Dell® OptiPlex® GX*pro* Systems
USB Enhanced and
Integrated 10/100-Mbps Ethernet

SERVICE MANUAL

DELL®

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Read This First

A prerequisite for using this manual to service Dell computer systems is a basic knowledge of IBM®-compatible PCs and prior training in IBM-compatible PC troubleshooting techniques. In addition to information provided in this manual and the *User's Guide* that came with the system, Dell provides the *Diagnostics and Troubleshooting Guide* for troubleshooting procedures and instructions on using the Dell diagnostics to test the computer system.

Warnings, Cautions, and Notes

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

WARNING: A WARNING indicates the potential for bodily harm and provides instructions for how to avoid the problem.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and provides instructions for how to avoid the problem.

NOTE: A NOTE provides helpful information about using the computer system.

Chapter 1
System Overview

*T*his service manual covers the Dell® OptiPlex® GX*pro* high-speed, upgradable desktop systems, which use the Intel® Pentium® Pro family of microprocessors. These Dell systems incorporate the high-performance PCI local bus as well as the ISA expansion bus. These buses are built into the system board, which also integrates a 3.3-V Pentium Pro microprocessor and all other elements of the basic computer system.

The Pentium Pro microprocessor contains a built-in clock multiplier circuit, which increases the microprocessor's internal operating frequency to a multiple of the system clock frequency. The microprocessors for each of these systems and their operating frequencies are as follows:

- Dell OptiPlex GX*pro* 180 systems — 180 MHz derived from a system clock frequency of 60 MHz

- Dell OptiPlex GX*pro* 200 systems — 200 MHz derived from a system clock frequency of 66 MHz

Dell OptiPlex GX*pro* systems contain either an integrated 10-Mbps or 10/100-Mbps 3Com® NIC, both of which are covered in this document.

*S*ystem Features

In addition to the standard features found in a traditional personal computer, the Dell OptiPlex GX*pro* desktop systems include the following new and/or advanced features:

- Dual-processor capability.

- Advanced combination ISA and PCI expansion subsystem.

- Plug and Play capability.

- Enhanced dual-interface EIDE subsystem.

- 16-bit integrated audio controller.

- PCI video card.

- Integrated 10-Mbps or 10/100-Mbps Ethernet NIC.

- Integrated Universal Serial Bus (USB) controller with two USB-compliant connectors (included on systems containing the 10/100-Mbps NIC).

- Desktop chassis.

- Thermal monitoring.

- Main system memory consisting of 16 to 512 MB of high-speed EDO DIMMs that provide ECC functionality when used with the Intel 82440FX PCIset.

- SMART support-compliant hard-disk drives and SMART support in the system BIOS, which warns you at system start-up if a hard-disk drive has become unreliable.

- Quick tests feature in the diskette-based diagnostics (for more information about Run Quick Tests, see "Running the Diskette-Based Diagnostics" in Chapter 2).

All of these features (except the Run Quick Tests feature described in Chapter 2) are briefly described in this chapter. For a complete list of system features, see "Technical Specifications" found later in this chapter.

When following the text in this manual, assume that the location or direction relative to the system unit is as shown in Figure 1-1.

back of system unit

left side

right side

front of system unit
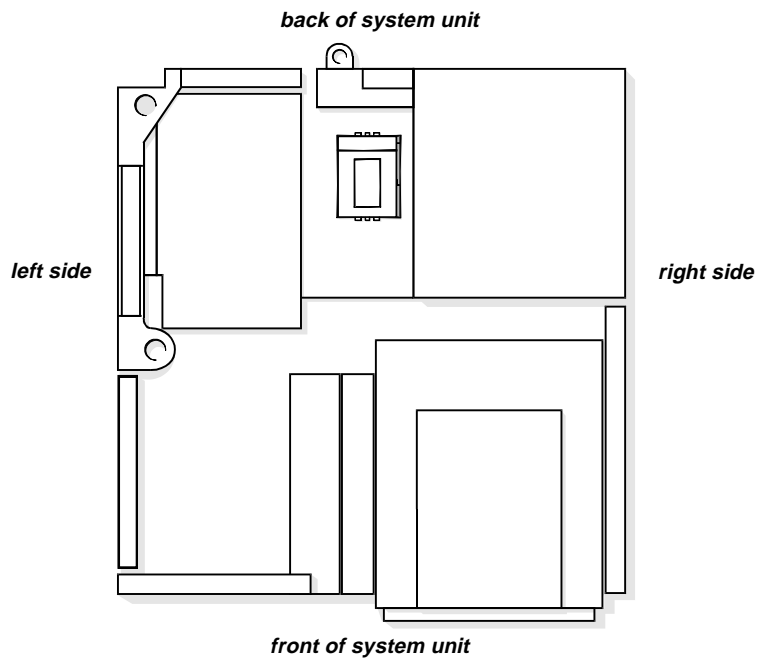
Figure 1-1. System Unit Orientation

CAUTION: To avoid possible data or file structure corruptions, the front-panel reset button should be used only when the system cannot be rebooted by pressing <Ctrl><Alt><Del>. Before you use the reset button to initiate a hardware reset, close any open application programs and files if possible.

---

power button

power indicator

reset button

hard-disk drive access indicator
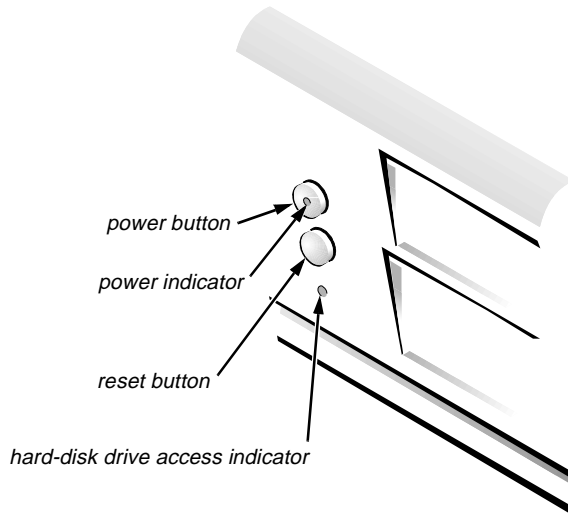
Figure 1-2. Front-Panel Features

3.5-inch drive

drive cage

diskette/tape drive
interface cable

hard-disk drive
bracket

DC power cable

system board

power supply

expansion-card
cage

AC power
receptacle

voltage
selection switch

parallel port connector

chassis

serial port 1 connector

mouse connector

keyboard connector

serial port 2 connector

USB connector (2)   NIC connector

card-slot openings

video connector
microphone jack

line-in jack

speaker-out jack

Figure 1-3. Internal View

Dual-Processor Capability

With the installation of a microprocessor add-in card in the terminator card slot, the system unit becomes a dual-processing system. The add-in card's microprocessor must have the same frequency and cache size as the system board's microprocessor. In order to take advantage of two processors, dual-processing systems must have multiprocessing operating systems, such as the Microsoft® Windows NT® 3.5*x*, Windows NT 4.0, and Novell® NetWare® SMP (symmetric multiprocessing) operating systems. The microprocessor chips on both the system board and the processor card are replaceable.

Advanced Expansion Subsystem

The computer system offers advanced expansion subsystems that can support a mixture of traditional ISA expansion cards (called *legacy* cards), Plug and Play ISA expansion cards, and PCI expansion cards. The ISA Configuration Utility (ICU) included with the system provides a means of avoiding resource conflicts that might arise from such an arrangement.

After all legacy cards have been configured with the ICU, the system automatically assigns any required memory space, IRQ lines, and DMA channels to any installed Plug and Play ISA expansion cards and PCI expansion cards the next time the system is rebooted. Chapter 4, "Using the ISA Configuration Utility," in the *User's Guide* describes the ICU and provides instructions for using it to configure the system.

The five expansion slots include two ISA expansion-card connectors and five PCI expansion-card connectors. (Two PCI expansion-card connectors and the two ISA expansion-card connectors share a single expansion slot, resulting in a total of five expansion slots.) The expansion-card connectors are located on a riser board (see Figure 1-4).
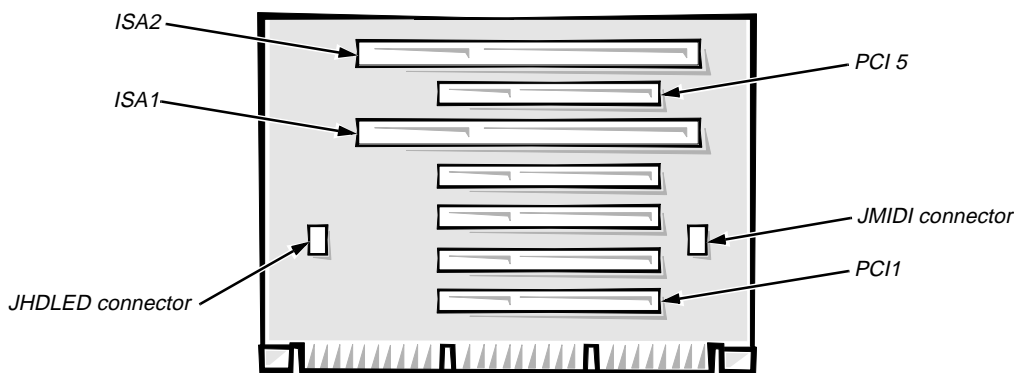
Figure 1-4. Riser-Board Expansion-Card Connectors

Hard-Disk Drive Options

The hard-disk drive bracket is located next to the drive bays at the front of the system unit. The system unit can contain up to two, one-inch-high, hard-disk drives or one, 1.6-inch-high, half-height and one, one-inch-high, hard-disk drive.

Enhanced Dual-Interface EIDE Subsystem

The enhanced dual-interface EIDE subsystem supports two EIDE interfaces (primary and secondary), each of which can support up to two EIDE devices. The EIDE controller resides on the high-speed PCI local bus.

- The primary EIDE interface (IDE1) provides support for up to two high-performance EIDE devices. The system's boot drive should be connected to the primary EIDE interface.

- The secondary EIDE interface (IDE2) also provides support for up to two high-performance EIDE devices, typically EIDE tape drives or CD-ROM drives.

NOTE: The externally accessible drive bays at the front of the system unit are normally used for diskette drives, CD-ROM drives, and/or tape drives. Hard-disk drives should be installed in the internal hard-disk drive bracket described in the previous subsection, "Hard-Disk Drive Options." For detailed information about the data storage subsystem, see Chapter 9, "Installing Drives," in the User's Guide.

Audio Controller

The system board has a built-in 16-bit Creative Labs ViBRA 16 audio controller chip and connectors on the back panel for connecting the system unit to external audio devices (speakers, microphone). The controller supports all the sound functions found on the Sound Blaster expansion card from Creative Laboratories, Inc.

Chapter 6, "Using the Integrated Audio Controller," in the *User's Guide* provides instructions for connecting the system to external audio devices and configuring the integrated audio controller to avoid resource conflicts.

PCI Video Card

The video subsystem consists of a high-speed, high-resolution video adapter card installed in one of the bottom two PCI expansion-card connectors (PCI1 or PCI2). Because the video adapter card connects to the PCI local bus rather than to the ISA-compatible system bus, communication between the video subsystem and the microprocessor is much faster. The PCI local bus operates at a frequency of 30 or 33 MHz as opposed to the 8-MHz operating frequency of the ISA bus.

NOTE: Some users may use an ISA video adapter card.

NIC

GX*pro* systems contain either an integrated 10-Mbps or 10/100-Mbps 3Com NIC. GX*pro* systems containing the 10-Mbps Ethernet NIC have a built-in integrated 3Com 3C915 NIC chip. GX*pro* systems containing the 10/100-Mbps Ethernet NIC have a built-in integrated 3Com 3C916 Ethernet NIC chip. The NIC subsystem connects to the Ethernet network through a single RJ45 connector on the back panel of the computer.

The 10/100-Mbps NIC supports a 10-Mbps direct connection to either a category-3 or a category-5 ethernet cable. When the NIC operates in the 100-Mbps mode, a category-5 ethernet cable must be used.

GX*pro s*ystems with the 10/100-Mbps NIC also contain two USB connectors. Thus, to determine whether a particular system contains the 10/100-Mbps NIC, look for one of the following indications:

- USB connectors next to the NIC connector on the computer's back panel
- The message `USB Enhanced` displayed during the boot routine
- A USB category on page 2 of the System Setup

If any of these indications are present, your system has the 10/100-Mbps NIC.

Chapter 5, "Using the Network Interface Controller," in the *User's Guide* provides instructions for connecting the system to, and configuring it for use on, an Ethernet network.

USB

USB capability simplifies connection of peripheral devices such as mice, printers, and computer speakers. The USB connectors on your computer's back panel provide a single connection point for multiple USB-compliant devices. USB-compliant devices can also be connected and disconnected while the system is running.

NOTE: USB capability is available only on systems with the 10/100-Mbps NIC.

Desktop Chassis

The system unit can be set horizontally or vertically, when used with the floor stand provided with the system. The floor stand attaches to the left side of the system.

Thermal Monitoring

The primary and, if installed, secondary microprocessors have a thermal sensor that monitors the processor's temperature. If the critical threshold is exceeded, a system alarm triggers a system management interrupt (SMI), which alerts the BIOS. The power indicator flashes, and a message appears on the monitor to alert the user that the system will shut down in an orderly manner, preventing the loss of data.

SMART Support

The system has SMART-compliant hard-disk drives and SMART support in the system BIOS, which warns you at system start-up if a hard-disk drive has become unreliable.

System Unit

The following subsections provide service-related information about the system unit.

System Power Supply

The 230-W system power supply can operate from an AC power source of 115 VAC at 60 Hz or 230 VAC at 50 Hz. The system power supply provides the DC operating voltages and currents listed in Table 1-1.

NOTE: The power supply produces DC voltages only under its loaded condition. Therefore, when you measure these voltages, the DC power connectors must be connected to their corresponding power input connectors on the system board or drives.

Table 1-1. DC Voltage Ranges

Voltage	Range	Maximum Output Current[1]
+3.3 VDC	+3.15 to +3.45 VDC	14.0 A
+5 VDC	+4.75 to +5.25 VDC	29.0 A
+12 VDC	+11.40 to +12.60 VDC	6.0 A
–12 VDC	–10.80 to –13.20 VDC	0.3 A
–5 VDC	–4.50 to –5.50 VDC	0.3 A
+5 VFP[2]	+4.75 to +5.25 VDC	10 mA

[1] *Maximum continuous DC output power shall not exceed 230 W. Maximum combined load on +5 VDC and +3.3 VDC shall not exceed 170 W.*

[2] *VFP (volts flea power) — sometimes called "standby power."*

Pin Assignments for the DC Power Connectors

The power-supply output voltages can be measured at the back (wire side) of the connectors without disconnecting them. The following illustrations show the wire side of the connectors.

