

Dell™ PowerVault™ 770N Systems Service Manual

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Notes, Notices, and Cautions



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



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



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

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System Overview

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Your Dell™ PowerVault™ 770N NAS system provides optimized file-serving capabilities on a robust rackmount or tower platform. The base configuration features one Intel® Xeon™ microprocessor with 512 MB of memory. The maximum configuration includes two Xeon microprocessors with up to six memory modules.

This section describes the major features of the system, including those that simplify servicing. It also provides information about other documents you may need when setting up your system, and technical specifications for the system.

System Features

- One or two Intel Xeon microprocessors with an internal operating speed of at least 1.8 GHz, a 512 KB cache, and a front-side (external) bus speed of 400 MHz.
- SMP is available on systems with two Xeon microprocessors. SMP greatly improves overall system performance by dividing microprocessor operations between independent microprocessors. To take advantage of this feature, you must use an operating system that supports multiprocessing.



NOTE: If you decide to upgrade your system by adding an additional microprocessor, you must order the microprocessor from the company where you purchased your system. Not all versions of the Intel Xeon microprocessor will work properly as an additional microprocessor. The upgrade kit contains the correct version of the microprocessor as well as the instructions for performing the upgrade. All microprocessors must have the same internal operating frequency and cache size.

- A minimum of 256 MB of system memory. To add additional system memory, install identical pairs of DDR SDRAM DIMMs in the six DIMM sockets on the system board.
- Support for up to six 1-inch, internal Ultra320 or Ultra160 SCSI hard drives.
- Support for two additional 1-inch internal hard drives in the external peripheral bay.
- Support for one full-height or one half-height tape drive.
- Support for RAID levels 0, 1, 5, and 10.
- A 1.44-MB, 3.5-inch diskette drive.
- An IDE CD drive.
- Up to two hot-pluggable, 730-W power supplies with optional 1 + 1 redundant configuration.
- Five hot-pluggable system cooling fans.
- An intrusion switch that signals the appropriate systems management software if the bezel is removed.

System Board Features

- Six 64-bit PCI/PCI-X slots and one 32-bit PCI slot. Slots accept full-length cards designed for 133 MHz, 100 MHz, 66 MHz, or 33 MHz.
- An integrated VGA-compatible video subsystem with an ATI RAGE XL video controller. This video subsystem contains 8 MB of SDRAM video memory (nonupgradable). Maximum resolution is 1600 x 1200 x 16.7 million colors (noninterlaced).
- An integrated, dual-channel Ultra320 SCSI host adapter.
- Optional 1 x 2 backplane automatically configures the ID numbers and SCSI termination on individual hard drives, greatly simplifying drive installation.
- One integrated 10/100/1000 NIC, which provides an Ethernet interface.
- Embedded systems management circuitry that monitors operation of the system fans as well as critical system voltages and temperatures. The systems management circuitry works in conjunction with your systems management software.
- Back-panel connectors including video, keyboard, mouse, two serial, one parallel, two USB, one NIC, and one optional embedded remote access Ethernet connector.

For more information about specific features, see "[Technical Specifications](#)."

Supported Operating Systems

Your system supports the Microsoft® Windows® Powered operating system.

Service Features

The system includes the following service features to make troubleshooting and repair easy and effective, in most cases without tools or service aids:

- System diagnostics are available for downloading from the Dell Support website at support.dell.com.
 - Systems management hardware and Server Administrator software, which monitor temperatures and voltages throughout the system and notify you if the system overheats, if a system cooling fan malfunctions, if a microprocessor overheats, or if a power supply or VRM fails. For information about the systems management option, see your systems management software documentation.
 - The system simplifies removing and replacing components. You can replace microprocessors or memory modules without removing the system board. The SCSI backplane board and hard-drive carriers eliminate the extensive cabling and drive configuration usually required for a SCSI subsystem.
-


Power Protection Devices

Certain devices protect your system from the effects of problems such as power surges and power failures.


- PDU — Uses circuit breakers to ensure that the AC current load does not exceed the PDU's rating.
- Surge protector — Prevents voltage spikes, such as those that may occur during an electrical storm, from entering the system through the electrical outlet. They do not protect against brownouts, which occur when the voltage drops more than 20 percent below the normal AC line voltage level.
- Line conditioner — Maintains a system's AC power source voltage at a moderately constant level and provides protection from brownouts, but does not protect against a complete power loss.
- UPS — Uses battery power to keep the system running when AC power is unavailable. The battery is charged by AC power while it is available so that after AC power is lost, the battery can provide power to the system for a limited amount of time—from 15 minutes to approximately an hour. A UPS that provides only 5 minutes of battery power

allows you to shutdown the system. Use surge protectors and PDUs with all universal power supplies, and ensure that the UPS is UL-safety approved.

Other Documents You May Need

 The *System Information Guide* provides important safety and regulatory information. Warranty information might be included within this document or as a separate document.

- The *Rack Installation Guide* describes how to unpack, set up, and install your system in a rack.
- The *Setting Up Your System* document provides general instructions for setting up your system.
- The *User's Guide* describes system features, technical specifications, and the System Setup program.
- The *Installation and Troubleshooting Guide* describes how to install, troubleshoot, and upgrade your system.
- The *System Administrator's Guide* provides system operation and management information.
- The systems management software documentation describes the features, requirements, installation, and basic operation of the software.
- Operating system documentation describes how to install (if necessary), configure, and use the operating system software.
- Documentation for any components you purchased separately from the system, which provides information you need to configure and install these options in your system.
- Updates are sometimes included with the system to describe changes to the system, software, and/or documentation

 **NOTE:** Always read the updates first, because they often supersede information in other documents.

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

Microprocessor	
Microprocessor type	one or two Intel Xeon microprocessors
Front-side bus (external) speed	at least 400 MHz
Internal cache	512 KB cache
Math coprocessor	internal to microprocessor

Expansion Bus	
Bus type	PCI/PCI-X
Expansion slots	six dedicated PCI/PCI-X (full-length, 64-bit, two at 33/66/100/133 MHz; four at 33/66/100 MHz) and one dedicated PCI (32/33 MHz)

Memory	

Architecture	72-bit ECC PC-2100 DDR SDRAM DIMMs, with 2-way interleaving
Memory module sockets	six 72-bit wide 168-pin DIMM sockets
Memory module capacities	256 and 512 MB registered DDR SDRAM DIMMs
Minimum RAM	512 MB

Drives	
Diskette drive	3.5-inch, 1.44-MB diskette drive
SCSI hard drives	up to eight 1-inch, internal Ultra320 SCSI
CD drive	one IDE CD drive

Ports and Connectors	
Externally accessible:	
Serial	two 9-pin connectors
Parallel	one 25-pin connector
USB	two 4-pin connectors
NIC	two RJ45 connectors for integrated 10/100/1000 NICs
Embedded remote access Ethernet	one RJ45 connector for embedded remote access card (10/100 Mbit Ethernet controller) used for remote system administration
Video	one 15-pin connector
PS/2-style keyboard	6-pin mini-DIN connector
PS/2-compatible mouse	6-pin mini-DIN connector

Video	
Video type	ATI Rage XL PCI video controller; VGA connector
Video memory	8 MB

Power	
Power supply:	
Input Wattage	730 W (AC)
Input Voltage	85–240 VAC, 50/60 Hz, 12.0 A 200–240 VAC, 50/60 Hz, 5.0 A
Heat dissipation	3100 BTU/hr.
Output hold up time	20 ms minimum
Maximum inrush current	under typical line conditions and over the entire system ambient operating range, the inrush current may reach 55 A per power supply for 10 ms or less
System battery	CR2032 3.0-V lithium coin cell

Physical	
Rack	
Height	21.7 cm (8.56 inches [5U])
Width	48.0 cm (18.9 inches)
Depth	62.9 cm (24.75 inches)
Weight	40.8 kg (90 lbs) maximum configuration
Tower	
Height	44.5 cm (17.5 inches)
Width	23.0 cm (9.125 inches)
Depth	62.9 cm (24.75 inches)
Weight	40.8 kg (90 lbs) maximum configuration

Environmental	
Temperature:	
Operating	10°C to 35°C (50°F to 95°F)
Storage	-40°C to 65°C (-40°F to 149°F)
Relative humidity:	
Operating	20% to 80% (noncondensing) with a maximum humidity gradation of 10% per hour
Storage	5% to 95% (noncondensing) with a maximum humidity gradation of 10% per hour
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz for 15 minutes
Storage	0.5 G at 3 to 200 Hz for 15 minutes
Maximum shock:	
Operating	one shock pulse in the negative z axis (one pulse on system bottom) of 41 G for up to 2 ms
Storage (non-operational)	six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 71 G for up to 2 ms
Altitude:	
Operating	-16 to 3,048 m (-50 to 10,000 ft.)
Storage	-16 to 10,600 m (-50 to 35,000 ft)

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Basic Troubleshooting

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- [External Visual Inspection](#)
- [Observing the Boot Routine](#)
- [Internal Visual Inspection](#)
- [Running the System Diagnostics](#)
- [System Diagnostics Testing Options](#)
- [Using the Advanced Testing Options](#)

Performing basic troubleshooting procedures can often reveal the source of a system problem or indicate the correct starting point for servicing the system.

Perform the following procedures in the order presented.



NOTE: While your NAS system can be run headless (without a keyboard, mouse, and monitor), some of the following diagnostic procedures will require that you have a keyboard, mouse, and monitor connected to your NAS system.

Initial User Contact

Ask the user to describe the problem and the conditions under which it occurs. Then perform the following steps:

1. Have the user back up the data on the hard drive, if possible.

Refer the user to the documentation provided with the operating system or application software for information about backing up data.

2. Have the user duplicate the problem.

If the user cannot duplicate the problem, proceed to "External Visual Inspection."

Yes. Proceed to step 3.

No. Proceed to the next section, "[External Visual Inspection](#)."

3. Observe the user's actions for errors such as typing an incorrect key combination or entering a command incorrectly.

If the problem is a result of user error, instruct the user in the proper procedure. If it is not, proceed to "[External Visual Inspection](#)."

External Visual Inspection



CAUTION: The power supplies in this system produce high voltages and energy hazards, which can cause bodily harm. Only trained service technicians are authorized to remove the system cover and access any of the components inside the system.

1. Inspect the status indicators for indications of component malfunction.
2. Turn off the system and all attached peripherals.
3. Verify that all power cables are properly connected to the system, peripherals, and their power sources.

4. Ensure that cables are properly attached to all attached devices.
5. If a monitor is used, inspect the video monitor controls for obvious damage or improper settings.

For proper settings of the monitor controls, see the monitor documentation.


6. If a keyboard is used, inspect the keyboard to ensure that keys are not sticking.

If keys are sticking, replace the keyboard.

7. Inspect the system and peripherals for signs of physical damage.

If a peripheral is damaged, see the peripheral documentation. If the system is damaged, see "Internal Visual Inspection."

Observing the Boot Routine

 **NOTE:** Most steps in this procedure require observation of system functions and indications, some of which can occur simultaneously. You may need to reboot the system several times to complete all of these steps.

1. If the system is off, turn on all peripherals and the system. If the system is on, reboot the system.
2. During the boot routine, observe the system for any of the following indications:
 - Beep codes indicate an error condition. See "[System Beep Codes](#)."
 - System error messages indicate problems or provide status information. See "[System Messages](#)."
 - Drive indicators light when data is transferred to or from the drives. If a drive indicator fails to light during the boot routine, troubleshoot the appropriate drive subsystem.
 - Three indicators on the upper-right corner of the keyboard should flash momentarily.


If the indicators flashed, proceed to the next step.

If the indicators did not flash, replace the keyboard with a keyboard that you know works. If the problem persists, troubleshoot the system power supply. If the troubleshooting procedure indicates that the system power supply is working, troubleshoot the memory. See the *Installation and Troubleshooting Guide*.

3. Observe the power-supply indicators.

If the fault indicator(s) is lit, troubleshoot the system power supply. See the *Installation and Troubleshooting Guide*.

Internal Visual Inspection

 **NOTICE:** Before proceeding with the internal visual inspection, save all open files and exit all open applications, if possible.

Visual inspection of a system's interior can often locate the source of a problem, such as a loose expansion card or cable connector. See "[Jumpers and Connectors](#)" to locate components referenced in the inspection procedure.


1. Remove the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including attached peripherals, and disconnect the system from the electrical outlets.

 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of

the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

3. Remove the system cover (see "Removing the Cover").

 **CAUTION:** The microprocessor and heat-sink assembly can get extremely hot during system operations. Ensure that both components have had sufficient time to cool before touching them.

 **CAUTION:** When handling the processor and heat-sink assembly, avoid sharp edges on the heat sink.

4. Ensure that all components (memory modules, expansion cards, and processors) are properly and securely installed.


See the *Installation and Troubleshooting Guide*.

5. Verify that all jumpers are set correctly (see "[Jumpers and Connectors](#)").
6. Ensure that all cables inside the system are firmly attached to their appropriate connectors.
7. Replace the system cover (see "Replacing the Cover").
8. Replace the bezel (see "Replacing the Bezel").
9. Reconnect the system to the electrical outlet and turn on the system, including attached peripherals.

If the problem is resolved, no further steps are necessary. If the problem is not resolved, proceed to "Observing the Boot Routine."

Running the System Diagnostics


You can run system diagnostics from a set of diskettes that you create by downloading the system diagnostics from the Dell Support website at support.dell.com.

 **NOTE:** To perform the tasks in this section, you can connect a keyboard, mouse, and monitor to your system, or you can use the console redirection function on the serial port (COM1). See the *Installation and Troubleshooting Guide* for detailed instructions and the location of the serial port. See the *System Administrator's Guide* for information about console redirection.

To run the system diagnostics from the diskettes, perform the following steps:

1. Go to the Dell Support website at **support.dell.com** and download the system diagnostics.
2. Create diskettes from the downloaded diagnostics program.
3. Insert the first diagnostics diskette.
4. Reboot the system.

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

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

System Diagnostics Testing Options

To select an option from the **Diagnostics** menu, highlight the option and press <Enter>, or press the key that corresponds to the highlighted letter in the option.

[Table 2-1](#) provides a brief explanation of testing options.

Table 2-1. System Diagnostics Testing Options

Testing Option	Function
Quick Tests	Performs a quick check of the system. Select Test All Devices and then select Quick Tests . This option runs device tests that do not require user interaction. Use this option to quickly identify the source of your problem.
Test One Device	Tests a particular device.
Extended Tests	Performs a more thorough check of the system. Select Test All Devices and then select Extended Tests .
Advanced Testing	Checks a particular area of the system.
Information and Results	Displays test results.
Program Options	Sets various test parameters.
Device Configuration	Displays an overview of the devices in the system.
Exit to MS-DOS	Exits the diagnostics and returns to the System Utilities menu.

Using the Advanced Testing Options

When you select **Advanced Testing** from the **Diagnostics** menu, the main screen of the diagnostics appears and displays the following information:

- Two lines at the top of the screen identify the diagnostics utility, the version number, and the system's service tag number.
- The left side of the screen under **Device Groups** lists the diagnostic device groups in the order that they are tested if you select **All** under the **Run Tests** submenu. Press the up- or down-arrow keys to highlight a particular device group. Press the left- or right-arrow keys to select the options on the menu. As you move from one menu option to another, a brief explanation of the highlighted option appears at the bottom of the screen.
- The right side of the screen under **Devices for Highlighted Group** lists the specific devices within a particular test group.
- The menu area consists of two lines at the bottom of the screen. The first line lists the menu options that you can select; press the left- or right-arrow key to highlight an option. The second line provides information about the highlighted option.

For more information about a device group or device, highlight the **Help** option and press <Enter>. Press <Esc> to return to the previous screen.

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Indicators, Codes, and Messages

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- [Front-Panel Indicators and Features](#)
- [Back-Panel Indicators and Features](#)
- [Power Indicator Codes](#)
- [Hard-Drive Indicator Codes](#)
- [NIC Indicator Codes](#)
- [ERA/O Ethernet Connector Indicator Codes \(Optional\)](#)
- [Cooling Fan Indicator Codes](#)
- [System Beep Codes](#)
- [System Board LED Codes](#)
- [System Messages](#)
- [Warning Messages](#)
- [Diagnostics Messages](#)
- [Alert Messages](#)

Applications, operating systems, and the system itself are capable of identifying problems and alerting you to them. When a problem occurs, a message may appear on the monitor, or a beep code may sound.

A variety of indicators, codes, and messages can alert you when the system is not functioning properly:

- System-status indicators
- Front-panel indicators and features
- Back-panel indicators and features
- Power indicator codes
- Hard-drive indicator codes
- NIC indicator codes
- ERA/O Ethernet connector indicator codes
- Cooling fan indicator codes
- System beep codes
- System board LED codes
- System messages
- Warning messages
- Diagnostics messages
- Alert messages

The system indicators and features are illustrated in [Figure 3-1](#) through [Figure 3-6](#). This section also describes each type of message, and lists the possible causes and actions you can take to resolve any problems indicated by a message. To determine what type of message you have received, read the following subsections.

System-Status Indicators

The system has indicators that can represent system status. When the bezel is installed (see [Figure 3-1](#)), the bezel system status indicator signifies when the system is operating properly or when the system needs attention. A caution code signifies a problem with microprocessors, power supply, system or power-supply fans, system temperature, hard drives, system memory, expansion cards, or integrated SCSI controller. When the bezel is off, the system status indicators on the system (see [Figure 3-2](#)) assume the same functions as the system status indicator.

[Table 3-1](#) lists the system's status indicator codes.

Figure 3-1. System-Status Indicators

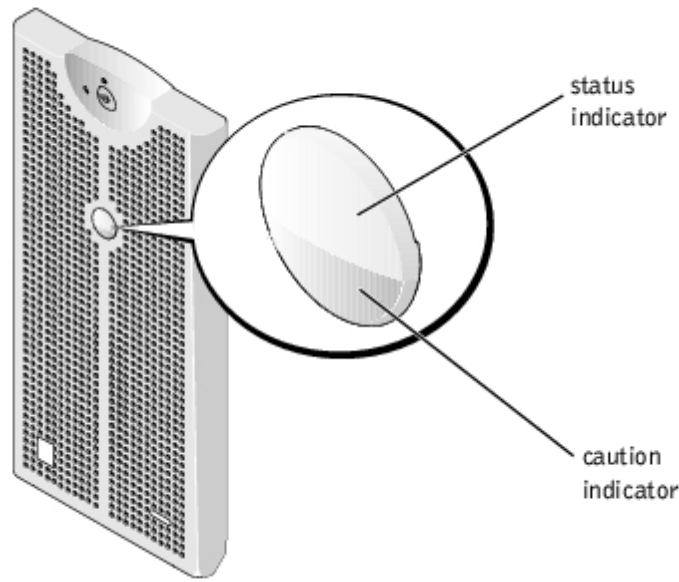


Table 3-1. System-Status Indicator Codes

Bezel Indicators		Indicator Code
Status	Caution	
Off	Off	No power is available to the system, or the system is not powered on.
On	Off	The system is operating normally.
Off	Blinking	The system has detected an error and requires attention.
Blinking	Off	The system is identifying itself (see " Front-Panel Indicators and Features ").
Blinking	Blinking or Off	Systems management software causes the status indicator to blink to identify a particular system.

Front-Panel Indicators and Features

Additional indicators are located behind the bezel on the power supplies, hard drives, and the control panel. The CD and diskette drives have a green activity indicator.

[Figure 3-2](#) shows the front-panel indicators and features of the system. [Table 3-2](#) describes the front-panel features.

Figure 3-2. Front-Panel Indicators and Features

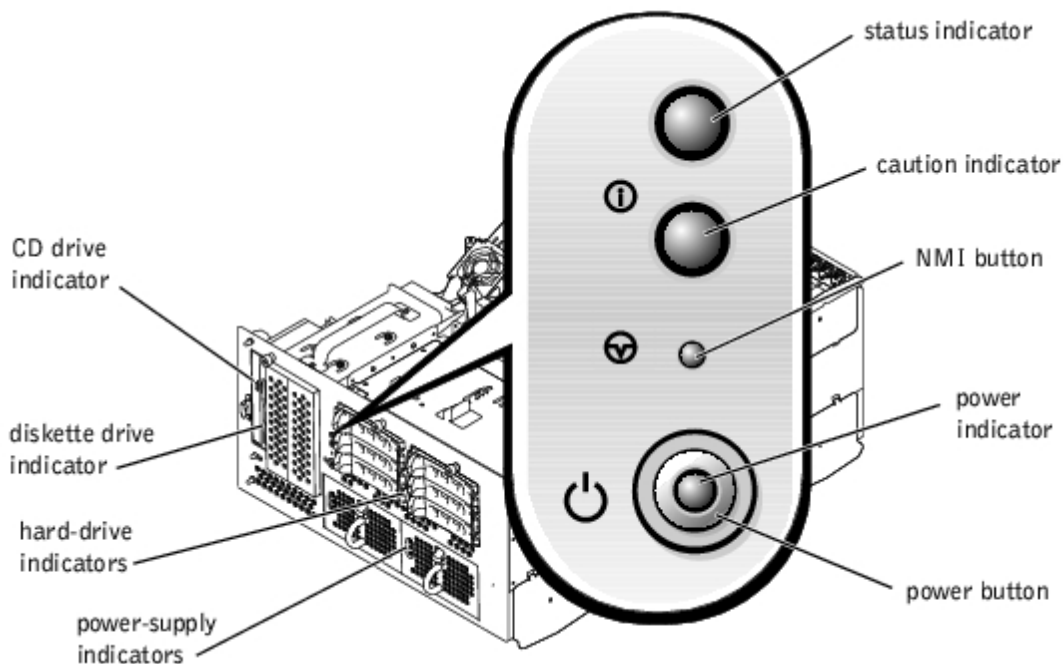



Table 3-2. Front-Panel Features

Component	Description
Power button	<p>Turns system power off and on.</p> <ul style="list-style-type: none"> If you turn off the system using the power button and the system is running an ACPI-compliant operating system, the system can perform an orderly shutdown before power is turned off. If the system is not running an ACPI-compliant operating system, power is turned off immediately after the power button is pressed. <p>The button is enabled in the System Setup program. When disabled, the button can only turn system power on. For more information, see the <i>User's Guide</i> and the operating system's documentation.</p>
Power indicator	Provides information on power status (see " Power Indicator Codes ").
Power-supply indicators	Provide information on power status (see " Power-Supply Indicator Codes ").
CD and diskette drive indicators	Indicates read or write access to the respective drive.
Hard-drive indicators	Provide information on the status of the respective hard drive (see " Hard-Drive Indicator Codes ").
NIC indicators	Indicate whether the NIC has a valid link to the network (see " NIC Indicator Codes ").
NMI button	<p>Troubleshoots software and device driver errors when using certain operating systems. You can press this button using the end of a paper clip. The NMI option is enabled in the System Setup program.</p> <p> NOTICE: Pressing this button halts the operating system and displays a diagnostic screen.</p>

Back-Panel Indicators and Features

[Figure 3-3](#) shows the back-panel features of the system. [Table 3-3](#) describes the back-panel features.

