Dell Precision™ WorkStation 420 Systems User's Guide

NOTE: You can obtain the latest version of this document from the Dell support Web site at **http://support.dell.com**.

Models WCP and WCM

Notes, Notices, and Cautions

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

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

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

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

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Using the Integrated Audio Controller: Dell Precision™ WorkStation 420 Systems User's Guide

- [Overview](#)
- [Connecting Audio Devices](#)
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- [Using Audio Utilities](#)
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Overview

This section describes how to connect your computer system to external audio devices that use the 32-bit integrated audio controller on your computer's system board.

The integrated Crystal SoundFusion CS4614 Peripheral Component Interconnect (PCI) audio controller is Sound Blaster Pro-compatible and supports Microsoft® DirectSound, DirectSound3D, and wavetable synthesis. The CS4614 controller has a Sound Retrieval System (SRS) 3D stereo digital signal processing (DSP) engine that retrieves and restores spatial sound information, directional cues, and other sonic nuances that are typically missing or are altered by electronic reproduction of stereo sound.

This section also describes the audio application programs that Dell has installed on your hard-disk drive, and it tells you how to reinstall audio drivers if necessary.

> NOTE: The instructions in this section apply to systems using the integrated audio controller. If you are using a sound card, use the connection instructions in the documentation that came with your sound card.

Connecting Audio Devices

You can connect a variety of audio devices to your computer. Use Figure 1 to locate the audio connectors on the input/output (I/O) panel on the back of your computer.

Figure 1. Audio Connectors

1 Microphone jack
2 Line-out jack
3 Line-in jack
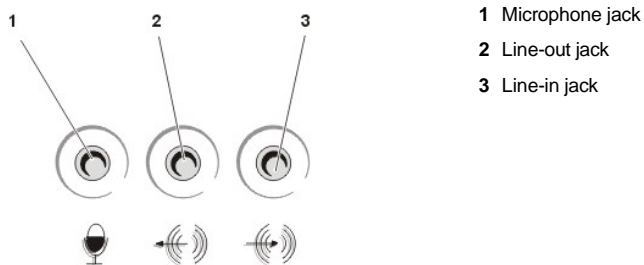
Before you use any audio device, be sure that **Sound** in the System Setup program is set to **On** (the default).

Speakers

Your computer system supports most standard speakers that have integrated amplifiers. You can purchase speakers separately from Dell.

Connect the audio cable from the speakers to the line-out jack (see [Figure 1](#)).

> NOTES: The line-out jack has a mechanical switch that detects when external speakers are plugged in. If external speakers are plugged in, the internal monophonic speaker is turned off. If no external speakers are plugged in, then all sound, including sounds from the operating system, is routed to the internal monophonic speaker. If external speakers are plugged in, all sound, including the PC beep, is routed through the line-out jack to the external speakers. Sound is never routed to the internal speaker and external speakers simultaneously.
>
> The **Sound** option in the System Setup program turns the audio controller on and off. When **Sound** is set to **Off**, sound from the operating system does not come out of either the external speakers or the internal speaker.
>
> The **PC Speaker** option in the System Setup program enables or disables the legacy PC sound. It does not turn the internal monophonic speaker on or off. Basic input/output system (BIOS) beep codes are always audible regardless of this option's setting.

Microphones

Your computer system supports most nondynamic monaural microphones for personal computers. You can purchase a microphone separately from Dell.

> NOTE: Do not use standard microphones. Use only microphones designed for personal computers.

Connect the audio cable from the microphone to the microphone jack (see Figure 1).

Record/Playback Devices

Your computer system supports a variety of record/playback devices such as cassette players, CD players, radios, stereo systems, VCRs, and tape players.

Connect the line-out cable from any one of these devices to the line-in jack on the back of your computer (see Figure 1).

CD-ROM Drives

To use an internal CD-ROM drive with the integrated audio controller, perform the following steps:

1. Install the CD-ROM drive in your computer.

   For instructions on installing a CD-ROM drive that uses the computer's enhanced integrated drive electronics (EIDE) interface, see "Installing Diskette, LS-120 SuperDisk, Tape, and CD-ROM Drives."

   For instructions on installing a small computer system interface (SCSI) CD-ROM drive, see "Installing SCSI Devices."

2. Connect the audio cable from the CD-ROM drive to the CD-IN audio connector on the system board.

   See Figure 1 in "Installing System Board Options" for the location of the CD-ROM drive audio connector on the system board.

> NOTES: The integrated audio controller allows you to manipulate musical instrument digital interface (MIDI) files on your computer and to hear output from those files on external speakers. However, to communicate with an external MIDI device, such as a synthesizer or other musical instrument, you must install a MIDI-compatible expansion card. If you use a MIDI card, set **Sound** in the System Setup program to **Off**.
>
> To use a joystick, install a joystick-compatible expansion card in your computer. If you use a joystick card with sound capabilities, set **Sound** in the System Setup program to **Off**.

AUX

Your computer system supports analog input from DVD decoder and TV tuner expansion cards.

Connect the data cable from either expansion card to the AUX connector on the system board.

TAPI

Your computer system allows a voice modem to interface with the integrated audio system.

Connect the voice modem data cable to the TAPI connector on the system board.

Adjusting Volume

Use the instructions in one of the following subsections to adjust the speaker balance and volume of an audio source that uses the integrated audio controller in your Dell™ computer.

Adjusting Volume in the Microsoft Windows® 98 Operating System

To adjust the speaker or headphone volume in the Windows 98 operating system, perform the following steps:

1. Click the **Start** button, point to **Settings**, and click **Control Panel**.

2. Double-click the **Multimedia** icon.

3. Click the **Audio** tab, and move the slide switch for playback or recording to the desired volume.

For detailed instructions on adjusting the volume, see your Windows 98 documentation.

Adjusting Volume in the Microsoft Windows NT® 4.0 Operating System

To adjust the speaker or headphone volume in the Windows NT 4.0 operating system, perform the following steps:

1. Start the Audio Mixer utility located in the **Audio Control** program folder.

2. Adjust the slide controls labeled "Master" to adjust the volume and balance for all devices, or adjust the slide controls for an individual device.

For detailed instructions on adjusting the volume, see your Windows NT documentation.

Using Audio Utilities

The operating system installed on your Dell system has its own utilities for playing audio CDs and recording or playing **.wav** files:

l For Windows 98 and Windows NT 4.0, use **Sound Recorder** under **Multimedia** in the **Accessories** program folder to control the input of devices from which you are recording **.wav** data. **Record** allows you to adjust your selected audio input device.

l Use **Volume Control** under **Multimedia** in the **Accessories** program folder (opens the **Master Out** window) to adjust sound levels from several different audio sources.

Installing Audio Drivers

Your system's audio drivers were installed at Dell and are operative when you receive the system—no further installation or configuration is needed. If you ever need to reinstall these drivers, see the documentation that came with your *Dell Precision ResourceCD.*

Basic Checks: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

If your Dell™ computer system is not working as expected, and if you are not sure what to do, start your troubleshooting with the procedures in this section. This section guides you through basic steps to solve basic computer problems. It also directs you to further detailed troubleshooting information and procedures to solve more complex problems.

Backing Up Your Files

If your system is behaving erratically, back up your files immediately. If your system has a tape drive installed, see the documentation that came with the tape backup software for instructions on performing a backup operation. Otherwise, see your operating system documentation for information on backing up data files.

Basic Checks

See the following sections in the order indicated until the problem is resolved:

- If your computer is wet or damaged, see "Troubleshooting a Wet Computer" or "Troubleshooting a Damaged Computer."

- Perform the steps in "Checking Connections and Switches."

- Perform the steps in "Look and Listen."

- If your system did not complete the boot (start-up) routine, see "Getting Help."

  ✖️ NOTE: The boot routine is the operating system's attempt to load its files into memory from the boot-up sector on the hard-disk drive or another bootable device.

- If your system displayed a message or emitted a beep code, see "Messages and Codes."

- Verify the settings in System Setup.

- Run the Dell Diagnostics.

Checking Connections and Switches

Improperly set switches and controls and loose or improperly connected cables are the most likely source of problems for your computer, monitor, or other peripheral (such as a printer, keyboard, mouse, or other external equipment).

✖️ NOTE: See "Hardware Configuration Features" for the location of your computer's external connections and switches.

Complete the following steps in the order indicated to check all the connections and switches:

1. Turn off the system, including any attached peripherals (such as the monitor, keyboard, printer, external drives, scanners, or plotters).

2. Disconnect all the AC power cables from their electrical outlets.

3. If your computer is connected to a power strip, turn the power strip off and then on again. If the problem is not resolved, try another power strip or connect the system directly to an electrical outlet to see if the original power strip is faulty.

4. Connect the system to a different electrical outlet.

   If doing so corrects the problem, the original outlet is faulty.

5. Reconnect the system to an electrical outlet. Make sure that all connections fit tightly together, and turn on the system.

6. If the problem is resolved, you have corrected a faulty connection.

7. If your monitor is not operating properly, see "Troubleshooting the Monitor."

8. If your keyboard is not operating properly, see "Troubleshooting the Keyboard."

9. If your mouse or printer is not operating properly, see "Troubleshooting I/O Ports." Otherwise, see "Look and Listen."

Look and Listen

Looking at and listening to your system is important in determining the source of a problem. Look and listen for the indications described in Table 1.

If after looking and listening to your computer you have not resolved the problem, continue with the recommendations in "System Setup."

Table 1. Boot Routine Indications

Look/Listen for:	Action
An error message	See "Messages and Codes."
The monitor's power indicator	Most monitors have a power indicator (usually on the front bezel). If the monitor's power indicator does not light up, see "Troubleshooting the Monitor."
The power indicator	Use the power indicator to help you identify a system problem when you press the power button to turn on the computer but the system does not boot: l A blinking yellow power indicator before power-on self-test (POST) indicates that the power supply may be faulty. In rare cases, the system board may be faulty. See "Getting Help" for instructions on getting technical assistance from Dell. l A solid yellow power indicator before POST indicates that a device on the system board may be faulty or is incorrectly installed. Be sure that the microprocessor is properly seated, remove all expansion cards, and then reboot. If the system does not boot, see "Getting Help" for instructions on getting technical assistance from Dell. l A solid green power indicator and a beep code during POST indicate that a Rambus in-line memory module (RIMM) may be faulty or is not properly seated. Remove all RIMMs and reinstall or pair with Rambus continuity modules (C-RIMMs) in the empty sockets, and then reboot. Repeat this procedure until you identify the faulty or improperly seated RIMM. l A solid green power indicator and no beep code and no video during POST indicate that the monitor or the integrated video controller may be faulty. See "Troubleshooting the Monitor." If the monitor is operating properly and is correctly connected, see "Getting Help" for instructions on getting technical assistance from Dell. l A solid green power indicator and no beep code with video during POST indicate that an integrated system board device may be faulty. See "Getting Help" for instructions on getting technical assistance from Dell.
The keyboard indicators	Most keyboards have one or more indicators (usually in the upper-right corner). Press <Num Lock>, <Caps Lock>, and <Scroll Lock> to toggle the keyboard indicators on and off. If the keyboard indicators do not light up, see "Troubleshooting the Keyboard."
The diskette-drive access indicator	The diskette-drive access indicator should quickly flash on and off when you access data on the diskette drive. On a system running a Microsoft® Windows® operating system, you can test the drive by opening Windows Explorer and clicking the icon for drive A. If the diskette-drive access indicator does not light up, see "Troubleshooting Drives."
The hard-disk drive access indicator	The hard-disk drive access indicator should quickly flash on and off when you access data on the hard-disk drive. On a system running a Windows operating system, you can test the drive by opening Windows Explorer and clicking the icon for drive C. If the hard-disk drive access indicator does not light up, see "Troubleshooting Drives."
A series of beeps	See "Messages and Codes."
An unfamiliar constant scraping or grinding sound when you access a drive	Make sure that the sound is not caused by the application program you are running. The sound could be caused by a hardware malfunction. See "Getting Help" for instructions on getting technical assistance from Dell.
The absence of a familiar sound	When you turn on your system, you can hear the hard-disk drive spin up, and the system tries to access the boot files from the hard-disk drive or the diskette drive. If your system boots, see "Dell Diagnostics." If your system does not boot, see "Getting Help."

System Setup

You can easily correct certain system problems by verifying the correct settings in [System Setup](#). When you boot your system, your system checks the system configuration information and compares it with the current hardware configuration. If your system hardware configuration does not match the information recorded by System Setup, an error message may appear on your screen.

This problem can happen if you changed your system's hardware configuration and forgot to run System Setup. To correct this problem, enter System Setup, correct the setting for the corresponding System Setup program option, and reboot your system.

If after checking the settings in System Setup you have not resolved the problem, see "[Dell Diagnostics](#)."

Installing System Board Options: Dell Precision™ WorkStation 420 Systems User's Guide

- **Overview**
- **Expansion Cards**
- **Adding Memory**

- **Microprocessor Upgrades**
- **Replacing the System Battery**

Overview

This section describes how to install the following options:

- Peripheral Component Interconnect (PCI), redundant arrays of independent disks (RAID), and accelerated graphics port (AGP) expansion cards

- System memory

- Microprocessor single-edge connector cartridge 2 (SECC2) package

This section also includes instructions for replacing the system battery, if necessary.

Use Figure 1 to locate the system board features.

Figure 1. System Board Features
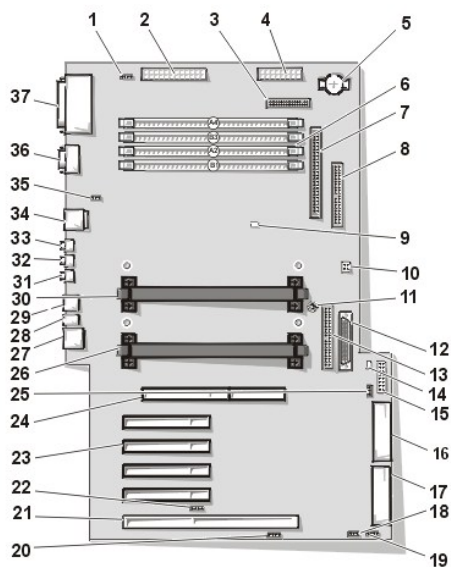
- **1** CD-ROM drive audio connector
- **2** Power connector (desktop chassis)
- **3** Diskette drive connector
- **4** Power connector (desktop chassis)
- **5** Battery
- **6** RIMM sockets
- **7** SCSI narrow connector
- **8** Secondary EIDE connector
- **9** Suspend to RAM LED
- **10** Jumper block
- **11** System board screw

12 LVD SCSI connector

13 Primary EIDE connector

14 Standby power LED

15 Control panel connector

16 Power connector (mini tower chassis)

17 Power connector (mini tower chassis)

18 TAPI/modem connector

19 Card cage area fan connector

20 Auxiliary sound input connector

21 PCI/RAID expansion card slot

22 Auxiliary hard-disk drive access LED connector

23 PCI expansion slots

24 AGP Pro50 (4X) graphics slot (desktop chassis), or AGP Pro110 (4X) graphics slot (mini tower chassis)

25 Wake on LAN connector

26 Processor 0

27 Network cable connector

28 Diagnostic LEDs

29 USB connectors

30 Processor 1

31 Line-in connector

32 Line-out connector

33 Microphone connector

34 Mouse/Keyboard (stacked)

35 System fan connector

36 Serial port 1/serial port 2 (stacked)

37 Parallel port/external SCSI port (stacked)

Expansion Cards

The system contains five 32-bit PCI expansion slots (one shared with the RAID slot) and one 32-bit AGP Pro50 (4X) slot (desktop chassis) or one AGP Pro110 (4X) slot (mini tower chassis). If you use an AGP Pro110 or Pro50 card, it occupies the AGP slot and may occupy PCI slots 1 and 2. See Figure 2 and Figure 3 for examples of the cards that occupy these slots.

Figure 2. Expansion Cards

1 32-bit PCI expansion card

2 32-bit AGP card
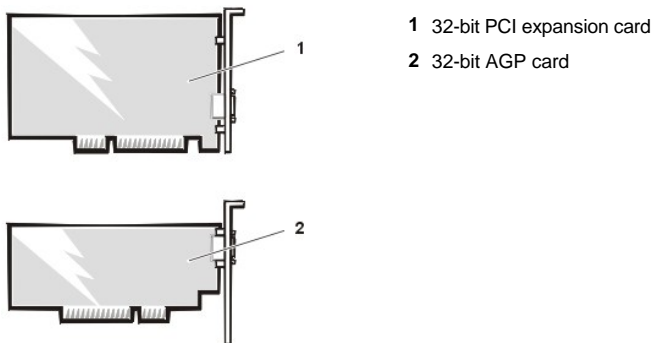
Figure 3. AGP Pro110 or Pro50 Card

Figure 3 shows the card extension that may occupy PCI slots 1 and 2.
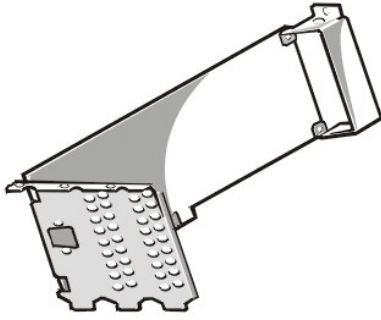
The following is a list of valid expansion-card combinations:

- One AGP card and five PCI cards.

- One AGP card, four PCI cards, and one RAID card.

- One AGP Pro50 card and four PCI cards

- One AGP Pro50 card, three PCI cards, and one RAID card

- One AGP Pro110 card and three PCI cards (mini tower chassis only)

- One AGP Pro110 card, two PCI cards, and one RAID card (mini tower chassis only)

Expansion Slots

The Dell Precision 420 systems provide five PCI 2.2-compliant expansion slots. Slot 5 is shared with the RAID port function.

NOTE: No Industry-Standard Architecture (ISA) slots are provided.

Installing an Expansion Card

To install an expansion card, perform the following steps.

NOTE: If you install a PCI expansion card, your system automatically performs any required configuration tasks during the boot routine.

NOTICE: See "Protecting Against Electrostatic Discharge" in your *System Information Guide*.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

1. Prepare the expansion card for installation, and remove the computer cover according to the instructions in "Removing the Computer Cover (Desktop Chassis)" or "Removing the Computer Cover (Mini Tower Chassis)."

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

⚠ **CAUTION: Some network cards automatically start up the system when they are connected. To guard against electrical shock and to avoid damaging electrical components, perform the following steps before you install any expansion cards:**

   1. **Disconnect the external power cable at the back of the system.**
   2. **Verify that the standby power light-emitting diode (LED) is off. See Figure 1 for the location of this LED.**

2. If you have a mini tower chassis, remove the AGP card brace according to the instructions in "Removing and Replacing the AGP Card Brace (Mini Tower Chassis Only)."

3. Unscrew and remove the metal filler bracket that covers the card-slot opening for the expansion slot that you intend to use (see Figure 4).

   Save the screw to use when you install the expansion card later in this procedure.

Figure 4. Removing the Filler Bracket

1 Filler bracket

4. Insert the expansion card into the expansion-card connector.

   If the expansion card is full-length, insert the front end of the card into the corresponding card guide on the inside front of the chassis as you insert the card into its connector.

   Insert the card-edge connector firmly into the expansion-card slot. Gently rock the card into the connector until it is fully seated (see Figure 5).

Figure 5. Installing an Expansion Card
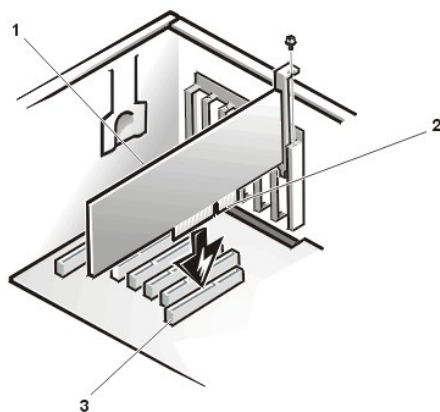
1 Expansion card

2 Card-edge connector

3 Expansion-card connector

5. When the card is firmly seated in the connector, secure the card's mounting bracket to the chassis with the screw that you removed in step 3.

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

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

7. If you have a mini tower chassis, replace the AGP card brace.

8. Replace the computer cover, and reconnect your computer and peripherals to their electrical outlets and turn them on.

   NOTE: After you remove and replace the cover, the chassis intrusion detector causes the following message to be displayed at the next system start-up:

   ```
   ALERT! Cover was previously removed.
   ```

9. To reset the chassis intrusion detector, enter the System Setup program and reset **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

   NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.

Removing an Expansion Card

To remove an expansion card, perform the following steps.

NOTICE: See "Protecting Against Electrostatic Discharge" in your *System Information Guide*.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

1. Remove the computer cover according to the instructions in "Removing the Computer Cover (Desktop Chassis)" or "Removing the Computer Cover (Mini Tower Chassis)."

2. If you have a mini tower chassis, remove the AGP card brace according to the instructions in "Removing and Replacing the AGP Card Brace (Mini Tower Chassis Only)."

3. If necessary, disconnect any cables connected to the card.

4. Unscrew the mounting bracket of the card you want to remove.

5. Grasp the card by its outside corners, and ease it out of its connector.

6. If you are not replacing the card, install a metal filler bracket over the empty card-slot opening.

   �NOTE: Installing filler brackets over empty card-slot openings is necessary to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of your computer.

7. If you have a mini tower chassis, replace the AGP card brace.

8. Replace the computer cover, and reconnect your computer and peripherals to their electrical outlets and turn them on.

   ✕NOTE: After you remove and replace the cover, the chassis intrusion detector causes the following message to be displayed at the next system start-up:

   ```
   ALERT! Cover was previously removed.
   ```

9. To reset the chassis intrusion detector, enter the System Setup program and reset **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

   ✕NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.

Adding Memory

Dell Precision 420 systems support dual direct Rambus dynamic random-access memory (RDRAM) channels. The channels are designated A and B. Dell Precision 420 systems support Rambus in-line memory modules (RIMMs) in 64-, 128-, 256-, and 512-megabyte (MB) capacities. The RIMMs feature error checking and correction (ECC).

Dell Precision 420 systems support a maximum of four RIMMs for up to 2 gigabytes (GB) of total memory.

Figure 6 shows the RIMMs and RIMM sockets.

Figure 6. RIMMs and RIMM Sockets

1 Socket RIMMB_1
2 Socket RIMMA_2
3 Socket RIMMB_3
4 Socket RIMMA_4
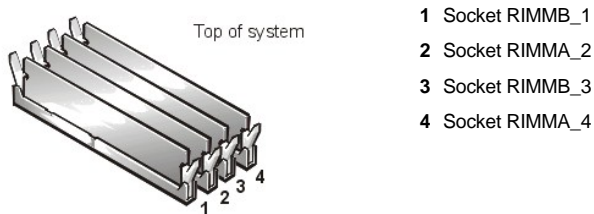
RIMM Installation Guidelines

When you add system memory, you must install RIMMs in matched pairs (pairs of identical capacity). If only one pair of RIMMs is installed, they must occupy slots RIMMB_1 and RIMMA_2, and you must install continuity RIMMs (C-RIMMs) in sockets RIMMB_3 and RIMMA_4.

Tables 1 lists sample memory configurations.

Table 1. Sample RIMM Configuration Options

Total Desired Memory	RIMM Socket			
	RIMMB_1	RIMMA_2	RIMMB_3	RIMMA_4
2048 MB	512 MB	512 MB	512 MB	512 MB
1024 MB	512 MB	512 MB	C-RIMM	C-RIMM
1024 MB	256 MB	256 MB	256 MB	256 MB
512 MB	128 MB	128 MB	128 MB	128 MB

512 MB	256 MB	256 MB	C-RIMM	C-RIMM
256 MB	64 MB	64 MB	64 MB	64 MB
256 MB	128 MB	128 MB	C-RIMM	C-RIMM
128 MB	64 MB	64 MB	C-RIMM	C-RIMM

To upgrade memory, perform the following steps.

NOTICE: See "Protecting Against Electrostatic Discharge" in your *System Information Guide*.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

1. Remove the computer cover according to the instructions in "Removing the Computer Cover (Desktop Chassis)" or "Removing the Computer Cover (Mini Tower Chassis)."

2. Determine the RIMM sockets in which you will install RIMMs or replace existing RIMMs.

3. Install or remove RIMMs as necessary to reach the desired memory total.

4. Install C-RIMMs in any RIMM slots that do not contain RIMMs.

5. Replace the computer cover, and reconnect your computer and peripherals to their electrical outlets and turn them on.

   📝 *NOTE: After you remove and replace the cover, the chassis intrusion detector causes the following message to be displayed at the next system start-up:*

   `ALERT! Cover was previously removed.`

   The system detects that the new memory does not match the existing system configuration information and generates the following message:

   The amount of system memory has changed.
   Strike the F1 key to continue, F2 to run the setup utility

6. Press <F2> to enter the System Setup program, and check the value for **System Memory** in the lower-right corner of Page 1.

   The system should have already changed the value of **System Memory** to reflect the newly installed memory. Verify the new total.

   📝 *NOTE: If the memory total is incorrect, turn off and disconnect your computer and peripherals from their electrical outlets. Remove the computer cover, rotate the power supply, and check the installed RIMMs to make sure that they are seated properly in their sockets. Then repeat steps 5, 6, and 7.*

7. While in the System Setup program, reset the chassis intrusion detector by changing **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

   📝 *NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.*

8. When the system memory total is correct, press the <Esc> key to exit the System Setup program.

9. Run the Dell Diagnostics to verify that the RIMMs are operating properly.

   See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

Installing a RIMM

If a RIMM is already installed in the socket you want to use, you must remove it.

NOTICE: To avoid damage to the memory module, press the module straight down into the socket with equal force applied at each end of the module.

To install a RIMM, perform the following steps (see Figure 7):

1. Locate the plastic securing clips at each end of the socket. Press the clips outward until they snap open.

2. Press the RIMM straight into the slot running down the center of the socket until the securing tabs snap into place around the ends of the RIMM.

Figure 7. Installing a RIMM

1 Securing clips (2)
2 Slot
3 Securing tab
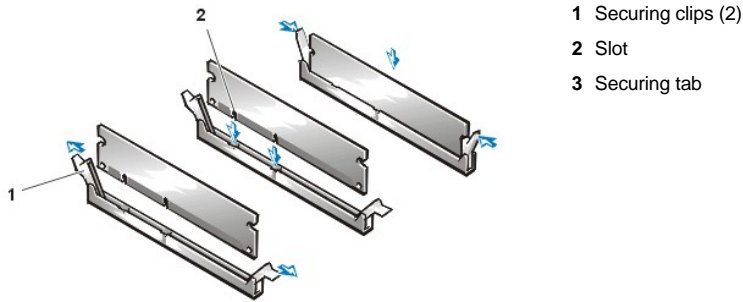
Removing a RIMM

To remove a RIMM, press the securing clips outward simultaneously until the RIMM disengages from the socket (see Figure 8). It should pop out slightly.

NOTICE: To avoid damage to the memory module, press the securing clips with equal force applied at each end of the socket.

Figure 8. Removing a RIMM

1 Securing clips (2)
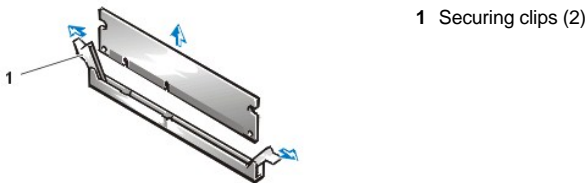
Microprocessor Upgrades

NOTE: Only the Microsoft® Windows NT® 4.0 and Windows® 2000 and higher operating systems support dual microprocessors.

To take advantage of future options in speed and functionality, you can add a second processor or replace either the primary or secondary processor.

NOTICE: The second processor must be of the same type and speed as the first processor.

Downloading Instructions for Installing Dual Processor Support

1. Go to **http://support.dell.com/**.

2. Complete the one-time registration process, if you have not already done so.

3. Click **Dell Knowledge Base** under **Support Tools**, enter `second processor` in the **Search Documents by Words in Title** option, and click **Go**.

4. Click the document that corresponds to the operating system you are running.

Each processor and its associated level-2 (L2) cache memory are contained in an SECC2 cartridge that is installed in a dedicated connector on the system board. In systems with only one processor, a terminator card is installed in the secondary processor connector. The following subsection describes how to install or replace an SECC2 cartridge in either the primary or secondary processor connector.

Adding or Replacing a Microprocessor

The following items are included in a processor upgrade kit:

- l The new processor SECC2 cartridge with attached heat sink

- l Two heat-sink securing thumbscrews

Use the following procedure to add or replace an SECC2 cartridge.

NOTE: Dell recommends that only a technically knowledgeable person perform this procedure.

NOTICE: See "Protecting Against Electrostatic Discharge" in your *System Information Guide*.

⚠️ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

1. Remove the computer cover according to the instructions in "Removing the Computer Cover (Desktop Chassis)" or "Removing the Computer Cover (Mini Tower Chassis)."

2. Rotate the power supply as described in "Rotating the Power Supply Away From the System Board (Desktop Chassis)" or "Rotating the Power Supply Away From the System Board (Mini Tower Chassis)."

3. Remove the airflow shroud.

4. If you are adding a second processor to a single-processor system, remove the terminator card from the secondary SECC2 cartridge connector (labeled "PROC_1").

   Pull the SECC2 cartridge release latches outward and pull the terminator card straight out to remove it from the connector.

5. If you are replacing an installed processor, remove the current SECC2 cartridge/heat sink assembly from its connector.

   Unscrew and remove the two large thumbscrews that secure the heat sink to the system board. Pull the SECC2 cartridge release latches outward. Grasp the SECC2 cartridge assembly firmly, and pull it away from the guide bracket assembly (see Figure 9). You must use up to 15 pounds (lb) of force to disengage the SECC2 cartridge from the connector.

Figure 9. SECC2 Cartridge/Heat Sink Assembly Removal

1 Airflow shroud

2 Processor/heat sink assembly

3 Guide bracket

4 Second processor

5 Cooling fan
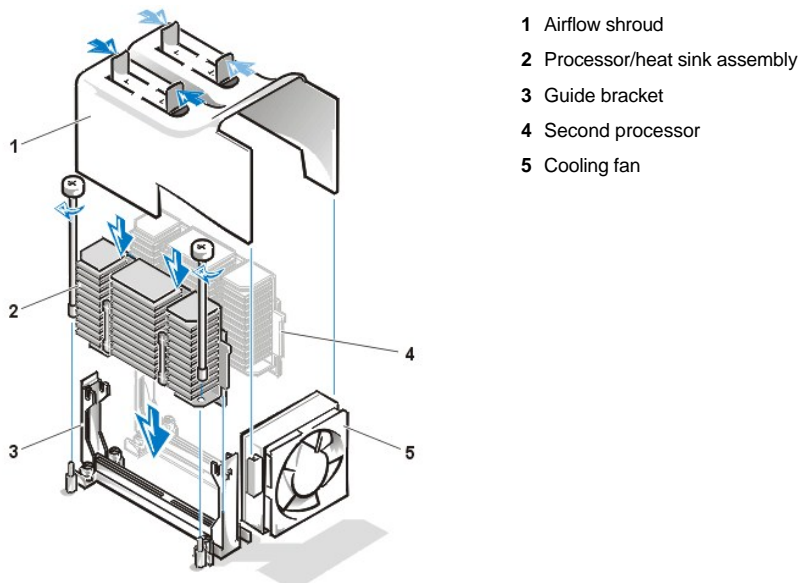
6. Insert the new SECC2 cartridge/heat sink assembly into the system board connector.

   Press the SECC2 cartridge firmly into its connector until it is fully seated and the latches snap into place. You must use up to 25 lb of force to fully seat the SECC2 cartridge in its connector. Install or replace the two large thumbscrews that secure the heat sink to the system board.

7. Replace the airflow shroud.

8. Rotate the power supply back into position, making sure that the securing tab snaps into place.

9. Replace the computer cover, and reconnect your computer and peripherals to their electrical outlets and turn them on.

   As the system boots, it detects the presence of the new processor and automatically changes the system configuration information in the System Setup program.

📝 *NOTE: After you remove and replace the cover, the chassis intrusion detector causes the following message to be displayed at the next system start-up:*

```
ALERT! Cover was previously removed.
```

10. Enter the System Setup program, and confirm that the system data area correctly identifies the type and number of installed processor(s).

11. While in the System Setup program, reset the chassis intrusion detector by changing **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

12. If you installed a second processor and your system is running Microsoft Windows NT 4.0, reinstall the operating system.

See your Windows NT documentation for instructions.

When you reinstall Windows NT 4.0, the operating system detects the second processor.

Replacing the System Battery

A 3.0-volt (V) CR2032 coin-cell battery installed on the system board maintains system configuration, date, and time information in a special section of memory.