−5 VDC (white) +5 VDC (red)
common (black) +5 VDC (red)
common (black) +5 VDC (red)
common (black) TFSC[2] (brown)
PSON#[1] (gray) +5 VDC (red)

11 12 13 14 15 16 17 18 19 20

P1

1 2 3 4 5 6 7 8 9 10

+5 VDC (red) common (black)
common (black) common (black)
+5 VDC (red) −12 VDC (blue)
common (black) +12 VDC (yellow)
PWRGOOD[3] (orange) +5 VFP (purple)
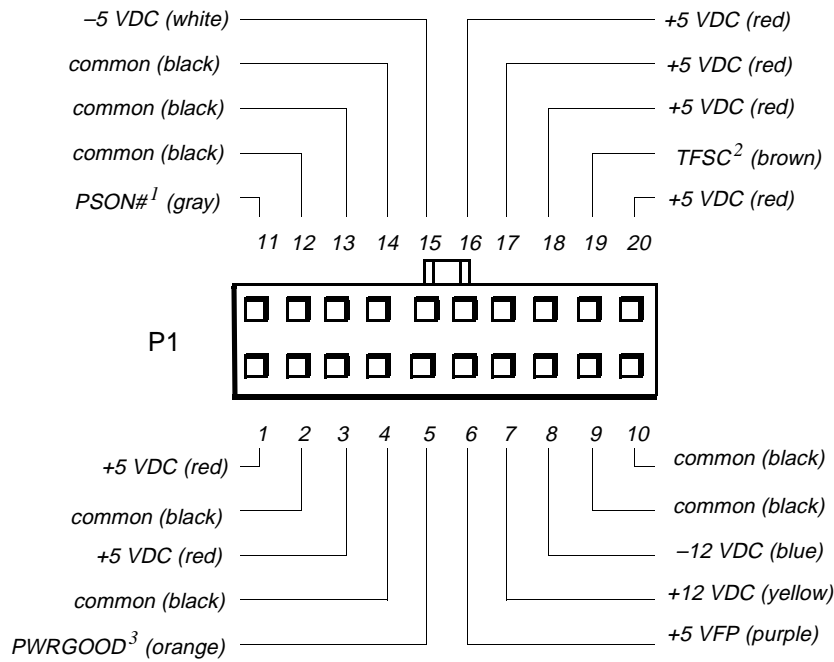
[1] Pin 11 — PSON# should measure between +4 and +5 VDC except when the power button on the front panel is pressed, taking PSON# to its active-low state.

[2] Pin 19 — Thermal fan-speed control (TFSC) is a power-supply input signal used to control power-supply fan speed in special applications.

[3] Pin 5 — PWRGOOD should measure between +4 and +5 VDC when the power supply is on and operating to indicate that all power-supply output voltages are within ranges specified in Table 1-1.

Figure 1-5. DC Power Connector P1

P2, P3,
P5, P6

1 2 3 4

+5 VDC (red)
common (black)
common (black)
+12 VDC (yellow)

P4

1 2 3 4

+12 VDC (yellow)
common (black)
common (black)
+5 VDC (red)
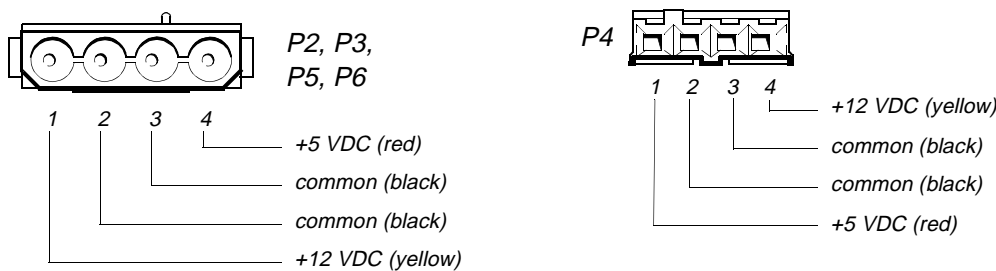
Figure 1-6. DC Power Connectors P2, P3, P4, P5, and P6

+3.3 VDC (blue/white)
+3.3 VDC (blue/white)
+3.3 VDC (blue/white)
common (black)
common (black)
common (black)
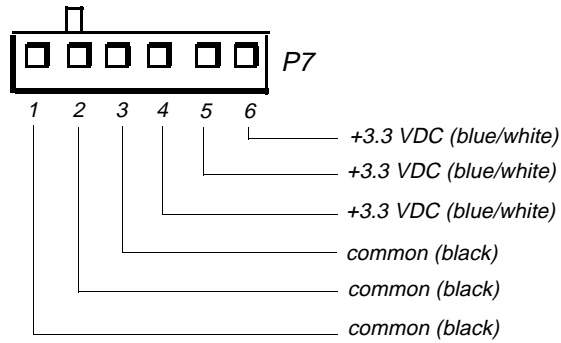
Figure 1-7. DC Power Connector P7

DC Power Distribution

Figures 1-8 and 1-9 provide the following information about DC power distribution:

• Power-supply connector identification

• Power cable connections for diskette, tape, CD-ROM, and hard-disk drives

• Power distribution to sockets and connectors on the system board
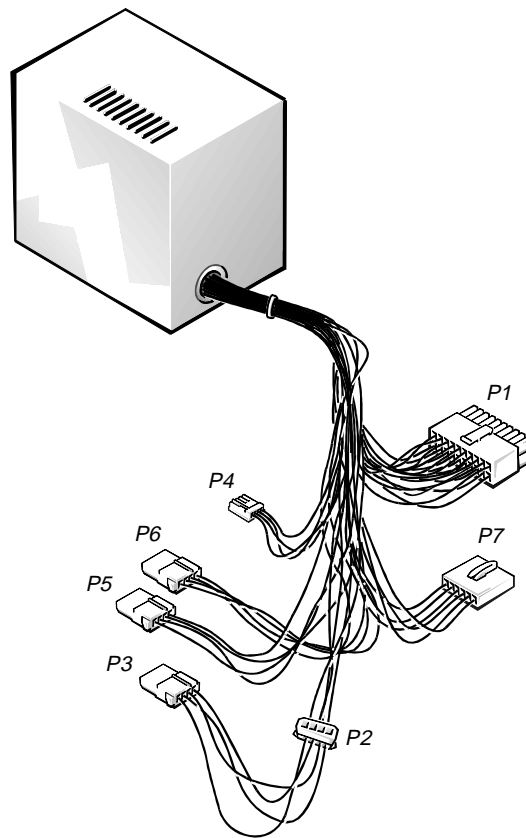
Figure 1-8. DC Power Cables
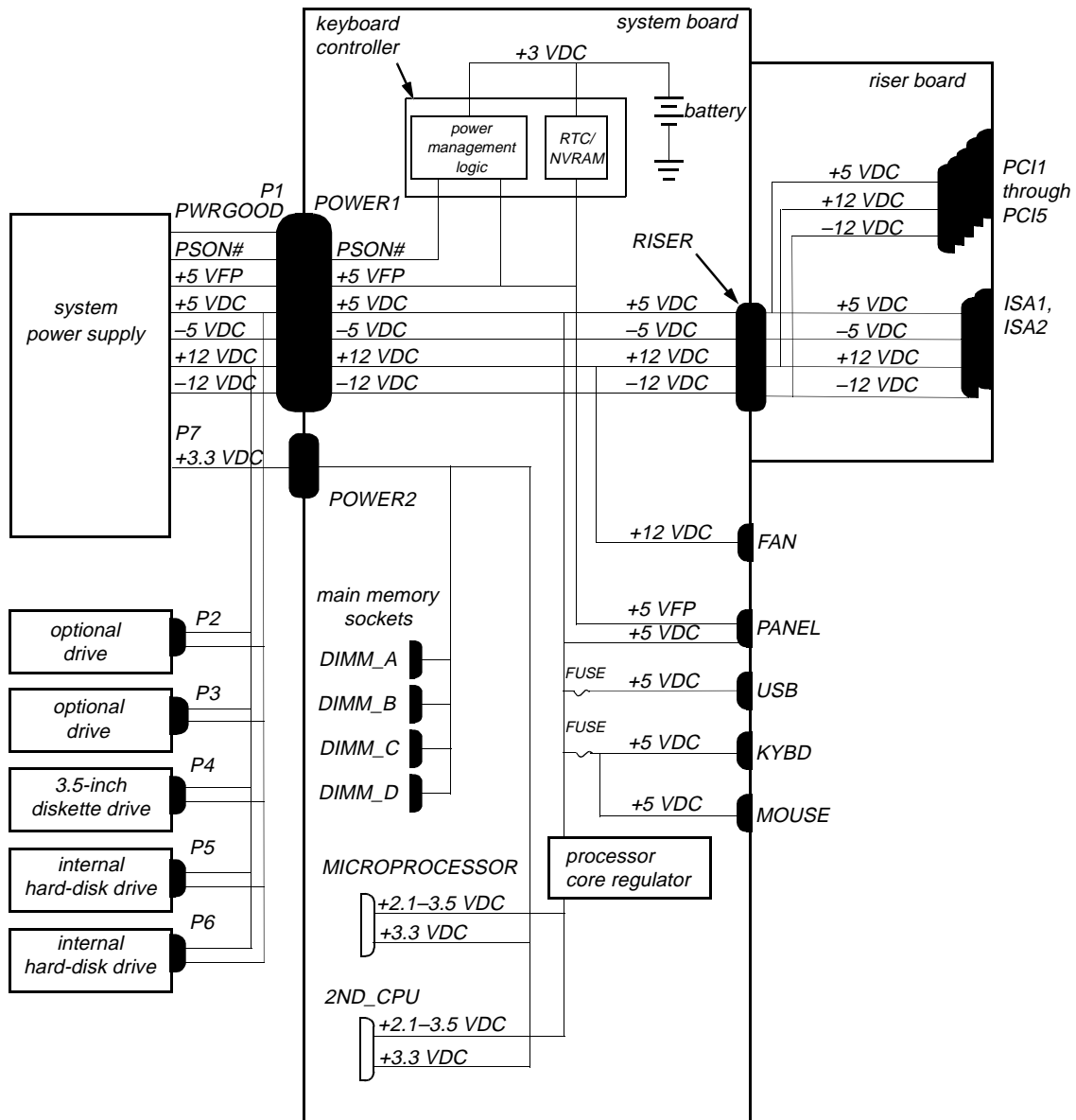
Figure 1-9. Power Distribution

System Board Layout

The subsections that follow provide service-related information about the system board components.

microphone jack (NIC-IN)

speaker-out jack (SPKR-OUT)

line-in jack (LINE-IN)

riser board power connector (RSR PWR1)

riser board connector (RISER)

riser board power connector (RSR PWR2)

secondary microprocessor card (or terminator card) connector (2ND_CPU)

NIC connector (ENET)

USB connector (USB)

serial port 2 connector (SERIAL2)

keyboard/mouse connectors (stacked) (KYBD/MOUSE)

serial port 1/parallel port connectors (stacked) (PARALLEL/SERIAL)

microprocessor fan connector (FAN)

battery socket (BATTERY)

DIMM sockets (4)

main power input connector (POWER1)

microprocessor socket (MICROPROCESSOR)

3.3-V power input connectors (POWER2)

CD-ROM connector (CD_IN)

diskette/tape drive interface connector (DSKT)

secondary EIDE interface connector (IDE2)

control panel connector (PANEL)

jumpers

primary EIDE interface connector (IDE1)

front of system unit

Figure 1-10. System Board Components

Video Memory

See the documentation from the video card manufacturer that came with your system for information on removing and replacing video-memory upgrade chips.

Main Memory

The four DIMM sockets on the system board can accommodate combinations of 16-, 32-, 64-, and 128-MB DIMMs up to a total memory capacity of 512 MB. The system is shipped with high-speed (60-ns) EDO DIMMs that provide ECC functionality when used with the Intel 82440FX PCIset. EDO parity mode DIMMs can be mixed, as follows:

- Any socket can be populated or not. There is no requirement that one socket be filled before the other, and empty sockets can be left between installed DIMMs. Dell recommends populating the sockets in order from A to D.

- Each DIMM socket does not have to contain DIMMs of the same size or speed. DIMMs may be installed in any order.

See "DIMMs" in Chapter 4 for information on removing and replacing DIMMs.

System Board Jumpers

Figure 1-11. System Board Jumpers
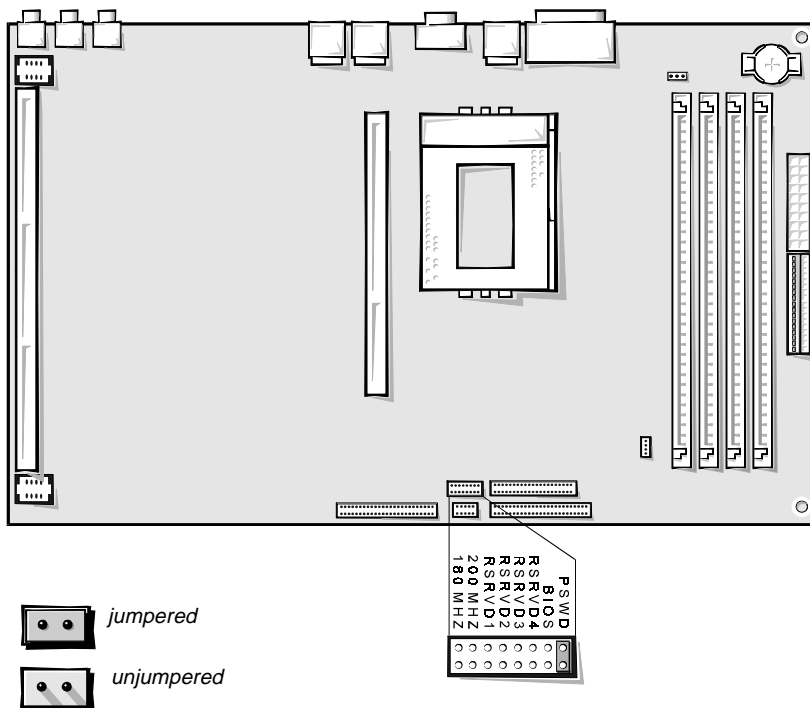
Table 1-2. Jumper Descriptions

Jumper	Description	Default Setting
PSWD	Password enable/disable. Jumper installed, activates password feature.	Installed (password feature enabled)
BIOS	Used for internal Dell debug tool.	Not installed (*reserved, do not change*)
RSRVD4 RSRVD3 RSRVD2 RSRVD1	Reserved.	Not installed (*reserved, do not change*)
200MHZ	Microprocessor speed.	Installed if the micro-processor's internal speed is 200 MHz, or else not installed
180MHZ	Microprocessor speed.	Installed if the micro-processor's internal speed is 180 MHz, or else not installed

*I*nterrupt Assignments

Table 1-3. Interrupt Assignments

IRQ Line	Used By/Available
IRQ0	Generated by system timer.
IRQ1	Generated by keyboard controller to indicate that keyboard's output buffer is full.
IRQ2	Generated internally by interrupt controller to enable IRQ8 through IRQ15.
IRQ3 and IRQ4	Generated by super I/O controller to indicate that device connected to corresponding serial port requires service (IRQ3 for COM2 or COM4; IRQ4 for COM1 or COM3).
IRQ5	Available for use by expansion card unless this IRQ line is used by secondary parallel port.
IRQ6	Generated by super I/O controller to indicate that diskette or tape drive requires service.
IRQ7	Generated by super I/O controller to indicate that device connected to parallel port requires service.