Figure 3-3. Back-Panel Features

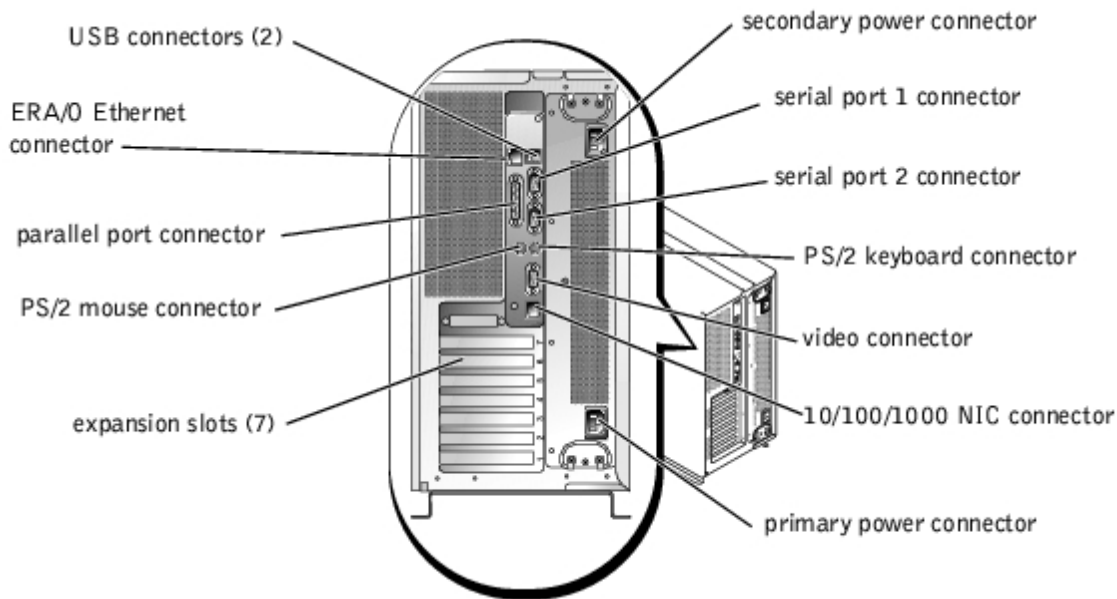


Table 3-3. Back-Panel Indicators

Component	Description
NIC indicators	Provides information on NIC status (see " NIC Indicator Codes ").
ERA/O Ethernet connector indicators	Provides information about the ERA/O Ethernet connector status (see " ERA/O Ethernet Connector Indicator Codes (Optional) ").

Power Indicator Codes

The system has indicators on the power button and on the power supplies that signify system power status.

Power-Button Indicator Codes

The power button controls the power input to the system's power supplies. The power-button indicator can provide information on power status (see [Figure 3-2](#)).

[Table 3-4](#) lists the power-button indicator codes.

Table 3-4. Power-Button Indicator Codes

Indicator	Indicator Code
On	Indicates that power is supplied to the system, and the system is operational.
Off	Indicates that no power is supplied to the system.
Blinking	Indicates that power is supplied to the system, but the system is in a standby state. For more information on standby states, see your operating system documentation.

Power-Supply Indicator Codes

Each hot-pluggable power supply has indicators that can provide information on power status, fault, and the presence of power (see [Figure 3-4](#)). [Table 3-5](#) lists the power-supply indicator codes.

Figure 3-4. Power-Supply Indicators

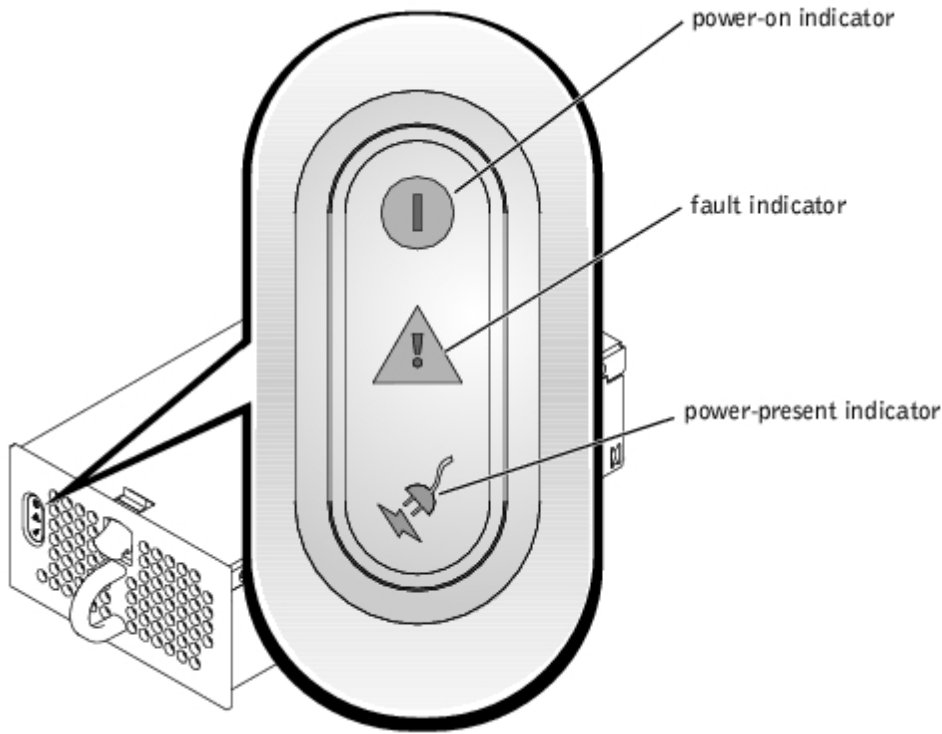


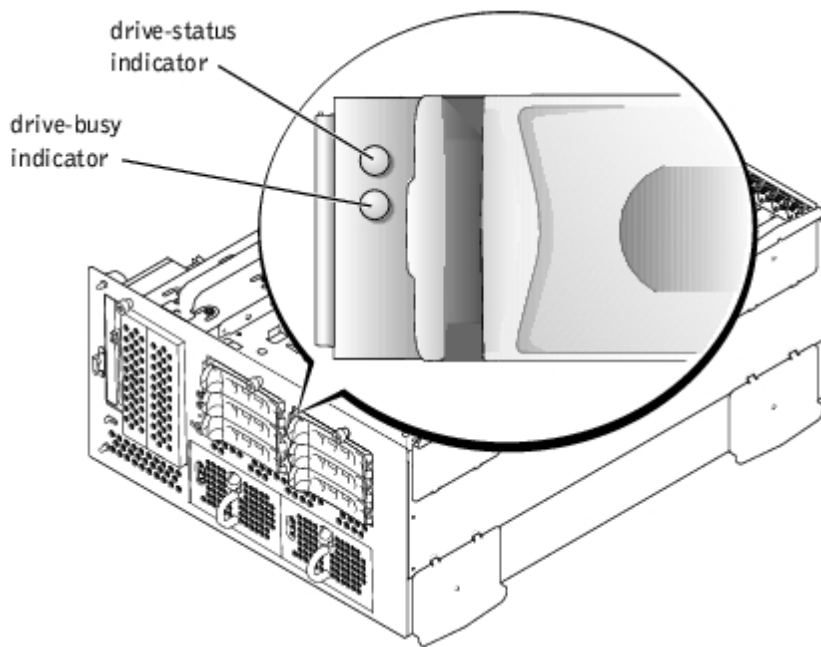
Table 3-5. Power-Supply Indicator Codes

Indicator	Indicator Code
Power-on	Green indicates that the power supply is operational.
Fault	Red indicates a problem with the power supply (fan failure, voltage error, etc.).
Power present	Green indicates that power is present at the power supply and that the system is connected to a power source.

Hard-Drive Indicator Codes

Each hard-drive carrier has two indicators: a busy indicator and a status indicator (see [Figure 3-5](#)). The indicators provide information on the status of the respective hard drive. [Table 3-6](#) lists the drive indicator codes.

Figure 3-5. Hard-Drive Indicators



[Table 3-6](#) lists the drive indicator codes. Different codes display as drive events occur in the system. For example, in the event of a hard-drive failure, the "drive fail" code appears. After the drive is selected for removal, the "preparing for removal" code appears. After the replacement drive is installed, the "preparing for operation, drive online" code appears.

Table 3-6. Hard-Drive Indicator Codes

Drive Status Indicator	Indicator Code
Drive bay empty, ready for insertion or removal	Off
Drive being prepared for operation, drive online	Steady green
Drive being identified	Blinks green four times per second
Drive being prepared for removal	Blinks green twice per second at equal intervals
Drive rebuilding	Blinks green twice per second at unequal intervals
Drive failed	Blinks amber four times per second
Predicted failure for the drive	Blinks green, then amber, and then off, repeating this sequence every two seconds

NOTE: The drive-busy indicator signifies whether the hard drive is active on the SCSI bus. This indicator is controlled by the hard drive.

NIC Indicator Codes

Each NIC on the back panel has an indicator that provides information on network activity and link status (see [Figure 3-6](#)). [Table 3-7](#) lists the NIC indicator codes on the back panel.

The front panel has a link indicator for each NIC (see [Figure 3-2](#)). Each indicator signifies whether the corresponding NIC is connected to a valid link partner on the network.

Figure 3-6. NIC Indicators

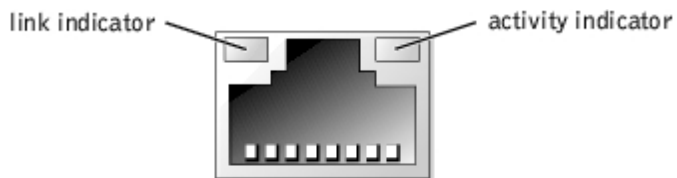


Table 3-7. NIC Indicator Codes

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

ERA/O Ethernet Connector Indicator Codes (Optional)

The embedded remote access option (ERA/O) Ethernet connector indicators on the back panel provide information on network activity and link status for the ERA/O Ethernet connector (see [Figure 3-7](#)). [Table 3-8](#) lists the ERA/O Ethernet connector indicator codes.

Figure 3-7. ERA/O Ethernet Connector

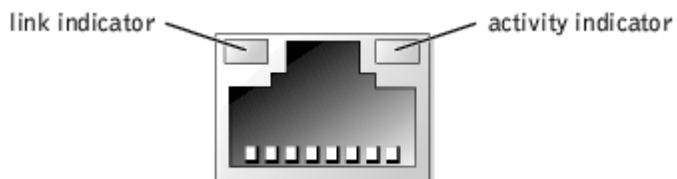


Table 3-8. ERA/O Ethernet Connector Indicator Codes

Link Indicator	Activity Indicator	Indicator Code
Off	Off	The ERA/O Ethernet connector is not connected to the network.
Green	Amber	The ERA/O Ethernet connector is connected to a valid link partner on the network.
Green	Amber blinking	Network data is being sent or received.

Cooling Fan Indicator Codes

Each individual fan has a status indicator adjacent to the fan connectors on either the system board or on the SCSI backplane board (see [Figure 3-8](#)). To locate the fan connectors on the system board, see [Figure 5-2](#). To locate the fan connector on the SCSI backplane board, see [Figure 5-4](#). [Table 3-9](#) lists the cooling fan indicator codes.

Figure 3-8. Cooling Fan Status Indicators

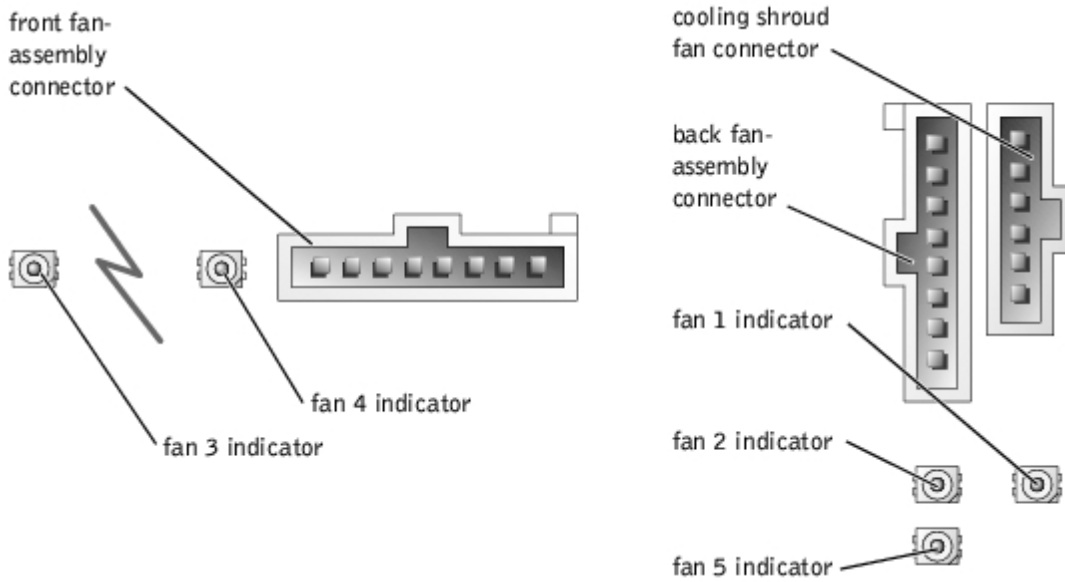


Table 3-9. Cooling Fan Indicator Codes

Indicator	Indicator Code
Off	The fan is not installed.
Green	The fan is operating normally.
Amber blinking	The fan is malfunctioning.

System Beep Codes

When an error that cannot be reported on the monitor occurs during a boot routine, the system may emit a series of beeps that identifies the problem.

When a beep code is emitted, make a note of it and then look it up in [Table 3-10](#). If you are unable to resolve the problem by looking up the meaning of the beep code, use the system diagnostics to identify a more serious cause.

NOTE: If the system boots without a keyboard, mouse, or monitor attached, the system will not issue beep codes related to those peripherals.

NOTE: Before you perform any procedures described in [Table 3-10](#), see "[External Visual Inspection](#)."

Table 3-10. System Beep Codes

Code	Cause	Corrective Action
1-1-2	CPU register test failure.	Replace microprocessor 0. See " Microprocessors ." If the problem persists, replace microprocessor 1.
1-1-3	CMOS write/read failure; faulty system board.	Replace the system board (see " System Board ").
1-1-4	BIOS error.	Reflash the BIOS firmware. Download the latest firmware from the Dell Support website at support.dell.com .
1-2-1	Programmable interval-timer failure; faulty system board.	Replace the system board (see " System Board ").

1-2-2	DMA initialization failure.	Ensure that the memory modules are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").	
1-2-3	DMA page register write/read failure.		
1-3-1	Main-memory refresh verification failure.		
1-3-2	No memory installed.		
1-3-3	Chip or data line failure in the first 64 KB of main memory.		
1-3-4	Odd/even logic failure in the first 64 KB of main memory.		
1-4-1	Address line failure in the first 64 KB of main memory.		
1-4-2	Parity failure in the first 64 KB of main memory.		
1-4-3	Fail-safe timer test failure.		
1-4-4	Software NMI port test failure.		
2-1-1 through 2-4-4	Bit failure in the first 64 KB of main memory.		
3-1-1	Slave DMA-register failure.		Replace the system board (see " System Board ").
3-1-2	Master DMA-register failure.		
3-1-3	Master interrupt-mask register failure.		
3-1-4	Slave interrupt-mask register failure.		
3-2-2	Interrupt vector loading failure.		
3-2-4	Keyboard-controller test failure.	Check the keyboard cable and connector. If the problem persists, replace the keyboard. If the problem persists, replace the system board (see " System Board ").	
3-3-1	CMOS failure.	Replace the system board (see " System Board ").	
3-3-2	System configuration check failure.		
3-3-3	Keyboard controller not detected.		
3-3-4	Video memory test failure.		
3-4-1	Screen initialization failure.		
3-4-2	Screen-retrace test failure.		
3-4-3	Video ROM search failure.		
4-2-1	No timer tick.		

4-2-2	Shutdown test failure.	
4-2-3	Gate A20 failure.	
4-2-4	Unexpected interrupt in protected mode.	Ensure that the expansion cards are properly installed. If the problem persists, replace the faulty expansion card(s) (see " Expansion Cards ").
4-3-1	Improperly installed or faulty memory modules.	Ensure that the memory modules are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").
4-3-2	No memory modules installed in bank 1.	Install memory modules in bank 1 of the same type and size (see " Installing Memory Modules ").
4-3-3	Faulty system board.	Replace the system board (see " System Board ").
4-3-4	Time-of-day clock stopped.	Ensure that the system battery is properly installed. If the problem persists, replace the battery (see " System Battery ").
4-4-1	Super I/O chip failure; faulty system board.	Replace the system board (see " System Board ").
4-4-2	BIOS-shadowing failure.	Ensure that the system cooling fans are properly installed. If the problem persists, replace the faulty fan(s) (see " System Fans "). If the problem persists, replace the system board (see " System Board ").
4-4-3	Microprocessor speed control sequence failure.	Ensure that the microprocessors are properly installed. If the problem persists, replace the faulty microprocessor(s) (see " Microprocessors "). If the problem persists, replace the system board (see " System Board ").
4-4-4	Cache test failure; faulty microprocessor.	

System Board LED Codes

⚠ CAUTION: The power supplies in this system produce high voltages and energy hazards, which can cause bodily harm. Only trained service technicians are authorized to remove the system cover and access any of the components inside the system.

Errors that cannot be reported on the monitor during the boot routine can appear on the system board as a series of five lit or flashing LEDs. The LEDs can only be seen when the system cover is removed (see [Figure 3-9](#)). [Table 3-11](#) defines these LED codes.

Figure 3-9. System Board LEDs

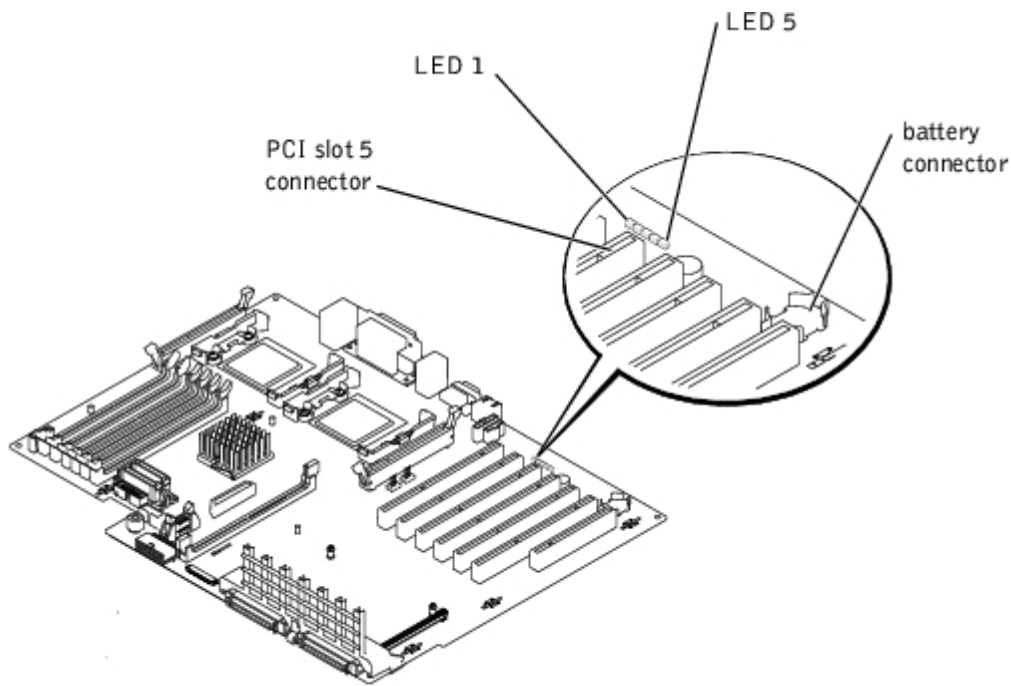


Table 3-11. System Board LED Codes

	Group, Meaning	LED 1	LED 2	LED 3	LED 4	LED 5
	System is healthy, AC power not present, bad 3.3 V AUX, or PDM not connected.	OFF	OFF	OFF	OFF	OFF
	1 - Cables and Installed Components					
1	Control panel cable not present	BLINK	OFF	OFF	OFF	OFF
2	Backplane cable not present	BLINK	OFF	OFF	OFF	ON
3	VRM_P1 missing	BLINK	OFF	OFF	ON	ON
4	PROC1 missing	BLINK	OFF	ON	OFF	OFF
5	PROC2 present but VRM_P2 missing	BLINK	OFF	ON	OFF	ON
6	VRM_P1 present but PROC1 missing	BLINK	OFF	ON	OFF	OFF
7	VRM_P1 and VRM_P2 vendor mismatch	BLINK	OFF	ON	ON	ON
8	PROC1 and PROC2 core voltage (VID) mismatch	BLINK	ON	OFF	OFF	OFF
9	PROC 1 and PROC 2 bus frequency mismatch	BLINK	ON	OFF	OFF	ON
10	DDR 200 memory in 533 MHz	BLINK	ON	OFF	ON	OFF
11	PROC1 heat sink not installed properly. Thermtrip on PROC1	BLINK	ON	OFF	ON	ON
12	PROC2 heat sink not installed properly. Thermtrip on PROC2	BLINK	ON	ON	OFF	OFF
	2 - VRMs and POWERGOOD					
1	PD_ON# from the ICH3 not happening	OFF	BLINK	OFF	OFF	ON
2	Power supply not turning ON. +12 V bad or missing.	OFF	BLINK	OFF	ON	OFF
3	+1.2V is not good.	OFF	BLINK	OFF	ON	ON
4	+1.8V is not good.	OFF	BLINK	ON	OFF	OFF
5	+1.25V is not good.	OFF	BLINK	ON	OFF	ON

6	+2.5V is not good.	OFF	BLINK	ON	ON	OFF
7	+3.3V is not good.	OFF	BLINK	ON	ON	ON
8	+3.3V_PCI is not good.	ON	BLINK	OFF	OFF	OFF
9	+5V is not good.	ON	BLINK	OFF	OFF	ON
10	System POWERGOOD missing. Bad U6009.	ON	BLINK	OFF	ON	OFF
11	Standby POWERGOOD missing. Bad +5V_AUX or +1.8V_AUX.	ON	BLINK	OFF	ON	ON
12	VRM_P1 is not good.	ON	BLINK	ON	OFF	OFF
13	VRM_P2 is not good.	ON	BLINK	ON	OFF	ON
	3 - NOPOST NO VIDEO (chipset)					
1	CPU POR is not high. North bridge chip on the planar has likely failed. Replace planar.	OFF	OFF	BLINK	OFF	ON
2	ICH3 PCI Reset is not high. ICH3 chip on the planar has likely failed. Replace planar.	OFF	OFF	BLINK	ON	OFF

System Messages

System messages appear on the console during POST to notify you of a possible problem with the system. If you are performing console redirection, system messages will appear on the remote console. [Table 3-12](#) lists the system messages that can occur and the probable cause for each message.


 **NOTE:** If you receive a system message that is not listed in [Table 3-12](#), check the documentation for the application program that is running when the message appears or the operating system's documentation for an explanation of the message and recommended action.

Table 3-12. System Messages

Message	Causes	Corrective Actions
Address mark not found	Faulty CD/diskette drive subsystem or hard-drive subsystem; faulty system board.	Replace the faulty drive(s) (see " Replacing the CD/Diskette Drive " and " Hard Drives "). If the problem persists, replace the system board (see " System Board ").
Alert! All memory in the system must have the same primary SDRAM width. The following memory DIMMs have been disabled: DIMMnX.	Memory modules installed are not the same type and size in all banks; faulty memory module(s).	Ensure that all banks contain memory modules of the same type and size and that they are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").
Alert! Unsupported memory or incomplete sets in the following bank(s): Bank DIMMnX	Memory modules installed in the specified bank(s) are not the same type and size; faulty memory module(s).	
Amount of available memory limited to 256 MB!	OS Install Mode is enabled in the System Setup program.	Disable OS Install Mode in the System Setup program (see " Using the System Setup Program ").
Auxiliary device failure	Loose or improperly connected mouse or keyboard cable; faulty mouse or keyboard.	Check the mouse and keyboard cables and connectors. If the problem persists, replace the mouse and keyboard. If the problem persists, replace the system board (see " System Board ").