The operating life of the battery can extend up to 10 years if the system remains plugged into an electrical outlet. If the system is in storage and disconnected from all power sources, the battery life is approximately 3.5 years. You may need to replace the battery if an incorrect time or date is displayed during the boot routine along with a message such as:

```
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, reenter the time and date through the System Setup program and exit the program properly to save the information. Turn off and unplug your system for a few hours, and then plug in and turn on your system. Enter the System Setup program. If the date and time are not correct in the System Setup program, replace your battery.

You can operate your system without a battery; however, without a battery, the system configuration information maintained by the battery is erased if the system is unplugged or AC power is lost. In this case, you must enter the System Setup program and reset the configuration options.

⚠️ **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.**

To replace the system battery with another CR2032 coin-cell battery, perform the following steps:

1. If you have not already done so, make a copy of your system configuration information in the System Setup program.

   If the settings are lost while you are replacing the battery, you can refer to your written or printed copy of the system configuration information to restore the correct settings.

   ⚠️ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. Remove the computer cover according to the instructions in "Removing the Computer Cover (Desktop Chassis)" or "Removing the Computer Cover (Mini Tower Chassis)."

   NOTICE: See "Protecting Against Electrostatic Discharge" in your *System Information Guide*.

3. (Desktop chassis only) To access the battery on the system board, rotate the power supply as described in "Rotating the Power Supply Away From the System Board (Desktop Chassis)."

4. (Mini tower chassis only) If installed, remove the CD-ROM drive according to the instructions in "Installing a Diskette, LS-120 SuperDisk, Tape, or CD-ROM Drive in a Mini Tower Chassis" to access the battery.

   NOTE: If a CD-ROM drive or hard-disk drive in the upper 5.25-inch drive bay obstructs your access to the battery, you may find it helpful to remove the front bezel and slide the drive forward slightly to provide more room for you to work. See "Removing and Replacing the Front Bezel (Mini Tower Chassis Only)" and "Installing an EIDE Hard-Disk Drive in the Mini Tower Chassis" for instructions.

5. Locate the battery and remove it.

   The battery is mounted in a socket labeled "BATTERY" at the upper front-right corner of the system board (as you face the side of the system) (see Figure 1).

   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. Make certain that the object is inserted between the battery and the socket before attempting 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.

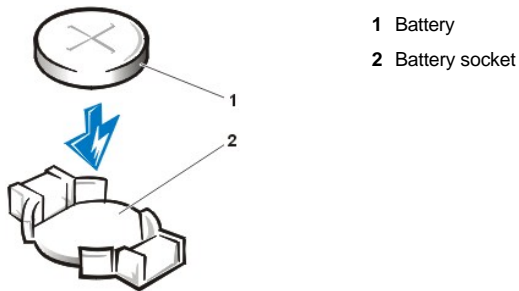Pry the battery out of its socket with your fingers or with a blunt, nonconductive object, such as a plastic screwdriver (see Figure 10).

Figure 10. System Battery and Battery Socket

1 Battery

2 Battery socket

6. Install the new battery.

    Orient the battery with the side labeled "+" facing up. Then insert the battery into the socket, and snap it into place.

7. Rotate the power supply back into position, making sure that the securing tab snaps into place.

8. Replace the computer cover, and reconnect your computer and peripherals to their electrical outlets and turn them on.

    NOTE: After you remove and replace the cover, the chassis intrusion detector will cause the following message to be displayed at the next system start-up:

    `ALERT! Cover was previously removed.`

9. Enter the System Setup program, and confirm that the battery is operating properly.

    Enter the correct time and date through the System Setup program's **Time** and **Date** options. Also, restore the correct settings for the system configuration information using the copy made in step 1.

10. While in the System Setup program, reset the chassis intrusion detector by changing **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

    NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.

11. Turn off your computer, and unplug it for at least 10 minutes.

12. After 10 minutes, plug in and turn on the computer and enter the System Setup program. If the time and date are still incorrect, see "Getting Help."

Contacting Dell: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

When you need to contact Dell, use the telephone numbers, codes, and electronic addresses provided in the following sections. "International Dialing Codes" provides the various codes required to make long-distance and international calls. "Americas Contact Numbers," "Europe Contact Numbers," and "Asia and Other Regions Contact Numbers" provide local telephone numbers, area codes, toll-free numbers, and e-mail addresses, if applicable, for each department or service available in various countries around the world.

If you are making a direct-dialed call to a location outside of your local telephone service area, determine which codes to use (if any) in "International Dialing Codes," in addition to the local numbers provided in the other sections.

For example, to place an international call from Paris, France to Bracknell, England, dial the international access code for France followed by the country code for the U.K., the city code for Bracknell, and then the local number as shown in the following illustration:

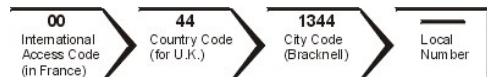To place a long-distance call within your own country, use area codes instead of international access codes, country codes, and city codes. For example, to call Paris, France from Montpellier, France, dial the area code plus the local number as shown in the following illustration:

The codes required depend on where you are calling from as well as the destination of your call; in addition, each country has a different dialing protocol. If you need assistance in determining which codes to use, contact a local or an international operator.

NOTES: Toll-free numbers are for use only within the country for which they are listed. Area codes are most often used to call long distance within your own country (not internationally)—in other words, when your call originates in the same country you are calling.

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

International Dialing Codes

Click a listed country to obtain the appropriate contact numbers.

Country (City)	International Access Code	Country Code	City Code
Australia (Sydney)	0011	61	2
Austria (Vienna)	900	43	1
Belgium (Brussels)	00	32	2
Brazil	0021	55	51
Brunei	—	673	—
Canada (North York, Ontario)	011	—	Not required
Chile (Santiago)	—	56	2
China (Xiamen)	—	86	592
Czech Republic (Prague)	00	420	2
Denmark (Horsholm)	00	45	Not required
Finland (Helsinki)	990	358	9
France (Paris) (Montpellier)	00	33	(1) (4)

Germany (Langen)	00	49	6103
Hong Kong	001	852	Not required
Ireland (Cherrywood)	16	353	1
Italy (Milan)	00	39	02
Japan (Kawasaki)	001	81	44
Korea (Seoul)	001	82	2
Luxembourg	00	352	—
Macau	—	853	Not required
Malaysia (Penang)	00	60	4
Mexico (Colonia Granada)	95	52	5
Netherlands (Amsterdam)	00	31	20
New Zealand	00	64	—
Norway (Lysaker)	00	47	Not required
Poland (Warsaw)	011	48	22
Portugal	00	35	—
Singapore (Singapore)	005	65	Not required
South Africa (Johannesburg)	09/091	27	11
Spain (Madrid)	00	34	91
Sweden (Upplands Vasby)	00	46	8
Switzerland (Geneva)	00	41	22
Taiwan	002	886	—
Thailand	001	66	—
U.K. (Bracknell)	010	44	1344
U.S.A. (Austin, Texas)	011	1	Not required

Americas Contact Numbers

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Brazil	Customer Support, Technical Support		toll free: 0800 90 3355
	Sales		toll free: 0800 90 3366
	Web site: **http://www.dell.com/br**		
Canada (North York, Ontario)	Automated Order-Status System		toll free: 1-800-433-9014
	AutoTech (Automated technical support)		toll free: 1-800-247-9362
	Customer Care (From outside Toronto)		toll free: 1-800-387-5759
	Customer Care (From within Toronto)	416	758-2400
	Customer Technical Support		toll free: 1-800-847-4096
	Sales (Direct Sales—from outside Toronto)		toll free: 1-800-387-5752
	Sales (Direct Sales—from within Toronto)	416	758-2200
	Sales (Federal government, education, and medical)		toll free: 1-800-567-7542
	Sales (Major Accounts)		toll free: 1-800-387-5755
	TechFax		toll free: 1-800-950-1329
Chile (Santiago) *NOTE: Customers in*	Sales, Customer Support, and Technical Support		toll free: 1230-020-4823

Chile call the U.S.A. for sales, customer, and technical assistance			
Latin America *NOTE: Customers in Latin America call the U.S.A. for sales, customer, and technical assistance.*	Customer Technical Support (Austin, Texas, U.S.A.)	512	728-4093
	Customer Service (Austin, Texas, U.S.A.)	512	728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512	728-3883
	Sales (Austin, Texas, U.S.A.)	512	728-4397
	SalesFax (Austin, Texas, U.S.A.)	512	728-4600 728-3772
Mexico *NOTE: Customers in Mexico call the U.S.A. for access to the Automated Order-Status System and AutoTech.*	Automated Order-Status System (Austin, Texas, U.S.A.)	512	728-0685
	AutoTech (Automated technical support) (Austin, Texas, U.S.A.)	512	728-0686
	Customer Technical Support	525	228-7870
	Sales	525	228-7811 toll free: 91-800-900-37 toll free: 91-800-904-49
	Customer Service	525	228-7878
	Main	525	228-7800
U.S.A. (Austin, Texas)	Automated Order-Status System		toll free: 1-800-433-9014
	AutoTech (for portable and desktop computers)		toll free: 1-800-247-9362
	Dell Home and Small Business Group (for portable and desktop computers):		
	Customer Technical Support (Return Material Authorization Numbers)		toll free: 1-800-624-9896
	Customer Technical Support (Home sales purchased via **http://www.dell.com**)		toll free: 1-877-576-3355
	Customer Service (Credit Return Authorization Numbers)		toll free: 1-800-624-9897
	National Accounts (systems purchased by established Dell national accounts [have your account number handy], medical institutions, or value-added resellers [VARs]):		
	Customer Service and Technical Support (Return Material Authorization Numbers)		toll free: 1-800-822-8965
	Public Americas International (systems purchased by governmental agencies [local, state, or federal] or educational institutions):		
	Customer Service and Technical Support (Return Material Authorization Numbers)		toll free: 1-800-234-1490
	Dell Sales		toll free: 1-800-289-3355 toll free: 1-800-879-3355
	Spare Parts Sales		toll free: 1-800-357-3355
	DellWare™		toll free: 1-800-753-7201
	Desktop and Portable Fee-Based Technical Support		toll free: 1-800-433-9005
	Server Fee-Based Technical Support		toll free: 1-800-967-0765
	Sales (Catalogs)		toll free: 1-800-426-5150
	Fax		toll free: 1-800-727-8320
	TechFax		toll free: 1-800-950-1329
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired		toll free: 1-877-DELLTTY (1-877-335-5889)
	Switchboard	512	338-4400

Europe Contact Numbers

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Austria (Vienna) *NOTE: Customers in Austria call Langen, Germany for Technical Support and Customer Care.*	Switchboard	01	491 040
	Home/Small Business Sales	01	795676-02
	Home/Small Business Sales Fax	01	795676-05
	Home/Small Business Customer Care	01	795676-03
	Preferred Accounts/Corporate Customer Care		0660-8056
	Home/Small Business Technical Support	01	795676-04
	Preferred Accounts/Corporate Technical Support		0660-8779
	Web site: **http://support.euro.dell.com**		
	E-mail: tech_support_central_europe@dell.com		
Belgium (Brussels)	Technical Support	02	481 92 88
	Customer Care	02	481 91 19
	Home/Small Business Sales		toll free: 0800 16884
	Corporate Sales	02	481 91 00
	Fax	02	481 92 99
	Switchboard	02	481 91 00
	Web site: **http://support.euro.dell.com**		
	E-mail: tech_be@dell.com		
Czech Republic (Prague)	Technical Support	02	22 83 27 27
	Customer Care	02	22 83 27 11
	Fax	02	22 83 27 14
	TechFax	02	22 83 27 28
	Switchboard	02	22 83 27 11
	Web site: **http://support.euro.dell.com**		
	E-mail: czech_dell@dell.com		
Denmark (Horsholm) *NOTE: Customers in Denmark call Sweden for fax technical support.*	Technical Support		45170182
	Relational Customer Care		45170184
	Home/Small Business Customer Care		32875505
	Switchboard		45170100
	Fax Technical Support (Upplands Vasby, Sweden)	46	859005594
	Fax Switchboard		45170117
	Web site: **http://support.euro.dell.com**		
	E-mail: den_support@dell.com		
	E-mail Support for Servers: Nordic_server_support@dell.com		
Finland (Helsinki)	Technical Support	09	253 313 60
	Technical Support Fax	09	253 313 81
	Relational Customer Care	09	253 313 38
	Home/Small Business Customer Care	09	693 791 94
	Fax	09	253 313 99
	Switchboard	09	253 313 00
	Web site: **http://support.euro.dell.com**		
	E-mail: fin_support@dell.com		
France	**Home and Small Business**		

(Paris/Montpellier)	Technical Support	0825	387 270
	Customer Care	0825	823 833
	Fax	0825	004 701
	Switchboard	0825	004 700
	Switchboard (Alternative)	04	99 75 40 00
	Sales	0825	004 700
	Web site: **http://support.euro.dell.com**		
	E-mail: web_fr_tech@dell.com		
	Corporate		
	Technical Support	0825	004 719
	Customer Care	0825	338 339
	Fax	01	55 94 71 01
	Switchboard	01	55 94 71 00
	Sales	01	55 94 71 00
	Web site: **http://support.euro.dell.com**		
	E-mail: web_fr_tech@dell.com		
Germany (Langen)	Technical Support	06103	766-7200
	Home/Small Business Customer Care		0180-5-224400
	Global Segment Customer Care	06103	766-9570
	Preferred Accounts Customer Care	06103	766-9420
	Large Accounts Customer Care	06103	766-9560
	Public Accounts Customer Care	06103	766-9555
	Switchboard	06103	766-7000
	Web site: **http://support.euro.dell.com**		
	E-mail: tech_support_central_europe@dell.com		
Ireland (Cherrywood)	Technical Support		0870 908 0800
	Home User Customer Care	01	204 4095
	Small Business Customer Care	01	204 4026
	Corporate Customer Care	01	204 4003
	Sales	01	286 0500
	SalesFax	01	204 0144
	Fax		0870 907 5590
	Switchboard	01	286 0500
	Web site: **http://support.euro.dell.com**		
	E-mail: dell_direct_support@dell.com		
Italy (Milan)	**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 11
	Web site: **http://support.euro.dell.com**		
	E-mail: web_it_tech@dell.com		
	Corporate		
	Technical Support	02	577 826 90
	Customer Care	02	577 825 55
	Fax	02	575 035 30
	Switchboard	02	577 821

	Web site: **http://support.euro.dell.com**		
	E-mail: web_it_tech@dell.com		
Luxembourg *NOTE: Customers in Luxembourg call Belgium for sales, customer, and technical assistance.*	Technical Support (Brussels, Belgium)	02	481 92 88
	Home/Small Business Sales (Brussels, Belgium)		toll free: 080016884
	Corporate Sales (Brussels, Belgium)	02	481 91 00
	Customer Care (Brussels, Belgium)	02	481 91 19
	Switchboard (Brussels, Belgium)	02	481 91 00
	Fax (Brussels, Belgium)	02	481 92 99
	Web site: **http://support.euro.dell.com**		
	E-mail: tech_be@dell.com		
Netherlands (Amsterdam)	Technical Support	020	581 8838
	Customer Care	020	581 8740
	Home/Small Business Sales		toll free: 0800-0663
	Home/Small Business Sales Fax	020	682 7171
	Corporate Sales	020	581 8818
	Corporate Sales Fax	020	686 8003
	Fax	020	686 8003
	Switchboard	020	581 8818
	Web site: **http://support.euro.dell.com**		
	E-mail: tech_nl@dell.com		
Norway (Lysaker) *NOTE: Customers in Norway call Sweden for fax technical support.*	Technical Support		671 16882
	Relational Customer Care		671 17514
	Home/Small Business Customer Care		231 62298
	Switchboard		671 16800
	Fax Technical Support (Upplands Vasby, Sweden)	00	08 590 05 594
	Fax Switchboard		671 16865
	Web site: **http://support.euro.dell.com**		
	E-mail: nor_support@dell.com		
	E-mail Support for Servers: Nordic_server_support@dell.com		
Poland (Warsaw)	Technical Support	22	57 95 700
	Customer Care	22	57 95 999
	Sales	22	57 95 999
	Switchboard	22	57 95 999
	Fax	22	57 95 998
	Web site: **http://support.euro.dell.com**		
	E-mail: pl_support@dell.com		
Portugal	Technical Support	35	800 834 077
	Customer Care		800 300 415 or 800 834 075
	Sales		800 300 410 or 800 300 411 or 800 300 412 or 351 214 220 710
	Switchboard	34	917 229 200
	Fax	35	121 424 01 12
	E-mail es_support@dell.com		
Spain	**Home and Small Business**		

(Madrid)	Technical Support		902 100 130
	Customer Care		902 118 540
	Switchboard		902 118 541
	Fax		902 118 539
	Web site: **http://support.euro.dell.com**		
	E-mail: web_esp_tech@dell.com		
	Corporate		
	Technical Support		902 100 130
	Customer Care		902 118 546
	Switchboard	91	722 92 00
	Fax	91	722 95 83
	Web site: **http://support.euro.dell.com**		
	E-mail: web_esp_tech@dell.com		
Sweden (Upplands Vasby)	Technical Support	08	590 05 199
	Relational Customer Care	08	590 05 642
	Home/Small Business Customer Care	08	587 70 527
	Fax Technical Support	08	590 05 594
	Sales	08	590 05 185
	Web site: **http://support.euro.dell.com**		
	E-mail: swe_support@dell.com E-mail Support for Latitude™ and Inspiron™: Swe-nbk_kats@dell.com E-mail Support for OptiPlex™ : Swe_kats@dell.com E-mail Support for Servers: Nordic_server_support@dell.com		
Switzerland (Geneva)	Technical Support (Home and Small Business)		0844 811 411
	Technical Support (Corporate)		0844 822 844
	Customer Care (Home and Small Business)		0848 802 202
	Customer Service (Corporate)		0848 821 721
	Switchboard	022	799 01 01
	Fax	022	799 01 90
	Web site: **http://support.euro.dell.com**		
	E-mail: swisstech@dell.com		
U.K. (Bracknell)	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870	908 0500
	Technical Support (Direct/PAD and General)	0870	908 0800
	Global Accounts Customer Care	01344	723186
	Corporate Customer Care	0870	908 0500
	Preferred Accounts (500-5000 employees) Customer Care	01344	723 196
	Central Government Customer Care	01344	723 193
	Local Government Customer Care	01344	723 194
	Home/Small Business Sales	0870	907 4000
	Home/Small Business Customer Care	0870	906 0010
	Corporate/Public Sector Sales	01344	860 456
	Web site: **http://support.euro.dell.com**		
	E-mail: dell_direct_support@dell.com		

Asia and Other Regions Contact Numbers

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Australia (Sydney)	Home and Small Business		1-300-65-55-33
	Government and Business		toll free: 1-800-633-559
	Preferred Accounts Division (PAD)		toll free: 1-800-060-889
	Customer Care		toll free: 1-800-819-339
	Corporate Sales		toll free: 1-800-808-385
	Transaction Sales		toll free: 1-800-808-312
	Fax		toll free: 1-800-818-341
Brunei *NOTE: Customers in Brunei call Malaysia for customer assistance.*	Customer Technical Support (Penang, Malaysia)		633 4966
	Customer Service (Penang, Malaysia)		633 4949
	Transaction Sales (Penang, Malaysia)		633 4955
China (Xiamen)	Technical Support		toll free: 800 858 2437
	Customer Experience		toll free: 800 858 2060
	Home and Small Business		toll free: 800 858 2222
	Preferred Accounts Division		toll free: 800 858 2062
	Large Corporate Accounts		toll free: 800 858 2999
Hong Kong *NOTE: Customers in Hong Kong call Malaysia for customer assistance.*	Technical Support		toll free: 800 96 4107
	Customer Service (Penang, Malaysia)		633 4949
	Transaction Sales		toll free: 800 96 4109
	Corporate Sales		toll free: 800 96 4108
Japan (Kawasaki)	Technical Support (Server)		toll free: 0120-1984-35
	Technical Support (Dimension™ and Inspiron)		toll free: 0120-1982-26
	Technical Support Outside of Japan (Dimension and Inspiron)	81-44	520-1435
	Technical Support (Dell Precision™, OptiPlex, and Latitude)	81-44	toll free: 0120-1984-33
	Technical Support Outside of Japan (Dell Precision, OptiPlex, and Latitude)		556-3894
	Customer Care	044	556-4240
	24-Hour Automated Order Status Service	044	556-3801
	Home and Small Business Group Sales	044	556-3344
	Individual User Sales	044	556-1760
	Business Sales Division (up to 400 employees)	044	556-1465
	Government, Educational, and Medical Sales	044	556-3345
	Preferred Accounts Division Sales (over 400 employees)	044	556-3433
	Dell Global Japan	044	556-3469
	Large Corporate Accounts Sales (over 3500 employees)	044	556-3430
	Faxbox Service	044	556-3490
	Switchboard	044	556-4300
	Web site: **http://support.jp.dell.com**		
Korea	Technical Support		toll free: 080-200-3800

(Seoul)	Sales		toll free: 080-200-3777
	Customer Service (Penang, Malaysia)		604-633-4949
	Customer Service (Seoul, Korea)		2194-6220
	Fax		2194-6202
	Switchboard		2194-6000
Macau *NOTE: Customers in Macau call Malaysia for customer assistance.*	Technical Support		toll free: 0800 582
	Customer Service (Penang, Malaysia)		633 4949
	Transaction Sales		toll free: 0800 581
Malaysia (Penang)	Technical Support		toll free: 1 800 888 298
	Customer Service	04	633 4949
	Transaction Sales		toll free: 1 800 888 202
	Corporate Sales		toll free: 1 800 888 213
New Zealand	Home and Small Business		0800 446 255
	Government and Business		0800 444 617
	Sales		0800 441 567
	Fax		0800 441 566
Singapore (Singapore) *NOTE: Customers in Singapore call Malaysia for customer assistance.*	Technical Support		toll free: 800 6011 051
	Customer Service (Penang, Malaysia)	04	633 4949
	Transaction Sales		toll free: 800 6011 054
	Corporate Sales		toll free: 800 6011 053
South Africa (Johannesburg)	Technical Support	011	709 7710
	Customer Care	011	709 7707
	Sales	011	709 7700
	Fax	011	706 0495
	Switchboard	011	709 7700
	Web site: **http://support.euro.dell.com**		
	E-mail: dell_za_support@dell.com		
Southeast Asian/Pacific Countries (excluding Australia, Brunei, China, Hong Kong, Japan, Korea, Macau, Malaysia, New Zealand, Singapore, Taiwan, and Thailand—refer to individual listings for these countries)	Customer Technical Support, Customer Service, and Sales (Penang, Malaysia)		60 4 633-4810
Taiwan	Technical Support		toll free: 0080 60 1225
	Technical Support (Servers)		toll free: 0080 60 1256
	Customer Service (Penang, Malaysia)		633 4949
	Transaction Sales		toll free: 0080 651 228/0800 33 556
	Corporate Sales		toll free: 0080 651 227/0800 33 555
Thailand *NOTE: Customers in Thailand call Malaysia for customer assistance.*	Technical Support		toll free: 088 006 007
	Customer Service (Penang, Malaysia)		633 4949
	Sales		toll free: 088 006 009

Diagnostics: Dell Precision™ WorkStation 420 System User's Guide

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Overview

If you experience a problem with your computer, run the Dell Diagnostics before you call Dell for technical assistance. The diagnostics tests check your computer's hardware without additional equipment and without the risk of destroying data. When the diagnostics tests complete without indicating problems, you can have confidence in your computer's operation. If the tests indicate a problem you cannot solve, the test error messages provide important information you need when talking to Dell's service and support personnel.

NOTICE: Only use the Dell Diagnostics to test your Dell computer system. Using this program with other computers may cause incorrect computer responses or result in error messages.

Features

The diagnostic test group features allow you to take the following actions:

- Perform quick checks or extensive tests on one or all devices
- Choose the number of times a test group or subtest is repeated
- Display or print test results or save them in a file
- Suspend testing if an error is detected or terminate testing when an adjustable error limit is reached
- Access online Help screens that describe the tests and tell how to run them
- Read status messages that inform you whether test groups or subtests completed successfully
- Receive error messages that appear if problems are detected

Before You Start Testing

- Read "Safety First—For You and Your Computer" and the safety instructions in your *System Information Guide*.
- Turn on your printer if one is attached, and make sure it is online.
- Enter system setup, confirm your computer's system configuration information, and enable all of its components and devices, such as ports.
- Perform the checks in "Basic Checks."

Starting the Dell Diagnostics

> NOTE: Dell recommends that you print these procedures before you begin. For additional information, refer to the "Dell Precision WorkStations ResourceCD User's Guide," located on the Dell ResourceCD.

1. Shut down and restart the computer.

2. Press <F2> at the start of the boot routine to access the **System Setup** screen.

3. Select the **Boot Sequence** option and press <Enter>.

   > NOTE: Record your current boot sequence in the event you want to restore it after running the Dell Diagnostics.
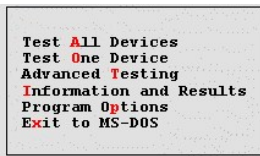
4. Select **CD/DVD/CD-RW Drive** as the first device in the boot sequence.

5. Insert the Dell *ResourceCD* into the CD-ROM drive.

6. Press <Alt><b> to exit system setup and save the change.

    The computer reboots and the Dell logo screen appears followed by a list of the available languages.

    > NOTE: If you are starting the ResourceCD for the first time on this computer, the **ResourceCD Installation** window opens to inform you that the ResourceCD is about to begin installation. Click **OK** to continue. To complete the installation, respond to the prompts offered by the installation program. If the **Welcome Dell System Owner** screen opens, click **Next** to continue.

7. Select the number for the language that you want.

    A numbered list of eight options appears.

8. Select **Option 2 – Dell Diagnostics** by typing `2` and pressing <Enter>. After the diagnostics load, the following **Diagnostics Main Menu** screen appears:

```
Test All Devices
Test One Device
Advanced Testing
Information and Results
Program Options
Exit to MS-DOS
```
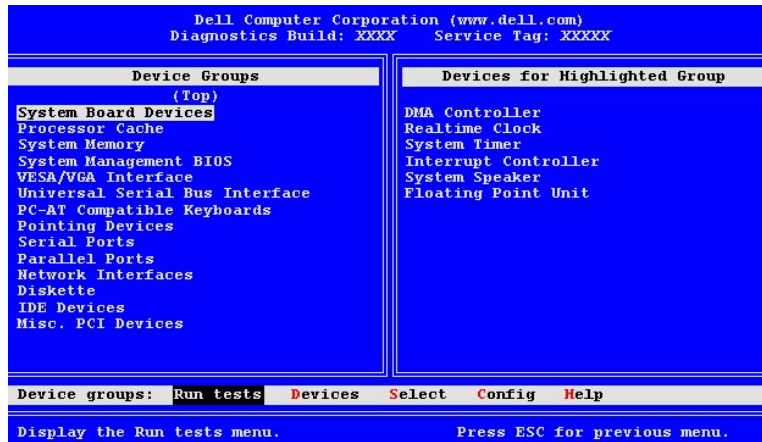
9. Select an option from the **Diagnostics Main Menu** screen by pressing the up- or down-arrow key to highlight the option and pressing <Enter>, or press the key that corresponds to the highlighted letter in the option title.

    ⌐ **Test All Devices** — Performs quick or extensive tests on all devices.

    ⌐ **Test One Device** — Performs quick or extensive tests on a single device after you select it from a list of device groups. After you select **Test One Device**, press <F1> for more information about a test.

    ⌐ **Advanced Testing** — Allows you to modify the parameters of a test, select a group of tests to perform, and access additional information about **Advanced Testing.**

    ⌐ **Information and Results** — Provides test results, test errors, version numbers of subtests, and additional information on the Dell Diagnostics.

    ⌐ **Program Options** — Allows you to change the settings of the Dell Diagnostics.

    ⌐ **Exit to MS-DOS** — Exits to the MS-DOS® prompt.

10. Select **Quick Tests** from the **Test All Devices** or **Test One Device** option to perform a quick check of your computer or a specific device.

    Quick Tests runs only the subtests that run fast and do not require user interaction. Dell recommends that you select **Quick Tests** first to increase your chance of locating the problem quickly.

11. Select **Extended Tests** from the **Test All Devices** or **Test One Device** option for a thorough check of your computer or to check a particular area of your computer.

12. Select the **Advanced Testing** option to customize your test(s).

13. Remove the *ResourceCD* from the CD-ROM drive when you have finished running the Dell Diagnostics.

> NOTE: To change the boot sequence, repeat steps 1 through 6, set the boot sequence to fit your needs, and restart your computer.

Advanced Testing

When you select **Advanced Testing** from the **Diagnostics Main Menu** screen, the following advanced testing screen appears.

```
              Dell Computer Corporation (www.dell.com)
            Diagnostics Build: XXXX   Service Tag: XXXXX

         Device Groups              Devices for Highlighted Group
              (Top)
   System Board Devices             DMA Controller
   Processor Cache                  Realtime Clock
   System Memory                    System Timer
   System Management BIOS           Interrupt Controller
   VESA/VGA Interface               System Speaker
   Universal Serial Bus Interface   Floating Point Unit
   PC-AT Compatible Keyboards
   Pointing Devices
   Serial Ports
   Parallel Ports
   Network Interfaces
   Diskette
   IDE Devices
   Misc. PCI Devices