Table 1-3. Interrupt Assignments (continued)

IRQ Line	Used By/Available
IRQ8	Generated by keyboard controller for each tick of RTC.
IRQ9	Available for use by expansion card.
IRQ10	Available for use by expansion card.
IRQ11	Available for use by expansion card.
IRQ12	Generated by keyboard controller to indicate that mouse's output buffer is full.
IRQ13	Generated by math coprocessor to indicate coprocessor error.
IRQ14	Generated by device connected to primary EIDE port to indicate that device requires service. If no EIDE devices are installed, this line is available for other use.
IRQ15	Generated by device connected to secondary EIDE port to indicate that device requires service. If no device is connected to secondary EIDE port, IRQ15 is available for use by expansion card.

DMA Channel Assignments

Table 1-4. DREQ Line Assignments

DREQ Line	Used By/Available
DREQ0	Available
DREQ1	Available
DREQ2	Generated by super I/O controller to initiate DMA cycle for attached diskette drive
DREQ3	Available
DREQ4	Generated by bus controller chip to activate second DMA controller
DREQ5	Available (default) DMA on-board sound controller
DREQ6	Available
DREQ7	Available

Technical Specifications

Table 1-5. Technical Specifications

Microprocessor	
Microprocessor type	Intel Pentium Pro microprocessor
Microprocessor speed	200 or 180 MHz
First-level cache	16 KB
Second-level cache	256 KB for 180 or 200 MHz; 512 KB for 200 MHz
Math coprocessor	internal to the microprocessor
System Information	
System chip set	Intel Natoma 82440FX set
Data bus width	64 bits
Address bus width	32 bits
Flash EPROM	2 Mbits
Expansion Bus	
Bus types	PCI and ISA
Bus speed	PCI: 30 MHz (180/60 processor); 33 MHz (200/66 processor) ISA: 7.5 MHz (180/60 processor); 8.25 MHz (200/66 processor)
PCI expansion-card connectors	five (two PCI connectors share card-slot openings with the two ISA connectors)
ISA expansion-card connectors	two (both ISA connectors share card-slot openings with two of the PCI connectors)
ISA expansion-card connector size	98 pins
ISA expansion-card connector data width (maximum)	16 bits
PCI expansion-card connector size	120 pins
PCI expansion-card connector data width (maximum)	32 bits

Table 1-5. Technical Specifications *(continued)*

System Clocks	
System clock	60 or 66 MHz (matches external processor speed)
Diskette/communications ports	24 MHz from the system clock
Memory	
Architecture	64-bit, noninterleaved
DIMM sockets	four
DIMM capacities	16, 32, 64, and 128 MB, EDO ECC mode
Standard RAM	16 MB
Maximum RAM	512 MB
BIOS address	F000:0000h–F0000:FFFFh
Drives	
Externally accessible bays . . .	one 3.5-inch bay, dedicated to a 3.5-inch diskette drive; two 5.25-inch bays for half-height diskette drives, tape drives, or CD-ROM drives
Internally accessible bays	two hard-disk drive bays; one 1.6-inch-high and one 1-inch-high EIDE or SCSI hard-disk drive
Ports	
Externally accessible:	
Serial (DTE)	two 9-pin connectors; 16550-compatible
Parallel	one 25-hole connector (bidirectional)
Video	one 15-hole connector (on add-in video card)
PS/2-style keyboard	6-pin mini-DIN
PS/2-compatible mouse	6-pin mini-DIN
NIC	RJ45 connector
USB	two USB-compliant connectors
Audio line in	miniature audio jack
Audio speaker out	miniature audio jack
Audio mike in	miniature audio jack

Table 1-5. Technical Specifications (continued)

Ports (continued)

Internally accessible:

EIDE hard-disk drive	two 40-pin connectors on PCI local bus
Diskette drive	34-pin connector

Video

Video type.	PCI video card (see manufacturer's specifications)

Key Combinations

<Ctrl><Alt><Del>	restarts (reboots) the system
<Ctrl><Alt><Enter>.	starts System Setup program (during POST only)
<Ctrl><Alt><\>	toggles microprocessor speeds on 101-key keyboard (in MS-DOS® real mode only)
<Ctrl><Alt><#>	toggles microprocessor speeds on 102-key keyboard

Controls and Indicators

Reset control.	push button
Power control	push button
Power indicator.	green LED
Hard-disk drive access indicator	green LED
Link integrity indicator (on NIC connector).	green LED
Activity indicator (on NIC connector).	yellow LED

Power

DC power supply:

Wattage.	230 W
Heat dissipation	600 BTUs (nominal)
Voltage	90 to 135 V at 60 Hz; 180 to 265 V at 50 Hz

Backup battery	3-V CR2032 coin cell

Table 1-5. *Technical Specifications* (continued)

Physical	
Height	16.5 cm (6.5 inches)
Width.	41.9 cm (16.5 inches)
Depth.	44.5 cm (17.5 inches)

Environmental	
Weight	12.7 kg (28 lb) or more, depending on options installed
Temperature:	
Operating	10° to 35°C (50° to 95°F)
Storage	–40° to 65°C (–40° to 149°F)
Relative humidity	8% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz for 30 min
Storage	0.5 G at 3 to 200 Hz for 30 min
Maximum shock:	
Operating	half-sine wave form: 50 G for 2 ms
Storage	half-sine wave form: 110 G for 2 ms; square wave form: 27 g for 15 ms
Altitude:	
Operating	–16 to 3048 m (–50 to 10,000 ft)
Storage	–16 to 10,600 m (–50 to 35,000 ft)

*T*his chapter describes basic troubleshooting procedures that can help you diagnose a computer system problem. These procedures can often reveal the source of a problem or indicate the correct starting point for troubleshooting the system. A brief explanation of how to load and start the diskette-based diagnostics is located at the end of the chapter. Dell recommends that you perform the following procedures in the order they are presented in this manual.

*I*nitial User Contact

When you first contact a user who has a problem, ask the user to describe the problem and the conditions under which it occurs. A verbal description can often indicate the cause of a problem or indicate the appropriate troubleshooting procedure to use. After the user describes the problem, follow these steps:

1. **Ask the user to back up any data on the hard-disk drive if the system's condition permits.**

   Appendix D, "Maintaining the System," in the *User's Guide* provides information about backing up data.

2. **Ask the user to try to duplicate the problem by repeating the operations he or she was performing at the time the problem occurred.**

   Can the user duplicate the problem?

   Yes. Proceed to step 3.

   No. Proceed to the next section, "External Visual Inspection."

3. **Observe the user to determine if he or she is making an error, such as typing an incorrect key combination or entering a command incorrectly.**

   Is the problem a result of user error?

   Yes. Instruct the user in the proper procedure, or direct him or her to the appropriate user documentation for the correct procedure.

   No. Proceed to the next section, "External Visual Inspection."

External Visual Inspection

The external visual inspection consists of a quick inspection of the exterior of the system unit, the monitor, the keyboard, any peripherals, and cables. While performing the visual inspection, make any necessary corrections. To perform the external visual inspection, follow these steps:

1. **Turn off the system unit, the monitor, and all peripherals.**

2. **Verify that all power cables are properly connected to the system unit, the monitor and peripherals, and their power sources.**

3. **Verify that the keyboard and mouse interface cables are firmly attached to the proper connectors on the back of the system unit.**

   For a PS/2-compatible mouse, the keyboard and mouse interface cable connectors are identical except for their labels. If needed, see "System Features" in Chapter 1.

   For a serial mouse, the mouse interface cable must be firmly attached to one of the serial port connectors, and its captive screws must be secure enough to ensure a firm connection.

4. **Verify that any devices connected to the serial ports, parallel port, and USB are properly attached.**

   Each of the serial, parallel, and USB interface cables must be firmly attached to an appropriate connector on the back of the system unit as well as to the interface connector on the device. The captive screws that secure these connectors at each end of the interface cable must be secure enough to ensure a firm connection.

5. **Verify that the video interface cable is firmly attached to the connector on the video expansion card and to the connector on the back of the monitor.**

   For proper connection of the video monitor, see the documentation for the monitor.

6. **Inspect all external monitor controls for any obvious damage or improper settings.**

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

7. **Inspect the keyboard to ensure that no keys are sticking.**

   If one or more keys are sticking, it may be necessary to replace the keyboard.

8. **Inspect the exterior of the system unit, including all controls and indicators, and all user-accessible data storage devices for any signs of physical damage.**

   Does the inspection reveal any problems?

   Yes. Proceed to the appropriate procedure in Chapter 4, "Removing and Replacing Parts."

   No. Proceed to the next section, "Observing the Boot Routine."

Observing the Boot Routine

After you have performed an external visual inspection as described in the previous section, you should boot the system and, while the boot routine is running, observe the system for any indications of problems.

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

To observe problem indications during the boot routine, follow these steps:

1. **Insert the diagnostics diskette into drive A. Turn on all peripherals and the system unit. If the system unit is already on, press the reset button or <Ctrl><Alt><Del> to reboot the system.**

2. **Check the power supply fan.**

   Does the fan run normally?

   Yes. Proceed to step 3.

   No. Troubleshoot the system power supply.

3. **Watch the Num Lock, Caps Lock, and Scroll Lock indicators on the upper-right corner of the keyboard. After all three indicators flash momentarily, the Num Lock indicator should light up and remain on.**

   Do these indicators flash on and off within approximately ten seconds after the boot routine starts?

   Yes. Proceed to step 4.

   No. Troubleshoot the system power supply. If the troubleshooting procedure indicates that the system power supply is operational, troubleshoot the memory.

4. **During the boot routine, observe the system unit for any of the following:**

   • *Diskette-drive and hard-disk drive access indicators*: These indicators light up in response to data being transferred to or from the drives. If either of these indicators fails to light up during the boot routine, troubleshoot the diskette drive or hard-disk drive subsystem, as appropriate.

- *System error messages:* These messages can indicate problems or provide status information. If a system error message is displayed, see Table 3-2.

- *Beep codes:* A beep code is a series of beeps that indicates an error condition. If the system emits a beep code, see Table 3-1.

  NOTE: The system beeps once during the boot routine. This single beep is normal and is not a beep code.

5. **Observe the monitor screen for the Diagnostics Menu.**

   Does the Diagnostics Menu appear?

   Yes. See "Running the Diskette-Based Diagnostics" found later in this chapter.

   No. Proceed to step 6.

6. **Insert another copy of the diagnostics diskette into the diskette drive, and reboot the system.**

   Does the Diagnostics Menu appear?

   Yes. See "Running the Diskette-Based Diagnostics" found later in this chapter.

   No. Proceed to the next section, "Internal Visual Inspection."

Internal Visual Inspection

> **CAUTION: Before you proceed with the internal visual inspection described in this section, ensure that the user has saved all open files and exited all open application programs if possible.**

A simple visual inspection of a system unit's interior hardware can often lead to the source of a problem, such as a loose expansion card, cable connector, or mounting screw. When you perform the visual inspection, refer to "System Features" in Chapter 1 to locate components in the inspection procedure.

To perform the internal visual inspection, follow these steps:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources.**

2. **Remove the system unit cover.**

3. **Verify that all chips, DIMMs, and expansion cards, are fully seated in their sockets or connectors.**

   > **WARNING: The microprocessor can get extremely hot. Be sure the chip has had sufficient time to cool before you touch it.**

   To ensure that the chips are fully seated in their sockets, press firmly on the top of each chip.

To reseat the microprocessor, remove it from its socket and reinstall it as described in "Microprocessor/Heat Sink Assembly" in Chapter 4.

To reseat a DIMM, remove it from its socket and reinstall it as described in "DIMMs" in Chapter 4.

If you need to reseat an expansion card, use a 1/4-inch nut driver to remove the screw that secures the card-mounting bracket. Grasp the card by its top corners, and carefully pull it out of its connector. Reinsert the card in its connector, and carefully push it in until it is fully seated. Then reinstall the card-mounting bracket's retaining screw.

4. **Verify that all jumpers are set correctly.**

For information about these jumpers, see "System Board Jumpers" in Chapter 1.

5. **Check all cable connectors inside the system unit to verify that they are firmly attached to their appropriate connectors.**

6. **Reinstall the system unit cover.**

7. **Reconnect the system unit and any attached peripherals to their power sources, and turn them on.**

Does the problem appear to be resolved?

Yes. No further steps are necessary. Terminate the procedure.

No. Proceed to "Eliminating Resource Conflicts," "Running the Diskette-Based Diagnostics," and to "Getting Help" found later in this chapter.

Eliminating Resource Conflicts

Devices within the system unit may require dedicated memory spaces, interrupt levels, or DMA channels, all of which must be allocated during installation of the devices. Because a device may be installed at a different time, it is possible that the same resource is assigned to two or more devices.

Resource conflicts can result in disorderly or erratic system operation or failure of the system to operate at all. If you suspect that resource conflicts might exist, check the system and reassign the resources as necessary.

Running the Diskette-Based Diagnostics

The diskette-based diagnostics (included with the system) contains tests that aid in troubleshooting all major components of the computer system.

> **CAUTION: To prevent damage to the original diagnostics diskette, always use a backup copy of the diagnostics diskette when servicing a user's system. Dell recommends that users make several copies of this diskette to ensure that one is always available.**

To start the diagnostics, turn off the system unit, insert a diagnostics diskette into drive A, and then turn on the system unit.

Starting the diagnostics causes the Dell logo screen to appear on the monitor screen, followed by a message indicating that the diagnostics is loading. Before the diagnostics loads, a program tests the portion of main memory (RAM) required for loading the diagnostics. If a RAM error is detected, a message appears on the screen telling you which DIMM has failed.