BIOS Update Attempt Failed!	Remote BIOS update attempt failed.	Retry the BIOS update. Download the latest firmware from the Dell Support website at support.dell.com .
CD-ROM drive not found	Improperly connected or missing CD drive.	Ensure that the CD/diskette drive is properly installed. If the problem persists, replace the CD/diskette drive (see " CD/Diskette Drive ").
CPUs with different cache sizes detected	Microprocessors with different cache sizes are installed.	Ensure that all microprocessors have the same cache size and that they are properly installed (see " Microprocessors ").
Decreasing available memory	Faulty or improperly installed memory modules.	Ensure that the memory modules are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").
Diskette drive n seek failure	Incorrect configuration settings in the System Setup program.	Run the System Setup program to correct the settings (see " Using the System Setup Program ").
	Faulty or improperly installed diskette drive.	Ensure that the CD/diskette drive is properly installed. If the problem persists, replace the CD/diskette drive (see " CD/Diskette Drive ").
Diskette read failure	Faulty or improperly inserted diskette.	Replace the diskette.
Diskette subsystem reset failed	Faulty or improperly installed diskette drive.	Ensure that the CD/diskette drive is properly installed. If the problem persists, replace the diskette drive (see " CD/Diskette Drive ").
ECC memory error	Faulty or improperly installed memory modules.	Ensure that the memory modules are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").
Embedded server management error Embedded server management is not present.	Embedded server management memory may be temporarily corrupted	To clear the embedded remote access memory, shut down the system, disconnect the power cords, wait approximately 30 seconds, reconnect the power cords, and restart the system. If the problem persists, replace the ERA/O card (see " ERA/O Card ").
Error: Maximum PCI option ROM count exceeded!	Too many expansion cards have ROM enabled in the System Setup program.	Disable ROM for some of the expansion cards (see " Using the System Setup Program ").
Gate A20 failure	Faulty keyboard controller; faulty system board.	Replace the system board (see " System Board ").
Hard disk controller failure Hard disk read failure	Incorrect configuration settings in System Setup program; improperly installed hard drive, or loose interface or power cable; faulty hard-drive controller subsystem.	Run the System Setup program to correct the drive type (see " Using the System Setup Program "). If the problem persists, ensure that the hard drives are properly installed (see " Hard Drives "). If the problem persists, replace the system board (see " System Board ").
I/O parity interrupt at <i>address</i>	Faulty or improperly installed expansion card.	Ensure that the expansion cards are properly installed. If the problem persists, replace the faulty expansion card(s) (see " Expansion Cards ").
Invalid configuration information - please run SETUP program	Incorrect configuration settings in System Setup program; NVRAM_CLR jumper is installed; faulty system battery.	Check the System Setup configuration settings (see " Using the System Setup Program "). Remove the NVRAM_CLR jumper (see Figure 5-2 for jumper location). If the problem persists, replace the system battery (see " System Battery ").
Invalid memory configuration		

detected; potential for data corruption exists	Faulty or improperly installed memory modules.	Memory modules must be populated in the following order: DIMM_1A and DIMM_1B must be in the first slots populated; DIMM_2A and DIMM_2B must be in the second slots populated, and so on. Remove and reseal the DIMMs in their sockets. If the problem persists, replace the memory module (" Memory Modules ").
Invalid NVRAM configuration, resource re-allocated	System configuration data has been ignored.	Check the System Setup configuration settings (see " Using the System Setup Program ").
Invalid SCSI configuration; SCSI cable not detected on connector SCSIB of the primary SCSI backplane, daughter card present	A SCSI cable is not connected to the channel B connector on the SCSI backplane board; SCSI backplane daughter card is installed.	If a cable is connected to the SCSIB backplane board connector, the SCSI backplane daughter card must be installed. Install the SCSI cable to SCSIB backplane board connector (see " Replacing the SCSI Backplane Board ").
Invalid SCSI configuration; SCSI cable detected on connector SCSIB of the primary SCSI backplane, daughter card not present	A SCSI cable is connected to the channel B connector on the SCSI backplane board; SCSI backplane daughter card is not installed.	If a cable is connected to the SCSIB backplane board connector, the SCSI backplane daughter card must be installed. Install the backplane daughter card (see " Replacing the SCSI Backplane Board ").
Keyboard controller failure	Faulty keyboard controller; faulty system board.	Replace the system board (see " System Board ").
Keyboard clock line failure	Loose or improperly connected keyboard cable; faulty keyboard; faulty keyboard controller.	Check the keyboard cable and connector. If the problem persists, replace the keyboard. If the problem still persists, replace the system board (see " System Board ").
Keyboard data line failure		
Keyboard failure		
Keyboard stuck key failure		
Memory address line failure at address, read value expecting value	Faulty or improperly installed memory modules.	Ensure that the memory modules are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").
Memory double word logic failure at address, read value expecting value		
Memory high address line failure at start address to end address		
Memory high data line failure at start address to end address		
Memory odd/even logic failure at start address to end address		
Memory parity failure at start address to end address		
Memory parity error at address		
Memory write/read failure at address, read value expecting value		
No boot device available	Faulty or missing CD/diskette drive subsystem, hard drive, or hard-drive subsystem.	Check the boot device configuration settings in the System Setup program for Integrated Devices (see " Using the System Setup Program "). If they were disabled, enable them and reboot. If booting from a SCSI controller, ensure that the controller is properly connected. If the problem persists, replace the faulty drive(s) (see " CD/Diskette Drive " and " Hard Drives "). If the problem still persists, replace the system board (see " System Board ").
No boot sector on hard-disk	No operating system on hard drive.	Check the hard-drive configuration settings in the System Setup program (see " Using the System Setup Program ").

No PXE-capable device available	<F12> pressed during POST and no PXE devices are detected.	Check the configuration settings in the System Setup program for the NICs (see " Using the System Setup Program ").
No timer tick interrupt	Faulty system board.	Replace the system board (see " System Board ").
Not a boot diskette	No operating system on diskette.	Use a bootable diskette.
PCI BIOS failed to install	Loose cables to expansion card(s); faulty or improperly installed expansion card.	Ensure that cables to expansion cards are properly connected. Ensure that the expansion cards are properly installed. If the problem persists, replace the faulty expansion card(s) (see " Expansion Cards ").
Plug & Play Configuration Error Embedded xxx	Error encountered in initializing PCI device; faulty system board.	Install the NVRAM_CLR jumper and reboot the system (see Figure 5-2 for jumper location). If the problem persists, ensure that the expansion cards are properly installed. If the problem still persists, replace the faulty expansion card(s) (see " Expansion Cards "). If the problem still persists, update the BIOS firmware. Download the latest firmware from the Dell Support website at support.dell.com .
Plug & Play Configuration Error PCI_n	Error encountered in initializing PCI adapter.	
Primary backplane is not present	Faulty or improperly installed SCSI backplane board.	Ensure that the SCSI backplane board is properly installed. If the problem persists, replace the backplane board (see " SCSI Backplane Board ").
Processor n internal error	Faulty microprocessor; faulty system board.	Ensure that the microprocessors are properly installed. If the problem persists, replace the faulty microprocessor(s) (see " Microprocessors "). If the problem persists, replace the system board (see " System Board ").
Processor bus parity error		
Processor in socket 1 not installed!	No microprocessor installed in primary microprocessor socket.	Install a microprocessor in the primary microprocessor socket. Also, ensure that a VRM for processor 1 is installed (see " Microprocessors ").
SCSI cable not present on connector SC5IA of the primary backplane	SCSI cable is loose, improperly connected, or faulty.	Ensure that the SCSI cables are properly installed. If problem persists, add or replace the cables.
Shutdown failure	Shutdown test failure.	Ensure that the memory modules are properly installed. If the problem persists, replace the faulty memory module(s) (see " Memory Modules ").
System backplane error	Faulty or improperly installed SCSI backplane board.	Ensure that the SCSI backplane board is properly installed. If the problem persists, replace the backplane board (see " SCSI Backplane Board ").
System halted! Must power down	Wrong password entered too many times.	Information only.
Time-of-day clock stopped	Faulty battery.	Ensure that the system battery is properly installed. If the problem persists, replace the battery (see " System Battery ").
Time-of-day not set - please run SETUP program	Incorrect Time or Date settings; faulty system battery.	Check the Time and Date settings (see " Using the System Setup Program "). If the problem persists, replace the system battery (see " System Battery ").
Timer chip counter 2 failed	Faulty system board.	Replace the system board (see " System Board ").
Unsupported CPU combination	Microprocessor(s) is not supported by the system.	Update the BIOS firmware. Download the latest firmware from the Dell Support website at support.dell.com . If the problem persists, install a supported microprocessor combination (see " Microprocessors ").
Unsupported CPU stepping detected		
Unsupported DIMM detected in the RAID DIMM slot!	RAID memory module is not supported by the system.	Install a correct version of the RAID memory module (see " Integrated RAID Controller ").

Unsupported RAID key detected!	RAID hardware key is not supported by the system.	Install the RAID hardware key for your specific system (see " Integrated RAID Controller ").
The VRM for the processor in socket <i>n</i> is not installed.	Specified microprocessor VRM is faulty, unsupported, improperly installed, or missing.	A VRM must be installed for each installed microprocessor. Install a VRM for the specified microprocessor or remove the VRM for the specified microprocessor if that microprocessor is not installed (see " Microprocessors "). To identify the microprocessors and VRMs, see Figure 5-2 .
Warning: Detected mode change from RAID to SCSI B of the embedded RAID subsystem.	Type of controller has changed since previous system boot.	Back up information on the hard drives before changing the type of controller used with the drives.
Warning: Detected missing RAID hardware for the embedded RAID subsystem. Data loss will occur! Press Y to switch mode to SCSI, press any other key to disable both channels. Press Y to confirm the change; press any other key to cancel.		
Warning: Firmware is out-of-date, please update.	Firmware error.	Update the firmware. Download the latest firmware from the Dell Support website at support.dell.com .
Warning! No microcode update loaded for processor <i>n</i>	BIOS error.	Update the BIOS firmware. Download the latest firmware from the Dell Support website at support.dell.com .
Warning! System FRU is not programmed	Faulty or corrupt data in NVRAM.	Ensure that the system board is properly installed and configured. If the problem persists, replace the system board (see " System Board ").
Write fault	Faulty diskette, CD/diskette drive assembly, hard drive, or hard-drive subsystem.	Replace the faulty drive(s) (see " CD/Diskette Drive " and " Hard Drives "). If the problem persists, replace the system board (see " System Board ").
Write fault on selected drive		

Warning Messages

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



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

Diagnostics Messages

When you run a test group or subtest in system diagnostics, an error message may result. Diagnostic error messages are not covered in this section. The message usually provides information for identification of the faulty component.

Alert Messages

The optional systems management software generates alert messages for your system. For example, the software generates messages that appear in the SNMP trap log file. Alert messages consist of information, status, warning, and failure messages for drive, temperature, fan, and power conditions. For more information, see the systems management software documentation.


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Removing and Replacing Parts


Dell™ PowerVault™ 770N Systems Service Manual

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- [System Fans](#)
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- [CD/Diskette Drive](#)
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- [Installing an External SCSI Tape Drive](#)
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- [Integrated RAID Controller](#)
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- [Memory Modules](#)
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- [System Battery](#)
- [System Board](#)

The procedures in this guide require that you remove the cover and work inside the system. While working inside the system, do not attempt to service the system except as explained in this manual and elsewhere in your system documentation. Always follow the instructions closely. Review all of the procedures in your *System Information Guide*.

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

This section provides servicing procedures for components inside the system. Before you start any of the procedures in this section, perform the following tasks:

 Read the safety information in the *System Information Guide*.

- Perform the procedures described in "[External Visual Inspection](#)."

When there is no replacement procedure provided, use the removal procedure in reverse order to install the replacement part.

Recommended Tools

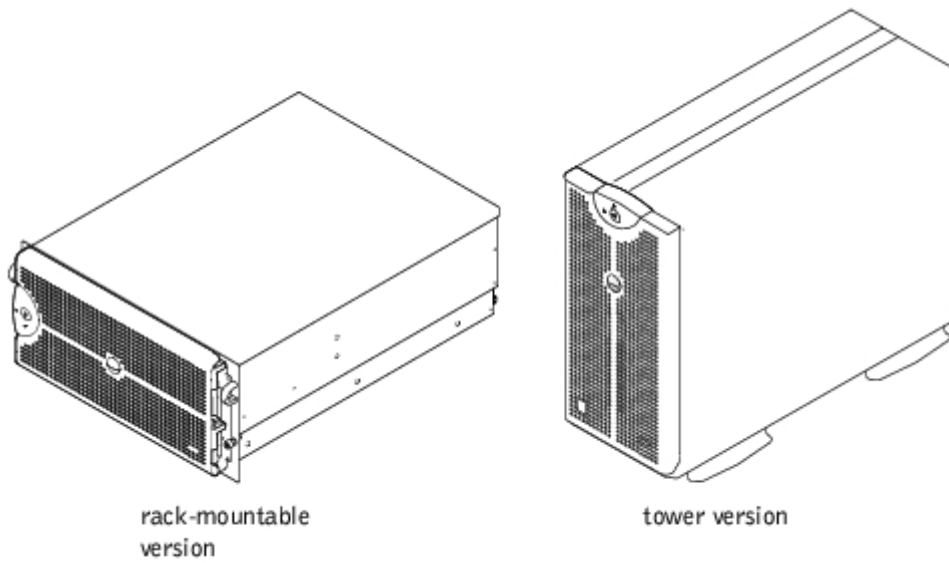
You need the following items to perform the procedures in this section:

- Key to the system keylock
 - #2 Phillips screwdriver
 - Wrist grounding strap
-

System Orientation

[Figure 4-1](#) shows the rack and tower versions of the system. The illustrations in this document depict the tower version of the system lying on its side.

Figure 4-1. System Orientation



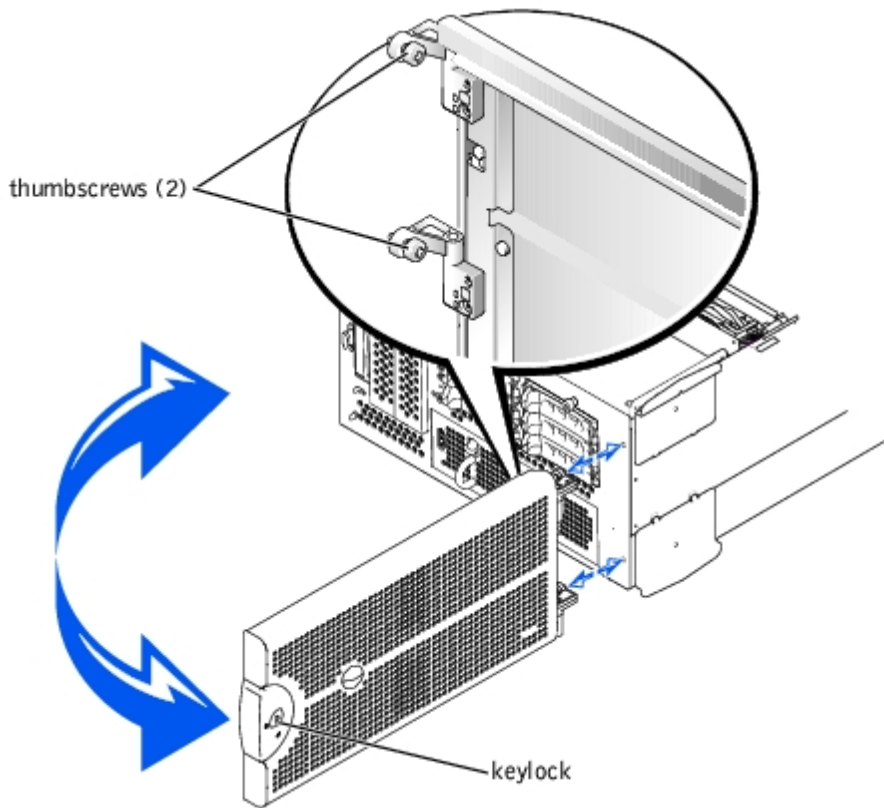
Bezel

The bezel has a system status indicator. A lock on the bezel restricts access to the power button, CD/diskette drive, hard drive(s), power supplies, and the interior of the system. You must open or remove the bezel and remove the system cover to gain access to internal components.

Removing the Bezel

1. Using the system key, unlock the bezel.
2. Press the tab at the left end of the bezel.
3. Pull the bezel away from the system so that it is perpendicular to the system (see [Figure 4-2](#)).
4. Loosen the thumbscrews to release the bezel (see [Figure 4-2](#)).
5. Pull the bezel away from the chassis.

Figure 4-2. Removing the Bezel



Replacing the Bezel

1. Align the two thumbscrews with the mounting holes on the front of the system.
2. Tighten the thumbscrews to secure the bezel (see [Figure 4-2](#)).
3. Swing the bezel closed until it snaps into place.
4. Using the system key, lock the bezel.

System Cover

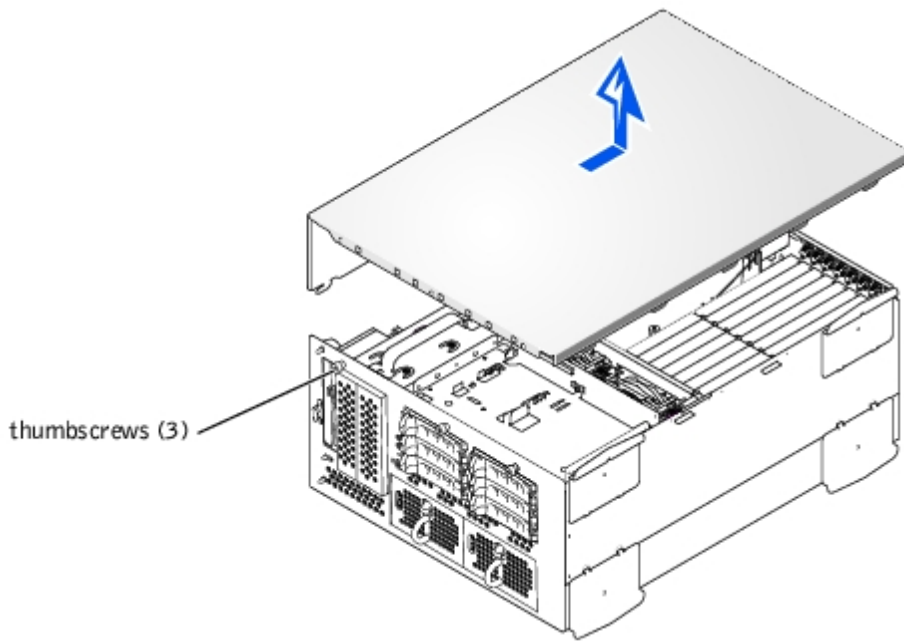
To upgrade or troubleshoot the system, remove the system cover to gain access to internal components.

Removing the Cover

⚠ CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, read the safety instructions in your *System Information Guide*.

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Loosen the three thumbscrews on the front of the system (see [Figure 4-3](#)).
4. Slide the system cover backward and grasp the cover at both ends.
5. Carefully lift the cover away from the system.

Figure 4-3. Removing the Cover



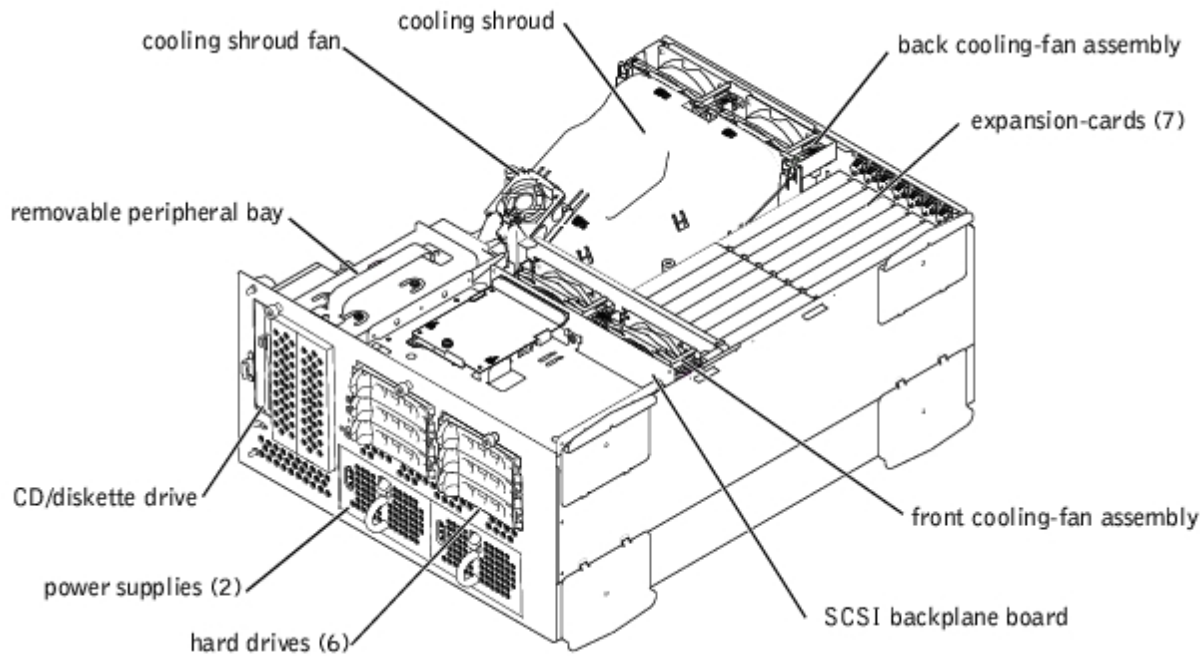
Replacing the Cover

1. Ensure that no tools or parts are left inside the system and that any cables are routed so that they will not be damaged by the cover.
2. Align the cover with the cover alignment hooks on the sides of the chassis, and slide the cover forward (see [Figure 4-3](#)).
3. Tighten the three thumbscrews that secure the cover to the chassis.
4. Replace the bezel (see "[Replacing the Bezel](#)").

Inside the System

In [Figure 4-4](#), the covers and bezel are removed to provide an interior view of the system.

Figure 4-4. Inside the System



The system board holds the system's control circuitry and other electronic components. Several hardware options, such as the microprocessors and memory, are installed directly on the system board. The system board can accommodate up to seven PCI expansion cards (two PCI or PCI-X cards at 64-bit/33-133 MHz, four PCI or PCI-X cards at 64-bit/33-100 MHz, and one PCI card at 32-bit/33 MHz).

The peripheral bay provides space for a 3.5-inch diskette drive, a CD drive, and two hard drives. The hard-drive bays provide space for up to five 1-inch SCSI hard drives. The hard drives connect to a controller on the system board or a RAID controller card through the SCSI backplane board. For more information, see "[Hard Drives](#)."

The hard-drive bays provide space for up to six 1-inch hard drives. These hard drives are connected to a SCSI host adapter on the system board or on an expansion card, by way of the SCSI backplane board.

The power supply distribution board (PSDB) provides power distribution for the system. One front-loadable power supply slides into connectors mounted on the PSDB to provide power to the system board and internal peripherals. An option for a second hot-pluggable power supply to provide redundant power is available.

For non-SCSI drives such as the diskette drive and CD drive, an interface cable connects the interposer board, attached to the diskette drive and CD drive, to the system board. For SCSI devices, interface cables connect externally accessible SCSI devices and the SCSI backplane board to a SCSI host adapter either on the system board or on an expansion card. For more information, see "[Installing a Hard Drive](#)."

During an installation, repair, or troubleshooting procedure, you may be required to change a jumper. For information on the system board jumpers, see "[Jumpers and Connectors](#)."

Peripheral Bay

The peripheral bay provides space for a CD/diskette drive and two hard drives (optional).