   Device groups:  Run tests   Devices   Select   Config   Help

   Display the Run tests menu.           Press ESC for previous menu.
```

Information in the **Advanced Testing** screen is presented as follows:

- **Device Groups** — Lists the diagnostic test groups in the order they run if you select **All** from the **Run tests** menu option

  To select a test device group, press the up- or down-arrow key to highlight the group.

  📝 NOTE: The diagnostics may not list in the **Device Groups** area the names of all components or devices that are part of your computer system. For example, it may not list a printer even though it is connected to your computer. However, the parallel port to which the printer is connected appears in the **Device Groups** list. You can test your printer connection in the **Parallel Ports** tests.

- **Devices for Highlighted Group** — Lists the computer's current hardware

- **Device groups:** menu bar — Contains the options **Run tests**, **Devices**, **Select**, **Config**, and **Help**

  To select a menu option, press the left- or right-arrow key to highlight the option and press <Enter>, or press the key that corresponds to the highlighted letter in the category title.

For more information on using the **Advanced Testing** screen, select the **Help** menu option.

📝 NOTE: The options displayed on your screen should reflect the hardware configuration of your computer.

Advanced Testing Help Menu

The **Help** options and a description of their functions are presented in the following table.

Help Option	Description
Menu	Describes the **Advanced Testing** screen, the **Device Groups**, and the diagnostic menus and commands and gives instructions on how to use them
Keys	Explains the functions of all keystrokes that can be used in the Dell Diagnostics
Device Group	Describes the highlighted group in the **Device Groups** list on the main menu and provides reasons for using certain tests
Device	Describes the highlighted device in the **Device Groups** list on the **Advanced Testing** screen
Test	Describes the test procedure for each highlighted test group subtest
Versions	Lists the version numbers of the subtests

Installing Diskette, LS-120 SuperDisk, Tape, and CD-ROM Drives: Dell Precision™ WorkStation 420 Systems User's Guide

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Installing a Diskette, LS-120 SuperDisk, Tape, or CD-ROM Drive in a Mini Tower Chassis

To install a diskette, LS-120 SuperDisk, tape, or CD-ROM drive in the mini tower chassis, perform the following steps.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

📝 *NOTES: LS-120 SuperDisk drives are enhanced integrated drive electronics (EIDE) devices.*

Dell Precision WorkStation 420 systems equipped with LS-120 SuperDisk drives have the drive configured as the master device on the secondary EIDE channel. If you install an LS-120 SuperDisk drive in your system, Dell recommends that you configure the drive for this setting. For instructions on configuring the drive as the master device, see the documentation that accompanied the drive.

1. Unpack the drive and prepare it for installation.

   NOTICE: Ground yourself by touching an unpainted metal surface on the back of the computer.

   Check the documentation that accompanied the drive to verify that the drive is configured for your computer system. Change any settings necessary for your configuration.

2. If you are installing an EIDE drive, configure the drive for the Cable Select setting as described in the documentation that accompanied your drive.

3. Remove the computer cover as instructed in Removing the Computer Cover (Mini Tower Chassis)."

4. Remove the front bezel as instructed in "Removing and Replacing the Front Bezel (Mini Tower Chassis Only)."

5. Remove the drive bracket from the bay you want to use.

   Squeeze the metal tabs that extend from each side of the drive bracket toward each other, and pull the bracket out of the bay (see Figure 1).

   📝 *NOTE: For easier access inside the chassis, you may want to rotate the power supply out of the way temporarily. To do so, see "Rotating the Power Supply Away From the System Board (Mini Tower Chassis)."*

Figure 1. Removing a Drive From the Mini Tower Chassis
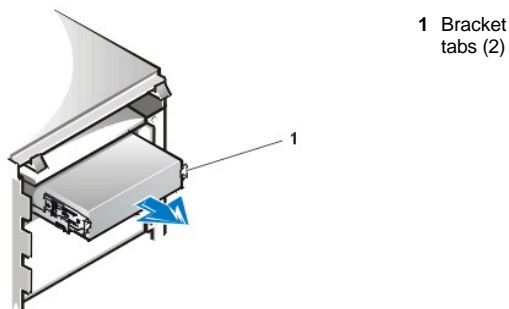

1 Bracket tabs (2)

If a drive is already installed in the bay and you are replacing it, disconnect the DC power cable and interface cable from the back of the drive before sliding the bracket out of the bay. To remove the old drive from the bracket, turn the drive/bracket assembly upside down and unscrew the four screws that secure the drive to the bracket (see Figure 2).

6. Attach the drive bracket to the new drive.

   Turn the drive upside down, and locate the four screw holes around its perimeter. Fit the bracket over the drive, and then tilt the front of the drive up so that the bracket drops down into place. To ensure proper installation, all screw holes should be aligned and the tabs on the front

of the bracket should be flush with the front of the drive (see Figure 2).

Figure 2. Attaching the Drive Bracket to the New Drive
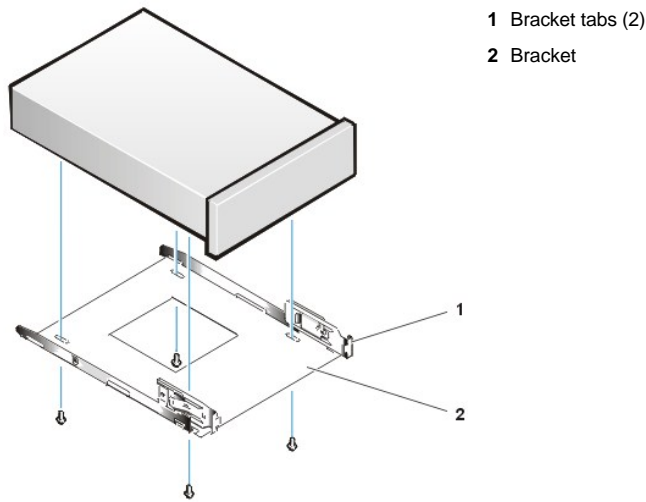
1 Bracket tabs (2)

2 Bracket

To further ensure proper positioning of the drive in the chassis, insert and tighten all four screws *in the order in which the holes are numbered* (the holes are marked "1" through "4").

7. Slide the new drive into the drive bay until the drive snaps securely into place (see Figure 3). Make sure that both bracket tabs snap into place in the drive bay.

**Figure 3. Inserting the New Drive Into the Drive Bay of the Mini Tower Chassis**

1 5.25-inch drive
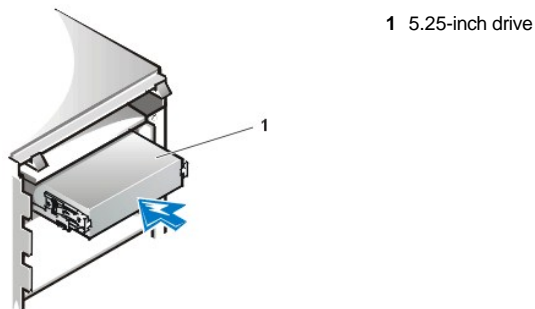
8. Connect a DC power cable to the power input connector on the back of the drive (see Figure 4)

9. Connect the appropriate interface cable to the interface connector on the back of the drive (see Figure 4).

If your system came with an EIDE CD-ROM or tape drive, use the spare connector on the existing interface cable. Otherwise, use the EIDE interface cable provided in the drive kit.

NOTICE: You must match the colored strip on the cable with pin 1 on the drive's interface connector to avoid possible damage to your system.

Figure 4. Attaching Diskette Drive or Tape Drive Cables in the Mini Tower Chassis
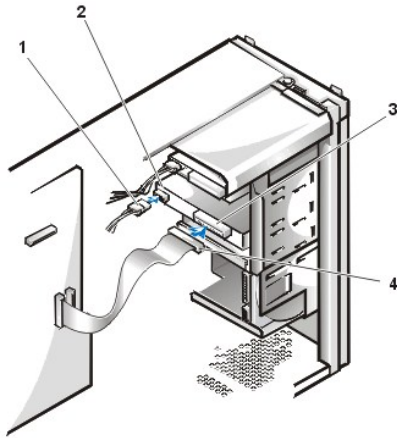
1 DC power cable
2 Power input connector
3 Interface connector
4 EIDE cable

10. For an EIDE device, connect the other end of the interface cable to the interface connector labeled "IDE2" on the system board.

    For a diskette drive, connect the cable from the drive to the interface connector labeled "FLOPPY" on the system board.

    Check all cable connections. Fold cables out of the way to provide airflow for the fan and cooling vents.

11. If the 5.25-inch drive bay was previously empty, remove the front-panel insert from the front bezel.

    Hold the bezel with the outside facing toward you and press each end of the insert with your thumbs until it snaps free of the bezel.

12. Replace the front bezel.

13. Replace the computer cover, reconnect your computer and peripherals to their power sources, and turn them on.

14. Update your system configuration information in System Setup.

    For a diskette drive, update **Diskette Drive A** or **Diskette Drive B** to reflect the size and capacity of your new diskette drive.

    For EIDE devices, set the appropriate **Secondary Drive 0** or **Secondary Drive 1** to **Auto**.

15. Verify that your system works correctly by running the Dell Diagnostics.

NOTE: Tape drives sold by Dell come with their own operating software and documentation. After you install a tape drive, refer to the documentation that came with the drive for instructions on installing and using the tape drive software.

Installing a Diskette, LS-120 SuperDisk, Tape, or CD-ROM Drive in a Desktop Chassis

To install a diskette, LS-120 SuperDisk, tape, or CD-ROM drive in the desktop chassis, perform the following steps.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

NOTES: LS-120 SuperDisk drives are EIDE devices.

Dell Precision WorkStation 420 systems equipped with LS-120 SuperDisk drives have the drive configured as the master device on the secondary EIDE channel. If you install an LS-120 SuperDisk drive in your system, Dell recommends that you configure the drive for this setting. For instructions on configuring the drive as the master device, see the documentation that accompanied the drive.

1. Unpack the drive and prepare it for installation.

    NOTICE: Ground yourself by touching an unpainted metal surface on the back of the computer.

    Check the documentation that accompanied the drive to verify that the drive is configured for your computer system. Change any settings necessary for your configuration.
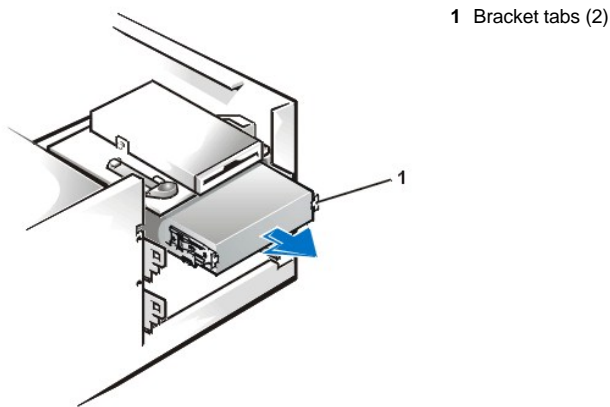
2. If you are installing an EIDE drive, configure the drive for the **Cable Select** setting as described in the documentation that accompanied your drive.

3. Remove the computer cover as instructed in "Removing the Computer Cover (Desktop Chassis)."

4. Remove the drive bracket from the bay you want to use.

Squeeze the metal tabs that extend from each side of the drive bracket toward each other, and pull the bracket out of the bay (see Figure 5).

Figure 5. Removing a Drive From the Desktop Chassis


1 Bracket tabs (2)

If a drive is already installed in the bay and you are replacing it, disconnect the DC power cable and interface cable from the back of the drive before sliding the bracket out of the bay. To remove the old drive from the bracket, turn the drive/bracket assembly upside down and unscrew the four screws that secure the drive to the bracket (see Figure 6).

5. Attach the drive bracket to the new drive.

    Turn the drive upside down, and locate the four screw holes around its perimeter. Fit the bracket over the drive, and then tilt the front of the drive up so that the bracket drops down into place. To ensure proper installation, all screw holes should be aligned and the tabs on the front of the bracket should be flush with the front of the drive (see Figure 6).

Figure 6. Attaching the Drive Bracket to the New Drive
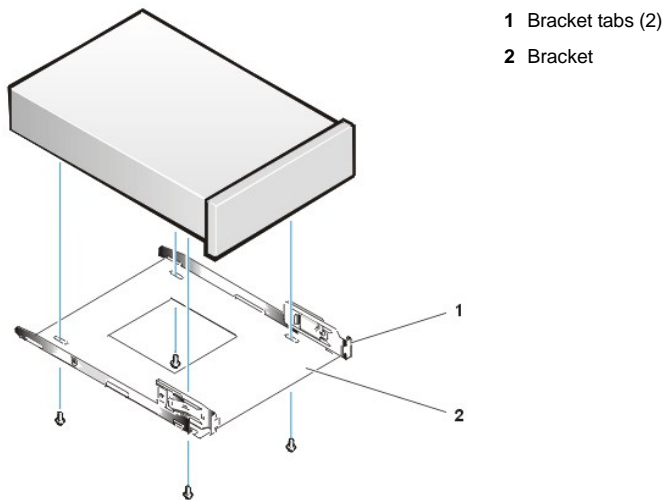

1 Bracket tabs (2)

2 Bracket

To further ensure proper positioning of the drive in the chassis, insert and tighten all four screws *in the order in which the holes are numbered* (the holes are marked "1" through "4").

6. Slide the new drive into the drive bay until the drive snaps securely into place (see Figure 7).

    Make sure that both bracket tabs snap into place in the drive bay.

Figure 7. Inserting the New Drive Into the Drive Bay of the Desktop Chassis

1 5.25-inch drive
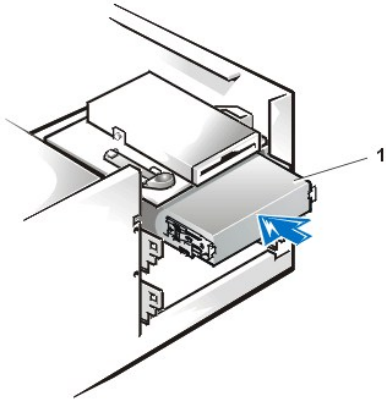
7. Connect a DC power cable to the power input connector on the back of the drive (see Figure 8).

8. Connect the appropriate interface cable to the interface connector on the back of the drive (see Figure 8).

   If your system came with an EIDE CD-ROM or tape drive, use the spare connector on the existing interface cable. Otherwise, use the EIDE interface cable provided in the drive kit.

   NOTICE: You must match the colored strip on the cable with pin 1 on the drive's interface connector to avoid possible damage to your system.

Figure 8. Attaching Diskette Drive or Tape Drive Cables in the Desktop Chassis
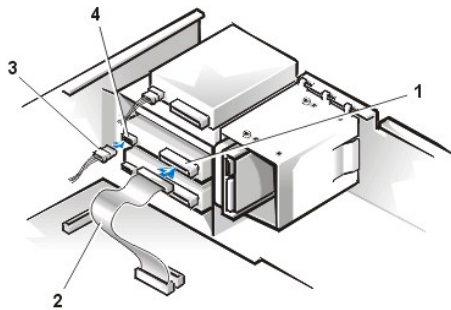
1 Interface connector
2 EIDE cable
3 DC power cable
4 Power input connector

9. For an EIDE device, connect the other end of the interface cable to the interface connector labeled "IDE2" on the system board.

   For a diskette drive, connect the cable from the drive to the interface connector labeled "FLOPPY" on the system board.

   Check all cable connections. Fold cables out of the way to provide airflow for the fan and cooling vents.

10. If the 5.25-inch drive bay was previously empty, remove the front-panel insert from the computer cover.

    Hold the cover with the inside facing toward you and press each end of the insert with your thumbs until it snaps free.

11. Replace the computer cover, reconnect your computer and peripherals to their power sources, and turn them on.

12. Update your system configuration information in System Setup.

    For a diskette drive, update **Diskette Drive A** or **Diskette Drive B** to reflect the size and capacity of your new diskette drive.

    For EIDE devices, set the appropriate **Secondary Drive 0** or **Secondary Drive 1** to **Auto**.

13. Verify that your system works correctly by running the Dell Diagnostics.

NOTE: Tape drives sold by Dell come with their own operating software and documentation. After you install a tape drive, refer to the documentation that came with the drive for instructions on installing and using the tape drive software.

External Components: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

This section provides troubleshooting procedures for equipment that connects directly to the input/output (I/O) panel of your computer, such as your monitor, keyboard, mouse, or printer. Before performing any of the procedures in this section, see "Checking Connections and Switches." Then perform the troubleshooting procedures for the equipment that is malfunctioning.

You need your *Dell Precision ResourceCD* to perform the procedures in this section.

Troubleshooting the Monitor

Troubleshooting video problems involves determining which of the following is the source of the problem:

  l Monitor or monitor interface cable

  l Video controller

The procedures in this section troubleshoot problems with the monitor and the monitor interface cable only.

If information on the monitor screen is displayed incorrectly or not at all, perform each of the following steps in the order indicated until the problem is resolved:

1. Turn on the system, including any attached peripherals.

2. Adjust the switches and controls as specified in the monitor's documentation to correct the video image, including the horizontal and vertical position and size.

3. If your monitor is equipped with a self-test function, run the monitor self-test (refer to your monitor manual to determine if your monitor has a self-test function).

4. Insert the *Dell Precision ResourceCD* in the CD-ROM drive, reboot the system, and run the **Video** test group in the Dell Diagnostics.

5. Turn off the system and disconnect it from the electrical outlet. Swap the monitor with one of the same type that is working, and reconnect the system to an electrical outlet.

6. Reboot the system and run the **Video** test group again.

   If the tests complete successfully, the original monitor was faulty. If the tests still fail, the video controller on the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting the Keyboard

This procedure determines what kind of keyboard problem you have. If a system error message indicates a keyboard problem when you start the computer system or if the keyboard does not operate as expected, perform the following steps in the order indicated until the problem is resolved:

1. If the keyboard or its cable shows signs of physical damage or if the keys do not work, replace the keyboard with a working keyboard.

2. Insert the *Dell Precision ResourceCD* in the CD-ROM drive, reboot the system, and run the **Keyboard** test group in the Dell Diagnostics.

3. If the **Keyboard Interactive Test** fails, replace the keyboard.

4. If the **Keyboard Controller Test** fails, the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting the Mouse

This procedure determines what kind of mouse problem you have. If a system error message indicates a mouse problem when you start the computer system or if the mouse does not operate as expected, perform the following steps in the order indicated until the problem is resolved:

1. Clean the mouse as instructed in your mouse documentation.

   Most mice have a ball that can be removed and cleaned of debris by turning the mouse upside down and removing a cover on the bottom of the mouse. Also remove any lint or other debris that has accumulated on the bottom of the mouse.

2. If the mouse or its cable shows signs of physical damage or if the buttons do not work, replace the mouse with a working mouse.

3. Insert the *Dell Precision ResourceCD* in the CD-ROM drive, reboot the system, and run the **Mouse Test** in the Dell Diagnostics.

4. If the **Mouse Test** fails, the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting I/O Ports

This section provides a procedure for troubleshooting the ports on your computer's I/O panel and the equipment connected to them, such as a printer, scanner, or other peripheral device.

You can also use this procedure to test I/O ports on expansion cards. However, you should first make sure that the card is configured and installed correctly.

If a system error message indicates a port problem or if equipment connected to a port seems to perform incorrectly or not at all, the source of the problem may be any of the following:

   l A faulty connection between the I/O port and the peripheral device

   l A faulty cable between the I/O port and the peripheral device

   l A faulty peripheral device

   l Incorrect settings in System Setup

   l Incorrect settings in the system's configuration files

   l Faulty I/O port logic on the system board

   *NOTE: With certain modems installed, the **Serial Port** test group subtests may fail because the modem appears to the diagnostics as a serial port, but it cannot be tested as a serial port. If you have a modem installed and you experience a serial port test failure, remove the modem and run the diagnostic tests again.*

Troubleshooting Basic I/O Functions

If a system error message indicates an I/O port problem or the device connected to the port does not function properly, follow these steps in the order indicated until the problem is resolved:

1. Enter System Setup and verify that the settings for the **Serial Port 1, Serial Port 2**, and **Parallel Port** options are set to **Auto**.

2. Insert the *Dell Precision ResourceCD* in the CD-ROM drive, reboot the system, and run the **Serial/Infrared Ports** test group and/or the **Parallel Ports** test group in the Dell Diagnostics.

If any of the tests fail, the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

If the problem persists, go to "Troubleshooting a Parallel Printer" or "Troubleshooting a Serial I/O Device," depending on which device appears to be malfunctioning.

Troubleshooting a Parallel Printer

If the information in "Troubleshooting Basic I/O Functions" indicates that the problem is with a parallel printer, perform the following steps in the order indicated until the problem is resolved:

1. Reinstall the printer device driver.

   See the documentation for the printer and for your operating system for instructions on reinstalling the printer driver.

2. Turn off the parallel printer and computer, replace the parallel printer interface cable with a known working cable, and turn on the parallel printer and computer.

   If the problem is resolved, the original printer cable was faulty.

3. Run the parallel printer's self-test.

   If the test fails, the printer is faulty.

If the problem still is not resolved, the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting a Serial I/O Device

If the information in "Troubleshooting Basic I/O Functions" indicates that the problem is with a device connected to one of the serial ports, perform the following steps in the order indicated until the problem is resolved:

1. Attach the serial device to the other serial port (for example, if it is currently connected to serial port 1, attach the device to serial port 2).

   If the problem is resolved, the serial port on the system board is faulty. See "Getting Help" for instructions on obtaining technical assistance.

2. If the faulty device has a detachable serial cable, replace the serial cable.

   If the problem is resolved, the serial cable was faulty.

3. Replace the faulty serial device.

If the problem is still not resolved, the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

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- Contacting Dell

Glossary: Dell Precision™ WorkStation 420 Systems User's Guide

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A

A

ampere(s)

AC

alternating current

ACPI

Advanced Configuration and Power Interface. ACPI enables operating-system-directed power management rather than system BIOS-directed power management. In addition, it provides a generic system event mechanism for Plug and Play and an interface for configuration control.

adapter card

An expansion card that plugs into an expansion-card connector on the computer's system board. An adapter card adds some specialized function to the computer by providing an interface between the expansion bus and a peripheral device. Examples of adapter cards include network cards and sound cards.

ADI

Autodesk Device Interface

AGP

accelerated graphics port. AGP is a dedicated graphics port that provides a faster interface between the video subsystem and system memory than a PCI graphics device and allows conventional memory to be used for video-related tasks. The improved interface enables AGP to deliver a smooth, true-color video image.

application program

Software, such as a spreadsheet or word processor, designed to help you perform a specific task or series of tasks. Application programs run from the operating system.

ASCII

American Standard Code for Information Interchange. A text file containing only characters from the ASCII character set (usually created with a text editor, such as Notepad in the Microsoft® Windows® operating system) is called an ASCII file.

ASIC

application-specific integrated circuit

asset tag code

An individual code assigned to a computer, usually by a system administrator, for security or tracking purposes.

attribute

As it relates to DMI, an attribute is a piece of information related to a component. Attributes can be combined to form groups. If an attribute is defined as read-write, it may be defined by a management application.

***autoexec.bat** file*

The **autoexec.bat** file (Windows 95 and MS-DOS only) is executed when you boot your computer (after executing any commands in the **config.sys** file). That start-up file contains commands that define the characteristics of each device connected to your computer, and it finds and executes programs stored in locations other than the active directory.

B

backup

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

backup battery

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

base memory

Synonym for [conventional memory](#).

batch file

An ASCII text file containing a list of commands that run in sequence. Instead of typing each command, you need only type the batch filename. The system executes the commands as if you had typed each one individually. Batch files must have a filename extension of **bat**.

baud rate

A measurement of data transmission speed. For example, modems are designed to transmit data at one or more specified baud rate(s) through the COM (serial) port of a computer.

BBS

bulletin board service. A computer system that serves as a central location for accessing data or relaying messages by modem. For example, the Dell™ TechConnect BBS contains the latest version of software such as video drivers. If your system has a modem, you can access the BBS and download the most recent version of this software.

beep code

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

binary

A base-2 numbering system that uses 0 and 1 to represent information. The computer performs operations based on the ordering and calculation of these numbers.

BIOS

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

- Communications between the microprocessor and peripheral devices, such as the keyboard and the video adapter

- Miscellaneous functions, such as system messages

bit

The smallest unit of information interpreted by your computer.

boot routine

When you start your computer, it clears all memory, initializes devices, and loads the operating system. Unless the operating system fails to respond, you can reboot (also called *warm boot*) your computer by pressing <Ctrl><Alt><Del>; otherwise, you must perform a cold boot by pressing the reset button or by turning the computer off and then back on.

bootable diskette

A diskette that can boot your computer to the operating system in the event that the computer will not boot from the hard-disk drive.

bpi

bits per inch

bps

bits per second

BTU

British thermal unit

bus

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

byte

Eight contiguous bits of information; the basic data unit used by your computer.

C

C

Celsius

C-RIMM

continuity Rambus inline memory module. Rambus continuity modules are used to populate empty RIMM slots in some systems.

cache

To facilitate quicker data retrieval, a storage area for keeping a copy of data or instructions. For example, your computer's BIOS may cache ROM code in faster RAM. Or a disk-cache utility may reserve RAM in which to store frequently accessed information from your computer's disk drives; when a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

card-edge connector

On the bottom of an expansion card, the metal-contact section that plugs into an expansion-card connector.

CD-ROM

compact disc read-only memory. CD-ROM drives use optical technology to read data from compact discs. Compact discs are read-only storage devices; you cannot write new data to a compact disc with standard CD-ROM drives.

cm

centimeter(s)

CMOS

complementary metal-oxide semiconductor. In computers, CMOS memory chips are often used for NVRAM storage.

COMn

The device names for the first through fourth serial ports on your computer are COM1, COM2, COM3, and COM4. The default interrupt for COM1 and COM3 is IRQ4, and the default interrupt for COM2 and COM4 is IRQ3. Therefore, you must be careful when you configure software that runs a serial device so that you do not create an interrupt conflict.

component

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

config.sys *file*

The **config.sys** file (Windows 95 and MS-DOS only) is executed when you boot your computer (before running any commands in the **autoexec.bat** file). This start-up file contains commands that specify which devices to install and which drivers to use. This file also contains commands that determine how the operating system uses memory and controls files.

controller

A chip that controls the transfer of data between the microprocessor and memory or between the microprocessor and a peripheral device such as a disk drive or the keyboard.

control panel

The part of the computer that contains indicators and controls, such as the power switch, hard-disk drive access indicator, and power indicator.

conventional memory

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

coprocessor

A chip that relieves the computer's microprocessor of specific processing tasks. A math coprocessor, for example, handles numeric processing. A graphics coprocessor handles video rendering. The Intel® Pentium® microprocessor, for example, includes an integrated math coprocessor.

cpi

characters per inch

CPU

central processing unit. See also [microprocessor](#).

cursor

A marker, such as a block, an underscore, or a pointer, that represents the position at which the next keyboard or mouse action will occur.

D

DAT

digital audio tape

dB

decibel(s)

dBA

adjusted decibel(s)

DC

direct current

Dell Diagnostics

A comprehensive set of diagnostic tests for your Dell computer. To use the diagnostics, you must boot your computer from the *Dell Diagnostics Diskette*. See your *Diagnostics and Troubleshooting Guide* for more information about using the Dell Diagnostics.

Dell Inspector

A DMI browser that allows you to view your computer system's current hardware configuration and operating system version. If your system includes Dell-installed software, you can select this program from the **Dell Accessories** program folder.

device driver

A program that allows the operating system or some other program to interface correctly with a peripheral device, such as a printer. Most device drivers are installed when the operating system is installed.

DIMM

dual in-line memory module

DIN

Deutsche Industrie Norm

DIP

dual in-line package. A circuit board, such as a system board or expansion card, may contain DIP switches for configuring the circuit board. DIP switches are always toggle switches, with an ON position and an OFF position.

directory

Directories help keep related files organized on a disk in a hierarchical, "inverted tree" structure. Each disk has a "root" directory; for example, a C:\> prompt normally indicates that you are at the root directory of hard-disk drive C. Additional directories that branch off of the root directory are called subdirectories. Subdirectories may contain additional directories branching off of them.

display adapter

See [video adapter](#).

DMA

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

DMI

Desktop Management Interface. DMI enables the management of your computer system's software and hardware. DMI collects information about the system's components, such as the operating system, memory, peripheral devices, expansion cards, and asset tag. Information about the system's components is displayed as a MIF file or through the Dell Inspector program.

DMTF

Desktop Management Task Force. A consortium of companies representing hardware and software providers, of which Dell Computer Corporation is a member.

dpi

dots per inch

DPMS

Display Power Management Signaling. A standard developed by the Video Electronics Standards Association (VESA) that defines the hardware signals sent by a video controller to activate power management states in a monitor. A monitor is said to be DPMS-compliant when it is designed to enter a power management state after receiving the appropriate signal from a computer's video controller.

DRAM

dynamic random-access memory. A computer's RAM is usually made up entirely of DRAM chips. Because DRAM chips cannot store an electrical charge indefinitely, your computer continually refreshes each DRAM chip in the computer.

drive-type number

Your computer can recognize a number of specific hard-disk drives. Each is assigned a drive-type number that is stored in NVRAM. The hard-disk drive(s) specified in your computer's System Setup program must match the actual drive(s) installed in the computer. The System Setup program also allows you to specify physical parameters (logical cylinders, logical heads, cylinder number, and logical sectors per pack) for drives not included in the table of drive types stored in NVRAM.

DSP

digital signal processing

DTE

data terminal equipment. Any device, such as a computer system, that can send data in digital form by means of a cable or communications line. The DTE is connected to the cable or communications line through a data communications equipment (DCE) device such as a modem.

E

ECC

error checking and correction

ECP

Extended Capabilities Port

EEPROM

electrically erasable programmable read-only memory

EIDE

enhanced integrated drive electronics. EIDE devices add one or more of the following enhancements to the traditional IDE standard:

- Data transfer rates of up to 16 MB/sec

- Support for drives other than just hard-disk drives, such as CD-ROM and tape drives

- Support for hard-disk drives with capacities greater than 528 MB

- Support for up to two controllers, each with up to two devices attached

EISA

Extended Industry-Standard Architecture, a 32-bit expansion-bus design. The expansion-card connectors in an EISA computer are also compatible with 8- or 16-bit ISA expansion cards.

To avoid a configuration conflict when installing an EISA expansion card, you must use the EISA Configuration Utility. This utility allows you to specify which expansion slot contains the card and obtains information about the card's required system resources from a corresponding EISA configuration file.

EMC

Electromagnetic Compatibility

EMI

electromagnetic interference

EMM

expanded memory manager. A utility that uses extended memory to emulate expanded memory on computers with an Intel386™ or higher microprocessor.

EMS

Expanded Memory Specification

EPROM

erasable programmable read-only memory

ESD

electrostatic discharge

expanded memory

A technique for accessing RAM above 1 MB. To enable expanded memory on your computer, you must use an EMM. You should configure your system to support expanded memory only if you run application programs that can use (or require) expanded memory.

expansion bus

Your computer contains an expansion bus that allows the microprocessor to communicate with controllers for peripheral devices, such as a network card or an internal modem.

expansion-card connector

A connector on the computer's system board or riser board for plugging in an expansion card.

extended memory

RAM above 1 MB. Most software that can use it, such as the Windows operating system, requires that extended memory be under the control of an XMM.

external cache memory

A RAM cache using SRAM chips. Because SRAM chips operate at several times the speed of DRAM chips, the microprocessor can retrieve data and instructions faster from external cache memory than from RAM.

F

F

Fahrenheit

FAT

file allocation table. The file system structure used by MS-DOS to organize and keep track of file storage. The Microsoft Windows NT and OS/2 operating systems can optionally use a FAT file system structure.

FCC

Federal Communications Commission

flash memory

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

format

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

ft

foot/feet

FTP

File Transfer Protocol

G

g

gram(s)

G

gravities

GB

gigabyte(s). A gigabyte equals 1,024 megabytes or 1,073,741,824 bytes.

graphics coprocessor

See [coprocessor](#).

graphics mode

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

group

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

GUI

graphical user interface

H

h

hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the computer's RAM and I/O memory addresses for devices. The sequence of decimal numbers from 0 through 16, for example, is expressed in hexadecimal notation as: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10. In text, hexadecimal numbers are often followed by *h*.

heat sink

A metal plate with metal pegs or ribs that help dissipate heat. Most microprocessors include a heat sink.

HMA

high memory area. The first 64 KB of extended memory above 1 MB. A memory manager that conforms to the XMS can make the HMA a direct extension of conventional memory. See also [upper memory area](#) and [XMM](#).

host adapter

A host adapter implements communication between the computer's bus and the controller for a peripheral device. (Hard-disk drive controller subsystems include integrated host adapter circuitry.)

HPFS

High Performance File System. A method of formatting and orgainizing data on a hard-disk drive.

Hz

hertz

I

ICES

Interface-Causing Equipment Standard (in Canada)

ICU

ISA Configuration Utility

I/O

input/output. The keyboard is an input device and a printer is an output device. In general, I/O activity can be differentiated from computational activity. For example, when a program sends a document to the printer, it is engaging in output activity; when the program sorts a list of terms, it is engaging in computational activity.

ID

identification

interlacing

A technique for increasing video resolution by only updating alternate horizontal lines on the screen. Because interlacing can result in noticeable screen flicker, most users prefer noninterlaced video adapter resolutions.

internal microprocessor cache

An instruction and data cache built into the microprocessor. The Intel Pentium microprocessor, for example, includes a 16-KB internal cache, which is set up as an 8-KB read-only instruction cache and an 8-KB read/write data cache.

IPX

Internetwork Packet eXchange

IPX/SPX

Internetwork Packet eXchange/Sequenced Packet eXchange

IRQ

interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the microprocessor. Each peripheral connection must be assigned an IRQ number. For example, the first serial port in your computer (COM1) is assigned to IRQ4 by default. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

ISA

Industry-Standard Architecture. A 16-bit expansion bus design. The expansion-card connectors in an ISA computer are also compatible with 8-bit ISA expansion cards.

ITE

information technology equipment

J

jumper

Jumpers are small blocks on a circuit board with two or more pins emerging from them. Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit. Jumpers provide a simple and reversible method of changing the circuitry in a printed circuit board.

K

K

kilo-, indicating 1,000.

KB

kilobyte(s), 1,024 bytes.

KB/sec

kilobyte(s) per second

Kbit(s)

kilobit(s), 1,024 bits.

Kbps

kilobit(s) per second

key combination

A command requiring that you press multiple keys at the same time. For example, you can reboot your computer by pressing the <Ctrl><Alt><Del> key combination.

kg

kilogram(s), 1,000 grams.

kHz

kilohertz, 1,000 hertz.

L

LAN

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

lb

pound(s)

LED

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

local bus

On a computer with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. Some local-bus designs allow peripherals to run at the same speed and with the same-width data path as the computer's microprocessor.

LPTn

The device names for the first through third parallel printer ports on your computer are LPT1, LPT2, and LPT3.

M

m

meter(s)

mA

milliampere(s)

mAh

milliampere-hour(s)

math coprocessor

See [coprocessor](#).

Mb

megabit(s)

MB

megabyte(s). The term *megabyte* means 1,048,576 bytes; however, when referring to hard-disk drive storage, the term is often rounded to mean 1,000,000 bytes.

MB/sec

megabytes per second

MBA

Managed PC Boot Agent. MBA is a package of multiprotocol preboot firmware and software tools that enables the network administrator to remotely administer software, operating systems, and applications over the network.

Mbps

megabits per second

MBR

master boot record

memory

A 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; for example, an unqualified statement such as "a computer with 16 MB of memory" refers to a computer with 16 MB of RAM.

memory address

A specific location, usually expressed as a hexadecimal number, in the computer's RAM.

memory manager

A utility that controls the implementation of memory in addition to conventional memory, such as extended or expanded memory.

memory module

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

MHz

megahertz

microprocessor

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

MIDI

musical instrument digital interface

MIF

management information format. A MIF file contains information, status, and links to component instrumentation. MIF files are installed into the MIF database by the DMI service layer. The content of a MIF is defined by a DTMF working committee and is published in the form of a MIF definition document. This document identifies the groups and attributes that are relevant to DMI-manageable components.

mm

millimeter(s)

modem

A device that allows your computer to communicate with other computers over telephone lines.

mouse

A pointing device that controls the movement of the cursor on a screen. Mouse-aware software allows you to activate commands by clicking a mouse button while pointing at objects displayed on the screen.

MPEG

Motion Picture Experts Group. MPEG is a digital video file format.

ms

millisecond(s)

MS-DOS®

Microsoft Disk Operating System

MTBF

mean time between failures

multifrequency monitor

A monitor that supports several video standards. A multifrequency monitor can adjust to the frequency range of the signal from a variety of video adapters.

mV

millivolt(s)

N

NDIS

Network Driver Interface Specification

NIC

network interface controller

NLM

NetWare® Loadable Module

NMI

nonmaskable interrupt. A device sends an NMI to signal the microprocessor about hardware errors, such as a parity error.

noninterlaced

A technique for decreasing screen flicker by sequentially refreshing each horizontal line on the screen.

ns

nanosecond(s), one billionth of a second.

NTFS

NT File System. An option in the Windows NT operating system.

NVRAM

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

O

OS/2®

Operating System/2

OTP

one-time programmable

P

parallel port

An I/O port used most often to connect a parallel printer to your computer. You can usually identify a parallel port on your computer by its 25-hole connector.

parameter

A value or option that you specify to a program. A parameter is sometimes called a *switch* or an *argument*.

partition

You can divide a hard-disk drive into multiple physical sections called *partitions* with the **fdisk** command. Each partition can contain multiple logical drives.

After partitioning the hard-disk drive, you must format each logical drive with the **format** command.

PCI

Peripheral Component Interconnect. A standard for local-bus implementation developed by Intel Corporation.

peripheral device

An internal or external device—such as a printer, a disk drive, or a keyboard—connected to a computer.

PGA

pin grid array. A type of microprocessor socket that allows you to remove the microprocessor chip.

pixel

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

Plug and Play

An industry-standard specification that makes it easier to add hardware devices to personal computers. Plug and Play provides automatic installation and configuration, compatibility with existing hardware, and dynamic support of mobile computing environments.

POST

power-on self-test. Before the operating system loads when you turn on your computer, the POST tests various system components such as RAM, the disk drives, and the keyboard.

ppm

pages per minute

PQFP

plastic quad flat pack. A type of microprocessor socket in which the microprocessor chip is permanently mounted.

Program Diskette Maker

The Program Diskette Maker allows you to create program diskette sets, or master copies, of software that Dell installed on your computer system. It is essential that you create these diskette sets as soon as possible. You may need a set of master diskettes if you ever experience problems with your hard-disk drive and need to reinstall your Dell-installed software. If your system includes Dell-installed software, you can select this program from the **Dell Accessories** program folder.

program diskette set

The set of diskettes from which you can perform a complete installation of an operating system or application program. When you reconfigure a program, you often need its program diskette set.

protected mode

An operating mode supported by 80286 or higher microprocessors, protected mode allows operating systems to implement:

  l A memory address space of 16 MB (80286 microprocessor) to 4 GB (Intel386 or higher microprocessor)

  l Multitasking

  l Virtual memory, a method for increasing addressable memory by using the hard-disk drive

The Windows NT, OS/2, and UNIX® 32-bit operating systems run in protected mode. MS-DOS cannot run in protected mode; however, some programs that you can start from MS-DOS, such as the Windows operating system, are able to put the computer into protected mode.

PS/2

Personal System/2

R

RAID

redundant arrays of independent disks

RAM

random-access memory. The computer's primary temporary storage area for program instructions and data. Each location in RAM is identified by a number called a *memory address*. Any information stored in RAM is lost when you turn off your computer.

RAMDAC

random-access memory digital-to-analog converter

RDRAM

Rambus dynamic random-access memory

read-only file

A read-only file is one that you are prohibited from editing or deleting. A file can have read-only status if:

- Its read-only attribute is enabled.

- It resides on a physically write-protected diskette or on a diskette in a write-protected drive.

- It is located on a network in a directory to which the system administrator has assigned read-only rights to you.

readme file

A text file included with a software package or hardware product that contains information supplementing or updating the documentation for the software or hardware. Typically, readme files provide installation information, describe new product enhancements or corrections that have not yet been documented, and list known problems or other things you need to be aware of as you use the software or hardware.

real mode

An operating mode supported by 80286 or higher microprocessors, real mode imitates the architecture of an 8086 microprocessor.

refresh rate

The rate at which the monitor redraws the video image on the monitor screen. More precisely, the refresh rate is the frequency, measured in Hz, at which the 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. The higher refresh rates are also noninterlaced.

RIMM

Rambus inline memory module

RFI

radio frequency interference

RGB

red/green/blue

ROM

read-only memory. Your computer contains some programs essential to its operation in ROM code. Unlike RAM, a ROM chip retains its contents even after you turn off your computer. Examples of code in ROM include the program that initiates your computer's boot routine and the POST.

rpm

revolutions per minute

RTC

real-time clock. Battery-powered clock circuitry inside the computer that keeps the date and time after you turn off the computer.

S

SDRAM

synchronous dynamic random-access memory. SDRAM is a memory technology that improves the performance of your system's memory subsystem by reducing the need for wait states. SDRAM devices have a synchronous interface to the devices to which they are connected and are governed by the system clock. These features reduce the need for wait states often required for conventional memory devices to ensure that timing signals have been set up correctly.

In equivalent configurations, a computer with SDRAM will have faster memory performance than a computer with EDO memory.

sec

second(s)

SEC

single-edge contact. Newer Intel processors, such as the Pentium II processor, use this type of connector as an interface between the processor and the system board.

serial port

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

service tag number

A bar code label on the computer that identifies it when you call Dell for customer or technical support.

shadowing

A computer's system and video BIOS code is usually stored on ROM chips. Shadowing refers to the performance-enhancement technique that copies BIOS code to faster RAM chips in the upper memory area (above 640 KB) during the boot routine.

SIMD

single instruction, multiple data

SIMM

single in-line memory module. A small circuit board containing DRAM chips that connects to the system board.

SMART

Self-Monitoring Analysis and Reporting Technology. A technology that allows hard-disk drives to report errors and failures to the system BIOS, which then displays an error message on the screen. To take advantage of this technology, you must have a SMART-compliant hard-disk drive and the proper support in the system BIOS.

SNMP

Simple Network Management Protocol. SNMP is an industry-standard interface that allows a network manager to remotely monitor and manage workstations.

SRAM

static random-access memory. Because SRAM chips do not require continual refreshing, they are substantially faster than DRAM chips.

SRS

sound retrieval system

SVGA

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

To display a program at a specific resolution, you must install the appropriate video drivers and your monitor must support the resolution. Similarly, the number of colors that a program can display depends on the capabilities of the monitor, the video driver, and the amount of video memory installed in the computer.

switch

On a computer system board, switches control various circuits or functions in your computer system. These switches are know as *DIP switches*; they are normally packaged in groups of two or more switches in a plastic case. Two common DIP switches are used on system boards: *slide* switches and *rocker* switches. The names of the switches are based on how the settings (on and off) of the switches are changed.

syntax

The rules that dictate how you must type a command or instruction so that the computer understands it.

system board

As the main circuit board, the system board usually contains most of your computer's integral components, such as:

- Microprocessor
- RAM
- Controllers for standard peripheral devices, such as the keyboard
- Various ROM chips

Frequently used synonyms for system board are *motherboard* and *logic board*.

system configuration information

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

system diskette

Synonym for bootable diskette.

system memory

Synonym for RAM.

System Setup program

A BIOS-based program that allows you to configure your computer's hardware and customize the computer's operation by setting such features as password protection and energy management. Some options in the System Setup program require that you reboot the computer (or the computer may reboot automatically) to effect a hardware-configuration change. Because the System Setup program is stored in NVRAM, any settings remain in effect until you change them again.

system.ini *file*

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

Revising the **Control Panel** settings or running the Windows Setup program may change options in the **system.ini** file. On other occasions, you may need to change or add options to the **system.ini** file manually with a text editor, such as Notepad.

T

termination

Some devices must be terminated to prevent reflections and spurious signals in the cable. When such devices are connected in a series, you may need to enable or disable the termination on these devices by changing jumper or switch settings in the configuration software for the devices.

text editor

An application program for editing text files consisting exclusively of ASCII characters. Windows Notepad is a text editor, for example. Most word processors use proprietary file formats containing binary characters, although some can read and write text files.

text mode

A video mode that can be defined as *x* columns by *y* rows of characters.

time-out

A specified period of system inactivity that must occur before an energy conservation feature is activated.

tpi

tracks per inch

TSR

terminate-and-stay-resident. A TSR program runs "in the background." Most TSR programs implement a predefined key combination (sometimes referred to as a *hot key*) that allows you to activate the TSR program's interface while running another program. When you finish using the TSR program, you can return to the other application program and leave the TSR program resident in memory for later use.

TSR programs can sometimes cause memory conflicts. When troubleshooting, rule out the possibility of such a conflict by rebooting your computer

without starting any TSR programs.

U

UL

Underwriters Laboratories

UMB

upper memory blocks.

upper memory area

The 384 KB of RAM located between 640 KB and 1 MB. If the computer has an Intel386 or higher microprocessor, a utility called a *memory manager* can create UMBs in the upper memory area, in which you can load device drivers and memory-resident programs.

UPS

uninterruptible power supply. A battery-powered unit that automatically supplies power to your computer in the event of an electrical failure.

USB

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

utility

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

UTP

unshielded twisted pair

V

V

volt(s)

VAC

volt(s) alternating current

VCCI

Voluntary Control Council for Interference

VCR

videocassette recorder

VDC

volt(s) direct current

VESA

Video Electronics Standards Association

VGA

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

To display a program at a specific resolution, you must install the appropriate video drivers and your monitor must support the resolution. Similarly, the number of colors that a program can display depends on the capabilities of the monitor, the video driver, and the amount of memory installed for the video adapter.

VGA feature connector

On some systems with an integrated VGA video adapter, a VGA feature connector allows you to add an enhancement adapter, such as a video

accelerator, to your computer. A VGA feature connector can also be called a *VGA pass-through connector.*