If no errors are found in RAM, the diagnostics loads and the Diagnostics Menu appears. This menu lets you choose the following options or exit to the MS-DOS prompt:

- **Run Quick Tests** — Runs selected tests from all test groups to quickly locate a failure or to indicate where further testing is needed to isolate a failure

- **Run All Tests** — Runs all tests for a thorough test of the system

- **Run Specific Tests** — Tests a particular area or subsystem

Getting Help

If none of the troubleshooting procedures in this chapter or the tests in the diskette-based diagnostics reveals the source of the problem or leads to the proper troubleshooting steps for determining the source of the problem, call Dell for technical assistance. For instructions, see the chapter titled "Getting Help" in the *Diagnostics and Troubleshooting Guide*.

Chapter 3
Beep Codes and Error Messages

*T*his chapter describes beep codes and system error messages that can occur during system start-up or, in the case of some failures, during normal system operation. The tables in this chapter list faults that can cause a beep code or system error message to occur and the probable causes of the fault in each case.

If a faulty system does not emit beep codes or display system error messages to indicate a failure, you should use the diskette-based diagnostics to run the appropriate tests to help isolate the source of the problem. See "Running the Diskette-Based Diagnostics" in Chapter 2.

*P*OST *Beep Codes*

If the monitor cannot display error messages during the POST, the system may emit a series of beeps that identifies the problem or that can help you identify a faulty component or assembly. Table 3-1 lists the beep codes that may be generated during the POST. Most beep codes indicate a fatal error that prevents the system from completing the boot routine until the indicated condition is corrected.

When the system emits a beep code, record the code and then find it in Table 3-1. If the table does not lead to the source of the problem, run the appropriate tests in the diskette-based diagnostics to assist in troubleshooting the problem.

Table 3-1. POST Beep Codes

Beep Code	Error	Probable Causes
1-3	Monitor not detected	Disconnected or faulty monitor
1-1-3	NVRAM write/read failure	Defective system board
1-1-4	BIOS checksum failure	Faulty BIOS or defective system board
1-2-1	Programmable interval-timer failure	Defective system board
1-2-2	DMA initialization failure	
1-2-3	DMA page register write/ read failure	

Table 3-1. POST Beep Codes (continued)

Beep Code	Error	Probable Causes
1-3-1	Main-memory refresh verification failure	Faulty or improperly seated DIMMs or defective system board
1-3-3	Chip or data line failure in the first 64 KB of main memory	Faulty or improperly seated DIMMs
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	
2-1-1 through 2-4-4	Bit failure in the first 64 KB of main memory	
3-1-1	Slave DMA-register failure	Defective 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	
3-2-4	Keyboard-controller test failure	Faulty keyboard controller (defective system board)
3-3-4	Screen initialization failure	Faulty video subsystem (defective video expansion card)
3-4-1	Screen-retrace test failure	
3-4-2	Search for video ROM failure	
4-2-1	No timer tick	Defective system board
4-2-2	Shutdown failure	
4-2-3	Gate A20 failure	
4-2-4	Unexpected interrupt in protected mode	
4-3-1	Memory failure above address 0FFFFh	Faulty or improperly seated DIMMs

Table 3-1. POST Beep Codes (continued)

Beep Code	Error	Probable Causes
4-3-3	Timer-chip counter 2 failure	Defective system board
4-3-4	Time-of-day clock stopped	Bad battery or defective system board
4-4-1	Serial/parallel port test failure	Faulty I/O chip (defective system board)

System Error Messages

Table 3-2 lists (in alphabetical order) system error messages that can appear on the monitor screen. These messages can help you find the source of a problem. Some of these error messages indicate fatal errors. When a fatal error occurs, the system usually cannot be rebooted until an appropriate hardware change has been made. The following messages indicate a fatal error:

- `Bad error-correction code (ECC) on disk read`
- `Controller has failed`
- `Data error`
- `Gate A20 failure`
- `Hard disk controller failure`
- `Hard disk drive read failure`
- `Hard disk failure`
- `Incompatible Processor: CPU0 is B0 step or below`
- `Incompatible Processor: CPU1 is B0 step or below`
- `Incompatible Processors: Cache sizes different`
- `Keyboard clock line failure`
- `Keyboard controller failure`
- `Keyboard data line failure`
- `Keyboard stuck key failure`
- `No timer tick interrupt`
- `Shutdown failure`
- `Terminator/processor card not installed! System HALTED!`
- `Timer chip counter 2 failed`
- `Unexpected interrupt in protected mode`

Table 3-2. System Error Messages

Message	Definition	Probable Causes
Address mark not found	BIOS found faulty disk sector or could not find particular disk sector.	Faulty diskette/tape drive subsystem or hard-disk drive subsystem (defective system board). Faulty interface cable or connector.
Attachment failed to respond	Diskette drive or hard-disk drive controller cannot send data to associated drive.	
Bad command or file name	Command entered does not exist or is not in pathname specified.	Bad command.
Bad error-correction code(ECC) on disk read	Diskette drive or hard-disk drive controller detected uncorrectable read error.	Faulty diskette/tape drive subsystem or hard-disk drive subsystem (defective system board).
Controller has failed	Hard-disk drive or associated controller defective.	
Data error	System received un-recoverable data-read error from diskette or hard-disk drive.	Faulty diskette, diskette drive, or hard-disk drive.
Decreasing available mem-ory	Read/write failure during POST prevents system from using available memory.	One or more DIMMs faulty or improperly seated.
Diskette drive 0 seek failure	Diskette/tape drive controller could not locate specific sector or track.	Faulty or improperly inserted diskette, incorrect settings in System Setup program, loose diskette/tape drive interface cable, or loose power cable.
Diskette drive 1 seek failure		
Diskette read failure	Failure occurred while system attempted to read diskette.	Faulty diskette, faulty or improperly connected diskette/tape drive interface cable, or loose power cable.

Table 3-2. System Error Messages (continued)

Message	Definition	Probable Causes

`Diskette sub-`
`system reset`
`failed`
	System could not suc-cessfully issue reset command to diskette controller.	Faulty diskette/tape drive controller (defective sys-tem board).

`Diskette`
`write pro-`
`tected`
	Diskette write-protect feature activated.	Diskette write-protected.

`Drive not` `ready`	Diskette missing from or improperly inserted in diskette drive.	Missing, defective, unfor-matted, or improperly inserted diskette.
`Gate A20 fail-` `ure`	Gate A20 of the keyboard controller malfunctioned.	Faulty keyboard control-ler (defective system board).
`General fail-` `ure`	Operating system can-not execute command.	Operating system cor-rupted or not installed properly.

`Hard disk`
`controller`
`failure`
 	
`Hard disk`
`drive read`
`failure`
 	
`Hard disk`
`failure`
	Hard-disk drive failed to initialize.	Incorrect configuration settings in System Setup program, improperly con-nected hard-disk drive cable, faulty hard-disk controller subsystem (defective system board), or loose power cable.

`Incompatible`
`Processor:`
`CPU0 is B0`
`step or below`
 	
`Incompatible`
`Processor:`
`CPU1 is B0`
`step or below`
	Unsupported version of microprocessor installed on system board.	Unsupported micro-processor installed.

`Incompatible`
`Processors:`
`Cache sizes`
`different`
	In a dual-processor system both micro-processors do not have the same level-2 cache.	Microprocessors do not have the same level-2 cache.

Table 3-2. System Error Messages (continued)

Message	Definition	Probable Causes

`Invalid con-`
`figuration`
`information -`
`please run`
`SETUP program`
	System Setup program contains incorrect system configuration settings.	Incorrect configuration settings in System Setup program or faulty battery.

`Keyboard`
`clock line`
`failure`
 	
`Keyboard fail-`
`ure`
 	
`Keyboard data`
`line failure`
 	
`Keyboard`
`stuck key`
`failure`
	System cannot communicate with keyboard.	Keyboard cable connector loose or improperly connected, defective keyboard, or defective keyboard/mouse controller (defective system board).

`Keyboard con-`
`troller`
`failure`
	Keyboard/mouse controller failed.	Defective keyboard/ mouse controller (defective system board).

Table 3-2. System Error Messages (continued)

Message	Definition	Probable Causes
`Memory address line failure at `*`address`*`, read `*`value`*` expecting `*`value`*	During memory test, value read at *address* was incorrect.	Faulty or improperly seated DIMMs or defective system board.
`Memory data line failure at `*`address`*`, read `*`value`*` expecting `*`value`*		
`Memory double word logic failure at `*`address`*`, read `*`value`*` expecting `*`value`*		
`Memory odd/ even logic failure at `*`address`*`, read `*`value`*` expecting `*`value`*		
`Memory write/ read failure at `*`address`*`, read `*`value`*` expecting `*`value`*		
`Memory allocation error`	Software in use conflicts with operating system, application program, or utility.	Faulty application program or utility.
`Memory tests terminated by keystroke`	Memory test did not complete.	POST memory test terminated by pressing <Spacebar>.
`"Network card is not present in the system"`	System does not detect NIC.	Incorrect NIC drivers installed.

Table 3-2. System Error Messages (continued)

Message	Definition	Probable Causes
No boot device available	System does not recognize diskette drive or hard-disk drive from which it is trying to boot.	Faulty diskette, diskette/tape drive subsystem, hard-disk drive, hard-disk drive subsystem, or no boot disk in drive A.
No boot sector on hard-disk drive	Configuration settings in System Setup program incorrect, or operating system corrupted.	Incorrect configuration settings in System Setup program, or no operating system on hard-disk drive.
No timer tick interrupt	Timer on system board malfunctioning.	Defective system board.
Non-system disk or disk error	Diskette in drive A or hard-disk drive does not have bootable operating system installed on it.	Faulty diskette, diskette/tape drive subsystem, or hard-disk drive subsystem.
Not a boot diskette	No operating system on diskette.	No operating system on diskette.
Plug and Play Configuration Error	System encountered problem in trying to configure one or more expansion cards.	System resource conflict.
Read fault	MS-DOS cannot read from diskette or hard-disk drive.	Faulty diskette, diskette/tape drive subsystem, or hard-disk drive subsystem (defective system board).
Requested sector not found	System could not find particular sector on disk, or requested sector defective.	
Reset failed	Disk reset operation failed.	Improperly connected diskette/tape drive, hard-disk drive interface cable, or power cable.

Table 3-2. *System Error Messages* (continued)

Message	Definition	Probable Causes
Sector not found	MS-DOS unable to locate sector on diskette or hard-disk drive.	Defective sectors on diskette or hard-disk drive.
Seek error	MS-DOS unable to locate specific track on diskette or hard-disk drive.	Defective diskette or hard-disk drive.
Seek opera-tion failed	System could not find particular address mark on disk.	Faulty diskette or hard-disk drive.
Shutdown fail-ure	System board chip faulty.	Defective system board.
Terminator/ processor card not installed! System HALTED!	System does not have terminator or add-in card.	Terminator or add-in card improperly installed, or no card installed.
Time-of-day clock stopped	Backup battery low.	Defective battery or faulty chip (defective system board).
Time-of-day not set	Time or Date settings in System Setup program incorrect, or backup battery bad.	Incorrect Time or Date settings, or defective backup battery.
Timer chip counter 2 failed	Timer circuit on system board malfunctioning.	Defective system board.
Unexpected interrupt in protected mode	Keyboard/mouse controller malfunctioning, or one or more DIMMs improperly seated.	Improperly seated DIMMs or faulty keyboard/mouse controller chip (defective system board).
Warning-Thermal probes failed	At system start-up, BIOS detected that one or both thermal probes are nonoperational.	Defective system board.

Table 3-2. System Error Messages (continued)

Message	Definition	Probable Causes
`Warning-Temperature is too high`	At system start-up, BIOS detected that one or both micro-processors have overheated.	One or both micro-processors are too hot.

`Write fault`
 	
`Write fault on selected drive`
	MS-DOS cannot write to diskette or hard-disk drive.	Faulty diskette or hard-disk drive.

Chapter 4
Removing and Replacing Parts

*T*his chapter provides procedures for removing the components, assemblies, and subassemblies in the system unit. Unless otherwise noted, each procedure assumes the following:

- You have performed the steps in "Precautionary Measures" found later in this chapter.

- You have removed the system unit cover.

- You can replace or reinstall a part by performing the removal procedure in reverse order unless additional information is provided.

Recommended Tools

Most of the procedures in this chapter require the use of one or more of the following tools:

- Small flat-blade screwdriver

- Wide flat-blade screwdriver

- Number 1 and number 2 Phillips-head screwdrivers

- Chip-removal tool

- 1/4-inch nutdriver

- Tweezers or long-nose pliers

Also, use a wrist grounding strap as explained in the next section, "Precautionary Measures."

*P*recautionary Measures

Before you perform any of the procedures in this chapter, take a few moments to read the following warning for your personal safety and to prevent damage to the computer system from ESD.

**WARNING FOR YOUR PERSONAL SAFETY
AND PROTECTION OF THE EQUIPMENT:**

Before you start to work on the computer, perform the following steps in the sequence indicated.

1. **Turn off the system unit and any attached peripherals.**

2. **Disconnect the system unit and any attached peripherals from their power sources to reduce the potential for personal injury or shock.**

3. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as the system power supply's fan guard, on the chassis.**

   If a wrist grounding strap is not available, touch the fan guard or some other unpainted metal surface on the back of the system unit to discharge any static charge from your body.

Floor Stand
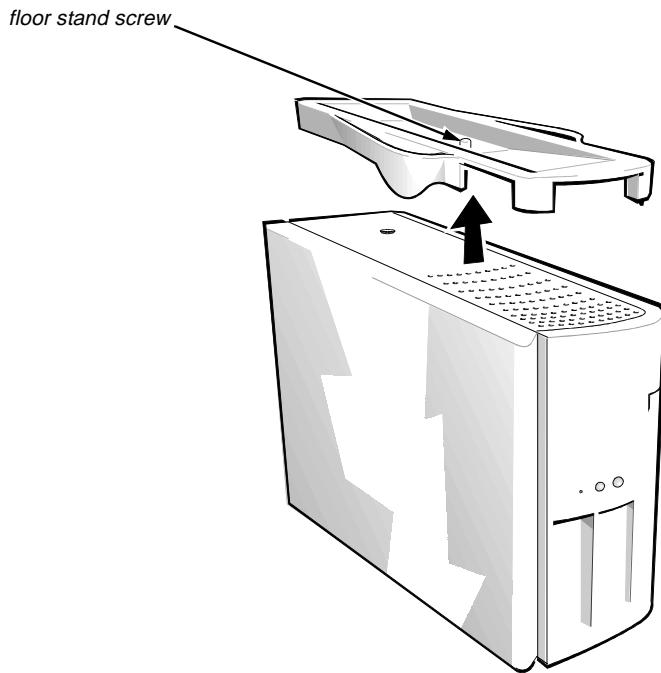
floor stand screw

Figure 4-1. Floor Stand Removal

To remove the floor stand, follow these steps:

1. **Place left side of the system unit on a flat work surface.**

2. **Unscrew the floor stand screw.**

   Use your fingers or a wide flat-blade screwdriver to unscrew the floor stand screw. The screw is captured and separated from the floor stand.