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

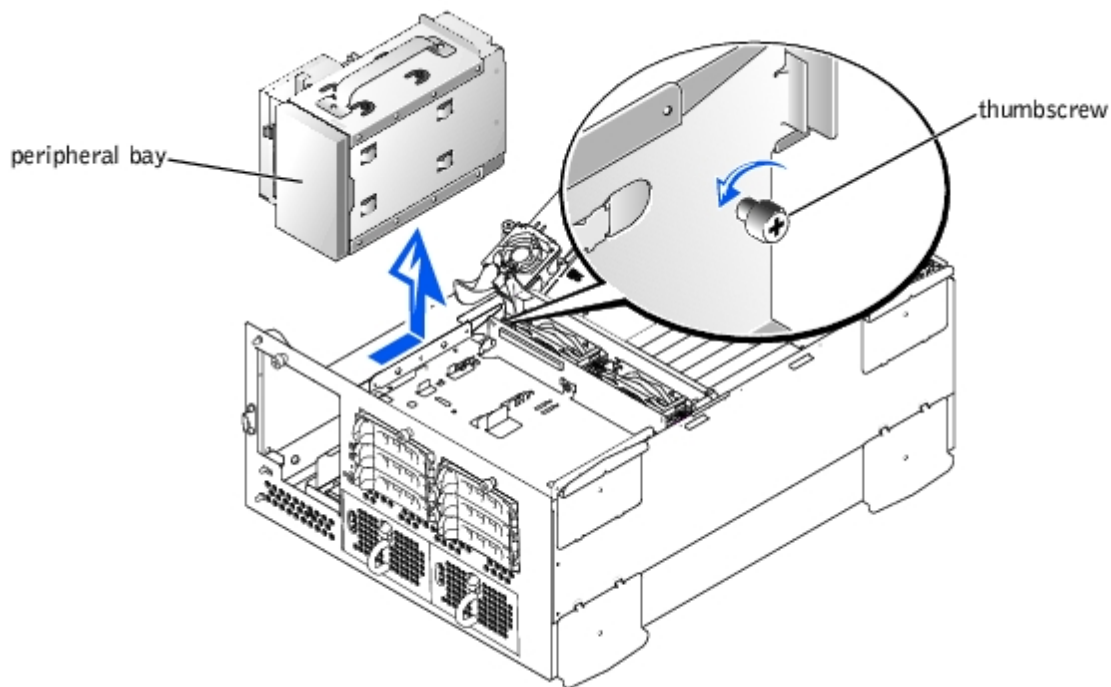
Removing the Peripheral Bay

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Remove the system cover (see "[Removing the Cover](#)").
3. Disconnect the CD/diskette drive cable from the back of the CD/diskette drive.

The other end of this cable connects to the system board.

4. Disconnect any cables from any devices already installed in the peripheral bay.
5. Loosen the thumbscrew securing the back of the peripheral bay to the chassis.
6. Grasping the peripheral bay by its top handle with one hand and pressing the front of the peripheral bay, slide the peripheral bay backward approximately 0.5-inch and lift up to remove the peripheral bay from the chassis.

Figure 4-5. Peripheral Bay Replacement



Replacing the Peripheral Bay

1. Holding the peripheral bay by its top handle, lower it into place and slide it forward approximately 0.5-inch (see Figure 4-5).

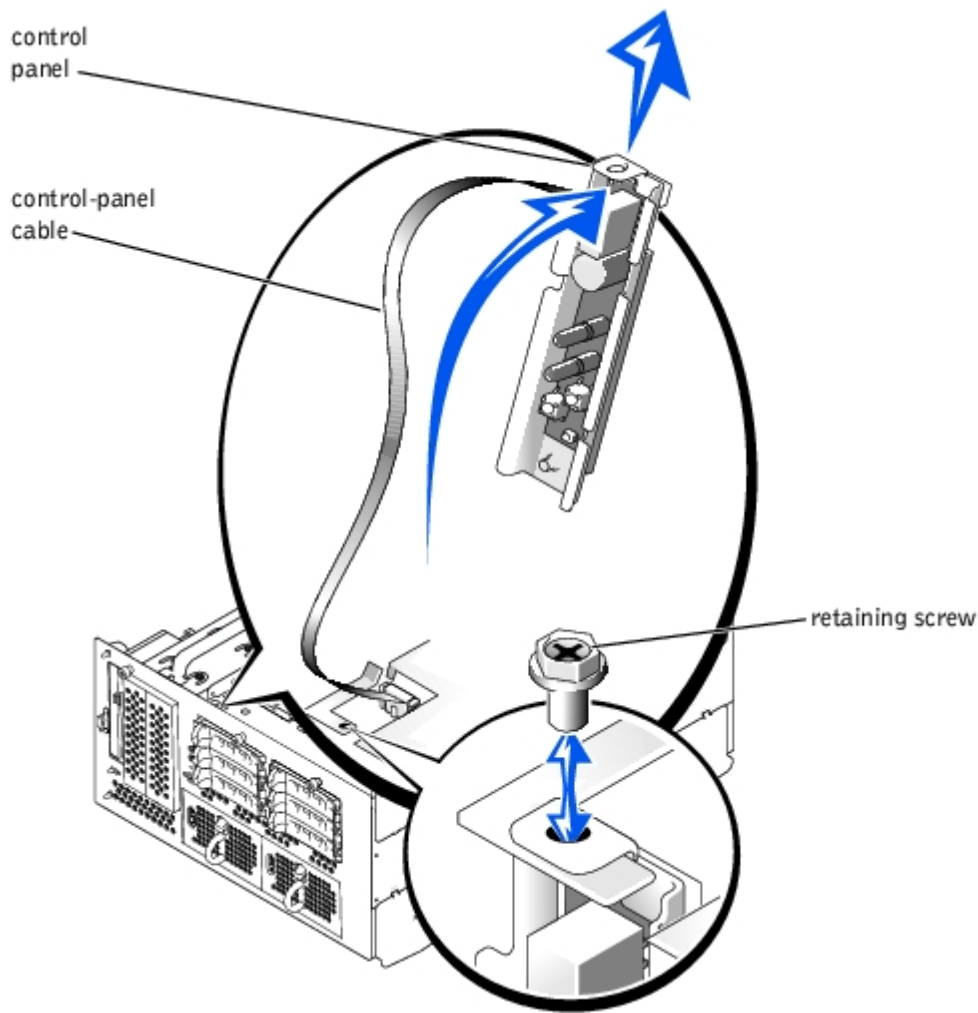
The front panel of the peripheral bay, with its attached CD/diskette drive, must be flush with the front panel.

2. Connect the CD/diskette drive cable to the back of the interposer board.
3. Connect any cables you removed from any devices already installed in the peripheral bay.
4. Tighten the thumbscrew to secure the peripheral bay to the chassis (see [Figure 4-5](#)).

Control Panel

In [Figure 4-6](#), the control panel is shown removed from the system chassis.

Figure 4-6. Control-Panel Removal



Removing the Control Panel

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

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Remove the system cover (see "[Removing the Cover](#)").
3. Disconnect the control panel cable from the system board.
4. Remove the retaining screw that secures the control-panel assembly to the system chassis (see [Figure 4-6](#)).
5. Move the control-panel back and up, out of the front panel.
6. Lift the control panel and its cable completely out of the chassis (see [Figure 4-6](#)).

Replacing the Control Panel


⚠ CAUTION: Before you perform this procedure, read the safety instructions in your *System Information Guide*.

⚠ CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information Guide*.

1. Lower the control-panel and its cable into the system.
 2. Connect the control-panel cable to the system board (see [Figure 4-6](#)).
 3. Slide the assembly towards the front panel (see [Figure 4-6](#)).
 4. Replace the retaining screw that secures the control-panel assembly to the front panel (see [Figure 4-6](#)).
-

Cooling Shroud

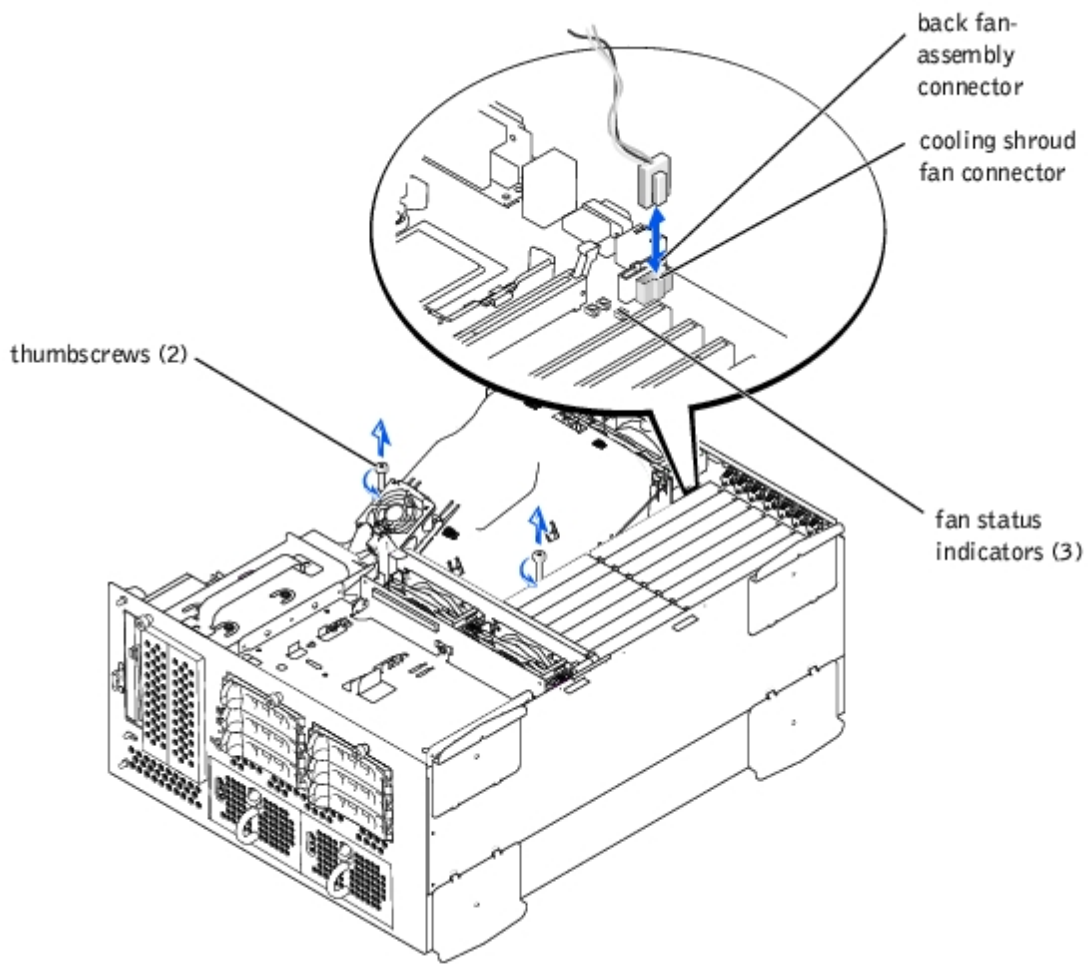
The cooling shroud is attached to the back fan assembly and secured to the system board with two thumbscrews.

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

Removing the Cooling Shroud

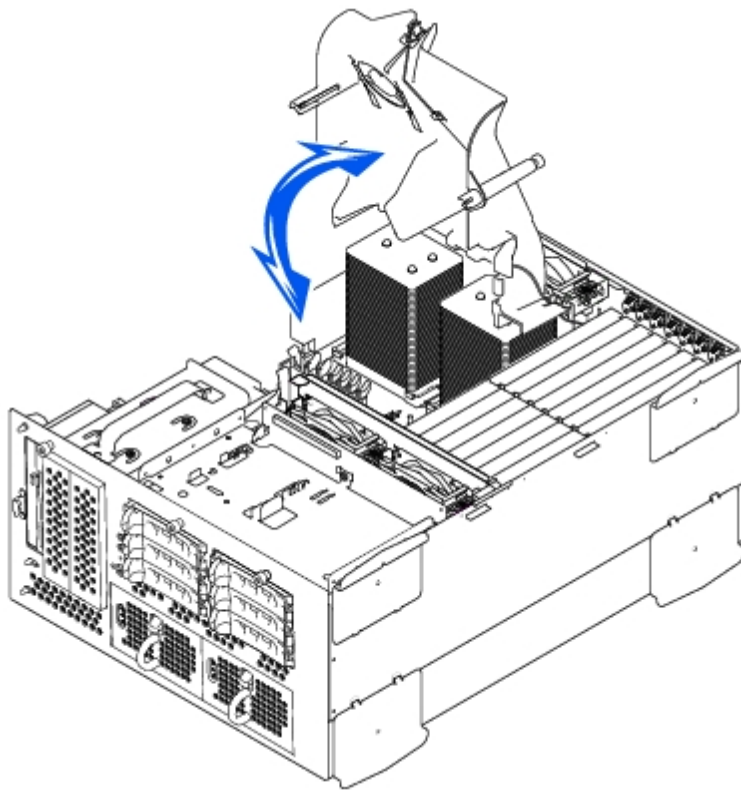
1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Disconnect the cooling shroud fan power cable from the fan connector on the system board (see [Figure 4-7](#)).
5. Loosen the two thumbscrews securing the cooling shroud to the system board (see [Figure 4-7](#)).

Figure 4-7. Removing and Replacing the Cooling Shroud



6. Rotate the cooling shroud up and lift to clear the back fan assembly and chassis (see [Figure 4-8](#)).

Figure 4-8. Rotating the Cooling Shroud



Replacing the Cooling Shroud

1. Lower the cooling shroud into the chassis ensuring that the cooling shroud is aligned with the rear cooling fan assembly guides.
2. Rotate the cooling shroud down ensuring the thumbscrews are aligned with the connecting posts on the system board (see [Figure 4-7](#)).
3. Tighten the two thumbscrews securing the cooling shroud to the system board.
4. Reconnect the cooling shroud fan cable to the system board.
5. Replace the cover (see "[Replacing the Cover](#)").

System Fans

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

The system includes the following hot-pluggable cooling fans:

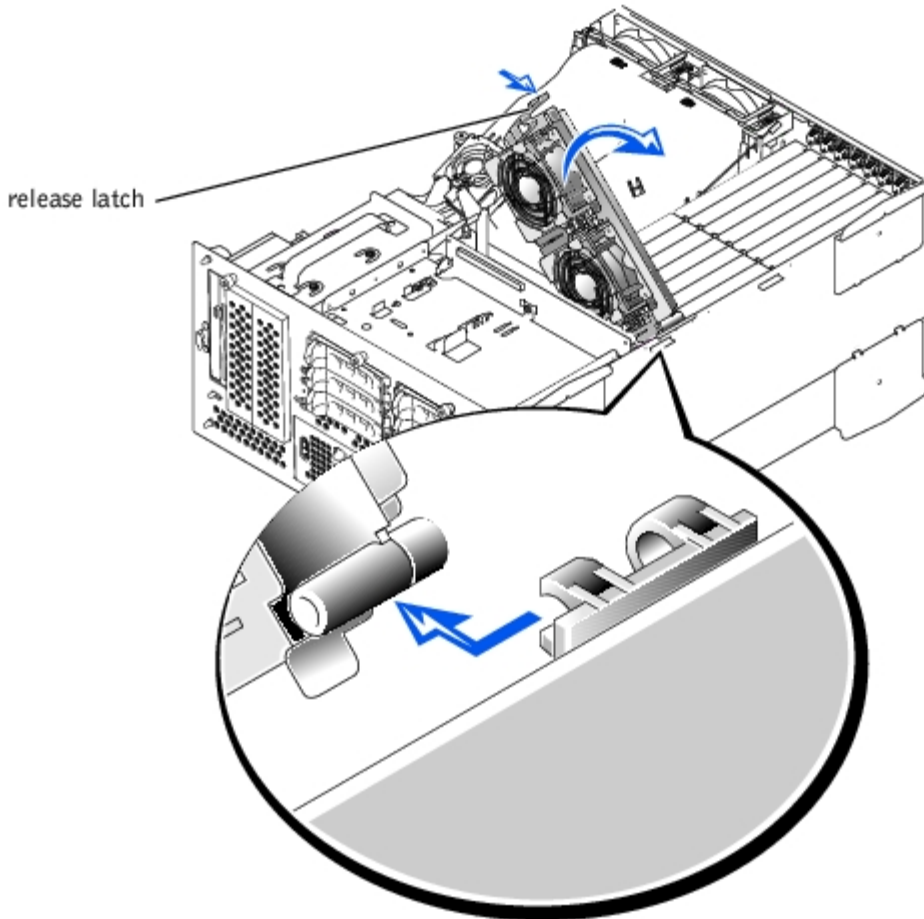
- Two fan assemblies containing two individual fans. One assembly is located near the SCSI backplane board. The other fan assembly is attached to the back of the chassis.
- One cooling fan located on the cooling shroud.

Removing the Front Fan Assembly

⚠ CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information Guide*.

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Disconnect the front fan assembly power cable from the front fan connector on the SCSI backplane board (see [Figure 5-4](#)).
5. Release the fan assembly by pressing the release lever (see [Figure 4-9](#)).
6. Swing the fan assembly up and out of the way.

Figure 4-9. Removing and Replacing the Front-Fan Assembly



Replacing the Front Fan Assembly

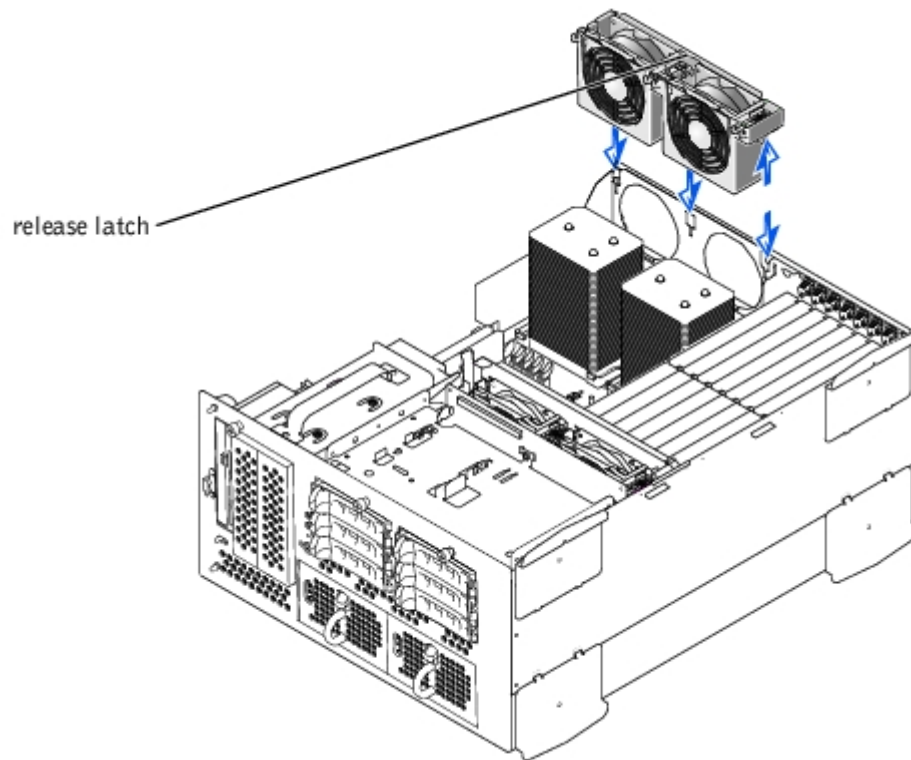
1. Place the fan assembly in the hinge bracket and swing the fan assembly down until the release lever snaps into place.
2. Connect the fan assembly power cable to the front fan connector on the SCSI backplane board (see [Figure 5-4](#)).
3. Replace the cover (see "[Replacing the Cover](#)").

Removing the Back Fan Assembly

⚠ CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information Guide*.

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Remove the cooling shroud (see "[Removing the Cooling Shroud](#)").
5. Disconnect the fan assembly power cable from the back fan connector on the system board (see [Figure 5-3](#)).
6. Pull on the release latch and lift the fan assembly straight up to clear the chassis (see [Figure 4-10](#)).

Figure 4-10. Removing and Replacing the Back Fan Assembly



Replacing the Back Fan Assembly

1. Align the fan assembly with the fan assembly guide on the back of the chassis, and push down until the fan assembly is firmly seated and the latch is engaged (see [Figure 4-10](#)).
2. Connect the fan assembly power cable to the back fan connector on the system board (see [Figure 4-10](#)).
3. Install the cooling shroud (see "[Replacing the Cooling Shroud](#)").
4. Replace the cover (see "[Replacing the Cover](#)").

Removing and Replacing Individual Fans

Each fan assembly contains two fans. The procedure for removing and replacing the four individual fans are the same.

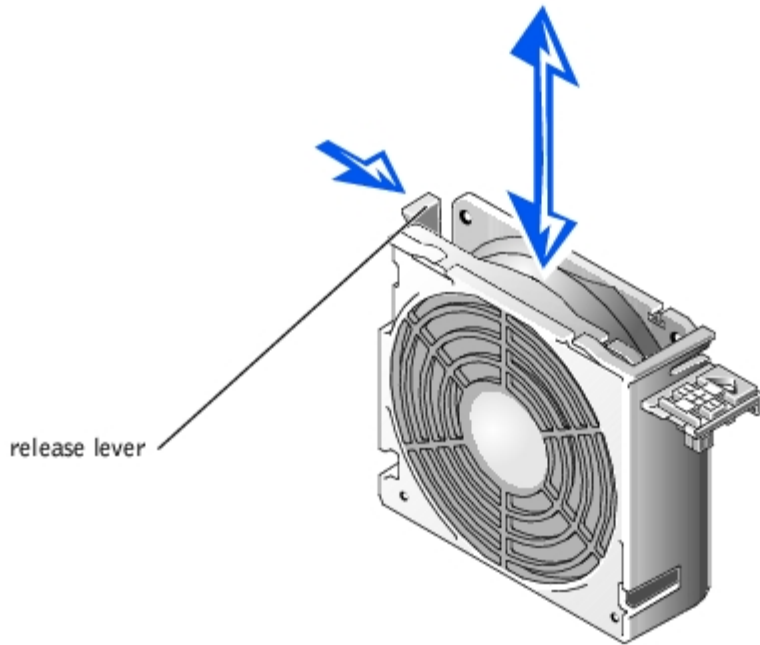
Removing a Fan

1. Remove the system cover (see "[Removing the Cover](#)").

NOTICE: The cooling fans are hot-pluggable. To maintain proper cooling while the system is on, only replace one fan at a time.

2. Locate the faulty fan and while pressing the fan release lever, lift the fan straight up to clear the fan assembly (see [Figure 4-11](#)).

Figure 4-11. Removing and Replacing Individual Fans



Replacing a Fan

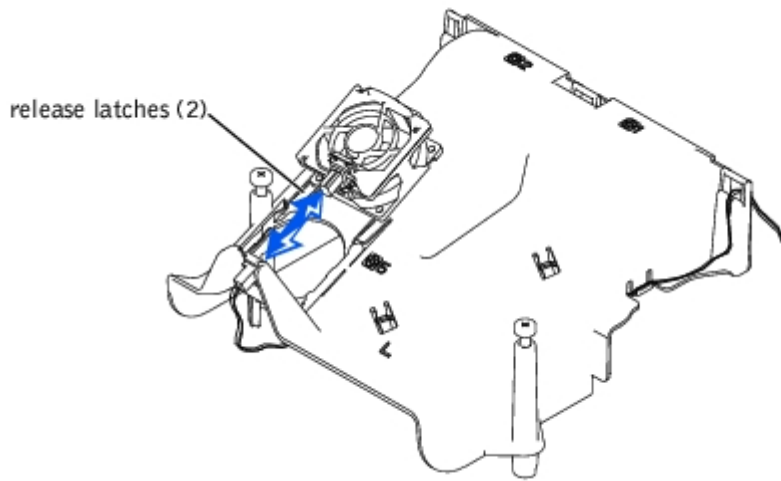
1. Lower the fan into the fan assembly until the fan snaps into position.
2. Replace the cover (see "[Replacing the Cover](#)").