video adapter

The logical circuitry that provides—in combination with the monitor—your computer's video capabilities. A video adapter may support more or fewer features than a specific monitor offers. Typically, a video adapter comes with video drivers for displaying popular application programs and operating systems in a variety of video modes.

On some Dell computers, a video adapter is integrated into the system board. Also available are many video adapter cards that plug into an expansion-card connector.

Video adapters often include memory separate from RAM on the system board. The amount of video memory, along with the adapter's video drivers, may affect the number of colors that can be simultaneously displayed. Video adapters can also include their own coprocessor for faster graphics rendering.

video driver

A program that allows graphics-mode application programs and operating systems to display at a chosen resolution with the desired number of colors. A software package may include some "generic" video drivers. Any additional video drivers may need to match the video adapter installed in the computer.

video memory

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

video mode

Video adapters normally support multiple text and graphics display modes. Character-based software displays in text modes that can be defined as *x* columns by *y* rows of characters. Graphics-based software displays in graphics modes that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

video resolution

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

virtual memory

A method for increasing addressable RAM by using the hard-disk drive. For example, in a computer with 16 MB of RAM and 16 MB of virtual memory set up on the hard-disk drive, the operating system would manage the system as though it had 32 MB of physical RAM.

virus

A self-starting program designed to inconvenience you. Virus programs have been known to corrupt the files stored on a hard-disk drive or to replicate themselves until a system or network runs out of memory.

The most common way that virus programs move from one system to another is via "infected" diskettes, from which they copy themselves to the hard-disk drive. To guard against virus programs, you should do the following:

- Periodically run a virus-checking utility on your computer's hard-disk drive.

- Always run a virus-checking utility on any diskettes (including commercially sold software) before using them.

VLSI

very-large-scale integration

Vpp

peak-point voltage

VRAM

video random-access memory. Some video adapters use VRAM chips (or a combination of VRAM and DRAM) to improve video performance. VRAM is dual-ported, allowing the video adapter to update the screen and receive new image data at the same time.

W

W

watt(s)

WH

watt-hour(s)

win.ini *file*

A start-up file for the Windows operating system. When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **win.ini** file records what printer(s) and fonts are installed for Windows. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard-disk drive.

Revising the **Control Panel** settings or running the Windows Setup program may change options in the **win.ini** file. On other occasions, you may need to change or add options to the **win.ini** file manually with a text editor such as Notepad.

Windows® 95

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

Windows NT®

High-performance server and workstation operating system software developed by Microsoft that is intended for technical, engineering, and financial applications.

write-protected

Read-only files are said to be *write-protected*. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position or by setting the write-protect feature in the System Setup program.

WWW

World Wide Web

X

XMM

extended memory manager. A utility that allows application programs and operating systems to use extended memory in accordance with the XMS.

XMS

eXtended Memory Specification

Z

ZIF

zero insertion force. Some computers use ZIF sockets and connectors to allow devices such as the microprocessor chip to be installed or removed with no stress applied to the device.

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Installing Hard-Disk Drives: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

You can install two 1.6-inch-high hard-disk drives in the hard-disk drive bracket in the desktop chassis. You can install three 1.6-inch-high, four 1-inch-high, or two 1-inch-high and two 1.6-inch-high hard-disk drives in the hard-disk drive bracket in the mini tower chassis.

EIDE Drive Addressing

All enhanced integrated drive electronics (EIDE) devices should be configured for the Cable Select jumper position, which assigns master and slave status to devices by their position on the interface cable. When two EIDE devices are connected to a single EIDE interface cable and are configured for the Cable Select jumper position, the device attached to the last connector on the interface cable is the master or boot device (drive 0), and the device attached to the middle connector on the interface cable is the slave device (drive 1). Refer to the drive documentation in your upgrade kit for information on setting devices to the Cable Select jumper position.

With the two EIDE interface connectors on the system board, your system can support up to four EIDE devices. EIDE hard-disk drives should be connected to the EIDE interface connector labeled "IDE1." EIDE tape drives and CD-ROM drives should be connected to the EIDE interface connector labeled "IDE2."

Installing an EIDE Hard-Disk Drive in the Mini Tower Chassis

NOTE: Dell Precision WorkStation 420 computer systems normally use only small computer system interface (SCSI) drives; however, if you prefer EIDE drives, your system will support them. You may install either SCSI drives or EIDE drives; however, your system does not support a mix of both SCSI and EIDE hard-disk drives.

To install an EIDE hard-disk drive in the mini tower chassis, perform the following steps.

⚠ CAUTION: Before you remove the computer cover, see "**Safety First — For You and Your Computer.**"

1. If you are replacing a hard-disk drive that contains data you want to keep, be sure to make a backup of your files before you begin this procedure.

2. Prepare the drive for installation.

   NOTICE: Ground yourself by touching an unpainted metal surface on the back of the computer.

   NOTICE: When you unpack the drive, do not set it on a hard surface, which may damage the drive. Instead, set the drive on a surface such as a foam pad that will sufficiently cushion it.

   Check the documentation for the drive to verify that it is configured for your computer system.

3. Remove the computer cover as instructed in "Removing the Computer Cover (Mini Tower Chassis)."

4. Remove the drive bracket from the chassis:

   a. If a hard-disk drive is already installed in the drive bracket, disconnect the DC power cable and EIDE cable from the drive.

   b. Pull the drive door forward and down until the hard-disk drive bracket is ejected halfway out of the chassis (see Figure 1).

   c. Grasp the bracket and pull it completely out of the chassis.

Figure 1. Removing the Hard-Disk Drive Bracket From the Mini Tower Chassis
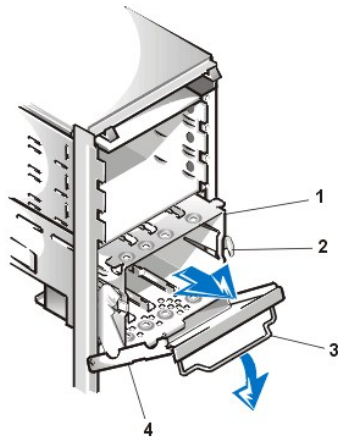
1 Hard-disk drive bracket

2 Hinge tabs

3 Drive door handle

4 Drive door

5. Slide the drive into the chosen bay of the bracket, oriented so that the connectors on the back of the drive will face the back of the chassis when the bracket is reinstalled (see Figure 2).

6. Align the four screw holes of the drive and bracket. Insert and tighten the screws that came with your upgrade kit (see Figure 2).

Figure 2. Inserting a Hard-Disk Drive in the Bracket for the Mini Tower Chassis
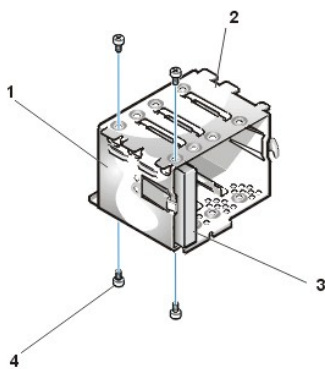
1 Drive bracket

2 Hooks (3)

3 1-inch drive (back)

4 Screws (4)

7. Reinstall the hard-disk drive bracket in the chassis (see Figure 3).

    a. Insert the bracket into the drive cage by sliding it in until the tabs snap into place.

    b. Rotate the drive door up and toward the chassis until it snaps securely into place.

       Be sure to fold down the drive door handle (see Figure 1) so that the bezel can be replaced on the chassis.

Figure 3. Inserting the Drive Bracket Into the Mini Tower Chassis
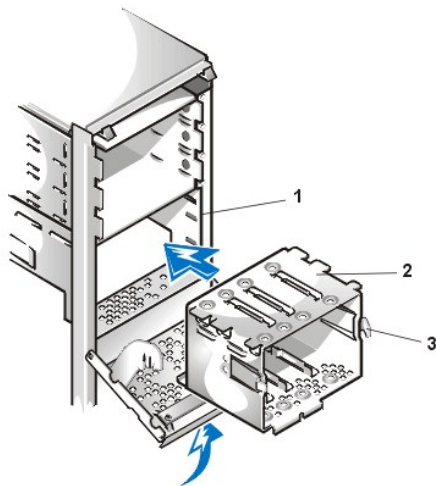
1 Drive cage
2 Drive bracket
3 Tabs

8. Connect a DC power cable to the power input connector on the back of the drive (see Figure 4).

   Check all connectors to be certain that they are properly cabled and firmly seated.

9. Connect one of the device connectors on the EIDE cable to the 40-pin interface connector on the back of the hard-disk drive.

   NOTICE: You must match the colored strip on the EIDE cable with pin 1 on the drive's interface connector to avoid possible damage to your system.

   NOTE: Ultra Advanced Technology Attachment (ATA)/66 hard-disk drives require an 80-conductor cable to transfer data at full speed. The 80-conductor cable has a 40-pin connector just like the Ultra ATA/33 cable but has twice as many wires within the cable itself. If you use an Ultra ATA/33 cable with Ultra ATA/66 hard-disk drives, the drives will transfer data at Ultra ATA/33 speeds.

Figure 4. Attaching Hard-Disk Drive Cables in the Mini Tower Chassis
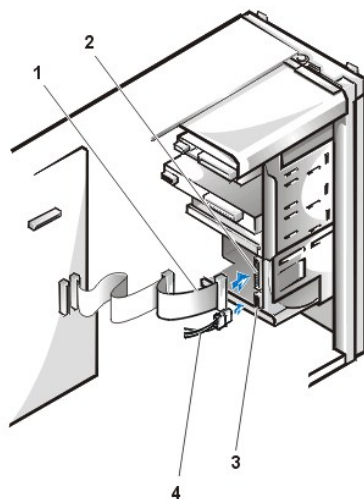
1 EIDE cable
2 Interface connector
3 Power input connector
4 DC power cable

10. If it is not already connected, connect the other end of the EIDE cable to the primary EIDE connector (labeled IDE1) on the system board.

    NOTICE: You must match the colored strip on the EIDE cable with pin 1 on the primary EIDE connector to avoid possible damage to your system.

    To locate the primary EIDE connector, see Figure 1 in "Installing System Board Options."

11. Replace the computer cover, reconnect your computer and peripherals to their power sources, and turn them on.

12. If the drive you just installed is the primary drive, insert a bootable diskette into drive A.

13. Enter System Setup, and update **Primary Drive 0** or **Primary Drive 1**.

    After you update the System Setup settings, reboot the system.

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

    See the documentation for your operating system for instructions.

15. Test the hard-disk drive by running the Dell Diagnostics.

16. If the drive you just installed is the primary drive, install your operating system on the hard-disk drive.

    Refer to the documentation that came with your operating system.

Installing an EIDE Hard-Disk Drive in the Desktop Chassis

To install an EIDE hard-disk drive in the desktop chassis, perform the following steps.

⚠ CAUTION: Before you remove the computer cover, see "**Safety First — For You and Your Computer**."

1. If you are replacing a hard-disk drive that contains data you want to keep, be sure to make a backup of your files before you begin this procedure.

2. Prepare the drive for installation.

    NOTICE: Ground yourself by touching an unpainted metal surface on the back of the computer.

    NOTICE: When you unpack the drive, do not set it on a hard surface, which may damage the drive. Instead, set the drive on a surface such as a foam pad that will sufficiently cushion it.

    Check the documentation for the drive to verify that it is configured for your computer system.

3. Remove the computer cover as instructed in "Removing the Computer Cover (Desktop Chassis)."

4. Remove the drive bracket from the chassis.

    a. If a hard-disk drive is already installed in the drive bracket, disconnect the DC power cable and EIDE cable from the drive.

    b. Remove the screw holding the drive bracket to the drive bay.

    c. Lift up on the drive bracket to disengage it from the latch on the drive bay and the three hooks on the front of the chassis (see Figure 5).

    d. Remove the bracket.

Figure 5. Removing the Hard-Disk Drive Bracket From the Desktop Chassis
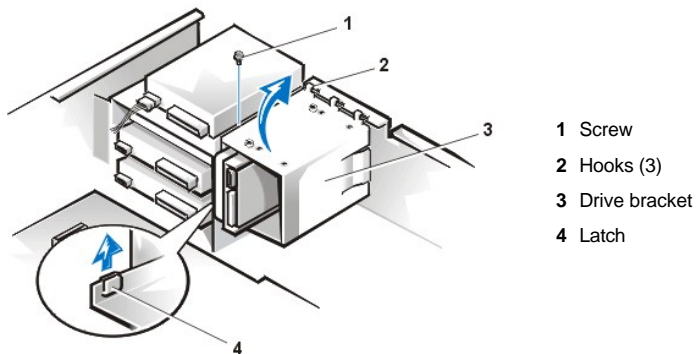
1 Screw
2 Hooks (3)
3 Drive bracket
4 Latch

5. Slide the drive into the chosen bay of the bracket, oriented so that the connectors on the back of the drive will face the back of the chassis when the bracket is reinstalled (see Figure 6).

6. Align the four screw holes of the drive and bracket. Insert and tighten the screws that came with your upgrade kit (see Figure 6).

Figure 6. Inserting a Hard-Disk Drive in the Bracket for the Desktop Chassis

1 Hooks (3)
2 Screws (4)
3 1-inch drive (back)
4 Drive bracket
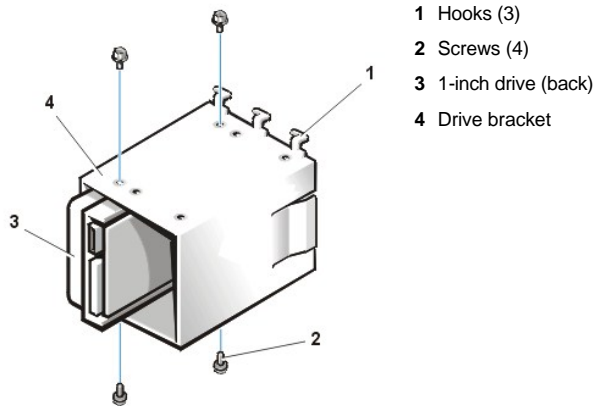
7. Reinstall the hard-disk drive bracket in the chassis (see Figure 7).

    a. Insert the bracket into the chassis by inserting the hooks in the slots on the front of the chassis.

    b. Lower the bracket to the bottom of the chassis, making sure that the latch on the drive bay is engaged.

    c. Replace the screw holding the drive bracket to the drive bay.

Figure 7. Inserting the Drive Bracket Into the Desktop Chassis

1 Screw
2 Hooks (3)
3 Drive bracket
4 Latch
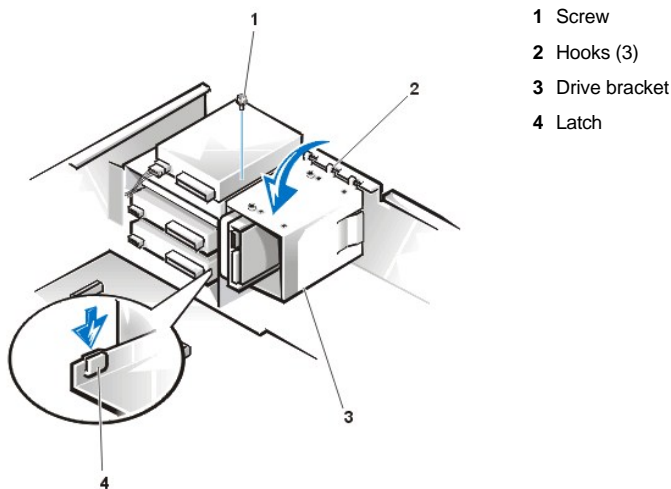
8. Connect a DC power cable to the power input connector on the back of the drive (see Figure 8).

Check all connectors to be certain that they are properly cabled and firmly seated.

9. Connect one of the device connectors on the EIDE cable to the 40-pin interface connector on the back of the hard-disk drive.

NOTICE: You must match the colored strip on the EIDE cable with pin 1 on the drive's interface connector to avoid possible damage to your system.

NOTE: Ultra ATA/66 hard-disk drives require an 80-conductor cable to transfer data at full speed. The 80-conductor cable has a 40-pin connector just like the Ultra ATA/33 cable but has twice as many wires within the cable itself. If you use an Ultra ATA/33 cable with Ultra ATA/66 hard-disk drives, the drives will transfer data at Ultra ATA/33 speeds.

Figure 8. Attaching Hard-Disk Drive Cables in the Desktop Chassis
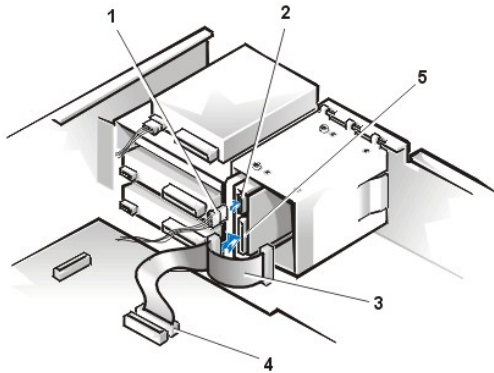
1 DC power cable
2 Power input connector on drive
3 EIDE cable
4 IDE1 connector
5 Interface connector on drive

10. If it is not already connected, connect the other end of the EIDE cable to the primary EIDE connector (labeled IDE1) on the system board.

    NOTICE: You must match the colored strip on the EIDE cable with pin 1 on the primary EIDE connector to avoid possible damage to your system.

    To locate the primary EIDE connector, see <u>Figure 1</u> in "Installing System Board Options."

11. Replace the computer cover, reconnect your computer and peripherals to their power sources, and turn them on.

12. If the drive you just installed is the primary drive, insert a bootable diskette into drive A.

13. Enter <u>System Setup</u>, and update **Primary Drive 0** or **Primary Drive 1**.

    After you update the System Setup settings, reboot the system.

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

    See the documentation for your operating system for instructions.

15. Test the hard-disk drive by running the <u>Dell Diagnostics</u>.

16. If the drive you just installed is the primary drive, install your operating system on the hard-disk drive.

    Refer to the documentation that came with your operating system.

Installing SCSI Devices

This section describes how to configure and install small computer system interface (SCSI) devices in your system.

SCSI Configuration Guidelines

Although you install SCSI devices essentially the same way as other devices, their configuration requirements are different. For details on configuring your particular SCSI subsystem, refer to the documentation for your SCSI devices and/or your host adapter card. The following subsections offer some general guidelines.

NOTE: Dell does not support mixing SCSI and EIDE hard-disk drives in the same system. If your system contains any EIDE hard-disk drives, do not install SCSI hard-disk drives.

SCSI ID Numbers

Internal SCSI devices must have a unique SCSI ID number from 0 to 15.

When SCSI devices are shipped from Dell, the default SCSI ID numbers for the primary and secondary controllers are assigned as follows:

  l SCSI controller: SCSI ID 7

  l Boot SCSI hard-disk drive: SCSI ID 0

  l SCSI CD-ROM drive: SCSI ID 5

  l SCSI tape or digital audio tape (DAT) drive: SCSI ID 6

NOTE: There is no requirement that SCSI ID numbers be assigned sequentially or that devices be attached to the cable in order by ID number.

SCSI devices installed by Dell are configured correctly during the manufacturing process. You do not need to set the SCSI ID for these SCSI devices.

If you attach additional optional SCSI devices, refer to the documentation for each device for information about setting the appropriate SCSI ID number.

NOTICE: Dell recommends that you use only SCSI cables purchased from Dell. SCSI cables purchased elsewhere are not guaranteed to work with Dell systems.

Device Termination

SCSI logic requires that either:

- l Termination be enabled for the two devices at opposite ends of the SCSI chain and disabled for all devices in between.

- l Termination be enabled at the ends of the cable and disabled on all devices in the chain.

Dell recommends that you use terminated cables and that you disable termination on all devices. See the documentation provided with any optional SCSI device you purchase for information on disabling termination on the device.

SCSI Cables

Ultra 160/m low-voltage differential (LVD) devices (hard-disk drives) use a 68-pin cable. One end of this cable should be attached to the SCSI controller connector. The remaining connectors on the cable should be attached to the various LVD devices.

Narrow SCSI devices (tape drives, CD-ROM drives, and some hard-disk drives) use a 50-pin cable. One end of this cable should be attached to the SCSI controller connector. The remaining connectors on the cable should be attached to the various Narrow SCSI devices.

General Procedure for Installing SCSI Devices

Configure and install one or more SCSI devices in your computer as follows:

1. Determine which connector on the internal SCSI cable you will attach to each SCSI device.

2. Unpack each SCSI device and prepare it for installation.

   NOTICE: Ground yourself by touching an unpainted metal surface on the back of the computer.

   NOTICE: When you unpack the drive, do not set it on a hard surface, which may damage the drive. Instead, set the drive on a surface such as a foam pad that will sufficiently cushion it.

   Configure the device for a SCSI ID number and disable termination, if necessary.

3. Install the SCSI devices as appropriate.

   - l To install a SCSI hard-disk drive, complete steps 3 through 7 of "Installing an EIDE Hard-Disk Drive in the Mini Tower Chassis" or "Installing an EIDE Hard-Disk Drive in the Desktop Chassis." Then continue with step 4 of this procedure.

   - l To install a SCSI tape drive, CD-ROM drive, or DAT drive, complete steps 3 through 7 of "Installing a Diskette, LS-120 SuperDisk, Tape, or CD-ROM Drive in a Mini Tower Chassis" or steps 3 through 6 of "Installing a Diskette, LS-120 SuperDisk, Tape, or CD-ROM Drive in a Desktop Chassis." Then continue with step 4 of this procedure.

   - l To install an external SCSI device, continue with step 4 of this procedure.

   - l To install a SCSI host adapter card, configure the card and install it in an empty expansion slot (see "Installing an Expansion Card"). If you attach any SCSI hard-disk drives to the host adapter card, connect the hard-disk drive access cable to the SCSI host adapter card and to the auxiliary hard-disk drive light-emitting diode (LED) connector on the system board (see Figure 1 in "Installing System Board Options").

4. Attach the SCSI cable to each SCSI device.

   NOTICE: You must match the colored strip on the cable with pin 1 on the drive's interface connector to avoid possible damage to your system.

   The connectors on Narrow SCSI cables are keyed for proper positioning—a raised area on the outside of the header connector fits into a notch on the device connector. The connectors on LVD SCSI cables are shaped so that they can be attached one way only.

   If you are installing an external SCSI device, connect one end of the external SCSI cable to the SCSI bus connector on the back of the device. Attach the other end of the external SCSI cable to the SCSI connector on the system back panel.

5. Connect the SCSI device(s) to power.

   - l If you are installing an internal SCSI device, connect a DC power cable to the power input connector on the SCSI device.

   - l If you are installing an external SCSI device, connect the socket end of the power cable into the AC power receptacle on the back

of the SCSI device. Connect the other end of the power cable into a standard electrical wall outlet.

Check all other cable connections. Fold all internal cables out of the way to provide airflow for the fan or cooling vents.

6. If you installed an externally accessible device, remove the front-panel insert for the drive bay.

For a mini tower chassis, you must first remove the front bezel as described in "Removing and Replacing the Front Bezel (Mini Tower Chassis Only)." To remove a front-panel insert, hold the bezel (mini tower chassis) or computer cover (desktop chassis) with the inside facing toward you and press each end of the insert with your thumbs until it snaps free of the bezel.

7. Replace the computer cover. Then reconnect your computer and peripherals to their power sources, and turn them on.

> NOTE: After you remove and replace the cover, the chassis intrusion detector will cause the following message to be displayed at the next system start-up:

    ALERT! Cover was previously removed.

8. To reset the chassis intrusion detector, enter System Setup and reset **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

See "Chassis Intrusion" for instructions.

> NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.

9. If necessary, update the drive system configuration information in System Setup.

After installing a SCSI hard-disk drive, **Primary Drive 0** and **Primary Drive 1** should be set to **None**. If you have any EIDE devices on the second EIDE channel, such as a CD-ROM or tape drive, **Secondary Drive 0** and/or **Secondary Drive 1** should be set to **Auto**. If you have any SCSI devices on the second SCSI channel, **Secondary Drive 0** and/or **Secondary Drive 1** should be set to **None**.

10. If you installed a SCSI hard-disk drive, partition and format the drive. Then install the operating system.

For instructions, see "Partitioning and Formatting SCSI Hard-Disk Drives" and your operating system documentation.

11. Test the SCSI devices.

Test a SCSI hard-disk drive by running the Dell Diagnostics.

To test a SCSI tape drive, refer to the documentation for the tape drive software to perform a tape drive backup and verification test.

Partitioning and Formatting SCSI Hard-Disk Drives

You may need to use different programs than those provided with the operating system to partition and format SCSI hard-disk drives. Refer to the documentation that came with your SCSI software drivers for information on installing the appropriate drivers and preparing your SCSI hard-disk drive for use.

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Hardware Configuration Features: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

This section provides specific information about the jumpers on your system board and the input/output (I/O) ports and connectors on the back panel of your computer. It also provides some basic information on jumpers, a listing of interrupt request (IRQ) assignments, and memory maps.
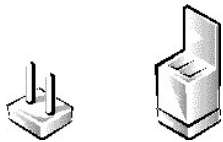
Jumpers

Jumpers provide a convenient and reversible way of reconfiguring the circuitry on a printed circuit board. When you reconfigure your system, you may need to change jumper settings on your system board; you may also need to change jumper settings on expansion cards or drives.

Jumpers are small blocks on a circuit board with two or more pins emerging from them (see Figure 1). Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit.

Figure 1. Jumpers

To change a jumper setting, pull the plug off its pin(s) and carefully fit it down onto the pin(s) indicated.

NOTICE: Make sure that your system is turned off before you change a jumper setting. Otherwise, damage to your system or unpredictable results may occur.

A jumper is referred to as *open* or *unjumpered* when the plug is pushed down over only one pin or if there is no plug at all. When the plug is pushed down over two pins, the jumper is referred to as *jumpered*. The jumper setting is often shown in text as two numbers, such as *1-2*. The number 1 is printed on the circuit board so that you can identify each pin number based on the location of pin 1.

Figure 2 shows the location and default settings of the jumper blocks on your system board. See Table 1 for the designations, default settings, and functions of your system's jumpers.

Figure 2. System Board Jumpers
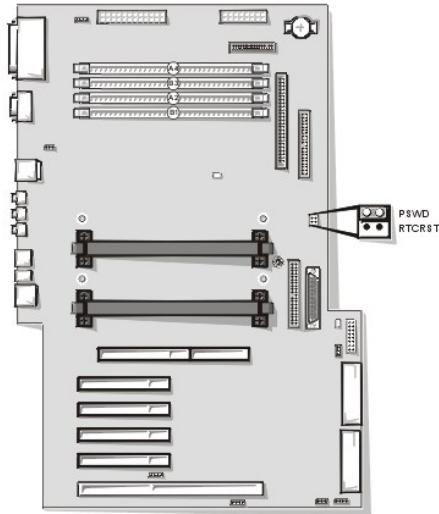
Table 1. System Board Jumpers Settings

Jumper	Setting	Description
RTCRST	⊙⊙	Real-time clock and CMOS reset. Install a jumper plug on these pins for approximately 1 second to reset the contents of the real-time clock and the CMOS. Do not leave the jumper plug installed.
PSWD	▣▣ / ⊙⊙	Password features enabled. Password features disabled.
NOTE: For the full name of an abbreviation or acronym used in this table, see the [Glossary](#).		
▣ jumpered ⊙⊙ unjumpered		

System Board Labels

Table 2 lists the labels for connectors and sockets on your system board and control panel and gives a brief description of their functions.

Table 2. System Board and Control Panel Connectors and Sockets

Connector or Socket	Description
AUX_LED	Hard-disk drive access indicator connector
BATTERY	Battery socket
CD-IN, AUX	Analog audio input connector
RIMMA_2, RIMMA_4	Memory RIMM sockets on channel A
RIMMB_1, RIMMB_3	Memory RIMM sockets on channel B
FAN_SYS	System fan connector
FAN_CCAG	Expansion card cage area fan connector
FLOPPY	Floppy disk connector (34-pin)
HD_TEMP	Hard-disk drive temperature sensor connector (on control panel)
IDE*n*	EIDE interface connector
INTRUSION	Chassis intrusion switch connector (on control panel)
KEYBOARD	PS/2 keyboard connector
LINE-IN	Line-in jack
LINE-OUT	Line-out jack
M_PWR1	Desktop chassis power connector 1
M_PWR2	Desktop chassis power connector 2
MT_PWR1	Mini tower chassis power connector 1
MT_PWR2	Mini tower chassis power connector 2
MIC-IN	Microphone jack

MOUSE	PS/2 mouse connector
NIC	10/100 Ethernet RJ45 connector
PANEL	Control panel connector
PARALLEL/SCSI	Parallel connector over Wide SCSI connector (stacked)
PCI1, PCI2, PCI3	PCI expansion-card connectors on primary PCI bus
PCI4, (PCI5)	PCI expansion-card connectors on secondary PCI bus
PCI5\RAIDPORT	RAID port connector extension to PCI5
RAID	Optional RAID PCI expansion card connector extension
SCSI_LVD	Primary (LVD/Wide) SCSI connector
SCSI_NARROW	Secondary (Narrow) SCSI connector
SERIAL1/2	Serial port connectors (sometimes referred to as *COM1* and *COM2*; stacked)
SPKR	Internal speaker connector (on control panel)
TAPI	Telophony microphone and speaker connector
PROC_0	SECC2 cartridge connector for processor 0
PROC_1	SECC2 cartridge connector for processor 1
USB 1/2	USB connectors (stacked)
WUOL	Remote wakeup on LAN connector
NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.	

I/O Ports and Connectors

The I/O ports and connectors on the back panel of your computer are the gateways through which your computer system communicates with external devices, such as a keyboard, mouse, printer, and monitor. Figure 3 identifies the I/O ports and connectors for your computer.

Figure 3. I/O Ports and Connectors

1 Parallel port connector

2 Serial port 1 connector

3 PS/2 mouse connector

4 PS/2 keyboard connector

5 USB connectors

6 Video out connector (may be in bottom or second expansion slot)

7 NIC connector

8 Diagnostic LEDs

9 Line-in jack

10 Line-out jack

11 Microphone jack

12 Serial port 2 connector

13 External SCSI connector
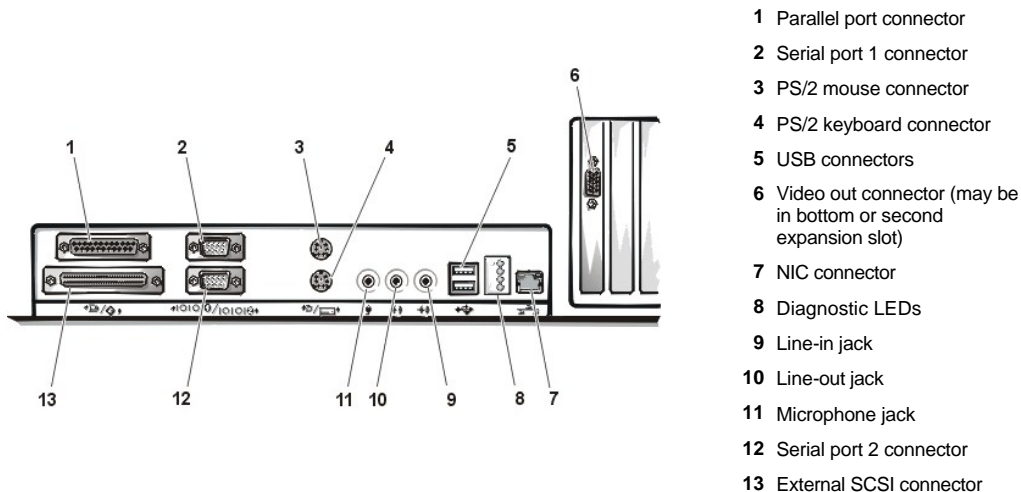
Serial and Parallel Ports Overview

The two built-in serial ports use 9-pin D-subminiature connectors on the back panel. These ports support devices such as external modems, printers, plotters, and mice that require serial data transmission (the transmission of data one bit at a time over one line).

Most software uses the term COM (for COMmunications) plus a number to designate a serial port (for example, COM1 or COM2). The default designations of your computer's integrated serial ports are COM1 and COM2.

The integrated parallel port uses a 25-pin D-subminiature connector on the computer's back panel. This I/O port sends data in parallel format (where eight data bits, or one byte, are sent simultaneously over eight separate lines in a single cable). The parallel port is used primarily for printers.

Most software uses the term LPT (for Line PrinTer) plus a number to designate a parallel port (for example, LPT1). The default designation of your computer's built-in parallel port is LPT1.

Port designations are used, for example, in software installation procedures that include a step in which you identify the port to which your printer is attached, thus telling your software where to send its output. (An incorrect designation prevents the printer from printing or causes scrambled print.)

Serial Port Connectors

If you reconfigure your hardware, you may need pin number and signal information for the serial port connectors. Figure 4 illustrates the pin numbers for the serial port connectors, and Table 3 lists and defines the pin assignments and interface signals for the serial port connectors.

Figure 4. Pin Numbers for the Serial Port Connectors
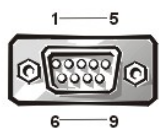
Table 3. Pin Assignments and Interface Signals for the Serial Port Connectors

Pin	Signal	I/O	Definition
1	DCD	I	Data carrier detect
2	SIN	I	Serial input
3	SOUT	O	Serial output
4	DTR	O	Data terminal ready
5	GND	N/A	Signal ground
6	DSR	I	Data set ready
7	RTS	O	Request to send
8	CTS	I	Clear to send
9	RI	I	Ring indicator
Shell	N/A	N/A	Chassis ground

Parallel Port Connector

If you reconfigure your hardware, you may need pin number and signal information for the parallel port connector. Figure 5 illustrates the pin numbers for the parallel port connector, and Table 4 lists and defines the pin assignments and interface signals for the parallel port connector.

Figure 5. Pin Numbers for the Parallel Port Connector
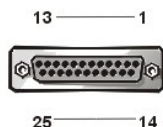
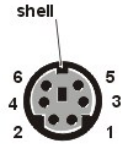**Table 4. Pin Assignments and Interface Signals for the Parallel Port Connector**

Pin	Signal	I/O	Definition
1	STB#	I/O	Strobe
2	PD0	I/O	Printer data bit 0
3	PD1	I/O	Printer data bit 1
4	PD2	I/O	Printer data bit 2
5	PD3	I/O	Printer data bit 3
6	PD4	I/O	Printer data bit 4
7	PD5	I/O	Printer data bit 5
8	PD6	I/O	Printer data bit 6
9	PD7	I/O	Printer data bit 7
10	ACK#	I	Acknowledge

11	BUSY	I	Busy
12	PE	I	Paper end
13	SLCT	I	Select
14	AFD#	O	Automatic feed
15	ERR#	I	Error
16	INIT#	O	Initialize printer
17	SLIN#	O	Select in
18-25	GND	N/A	Signal ground

External SCSI Connector

The 68-pin external small computer system interface (SCSI) connector on the system back panel supports external Ultra SCSI devices such as scanners, zip drives, and optical drives.

If you reconfigure your hardware, you may need pin number and signal information for the external SCSI connector. Figure 6 illustrates the pin numbers for the external SCSI connector, and Table 5 lists and defines the pin assignments and interface signals for the external SCSI connector.

Figure 6. Pin Numbers for the External SCSI Connector
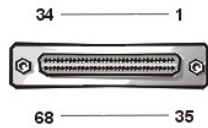
Table 5. Pin Assignments and Interface Signals for the External SCSI Connector

Pin	Signal	I/O	Definition
1-16	GND	N/A	Signal ground
17-18	TRMPWR	N/A	Terminator power
19	RSVD	N/A	Reserved
20-34	GND	N/A	Signal ground
35	D12	I/O	SCSI data bit 12
36	D13	I/O	SCSI data bit 13
37	D14	I/O	SCSI data bit 14
38	D15	I/O	SCSI data bit 15
39	DPARH	I/O	SCSI data parity high
40	D0	I/O	SCSI data bit 0
41	D1	I/O	SCSI data bit 1
42	D2	I/O	SCSI data bit 2
43	D3	I/O	SCSI data bit 3
44	D4	I/O	SCSI data bit 4
45	D5	I/O	SCSI data bit 5
46	D6	I/O	SCSI data bit 6
47	D7	I/O	SCSI data bit 7
48	DPARL	I/O	SCSI data parity low
49-50	GND	N/A	Signal ground
51-52	TRMPWR	N/A	Terminator power
53	RSVD	N/A	Reserved
54	GND	N/A	Signal ground
55	ATN	I/O	SCSI attention
56	GND	N/A	Signal ground

57	BSY	I/O	SCSI busy
58	ACK	I/O	SCSI acknowledge
59	RST	I/O	SCSI reset
60	MSG	I/O	SCSI message
61	SEL	I/O	SCSI select
62	C/D	I/O	SCSI command/data
63	REQ	I/O	SCSI request
64	I/O	I/O	SCSI in/out
65	D8	I/O	SCSI data bit 8
66	D9	I/O	SCSI data bit 9
67	D10	I/O	SCSI data bit 10
68	D11	I/O	SCSI data bit 11

Keyboard and Mouse Connectors Overview

Your system uses a Personal System/2 (PS/2)-style keyboard and supports a PS/2-compatible mouse. Cables from both devices attach to 6-pin miniature *Deutsche Industrie Norm* (DIN) connectors on the back panel of your computer.

A PS/2-compatible mouse works identically to an industry-standard serial mouse or bus mouse except that it has its own dedicated connector, which frees up both serial ports and does not require an expansion card. Circuitry inside the mouse detects either the movement of a small ball or the input from an optical sensor and relays the direction to the computer.

Mouse driver software can give the mouse priority with the microprocessor by issuing IRQ12 whenever a new mouse movement is made. The driver software also passes along the mouse data to the application program that is in control.

Keyboard Connector

If you reconfigure your hardware, you may need pin number and signal information for the keyboard connector. Figure 7 illustrates the pin numbers for the keyboard connector, and Table 6 lists and defines the pin assignments and interface signals for the keyboard connector.

Figure 7. Pin Numbers for the Keyboard Connector
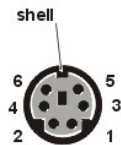
Table 6. Pin Assignments and Interface Signals for the Keyboard Connector

Pin	Signal	I/O	Definition
1	KBDATA	I/O	Keyboard data
2	NC	N/A	No connection
3	GND	N/A	Signal ground
4	FVcc	N/A	Fused supply voltage
5	KBCLK	I/O	Keyboard clock
6	NC	N/A	No connection
Shell	N/A	N/A	Chassis ground

Mouse Connector

If you reconfigure your hardware, you may need pin number and signal information for the mouse connector. Figure 8 illustrates the pin numbers for the mouse connector, and Table 7 lists and defines the pin assignments and interface signals for the mouse connector.

Figure 8. Pin Numbers for the Mouse Connector

Table 7. Pin Assignments and Interface Signals for the Mouse Connector

Pin	Signal	I/O	Definition
1	MFDATA	I/O	Mouse data
2	NC	N/A	No connection
3	GND	N/A	Signal ground
4	FVcc	N/A	Fused supply voltage
5	MFCLK	I/O	Mouse clock
6	NC	N/A	No connection

Video Connector

For information on your video connector, see the manufacturer's specifications that came with your video card.

NIC Connector

Your system contains an RJ45 connector (see Figure 9) on the back panel for attaching an unshielded twisted pair (UTP) Ethernet cable, which is used in 10BASE-T and 100BASE-TX networks. The network interface controller (NIC) provides all the functions normally handled by a separate network expansion card. To connect your system to and configure it for use on an Ethernet network, see "Using the Network Interface Controller."

Figure 9. NIC Connector

USB Connectors

Your system contains two Universal Serial Bus (USB) connectors for attaching USB-compliant devices. USB devices are typically peripherals such as keyboards, mice, printers, and computer speakers.

NOTICE: Do not attach a USB device or a combination of USB devices that draw a maximum current over 500 milliamperes (mA) per channel at +5 volts (V). Attaching devices that exceed this threshold may cause the USB ports to shut down. See the documentation that came with the USB devices for their maximum current ratings.

If you reconfigure your hardware, you may need pin number and signal information for the USB connectors. Figure 10 illustrates the pin numbers for the USB connectors, and Table 8 lists and defines the pin assignments and interface signals for the USB connectors.

Figure 10. Pin Numbers for the USB Connectors
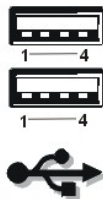
Table 8. Pin Assignments and Interface Signals for the USB Connectors

Pin	Signal	I/O	Definition
1	Vcc	N/A	Supply voltage

2	DATA	I	Data in
3	+DATA	O	Data out
4	GND	N/A	Signal ground

Microphone Jack

You can use the microphone jack (see Figure 11) to attach a nondynamic monaural microphone for personal computers. Connect the audio cable from the microphone to the microphone jack. The microphone input is a mono source with maximum signal levels of 130 millivolts root mean squared (mVrms).

Figure 11. Microphone Jack

Line-Out Jack

You can use the line-out jack (see Figure12) to attach most computer speakers. The line-out jack is not amplified, so speakers with integrated amplifiers are required. Connect the audio cable from the speakers to this jack.

Figure 12. Line-Out Jack

Line-In Jack

You can use the line-in jack (see Figure 13) to attach record/playback devices such as cassette players, CD players, and VCRs. Connect the line-out cable from any of these devices to the line-in jack on the back of your computer.

Figure 13. Line-In Jack

Interrupt Assignments

Problems can arise if two devices attempt to use the same IRQ line. To avoid this type of conflict, check the documentation for the default IRQ line setting for each installed device. Then consult Table 9 to configure each device for one of the available IRQ or other lines.

NOTE: Interrupts for the integrated sound, NIC, and both SCSI channels are assigned dynamically by the system basic input/output system (BIOS).

Table 9. Interrupt Assignments

IRQ Line	Used By/Available
IRQ0	System timer
IRQ1	Keyboard controller
IRQ2	Interrupt controller (enables IRQ8 through IRQ15)
IRQ3	COM2 and COM4 serial ports (if enabled in System Setup program)

IRQ4	COM1 and COM3 serial ports (if enabled in System Setup program)
IRQ5	Available
IRQ6	Diskette drive interface
IRQ7	Parallel port (if enabled in System Setup program)
IRQ8	RTC
IRQ9	Available
IRQ10	Available
IRQ11	Available
IRQ12	Mouse controller
IRQ13	Math coprocessor
IRQ14	Primary EIDE interface (if enabled in System Setup program)
IRQ15	Secondary EIDE interface (if enabled in System Setup program)
NOTE: For the full name of an abbreviation or acronym used in the table, see the Glossary.	

Memory Allocations

Programs operating under MS-DOS® (real-mode operation) can address only 1 megabyte (MB) (1024 kilobytes [KB]) of system memory. This area is divided into *conventional memory* (sometimes called *base memory*) and *upper memory*. All system memory above this 1 MB is called *extended memory* and cannot be directly addressed by MS-DOS-based programs without the aid of memory-managing software as found in Microsoft® Windows® 98 or Windows NT®.

Table 10 provides a map of the conventional memory area. When the microprocessor or a program addresses a location within the conventional memory range, it is physically addressing a location in main memory, which is the only main memory it can address under MS-DOS.

Table 10. Conventional Memory Map

Address Range	Use
00000h-003FFh	Interrupt vector table
00400h-004FFh	BIOS data area
00500h-005FFh	MS-DOS and BASIC work area
00600h-0FFFFh	User memory
10000h-1FFFFh	User memory
20000h-2FFFFh	User memory
30000h-3FFFFh	User memory
40000h-4FFFFh	User memory
50000h-5FFFFh	User memory
60000h-6FFFFh	User memory
70000h-7FFFFh	User memory
80000h-8FFFFh	User memory
90000h-9FBFFh	User memory
NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.	

Table 11 provides a map of the upper memory area. Some of these addresses are dedicated to various system devices, such as the system BIOS. Others are available for use by expansion cards and/or an expanded memory manager (EMM). When the microprocessor or a program addresses a location within the upper memory area, it is physically addressing a location within one of these devices.

Table 11. Upper Memory Map

Address Range	Use
0009FC00-0009FFFF	PS/2-mouse data area
000A0000-000BFFFF	Video RAM
000C0000-000C7FFF	Video BIOS
000C8000-000EFFFF	Available

000F0000-000FFFFF	System BIOS
00100000-0010FFEF	High memory area
0010FFF0-3FFFFFFF	Extended memory
40000000-FFF7FFFF	Reserved
FFF80000-FFFFFFFF	BIOS ROM
NOTE: For the full name of an abbreviation or acronym used in this table, see the [Glossary](#).	

[Back to Contents Page](#)

Help Overview: Dell Precision™ WorkStation 420 Systems User's Guide

- Technical Assistance
- Help Tools
- Problems With Your Order

- Product Information
- Returning Items for Warranty Repair or Credit
- Before You Call

Technical Assistance

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

1. Run the Dell Diagnostics as described in "Dell Diagnostics."

2. Make a copy of the Diagnostics Checklist and fill it out.

3. Use Dell's extensive suite of online services available at Dell's World Wide Web site (**http://www.dell.com**) for help with installation and troubleshooting procedures.

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

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

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

For instructions on using the technical support service, see "Technical Support Service" and "Before You Call."

Help Tools

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

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

World Wide Web on the Internet

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

From Dell's World Wide Web home page (**http://www.dell.com**), click the **Support** icon, and click **Support Your Dell**. Enter your service tag number (or, if you have one, your Express Service Code) and click **Submit**. If you don't have your service tag number or Express Service Code available, you can also select support information by system.

Everything you need to know about your system is presented on the system support page, including the following tools and information:

- Technical information — Details on every aspect of your system, including hardware specifications.

- Self-diagnostic tools — A system-specific troubleshooting application for resolving many computer-related issues by following interactive flowcharts.

- Drivers, files, and utilities — The latest drivers and basic input/output system (BIOS) updates to keep your system functioning at its best.

- Component support — Technical information, documentation, and troubleshooting tips for different system components.

- Online communications center — Tool for submitting requests for both technical and nontechnical information on Dell products. Avoid telephone delays by receiving an e-mail response to your request for information if your computer is not functioning properly or if you have questions regarding your computer's hardware or operation.

You can contact Dell electronically by using the following addresses:

- World Wide Web

  http://www.dell.com/

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

http://www.euro.dell.com (for Europe only)

    ₗ Anonymous file transfer protocol (FTP)

ftp.dell.com/

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

    ₗ Electronic Support Service

support@us.dell.com

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

support.euro.dell.com (for Europe only)

    ₗ Electronic Quote Service

sales@dell.com

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

    ₗ Electronic Information Service

info@dell.com

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers.

When you call AutoTech, you use your touch-tone telephone to select the subjects that correspond to your questions. You can even interrupt an AutoTech session and continue the session later. The code number that the AutoTech service gives you allows you to continue your session where you ended it.

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

TechFax Service

Dell takes full advantage of fax technology to serve you better. Twenty-four hours a day, seven days a week, you can call the Dell TechFax line toll-free for all kinds of technical information.

Using a touch-tone phone, you can select from a full directory of topics. The technical information you request is sent within minutes to the fax number you designate. For the TechFax telephone number to call, see the contact numbers for your region.

TechConnect BBS

Use your modem to access Dell's TechConnect bulletin board service (BBS) 24 hours a day, seven days a week. The service is menu-driven and fully interactive. The protocol parameters for the BBS are 1200 to 19.2K baud, 8 data bits, no parity, 1 stop bit.

Automated Order-Status System

You can call this automated service to check on the status of any Dell products that you have ordered. A recording prompts you for the information needed to locate and report on your order. For the telephone number to call, see the contact numbers for your region.

Technical Support Service

Dell's industry-leading hardware technical support service is available 24 hours a day, seven days a week, to answer your questions about Dell hardware.

Our technical support staff pride themselves on their track record: more than 90 percent of all problems and questions are taken care of in just one toll-free call, usually in less than 10 minutes. When you call, our experts can refer to records kept on your Dell system to better understand your particular question. Our technical support staff use computer-based diagnostics to provide fast, accurate answers to questions.

To contact Dell's technical support service, 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, see the contact numbers for your region.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit Dell's World Wide Web site at **http://www.dell.com**. For the telephone number to call 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 an authorization number, and write it clearly and prominently on the outside of the box.

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

2. Include a copy of the invoice and a letter describing the reason for the return.

3. Include a copy of the Diagnostics Checklist indicating the tests you have run and any error messages reported by the Dell Diagnostics.

4. Include any accessories that belong with the item(s) being returned (power cables, software diskettes, guides, and so on) if the return is for credit.

5. Pack the equipment to be returned in the original (or equivalent) packing materials.

You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect On Delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

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

Remember to fill out the Diagnostics Checklist. If possible, turn on your system before you call Dell for technical assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer system itself. Make sure the system documentation is available.

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

Diagnostics Checklist

Date:
Name:
Address:
Phone number:
Service tag (bar code on the back of the computer):
Express Service Code:
Return Material Authorization Number (if provided by Dell support technician):
Operating system and version:
Peripherals:
Expansion cards:
Are you connected to a network? Yes No
Network, version, and network card:
Programs and versions:

Refer to your operating system documentation to determine the contents of the system's start-up files. If the computer is connected to a printer, print each file. Otherwise, record the contents of each file before calling Dell.
Error message, beep code, or diagnostic code:
Description of problem and troubleshooting procedures you performed:

Working Inside Your Computer: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

Your Dell Precision WorkStation 420 system supports a variety of internal options that expand system capabilities. This section prepares you to install options inside the computer. It describes how to remove and replace the computer cover and rotate the power supply away from the system board. It also familiarizes you with the internal components that you may handle if you install Dell™ hardware options.

Before You Begin

To make working inside your computer easier, make sure that you have adequate lighting and a clean work space. If you temporarily disconnect cables or remove expansion cards, note the position of the connectors and slots so that you can reassemble the system correctly.

You will use the information in this section every time you install a hardware option inside your computer. *Read this section carefully*, because the information is not repeated in detail elsewhere in this guide.

Safety First—For You and Your Computer

Working inside your computer is safe if you observe the following precautions.

⚠ **CAUTION FOR YOUR PERSONAL SAFETY AND PROTECTION OF YOUR EQUIPMENT**

Before starting to work on your computer, perform the following steps in the sequence indicated:

1. Turn off your computer and all peripherals.

2. Disconnect your computer and peripherals from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer. Doing so reduces the potential for personal injury or shock.

3. If you are disconnecting a peripheral from the computer or are removing a component from the system board, wait 10 to 20 seconds after disconnecting the computer from the electrical outlet before disconnecting the peripheral or removing the component to avoid possible damage to the system board.

   To verify that all power has been removed from the system, make sure that the standby power light-emitting diode (LED) on the system board has gone out. For the location of this LED, see Figure 1 in "Installing System Board Options."

4. Touch an unpainted metal surface on the computer chassis, such as the power supply, before touching anything inside your computer.

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components. Also avoid touching components or contacts on a card and avoid touching pins on a chip.

In addition, Dell recommends that you periodically review the safety instructions in your *System Information Guide*.

Unpacking Your Hardware Option

When you remove an option from its shipping carton, you may find it wrapped in antistatic packing material designed to protect it from electrostatic damage. Do not remove the packing material until you are ready to install the option.

NOTICE: See "Protecting Against Electrostatic Discharge" in your *System Information Guide*.

Removing the Computer Cover (Desktop Chassis)

1. Turn off your computer and peripherals, and make sure that you unplug the computer from its electrical outlet before you remove the computer cover. Observe the *Caution for Your Personal Safety and Protection of Your Equipment*. Also observe the safety instructions found in your *System Information Guide*.

2. If you have installed a padlock through the padlock ring on the back panel (see Figure 1), remove the padlock.

Figure 1. Padlock Installed (Desktop Chassis)

1 Padlock ring
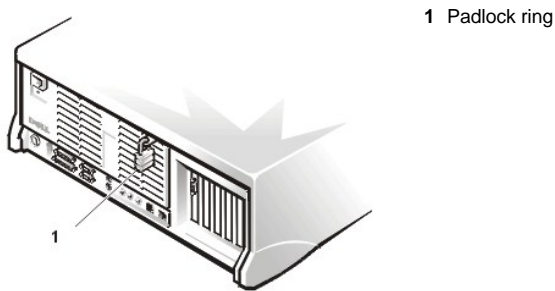
3. Locate the release buttons on the sides of the cover (see Figure 2).

4. From the front of the computer, press and hold the release buttons, and pivot the cover up toward you (see Figure 2).

5. Disengage the cover hooks that secure the cover to the front of the chassis, and lift the cover away.

Figure 2. Removing the Computer Cover (Desktop Chassis)

1 Release button (two, one each side)
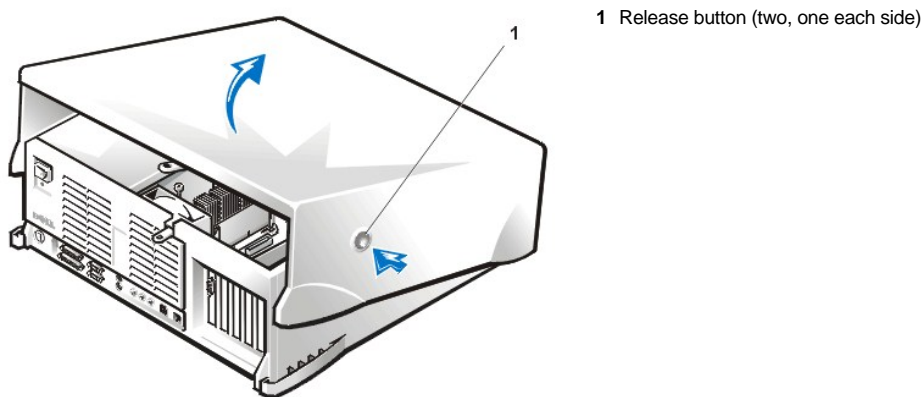
Replacing the Computer Cover (Desktop Chassis)

1. Check all cable connections, especially those that might have come loose during your work. Fold cables out of the way so that they do not catch on the computer cover. Make sure cables are not routed over the drive cage—they will prevent the cover from closing properly.

2. Check to see that no tools or extra parts (including screws) are left inside the computer's chassis.

3. Facing the front of the computer, hold the cover at a slight angle as shown in Figure 3.

4. Fit the three cover hooks into the rectangular slots on the chassis. (It might be helpful to look down into the chassis to verify that the hooks are in place.)

5. Pivot the cover down toward the back of the computer and into position.

   Make sure that the two release buttons click into place.

   NOTE: The computer should be placed fully on a flat surface. It is difficult to align the cover if the front of the computer is hanging over the edge of a table.

Figure 3. Replacing the Computer Cover (Desktop Chassis)
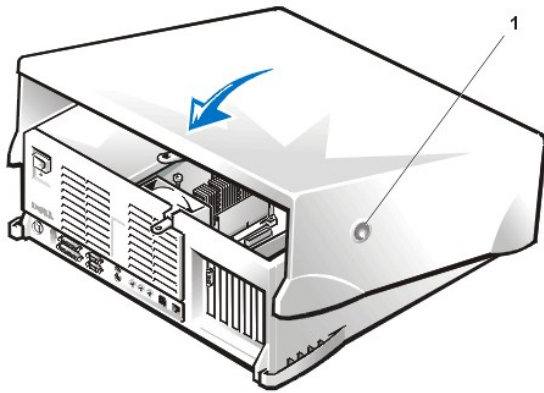
1 Release button (two, one each side)

6. If you are using a padlock to secure your system, reinstall the padlock.