3. **Pull the floor stand away from the system unit.**

   Disengage the three orientation nubs that position and help hold the floor stand to the system unit.

*S*ystem Unit Cover

securing
button

front of system unit
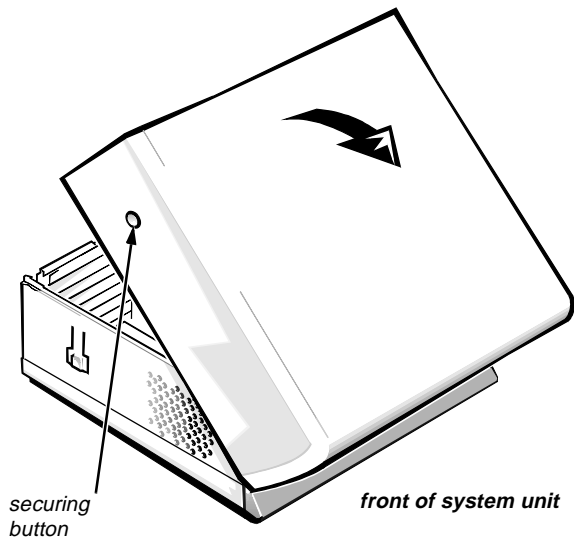
Figure 4-2. System-Unit Cover Removal

To remove the system unit cover, follow these steps:

1. **Remove the padlock if one is installed.**
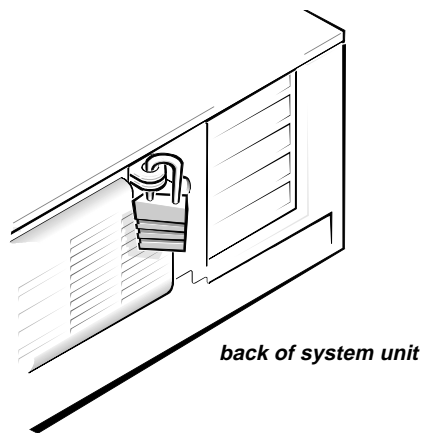
back of system unit

Figure 4-3. Padlock Removal

2. **Press in the two securing buttons until the cover is free to swing up.**

3. **Lift the cover, from the back, pivoting it toward the front of the system unit.**

    Four plastic hooks on the inside of the front part of the cover secure it to the chassis.

    Before you *reinstall* the cover, fold all cables out of the way so that they do not interfere with the cover or with the proper airflow inside the system unit.

*E*ject, Power, and Reset Buttons

system unit cover
(upside down)

reset button

power button

eject button

3.5-inch front-
panel insert
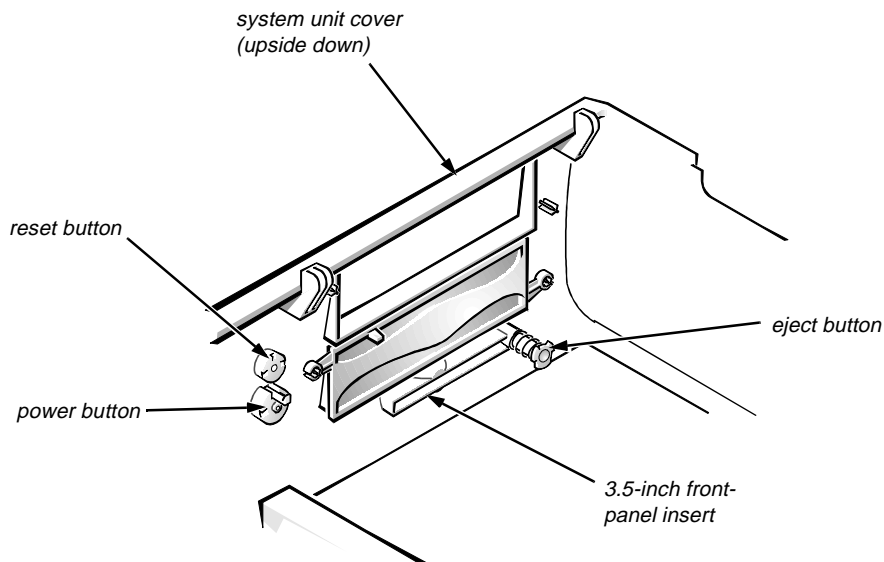
Figure 4-4. Eject, Power, and Reset Button Removal

To remove the eject, power, and reset buttons, follow these steps:

1. **Lay the system unit cover upside down on a flat work surface, with the back of the cover facing you.**

2. **To remove the 3.5-inch diskette-drive eject button, pull gently on the plastic part of the button until it comes free.**

3. **To remove the power button or the reset button, use a small screw-driver and push in on the two or three plastic clips that hold the button to the system unit cover. When these clips are released, the button comes free from the front panel of the cover.**

*F*ront-Panel Inserts

system unit cover
(upside down)

post (2)

ring-tab (2)

5.25-inch front-
panel insert
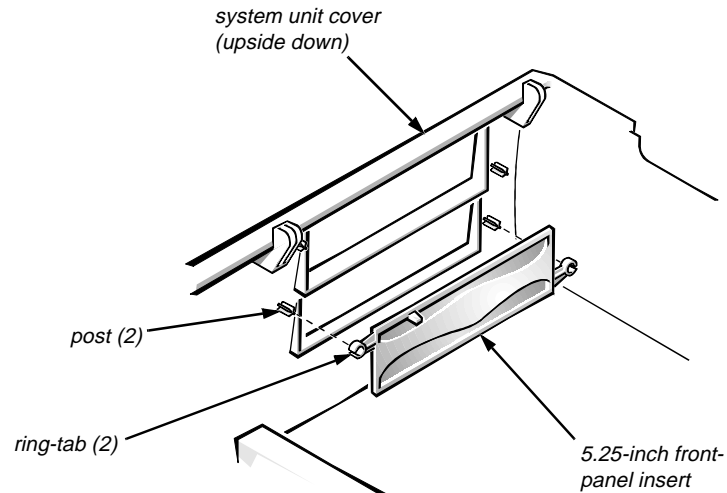
Figure 4-5. Front-Panel Insert Removal

To remove a front-panel insert, follow these steps:

1. **Lay the system unit cover upside down on a flat work surface, with the back of the cover facing you.**

2. **For a 5.25-inch bay, pull the insert from the two retaining posts until the ring-tabs are released (see Figure 4-5).**

    For the 3.5-inch bay, locate the spring-loaded back end of the eject button mechanism. Press the mechanism toward the front panel to snap the plastic insert out of its opening (see Figure 4-4).

To replace a front-panel insert for a 5.25-inch bay, position the insert over the drive bay opening. Place the panel over the retaining posts, and then press hard to get the ring-tabs over the posts. If necessary, use a 1/4-inch nutdriver to help push the ring-tabs.

To replace the front-panel insert for the 3.5-inch bay, from outside the cover, place the insert in position and press it into the opening.

*I*ndicator Card

Figure labels: chassis hook (2), indicator card, screw, speaker connector, indicator card cable
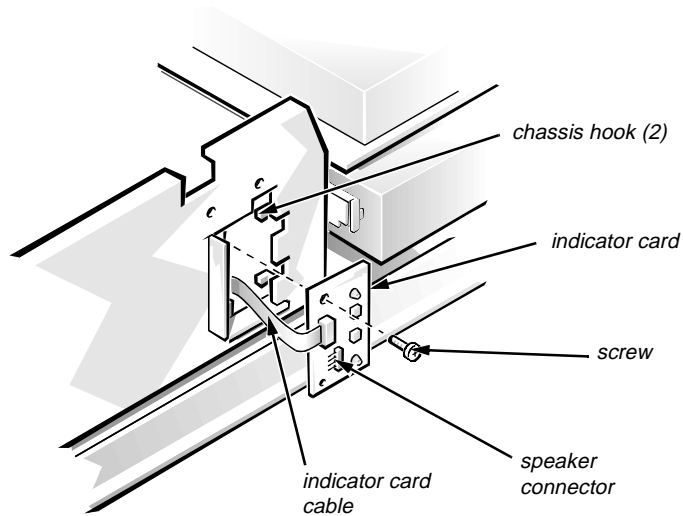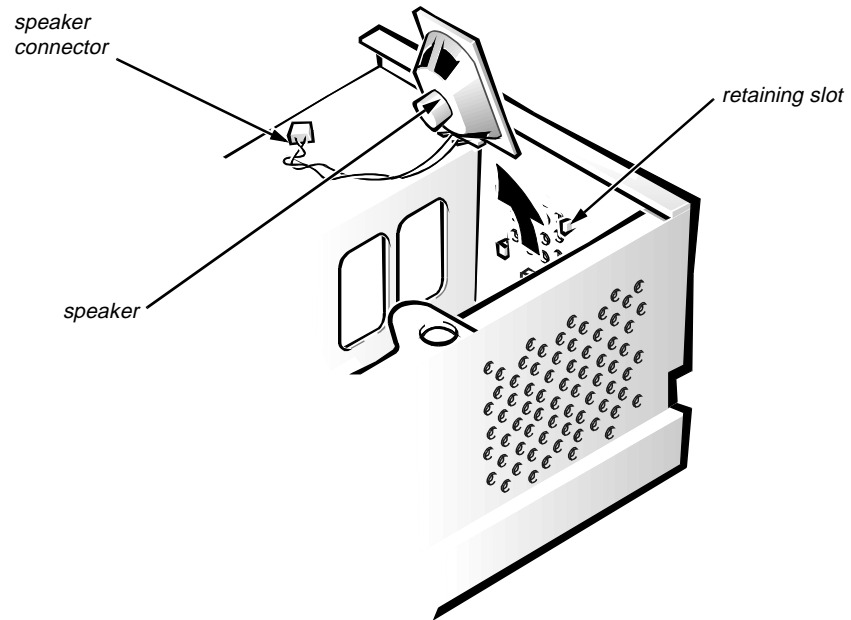
Figure 4-6. Indicator Card Removal

To remove the indicator card, follow these steps:

1. **Remove the hard-disk drive bracket.**

   See "Drives" found later in this chapter.

2. **Remove the speaker connector from the indicator card.**

3. **Disconnect the indicator cable from the system board.**

   Slide the indicator cable through the cable slot in the bottom of the chassis.

4. **Remove the mounting screw holding the indicator card to the chassis.**

5. **Rotate the card to the left, and lift it out of the hooks holding it to the chassis.**

Speaker

Figure 4-7. Speaker Removal

To remove the speaker, follow these steps:

1. **Remove the hard-disk drive bracket.**

   See "Drives" found later in this chapter.

2. **Remove the speaker connector from the indicator card.**

3. **Lift the speaker out of the retaining slots on the front of the chassis.**

Drives

Figure 4-8 shows an example of drive hardware that can be installed in the system unit. Refer to this figure when you perform any of the procedures in the following subsections.
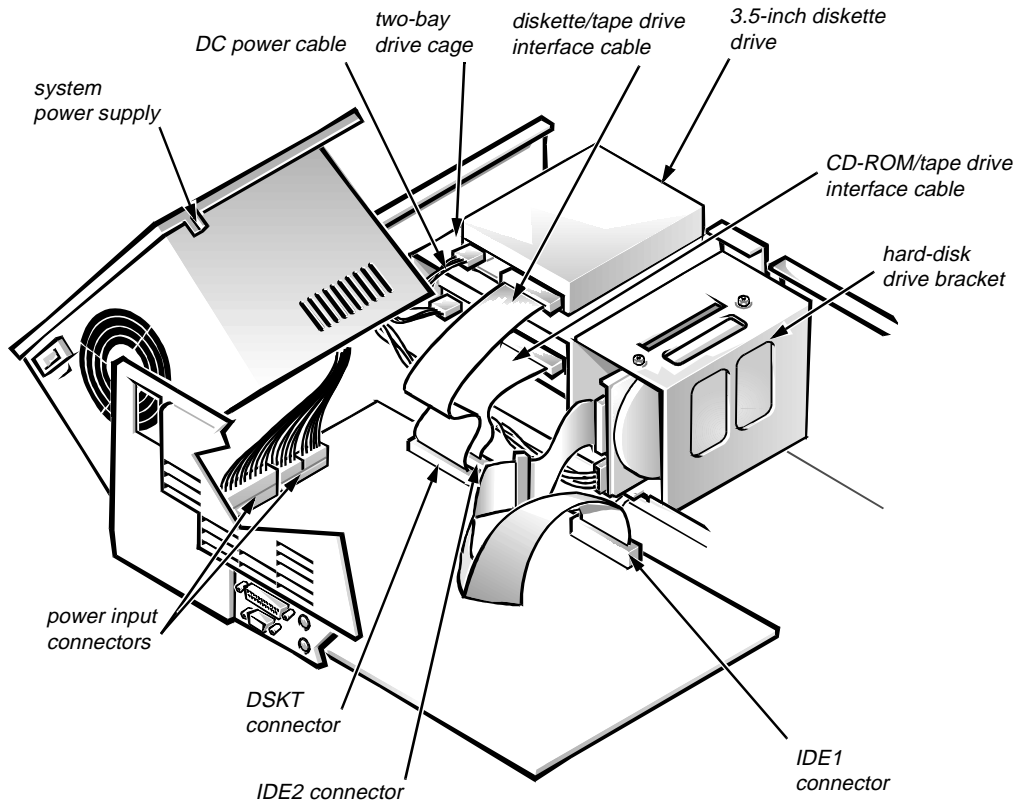
Figure 4-8. Drive Hardware

Drives in the Drive Cage

retaining screw

bracket mounting screw (2)

hook (2)

bracket catch
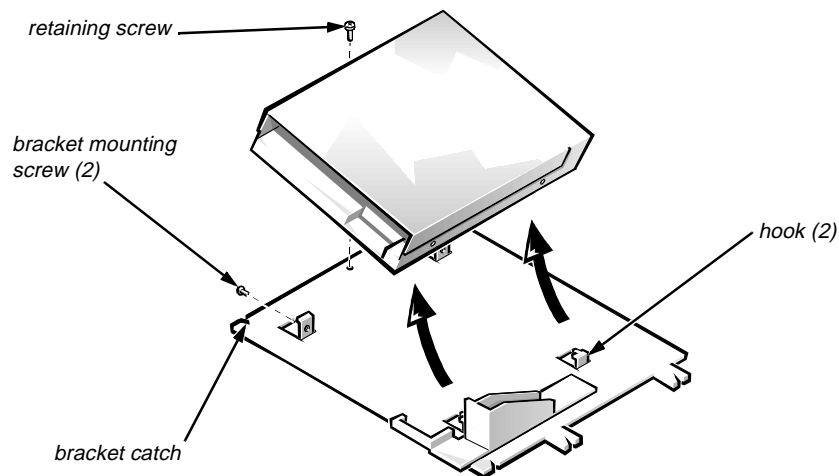
Figure 4-9. 3.5-Inch Diskette Drive Removal

To remove a drive from the 3.5-inch diskette drive bay, follow these steps:

1. **Disconnect the DC power cable and the interface cable from the back of the drive.**

2. **Remove the bracket retaining screw.**

3. **Release the bracket catch from the chassis.**

    Rotate the drive bracket to the right, and lift the bracket from the top of the drive bay.