Removing and Replacing the Cooling Shroud Fan

Removing the Cooling Shroud Fan

1. Remove the cover (see "[Removing the Cover](#)").
2. Push down on the two release latches and slide the fan out of the bracket on the cooling shroud (see [Figure 4-12](#)).

Figure 4-12. Removing and Replacing the Cooling Shroud Fan



Replacing the Cooling Shroud Fan

1. Slide the fan into the bracket on the cooling shroud until the fan snaps into position (see [Figure 4-12](#)).
 2. Replace the system cover.
-

Power Supplies

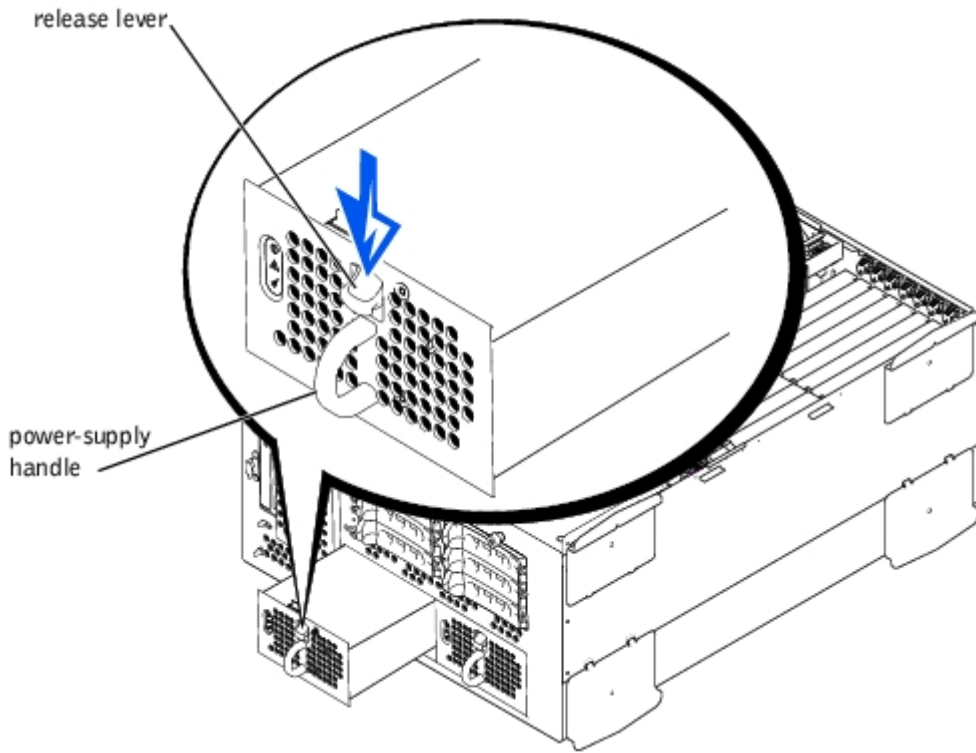
The system includes one or two hot-pluggable power supplies.

Removing a Power Supply

➡ **NOTICE:** The power supplies are hot-pluggable. The system requires one power supply to be installed for the system to operate normally. The system is in the redundant mode when two power supplies are installed. Remove and replace only one power supply at a time in a system that is powered on.


1. Open the bezel (see "[Removing the Bezel](#)").
2. If only one power supply is installed in the system, you must turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Grasp the power-supply handle and press down on the release lever while pulling the power supply straight out to clear the chassis (see [Figure 4-13](#)).

Figure 4-13. Removing and Replacing a Power Supply



Replacing a Power Supply


1. Slide the power supply into the chassis until it snaps into place (see [Figure 4-13](#)).
2. If the system has one power supply, reconnect the system and peripherals to their electrical outlets, and turn them on.

 **NOTE:** After installing a power supply, allow several seconds for the system to recognize the power supply and determine whether it is working properly. The power-on indicator will turn green to signify that the power supply is functioning properly (see [Figure 3-4](#)).

3. Close the bezel (see "[Replacing the Bezel](#)").

Expansion Cards

The system includes seven expansion slots. The expansion cards are installed on the system board (see [Figure 5-3](#) to identify the expansion slots).

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

Expansion Card Installation Guidelines

You can install expansion cards of different operating speeds on the same bus; however, the bus will operate at the slowest operating speed of the cards on that bus. For example, if one card on the bus has an operating speed of 66 MHz and the other card has an operating speed of 100 MHz, the bus will only operate at 66 MHz.

To identify expansion slots, see [Figure 5-3](#). [Table 4-1](#) lists the PCI bus, operating speed, and signalling level for each expansion-card slot.

Table 4-1. Expansion Slot Speeds

Slot	Bus	Operating Speed	Signalling Level
1	0	33 MHz	5 V
2	5	33, 66, or 100 MHz	3.3 V
3	5	33, 66, or 100 MHz	3.3 V
4	4	33, 66, or 100 MHz	3.3 V
5	4	33, 66, or 100 MHz	3.3 V
6	3	33, 66, 100, or 133 MHz	3.3 V
7	2	33, 66, 100, or 133 MHz	3.3 V

NOTE: If you are using expansion cards of different operating speeds, you should install the fastest card in slot 7 and the slowest card in slot 1.

PCI Bus Scan Order

The system's BIOS scans and numbers PCI buses and devices during startup. Expansion slots are scanned according to the host bus ordering, not by the slot numbers. See [Table 4-2](#) for the order in which the expansion slots and embedded PCI devices are scanned.

An additional factor affects the assignment of PCI bus numbers: an expansion card may have its own PCI bridge chip which requires the assignment of a bus number for the card as well as one for the bridge. A particular expansion card may have two PCI bridge chips which would result in three sequential PCI bus numbers all assigned in the same expansion slot.

If you install expansion cards, you may have some difficulty in directly determining the bus number of a controller on a particular expansion card. However, the PCI bus scan order listed in [Table 4-2](#) can help determine the relative numbering of PCI buses within the expansion slots. For example, a PCI controller residing in expansion slot 3 will never have a lower bus number than one in slot 2 because slot 2 precedes slot 3 in the scan order.

Table 4-2. PCI Bus Scan Order

Order	Device or Slot
1	Expansion slot 1
2	Embedded remote access components
3	Video
4	Integrated Gigabit NIC
5	Expansion slot 7
6	Expansion slot 6
7	Expansion slot 4
8	Expansion slot 5
9	Expansion slot 4
10	Expansion slot 3
11	Expansion slot 2
12	Optional integrated RAID controller on the system board
13	Integrated SCSI controller on the system board

Installing an Expansion Card

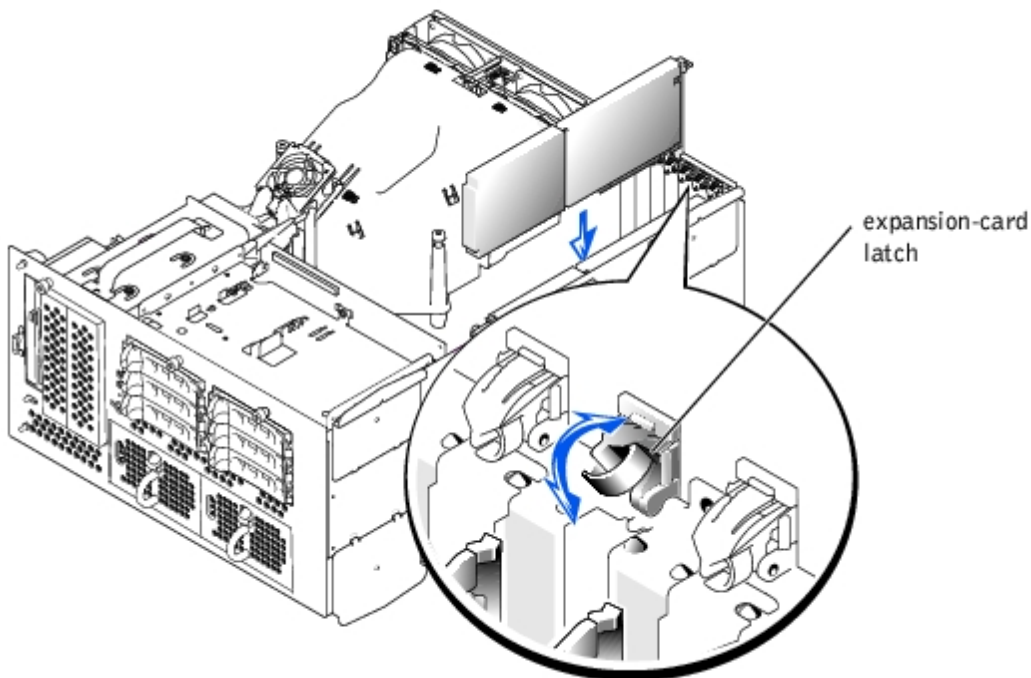
⚠ CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Unpack the expansion card, and prepare it for installation.

For instructions, see the documentation accompanying the card.

2. Open the bezel (see "[Removing the Bezel](#)").
3. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
4. Remove the cover (see "[Removing the Cover](#)").
5. Disconnect all expansion-card cables.
6. Remove the front fan assembly (see "[Removing the Front Fan Assembly](#)").

Figure 4-14. Installing an Expansion Card




7. Open the expansion-card latch (see [Figure 4-14](#)) and remove the filler bracket.
8. Install the expansion card (see [Figure 4-14](#)):
 - a. Position the expansion card so that the card-edge connector aligns with the expansion-card connector on the system board.
 - b. Insert the card-edge connector firmly into the expansion-card connector until the card is fully seated.
 - c. When the card is seated in the connector, close the expansion-card latch (see [Figure 4-14](#)).

🔧 NOTE: SCSI cables connected from an expansion card to the SCSI backplane board should be routed under the front fan assembly.


9. Reconnect all expansion-card cables, including those for the new card.

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


 **NOTE:** If the expansion card you are installing is of a different operating speed as the card already installed on the same PCI bus, all expansion cards on that bus will operate at the slower speed.

10. Replace the front fan assembly (see "[Removing the Front Fan Assembly](#)").
11. Replace the cover (see "[Replacing the Cover](#)").

Removing an Expansion Card

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

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Disconnect all expansion-card cables.
5. Remove the front fan assembly (see "[Removing the Front Fan Assembly](#)").
6. Release the expansion card:
 - a. Open the expansion-card latch (see [Figure 4-14](#)).
 - b. Grasp the expansion card by its top corners, and carefully remove it from the expansion-card connector.
7. If you are removing the card permanently, install a metal filler bracket over the empty expansion slot opening and close the expansion-card latch.


 **NOTICE:** You must install a filler bracket over an empty expansion slot to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.


8. Reconnect all expansion-card cables.
9. Replace the front fan assembly (see "[Replacing the Front Fan Assembly](#)").
10. Replace the cover (see "[Replacing the Cover](#)").


ERA/O Card

Removing the ERA/O Card

To remove the ERA/O card, perform the following steps.

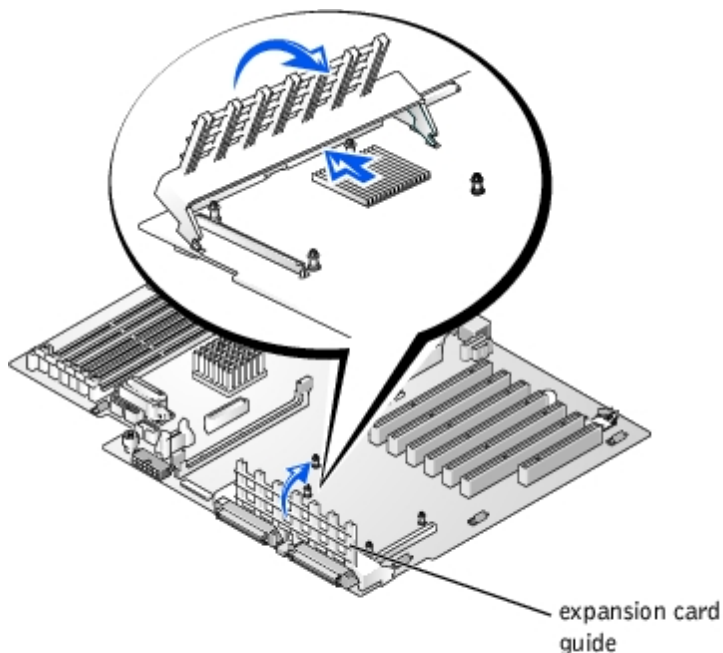
 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

 **CAUTION:** Your system has two power supply cables. To reduce the risk of electrical shock, a trained service technician must disconnect both power supply cables before servicing the system.

 **NOTE:** For more information about setting up and using an ERA/O, see the remote access controller documentation provided on the documentation CD that came with your system.

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Remove any full-length expansion-cards that are installed (see "[Expansion Cards](#)").
5. Remove the front fan assembly (see "[Removing the Front Fan Assembly](#)").
6. You must remove the expansion card guide from the system before you remove the ERA/O card. To remove the expansion card guide, perform the following steps:
 - a. Press the middle of the expansion card guide in the direction of the SCSI backplane (away from the system board) and carefully rotate the expansion card guide toward the system board until the card guide unhooks from the system board (see [Figure 4-15](#)).
 - b. Swing the expansion card guide up.

Figure 4-15. Removing the Expansion Card Guide

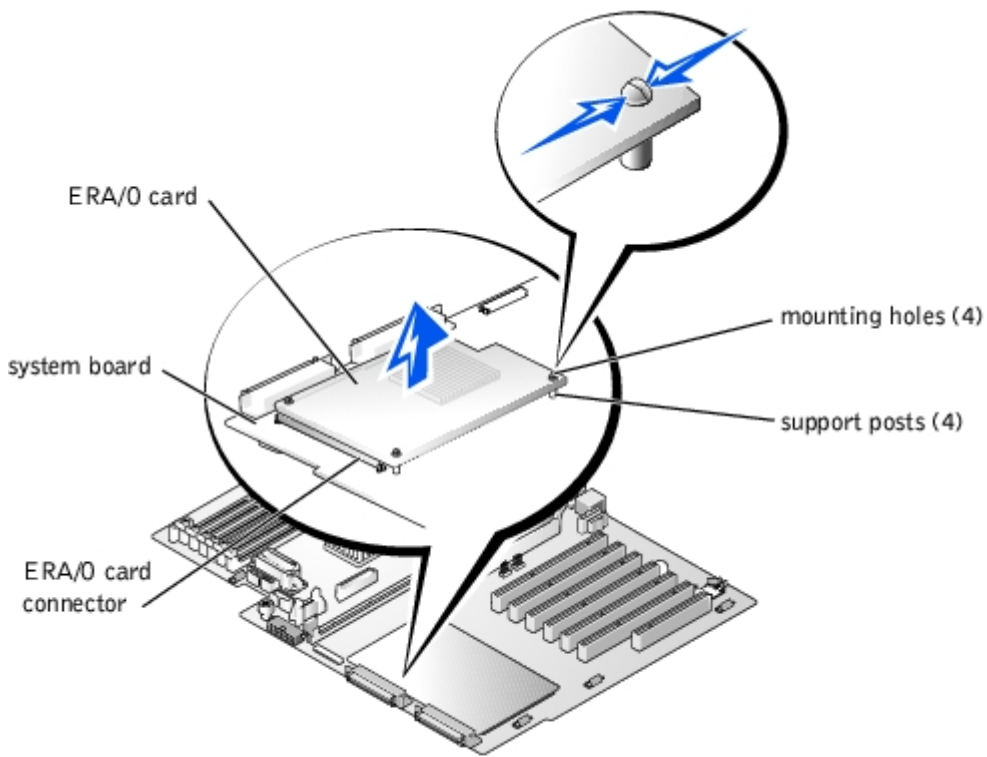


7. To remove the ERA/O card from its connector on the system board, unfasten each of the support posts from the card.

NOTICE: Do not attempt to disconnect the ERA/O card from the connector on the system board until you have unfastened the card from each of the four support posts.

- a. Compress the clasp at the top of the support post while carefully lifting up on the corner of the card to unseat the post (see [Figure 4-16](#)).
 - b. Repeat step a for each support post.
8. Lift the ERA/O card straight up and out of the chassis.
 9. If you are not installing a replacement ERA/O card at this time, disconnect the network cable from the 10-Mbps server management Ethernet connector on the system back panel.

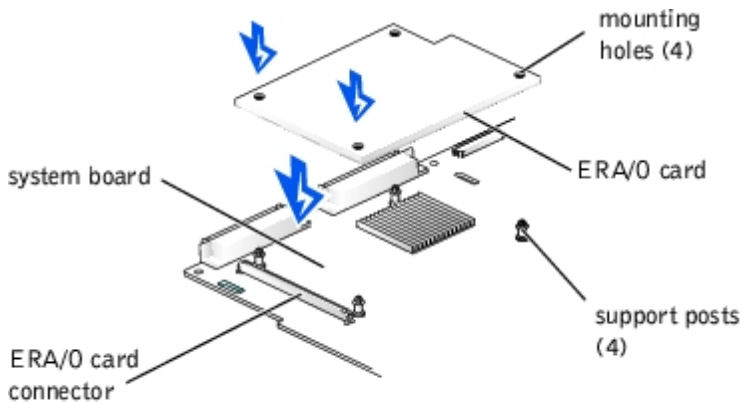
Figure 4-16. Removing the ERA/O Card



Installing a Replacement ERA/O Card

1. To install the replacement ERA/O card in the system, perform the following steps:
 - a. Position the ERA/O card so that the card connector is directly over the connector on the system board and the mounting holes on the card line up with the support posts on the system board (see [Figure 4-17](#)).
 - b. Press down until the ERA/O card connector is fully seated in the connector on the system board and the support posts are secured in the mounting holes on the card.

Figure 4-17. Installing the ERA/O Card



2. Reinstall the expansion-card guide:
 - a. Holding the expansion-card guide at a 45-five degree angle, insert the two tabs at the ends of the expansion-card guide base into the slots on the system board (see [Figure 4-15](#)).
 - b. Rotate the expansion-card guide down until the clip snaps securely onto the system board.

3. Reinstall any expansion cards that you removed (see "[Installing an Expansion Card](#)").

NOTE: SCSI cables connected from an expansion card to the SCSI backplane board should be routed under the front fan assembly.

4. Reinstall the front fan assembly (see "[Replacing the Front Fan Assembly](#)").
5. Replace the cover (see "[Replacing the Cover](#)").
6. Replace the bezel (see "[Replacing the Bezel](#)").
7. Connect a network cable to the 10-Mbps server management Ethernet connector on the system back panel.
8. Reconnect the system and peripherals to their electrical outlets, and turn them on.

CD/Diskette Drive

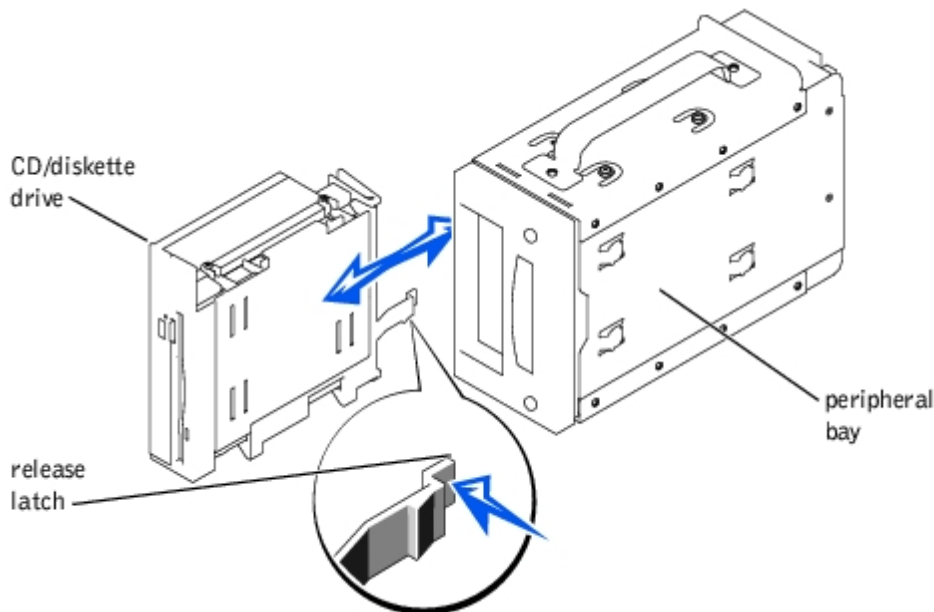
A CD/diskette drive assembly mount to the side of the peripheral bay and connects to the controllers on the system board through a single ribbon cable to the system board.

Removing the CD/Diskette Drive


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

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
3. Remove the peripheral bay from the system chassis (see "[Removing the Peripheral Bay](#)").
4. Lift the CD/diskette drive release latch and slide the CD/diskette drive toward the front of the peripheral bay (see [Figure 4-18](#)).

Figure 4-18. Removing and Installing the CD/Diskette Drive




Replacing the CD/Diskette Drive

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

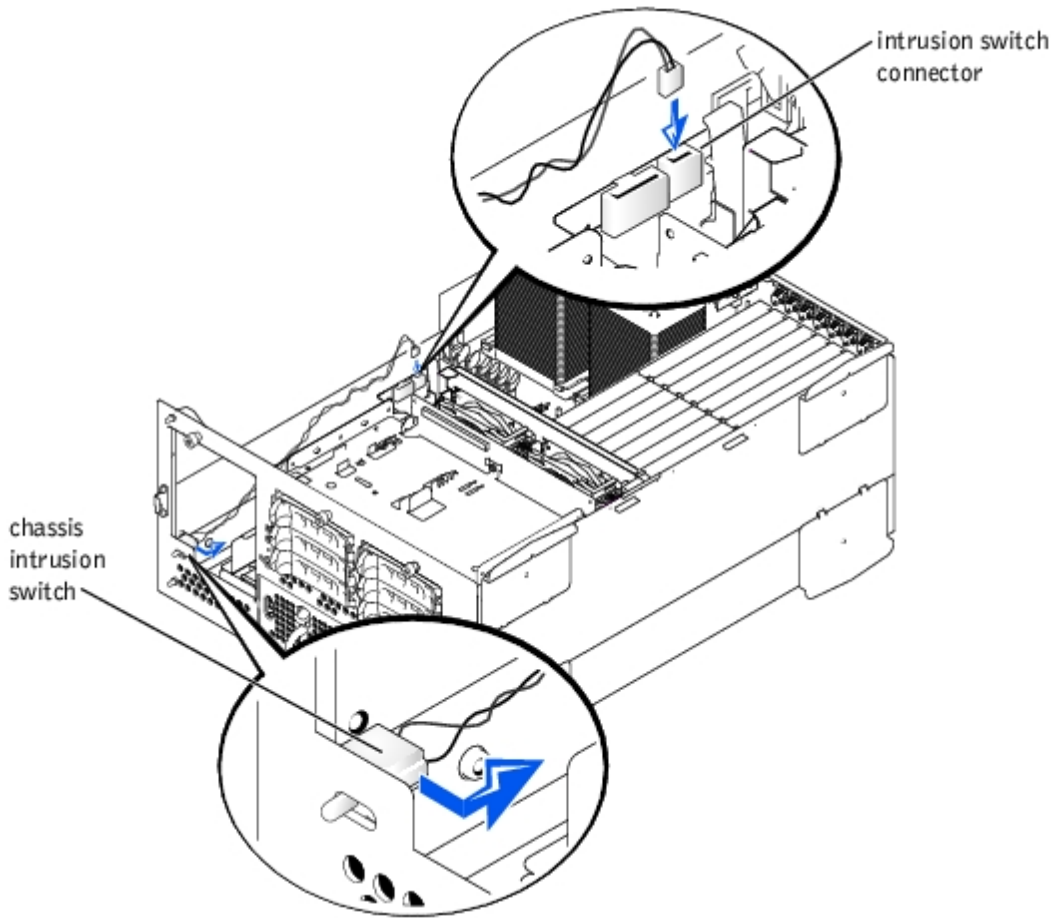
1. Align the CD/diskette drive with the opening in the side of the peripheral bay.
 2. Press the CD/diskette drive assembly firmly into the side of the peripheral bay and slide the assembly towards the back of the peripheral bay until the release latch snaps into place (see [Figure 4-18](#)).
 3. Replace the peripheral bay into the system chassis (see "[Replacing the Peripheral Bay](#)").
 4. Replace the system cover (see "[Replacing the Cover](#)").
 5. Replace the bezel (see "[Replacing the Bezel](#)").
 6. Reconnect your system and peripherals to their electrical outlets, and turn on the system.
-

Chassis Intrusion Switch

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

1. Remove the front bezel (see "[Removing the Bezel](#)").
2. Remove the system cover (See "[Removing the Cover](#)").
3. Disconnect the chassis intrusion switch cable connector on the system board.
4. Grasp and slide the switch toward the center of the front panel until it comes free of its slot (see [Figure 4-19](#)).