   📝 *NOTE: After you remove and replace the cover, the chassis intrusion detector causes the following message to be displayed at the next system start-up:*

   ```
   ALERT! Cover was previously removed.
   ```

7. Reset the chassis intrusion detector by entering the System Setup program and setting **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

   📝 *NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.*
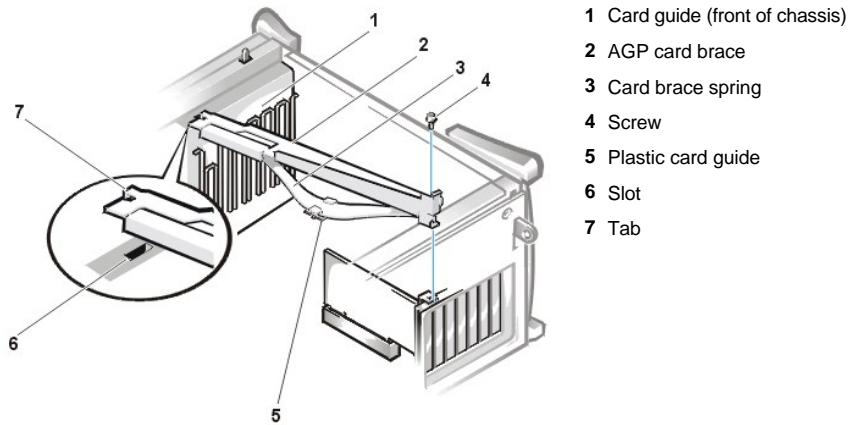

Removing the Computer Cover (Mini Tower Chassis)

1. Turn off your computer and peripherals, and make sure that you unplug the computer from its electrical outlet before you remove the computer cover. Observe the *Caution for Your Personal Safety and Protection of Your Equipment*. Also observe the safety instructions found in your *System Information Guide*.

2. If you have installed a padlock through the padlock ring on the back panel (see Figure 4), remove the padlock and slide the padlock ring to the open position.

Figure 4. Padlock Ring and Cable Slot
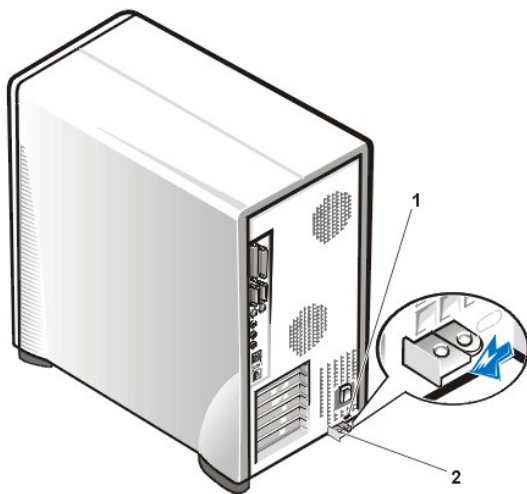
1 Security cable slot

2 Padlock ring

3. Facing the left side cover, press the release button (located at the bottom-left corner of the front bezel) and lift the bottom of the cover, allowing it to pivot up toward you (see Figure 5).

4. Disengage the hooks that secure the cover to the top of the chassis, and lift the cover away.

Figure 5. Removing the Computer Cover (Mini Tower Chassis)

1 Release button

1
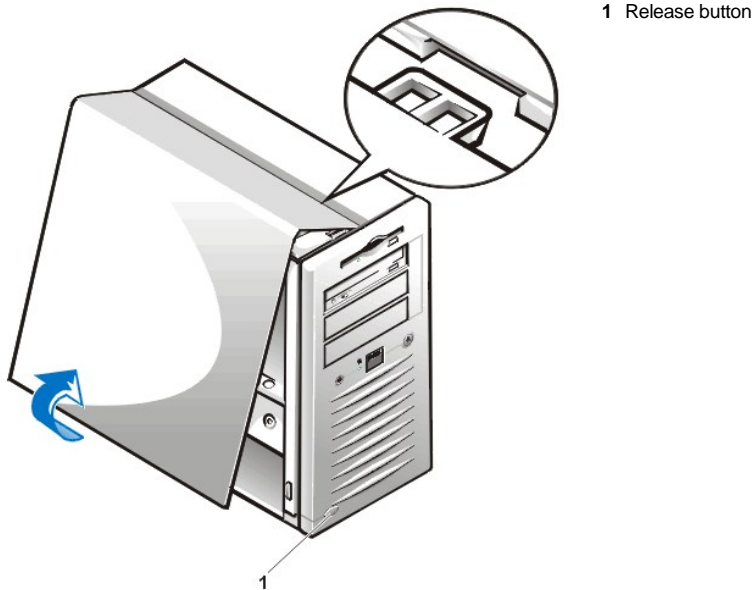
Removing and Replacing the Front Bezel (Mini Tower Chassis Only)

To access some drive bays in the mini tower chassis, you must first remove the front bezel. To remove the front bezel, you first must remove the computer cover (see " Removing the Computer Cover (Mini Tower Chassis)"). With the cover removed, release the bezel by pressing the tab release marked with the icon (see Figure 6).

Figure 6. Removing the Front Bezel

1 Tab release
2 Retaining hooks (2)
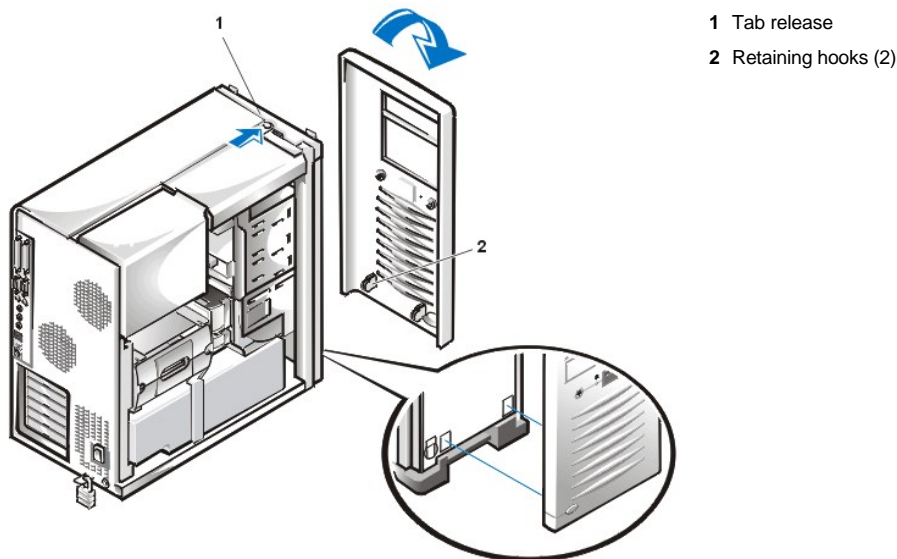
While pressing the tab release, tilt the bezel away from the chassis, disengage the two retaining hooks at the bottom of the bezel, and carefully pull the bezel away from the chassis.

To replace the bezel, fit the two retaining hooks on the bezel into their corresponding slots at the bottom of the chassis (see Figure 6). Then rotate the top of the bezel toward the chassis until the top tabs snap into their corresponding slots on the bezel.

Replacing the Computer Cover (Mini Tower Chassis)

To replace the computer cover, perform the following steps:

1. Check all cable connections, especially those that might have come loose during your work. Fold cables out of the way so that they do not catch on the computer cover. Make sure cables are not routed over the drive cage—they will prevent the cover from closing properly.

2. Check to see that no tools or extra parts (including screws) are left inside the computer's chassis.

3. Facing the left side of the computer, hold the cover at a slight angle as shown in Figure 7, and then align the top of the cover with the top of the chassis.

4. Insert the three hooks on the cover into the three recessed slots on the computer chassis so that the tabs catch the hooks inside the slots.

5. Pivot the cover down toward the bottom of the chassis and into position. Make sure the securing hooks at the bottom of the cover click into place.

Figure 7. Replacing the Computer Cover (Mini Tower Chassis)

1 Hook
2 Recessed slot
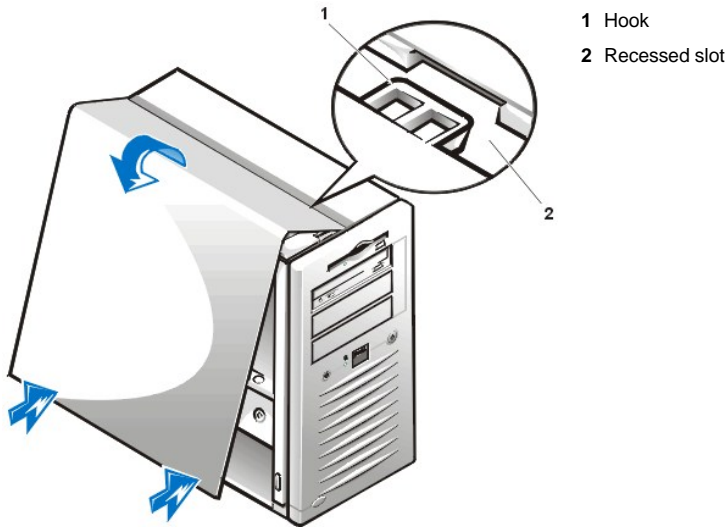
6. If you are using a padlock to secure your system, reinstall the padlock.

    NOTE: After removing and replacing the chassis, the chassis intrusion detector causes the following message to be displayed at the next system start-up:

    ```
    ALERT! Cover was previously removed.
    ```

7. Reset the chassis intrusion detector by entering the System Setup program and setting **Chassis Intrusion** to **Enabled** or **Enabled-Silent**.

    NOTE: If a setup password has been assigned by someone else, contact your network administrator for information on resetting the chassis intrusion detector.

Removing and Replacing the AGP Card Brace (Mini Tower Chassis Only)

To access any expansion cards in the mini tower chassis, you must first remove the accelerated graphics port (AGP) card brace that secures an AGP card in the AGP socket.

⚠ **CAUTION:** Before you remove the computer cover, see "Safety First—For You and Your Computer."

1. Remove the computer cover as instructed in "Removing the Computer Cover (Mini Tower Chassis)."

2. Remove the screw securing the AGP card brace to the chassis (see Figure 8).

Figure 8. Removing the AGP Card Brace

1 Card guide (front of chassis)
2 AGP card brace
3 Card brace spring
4 Screw
5 Plastic card guide
6 Slot
7 Tab

3. Slide the brace toward the front of the system until it disengages from the slot in the card guide; then rotate the brace up and lift it away from the chassis.

To replace the brace, perform the following steps:

1. Insert the tab on the end of the brace into the slot in the card guide at the front of the chassis (see Figure 8).

2. Lower the brace, ensuring that the plastic card guide on the bottom of the brace spring engages the AGP card.

3. Slide the brace toward the back of the system until the tab at the end engages the slot in the back wall.

4. Replace the screw that secures the brace to the chassis.

Inside Your Computer

Figure 9 shows a top view of a desktop chassis computer to help you orient yourself when installing hardware options. Unless otherwise specified, locations or directions relative to the computer are as shown.

Figure 9. Computer Orientation View (Desktop Chassis)

1 Power supply
2 Externally accessible drive bays
3 Hard-disk drive bracket
4 System board
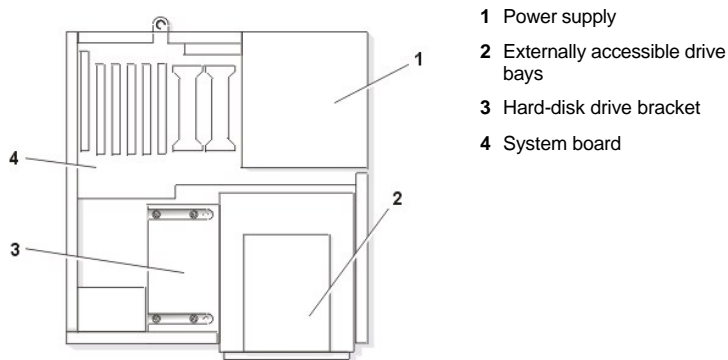
Figure 10 shows a top view of a mini tower chassis computer to help you orient yourself when installing hardware options. Unless otherwise specified, locations or directions relative to the computer are as shown.

Figure 10. Computer Orientation View (Mini Tower Chassis)

1 Externally accessible drive bays
2 Hard-disk drive bracket
3 Power supply
4 System board
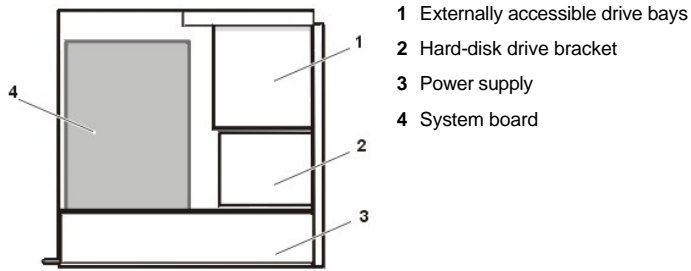
Figure 11 shows a desktop chassis computer with its cover removed. Refer to this illustration to locate interior features and components of the desktop chassis discussed in this guide.

Figure 11. Inside the Chassis (Desktop Chassis)

1 Externally accessible drive bays
2 Hard-disk drive cage
3 System board
4 Expansion-card slots
5 Padlock ring
6 I/O panel connectors
7 Security cable slot
8 AC power receptacle
9 Power supply
10 Drive interface cable
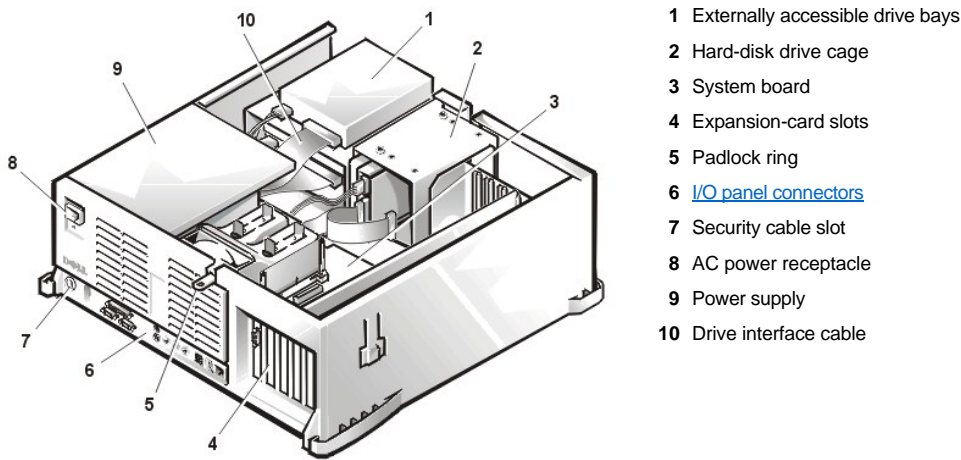
Figure 12 shows a mini tower chassis computer with its cover removed. Refer to this illustration to locate interior features and components of the mini tower chassis discussed in this guide.

Figure 12. Inside the Chassis (Mini Tower Chassis)

1 Externally accessible drive bays
2 Hard-disk drive cage
3 Power Supply
4 Security cable slot
5 Padlock ring
6 AC power receptacle
7 Expansion-card slots
8 I/O panel connectors
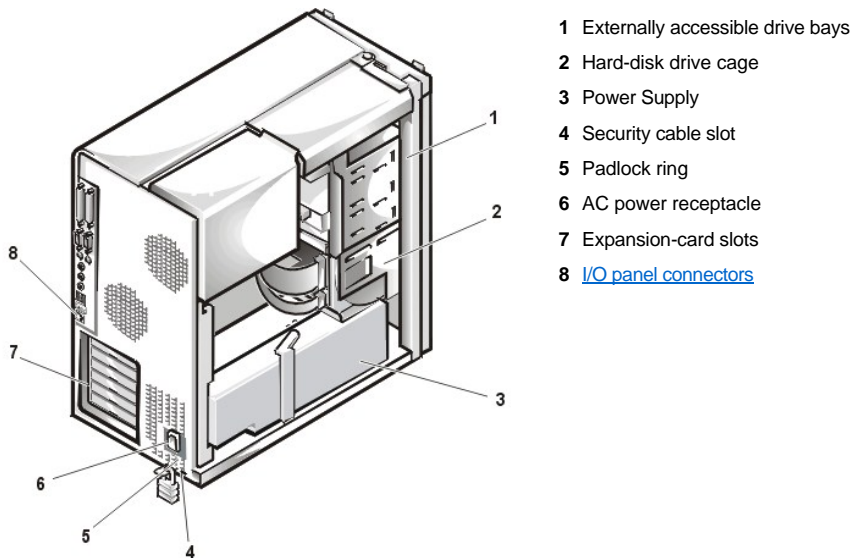
Rotating the Power Supply Away From the System Board (Desktop Chassis)

To access some components on the system board, you may have to rotate the system power supply out of the way. To rotate the power supply, perform the following steps.

⚠️ **CAUTION:** Before you remove the computer cover, see "Safety First—For You and Your Computer."

1. Remove the computer cover as instructed in "Removing the Computer Cover (Desktop Chassis)."

2. Disconnect the AC power cable from the AC power receptacle on the back of the power supply (see Figure 12).

3. Free the power supply by pressing the latch labeled "RELEASE," and then rotate the power supply upward to a vertical position. See Figure 13.

Figure 13. Rotating the Power Supply (Desktop Chassis)
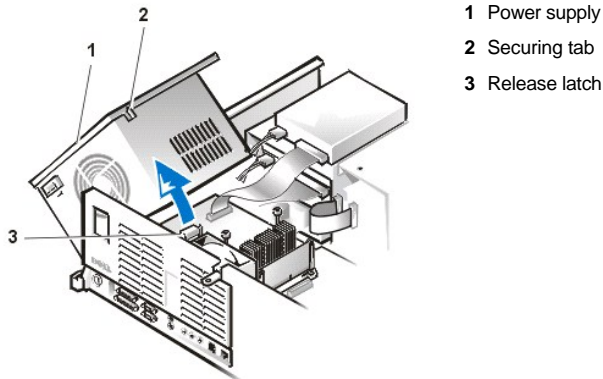
1 Power supply
2 Securing tab
3 Release latch

Rotating the Power Supply Away From the System Board (Mini Tower Chassis)

To access some components on the system board, you may have to rotate the system power supply out of the way. To rotate the power supply, perform the following steps:

1. Remove the computer cover as instructed in "Removing the Computer Cover (Mini Tower Chassis)."

2. Disconnect the AC power cable from the AC power receptacle on the back of the power supply (see Figure 12).

3. Free the power supply by rotating the power supply release handle outward, and then slide the power supply toward the front of the system.

📝 *NOTE: Ensure that you slide the power supply all the way toward the front of the system before proceeding to the next step.*

4. Rotate the power supply downward. See Figure 14.

📝 *NOTE: It is helpful to lay the system on its right side so that you can rotate the power supply completely out of the system.*

Figure 14. Rotating the Power Supply (Mini Tower Chassis)
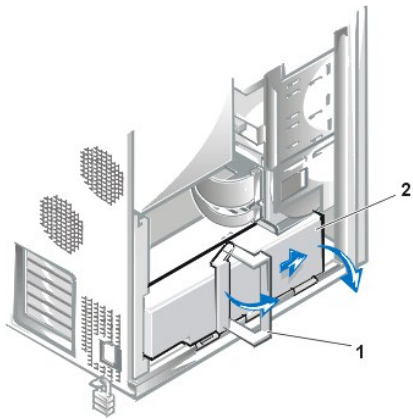
| 1 | Power supply release handle |
| 2 | Power supply |

To return the power supply to its original position, perform the following steps.

1. Rotate the power supply to its original position and hold it there (see Figure 14).

2. Rotate the power supply release handle towards the back of the system until it is closed.

   Make sure that the handle latches onto the power supply properly and the power supply slides slightly to the back of the system and locks in place.

3. Replace the cover.

4. Reconnect the AC power cable to the AC power receptacle on the back of the power supply.

Internal Components: Dell Precision™ WorkStation 420 Systems User's Guide

Overview

This section provides troubleshooting procedures for components inside your computer. Before you start any of the procedures in this section, do the following:

l Perform the procedures described in "Checking Connections and Switches" and "System Setup."

l Read the safety instructions in "Safety First—For You and Your Computer."

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

l Your *Dell Precision ResourceCD*

l A small flat-blade screwdriver and a #1 Phillips-head screwdriver (or quarter-inch hex-nut driver)

Your system also includes an interior system service label affixed to the inside of the computer cover (see Figure 1 and Figure 2 for the location of this label on the mini tower and desktop chassis, respectively). This label shows the location of components within the chassis and locations of system board components and connectors. It also contains an important notice that provides instructions you need to follow to help prevent damage to your system board while you troubleshoot your computer system.

Figure 1. Mini Tower Chassis Interior Service Label
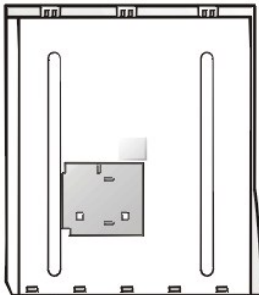
Figure 2. Desktop Chassis Interior Service Label
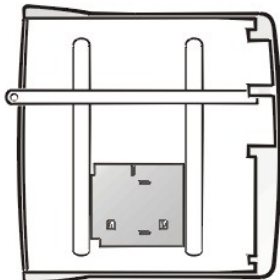
Safety First—For You and Your Computer

The procedures in this section require that you remove the cover and work inside your computer. While working inside your computer, do not attempt to service the computer except as explained in this guide and elsewhere in Dell™ documentation. Always follow the instructions closely.

Working inside your computer is safe—*if* you observe the following precautions.

⚠ **CAUTION FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT**

Before you start to work on the computer, perform the following steps in the sequence indicated:

1. *Turn off* the computer and all peripherals.

2. *Touch* an unpainted metal surface on the computer chassis, such as the metal around the card-slot openings at the back of your computer, before touching anything inside your computer.

3. *Disconnect* the computer and peripherals from their electrical outlets. Doing so reduces the potential for personal injury or shock. Also disconnect any telephone or telecommunication lines from the computer.

▨ *NOTE: Before disconnecting a peripheral from the system or removing a component from the system board, verify that the standby power light-emitting diode (LED) on the system board has turned off. For the location of this LED, see Figure 1 in "Installing System Board Options."*

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

In addition, Dell recommends that you periodically review the safety instructions in your *System Information Guide.*

Removing and Replacing the Computer Cover

If your computer has a desktop chassis, see "Removing the Computer Cover (Desktop Chassis)" and "Replacing the Computer Cover (Desktop Chassis)."

If your computer has a mini tower chassis, see "Removing the Computer Cover (Mini Tower Chassis)" and "Replacing the Computer Cover (Mini Tower Chassis)."

Troubleshooting a Wet Computer

▨ *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

Liquids can damage your computer. While you are not likely to submerge your computer, spills, splashes, and excessive humidity can also cause damage. If an external device (such as a printer or an external drive) gets wet, contact the manufacturer for instructions. If your computer gets wet, perform the following steps:

1. Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. Remove the cover from your desktop chassis or from your mini tower chassis.

3. Let the computer dry for at least 24 hours. Make sure that it is thoroughly dry before you proceed.

4. If you have a mini tower chassis, remove the accelerated graphics port (AGP) card brace according to the instructions in "Removing and Replacing the AGP Card Brace."

5. Remove all expansion cards installed in the computer except a drive controller card and video expansion card.

6. Replace the computer cover on your desktop chassis or on your mini tower chassis, reconnect the system to an electrical outlet, and turn it on.

   If the system has power, proceed to step 7. If the system does not have power, see "Getting Help" for instructions on obtaining technical assistance.

7. Turn off the system, disconnect it from the electrical outlet, remove the computer cover, touch an unpainted metal surface to discharge any static electricity, and reinstall all expansion cards that you removed in step 5.

8. If you have a mini tower chassis, replace the AGP card brace.

9. Replace the computer cover and reconnect the system to an electrical outlet. Also, reconnect any telephone or telecommunication lines to the computer.

10. Insert the *Dell Precision ResourceCD* into the CD-ROM drive, reboot the system, and run the **System Board Devices** test group in the Dell Diagnostics.

If the tests complete successfully, your system is operating properly. If any of the tests fail, see "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting a Damaged Computer

NOTE: Dell Precision WorkStation 420 systems are equipped with *diagnostic LEDs* to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.

If your computer was dropped or damaged, you should check your computer to see if it functions properly. If an external device attached to your computer is dropped or damaged, contact the manufacturer of the device for instructions or see "Getting Help" for information on obtaining technical assistance from Dell. To troubleshoot a damaged computer, perform the following steps:

1. Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. Remove the cover from your desktop chassis or from your mini tower chassis.

3. Check all the expansion card and component connections in the computer.

   Make sure that all cables are properly connected and that all expansion cards and components are properly seated in their connectors and sockets.

4. Replace the computer cover on your desktop chassis or on your mini tower chassis, reconnect the system to an electrical outlet, and reconnect any telephone or telecommunication lines.

5. Insert the *Dell Precision ResourceCD* into the CD-ROM drive, reboot the system, and run the **System Board Devices** test group in the Dell Diagnostics.

If the tests complete successfully, your system is operating properly. If any of the tests fail, see "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting the Battery

⚠ **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.**

NOTE: Dell Precision WorkStation 420 systems are equipped with *diagnostic LEDs* to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.

If an error message indicates a problem with the battery, or if System Setup loses the system configuration information when the computer is turned off, the battery may be discharged.

To troubleshoot the battery, perform the following steps:

1. Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. Remove the cover from your desktop chassis or from your mini tower chassis.

3. Reseat the battery in its socket, ensuring that it is properly seated.

   The battery is a coin cell that snaps into a socket on the system board.

4. If the problem is not resolved, replace the battery.

   Your Dell Precision System 420 uses a 3-V CR2032 coin cell battery.

If the problem is still not resolved, you may have a faulty system board. See "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting Expansion Cards

> *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

If an error message indicates an expansion-card problem or if an expansion card seems to perform incorrectly or not at all, the problem could be a faulty connection, a conflict with software or other hardware, or a faulty expansion card. To troubleshoot expansion cards, perform the following steps:

1. Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. Remove the cover from your desktop chassis or from your mini tower chassis.

3. If you have a mini tower chassis, remove the AGP card brace according to the instructions in "Removing and Replacing the AGP Card Brace."

4. Verify that each expansion card is properly seated in its connector. If any expansion cards are loose, reseat them.

5. Verify that any cables are firmly connected to their corresponding connectors on the expansion cards. If any cables appear loose, reconnect them.

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

6. Remove all expansion cards except the video card.

7. Replace the computer cover on your desktop chassis or on your mini tower chassis, reconnect the system to an electrical outlet, and turn it on.

8. Insert the *Dell Precision ResourceCD* into the CD-ROM drive, reboot the system, and run the **RAM** test group in the Dell Diagnostics.

   If the tests complete successfully, proceed to step 9. If any of the tests fail, see "Getting Help" for information on obtaining technical assistance.

9. Turn off the system, disconnect it from the electrical outlet, and remove the computer cover.

10. Reinstall one of the expansion cards that you removed previously, and repeat steps 7 and 8.

    If any of the tests fail, the expansion card you just reinstalled is faulty and needs to be replaced. If the tests complete successfully, repeat steps 9 and 10 with another expansion card.

11. If you have replaced all the expansion cards removed previously and the expansion card problem is not resolved, see "Getting Help" for information on obtaining technical assistance.

Troubleshooting System Memory

> *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

A computer memory problem can be a faulty Rambus in-line memory module (RIMM) or a faulty system board. If a random-access memory (RAM) error message appears, the computer may have a memory problem.

When you turn on or reboot the system, the Caps Lock and Scroll Lock indicators on the keyboard should flash momentarily and then turn off. If the **Num Lock** option in System Setup is set to **On**, the Num Lock indicator should flash momentarily and then remain on; otherwise, it should turn off. Abnormal operation of these indicators can result from a defective RIMM in socket A. To troubleshoot system memory, perform the following steps:

1. Turn on the system, including any attached peripherals.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. If an error message indicates invalid system configuration information, enter System Setup and check the **System Memory** option. If the amount of memory displayed does not match the amount of memory installed, turn off the computer, disconnect it from the electrical outlet, remove the cover from your desktop chassis or from your mini tower chassis, and reseat the RIMMs in their sockets.

3. Replace the computer cover on your desktop chassis or on your mini tower chassis, reconnect the system to an electrical outlet, and turn it on.

4. If the problem is not resolved, insert the *Dell Precision ResourceCD* into the CD-ROM drive, reboot the system, and run the **RAM** test group in the Dell Diagnostics.

If the Dell Diagnostics identifies a faulty RIMM, replace that RIMM. If the Dell Diagnostics determines that the system board is faulty, or if the Dell Diagnostics does not identify the cause of the problem and the problem is still not resolved, see "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting the Video Subsystem

> *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

Troubleshooting video problems involves determining which of the following is the source of the problem: the monitor, the monitor interface cable, or the integrated video subsystem.

Before you attempt to troubleshoot the video subsystem, perform the procedure found in "Troubleshooting the Monitor" to determine whether the monitor is the source of the problem.

If the monitor is not at fault, perform the following steps:

1. Check the monitor cable connections as indicated in "Checking Connections and Switches."

2. If the problem is not resolved, see your video card documentation for further troubleshooting instructions.

   If any of the tests fail, see "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting the System Board

> *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

A system board problem can result from a defective system board component, a faulty power supply, or a defective component connected to the system board. If an error message indicates a system board problem, perform the following steps:

1. Insert the *Dell Precision ResourceCD* into the CD-ROM drive, and reboot the system. Run the **System Board Devices** test group in the Dell Diagnostics.

   If any of the tests fail, see "Getting Help" for instructions on obtaining technical assistance.

2. Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ CAUTION: Before you remove the computer cover, see "**Safety First—For You and Your Computer.**"

3. Remove the cover from your desktop chassis or from your mini tower chassis.

4. If you have a mini tower chassis, remove the AGP card brace according to the instructions in "Removing and Replacing the AGP Card Brace."

5. Verify that the power cables from the power supply are firmly connected to the connectors on the system board.

6. If you have a mini tower chassis, replace the AGP card brace.

7. Replace the computer cover on your desktop chassis or on your mini tower chassis, reconnect the system to an electrical outlet, and turn it on. If the problem is not resolved, proceed to step 8.

8. Perform the procedure in "Troubleshooting Expansion Cards." If the problem is not resolved, proceed to step 9.

9. Perform the procedure in "Troubleshooting the Keyboard." If the problem is not resolved, proceed to step 10.

10. Perform the procedure in "Troubleshooting a Dead System Board With the RTCRST Jumper."

11. If the problem is still not resolved, see "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting a Dead System Board With the RTCRST Jumper

> *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

If the system cannot boot and you have exhausted all other troubleshooting options, perform the following steps:

1. Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

2. Remove the computer cover.

3. If you have a mini tower chassis, remove the AGP card brace according to the instructions in "Removing and Replacing the AGP Card Brace."

4. Install a jumper plug on the RTCRST jumper pins and then remove it.

5. Replace the computer cover, reconnect the system to an electrical outlet, and turn it on. If the problem is not resolved, see "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting Drives

📝 *NOTE: Dell Precision WorkStation 420 systems are equipped with diagnostic LEDs to help provide information about possible problems. Make note of any LED codes you observe before contacting Dell for technical assistance.*

If the monitor displays a system error message to indicate a drive problem during execution of either the boot routine or the Dell Diagnostics, or if a drive is not operating correctly, perform the following steps:

1. Enter System Setup and verify that the problem drive is configured correctly. Make any necessary changes, and reboot the system.

2. If the problem is not resolved, turn off the system, including any attached peripherals, and disconnect all the AC power cables from their electrical outlets. Also, disconnect any telephone or telecommunication lines from the computer.

⚠ **CAUTION: Before you remove the computer cover, see "Safety First—For You and Your Computer."**

3. Remove the cover from your desktop chassis or from your mini tower chassis.

4. Verify that the DC power cables from the power supply are firmly connected to the connectors on each drive. Also verify that the interface cable for each drive is firmly connected to the drive and to the system board.

5. Replace the computer cover on your desktop chassis or on your mini tower chassis, reconnect the system to an electrical outlet, and turn it on. If the problem is not resolved, proceed to step 6.

6. Insert the *Dell Precision ResourceCD* into the CD-ROM drive, reboot the system, and run the appropriate test group in the Dell Diagnostics.

   If the Dell Diagnostics identifies a faulty drive, replace the drive. If the Dell Diagnostics identifies a faulty controller, the system board may be faulty. See "Getting Help" for instructions on obtaining technical assistance.

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Introduction: Dell Precision™ WorkStation 420 Systems User's Guide

● Overview

● System Features

● Important Note to Microsoft Windows 98 and Windows NT 4.0 Users

● Front Panel

● Back Panel

● Getting Help

Overview

Dell Precision WorkStation 420 systems are high-speed, upgradable workstations, designed around Intel® Pentium® III slot 1 microprocessors. These systems support the high-performance Peripheral Component Interconnect (PCI) bus and the accelerated graphics port (AGP) bus. One of the 32-bit PCI slots has a port extension that supports an optional redundant arrays of independent disks (RAID) card.

NOTE: Dell Precision WorkStation 420 systems do not support the 16-bit Industry-Standard Architecture (ISA) bus.

This section describes the major hardware and software features of the system and provides information you need to reinstall the operating system, if necessary. It also provides information about the indicators and controls on the computer's front panel and discusses connecting external devices to the computer.

System Features

The system offers the following features:

l Single or dual Pentium III microprocessor(s) with a front-side bus with an external speed of 133 MHz.

The Intel Pentium III processor includes MMX™ technology designed to handle complex multimedia and communications software. This microprocessor incorporates an instruction set called Streaming™ SIMD extensions (SSE). SSE allows the microprocessor to process multiple data elements in parallel, thereby improving system performance when you are running application programs written to take advantage of MMX technology. The SSE instruction set includes floating-point single instruction, multiple data (SIMD) to enhance 3D display performance and other multimedia capabilities.

The Intel Pentium III processor also includes the new processor serial number feature, which uniquely identifies each Pentium III processor. This feature can be enabled or disabled (default) (see **CPU Serial Number** in System Setup Options).

The Intel Pentium III processor has a 16-kilobyte (KB) internal data cache and a 16-KB internal instruction cache, an internal math coprocessor, and other advanced internal logic.

A second Pentium III processor single-edge connector cartridge 2 (SECC2) package (of the same type and operating frequency as the installed microprocessor) can be purchased as a kit from Dell. Dual processing improves performance under operating systems that support multiprocessing, such as the Microsoft® Windows NT® 4.0 and Windows® 2000 operating systems.

l A secondary cache of static random-access memory (SRAM) integrated in the microprocessor.

l Self-Monitoring Analysis and Reporting Technology (SMART) support, which warns you at system start-up if the hard-disk drive may be becoming unreliable. To take advantage of this technology, you must have a SMART-compliant hard-disk drive in the computer. All enhanced integrated drive electronics (EIDE) and small computer system interface (SCSI) hard-disk drives shipped with Dell Precision 420 systems are SMART-compliant.

l A 32-bit integrated Crystal SoundFusion CS4614 PCI audio controller that is Sound Blaster Pro-compatible and supports Microsoft DirectSound, DirectSound3D, and wavetable synthesis. See "Using the Integrated Audio Controller" for details.

l System memory of up to 1 gigabyte (GB) on dual Rambus dynamic random-access memory (RDRAM) Rambus in-line memory modules (RIMMs) in the four RIMM slots on the system board (two channels). Memory connectors support four RIMM modules in matched pairs of 64-, 128-, 256-, and 512-megabyte (MB) module capacity.

The memory subsystem also provides error checking and correction (ECC) capability, which corrects all single-bit memory errors and detects all double-bit errors. See "Adding Memory" for details on installing additional memory.

l The system's basic input/output system (BIOS), which resides in flash memory and can be upgraded remotely or by diskette if required.

l Remote Wake Up capability, which, when enabled in the System Setup program, allows the system to be started up from a server management console. Remote Wake Up capability also allows remote computer setup, BIOS upgrades, software downloading and installation, file updates, and asset tracking after hours and on weekends when local area network (LAN) traffic is at a minimum.

l Universal Serial Bus (USB) capability, which simplifies connection of peripheral devices such as keyboards, printers, and speakers. The USB connectors on the system's back panel provides two connection points for multiple USB-compliant devices. USB-compliant devices

can be connected and disconnected while the system is running. USB functionality requires an operating system that supports USB, such as Windows 98. Windows NT 4.0 Service Pack (SP) 5 and earlier do not support USB; however, your Dell Precision WorkStation 420 system supports a USB keyboard through its BIOS.

l A modular computer chassis with a minimum number of screws for easy disassembly and improved serviceability.

l A high-speed, high-resolution AGP or PCI video card. (Documentation from the video card manufacturer is included with the system.) AGP greatly improves graphics performance by providing a dedicated bus for a faster interface between the video subsystem and system memory. AGP also allows conventional memory to be used for video-related tasks.

l An optional LS-120 SuperDisk drive capable of storing up to 120-MB per diskette. The SuperDisk can be installed in place of the standard diskette drive or in one of the externally accessible 5.25-inch bays. LS-120 SuperDisk drives are installed on the secondary EIDE channel.

The system board includes the following integrated features:

l Five 32-bit PCI expansion slots; one PCI slot has an extension for a RAID upgrade.

l One AGP Pro50 (4X) expansion slot (desktop chassis) or one AGP Pro (4X) expansion slot (mini tower chassis).

> NOTE: An AGP Pro110 (4X) graphics adapter expansion card may require the AGP expansion slot and one or two adjacent PCI slots.

l A diskette drive interface, which supports a 3.5-inch diskette drive.

l Ultra Advanced Technology Attachment (ATA)/66 support, which allows fixed hard-disk drives to transfer data at speeds of up to 66 MB per second (MB/sec). The two ATA/66 channels support up to four EIDE devices. The primary and secondary channels utilize the PCI bus to provide faster data throughput. The primary channel supports up to two extremely high-capacity EIDE drives, while the secondary channel supports up to two devices such as EIDE CD-ROM drives and EIDE tape drives.

l SCSI support using two integrated SCSI channels:

  o The primary channel provides Ultra 160/m low-voltage differential (LVD) (160-MB/sec) support for high-performance SCSI hard-disk drives and an optional RAID subsystem that requires an optional RAID card. This channel also supports Ultra2 and Ultra SCSI devices. The maximum total length of the SCSI cable for the primary SCSI channel is 12 meters (m).

  o The secondary channel provides support for external Ultra/Wide (40-MB/sec) SCSI devices, such as scanners, and for internal Narrow SCSI devices, such as CD-ROM drives, tape drives, and optical drives. The maximum total length of the external cable on the secondary channel is .5 m with eight devices or 1 m with four devices.

l Two high-performance serial ports and one bidirectional parallel port for connecting external devices.

l A Personal System/2 (PS/2)-style keyboard port and a PS/2-compatible mouse port.

l An integrated 10/100-megabit-per-second (Mbps) 3Com® PCI Ethernet (3C905C-TX compatible) network interface controller (NIC) with Remote Wake Up support.

l Four dual-color diagnostic light-emitting diodes (LEDs) (visible on the back panel) to indicate problems or operational states.

The following software is included with your Dell™ computer system.

> NOTE: Backup copies of most drivers for your system are included on the Dell Precision ResourceCD. If you need to reinstall any of these drivers, see the documentation that accompanies the CD.

l For systems with Microsoft Windows 98 or Windows NT only, utilities that safeguard the system and enhance the operation of its hardware features; for example, the AutoShutdown service lets you perform an orderly shutdown with a single touch of the power button.

l Graphics drivers for the Microsoft Windows 98, Windows NT 4.0, and Windows 2000 operating systems.

> NOTE: Some video cards support either the Windows NT 4.0 or Windows 2000 operating system. Refer to the documentation that came with your video card for more information.

To change the resolution, check the documentation that came with your monitor to determine the resolutions and refresh rates supported by the monitor. Then check the documentation that came with your AGP or PCI video card for instructions on changing the resolution.

l Optional RAID drivers for the Microsoft Windows NT 4.0 and Windows 2000 operating systems (requires the 1302 RAID card).

l The System Setup program for quickly viewing and changing the system configuration information.

l Enhanced security features (a setup password, a system password, a system password lock option, a write-protect option for diskette drives, and automatic display of the system's service tag number) available through the System Setup program. In addition, a customer-definable asset tag number can be assigned via a software support utility and viewed on the System Setup screens. An integrated chassis intrusion detector is also available.

- [Dell Diagnostics](#) for evaluating the computer's components and devices.

- Network device drivers for several network operating systems. These drivers are described in "[Using the Network Interface Controller](#)."

- (For systems with Microsoft Windows 98, Windows NT, or Windows 2000 only) Desktop Management Interface (DMI) support for managing the computer system. DMI defines the software, interfaces, and data files that enable the system to determine and report information about system components.

  DMI is optional and can be downloaded from **http://support.dell.com/**. To learn more about DMI, double-click the Dell **DMI Help** icon in the **Dell DMI** folder under the **Start** button.

- The optional Dell OpenManage™ IT Assistant program, which is a DMI, Simple Network Management Protocol (SNMP), and Common Information Model (CIM) browser that allows the network administrator to view the computer's current hardware configuration, status, and operating system version. Dell OpenManage IT Assistant provides information you may need if you call Dell for technical assistance or if you install hardware or software in the system. For more information, see the *Dell OpenManage IT Assistant User's Guide* at **http:\\support.dell.com**.

  In addition to providing the client features described in the preceding paragraph, Dell OpenManage IT Assistant enables network administrators to view, manage, and inventory remote systems in a network.

- Advanced Configuration and Power Interface (ACPI) for operating systems that support ACPI functionality.

- Sound drivers.

- SCSI drivers.

Important Note to Microsoft Windows 98 and Windows NT 4.0 Users

Your system was configured by Dell to optimize the features of your computer and of the Microsoft Windows NT 4.0 or Windows 98 operating system. If you need to reinstall either of these operating systems, you must install several supplemental items to return the system to its full functionality. See "[Reinstalling Windows NT 4.0](#)" or "[Reinstalling Windows 98](#)."

Reinstalling Windows NT 4.0

To reinstall the Windows NT 4.0 operating system, you must have the following items:

- *Dell Precision ResourceCD*

- Windows NT 4.0 CD from Dell

- Windows NT 4.0 SCSI controller driver diskettes

- Windows NT 4.0 Service Pack 4 (or later) CD

NOTICE: The drivers for the integrated SCSI controller and RAID solution are not part of the Windows NT 4.0 operating system. Therefore, when you reinstall Windows NT 4.0, you must exit the installation process by pressing <F6> when the system displays the message `Setup is inspecting your hardware configuration`. You must then install the SCSI controller drivers as described in "[Using the Integrated SCSI Controllers,](#)" and then proceed with installing the other supplemental items. If you do not interrupt the installation procedure, the system does not identify the AIC-7899 SCSI controller and locks up.

> NOTE: You must install Windows NT 4. 0 Service Pack 4 or 5 before you install the NIC drivers. Otherwise, the integrated NIC will not function properly.

See the *Dell Microsoft Windows NT Workstation 4.0 Setup Guide* for general installation information for Windows NT 4.0 and for information about other drivers or supplements that may be required. For installation instructions for the various drivers, see the document recommended in the following list:

- Windows NT 4.0 SCSI controller drivers — See the documentation that came with your *Dell Precision ResourceCD.*

- Windows NT 4.0 bus-mastering EIDE driver — See the documentation that came with your *Dell Precision ResourceCD.*

- Windows NT 4.0 video drivers — See the documentation for your video card.

- Windows NT 4.0 NIC driver — See the documentation that came with your *Dell Precision ResourceCD.*

- Windows NT 4.0 audio drivers — See the documentation that came with your *Dell Precision ResourceCD.*

Reinstalling Windows 98

To reinstall the Windows 98 operating system, you must have the following items:

- Windows 98 CD from Dell

- *Dell Precision ResourceCD*

- SCSI boot diskette

See the *Dell Microsoft Windows 98 Setup Guide* for general installation information for Windows 98 and for information about other drivers or supplements that may be required. For installation instructions for the various drivers, see the document reccommended in the following list:

- Windows 98 SCSI controller drivers — See the documentation that came with your *Dell Precision ResourceCD*.

- Windows 98 video drivers — See the documentation for your video card.

- Windows 98 NIC driver — See the documentation that came with your *Dell Precision ResourceCD*.

- Windows 98 audio drivers — See the documentation that came with your *Dell Precision ResourceCD*.

Front Panel

The computer's front panel contains the following indicators and controls (see [Figure 1](#) for the desktop chassis or [Figure 2](#) for the mini tower chassis):

- The *power button* controls the system's DC input power. When the system is turned off, pressing the power button turns the system on. When the system is on, the power button operates as follows:

    - In Windows NT, if the Dell AutoShutdown service is operational, the system performs an orderly operating system shutdown before turning off.

      If the Dell AutoShutdown service is not operational, the system turns off without writing unsaved data to the disk. This could result in a loss of data.

    - In Windows 2000, the system performs an orderly operating system shutdown before turning off. However, the power button can be configured to put the computer in a low-power sleep state.

      When the system is on, the power indicator LED displays a solid green. When the system is in a software-induced sleep state, the power indicator displays a blinking green. When you press the power button to turn off the system, the power indicator turns off; however, the power supply maintains a low-voltage (standby) current. To completely remove all power from the system, unplug the DC power cable from its electrical outlet and disconnect the network and telephone cables.

    For systems running Microsoft Windows NT with the Dell AutoShutdown service operational, pressing the power button causes the system to perform an orderly operating system shutdown before turning off.

    > NOTE: A Display Power Management Signaling (DPMS) monitor does not begin warming up until the computer to which it is attached is turned on. Thus, some DPMS monitors may not display a video image until several seconds after you turn on the computer.

- The *power indicator* LED is green during normal system operation and blinks green when the computer is in sleep mode.

- The *hard-disk drive access* LED lights up when a hard-disk drive is in use.

> NOTE: The power and hard-disk drive access LEDs are also used to display [diagnostic codes](#).

- The *diskette-drive access indicator* lights up when the diskette drive is in use. (The drive access indicator for the tape drive is located on the front of the drive.)

- The *reset button* reboots (restarts) the system without your having to turn the power off and then on again. Rebooting the system in this manner reduces stress on system components.

Figure 1. Desktop Chassis Front Panel
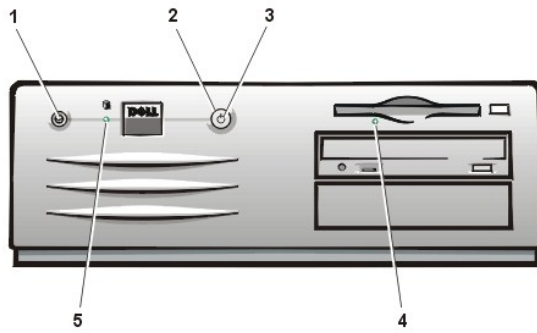
1	Reset button
2	Power button
3	Power indicator
4	Diskette-drive access indicator
5	Hard-disk drive access indicator

Figure 2. Mini Tower Chassis Front Panel
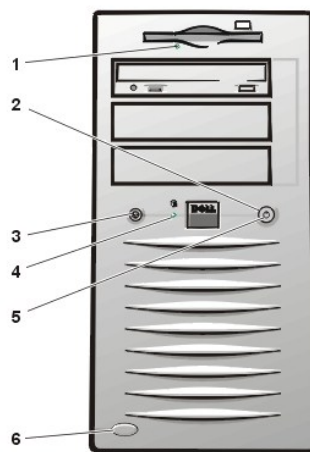
1	Diskette-drive access indicator
2	Power button
3	Reset button
4	Hard-disk drive access indicator
5	Power indicator
6	Chassis door latch release button

Back Panel

The computer's back panel contains various ports and connectors for attaching external devices and includes a security cable slot. These features are described in the following subsections.

For information about enabling, disabling, or configuring input/output (I/O) ports and connectors, see "Using System Setup." For detailed descriptions and illustrations of each port and connector on the back panel, see "I/O Ports and Connectors."

Connecting External Devices

You can connect various external devices, such as a mouse and printer, to the I/O ports and connectors on the computer's back panel. The system BIOS detects the presence of most external devices when you boot or reboot the system. When connecting external devices to the computer, follow these guidelines:

ι Check the documentation that came with the device for specific installation and configuration instructions.

For example, most devices must be connected to a particular I/O port or connector to operate properly. Also, external devices such as a mouse or printer usually require you to load software files called *device drivers* into system memory before they will work. These device drivers help the computer recognize the external device and direct its operation.

ι Dell recommends that you attach external devices *only while the computer is turned off* unless you are instructed otherwise in the documentation for the particular device. Then turn the computer on before turning on any external devices unless the documentation for the device specifies otherwise. (If the computer does not seem to recognize the device, try turning on the device before turning on the computer.)

NOTICE: When you disconnect external devices from the back of the computer, wait 10 to 20 seconds after disconnecting the computer from the electrical outlet before you disconnect the device to avoid possible damage to the system board.

Security Cable Slot and Padlock Ring

On the back of the computer are a security cable slot and padlock ring (see Figure 3 for the desktop chassis or Figure 4 for the mini tower

chassis) for attaching commercially available theft-deterrent devices. Security cables for personal computers usually include a segment of galvanized cable with an attached locking device and key. To prevent unauthorized removal of the computer, loop the cable around an immovable object, ensure the padlock ring is in its closed position, insert the locking device into the security cable slot on the back of the computer, and lock the device with the key provided. Complete instructions for installing this kind of theft-deterrent device are usually included with the device.

> NOTE: Theft-deterrent devices are of differing designs. Before you purchase such a device, make sure it will work with the cable slot on the computer.

The padlock ring allows you to secure the computer cover to the chassis to prevent unauthorized access to the inside of the computer. To use the padlock ring, slide the padlock ring to its closed position, insert a commercially available padlock through the ring, and then lock the padlock.

Figure 3. Desktop Chassis Security Cable Slot and Padlock Ring

1 Padlock ring

2 Security cable slot

Figure 4. Mini Tower Chassis Security Cable Slot and Padlock Ring

1 Security cable slot

2 Padlock ring
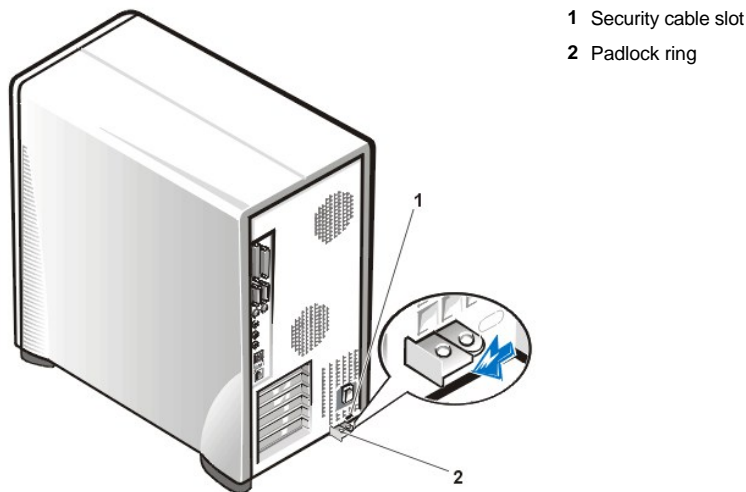
Getting Help

If at any time you do not understand a procedure described in this guide or if the system does not perform as expected, Dell provides a number of tools to help you. For more information on these help tools, see "Getting Help."

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Overview

Your application programs, operating system, and the computer itself are capable of identifying problems and alerting you to them. When a problem occurs, a message may appear on your monitor screen or a beep code may sound. See "System Messages" or "System Beep Codes" for information about each message or beep code.

System Messages

If you receive a system message, see Table 1 for suggestions on resolving any problems indicated by the message. The system messages are listed alphabetically.

📝 *NOTE: If the system message you received is not listed in the table, check the documentation for the application program that you were running at the time the message appeared and/or the operating system documentation for an explanation of the message and a recommended action.*

Table 1. System Messages

Message	Cause	Action
Address mark not found	The basic input/output system (BIOS) found a faulty disk sector or could not find a particular disk sector.	See "Troubleshooting Drives."
Alert! Card-cage fan not detected.	Expansion card cage fan is not installed in mini tower chassis; expansion card cage fan has failed; expansion card cage fan is not connected to the system board.	Ensure that an operational expansion card cage fan is installed and connected to the system board.
Alert! Cover was previously removed.	The computer cover was removed.	Reset Chassis Intrusion in System Setup.
Alert! Hard drive thermal probe not detected.	No hard-disk drive thermal probe is installed; system has a defective thermal probe; thermal probe cable is not connected to the control panel.	Ensure that an operational hard-disk drive thermal probe is installed and connected to the control panel.
Alert! Power supply fan failure.	Power supply fan has failed or is blocked.	Ensure that an operational power supply fan is installed and that chassis ventilation slots are not blocked.
Alert! Previous card-cage fan failure.	Expansion card cage fan has failed or is blocked.	Ensure that an operational expansion card cage fan is installed, connected to the system board, and that chassis ventilation slots are not blocked.
Alert! Previous hard drive temperature failure.	Hard-disk drive(s) exceeded recommended operating temperature range during the previous operating session.	Ensure that fans are operational and that chassis ventilation slots are not blocked.
Alert! Previous power supply fan failure.	Power supply fan failed or was blocked during the previous operating session.	Ensure that an operational power supply fan is installed and that chassis ventilation slots are not blocked.
Alert! Previous shutdown due to thermal event.	Microprocessor(s) or hard-disk drive(s) exceeded recommended operating temperature range during the previous operating session. System was shut down to protect the components.	Ensure that fans are operational and that chassis ventilation slots are not blocked.

Alert! Previous system fan failure.	System fan failed or was blocked during the previous operating session.	Ensure that an operational system fan is installed, connected to the system board, and that chassis ventilation slots are not blocked.
Alert! Previous temperature failure at Processor 0.	Processor 0 exceeded its recommended operating temperature range during the previous operating session.	Ensure that an operational processor fan is installed, connected to the system board, and that chassis ventilation slots are not blocked.
Alert! Previous temperature failure at Processor 1.	Processor 1 exceeded its recommended operating temperature range during the previous operating session.	Ensure that an operational processor fan is installed, connected to the system board, and that chassis ventilation slots are not blocked.
Alert! Previous voltage failure.	System voltage exceeded or fell below acceptable thresholds.	See "Troubleshooting the System Board."
Alert! Processor 0 failed Build-In Self Test (BIST).	Processor 0 is faulty or improperly seated.	Reseat or replace processor 0.
Alert! Processor 1 failed Build-In Self Test (BIST).	Processor 1 is faulty or improperly seated.	Reseat or replace processor 1.
Alert! Processor Cache Size Mismatch.	Two processors with different L2 cache sizes are installed.	Replace one of the processors so that the L2 cache sizes match, or install a termination card in PROC_1 slot on system board.
Alert! Processor Speed Mismatch. Install like processors or one processor and a termination card.	Two processors that are not of the same speed are installed.	Replace one of the processors so that the speeds match, or install a termination card in PROC_1 slot on system board.
Alert! Processor Type Mismatch. Install like processors or one processor and a termination card.	Two processors that are not of the same type are installed.	Replace one of the processors so that the types match, or install a termination card in PROC_1 slot on system board.
Alert! Single-bit memory error previously detected in XXXXh.	Faulty or improperly seated RIMMs or defective system board.	See "Troubleshooting System Memory." See "Troubleshooting the System Board."
Alert! System battery voltage is low.	System battery is providing inadequate voltage.	See "Troubleshooting the Battery."
Alert! System fan not detected.	No system fan is installed; system fan has failed; system fan is not connected to the system board.	Ensure that an operational system fan is installed and connected to the system board.
Alert! Uncorrectable memory error previously detected in XXXXh.	RIMMs are faulty or improperly seated, or system board is defective.	See "Troubleshooting System Memory." See "Troubleshooting the System Board."
Alert! Unsupported high power AGP Pro video adapter detected. System halted!	A high-power AGP Pro110 video adapter is installed in the desktop chassis.	Replace the AGP Pro110 video adapter with an AGP Pro50 video adapter.
Attachment failed to respond	The diskette drive or hard-disk drive controller cannot send data to the associated drive.	See "Troubleshooting Drives."