4. **Remove the two mounting screws from each side of the drive and remove the drive from the bracket.**

To replace a 3.5-inch diskette drive, locate the two hooks on the right side of the bracket that hold the drive in position. Engage those two hooks in the side of the drive.
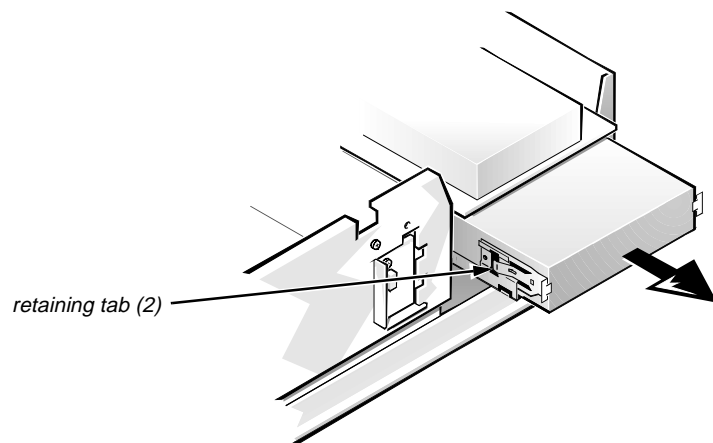
retaining tab (2)

Figure 4-10. 5.25-Inch Drive Removal

To remove a 5.25-inch drive from the middle or lower drive bay, follow these steps:

1. **Disconnect the DC power cable and the interface cable from the back of the drive.**

2. **Press out on the two retaining tabs on the sides of the drive bay, slide the drive forward, and remove it from the drive bay.**
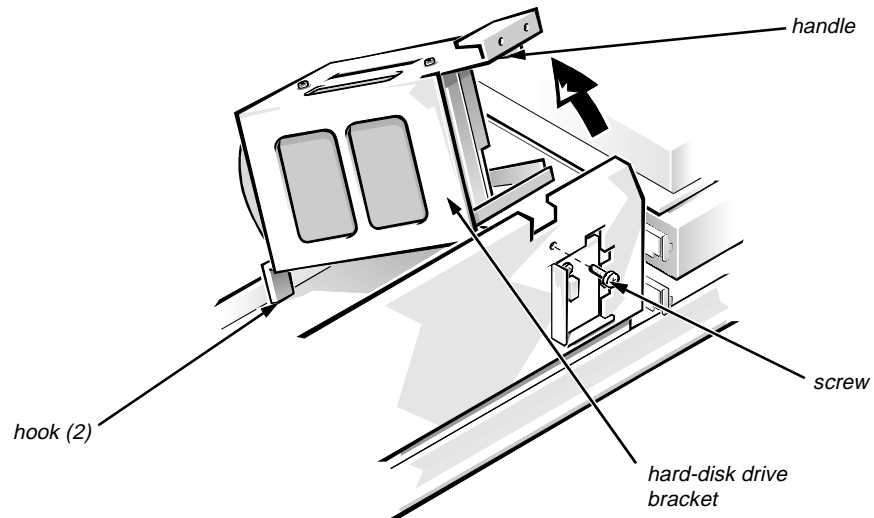
Hard-Disk Drives

Figure 4-11. Hard-Disk Drive Bracket Removal

To remove a hard-disk drive bracket, follow these steps:

1. **Disconnect the DC power cable(s) and the interface cable(s) from the back of the drive(s).**

2. **Remove the screw that secures the hard-disk drive bracket to the chassis.**

3. **Grasp the handle on the front of the bracket, and rotate the bracket back until it swings free from the chassis.**

   Disengage the bracket from the two hooks on the bottom of the chassis support.

4. **Lift the hard-disk drive bracket out of the system unit.**
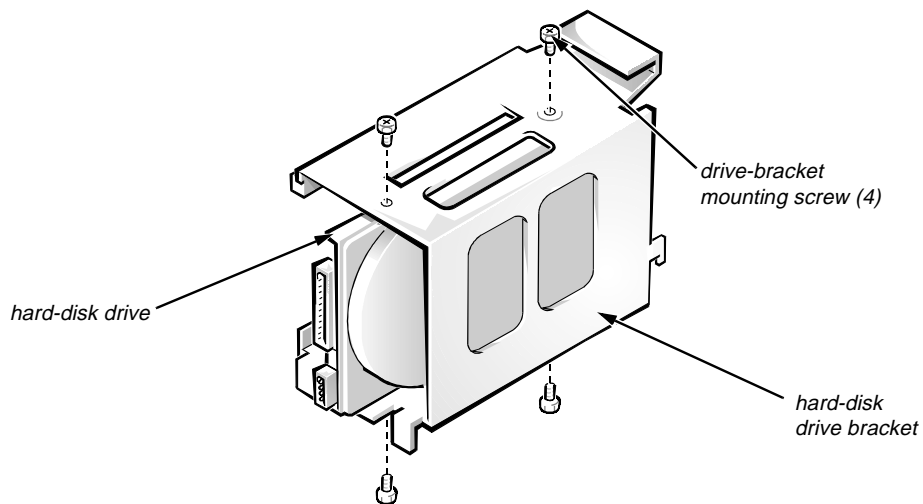
Figure 4-12. Hard-Disk Drive Removal

To remove a hard-disk drive, follow these steps:

1. Remove the hard-disk drive bracket from the system unit.

See the preceding procedure.

2. Remove the four screws that secure the hard-disk drive(s) to the bracket.

3. Slide the drive(s) out of the hard-disk drive bracket.
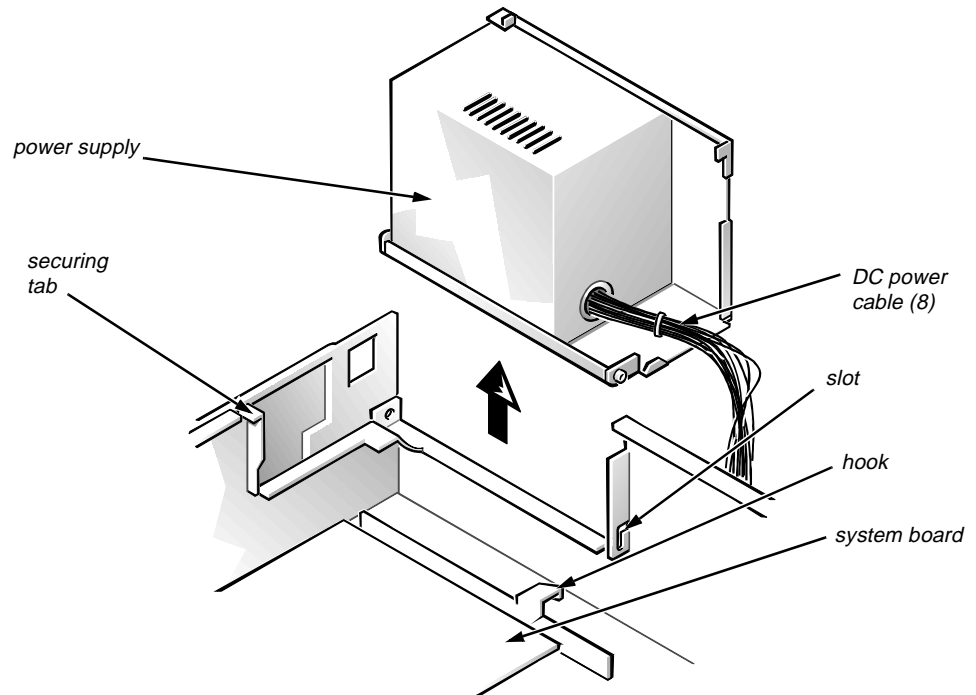
System Power Supply

Figure 4-13. Power Supply Removal

To remove the system power supply, follow these steps:

1. **Disconnect the AC power cable from the back of the power supply.**

2. **Disconnect the DC power cables from the system board, drives, and expansion cards.**

3. **Free the system power supply from the securing tab labeled "RELEASE —>," and rotate it to the right until it stops.**

   Press the securing tab to the left to disengage the power supply.

4. **Free the power cable bundle from the hook on the bottom of the chassis.**

5. **Lift the front end of the system power supply up, and move it to the right to disengage the power supply from the slot in the chassis.**

6. **Lift the system power supply from the system unit.**
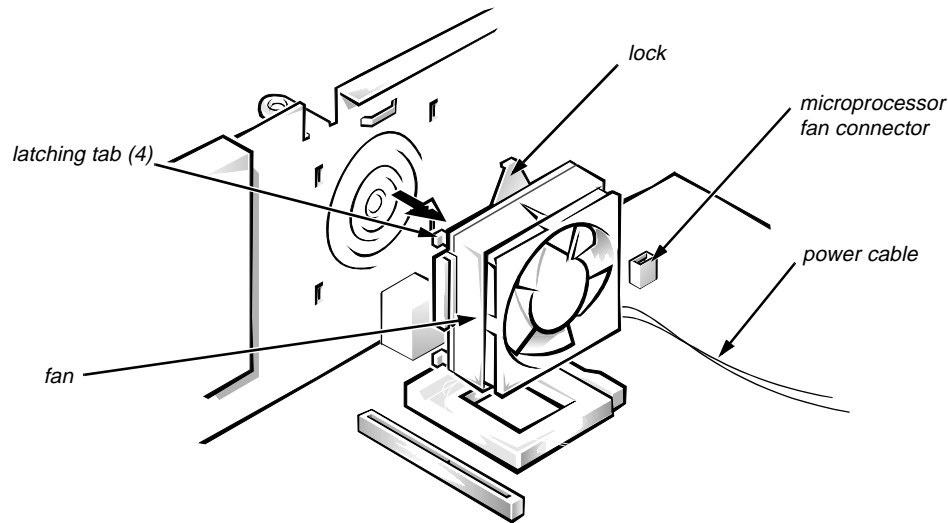
Microprocessor Fan

Figure 4-14. Microprocessor Fan Removal

To remove the system power supply, follow these steps:

1. **Rotate the power supply to the right to access the microprocessor fan connector.**

    See "*System Power Supply,*" found earlier in this chapter.

2. **Sqeeze the latch and pull out the fan power cable from the microprocessor fan connector located on the system board under the power supply.**

3. **Gently pull the plastic lock, and push down on the fan to disengage the four latching tabs holding the fan to the back of the chassis.**

4. **Remove the fan.**

    Pull the fan forward and out of the system unit.

System Board Components

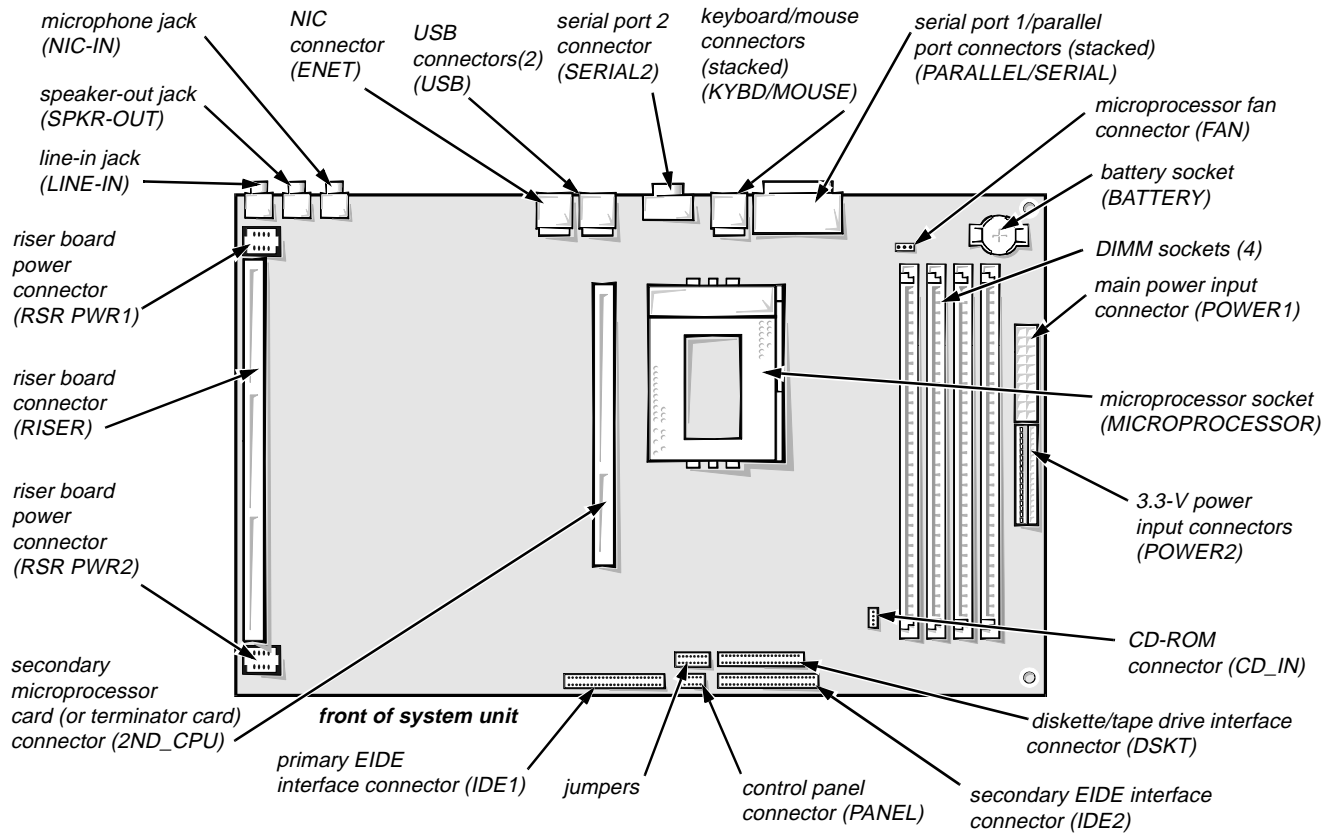The subsections that follow contain procedures for removing system board components.