Figure 4-19. Chassis Intrusion Switch Replacement



Installing an External SCSI Tape Drive

This section describes how to configure and install an external SCSI tape drive.

Interface Cables

You must connect external SCSI devices to a SCSI host adapter expansion card. See "[Expansion Cards](#)" for information on installing expansion cards.

SCSI interface connectors are keyed for correct insertion. Keying ensures that the pin-1 conductor in the cable connects to pin-1 in the connectors at both ends.

When you disconnect an interface cable, take care to grasp the cable connector, rather than the cable itself, to avoid stress on the cable.


SCSI Configuration Information

Although SCSI devices are installed in essentially the same way as other devices, their configuration requirements are different. To install and configure an external SCSI device, follow the guidelines in the following subsections.

SCSI ID Numbers

Each device attached to a SCSI host adapter must have a unique SCSI ID number from 0 to 15.


A SCSI tape drive is configured by default as 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.

Device Termination

SCSI logic requires that termination be enabled for the two devices at opposite ends of the SCSI chain and disabled for all devices in between. For internal SCSI devices, termination is configured automatically. For external SCSI devices, you should disable termination on all devices and use terminated cables. See the documentation provided with any optional SCSI device you purchase for information on disabling termination.

External SCSI Tape Drive Installation

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

1. Remove the bezel (see "[Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Prepare the tape drive for installation.


Ground yourself by touching an unpainted metal surface on the back of the system, unpack the drive (and controller card, if applicable), and compare the jumper and switch settings with those in the drive documentation. Change any settings necessary for your system's configuration.

See "SCSI Configuration Information," for information on setting the drive's SCSI ID number and enabling termination (if required). Change any settings necessary for your systems configuration.

4. Remove the cover (see "[Removing the Cover](#)").
5. Connect the tape drive's interface cable to the external SCSI connector on the host adapter expansion card (for specific instructions, see the documentation supplied with your tape drive).
6. Replace the cover (see "[Replacing the Cover](#)").
7. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
8. Perform a tape backup and verification test with the drive as instructed in the software documentation that came with the drive.




Hard Drives

This subsection describes how to install and configure SCSI hard drives in the system's internal hard-drive bays.

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

Before You Begin

Hard drives are supplied in special drive carriers that fit in the hard-drive bays.

-  **NOTICE:** Before attempting to remove or install a drive while the system is running, see the documentation for the host adapter to ensure that the host adapter is configured correctly to support hot-pluggable drive removal and insertion.
-  **NOTICE:** Do not turn off or reboot your system while the drive is being formatted. Doing so can cause a drive failure.
-  **NOTE:** Only use drives that have been tested and approved for use with the SCSI backplane board.

When you format a high-capacity hard drive, allow enough time for the formatting to be completed. Long format times for these drives are normal. For example, an exceptionally large drive can take over an hour to format.

SCSI Backplane Board Configuration

The hard-drive bays provide space for up to six 1-inch hard drives, and the peripheral bay provides space for two more drives. The hard drives connect to a controller on the system board or a RAID controller card through the SCSI backplane board.

The system provides the following options for hard drive configurations:

- 1 x 6 configuration
- 1 x 6 + 1 x 2 split configuration, with two hard drives installed in the peripheral bay (see "[Replacing the Peripheral Bay](#)")
- RAID controller:
 - Integrated RAID controller (see "[Integrated RAID Controller](#)")
 - RAID controller card (see "[Installing a RAID Controller Card](#)")
- Cabling:
 - Additional cables are not required to use either the onboard SCSI controller or integrated RAID controller in a 1 x 6 configuration.
 - If a RAID controller card is installed, cables can be connected from the controller card to SCSI A and/or SCSI B backplane board connector(s). A backplane board connector that is not attached to the RAID controller card will use the onboard SCSI controller or integrated RAID controller.

See Figure 5-4 to locate the connectors on the SCSI backplane board.

Removing a Hard Drive

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Take the hard drive offline and wait until the hard-drive indicator codes on the drive carrier signal that the drive may be removed safely (see [Table 3-6](#)).

If the drive has been online, the drive status indicator will blink green two times a second as the drive is powered down. When all indicators are off, the drive is ready for removal.

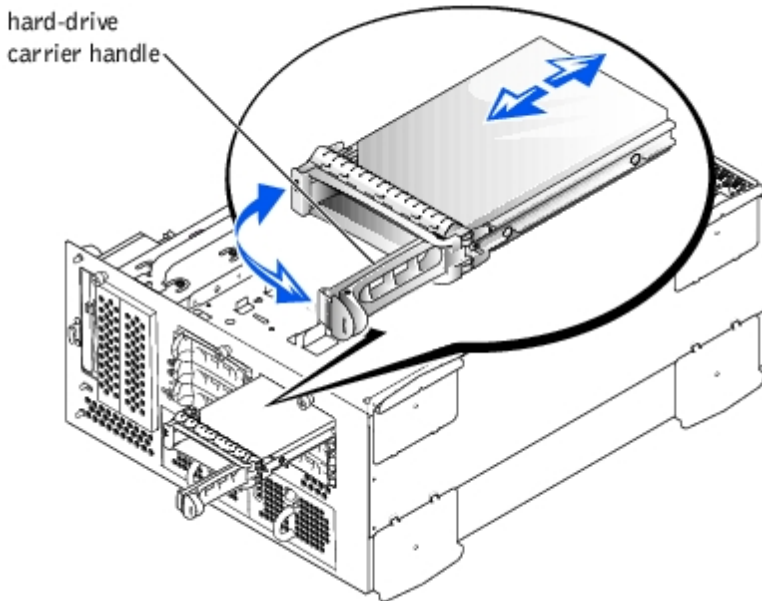
See your operating system documentation for more information on taking the hard drive offline.

3. Open the hard-drive carrier handle to release the drive (see [Figure 4-20](#)).
4. Slide the hard drive out until it is free of the drive bay (see [Figure 4-20](#)).

If you are permanently removing the hard drive, install a blank insert.

5. Replace the bezel (see "[Replacing the Bezel](#)").

Figure 4-20. Removing and Installing a Hard-Drive



Installing a Hard Drive

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

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Open the hard-drive carrier handle (see [Figure 4-20](#)).

➡ **NOTICE:** Do not insert a hard-drive carrier and attempt to lock its handle next to a partially installed carrier. Doing so can damage the partially installed carrier's shield spring and make it unusable. Ensure that the adjacent drive carrier is fully installed.

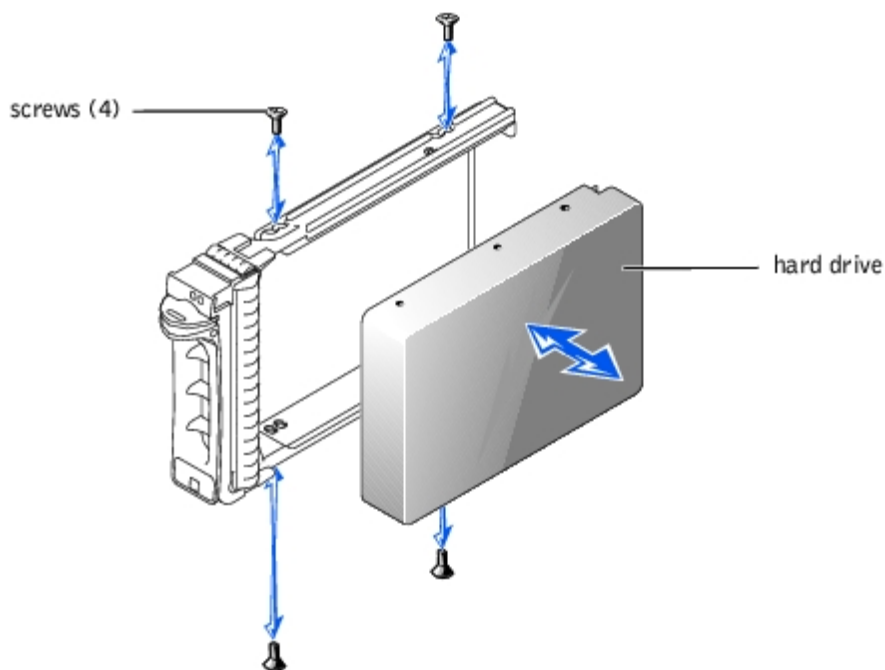
3. Insert the hard-drive carrier into the drive bay (see [Figure 4-20](#)).
4. Close the hard-drive carrier handle to lock it in place.
5. Replace the bezel (see "[Replacing the Bezel](#)").
6. If the hard drive is new, run the SCSI controllers test in system diagnostics.

Removing a Hard Drive From Its Carrier

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

1. Remove the hard drive from the system (see "[Removing a Hard Drive](#)").
2. Remove the four screws that secure the drive to the carrier (see [Figure 4-21](#)).
3. Remove the hard drive from the carrier.

Figure 4-21. Removing a Hard Drive From Its Carrier



Installing a Hard Drive on a Carrier

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

1. Insert the replacement hard drive into the carrier (see [Figure 4-21](#)).
2. Install the four screws that secure the drive to the carrier.
3. Install the hard drive in the system (see "[Installing a Hard Drive](#)").

Upgrading to Eight Hard Drives

If your system has two or more hard drives, and you want to add additional drives up to eight hard drives, perform the following tasks.

Installation Tasks

1. Back up any data files on the two mirrored operating system drives.
2. Remove the bezel (see "[Removing the Bezel](#)").
3. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
4. Remove the cover (see "[Removing the Cover](#)").
5. Install the drive cage with its 1 x 2 backplane into the peripheral bay (this optional kit is provided with an installation document, "Installing the 1 x 2 SCSI Backplane").
6. Remove the left most (operating system mirror) hard drive from the main drive bay and install it in the left slot in the peripheral bay.
7. Remove the right most (operating system mirror) hard drive from the main drive bay and install it in the right slot in

the peripheral bay




8. Install six new hard drives into the slots in the drive bay.
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
10. Reconfigure the two mirrored operating system drives in the peripheral bay as RAID level 1 drives.
11. Reboot the system to verify that the operating system boots from the two mirrored drives in the peripheral bay.
12. Create a RAID level 5 data volume (see your array management software documentation).

Integrated RAID Controller

The integrated RAID controller, consists of three components: the RAID controller memory module, hardware key, and the RAID battery. If the integrated RAID controller is disabled and you want to reactivate it, see "Activating the Integrated RAID Controller" in the *Installation and Troubleshooting Guide*.

Integrated RAID Controller Memory Module

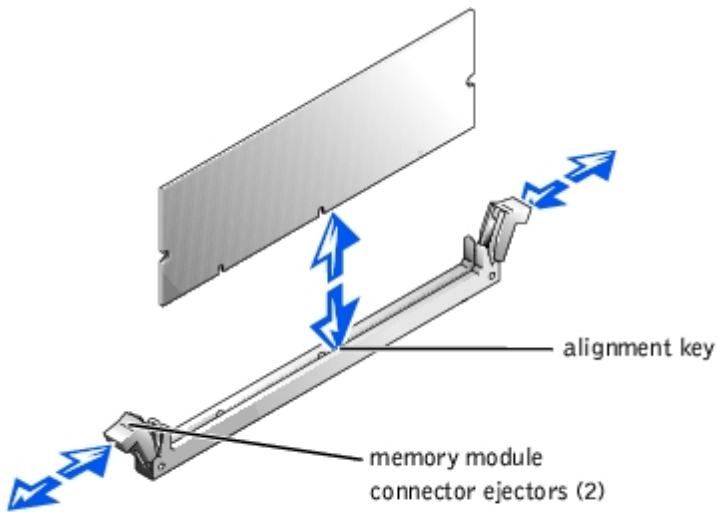
Removing the RAID Controller Memory Module

-  **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.
-  **CAUTION:** Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. See the *System Information Guide* for additional information.
-  **NOTICE:** To avoid possible data loss, back up all data on the hard drives before changing the mode of operation of the integrated SCSI controller from SCSI to RAID.

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Push the ejectors on the RAID memory module connector down and outward to eject the memory module from the connector (see [Figure 4-22](#)).

See [Figure 5-3](#) to locate the RAID memory module connector on the system board.

Figure 4-22. Removing and Installing the RAID Controller Memory Module



Installing the RAID Controller Memory Module

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

1. Push the ejectors on the RAID memory module connector down and outward to allow the memory module to be inserted into the connector (see [Figure 4-22](#)).

See [Figure 5-3](#) to locate the RAID memory module connector on the system board.

2. Insert the RAID hardware key into its connector on the system board and secure the key with the latches on each end of the connector (see [Figure 4-23](#)).

See [Figure 5-3](#) to locate the RAID hardware key on the system board.

NOTE: The RAID controller memory module must be an unbuffered memory module, rated to run at 100 MHz or faster. Do not substitute registered memory modules such as those used for system memory.

3. Press on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the connector.

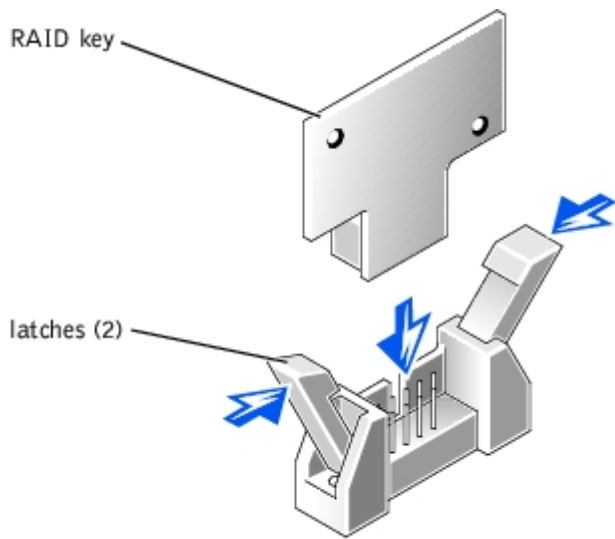
Removing the RAID Controller Hardware Key

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

1. Push the ejectors on the RAID hardware key connector down and outward to eject the RAID hardware key from the connector (see [Figure 4-23](#)).
2. Lift the RAID hardware key out of its connector on the system board (see [Figure 4-23](#)).

See [Figure 5-3](#) to locate the RAID hardware key on the system board.

Figure 4-23. Installing the RAID Hardware Key



Installing the RAID Controller Hardware Key

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

1. Push the ejectors on the RAID hardware key connector down and outward to allow the key to be inserted into the connector (see [Figure 4-23](#)).
2. Insert the RAID hardware key into its connector on the system board and secure the key with the latches on each end of the connector (see [Figure 4-23](#)).
3. Press on the hardware key with your thumbs while pulling up on the ejectors with your index fingers to lock the hardware key into the connector.

Removing the Integrated RAID Battery

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

⚠ CAUTION: Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. See the *System Information Guide* for additional information.

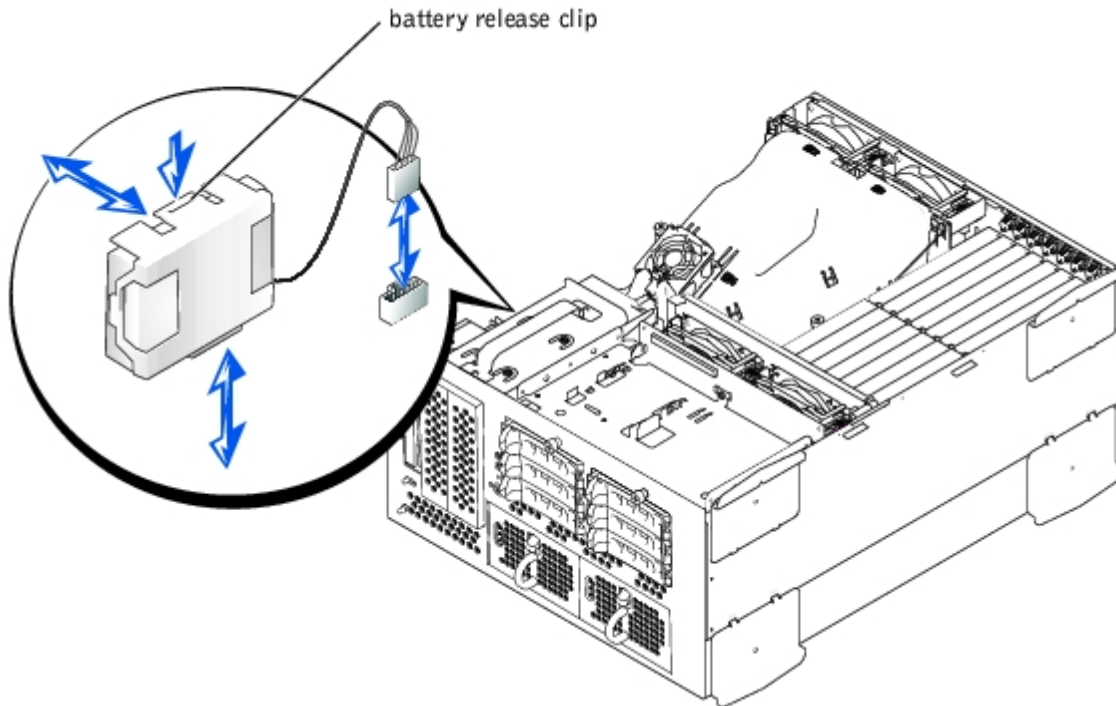
🔄 NOTICE: To avoid possible data loss, back up all data on the hard drives before changing the mode of operation of the integrated SCSI controller from SCSI to RAID.

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Disconnect the battery cable to the RAID battery cable connector on the system board.

See [Figure 5-3](#) to locate the RAID battery cable connector on the system board.

5. Press on the battery release clip on the top of the battery in the chassis side wall, and then rotate the battery away and out of its slot in the chassis wall (see [Figure 4-24](#)).

Figure 4-24. Removing and Installing the RAID Battery



Installing the Integrated RAID Battery


- ⚠ CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.
- ⚠ CAUTION:** Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. See the *System Information Guide* for additional information.
- 🔄 NOTICE:** To avoid possible data loss, back up all data on the hard drives before changing the mode of operation of the integrated SCSI controller from SCSI to RAID.

1. Remove the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Connect the battery cable to the RAID battery cable connector on the system board.

See [Figure 5-3](#) to locate the RAID battery cable connector on the system board.


5. Hook the retention tab on the bottom of the battery into the slot in the chassis side wall, and then snap the battery release clip into place (see [Figure 4-24](#)).
6. Replace the cover (see "[Replacing the Cover](#)").
7. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

RAID Controller Card

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

Installing a RAID Controller Card


Follow these general guidelines when installing a RAID controller card. For specific instructions, see the documentation supplied with the RAID controller card.

 **NOTICE:** To avoid possible data loss, back up all data on the hard drives before changing the mode of operation of the integrated SCSI controller from SCSI to RAID.

1. Unpack the RAID controller card, and prepare it for installation.

For instructions, see the documentation accompanying the card.

2. Remove the bezel (see "[Removing the Bezel](#)").
3. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
4. Remove the cover (see "[Removing the Cover](#)").
5. Install the RAID controller card (see "[Installing an Expansion Card](#)").
6. Connect SCSI interface cables supplied with the card to the SCSI A and/or SCSI B connectors on the SCSI backplane board.

 **NOTE:** Cables can be connected from the RAID controller card to SCSI A and/or SCSI B backplane board connector(s). A backplane board connector that is not attached to the RAID controller card will use the integrated SCSI controller or optional integrated RAID controller.

To identify the connector on the RAID controller card, see documentation for the card. See [Figure 5-4](#) to locate the SCSI controller connectors on the SCSI backplane board.

Route the SCSI cables around the expansion-card guide and under the front-fan assembly to reach the RAID controller card.

7. Connect the external SCSI devices to the card's external connector on the system's back panel.


If you are attaching multiple external SCSI devices, daisy-chain the devices to each other using the cables shipped with each device.

8. Replace the cover (see "[Removing the Cover](#)").
9. Remove the bezel (see "[Removing the Bezel](#)").
10. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
11. Install any required SCSI device drivers (see "Installing and Configuring SCSI Drivers" in the *User's Guide*).
12. Test the SCSI devices.

Test a SCSI hard drive by running the **SCSI Controllers** test in the system diagnostics.

SCSI Backplane Board

The system contains a 3.5-inch diskette drive and a CD drive assembly mounted on the peripheral bay drive cage that connects to the controllers on the system board. The system also contains up to six 1-inch SCSI hard drives that connect to a controller on the system board or a RAID controller card through the SCSI backplane board.

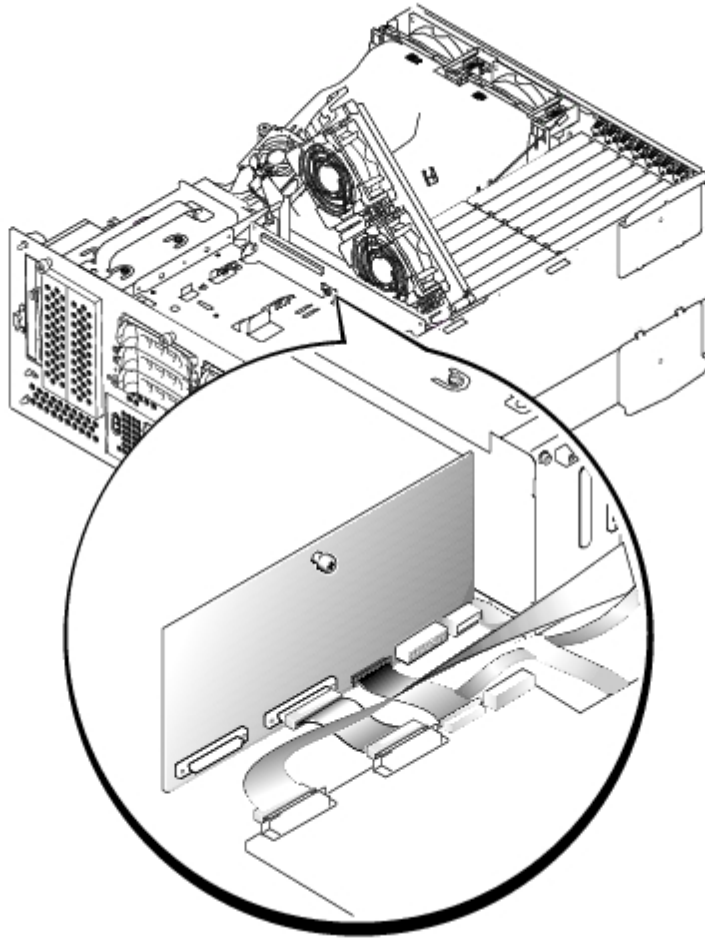
 **CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

Removing the SCSI Backplane Board

 **CAUTION:** Read the safety instructions in your *System Information Guide*.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the cover (see "[Removing the Cover](#)").
3. Remove the control-panel cable cover (see "[Removing the Control Panel](#)").
4. Pull the system board straight back until it stops (see "[Removing the System Board](#)").
5. Remove the CD/diskette drive tray (see "[Removing the CD/Diskette Drive](#)").
6. Remove all hard drives (see "[Removing a Hard Drive](#)").
7. Loosen the thumbscrew that secures the SCSI backplane board in the system (see [Figure 4-25](#)).
8. Slide the backplane board toward the right side chassis wall about 0.5 inch.
9. Lift the backplane board off of its grounding tabs.
10. Lift the backplane board and disconnect the control-panel cable from the board (see "[Replacing the Control Panel](#)").
11. Lift the backplane board out of the system board tray (see [Figure 4-25](#)).