Bad command or file name	The command you entered does not exist or is not in the pathname you specified.	Make sure you have spelled the command correctly, placed spaces in the proper location, and used the correct pathname.
Bad error-correction code(ECC) on disk read	The diskette drive or hard-disk drive controller detected an uncorrectable read error.	See "Troubleshooting Drives."
Controller has failed	The hard-disk drive or the associated controller is defective.	See "Troubleshooting Drives."
Data error	The diskette or hard-disk drive cannot read the data.	Run the ScanDisk utility in the Microsoft® Windows® operating system to check the file structure of the diskette or hard-disk drive. See your operating system documentation for more information. If you are using another operating system, run the appropriate utility to check the file structure of the diskette or hard-disk drive. See your operating system documentation.
Decreasing available memory	One or more Rambus in-line memory modules (RIMMs) may be	See "Troubleshooting System Memory."

	faulty or improperly seated.	

`Diskette drive 0 seek failure`
 	
`Diskette drive 1 seek failure`
	A cable may be loose, or the system configuration information may not match the hardware configuration.	See "Troubleshooting Drives."

`Diskette read failure`	A cable may be loose, or the diskette may be faulty.	See "Troubleshooting Drives."
`Diskette subsystem reset failed`	The diskette drive controller may be faulty.	Run the **Diskette** tests in the Dell Diagnostics.
`Drive not ready`	No diskette is in the drive. The operation requires a diskette in the drive before it can continue.	Put a diskette in the drive or close the drive latch.
`Diskette write protected`	The diskette write-protect feature is activated.	Remove the diskette from drive A and move the write-protect tab to the unlocked position.
`Gate A20 failure`	One or more RIMMs may be loose.	See "Troubleshooting System Memory."
`General failure`	The operating system is unable to carry out the command.	This message is usually followed by specific information—for example, `PRINTER OUT OF PAPER`. Respond by taking the appropriate action.
`Hard disk configuration error`	The hard-disk drive failed initialization.	See "Troubleshooting Drives."

`Hard disk controller failure`
 	
`Hard disk failure`
 	
`Hard-disk drive read failure`
	The hard-disk drive failed initialization.	See "Troubleshooting Drives."

`Invalid configuration information - please run SETUP program`	The system configuration information does not match the hardware configuration.	Enter System Setup and correct the system configuration information.

`Keyboard clock line failure`
 	
`Keyboard controller failure`
 	
`Keyboard data line failure`
 	
`Keyboard failure`
 	
`Keyboard stuck key failure`
	A cable or connector may be loose, or the keyboard or keyboard/mouse controller may be faulty.	See "Troubleshooting the Keyboard."

`Memory address line failure at address, read value expecting value`	One or more RIMMs may be faulty or improperly seated.	See "Troubleshooting System Memory."
`Memory allocation error`	The software you are attempting to run is conflicting with the operating system or another application program or utility.	Turn off the computer, wait 30 seconds, and then turn it on. Try to run the program again. If the problem persists, contact the software company.

`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`
	One or more RIMMs may be faulty or improperly seated.	See "Troubleshooting System Memory."

`Memory size in CMOS invalid`	The amount of memory recorded in the system configuration information does not match the memory installed in the computer.	Reboot the computer. If the error appears again, see "Getting Help" for instructions on obtaining technical assistance.
`Memory tests terminated by keystroke`	The memory test did not complete.	Rerun the memory test.
`No boot device available`	The computer cannot find the diskette or hard-disk drive.	Enter System Setup, check the system configuration information for the diskette and hard-disk drive, and if necessary, correct the information.
`No boot sector on hard-disk drive`	The system configuration information in System Setup may be incorrect, or the operating system	Enter System Setup, check the system configuration information for the hard-disk drive, and if necessary, correct the

| | may be corrupted. | information. |
		If the message persists, reinstall your operating system. See the documentation that came with your operating system.
`No timer tick interrupt`	A chip on the system board might be malfunctioning.	Run the **System Board Devices** tests in the Dell Diagnostics.
`Non-system disk or disk error`	The diskette in drive A or your hard-disk drive does not have a bootable operating system installed on it.	A nonbootable diskette is in drive A. Either replace the diskette with one that has a bootable operating system, or remove the diskette from drive A and restart the computer.
`Not a boot diskette`	There is no operating system on the diskette.	Boot the computer with a diskette that contains an operating system.
`Plug and Play Configuration Error`	The system has encountered a problem in trying to configure one or more expansion cards.	Turn your system off and unplug it. Remove all but one of the cards. Plug in your system and reboot it. If the message persists, the expansion card may be malfunctioning. If the message does not appear, turn off the power and reinsert one of the other cards. Repeat this process until you identify the malfunctioning card.
`Processor or termination card not installed!`	No secondary processor or termination card is installed.	Ensure that either a processor or termination card is installed in PROC_1 slot on system board.

`Read fault`
 	
`Requested sector not found`
	The operating system cannot read from the diskette or hard-disk drive.
	
	The system could not find a particular sector on the disk, or the requested sector is defective.
		See "Troubleshooting Drives."

`Reset failed`	The disk reset operation failed.	See "Troubleshooting Drives."
`Sector not found`	The operating system is unable to locate a sector on the diskette or hard-disk drive.	See "Troubleshooting Drives."
`Seek error`	The operating system is unable to find a specific track on the diskette or hard-disk drive.	If the error is on the diskette drive, try another diskette in the drive.
`Shutdown failure`	A chip on the system board might be malfunctioning.	Run the **System Board Devices** tests in the Dell Diagnostics.
`Time-of-day clock stopped`	The battery may be dead.	Enter System Setup and correct the date or time. If the problem persists, see "Troubleshooting the Battery."
`Time-of-day not set`	The time or date displayed in the system configuration information does not match the system clock.	Enter System Setup and correct the date or time.
`Timer chip counter 2 failed`	A chip on the system board might be malfunctioning.	Run the **System Board Devices** tests in the Dell Diagnostics.
`Unexpected interrupt in protected mode`	The keyboard controller may be malfunctioning, or one or more RIMMs may be loose.	Run the **System Memory** and the **Keyboard** tests in the Dell Diagnostics.
`WARNING:Dell's Disk Monitoring System has detected that drive [0/1] on the [primary/secondary] EIDE controller is operating outside of normal specifications. It is advisable to immediately back up your data and replace your hard-disk drive by calling your support desk or Dell Computer Corporation.`	Power-on self-test (POST) has queried the enhanced integrated drive electronics (EIDE) drive for status information. The drive has returned a parameter from the call that indicates it has detected possible error conditions for its operating specifications.	When your computer finishes booting, immediately back up your data and replace your hard-disk drive. Restore the data to the replaced drive. If a replacement drive is not immediately available and the drive is not the only bootable drive, enter System Setup and change the appropriate drive setting to **None**. Remove the drive from the system. This should be done only after you have backed up the data.
`Write fault`	The operating system cannot write to the diskette or hard-disk drive.	See "Troubleshooting Drives."

Write fault on selected drive		

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

System Beep Codes

When errors occur during a boot routine that cannot be reported on the monitor, your computer may emit a series of beeps that identify the problem. The beep code is a pattern of sounds: for example, one beep, followed by a second beep, and then a burst of three beeps (code 1-1-3) means that the computer was unable to read the data in nonvolatile random-access memory (NVRAM). This information is invaluable to the Dell support staff if you need to call for technical assistance.

When a beep code is emitted, write it down on a copy of the Diagnostics Checklist and then look it up in Table 2. If you are unable to resolve the problem by looking up the meaning of the beep code, use the Dell Diagnostics to identify a more serious cause. If you are still unable to resolve the problem, see "Getting Help" for instructions on obtaining technical assistance.

Table 2. System Beep Codes

Code	Cause	Action
1-1-2	Microprocessor register failure	See "Getting Help" for instructions on obtaining technical assistance.
1-1-3	NVRAM unreadable	Run the **System Board Devices** tests in the Dell Diagnostics.
1-1-4	ROM BIOS checksum failure	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
1-2-1	Programmable interval timer	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
1-2-2	Direct memory access (DMA) initialization failure	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
1-2-3	DMA page register read/write failure	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
1-3	Video Memory Test failure	Run the **VESA/VGA Interface** tests in the Dell Diagnostics.
1-3-1	RIMMs not being properly identified or used	See "Troubleshooting System Memory."
1-3-2	No RIMM detected	Install RIMM pair or reseat RIMMs.
1-3-3 through 2-4-4	RIMMs not being properly identified or used	See "Troubleshooting System Memory."
3-1-1	Slave DMA register failure	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
3-1-2	Master DMA register failure	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
3-1-3	Master interrupt mask register failure	See "Getting Help" for instructions on obtaining technical assistance.
3-1-4	Slave interrupt mask register failure	See "Getting Help" for instructions on obtaining technical assistance.
3-2-2	Interrupt vector loading failure	See "Getting Help" for instructions on obtaining technical assistance.
3-2-4	Keyboard Controller Test failure	Run the **Keyboard** tests in the Dell Diagnostics. Otherwise, see "Getting Help" for instructions on obtaining technical assistance.
3-3-1	NVRAM power loss	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
3-3-2	NVRAM configuration	Run the **System Board Devices** tests in the Dell Diagnostics, if possible.
3-3-4	Video Memory Test failure	Run the **VESA/VGA Interface** tests in the Dell Diagnostics.
3-4-1	Screen initialization failure	Run the **VESA/VGA Interface** tests in the Dell Diagnostics.
3-4-2	Screen retrace failure	Run the **VESA/VGA Interface** tests in the Dell Diagnostics.
3-4-3	Search for video ROM failure	Run the **VESA/VGA Interface** tests in the Dell Diagnostics.
4-2-1	No time tick	See "Getting Help" for instructions on obtaining technical assistance.
4-2-2	Shutdown failure	See "Getting Help" for instructions on obtaining technical assistance.
4-2-3	Gate A20 failure	See "Getting Help" for instructions on obtaining technical assistance.
4-2-4	Unexpected interrupt in protected mode	See "Getting Help" for instructions on obtaining technical assistance.
4-3-1	Memory failure above address 0FFFFh	Run the **System Memory** tests in the Dell Diagnostics.
4-3-3	Timer-chip counter 2 failure	See "Getting Help" for instructions on obtaining technical assistance.
4-3-4	Time-of-day clock stopped	See "Getting Help" for instructions on obtaining technical assistance.
4-4-1	Serial or parallel port test failure	Run the **Serial Ports** and the **Parallel Ports** tests in the Dell Diagnostics.
4-4-2	Failure to decompress code to shadowed memory.	Run the **System Board Devices** tests in the Dell Diagnostics.

4-4-3	Math-coprocessor test failure	Run the **System Board Devices** tests in the Dell Diagnostics.
5-2-2-1	Mismatch RDRAM device count; unsupported RIMM device count or technology	Replace RIMM pair with supported matching device count.
5-2-2-2	Mismatch RDRAM technology or timing pair; unsupported RIMM timing	Replace RIMM pair with matching technology and timing.
5-2-2-3	RDRAM levelization failure	Reseat RIMMs and C-RIMMs or replace faulty or unsupported RIMMs.
NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.		

Warning Messages

A warning message alerts you to a possible problem and asks you to do something before execution continues. For example, before you format a diskette, a message may warn you that you may lose all data on the diskette as a way to protect against inadvertently erasing or writing over the data. These warning messages usually interrupt the procedure and require you to respond by typing a `y` (yes) or `n` (no).

NOTE: Warning messages are generated by either your application programs or your operating system. See "Software Checks" and the documentation that came with your operating system and application programs.

Diagnostics Messages

When you run a test group or subtest in the Dell Diagnostics, an error message may result. These particular error messages are not covered in this section. Record the message on a copy of your Diagnostics Checklist. Also see "Getting Help" for instructions on obtaining technical assistance.

Diagnostic LEDs

Light-emitting diodes (LEDs) are located on the front panel and back panel of the chassis. These LEDs display diagnostic codes that can help you troubleshoot a system problem. The following sections describe the meaning of the diagnostic codes.

⚠ **CAUTION: Before servicing any components inside your computer, see "Safety First—For You and Your Computer."**

Front Panel LEDs

Table 3 lists the codes for the front panel diagnostic LEDs, probable causes, and suggested corrective actions.

Table 3. Front Panel Diagnostic LED Codes

Power LED Code	Hard-Disk Drive LED Code	Cause	Action
Blinking yellow	Off	System power supply has failed.	See "Getting Help" for instructions on obtaining technical assistance.
Blinking yellow	Solid green	Voltage regulator on the system board has failed.	See "Getting Help" for instructions on obtaining technical assistance.
Solid yellow	N/A	A device on the system board may be faulty or is incorrectly installed.	Be sure that each microprocessor is properly seated, remove all expansion cards, and then reboot. If the system does not boot, see "Getting Help" for instructions on obtaining technical assistance.
Solid green *and a beep code* during POST	N/A	A problem was detected while the BIOS was executing.	See Table 2 for instructions on diagnosing the beep code.
Solid green power indicator *and no beep code and no video* during POST	N/A	The monitor or the graphics card may be faulty.	See "Troubleshooting the Monitor." If the monitor is operating properly and is correctly connected, see "Getting Help" for instructions on obtaining technical assistance.
Solid green power indicator *and no beep code but the system locks up during POST*	N/A	An integrated system board device may be faulty.	See "Getting Help" for instructions on obtaining technical assistance.
NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.			

Back Panel LEDs

When you turn on your system, it performs a power-on-self-test (POST), which is a series of self-diagnostic checks. A successful POST ends with
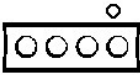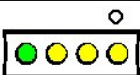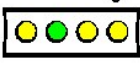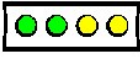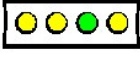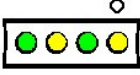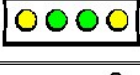
a single beep that signifies the start of normal operation. If the system fails to emit the single beep or appears to stop responding during POST, a series of LEDs located at the back of the computer can help you understand which POST test failed or why the system stopped responding. These LEDs indicate problems encountered during POST only, not during normal operation.
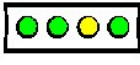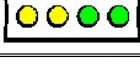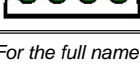
The LED patterns described in Table 4 can help you determine what to do to resolve the problem. If a problem resolution requires you to open the computer chassis, refer to "Working Inside Your Computer" for precautionary steps to take prior to performing the suggested action. If the problem persists after you perform the suggested problem resolution(s), contact Dell Technical Support for further help.

Table 4 lists the LED patterns for the back panel diagnostic LEDs, probable causes, and suggested corrective actions. The LED patterns are shown as they appear on the mini tower chassis. If you have a desktop chassis, locate the small circle by the top LED on your computer; this circle is shown in each LED pattern in Table 4. Use this circle to match the LED pattern your computer is displaying with one of the patterns shown in Table 4.

Table 4. Back Panel Diagnostic LED Codes

Key: Led OFF ◯   **LED Yellow** 🟡   **LED Green** 🟢

State	LED pattern	Problem Description	Suggested Resolution
S0	◯ ◯◯◯◯	Normal off condition or possible pre-BIOS failure	Check the power LED on the front panel to determine if the system is receiving proper power. See Table 3 for front panel LED codes.
S1	◯ 🟢◯◯◯	BIOS checksum failure was detected and the system is now in recovery mode	Insert the BIOS recovery diskette and wait for recovery completion.
S2	◯ 🟡🟢🟡🟡	Possible processor failure	Reseat the processor(s) and, if present, the terminator card and restart the system to retest.
S3	◯ 🟢🟢🟡🟡	Possible memory failure	Reseat all memory RIMMs and, if present, the C-RIMMS and restart the system to retest.
S4	◯ 🟡🟡🟢🟡	Possible expansion card failure	Remove each expansion card individually and restart the system to retest. Reinstall the expansion card(s) one at a time and restart the system to retest. Move each expansion card, one at a time, to another PCI slot and restart the system to retest.
S5	◯ 🟢🟡🟡🟡	Possible video card failure	Reseat the video card and restart the system to retest.
S6	◯ 🟡🟡🟡🟡	Possible diskette drive or hard-disk drive failure	Reseat all power and data cables and restart the system to retest.
S7	◯ 🟢🟡🟡🟡	Possible USB failure	Reseat all USB devices and cables and restart the system to retest.

S9		Possible system board failure	Remove any internal options recently added and restart the system to retest.
S11		Possible system board resource conflict	Remove any internal options recently added and restart the system to retest.
S12		Possible system board resource conflict	Remove any internal options recently added and restart the system to retest.
S14		Possible system board resource conflict	Remove any internal options recently added and restart the system to retest.
S15		Normal operating condition after POST	None

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

Simple Network Management Protocol (SNMP) Platform Event Traps

Your system can generate several SNMP platform event trap (PET) messages that are sent to network management software to inform the network manager that specific events have occurred on your system.

Table 5 lists the SNMP platform event traps your system may generate.

Table 5. SNMP Platform Event Traps

Description	Code
BIOS boot failure	02 03 23 6f 00
Fan failure	02 03 04 06 01
Chassis intrusion	02 03 05 6f 00
Temperature failure	02 03 01 06 01
Invalid password	02 03 06 6f 01
Voltage failure	02 03 02 06 01
SOS enable / PC presence	02 03 25 6f 00

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Using the Network Interface Controller: Dell Precision™ WorkStation 420 Systems User's Guide

- Overview

- Connecting to a Network

- Reinstalling the NIC Drivers

Overview

This section describes how to connect your computer system to an Ethernet network using the integrated 3Com® Peripheral Component Interconnect (PCI) 3C920 (3C905C-TX compatible) network interface controller (NIC). The NIC provides all the functions normally provided by a separate network expansion card, but does not require a slot in the system.

The integrated NIC includes a Remote Wake Up feature that enables the computer to be started up by a special local area network (LAN) signal from a server management console. Wakeup On LAN capability allows remote computer setup, basic input/output system (BIOS) upgrades, software downloading and installation, file updates, and asset tracking after hours and on weekends when LAN traffic is typically at a minimum.

> NOTES: The Wakeup On LAN feature functions even when the computer is turned off; however, the computer must be plugged into a working electrical outlet at all times, have a valid network connection at all times, and must be shut down in the normal method expected by the operating system. Thus, if you disconnect the system power cable from the electrical outlet, if a power failure occurs, or if you shut down the system abnormally, the Wakeup On LAN feature will not work.
>
> The link-integrity and activity indicators on the NIC connector (see Figure 1) remain active whenever the computer is plugged in, whether or not the computer is turned off, and whether or not the **Network Interface Controller** and **Remote Wake Up** options are enabled in System Setup.

This section also provides instructions for configuring the NIC under the following operating systems:

- Microsoft® Windows NT® 4.0

- Microsoft Windows® 98

- Microsoft Windows 2000

> NOTE: The NIC drivers for systems running Dell-installed Windows operating systems are installed at the factory. Instructions for reinstalling these NIC drivers are included in the documentation that came with your Dell Precision Resource CD.

The NIC connector on the computer's back panel (see Figure 1) has the following indicators:

- A yellow *activity indicator* flashes when the system is transmitting or receiving network data. (A high volume of network traffic may make this indicator appear to be in a steady "on" state.)

- A dual-colored *link integrity and speed indicator*, which lights up green when there is a good connection between a 10-Mbps network and the NIC, or it lights up orange when there is a good connection between a 100-Mbps network and the NIC. When the orange or green indicator is off, the computer is not detecting a physical connection to the network.

> NOTE: The activity and link integrity and speed indicator remain active even if the system is turned off or if the NIC is disabled in System Setup.

Figure 1. NIC Connector and Indicators
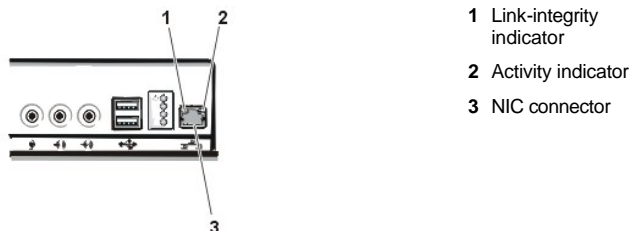
1 Link-integrity indicator

2 Activity indicator

3 NIC connector

Connecting to a Network

To connect your system to and configure it for use on an Ethernet network, perform the following steps:

1. Connect the network cable to the back of your computer.

2. Verify that the NIC is enabled in the System Setup program.

3. Install the network driver, if necessary.

   For instructions, see the documentation that came with your *Dell Precision Resource CD*.

4. Run the Network Interface Test Group in the Dell™ Diagnostics to verify that the NIC is operating properly.

   See "Starting the Dell Diagnostics" for detailed instructions.

Network Cable Requirements

The network adapter connector attaches an unshielded twisted pair (UTP) Ethernet cable to your computer. Press one end of the UTP cable to an RJ45 jack wall plate or to an RJ45 port on a UTP concentrator or hub, depending on your network configuration, and press the other end of the UTP cable into the network adapter connector until the cable snaps securely into place.

Observe the following cabling restrictions for 10BASE-T and 100BASE-TX networks:

l Dell recommends the use of Category 5 wiring and connectors for networks.

l Voice and data lines should be in separate sheaths.

l The maximum cable run length (from a workstation to a concentrator) is 100 meters (m) (328 feet [ft]).

l The maximum number of workstations (not counting concentrators) on a network is 1024.

l The maximum number of daisy-chained concentrators on one network segment is four.

Setting the Network Frame Type

This section describes how to set the network frame type for an Internetwork Packet eXchange/Sequenced Packet eXchange (IPX/SPX)-compatible network protocol.

NOTE: The default frame type **Auto** is optimal for most installations. For more information concerning frame types, contact your network administrator or Internet Service Provider (ISP).

If your system is connected to a network, perform the following steps:

1. Right-click the **Network Neighborhood** icon on the Windows desktop, and click **Properties** in the pop-up menu.

2. Under the **Configuration** tab in the **Network** window, click **IPX/SPX-compatible Protocol** if it is not already selected.

3. Click **Properties** to open the **IPX/SPX-compatible Protocol Properties** window.

4. Click the **Advanced** tab, and then select **Frame Type** from the **Property** list.

5. Select the appropriate frame type (according to your network requirements) from the **Value** menu, and click **OK**.

6. Follow the instructions on your screen to complete the configuration.

Reinstalling the NIC Drivers

For information on how to reinstall the NIC driver, see the documentation that came with your *Dell Precision ResourceCD*.

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Temporary file. Delete before release.

Using the Integrated SCSI Controllers: Dell Precision™ WorkStation 420 Systems User's Guide

● Overview

● Reinstalling SCSI Drivers

● SCSI Device Considerations

Overview

This section provides instructions for installing drivers for the integrated dual-channel Adaptec 7899 Ultra160/m low-voltage differential (LVD) small computer system interface (SCSI) controller. This controller provides transfer rates of up to 160 megabytes per second (MB/sec) with LVD hard-disk drives on the primary channel, and up to 40 MB/sec with non-LVD hard-disk drives on the secondary channel. The primary channel also supports Ultra2 and Ultra SCSI. The desktop chassis supports up to two hard-disk drives, and the mini tower chassis supports up to four hard-disk drives.

> *NOTES: To achieve 160-MB/sec data transfer rates on the primary SCSI channel, you must use LVD hard-disk drives and either an LVD terminator or a multimode terminator.*
>
> *If you install a mix of LVD and non-LVD hard-disk drives, the system can only achieve 40-MB/sec data transfer rates for all SCSI drives. In addition, the LVD drives in this mix must be capable of reverting to 40 MB/sec. In this configuration, you can terminate the SCSI subsystem with either a single-ended or multimode terminator.*
>
> *Dell ships multimode terminators only, regardless of system configuration.*
>
> *The maximum total length of the SCSI cable for the primary SCSI channel is 12 meters (m). The maximum total length of the SCSI cable for the secondary SCSI channel is 0.5 m with eight devices or 1 m with four devices.*
>
> *The total number of SCSI devices connected to the secondary 7899 controller, both internally and externally, cannot exceed 15.*


SCSI Device Considerations

The 5.25-inch externally accessible drive bays at the front of the computer are used for non-hard-disk drive devices such as CD-ROM drives and/or tape drives. These can be enhanced integrated drive electronics (EIDE) or SCSI devices.

NOTICE: Your hard-disk drive subsystem must consist of either SCSI hard-disk drives or EIDE hard-disk drives. Dell does not support a mix of both types of hard-disk drives.

The desktop chassis has two internal drive bays (located in the drive cage next to the externally accessible drive bays; see Figure 1) that can accommodate either two SCSI hard-disk drives or two EIDE hard-disk drives. Internal hard-disk drives are mounted vertically in a removable drive bracket that can contain two 1.6-inch hard-disk drives.

> *NOTE: Dell supports only the drives it furnishes.*

Figure 1. Internal Drive Bays (Desktop Chassis)
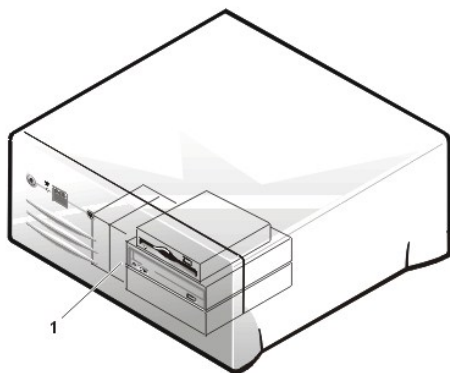
1 Two-bay hard-disk drive cage (internal)

The mini tower chassis has four internal drive bays (located in the drive cage beneath the externally accessible drive bays; see Figure 2) that can accommodate either two EIDE hard-disk drives or four SCSI hard-disk drives. Internal hard-disk drives are mounted vertically in a removable drive bracket that can contain four 1-inch hard-disk drives, two 1-inch and two 1.6-inch hard-disk drives, or three 1.6-inch hard-disk drives.

Figure 2. Internal Drive Bays (Mini Tower Chassis)
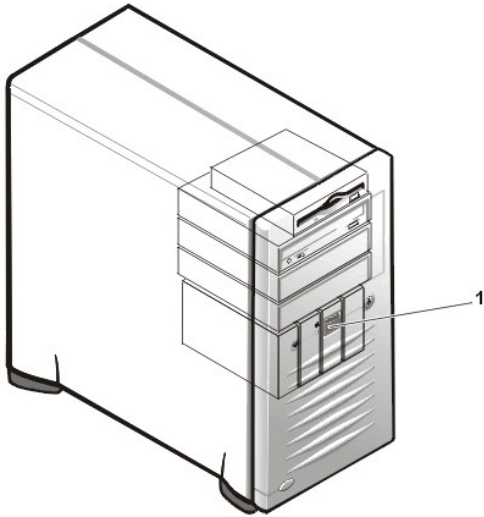
1 Four-bay hard-disk drive cage (internal)

See "Installing SCSI Devices" for detailed information about installing drives in the externally accessible or internally accessible drive bays.

Reinstalling SCSI Drivers

Dell installed the SCSI drivers for your system on your system's hard-disk drive. Backup copies of these drivers are provided on the *Dell Precision ResourceCD*. If your system's SCSI drivers are ever inadvertently erased or corrupted, you must reinstall them. For instructions on reinstalling these drivers, refer to the documentation that came with your *Dell Precision Resource CD.*

NOTE: SCSI Drivers for the Linux operating system are included with the Linux operating system and distribution media. They are not provided on the Dell Precision ResourceCD.

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System Setup Options: Dell Precision™ WorkStation 420 Systems User's Guide

- AC Power Recovery
- Asset Tag
- Auto Power On
- Boot Sequence
- CPU Information
- Diskette Drive A and Diskette Drive B
- Integrated Devices
- Keyboard NumLock
- PCI IRQ Assignment
- Primary Drive *n* and Secondary Drive *n*

- Primary Video Controller
- Remote Wake Up
- Report Keyboard Errors
- Second Processor
- System Data
- System Date
- System Memory
- System Security
- System Time
- ZIP Floppy Support

AC Power Recovery

AC Power Recovery determines what happens when AC power is restored to the system. When **Off** is selected, the system remains off when AC power is restored. When **On** is selected, the system starts up when AC power is restored. When **Last** (the default) is selected, the system returns to the power state (on or off) that it was in when AC power was removed.

Asset Tag

Asset Tag displays the customer-programmable asset tag number for the system if an asset tag number is assigned. You can use the Asset Tag utility, which is included with your software support utilities, to enter an asset tag number up to ten characters long into nonvolatile random-access memory (NVRAM).

Auto Power On

Auto Power On allows you to set the time and days of the week to turn on the computer system automatically. You can set **Auto Power On** to turn on the system either every day or every Monday through Friday.

> NOTE: This feature does not work if you turn off your system using a power strip or surge protector.

Time is kept in a 24-hour format (*hours:minutes*). To change the start-up time, press the right-arrow key to increase the number in the highlighted field or press the left-arrow key to decrease the number. If you prefer, you can type numbers in both fields.

The default for **Auto Power On** is **Disabled**.

Boot Sequence

Boot Sequence enables you to set the order of the devices from which the system attempts to boot.

The term *boot* refers to the system's start-up procedure. When turned on, the system "bootstraps" itself into an operational state by loading into memory a small program, which in turn loads the necessary operating system. **Boot Sequence** tells the system where to look for the files that it needs to load.

To set the boot device order, press <Enter> to access the field's pop-up options menu. Press the up- and down-arrow keys to move through the list of devices. Press the spacebar to enable or disable a device (enabled devices appear with a check mark). Press plus (+) or minus (–) to move a selected device up or down the list. The following subsections describe typical boot devices.

Diskette Drive

Selecting **Diskette Drive** as the first device causes the system to try booting from the diskette drive first. If the system finds a diskette that is not bootable in the drive or finds a problem with the drive itself, it displays an error message. If it does not find a diskette in the drive, the system tries

to boot from the next device in the boot sequence list.

Hard-Disk Drive

Selecting **Hard-Disk Drive** causes the system to attempt to boot first from the hard-disk drive and then from the next device in the boot sequence list.

IDE CD-ROM Device

Selecting **IDE CD-ROM Device** causes the system to try booting from an IDE CD-ROM drive first. If it does not find a CD in the drive, the system tries to boot from the next device in the boot sequence list.

MBA

Selecting **MBA** causes the system to prompt you to press <Ctrl><Alt><b> at the Dell™ logo screen during boot. A menu then appears that allows you to select **PXE**, **RPL**, **BootP**, or **NetWare** as the active boot mode. If a boot routine is not available from the network server, the system tries to boot from the next device in the boot sequence list.

AIC-7899 SCSI CD-ROM Drive

Selecting **AIC-7899 SCSI CD-ROM Drive** causes the system to try booting from a SCSI CD-ROM drive first. If it does not find a CD in the drive, the system tries to boot from the next device in the boot sequence list.

ATAPI ZIP Drive

Selecting **ATAPI ZIP Drive** causes the system to try booting from the ZIP drive first. If it does not find a ZIP drive, the system tries to boot from the next device in the boot sequence list.

CPU Information

CPU Information opens a window that allows you to configure or view the following properties of the installed microprocessor(s):

CPU Speed allows you to configure the internal clock speed of the installed microprocessor(s). Set this option to **Normal** for the rated speed, or to **Compatible** for a slower compatibility speed.

Bus Speed displays the front-side bus external speed of the installed microprocessor(s).

Processor 0 ID displays the processor serial number of processor 0.

Clock Speed (under Processor 0 ID) displays the rated internal speed of processor 0.

Cache Size (under Processor 0 ID) displays the amount of level-2 (L2) cache for processor 0.

Processor 1 ID displays the processor serial number of processor 1.

Clock Speed (under Processor 1 ID) displays the rated internal speed of processor 1.

Cache Size (under Processor 1 ID) displays the amount of L2 cache for processor 1.

Diskette Drive A and Diskette Drive B

Diskette Drive A and **Diskette Drive B** identify the type of diskette drives installed in your computer. With the standard cabling configuration, **Diskette Drive A** (the boot diskette drive) is the 3.5-inch diskette drive installed in the top externally accessible drive bay; **Diskette Drive B** is a second diskette drive installed in any of the lower externally accessible drive bays.

The **Diskette Drive A** and **Diskette Drive B** options have the following possible settings:

   l **5.25 Inch, 360 KB**

   l **5.25 Inch, 1.2 MB**

   l **3.5 Inch, 720 KB**

   l **3.5 Inch, 1.44 MB**

   l **Not Installed**

   *NOTES: Tape drives are not reflected in the **Diskette Drive A** and **Diskette Drive B** options. For example, if you have a single diskette drive and a tape drive attached to the diskette/tape drive interface cable, set **Diskette Drive A** to match the characteristics of the diskette drive and set **Diskette Drive B** to **Not Installed**.*

*For LS-120 SuperDisk drives installed in place of a 1.44-MB diskette drive, set these options to **Not Installed**.*

*If your system has a 1.44-MB diskette drive as Diskette Drive A and you install an LS-120 SuperDisk drive in one of the lower externally accessible drive bays, the system automatically assigns drive letter **B** to it.*

Integrated Devices

Integrated Devices configures the following devices integrated with the system board:

- **Sound**

- **Network Interface Controller**

- **Mouse Port**

- **Serial Port 1** and **Serial Port 2**

- **Parallel Port**

- **IDE Drive Interface**

- **Diskette Interface**

- **USB Emulation**

- **PC Speaker**

- **Video DAC Snoop**

- **SCSI Controllers**

Press <Enter> to configure these options as explained in the following subsections.

Sound

Sound determines whether the integrated audio controller is **On** or **Off**. The default is **On**.

Network Interface Controller

Network Interface Controller determines whether the integrated NIC is **On**, **Off**, or **On w/ MBA**. The default is **On. On w/ MBA** means that the NIC is enabled and set to boot the system remotely from a network server. If you select **On w/ MBA**, you are prompted to press <Ctrl><Alt><b> at the Dell logo screen during the boot routine. A menu then appears that allows you to select **PXE**, **RPL**, **BootP**, or **NetWare** as the active boot mode.

> NOTE: The link integrity and activiy indicators on the NIC remain active as long as the system is plugged into an electrical outlet. This remains true even if the system is turned off or if the **Network Interface Controller** or **Remote Wake Up** options are disabled in System Setup.

Mouse Port

Mouse Port enables or disables the system's integrated Personal System/2 (PS/2)-compatible mouse port. Disabling the mouse allows an expansion card to use interrupt request (IRQ)12.

Serial Port 1 and Serial Port 2

Serial Port 1 and **Serial Port 2** configure the system's integrated serial ports. You can set these options to **Auto** (the default) to automatically configure a port, to a particular designation (**COM1** or **COM3** for **Serial Port 1**; **COM2** or **COM4** for **Serial Port 2**), or to **Off** to disable the port.

If you set a serial port to **Auto** and add an expansion card containing a port configured to the same designation, the system automatically remaps the integrated port to the next available port designation that shares the same IRQ setting as follows:

- **COM1** (input/output [I/O] address 3F8h), which shares IRQ4 with **COM3**, is remapped to **COM3** (I/O address 3E8h).

- **COM2** (I/O address 2F8h), which shares IRQ3 with **COM4**, is remapped to **COM4** (I/O address 2E8h).

> NOTE: When two COM ports share an IRQ setting, you can use either port as necessary, but you may not be able to use them both at the same time. If the second port (**COM3** or **COM4**) is also in use, the integrated port is turned off.

Parallel Port

Parallel Port configures the system's integrated parallel port. Press <Enter> to configure **Parallel Port** options as explained in the following subsections.

Mode

You can set this option to **PS/2** (the default) , **EPP**, **ECP**, **AT**, or **Off** to disable the port.

Set this option according to the type of peripheral device connected to the parallel port. To determine the correct mode to use, see the documentation that came with the device.

I/O Address

This option determines the I/O address used by the parallel port and appears except when **Mode** is set to **Off**. You can set **I/O Address** to **378h** (the default), **278h**, or **3BCh**.

DMA Channel

This option determines the direct memory access (DMA) channel used by the parallel port and appears only when **Mode** is set to **ECP**. The available options are **DMA 1**, **DMA 3**, and **Off**.

IDE Drive Interface

IDE Drive Interface enables or disables the system's enhanced integrated drive electronics (EIDE) hard-disk drive interface.

With **Auto** (the default) selected, the system turns off the EIDE interface when necessary to accommodate an EIDE controller card installed in an expansion slot.

As part of the boot routine, the system first checks for a primary hard-disk drive controller card installed in an expansion slot. If no card is found, the system enables the EIDE interface to use IRQ14 and IRQ15.

If a primary controller is detected on the expansion bus, the EIDE interface is disabled.

Selecting **Off** disables the integrated EIDE interface.

Diskette Interface

Diskette Interface controls the operation of the system's integrated diskette drive controller.

With **Auto** (the default) selected, the system turns off the integrated diskette drive controller when necessary to accommodate a controller card installed in an expansion slot.

With **Read Only** selected, nothing can be written to any diskette drives and tape drives using the system's integrated diskette/tape drive controller. (The system can still read from the drives.) When **Read Only** is selected, **Auto** (whereby the system turns off the integrated diskette drive controller as necessary) is also in effect.

Selecting **Off** turns off the integrated diskette/tape drive controller; this setting is used primarily for troubleshooting purposes.

USB Emulation

USB Emulation determines whether the system basic input/output system (BIOS) controls Universal Serial Bus (USB) keyboards and mice. When **On** is selected, the system BIOS controls USB keyboards and mice until a USB driver is loaded by the operating system. When **Off** is selected (the default), the system BIOS does not control USB keyboards and mice, though they are functional during the boot routine. Set **USB Emulation** to **Off** if you are using a Personal System/2 (PS/2)-compatible keyboard and mouse. You cannot use the USB ports with PS/2 peripherals.

PC Speaker

PC Speaker determines whether the legacy PC sound is **On** (the default) or **Off**. A change to this option takes effect immediately (rebooting the system is not required).

> NOTE: This option enables or disables only the legacy PC sound. It does not turn the internal monophonic speaker on or off. Basic input/output system (BIOS) beep codes are always audible regardless of this option's setting.

Video DAC Snoop

Video DAC Snoop lets you correct video problems that may occur with the use of some video expansion cards. The default is **Off**. If you are using a video expansion card and problems such as incorrect colors or blank windows occur, set **Video DAC Snoop** to **On**.

SCSI Controllers

SCSI Controllers turns the integrated SCSI channels **On** or **Off** (the default).

Keyboard NumLock

Keyboard NumLock determines whether your system boots with the Num Lock mode activated on 101- or 102-key keyboards (it does not apply

to 84-key keyboards).

When Num Lock mode is activated, the rightmost bank of keys on your keyboard provides the mathematical and numeric functions shown at the tops of the keys. When Num Lock mode is turned off, these keys provide cursor-control functions according to the label on the bottom of each key.

PCI IRQ Assignment

PCI IRQ Assignment specifies which IRQ lines are assigned to the Peripheral Component Interconnect (PCI) devices installed in the computer. Press <Enter> to configure these devices. Then select the device whose IRQ line you want to change, and press the plus (+) or minus (–) key to scroll through the available IRQ lines. Normally you do not need to change the IRQ lines assigned to PCI devices unless a particular device, device driver, or operating system requires a specific IRQ line already in use by a PCI device.

NOTE: Manually assigning a particular IRQ line to a device may cause a conflict with another device trying to use the same IRQ line, which can cause one of the devices or the system to become unstable or inoperable.

Primary Drive *n* and Secondary Drive *n*

Primary Drive *n* identifies drives attached to the primary EIDE interface connector (labeled "IDE1") on the system board; **Secondary Drive *n*** identifies drives connected to the secondary EIDE interface connector (labeled "IDE2"). Use the secondary EIDE interface connector for EIDE CD-ROM and EIDE tape drives.

NOTE: For all devices obtained from Dell that use the integrated EIDE controller, set the appropriate **Drive** option to **Auto**.

The following settings identify the type of EIDE devices installed in the computer:

- **Auto** (use this setting for all EIDE devices from Dell)

- **Off**

- **User 1** or **User 2**

- A specific drive-type number

To choose a setting for each option, press <Enter> to access the field's pop-up settings menu. Then type characters from the keyboard or press the left- or right-arrow key to cycle through the settings.

A *drive-type number* specifies the parameters of a hard-disk drive, based on a table recorded in the system's BIOS.

NOTE: Operating systems that bypass the system BIOS may not obtain optimum hard-disk drive performance.

If You Have a Problem

If the system generates a drive error message the first time you boot your system after you install an EIDE drive, it may mean that a third-party drive (a drive not purchased from Dell) does not work with the automatic drive-type detect feature. If you suspect that your problem is related to drive type, try entering your drive-type information in one of the following ways:

- If you know the drive-type number

  Use the drive-type number you found in the documentation that came with the drive, or if the drive was installed by Dell when you purchased your system, access the Manufacturing Test Report from the **Dell Accessories** folder.

  To set the drive-type number in System Setup, highlight the appropriate drive option (**Primary Drive 0** or **Primary Drive 1**) and type the correct drive-type number. If you prefer, you can press the right- or left-arrow key to increase or decrease, respectively, the drive-type number until the correct one is displayed.

- If you do not know the drive-type number

  The **Drive 0** and **Drive 1** options display the following parameters for each drive:

  - **Drive Type** is the drive-type number for the selected hard-disk drive.
  - **Capacity** (automatically calculated by the system) indicates the number of millions of bytes of storage provided by the drive.
  - **Cylinders** is the number of logical cylinders.
  - **Heads** indicates the number of logical heads in the drive.
  - **Sectors** is the number of logical sectors per track.

If none of the supported drive types match the parameters of your new drive, you can enter your own parameters. To do so, highlight the **Drive 0** option and type u to display **User 1**. You can then press the right- or left-arrow key to switch between the **User 1** and **User 2** settings (only two user-defined drive types are allowed). Then press <Tab> to highlight each of the parameter fields in succession, and enter the appropriate number for each field.

Primary Video Controller

Primary Video Controller determines whether the system looks for a video card in a PCI slot during the boot routine. When **Auto** is selected, the system uses any PCI video card it finds during the boot routine. If no PCI video card is found, the system uses the video card in the Accelerated Graphics Port (AGP) slot. When **AGP** is selected, the system uses the video card in the AGP slot as the primary video controller. If you have both a PCI and an AGP card, setting this option to **Auto** designates the PCI card as primary video; setting it to **AGP** designates the AGP card as primary video.

Remote Wake Up

Remote Wake Up enables you to turn the Wakeup On LAN feature **On** or **Off**. You must reboot your system before a change takes effect.

Report Keyboard Errors

Report Keyboard Errors enables or disables reporting of keyboard errors during the power-on self-test (POST), which is a series of tests that the system performs on the hardware each time you turn on the system or press the reset button.

This option is useful when applied to self-starting servers or host systems that have no permanently attached keyboard. In these situations, selecting **Do Not Report** suppresses all error messages relating to the keyboard or to the keyboard controller during POST. This setting does not affect the operation of the keyboard itself if a keyboard is attached to the computer.

Second Processor

Second Processor enables or disables a second microprocessor for troubleshooting purposes. If the system is having microprocessor-related problems, you can disable the second microprocessor to see if the problem is isolated to this microprocessor. This option appears only if the system has two microprocessors.

System Data

The following information about the system is displayed in the system data area of the System Setup screen:

- The microprocessor type and BIOS level.

- The size of the integrated level 2 (L2) cache.

- The system's five-character service tag number, which was programmed into NVRAM by Dell during the manufacturing process. Refer to this number during technical assistance or service calls. The service tag number is also accessed by certain Dell support software, including the diagnostics software.

System Date

System Date enables the date on the computer's internal calendar to be reset.

Your system automatically displays the day of the week corresponding to the settings in the **month**, **day-of-month**, and **year** fields.

To change the date, press the left- or right-arrow key to select a field, and then press plus (+) or minus (–) to increase or decrease the number. If you prefer, you can type numbers in the **month**, **day-of-month**, and **year** fields.

System Memory

System Memory indicates the entire amount of installed memory detected in your system. After you add memory, check this option to confirm that the new memory is installed correctly and is recognized by the system. Select this option and press <Enter> to view the capacity and configuration of the memory in each RIMM slot.

System Security

System Security configures the following password and chassis intrusion options:

- **System Password**

- **Password Status**

- **Setup Password**

- **Chassis Intrusion**

- **CPU Serial Number**

Press <Enter> to configure these options as explained in the following subsections.

System Password

System Password displays the current status of your system's password security feature and allows you to assign and verify a new password. No one can assign a new password unless the current status is **Not Enabled**, which is displayed in bright characters.

The **System Password** option has the following settings:

- **Not Enabled** (the default)

- **Enabled**

- **Disabled by Jumper**

NOTE: See "*Using the System Password Feature*" *for instructions on assigning a system password and using or changing an existing system password. See "*Disabling a Forgotten Password*" *for instructions on disabling a forgotten system password.*

Password Status

When **Setup Password** is set to **Enabled**, **Password Status** allows you to prevent the system password from being changed or disabled at system start-up.

To lock the system password, you must first assign a setup password in **Setup Password** and then change the **Password Status** option to **Locked**. When **Setup Password** has a password assigned and **Password Status** is set to **Locked**, the system password cannot be changed through the **System Password** option and cannot be disabled at system start-up by pressing <Ctrl><Enter>.

To unlock the system password, you must enter the setup password in **Setup Password** and then change the **Password Status** option to **Unlocked**. When the option is set to **Unlocked**, you can disable the system password at system start-up by pressing <Ctrl><Enter>. Then change the password through the **System Password** option.

Setup Password

Setup Password lets you restrict access to System Setup in the same way that you restrict access to your system with the system password feature. The settings are:

- **Not Enabled** (the default)

- **Enabled**

- **Disabled by Jumper**

NOTE: See "*Using the Setup Password Feature*" for instructions on assigning a setup password and using or changing an existing setup password. See "*Disabling a Forgotten Password*" for instructions on disabling a forgotten setup password.

Chassis Intrusion

Chassis Intrusion displays the status of the system chassis intrusion monitor and can be set to **Enabled, Enabled-Silent**, or **Disabled**. The default is **Enabled**.

If the computer cover is removed while the intrusion monitor is set to **Enabled**, a Desktop Management Interface (DMI) event is generated, the setting changes to **Detected**, and the following message appears during the boot routine at the next system start-up:

```
Alert! Cover was previously removed.
```

If the computer cover is removed while the intrusion monitor is set to **Enabled-Silent**, a DMI event is generated and the setting changes to **Detected**, but the alert message does not appear during the boot sequence at the next system start-up.

If the intrusion monitor is set to **Disabled**, no intrusion monitoring occurs and no messages appear.

To reset the **Detected** setting, enter System Setup during the system's POST. In the **Chassis Intrusion** option, press the left- or right-arrow key to

select **Reset**, and then choose **Enabled**, **Enabled-Silent**, or **Disabled**.

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

CPU Serial Number

CPU Serial Number determines whether the microprocessor serial number(s) (if any) is provided to programs that request it. When **Enabled** is selected, the system provides the microprocessor serial number(s) to programs that request it. When **Disabled** is selected, the system never provides the microprocessor serial number(s). The default is **Disabled**.

System Time

System Time enables the time on the computer's internal clock to be reset.

Time is kept in a 24-hour format (*hours:minutes:seconds*). To change the time, press the left- or right-arrow key to select a field, and then press plus (+) or minus (–) to increase or decrease the number. If you prefer, you can type numbers in each of the fields.

ZIP Floppy Support

ZIP Floppy Support enables or disables the support of Advanced Technology Attachment Packet Interface (ATAPI) ZIP devices by the system BIOS. When **Enabled** is selected, ATAPI ZIP devices are supported as diskette drives and the first ZIP device is listed as a bootable device under **Boot Sequence**. When **Disabled** is selected, the system BIOS ignores ATAPI ZIP devices, though the operating system may still support them.

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- Installing and Configuring Software
- Error Messages
- Input Errors

- Program Conflicts
- Memory Address Conflicts
- Interrupt Assignment Conflicts

Overview

Because most computers have several application programs installed in addition to the operating system, isolating a software problem can be confusing. Software errors can also appear to be hardware malfunctions at first. Software problems can result from the following circumstances:

- Improper installation or configuration of a program

- Input errors

- Device drivers that conflict with certain application programs

- Memory conflicts resulting from the use of terminate-and-stay-resident (TSR) programs

- Interrupt conflicts between devices

You can confirm that a computer problem is caused by software by running the **System Board Devices** test group as described in "Dell Diagnostics." If all tests in the test group complete successfully, the error condition is most likely caused by software.

This section provides some general guidelines for analyzing software problems. For detailed troubleshooting information on a particular program, see the documentation that came with the software or consult the support service for the software.

Installing and Configuring Software

When you obtain software, check it for viruses with virus-scanning software before you install it on your computer's hard-disk drive. Viruses, which are pieces of code that can replicate themselves, can quickly use all available system memory, damage or destroy data stored on the hard-disk drive, and permanently affect the performance of the programs they infect. Several commercial virus-scanning programs are available for purchase, and most bulletin board services (BBSs) archive freely distributed virus-scanning programs that you can download with a modem.

Before you install a program, read its documentation to learn how the program works, what hardware it requires, and what its defaults are. A program usually includes installation instructions in its accompanying documentation and a software installation routine on its program diskette(s) or CD(s).

The software installation routine assists you in transferring the appropriate program files to your computer's hard-disk drive. Installation instructions may provide details about how to configure your operating system to successfully run the program. Always read the installation instructions before you run a program's installation routine. You may be instructed to modify some operating system start-up files, such as **config.sys** and **autoexec.bat**, or the installation routine may modify start-up files automatically.

When you run the installation routine, be prepared to respond to prompts for information about how your computer's operating system is configured, what type of computer you have, and what peripherals are connected to your computer.

Error Messages

Error messages can be produced by an application program, the operating system, or the computer. "Messages and Codes" discusses the error messages that are generated by the system. If you receive an error message that is not listed in "Messages and Codes," check your operating system or application program documentation.

Input Errors

If a specific key or set of keys is pressed at the wrong time, a program may give you unexpected results. See the documentation that came with your application program to make sure the values or characters you are entering are valid.

Make sure that the operating environment is set up to accommodate the programs you use. Keep in mind that whenever you change the parameters of the computer's operating environment, you may affect the successful operation of your programs. Sometimes, after modifying the operating environment, you may need to reinstall a program that no longer runs properly.

Program Conflicts

Some programs may leave portions of their setup information behind, even though you have exited from them. As a result, other programs cannot run. Rebooting your system can confirm whether or not these programs are the cause of the problem.

Programs that use specialized subroutines called *device drivers* can also cause problems with your computer system. For example, a variation in the way the data is sent to the monitor may require a special screen driver program that expects a certain kind of video mode or monitor. In such cases, you may have to develop an alternative method of running that particular program—the creation of a boot file made especially for that program, for example. Call the support service for the software you are using to help you with this problem.

Memory Address Conflicts

Memory address conflicts occur when two or more devices try to access the same address in the upper memory blocks (UMB). For example, if a network expansion card and an expanded-memory page frame are assigned an overlapping block of addresses, a memory address conflict arises. As a result, when you try to log in to the network, the operation fails.

To resolve this type of conflict, you can change the address of one of the devices. For example, in the case of the network expansion card and expanded-memory page-frame address conflict, you can move the network card to an address block in the range of CC000h through D0000h. To reassign the expansion card's address block, refer to the documentation for the card.

Interrupt Assignment Conflicts

Problems can arise if two devices attempt to use the same interrupt request (IRQ) line. To avoid this type of conflict, check the documentation for the default IRQ-line setting for each installed expansion card. Then consult Table 1 to configure the card for one of the available IRQ lines.

Table 1. Default IRQ Line Assignments

IRQ Line	Used/Available
IRQ0	Used by the system timer
IRQ1	Used by the keyboard to signal that the output buffer is full
IRQ2	Used by interrupt controller 1 to enable IRQ8 through IRQ15
IRQ3	Used by serial port 2
IRQ4	Used by serial port 1
IRQ5	Available
IRQ6	Used by the diskette/tape drive controller
IRQ7	Used by the parallel port
IRQ8	Used by the real-time clock (RTC)
IRQ9	Available
IRQ10	Available
IRQ11	Available
IRQ12	Used by the mouse port
IRQ13	Used by the math coprocessor (if applicable)
IRQ14	Used by the primary integrated drive electronics (IDE) controller
IRQ15	Used by the secondary IDE controller

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Microprocessor

Microprocessor type	dual Intel® Pentium® III microprocessors with a front-side bus external speed of 133 megahertz (MHz). See System Setup to identify your system's processor speed. A slower compatibility speed can be set through the System Setup program.
Internal cache	32-kilobyte (KB) first-level (16-KB data cache; 16-KB instruction cache)
Level 2 (L2) cache memory	see System Setup to determine the amount of L2 cache your system supports.
Math coprocessor	internal to microprocessor

System Information

System chip set	Intel 840
Data bus width	64 bits
Address bus width	32 bits
Direct memory access (DMA) channels	eight
Interrupts	15
System basic input/output system (BIOS)	year 2000 (Y2K)-, Desktop Management Interface (DMI) 2.0s-, system management (SM)BIOS 2.3-compliant BIOS in 4-megabit (Mb) firmware hub
Audio controller	integrated Crystal SoundFusion CS4614 Peripheral Component Interconnect (PCI) audio controller audio controller
Integrated dual channel PCI small computer system interface (SCSI) controller	Adaptec 7899 Ultra 160m/low voltage differential (LVD)
Network interface controller (NIC)	integrated 3C920-based 10/100 3Com® Ethernet controller with Remote Wake Up capabilities (3C905C-TX compatible)
System clock	133 MHz

Expansion Bus

Bus types	PCI, PCI/redundant arrays of independent disks (RAID), and accelerated graphics port (AGP) 2.0 (4X) on the desktop chassis, and AGP Pro110 (4X) on the mini tower chassis
Bus speed	PCI: 33.3 MHz PCI/RAID: 33.3 MHz AGP Pro: 66.6 MHz (4X-capable)
PCI/RAID expansion-card connector	32 bit
Video card connectors:	
Desktop chassis	AGP Pro50 (4X) expansion-card connector
Mini tower chassis	AGP Pro110 (4X) expansion-card connector
Expansion-card connectors:	
Desktop chassis	five PCI expansion-card connectors

Mini tower chassis	five PCI expansion-card connectors

PCI expansion-card connector size	120 pins
PCI expansion-card connector data width (maximum)	32 bits

Memory

Architecture	Rambus dynamic random-access memory (RDRAM) technology
Rambus in-line memory module (RIMM) slots	four (dual channels)
RIMM module capacities	64-, 128-, 256-, and 512-megabyte (MB) 800-MHz Rambus DRAM with error checking and correction (ECC)
Minimum and maximum total RDRAM capacities	128 MB to 2 gigabytes (GB)
BIOS address	F000:0000h-F000:FFFFh

Drives

Externally accessible bays:	
Desktop chassis	3.5-inch bay for a 3.5-inch diskette drive; two 5.25-inch bays for removable media devices
Mini tower chassis	3.5-inch bay for a 3.5-inch diskette drive; three 5.25-inch bays for removable media devices
Internally accessible bays:	
Desktop chassis	two 1.6-inch bays for 1.6-inch-high hard-disk drives
Mini tower chassis	three 1.6-inch bays for 1.6-inch-high hard-disk drives; four 1-inch bays for 1-inch-high hard-disk drives

Ports and Connectors

Externally accessible:	
Serial (data terminal equipment [DTE])	two 9-pin connectors; 16550-compatible
Parallel	25-hole connector (bidirectional)
Video	15-hole connector (on video card)
Audio	Three 1/8-inch phone jacks for microphone, audio in, and audio out
Integrated NIC	RJ45 connector
Personal System/2 (PS/2)-style keyboard	6-pin mini-Deutche Industrie Norm (DIN)
PS/2-compatible mouse	6-pin mini-DIN
Universal Serial Bus (USB)	two USB-compliant connectors
Secondary Ultra/Wide SCSI	68-pin connector
Internally accessible:	
Primary Ultra 160/m LVD SCSI	68-pin connector
Secondary Narrow SCSI	50-pin connector

Primary EIDE hard-disk drive	40-pin connector
Secondary EIDE hard-disk drive	40-pin connector
Diskette drive	34-pin connector
Remote Wake Up	3-pin connector
Audio	4-pin CD-IN connector, 4-pin AUX pocket connector; and 4-pin TAPI pocket connector
Fans	3-pin connectors

Graphics and Video

Graphics architecture:	
Desktop chassis	AGP Pro50 (4X) video card (see manufacturer's specifications)
Mini tower chassis	AGP Pro110 (4X) video card (see manufacturer's specifications)

Key Combinations

<Ctrl><Alt><Del>	Operates differently depending on your operating system. See your operating system documentation.
<F2> or <Ctrl><Alt><Enter>	starts embedded System Setup program (during power-on self test [POST] only)
<F3>	automatically starts (boots) the system from the network environment specified by the managed boot agent (MBA) rather than from one of the devices in the System Setup Boot Sequence option
<F10>	launches the utility partition (if installed) during system start-up

Controls and Indicators

Reset control	push button
Power control	push button
Power indicators	green light-emitting diode (LED) on system board by control panel connector to indicate standby power
	green LED on system board by memory—steady when system is on; blinking in sleep state
	dual-color LED on front panel—steady green when system is on; blinking green in sleep state; yellow for diagnostics
Hard-disk drive access indicator	green LED
Diagnostic LEDs	four dual-color LEDs on back panel—green, yellow, or off to indicate diagnostic codes
Link integrity indicator	green LED for 10-Mb operation; orange LED for 100-Mb operation
Activity indicator (on integrated NIC connector)	yellow LED

Power

DC power supply:	
Wattage	desktop chassis: 330 watts (W) mini tower chassis: 410 W
Heat dissipation	desktop chassis: 750 British thermal units (BTU)/hour (hr) (nominal) mini tower chassis: 750 BTU/hr (nominal)
Voltage	90 to 135 volts (V) at 60 hertz (Hz); 180 to 265 V at 50 Hz
Backup battery	3-V CR2032 coin cell

Physical

Desktop chassis:

Height	16.5 centimeters (cm) (6.5 inches)
Width	44.2 cm (17.4 inches)
Depth	45 cm (17.7 inches)
Weight	10.9 kilograms (kg) (24 pounds [lb])

Mini tower chassis:

Height	49 cm (19.3 inches)
Width	22.1 cm (8.7 inches)
Depth	45.2 cm (17.8 inches)
Weight	16.8 kg (37.0 lb) or more, depending on options installed

Environmental

Temperature:

Operating	10° to 35° Celsius (C) (50° to 95° Fahrenheit [F])
Storage	–40° to 65° C (–40° to 149° F)

Relative humidity	20% to 80% (noncondensing)

Maximum vibration:

Operating	0.25 gravities (G) at 3 to 200 Hz at 1 octave/minute (min)
Storage	0.5 G at 3 to 200 Hz at 1 octave/min

Maximum shock:

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

Altitude:

Operating	–16 to 3048 meters (m) (–50 to 10,000 feet [ft])
Storage	–16 to 10,600 m (–50 to 35,000 ft)

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 Using System Setup

 System Setup Options

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Overview

Each time you turn on your computer system or press the reset button, the system scans the system configuration for changes. If the system detects any changes, it generates messages that identify them. If required, the system then prompts you to enter System Setup to correct any settings.

You can use System Setup as follows:

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

l   To set or change user-selectable options—for example, the time or date on your system

You can view the current settings at any time. When you change a setting, in many cases you must reboot the system before the change takes effect.

After you set up your system, run System Setup to familiarize yourself with your system configuration information and optional settings. Dell recommends that you print the System Setup screens (by pressing <Print Screen>) or record the information for future reference.

Before you use System Setup, you need to know the kind of diskette drive(s) and hard-disk drive(s) installed in your computer. If you are unsure of this information, see the Manufacturing Test Report that was shipped with your system and is located in the **Dell Accessories** folder.

Entering System Setup

NOTE: The following instructions require you to restart your system. You may want to print these instructions before restarting your system if you do not have another system on which to view them.

To enter System Setup, perform the following steps:

1.   Press the power button to turn on your system.

     If your system is already on, shut it down and then turn it on again.

2.   When the **Press <F2> to Enter Setup** window appears in the upper-right corner of the screen, press <F2>.

If you wait too long to press <F2> and cannot enter System Setup, *let the system complete the startup operation*; then shut down the system and try again.

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

System Setup Screen

*NOTE: You or your system administrator may have established a setup password on your system. See Using the Setup Password Feature for information on entering the **System Setup** screen using a setup password.*

The **System Setup** screen displays the current setup and configuration information and optional settings for your system. Information on the **System Setup** screen is organized in four areas:

l   Title — The box at the top of all screens lists the system name.

l   System data — The two boxes below the title box display your system processor, level 2 (L2) cache, service tag, and the version number of the basic input/output system (BIOS).

l   Options — The main area of the screen is a scrollable window containing options that define the installed hardware in your computer and the power conservation and security features for your computer.

Fields next to the options contain settings or values. You can change those values that appear bright on the screen. Options or values that you cannot change (because they are determined or calculated by the computer) appear less bright.

l   Key functions — The line of boxes across the bottom of all screens lists keys and their functions within System Setup.

System Setup Navigation Keys

Table 1 lists the keys you use to view or change information on the **System Setup** screen and to exit the program.

Table 1. System Setup Navigation Keys

Keys	Action
Tab or ▼	Moves to the next field.
Shift Tab or ▲	Moves to the previous field.
◄ or ►	Cycles through the options in a field. In many fields, you can also type the appropriate value.
Page Down or Page Up	Scrolls through help information.
Enter	Enters the selected field's pop-up options menu.
spacebar or + or −	In the selected field's pop-up options menu, cycles through the options in a field.
Esc	Saves the selected settings in a field's pop-up settings menu and returns to the main System Setup screen. For a few options (as noted in the help area) the changes take effect immediately. Exits the System Setup program at the System Setup screen if no settings in any option were changed. Provides exit menu options if changes were made. Highlight a menu option to select it and press <Enter> to activate it. l Save Changes and Exit option exits the System Setup program and reboots the system, implementing any changes you have made. l Discard Changes and Exit option exits the System Setup program without rebooting the system and returns the system to its previous state - the boot routine. l Return to Setup option returns to the System Setup screen.
Alt X	Exits System Setup without rebooting the system and returns the system to its previous state—the boot routine.[1]
Alt B	Exits System Setup and reboots the system, implementing any changes you have made.
Alt D	Resets the selected option to its default setting.
F1	Displays help information for the selected option.

[1]For most of the options, any changes you make are recorded but do not take effect until the next time you boot the system. For a few options (as noted in the help area), the changes take effect immediately.

Using the System Password Feature

NOTICE: The password features provide a basic level of security for the data on your system. However, 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.

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

You can assign a system password whenever you use the System Setup program. After a system password is assigned, only those who know the

password have full use of the system.

When **System Password** is set to **Enabled**, the computer system prompts you for the system password just after the system boots.

To change an existing system password, you must either know the password or have access to the inside of the computer.

If you assign and later forget a system password, you need your computer key to get inside the chassis, where you can change a jumper setting to disable the system password feature. Note that you erase the *setup password* at the same time.

NOTICE: If you leave your system 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-disk drive.

Assigning a System Password

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

With a system password assigned, the status shown in **System Password** is **Enabled**. With the system password feature disabled by a jumper setting on the system board, the status shown is **Disabled By Jumper**. *You cannot change or enter a new system password if either of these settings is displayed*.

With no system password assigned and with the password jumper on the system board in the enabled position (its default), the status shown for **System Password** is **Not Enabled**. *Only when **System Password** is set to **Not Enabled** can you assign a system password*, using the following procedure:

1. Verify that **Password Status** is set to **Unlocked**.

   For instructions on changing the setting for Password Status, see "Password Status."

2. Press the left- or right-arrow key.

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

3. Type the new system password.

   You can use up to seven characters in the password.

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

   The password assignment operation recognizes keys by their location on the keyboard, without distinguishing between lowercase and uppercase characters. For example, if you have an *M* in your password, the system recognizes either *M* or *m* as correct.

   Certain key combinations are not valid. If you enter one of these combinations, the speaker emits a beep.

   To erase a character when you enter your password, press the <Backspace> key or the left-arrow key.

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

4. Press <Enter>.

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

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

   The password setting changes to **Enabled**. Your system password is now set; you can exit the System Setup program and begin using your system. Note, however, that password protection does not take effect until you reboot the system by pressing the reset button or by turning the system off and then on again.

Using Your System Password to Secure Your System

Whenever you turn on your system, press the reset button, or reboot the system by pressing the <Ctrl><Alt><Del> key combination, the following prompt appears on the screen when **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**, the following prompt appears:

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

After you type the correct system password and press <Enter>, your system boots and you can use the keyboard to operate your system as usual.

If a wrong or incomplete system password is entered, the following message appears on the screen:

```
** Incorrect password. **

Enter password:
```

If an incorrect or incomplete system password is entered again, the same message appears on the screen.

The third and subsequent times an incorrect or incomplete system password is entered, the system displays the following message:

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

The number of unsuccessful attempts made to enter the correct system password can alert you that an unauthorized person has attempted to use your system.

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

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

Deleting or Changing an Existing System Password

To delete or change an existing system password, perform the following steps:

1. Enter the System Setup program and verify that **Password Status** is set to **Unlocked**.

   Enter the System Setup program by pressing the <Ctrl><Alt><Enter> key combination. Press the <Alt><p> key combination to move to Page 2 of the System Setup screens. For instructions on changing the setting for **Password Status**, see "Password Status."

2. Reboot your system to force it to prompt you for a system password.

3. When prompted, type the system password.

4. Press the <Ctrl><Enter> key combination to disable the existing system password, instead of pressing <Enter> to continue with the normal operation of your system.

5. Reboot the system and enter the System Setup program.

6. Confirm that **Not Enabled** is displayed for **System Password** in the System Setup program.

   If **Not Enabled** appears, the system password has been deleted. If you want to assign a new password, go to step 7.

   If **Not Enabled** is *not* displayed, press the <Alt><b> key combination to reboot the system, and then repeat steps 3 through 6.

7. Assign a system password.

Using the Setup Password Feature

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

You can assign a setup password whenever you use the System Setup program. After a setup password is assigned, only those who know the password have full use of the System Setup program.

To change an existing setup password, you must know the setup password. If you assign and later *forget* a setup password, you need your computer key to get inside the chassis, where you can change a jumper setting to disable the password feature. Note that you erase the *system password* at the same time.

Assigning a Setup Password

A setup password can be assigned (or changed) only when **Setup Password** is set to **Not Enabled**. To assign a setup password, highlight **Setup Password** and press the left- or right-arrow key. The system prompts you to enter and verify the password. If a character is illegal for password use, the system emits a beep.

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

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

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

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

Operating With a Setup Password Enabled

If **Setup Password** is set to **Enabled**, you must enter the correct setup password before you can modify the majority of the System Setup options.

When you start the System Setup program, Page 2 of the System Setup screens appears with **Setup Password** highlighted, prompting you to type the password.

If you do not enter the correct password in three tries, the system lets you view, but not modify, the System Setup screens—with the following exceptions:

l You can still modify **Date**, **Time**, **CPU Speed**, **Num Lock**, and **Speaker**.

l If **System Password** is not enabled and is not locked via **Password Status**, you can assign a system password (however, you cannot disable or change an existing system password).

   *NOTE: You can use **Password Status** in conjunction with **Setup Password** to protect **System Password** from unauthorized changes.*

Deleting or Changing an Existing Setup Password

To delete or change an existing setup password, perform the following steps:

1. Enter the System Setup program.

2. Highlight **Setup Password**, and press the left- or right-arrow key to delete the existing setup password.

   The setting changes to **Not Enabled**.

3. If you want to assign a new setup password, follow the procedure in "Assigning a Setup Password."

Disabling a Forgotten Password

If you forget your system or setup password, you cannot operate your system or change settings in the System Setup program, respectively, until you open the computer, change the password jumper setting to disable the passwords, and erase the existing passwords.

To disable a forgotten password, perform the following steps.

⚠ CAUTION: Before you remove the computer cover, see "**Safety First—For You and Your Computer**."

1. Remove the computer cover of your desktop or mini tower chassis.

2. Refer to "Jumpers" for jumper information and to Figure 2 in "Hardware Configuration Features" for the location of the password jumper (labeled "PSWD") on the system board.

3. Remove the jumper plug from the PSWD jumper (the *disable* setting).

4. Replace the computer cover of your desktop or mini tower chassis.

5. Reconnect your computer to its electrical outlet and turn it on.

   Booting your system with the PSWD jumper plug removed erases the existing password(s).

   NOTE: Before you assign a new system and/or setup password, you must replace the PSWD jumper plug.

6. Remove the computer cover of your desktop or mini tower chassis.

7. Replace the PSWD jumper plug (the *enable* setting).

8. Replace the computer cover of your desktop or mini tower chassis, and then reconnect the computer and peripherals to their electrical outlets and turn them on.

   Booting with the PSWD jumper installed reenables the password features. When you enter the System Setup program, both password fields appear as **Not Enabled**, meaning that password protection is no longer available because no passwords have been assigned.

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

10. Reset the chassis intrusion detector.

Troubleshooting: Dell Precision™ WorkStation 420 Systems User's Guide

- Basic Checks
- Messages and Codes
- Software Checks
- Diagnostics

- External Components
- Internal Components
- Getting Help