Figure 4-15. System Board Components

Expansion Cards

The system unit has a removable expansion-card cage. The expansion cards fit into connectors on a riser board. Dell recommends that you remove the expansion-card cage first before removing or installing expansion cards.
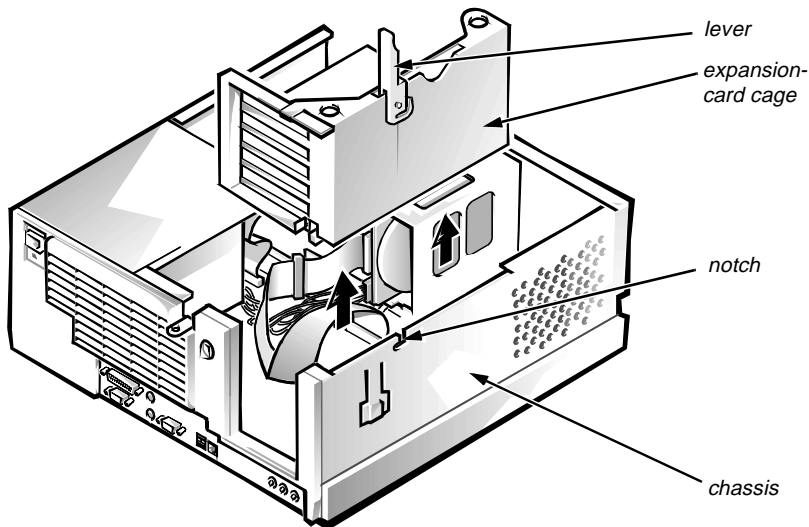
Expansion-Card Cage

lever

expansion-
card cage

notch

chassis

Figure 4-16. Expansion-Card Cage Removal

To remove an expansion-card cage, follow these steps:

1. **Disconnect any cables from the expansion cards and the riser board.**

2. **Rotate the lever toward the back of the system unit until it stops in the upright position.**

3. **Lift the expansion-card cage up and away from the system unit.**

To replace an expansion-card cage, keep the cage flush against the chassis to insure that the lever engages the notch when the lever is depressed.
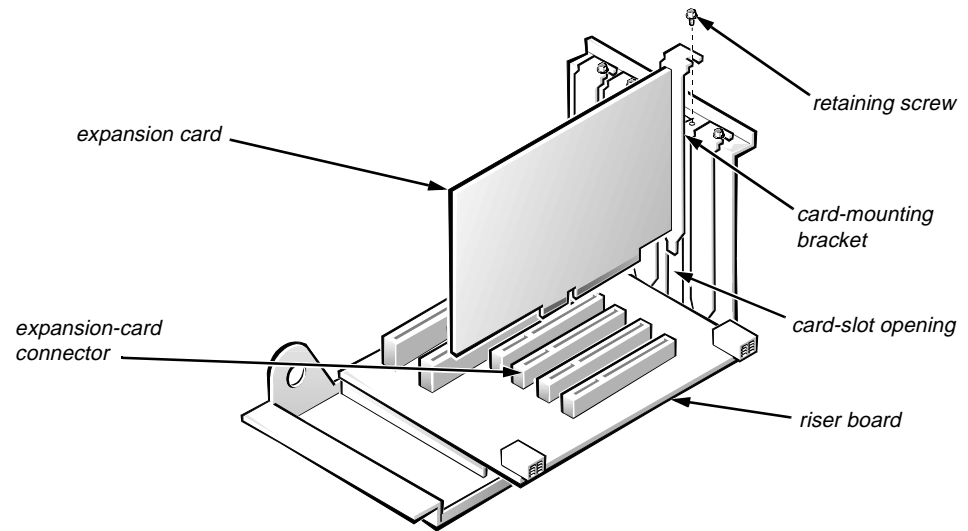
Expansion Card

Figure 4-17. Expansion-Card Removal

To remove an expansion card, follow these steps:

1. **Remove the expansion-card cage.**

   See the preceding procedure.

2. **Remove the retaining screw from the card-mounting bracket.**

3. **Grasp the expansion card by its corners, and carefully remove it from the expansion-card connector.**
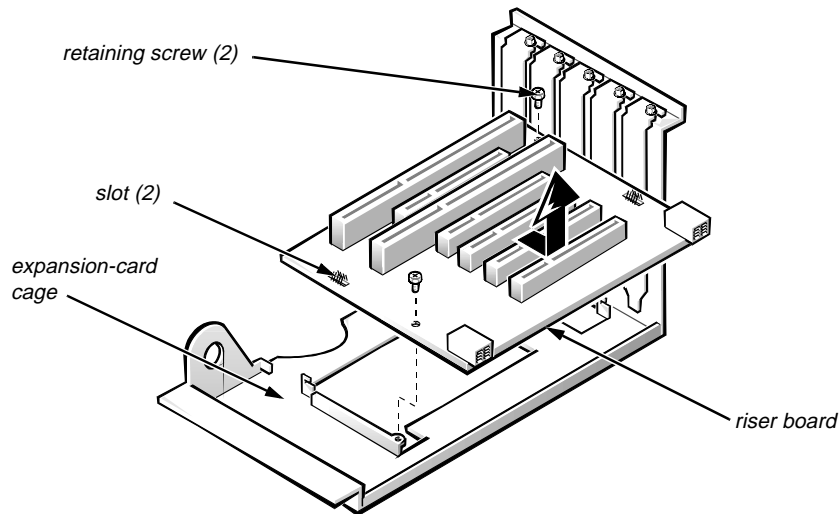
Riser Board

Figure 4-18. Riser Board Removal

To remove the riser board, follow these steps:

1. **Remove the expansion-card cage and all expansion cards.**

    See the preceding two procedures.

2. **On a flat work surface, turn the expansion-card cage over, with the riser board facing you.**

3. **Remove the riser-board retaining screws.**

4. **Slide the riser board down approximately one-half inch to release the board from the two slots on the expansion-card cage.**

5. **Lift the riser board away from the expansion-card cage.**
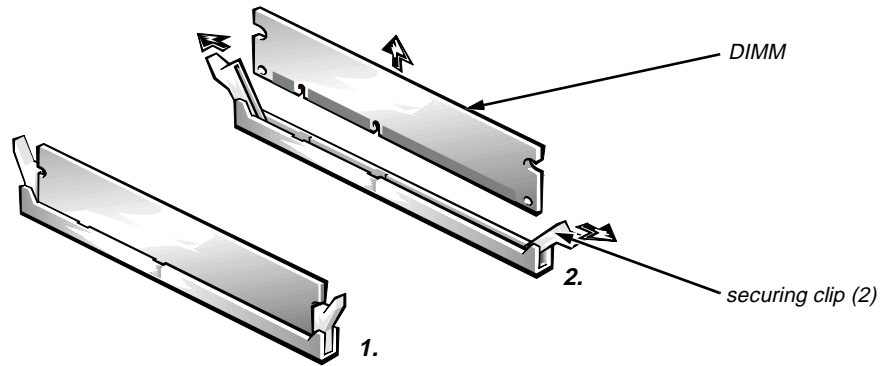
DIMMs

Figure 4-19. DIMM Removal

To remove a DIMM, push outward on the DIMM socket's securing clips until
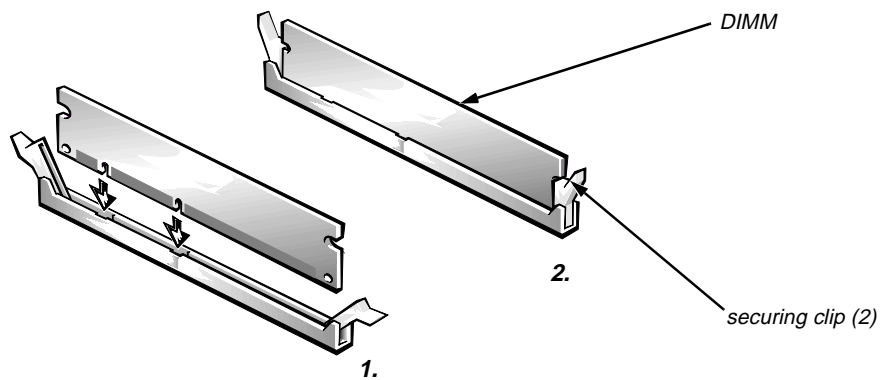the DIMM is released from its socket. Then lift the DIMM away from the
socket.

Figure 4-20. DIMM Installation

To replace a DIMM, press outward on the securing clips at each end of the
socket until they snap open. Orient the DIMM to the socket, and press the
DIMM straight down into the socket slot until the securing clips snap into place
around the ends of the DIMM.
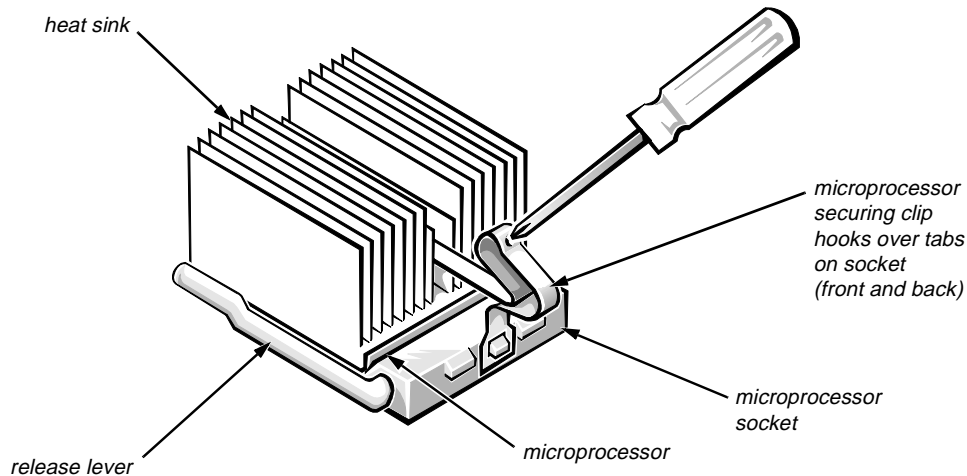
Microprocessor/Heat Sink Assembly

Figure 4-21. Microprocessor Securing Clip

To remove the microprocessor/heat sink assembly, follow these steps:

1. **Remove the microprocessor securing clip from the microprocessor/heat sink assembly.**

> **WARNING: The microprocessor chip can get extremely hot during system operations. Be sure the chip has had sufficient time to cool before touching it.**

   Press down on the folded part of the clip with a small screwdriver to release the clip.

2. **Push outward and then upward on the microprocessor release lever to rotate the lever to its fully vertical position.**

3. **Lift the microprocessor/heat sink assembly out of its socket (see Figure 4-22).**

To install the replacement microprocessor/heat sink assembly, ensure that the microprocessor release lever is in its fully vertical position to allow the microprocessor pins to easily slip into the socket. When the microprocessor/heat sink assembly is in place, rotate the microprocessor release lever to its horizontal position. Hook the microprocessor securing clip over the socket tab nearest the front of the system board, and then snap it over the tab on the back of the socket.

NOTE: Pin 1 on the microprocessor is located on the corner with the largest bevel. The pin-1 hole in the microprocessor socket is located on the corner where the holes are in a diagonal pattern.
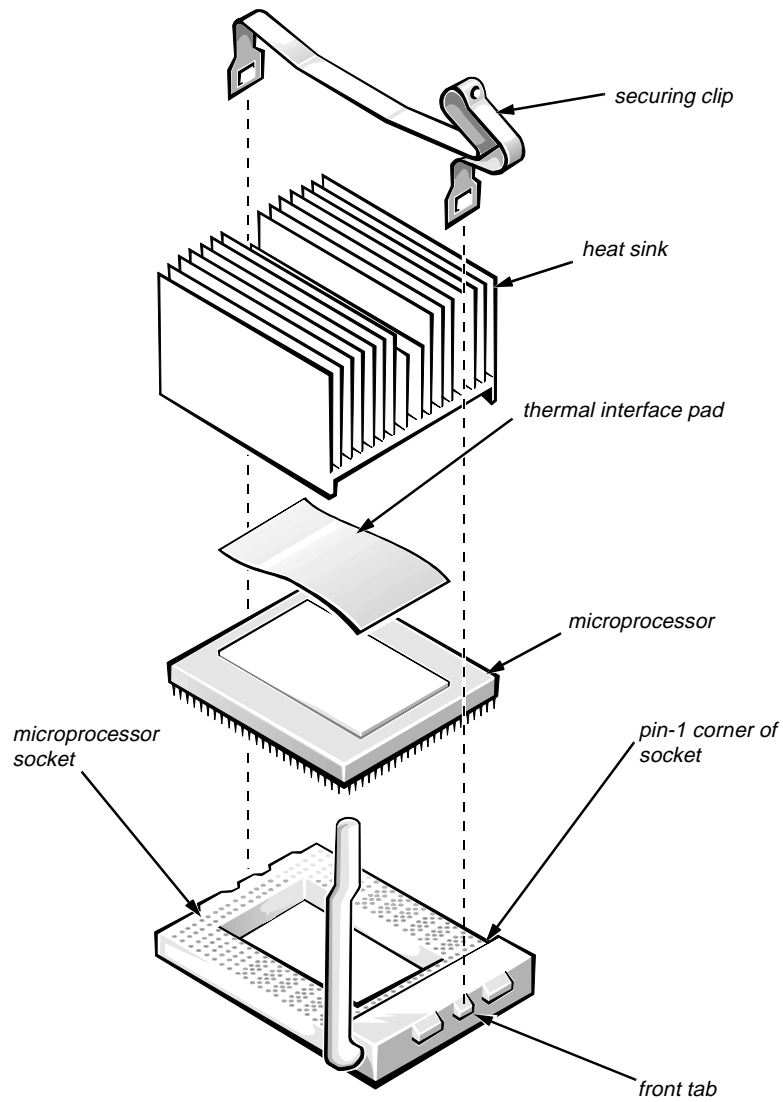
securing clip

heat sink

thermal interface pad

microprocessor

microprocessor
socket

pin-1 corner of
socket

front tab

Figure 4-22. Microprocessor Removal

If you are installing a new microprocessor/heat sink assembly, you need to
place the thermal interface pad that comes with the replacement microprocessor
between the microprocessor and the heat sink before reinstalling the securing
clip.

