.

3. Restart the computer.

4. **Press <F12> immediately after the DELL™ logo appears.**

   If the operating system logo appears, wait until you see the Windows desktop, and then shut down the computer and try again.

5. Press the arrow keys to select **CD-ROM**, and press <Enter>.

6. When the `Press any key to boot from CD` message appears, press any key.

Windows XP Setup

1. When the **Windows XP Setup** screen appears, press <Enter> to select **To set up Windows now**.

2. Read the information on the **Microsoft Windows Licensing Agreement** screen, and press <F8> to accept the license agreement.

3. If your computer already has Windows XP installed and you want to recover your current Windows XP data, type r to select the repair option, and remove the CD.

4. If you want to install a new copy of Windows XP, press <Esc> to select that option.

5. Press <Enter> to select the highlighted partition (recommended), and follow the instructions on the screen.

   The **Windows XP Setup** screen appears, and the operating system begins to copy files and install the devices. The computer automatically restarts multiple times.

NOTE: The time required to complete the setup depends on the size of the hard drive and the speed of your computer.

NOTICE: Do not press any key when the following message appears: `Press any key to boot from the CD`.

6. When the **Regional and Language Options** screen appears, select the settings for your location and click **Next**.

7. Enter your name and organization (optional) in the **Personalize Your Software** screen, and click **Next**.

8. At the **Computer Name and Administrator Password** window, enter a name for your computer (or accept the one provided) and a password, and click **Next**.

9. If the **Modem Dialing Information** screen appears, enter the requested information and click **Next**.

10. Enter the date, time, and time zone in the **Date and Time Settings** window, and click **Next**.

11. If the **Networking Settings** screen appears, click **Typical** and click **Next**.

12. If you are reinstalling Windows XP Professional and you are prompted to provide further information regarding your network configuration, enter your selections. If you are unsure of your settings, accept the default selections.

   Windows XP installs the operating system components and configures the computer. The computer automatically restarts.

NOTICE: Do not press any key when the following message appears: `Press any key to boot from the CD`.

13. When the **Welcome to Microsoft** screen appears, click **Next**.

14. When the `How will this computer connect to the Internet?` message appears, click **Skip**.

15. When the **Ready to register with Microsoft?** screen appears, select **No, not at this time** and click **Next**.

16. When the **Who will use this computer?** screen appears, you can enter up to five users.

17. Click **Next**.

18. Click **Finish** to complete the setup, and remove the CD.

NOTE: When Windows Setup completes, remove any installed floppy disk and store it in a safe place.

19. Reinstall the appropriate drivers with the *Drivers and Utilities* CD (see Manually Reinstalling Drivers).

20. Reinstall your virus protection software.

21. Reinstall your programs.

NOTE: To reinstall and activate your Microsoft Office or Microsoft Works Suite programs, you need the Product Key number located on the back of the Microsoft Office or Microsoft Works Suite CD sleeve.

Dell Precision™ Workstation 390 User's Guide

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

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

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

For a complete list of abbreviations and acronyms, see the Glossary.

If you purchased a Dell™ n Series computer, any references in this document to Microsoft® Windows® operating systems are not applicable.

NOTE: Some features or media may not be available for your computer or in certain countries.