Figure 4-25. Removing and Replacing the SCSI Backplane Board



Replacing the SCSI Backplane Board

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

1. Lower the backplane board into the system board tray.
2. Connect the control-panel cable to the SCSI backplane board (see "[Replacing the Control Panel](#)").

➡ NOTICE: To avoid damage to the system, align the bottom of the backplane board in the board's mounting grooves before rotating the top of the board onto the grounding tabs (see [Figure 4-25](#)).

3. Align the bottom of the backplane board in the board's mounting grooves (see [Figure 4-25](#)).
4. Rotate the top of the backplane board onto the board's grounding tabs.
5. Slide the backplane board toward the left side chassis wall about 0.5 inch.
6. Tighten the thumbscrew on the backplane board.
7. Install all SCSI hard drives (see "[Installing a Hard Drive](#)").
8. Replace the CD/diskette drive (see "[Replacing the CD/Diskette Drive](#)").
9. Replace the system board tray (see "[Removing the System Board](#)").
10. Replace the control-panel cable cover (see "[Removing the Control Panel](#)").
11. Replace the cover (see "[Replacing the Cover](#)").

12. Reconnect your system and peripherals to their electrical outlets, and turn on the system.

Memory Modules

The six memory module connectors on the system board can accommodate a minimum of 512 MB of registered memory modules. The memory module connectors are arranged in pairs which consist of three banks (bank 1, bank 2, and bank 3).

Memory Upgrade Kits

The system is upgradable by installing combinations of 256- and 512-MB registered DDR SDRAM modules. You can purchase memory upgrade kits as needed.

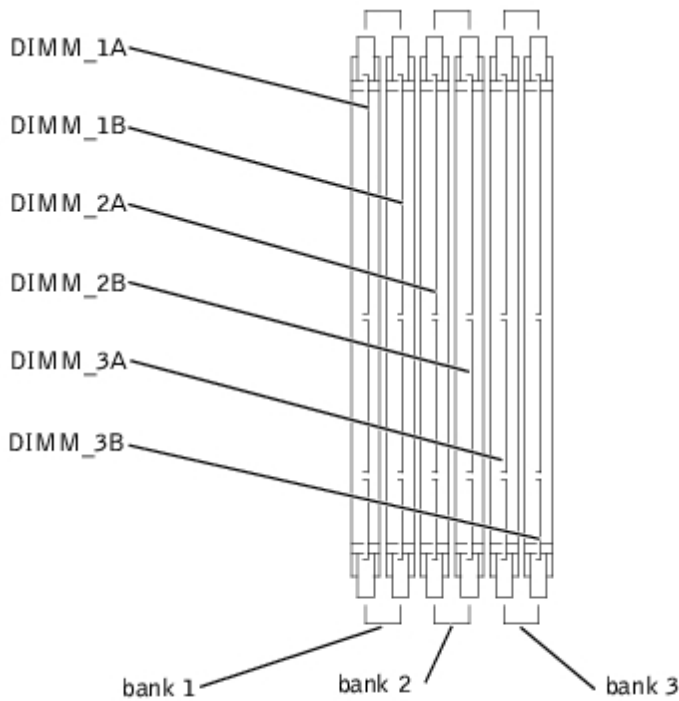
NOTICE: The memory modules must be PC-2100 compliant.

Memory Module Installation Guidelines

Starting with the connector nearest the side of the chassis, the memory module connectors are labeled "DIMM_1A" through "DIMM_3B" (see [Figure 4-26](#)). When you install memory modules, follow these guidelines:

- You must install memory modules in matched pairs.
- Install a pair of memory modules in connector DIMM_1A and DIMM_1B before installing a second pair in connectors DIMM_2A and DIMM_2B, and so on.

Figure 4-26. Memory Module Sockets




[Table 4-3](#) lists several sample memory configurations based on these guidelines.

Table 4-3. Sample Memory Module Configurations

Total Desired Memory	Bank 1		Bank 2		Bank 3	
	A	B	C	D	E	F
512 MB	256 MB	256 MB	None	None	None	None
1 GB	512 MB	512 MB	None	None	None	None
2 GB	512 MB	512 MB	512 MB	512 MB	None	None
3 GB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB

Performing a Memory Upgrade

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

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Remove the cooling shroud (see "[Removing the Cooling Shroud](#)").
5. Install or replace the memory module pairs as necessary to reach the desired memory total (see "[Installing Memory Modules](#)" and "[Removing Memory Modules](#)").

See [Figure 4-26](#) to locate the memory module connectors.

6. Replace the cooling shroud (see "[Replacing the Cooling Shroud](#)").
7. Replace the cover (see "[Replacing the Cover](#)").
8. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

After the system completes the POST routine, it runs a memory test.

The system detects that the new memory does not match the system configuration information, which is stored in NVRAM. The monitor displays an error message that ends with the following words:

```
Press <F1> to continue; <F2> to enter System Setup
```


9. Press <F2> to enter the System Setup program, and check the **System Memory** setting.

The system should have already changed the value in the **System Memory** setting to reflect the newly installed memory.

10. If the **System Memory** value is incorrect, one or more of the memory modules may not be installed properly. Repeat steps 1 through 8, ensuring that the memory modules are firmly seated in their connectors.
11. Run the system memory test in system diagnostics.

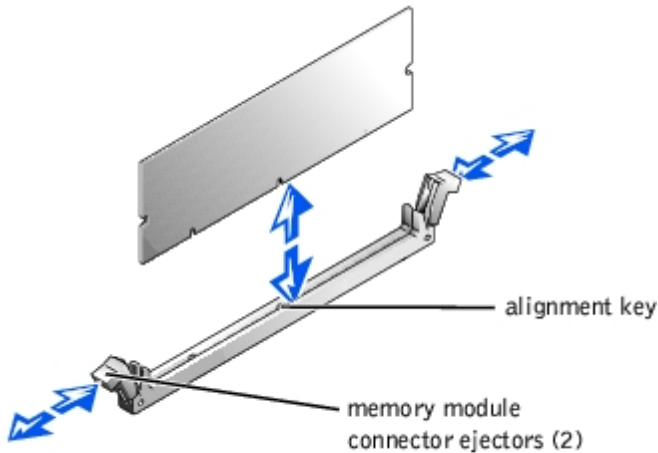
Installing Memory Modules

 **CAUTION:** Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see the safety instructions in your *System Information Guide*.

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

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Remove the cooling shroud (see "[Removing the Cooling Shroud](#)").
5. Locate the memory module connectors in which you will install a memory module (see [Figure 4-26](#)).
6. Press down and outward on the memory module connector ejectors, as shown in [Figure 4-27](#), to allow the memory module to be inserted into the connector.

Figure 4-27. Removing and Installing a Memory Module



7. Align the memory module's edge connector with the alignment key, and insert the memory module in the connector (see [Figure 4-27](#)).

The memory module connector has an alignment key that allows the memory module to be installed in the connector in only one way.

8. Press down on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the connector (see [Figure 4-27](#)).

When the memory module is properly seated in the connector, the memory module connector ejectors should align with the ejectors on the other connectors with memory modules installed.

9. Repeat steps 5 through 8 of this procedure to install the remaining memory modules.
10. Perform steps 6 through 11 of the procedure in "[Performing a Memory Upgrade](#)."

Removing Memory Modules


- CAUTION:** Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see the safety instructions in your *System Information Guide*.
- CAUTION:** Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.


3. Remove the cover (see "[Removing the Cover](#)").
 4. Remove the cooling shroud (see "[Removing the Cooling Shroud](#)").
 5. Locate the memory module connectors from which you will remove memory modules (see [Figure 4-26](#)).
 6. Press down and outward on the memory module connector ejectors until the memory module pops out of the connector (see [Figure 4-27](#)).
 7. Repeat steps 4 through 6 of this procedure to remove any other memory modules.
 8. Perform steps 6 through 11 of the procedure in "[Performing a Memory Upgrade](#)."
-

Microprocessors

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

 **NOTE:** The second microprocessor must be of the same type as the first. If the two microprocessors are different speeds, both will operate at the speed of the slower microprocessor.


Each microprocessor and its associated cache memory are contained in a PGA package that is installed in a ZIF socket on the system board. A second ZIF socket accommodates a secondary microprocessor.

 **NOTE:** In a single microprocessor system, the microprocessor must be installed in the PROC 1 socket.

Microprocessor Upgrade Kit Contents

- A microprocessor
- A heat sink
- Two securing clips
- A VRM, if adding a second microprocessor

Removing and Replacing a Microprocessor

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

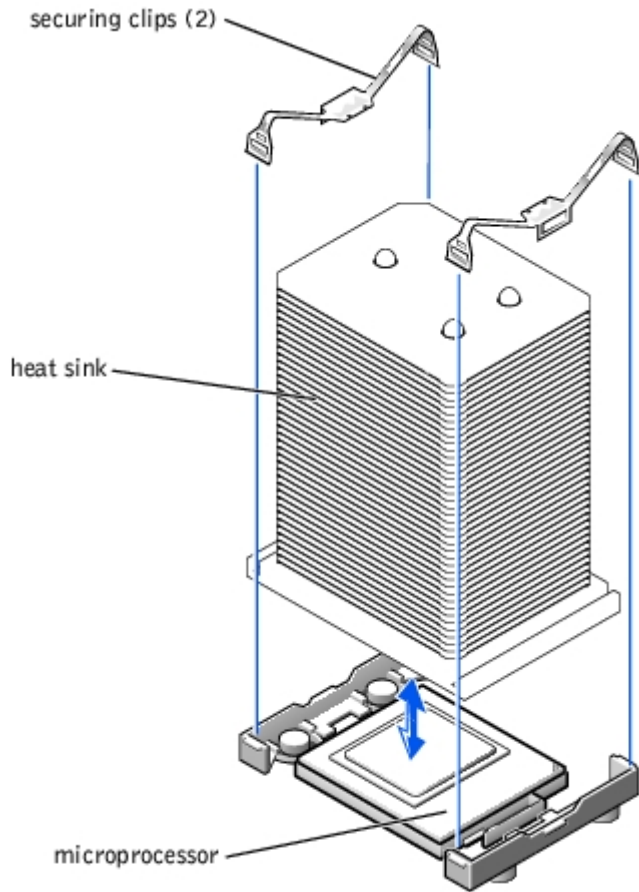
1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Remove the cooling shroud (see "[Removing the Cooling Shroud](#)").
5. Remove the back fan assembly (see "[Removing the Back Fan Assembly](#)"). If you are installing a second microprocessor, go to step 9.
6. Remove the microprocessor heat sink:
 - a. Press down on the heat-sink securing clips to release the clips from the retaining tabs on the ZIF socket (see [Figure 4-28](#)).
 - b. Remove the heat-sink securing clips.

CAUTION: The microprocessor and heat sink can become extremely hot. Be sure the microprocessor has had sufficient time to cool before handling.

NOTICE: Never remove the heat sink from a microprocessor unless you intend to remove the microprocessor. The heat sink is required to maintain proper thermal conditions.

- c. Lift the heat sink out of the chassis and place it on its side.

Figure 4-28. Removing and Replacing a Heat Sink

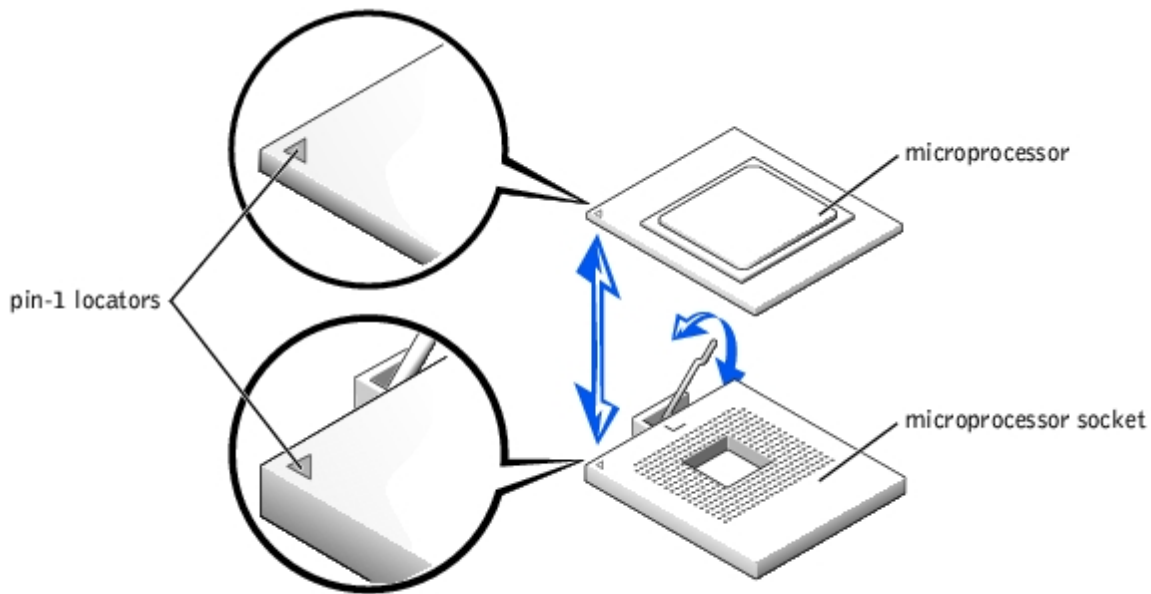


7. Pull the socket release lever straight up until the microprocessor is released (see [Figure 4-29](#)).

8. Lift the microprocessor out of the socket and leave the release lever up so that the socket is ready for the new microprocessor.

NOTICE: Be careful not to bend any of the pins when removing the microprocessor. Bending the pins can permanently damage the microprocessor.


Figure 4-29. Removing and Replacing a Microprocessor




9. Unpack the new microprocessor.

If any of the pins on the microprocessor appear bent, contact the source from whom you purchased the microprocessor.

10. Ensure that the release lever on the microprocessor socket is in the upright position.
11. Align pin 1 on the microprocessor (see [Figure 4-29](#)) with pin 1 on the microprocessor socket.

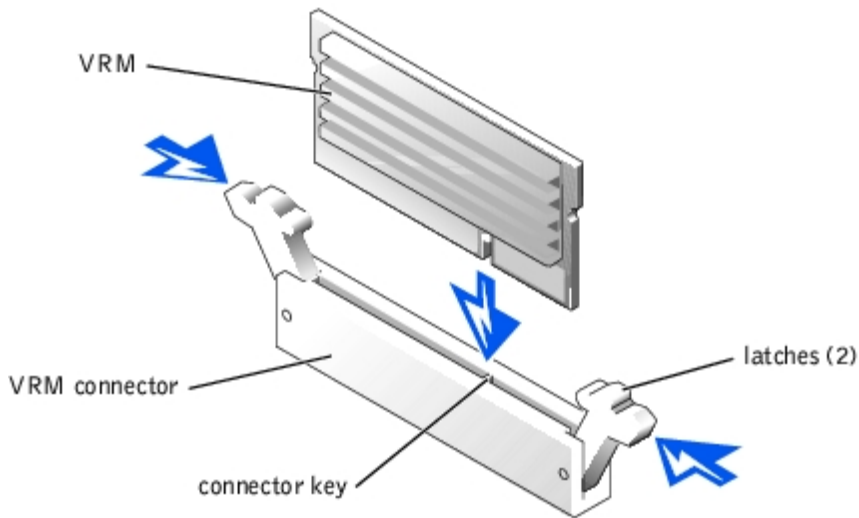
 **NOTE:** No force is needed to install the microprocessor in the socket. When the microprocessor is aligned correctly, it should drop into the socket.

12. Install the microprocessor in the socket (see [Figure 4-29](#)).

 **NOTICE:** Positioning the microprocessor incorrectly can permanently damage the microprocessor and the system when you turn on the system. When placing the microprocessor in the socket, be sure that all of the pins on the microprocessor go into the corresponding holes. Be careful not to bend the pins.

13. When the microprocessor is fully seated in the socket, rotate the socket release lever back down until it snaps into place, securing the microprocessor.
14. Place the new heat sink on top of the microprocessor (see [Figure 4-28](#)).
15. Orient the securing clips as shown in [Figure 4-28](#).
16. Hook the end of the clips without the latch to the tab on the edge of the socket.
17. Push down and pivot the securing clip latch until the hole on the clip latches onto the ZIF socket tab.
18. If you are adding a second microprocessor, you must install a VRM in the VRM 2 connector, pushing down firmly to make sure that the latches engage (see [Figure 4-30](#)).

Figure 4-30. Installing the VRM



19. Replace the back fan assembly (see "[Replacing the Back Fan Assembly](#)").
20. Replace the cooling shroud (see "[Replacing the Cooling Shroud](#)").
21. Replace the cover (see "[Replacing the Cover](#)").
22. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
23. Enter the System Setup program, and ensure that the microprocessor options match the new system configuration (see "Using the System Setup Program" in your User's Guide).

As the system boots, it detects the presence of the new microprocessor and automatically changes the system configuration information in the System Setup program. If you installed a second microprocessor, a message similar to the following appears:

```
Two 2.2 GHZ Processors, Processor Bus: 400 MHz, L2 cache 512 KB Advanced
```

If only one microprocessor is installed, a message similar to the following appears:

```
One 2.2 GHz Processor, Processor Bus: 400 MHz, L2 cache 512 KB Advanced
```

24. Confirm that the top line of the system data area in the System Setup program correctly identifies the installed microprocessor(s) (see "Using the System Setup Program" in your User's Guide).
25. Exit the System Setup program.
26. Run the system diagnostics to verify that the new microprocessor is operating correctly.

See "[Running the System Diagnostics](#)" for information on running the diagnostics and troubleshooting any problems that may occur.

System Battery

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

Removing and Replacing the System Battery

- ⚠ CAUTION:** Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see the safety instructions in your *System Information Guide*.
- ⚠ CAUTION:** There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries

according to the manufacturer's instructions. See the *System Information Guide* for additional information.

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

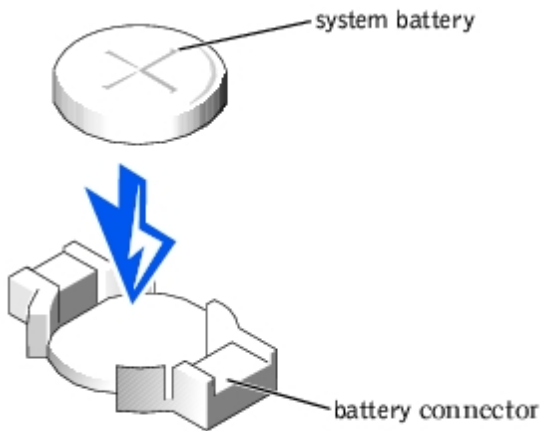
1. Open the bezel (see "[Removing the Bezel](#)").
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the cover (see "[Removing the Cover](#)").
4. Remove any expansion cards that are installed above the system battery (see "[Expansion Cards](#)").
5. Remove the system battery (see [Figure 4-31](#)).

See [Figure 4-31](#) to locate the system battery on the system board.

You can pry the system battery out of its connector with your fingers or with a blunt, nonconductive object such as a plastic screwdriver.

6. Install the new system battery with the side labeled "+" facing up (see [Figure 4-31](#)).

Figure 4-31. Removing and Installing the System Battery



7. Replace any expansion cards that were removed in step 3 (see "[Expansion Cards](#)").
8. Replace the cover (see "[Removing the Cover](#)").
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
10. Enter the System Setup program to confirm that the battery is operating properly (see "[Using the System Setup Program](#)").
11. Enter the correct time and date in the System Setup program's **Time** and **Date** fields.
12. Exit the System Setup program.
13. To test the newly installed battery, turn off the system and disconnect it from the electrical outlet for at least an hour.
14. After an hour, reconnect the system to its electrical outlet and turn it on.
15. Enter the System Setup program and if the time and date are still incorrect, replace the system board (see "[System Board](#)").

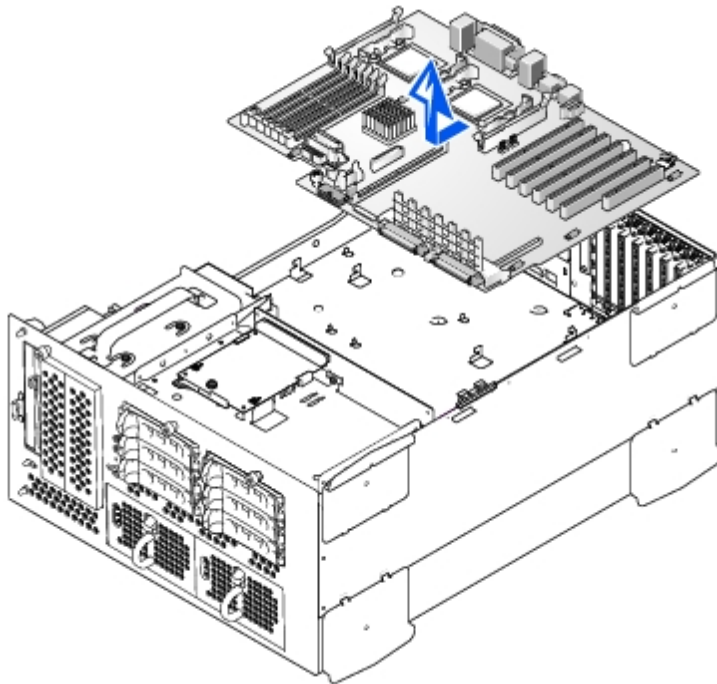
System Board

Removing the System Board


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

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the cover (see "[Removing the Cover](#)").
3. Remove the power supplies (see "[Removing a Power Supply](#)").
4. Remove the cooling fans (see "[System Fans](#)").
5. Remove the expansion-cards (see "[Expansion Cards](#)").
6. Remove the memory modules (see "[Removing Memory Modules](#)").
7. Remove the memory module, hardware key, and battery for the integrated RAID controller (if those components are installed) (see "[Integrated RAID Controller](#)").
8. Remove the microprocessors and VRMs (see "[Removing and Replacing a Microprocessor](#)").
9. Remove the system battery (see "[Removing and Replacing the System Battery](#)").
10. Remove the system board (see [Figure 4-32](#)):
 - a. Lift the system board's plunger and slide the system board forward about 0.5 inch.
 - b. Lift the system board off its grounding tabs in the system board tray.
 - c. Lift the back of the system board upward and then lift the board away from the tray.

Figure 4-32. Removing the System Board



Replacing the System Board

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

1. Replace the system board (see [Figure 4-32](#)):
 - a. Lower the front of the system board into the system board tray, under the tray levers.
 - b. Lower the system board onto its grounding tabs in the system board tray and slide the system board back until the board's plunger snaps into place.
2. Replace the system battery (see "[Removing and Replacing the System Battery](#)").
3. Replace the microprocessors and VRMs (see "[Removing and Replacing a Microprocessor](#)").
4. If necessary, replace the memory module, hardware key, and battery for the integrated RAID controller (see "[Integrated RAID Controller](#)").
5. Install the memory modules (see "[Installing Memory Modules](#)").
6. Replace the expansion-card cage (see "[Expansion Cards](#)").
7. Replace the cooling fans (see "[System Fans](#)").
8. Replace the power supplies (see "[Replacing a Power Supply](#)").
9. Replace the cover (see "[Replacing the Cover](#)").
10. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

[Back to Contents Page](#)

Jumpers and Connectors

Dell™ PowerVault™ 770N Systems Service Manual

- [Jumpers—A General Explanation](#)
- [System Board Jumpers](#)
- [System Board Connectors](#)
- [SCSI Backplane Board Connectors](#)
- [Disabling a Forgotten Password](#)

This section provides specific information about the system jumpers. It also provides some basic information on jumpers and switches and describes the connectors on the various boards in the system.

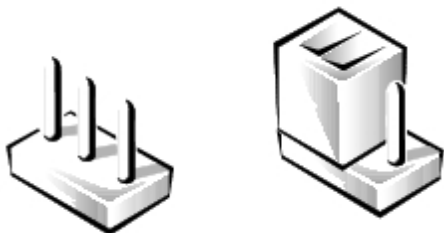
Jumpers—A General Explanation

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

Jumpers

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. To change a jumper setting, pull the plug off its pin(s) and carefully fit it down onto the pin(s) indicated. [Figure 5-1](#) shows an example of a jumper.

Figure 5-1. Example Jumpers



⚠ CAUTION: Ensure that the system is turned off before you change a jumper setting. Otherwise, damage to the system or unpredictable results may occur.

A jumper is referred to as open or unjumped 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 jumped. 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 5-2](#) shows the location and default settings of the system jumper blocks. See [Table 5-1](#) for the designations, default settings, and functions of the system's jumpers.

System Board Jumpers

[Figure 5-2](#) shows the location of the configuration jumpers on the system board. [Table 5-1](#) lists the jumpers settings.

Figure 5-2. System Board Jumpers

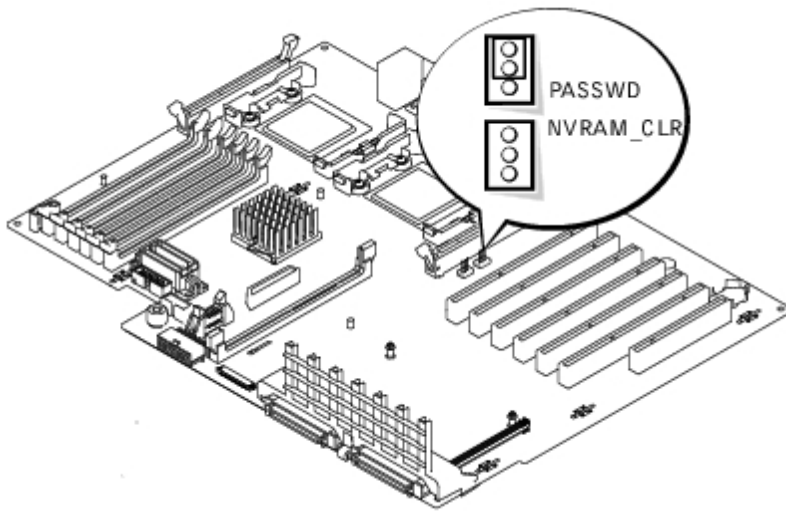








Table 5-1. System Board Jumper Settings

Jumper	Setting	Description
PASSWD	 (default)	The password feature is enabled.
		The password feature is disabled.
NVRAM_CLR	 (default)	The configuration settings are retained at system boot.
		The configuration settings are cleared at next system boot. (If the configuration settings become corrupted to the point where the system will not boot, install the jumper and boot the system. Remove the jumper before restoring the configuration information.)
jumpered  unjumpered 		

System Board Connectors

See [Figure 5-3](#) and [Table 5-2](#) for the location and description of system board connectors.

Figure 5-3. System Board Connectors

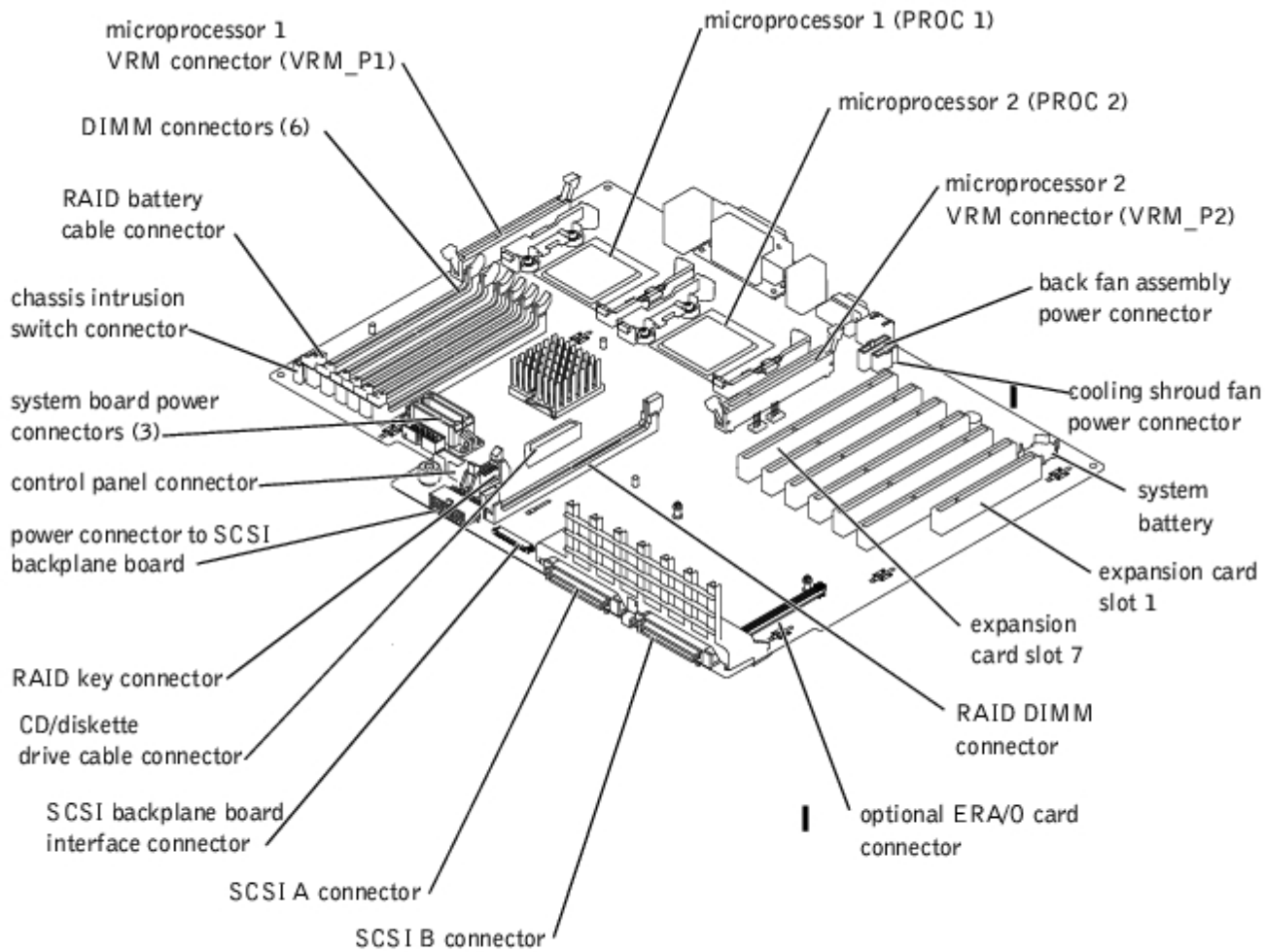


Table 5-2. System Board Connectors

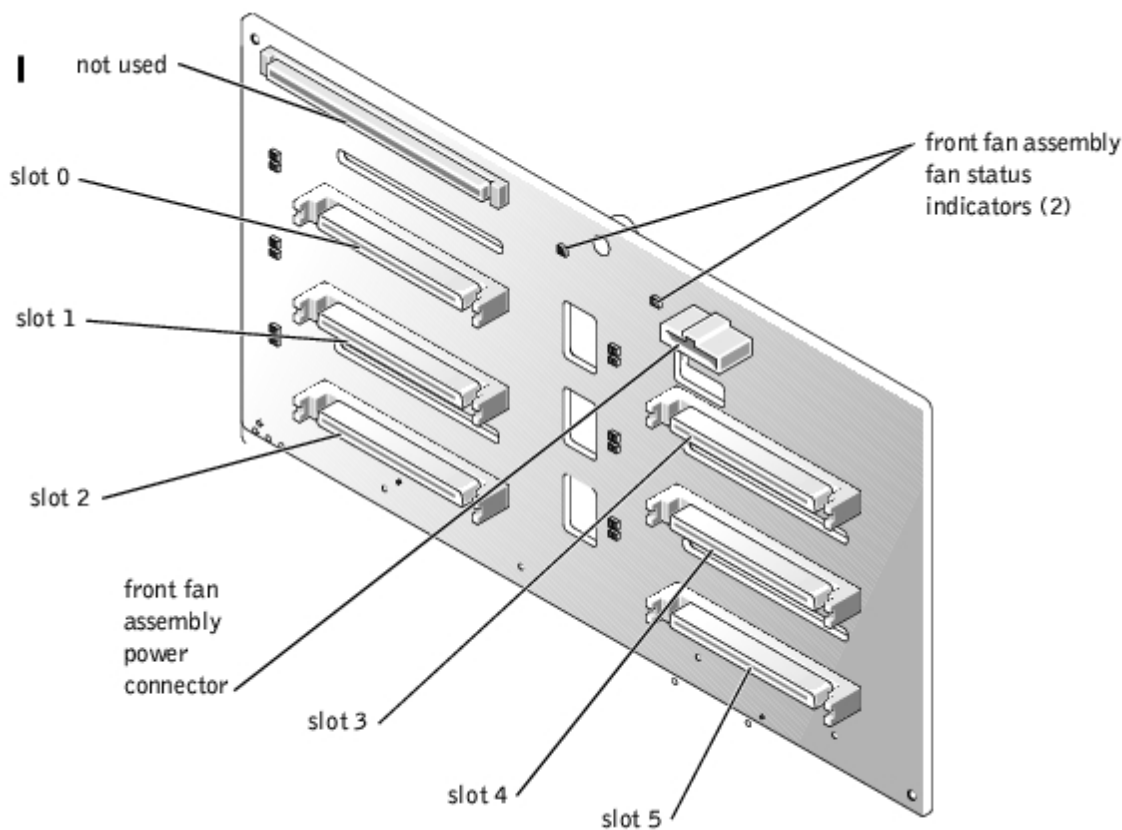
Connector	Description
BACKPLANE	SCSI backplane board interface cable connector
BATTERY	System battery
CONTROL_PANEL	System control panel connector
DIMM_nX	Memory modules (6), where <i>n</i> is the bank and <i>X</i> is the slot in the bank
ERA_CARD	ERA/O card connector
FAN_n	Cooling fan power connector: <ul style="list-style-type: none"> • 1 — Back fan assembly (fans 1 and 2) • 2 — Front fan assembly (fans 2 and 4) • 3 — Cooling shroud fan (fan 5)
IDE	CD/diskette drive interposer board power and data cable connector
POWERn	Power connectors
PROCn	Microprocessors (2)

RAID_BAT	Battery cable for optional integrated RAID controller
RAID_DIMM	Memory module for optional integrated RAID controller
RAID_KEY	Socket for integrated RAID controller hardware key
SCSI_A, SCSI B	SCSI host adapter connectors
PCI_n	Expansion card connectors (PCI 1 – PCI 7)
VRM_Pn	Microprocessor VRMs (2)

SCSI Backplane Board Connectors

[Figure 5-4](#) shows the location of the connectors on the SCSI backplane board.

Figure 5-4. SCSI Backplane Board Components



Disabling a Forgotten Password

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

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

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the cover (see "[Removing the Cover](#)").

3. Remove the jumper plug from the password jumper.

See [Figure 5-2](#) to locate of the password jumper (labeled "PASSWD") on the system board.

4. Replace the cover (see "[Removing the Cover](#)").
5. Reconnect your system and peripherals to their electrical outlets, and turn on the system.

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



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

6. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
7. Remove the cover (see "[Removing the Cover](#)").
8. Install the jumper plug on the password jumper.
9. Replace the cover (see "[Removing the Cover](#)").
10. Reconnect your system and peripherals to their electrical outlets, and turn on the system.
11. Assign a new system and/or setup password.

To assign a new passwords using the System Setup program, see "[Assigning a System Password](#)" and "[Assigning a Setup Password](#)."

Using the System Setup Program

Dell™ PowerVault™ 770N Systems Service Manual

- [Entering the System Setup Program](#)
- [System Setup Options](#)
- [System and Setup Password Features](#)
- [Disabling a Forgotten Password](#)

After you set up your system, run the System Setup program to familiarize yourself with your system configuration and optional settings. Print the System Setup screens by pressing <Print Screen> or record the information for future reference.

You can use the System Setup program to:


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

Entering the System Setup Program

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


<F2> = System Setup

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

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

Responding to Error Messages

You can enter the System Setup program by responding to certain error messages. If an error message appears while the system is booting, make a note of the message. Before entering the System Setup program, see "System Beep Codes" and "System Messages" in your *Installation and Troubleshooting Guide* for an explanation of the message and suggestions for correcting errors.

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


Using the System Setup Program

[Table 6-1](#) lists the keys that you use to view or change information on the System Setup program screens and to exit the program.

Table 6-1. System Setup Program Navigation Keys

Keys	Action
------	--------

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

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

System Setup Options

Main Screen

When you enter the System Setup program, the main System Setup program screen appears (see [Figure 6-1](#)).

Figure 6-1. Main System Setup Screen

```

Dell Computer Corporation (www.dell.com) - PowerVault 770N
-----
Intel® Xeon™ Processor          BIOS Version: XXXX
Processor Speed: 1800 MHz       Service Tag : XXXXX

System Time ..... 06:12:45
System Date ..... Tue May 28, 2002

Diskette Drive A: ..... 3.5 inch, 1.44 MB

System Memory ..... 512 MB ECC DDR
Video Memory ..... 8 MB SDRAM

OS Install Mode ..... OFF
CPU Information ..... <ENTER>

Boot Sequence ..... <ENTER>
Hard-Disk Drive Sequence ..... <ENTER>

Integrated Devices ..... <ENTER>
PCI IRQ Assignment ..... <ENTER>
PCI-X Slot Information ..... <ENTER>

Console Redirection ..... <ENTER>

System Security ..... <ENTER>

Keyboard NumLock ..... On
Report Keyboard Errors ..... Report

Asset Tag ..... XXXXX

Up,Down Arrow to select | SPACE,+, - to change | ESC to exit | F1=HELP

```

[Table 6-2](#) lists the options and descriptions for the information fields that appear on the main System Setup program screen.


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

Table 6-2. System Setup Program Options

Option	Description
System	Resets the time on the system's internal clock.

Time	
System Date	Resets the date on the system's internal calendar.
Diskette Drive A:	Displays a screen that allows you to select the type of diskette drive for your system.
System Memory	Displays the amount of system memory. This option has does not have user-selectable settings.
Video Memory	Displays the amount of video memory. This option does not have user-selectable settings.
OS Install Mode (Off default)	Determines the maximum amount of memory available to the operating system. On sets the maximum memory to 256 MB. Off makes all of the system memory available to the operating system. Some operating systems cannot install with more than 2 GB of system memory. Enable this option (On) during operating system installation and disable (Off) after installation.
CPU Information (Logical Processor Enabled default)	Displays information related to microprocessors (speed, cache size, and so on). Enable or disable Hyper-Threading technology by changing the setting of the Logical Processor option.
Boot Sequence	Determines the order in which the system searches for boot devices during system startup. Available options can include the diskette drive, CD drive, hard drives, and network.
Hard-Disk Drive Sequence	Determines the order in which the system searches the hard drives during system startup. The selections depend on the hard drives installed in your system.
Integrated Devices	See " Integrated Devices Screen ."
PCI IRQ Assignment	Displays a screen to change the IRQ assigned to each of the integrated devices on the PCI bus, and any installed expansion cards that require an IRQ.
PCI-X Slot Information	Displays a menu of selectable fields. Selecting any of the fields displays the following information for the PCI-X bus you selected: <ul style="list-style-type: none"> • Occupied or unoccupied • For occupied slots, the operating frequency and mode of the slots (PCI or PCI-X) • For unoccupied slots, the maximum operating frequency and the capable operating mode of the slots
Console Redirection	See " Console Redirection Screen ."
System Security	Displays a screen to configure the system password and setup password features. See " Using the System Password " and " Using the Setup Password " for more information.
Keyboard NumLock	Determines whether your system starts up with the NumLock mode activated on 101- or 102-key keyboards (does not apply to 84-key keyboards).
Report Keyboard Errors	Enables or disables reporting of keyboard errors during the POST. Enable this option for host systems that have keyboards attached. Select Do Not Report to suppress all error messages relating to the keyboard or keyboard controller during POST. This setting does not affect the operation of the keyboard itself if a keyboard is attached to the system.
Asset Tag	Displays the customer-programmable asset tag number for the system if an asset tag number has been assigned.

Integrated Devices Screen

[Table 6-3](#) lists the options and descriptions for the information fields that appear on the **Integrated Devices** screen.

Table 6-3. Integrated Devices Screen Options

Option	Description
Embedded RAID Controller	<p>Selects between RAID, SCSI, or Off. The configurable options vary, depending on whether the optional ROMB key and memory are installed.</p> <ul style="list-style-type: none"> With the ROMB key and memory module installed — Select either RAID Enabled or Off. <p>NOTE: If a RAID controller is installed, you may need to turn on the SCSI controller.</p> <ul style="list-style-type: none"> Without the ROMB key and memory module installed — Select either SCSI or Off.
IDE CD-ROM Controller	Enables the integrated IDE controller. When set to Auto , each channel of the integrated IDE controller is enabled if IDE devices are attached to the channel and external the IDE controller is not detected. Otherwise, the channel is disabled.
Diskette Controller (Auto default)	Enables or disables the system's diskette drive controller. When Auto is selected, the system turns off the controller when necessary to accommodate a controller card installed in an expansion slot. You can also configure the drive as read-only. When using the read-only setting, the drive cannot be used to write to a disk.
USB Controller (On with BIOS support default)	Enables or disables the system's USB ports. Options are On with BIOS support , On without BIOS support , or Off . Disabling the USB ports makes system resources available for other devices.
Embedded 10/100/1000 NIC	Enables or disables the system's integrated NIC. Options are Enabled without PXE , Enabled with PXE , and Disabled . PXE support allows the system to boot from the network. Changes take effect after the system reboots.
MAC Address	Displays the MAC address for the integrated 10/100/1000 NIC. This field does not have user-selectable settings.
Mouse Controller (On default)	Sets the built-in PS/2-compatible mouse On or Off .
Serial Port (1 and 2) (Auto default)	<p>Serial port 1 options are COM1, COM3, Auto, and Off.</p> <p>Serial port 2 options are COM2, COM4, Auto, and Off.</p> <p>When serial port 1 or 2 are set to Auto, the integrated port automatically maps to the next available port. Serial port 1 attempts to use COM1 first, and then COM3. Serial port 2 attempts to use COM2 first, and then COM4. If both addresses are in use for a specific port, the port is disabled.</p> <p>If you set the serial port to Auto and add an expansion card with 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.</p>
Parallel Port (378h default address)	<p>Selects the address for the parallel port.</p> <p>The system automatically disables the built-in parallel port if an expansion card containing a parallel port at the same address is detected.</p>
Parallel Port Mode	Sets the parallel port mode of operation between AT mode and PS/2 mode. In AT mode, the integrated parallel port can output data only to an attached device. In PS/2 mode, the built-in parallel port can both input and output data.
Speaker (On default)	Sets the integrated speaker On or Off . A change to this option takes effect immediately (rebooting the system is not required).

System Security Screen

[Table 6-4](#) lists the options and descriptions for the information fields that appear on the **System Security** screen.

Table 6-4. System Security Screen Options

--	--

Option	Description
Password Status	<p>Setting the Setup Password option to Enabled prevents the system password from being changed or disabled at system start-up.</p> <p>To <i>lock</i> the system password, assign a setup password in the Setup Password option and then change the Password Status option to Locked. In this state, you cannot change the system password using the System Password option and cannot be disabled at system start up by pressing <Ctrl><Enter>.</p> <p>To <i>unlock</i> the system password, enter the setup password in the Setup Password field and then change the Password Status option to Unlocked. In this state, you can disable the system password at system start up by pressing <Ctrl><Enter> and then change the password using the System Password option.</p>
Setup Password	<p>Restricts access to the System Setup program in the same way that you restrict access to your system using the system password feature.</p> <p>NOTE: See "Using the Setup Password" for instructions on assigning a setup password and using or changing an existing setup password.</p>
System Password	<p>Displays the current status of your system's password security feature and allows you to assign and verify a new system password.</p> <p>NOTE: See "Using the System Password" for instructions on assigning a system password and using or changing an existing system password.</p>
Front-Bezel Chassis Intrusion	<p>Enables or disables the chassis-intrusion detection feature.</p> <p>NOTE: You can still turn on the system by using the power button, even if the Power Button option is set to Disabled.</p>
Power Button	<p>Turns system's power off and on.</p> <ul style="list-style-type: none"> • If you turn off the system using the power button and the system is running an ACPI-compliant operating system, the system can perform an orderly shutdown before power is turned off. • If the system is not running an ACPI-compliant operating system, power is turned off immediately after the power button is pressed. <p>The button is enabled in the System Setup program. When disabled, the button can only turn on system power.</p>
NMI Button	<p>NOTICE: Pressing this button halts the operating system and displays a diagnostic screen.</p> <p>Sets the NMI feature On or Off.</p>

Console Redirection Screen

[Table 6-5](#) lists the options and descriptions for the information fields that appear on the **Console Redirection** screen. For more information about using console redirection, see your *System Administrator's Guide*.

Table 6-5. Console Redirection Screen Options

Option	Description
Console Redirection (On default)	Sets the console redirection feature to On or Off .
Remote Terminal Type (VT 100/VT 220 default)	Select either VT 100/VT 220 or ANSI .
Redirection After Boot (Enabled default)	Enables or disables console redirection after your system restarts.



Exit Screen

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

- Save Changes and Exit

- Discard Changes and Exit
 - Return to Setup
-

System and Setup Password Features

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

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

To change or delete an existing password, you must know the password (see "[Deleting or Changing an Existing System Password](#)"). If you forget your password, you cannot operate your system or change settings in the System Setup program until a trained service technician changes the password jumper setting to disable the passwords, and erases the existing passwords. This procedure is described in the *Installation and Troubleshooting Guide*.

Using the System Password

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

Assigning a System Password

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

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


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

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

You can use up to 32 characters in your password.

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


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

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

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

The setting shown for the **System Password** changes to **Enabled**. Exit the System Setup program and begin using your system.

6. Either reboot your system now for your password protection to take effect or continue working.

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

Using Your System Password to Secure Your System

 **NOTE:** If you have assigned a setup password (see "[Using the Setup Password](#)"), the system accepts your setup password as an alternate system password.

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

To leave the password security enabled:

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

To disable the password security:


1. Turn on or reboot your system by pressing <Ctrl><Alt>.
2. Press <Ctrl><Enter>.

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

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

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

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

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

Deleting or Changing an Existing System Password

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

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

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


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

repeat steps 2 through 5.

Using the Setup Password

Assigning a Setup Password

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

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

You can use up to 32 characters in your password.

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

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


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

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

Operating With a Setup Password Enabled

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

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

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

Deleting or Changing an Existing Setup Password

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

The setting changes to **Not Enabled**.

3. If you want to assign a new setup password, perform the steps in "[Assigning a Setup Password](#)."

Disabling a Forgotten Password

See "[Jumpers and Connectors](#)".

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