Terminator or Add-In Card

The system unit may have a terminator card or a secondary microprocessor (dual-processing systems) on an add-in card installed on the system board. This section describes removing and replacing the terminator card and the add-in card.
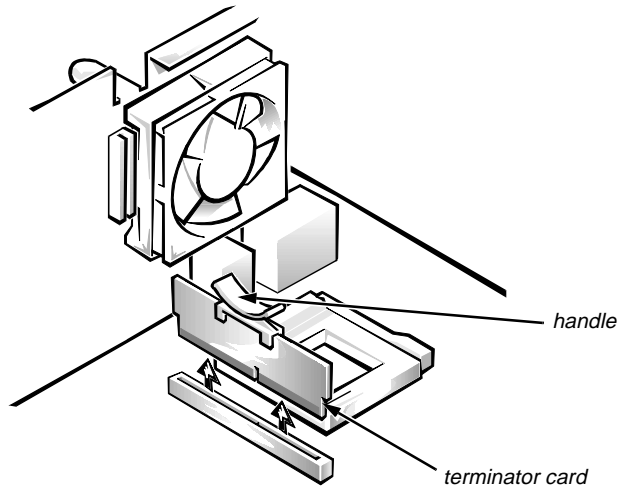
Terminator Card

Figure 4-23. Terminator Card Removal

To remove a terminator card, follow these steps:

1. **Grasp the small white "handle" installed on the top of the card.**

   If a handle is not installed, use the handle that is in the upgrade kit with the secondary microprocessor. Fit the handle over the top of the card so that the nubs of the handle fit through two holes in the top of the card.

2. **Pull straight up on the card to free it from the connector.**

Add-In Card

mounting-
bracket edge

card guide
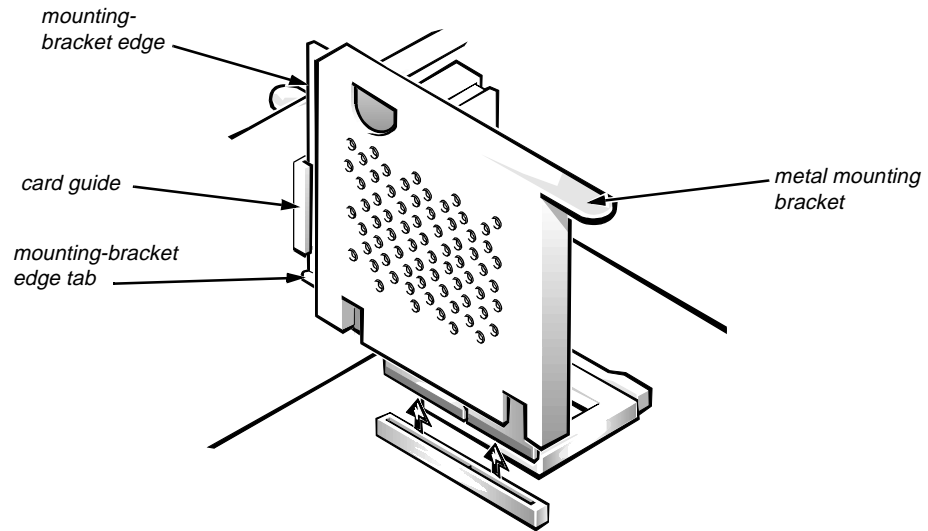
mounting-bracket
edge tab

metal mounting
bracket

Figure 4-24. Add-In Card Removal

To remove an add-in card, follow these steps:

1. **Gently grip the card's metal mounting bracket with both hands.**

2. **Pull up until the card is freed from the connector.**

To reinstall the card, with the metal mounting bracket facing the left side of the chassis, fit the edge of the bracket into the card guide attached to the back wall of the chassis. Make sure that the bracket edge tab is below the bottom of the guide.

System Battery

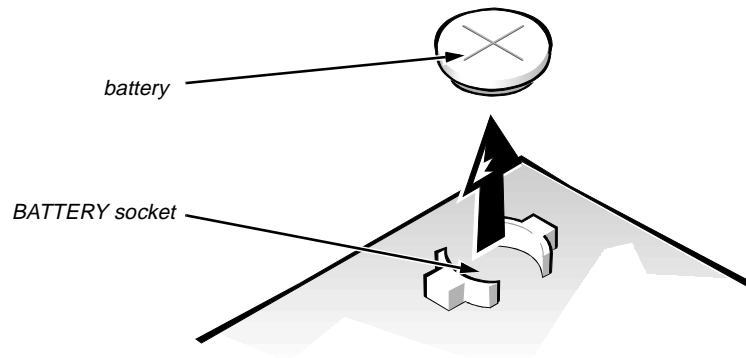battery

BATTERY socket

Figure 4-25. System Battery Removal

To remove the system battery, follow these steps:

1. **If possible, enter the System Setup program, and make a printed copy of the System Setup screens.**

2. **Rotate the power supply out of the way.**

    See "System Power Supply" found earlier in this chapter.

3. **Remove the battery.**

    Pry the battery out of its socket with your fingers or with a blunt, non-conducting object, such as a plastic screwdriver.

To replace the system battery, follow these steps.

WARNING: There is a danger of the 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.

1. **Orient the new battery with the "+" facing up. Insert the battery into its socket and snap it into place.**

    Rotate the power supply back into position.

2. **Start the System Setup program, and reset the Date and Time categories.**

    Also, compare the system configuration information with the copy of the system configuration settings you made in step 1 of the removal procedure. Restore any system configuration information that was lost while replacing the battery.
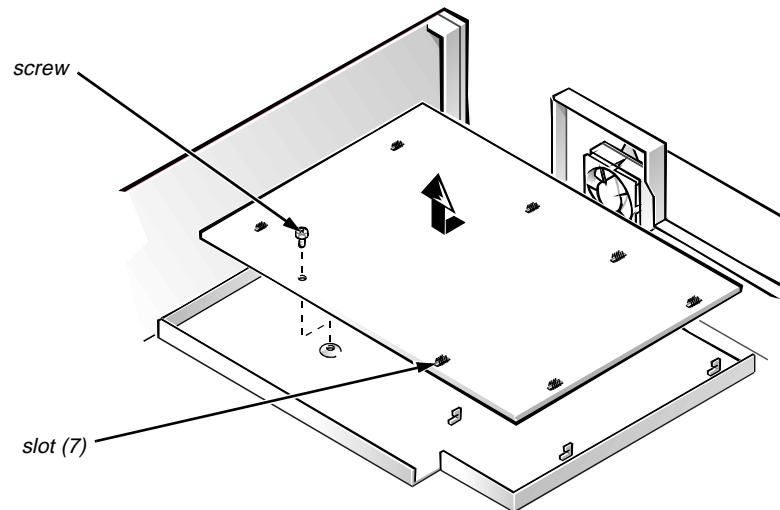
System Board

Figure 4-26. System Board Removal

To remove the system board, follow these steps:

1. **Disconnect all cables from their connectors at the back of the system unit.**

2. **Remove the expansion-card cage.**

3. **Remove the microprocessor fan.**

4. **Disconnect all cables from the system board.**

   Remove the hard-disk drive power cable(s). Slide any drives in the 5.25-inch bays toward the front of the system unit, but leave them cabled.

5. **Remove the system board as follows:**

   a. Remove the screw that secures the system board to the bottom of the system unit.

   b. Slide the system board toward the front of the system unit approximately one-half inch to release the board from the seven slots in the floor of the system unit.

   c. Lift the system board out of the system unit.

If you are replacing a system board, remove the DIMMs, the microprocessor, the terminator or add-in card, and the expansion-card cage from the old system board and install them on the replacement board.

*T*his appendix describes the System Setup program, which is used to change the system configuration information stored in NVRAM on the system board.

To enter the System Setup program, follow these steps:

1. **Turn on (or reboot) the system.**

2. **Press <Ctrl><Alt><Enter>** *immediately* **after the monitor displays the message** `Press <CTRL><ALT><ENTER> for System Setup`**.**

   If you wait too long, the operating system begins to load into memory, the message disappears, and you cannot enter the System Setup program. *Let the system complete the load operation*; then shut down the system and try again.

   NOTE: To ensure an orderly system shutdown, consult the documentation that accompanied the operating system.

System Setup Screens

```
┌──────────────────────────────────────────────────────────────────────────────────┐
│                        Dell Computer Corporation                                   │
│  Page 1 of 2            System OptiPlex GXpro 200 Setup         BIOS Version: XXX   │
├──────────────────────────────────────────────────┬───────────────────────────────┤
│  Time:  13:17:02  Date:  Mon Jan 6, 1997          │  This category sets the time in│
│                                                    │  24-hour format (hours:minutes:│
│  Diskette Drive A:     3.5 inch, 1.44 MB          │  seconds) for the internal clock/│
│  Diskette Drive B:        Not Installed           │  calendar.                     │
│  Drive A Location:          Top                    │                                │
│  Drives:                                           │  To change the value in a field,│
│                                                    │  enter a number or use the left-│
│   Primary   Type Cyls Hds  Pre  LZ  Sec  Size     │  or right-arrow key.           │
│    Drive 0: Auto  524  32   -1  524  63   540     │                                │
│    Drive 1: None                                   │                                │
│   Secondary                                        ├───────────────────────────────┤
│    Drive 0: Auto  Packet Interface Device          │                                │
│    Drive 1: None                                   │  Microprocessor:   Pentium Pro-200│
│      Base Memory:              640 KB             │   Level 2 Cache:   512 KB Integrated│
│  Extended Memory:              63 MB              │   System Memory:   64 MB ECC EDO│
│  Reserved Memory:              None              │     Service Tag:   XXXXX        │
│  Fast Video BIOS:              On                 │                                │
│        CPU Speed:              200 MHz            │                                │
├──────────────────────────────────────────────────┴───────────────────────────────┤
│  Tab,Shift-Tab change fields │ ←  → change values │ Alt-P next │ Esc exit │ Alt-B reboot│
└──────────────────────────────────────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────────────────────────────────────┐
│                        Dell Computer Corporation                                   │
│  Page 2 of 2            System OptiPlex GXpro 200 Setup         BIOS Version: XXX   │
├──────────────────────────────────────────────────┬───────────────────────────────┤
│   Keyboard Errors:          Report               │  This category determines whether│
│   System Password:        Not Enabled            │  keyboard-related error messages are│
│   Password Status:         Unlocked              │  reported at system startup.   │
│    Boot Sequence:       Diskette First           │                                │
│   Setup Password:         Not Enabled            │                                │
│    Auto Power On:        Mon-Fri 07:30           │                                │
│  Power Management:          Regular              │                                │
│          ──── Integrated Devices ────            │                                │
│              Sound:        On                    │                                │
│                NIC:        On                    ├───────────────────────────────┤
│              Mouse:        On                    │  Microprocessor:   Pentium Pro-200│
│      Serial Port 1:        Auto                  │   Level 2 Cache:   512 KB Integrated│
│      Serial Port 2:        Auto                  │   System Memory:   64 MB ECC EDO│
│      Parallel Port:        378h                  │     Service Tag:   XXXXX        │
│      Parallel Mode:        AT                    │                                │
│      IDE Hard Disk:        Auto                  │                                │
│           Diskette:        Auto                  │                                │
│                USB:        On                    │                                │
│           Speakers:        On                    │                                │
├──────────────────────────────────────────────────┴───────────────────────────────┤
│   Tab,Shift-Tab change fields │ ←→ change values│ Alt-P next │ Esc exit │ Alt-B reboot│
└──────────────────────────────────────────────────────────────────────────────────┘
```

Figure A-1. System Setup Screens

Table A-1. System Setup Categories

Category	Function
Time	Resets time on system's internal clock.
Date	Resets date on system's internal calendar.
Diskette Drive A Diskette Drive B	Identifies type of diskette drives installed. Category options always match physical locations of drives in system unit. Tape drives are *not* reflected in these categories.
Drive A Location	Identifies which diskette drive is used as the boot drive.
Drives: Primary Secondary	Identifies drives attached to the IDE1 and IDE2 connectors on system board. Each EIDE connector supports two EIDE drives (Drive 0 and Drive 1). For EIDE hard-disk drives, the system provides an automatic drive-type detect feature. To use this feature, highlight the appropriate drive category and type a (for *automatic*). If none of the supported drive types match the parameters of the new drive, enter the parameters directly. To do so, highlight the appropriate drive category (Drive 0 and Drive 1) and type u to display User1. Press <Tab> to highlight each of the parameter fields in succession, and enter the appropriate number for each field. *NOTE: For EIDE devices such as EIDE CD-ROM drives and EIDE tape drives that are using the built-in EIDE controller, set the appropriate Drive category to Auto.*
Base Memory	Displays amount of memory available to MS-DOS programs that do not use extended or expanded memory.
Extended Memory	Displays amount of memory available as extended memory.

Category	Function
Reserved Memory	Designates a region of system board memory that can be supplied by an expansion card.
	This feature should not be enabled unless an expansion card that requires special addressing is installed.
Fast Video BIOS	Enables shadowing and caching the BIOS for a video card installed in an expansion slot.
	NOTE: Some video cards are not designed to be shadowed or cached. If video problems occur, try setting Fast Video BIOS to Off.
CPU Speed	Indicates processor speed at which system boots—the processor's rated speed or a slower compatibility speed.
Num Lock	Determines whether keyboard's Num Lock mode is activated.
Keyboard Errors	Enables or disables reporting of keyboard errors during POST.
System Password	Displays current status of system's password security feature. Also used to assign and verify a new password.
Password Status	Provides an extra measure of system security by letting you set the system password to Locked or Unlocked.
Boot Sequence	Determines whether system boots from diskette (if present) or hard-disk drive.
Setup Password	Restricts access to System Setup program.

Table A-1. System Setup Categories (continued)

Category	Function
Power Management	With the Power Management category enabled, DPMS monitors and most EIDE drives automatically switch into low-power mode during periods of system inactivity. **CAUTION: Before enabling this feature, check the monitor documentation to make sure the system has a DPMS-compliant monitor. Otherwise, there is a risk of damaging the monitor.** *NOTE: Not all EIDE hard-disk drives support this feature. Enabling this feature for drives that do not support it may cause the EIDE drive to become inoperable until the system is restarted and the Power Management category is disabled.*
Sound	Enables (On [default]) or disables (Off) the audio controller.
NIC	Enables (On) or disables (Off) the network interface controller.
Mouse	Enables or disables the built-in PS/2-compatible mouse port.
Serial Port 1 Serial Port 2	Configures system's built-in serial ports.
Parallel Port	Configures system's built-in parallel port. The port's I/O address may be set to 278H, 3BCH, or 378H. Otherwise, the port may be disabled.
Parallel Modes	Controls whether system's built-in parallel port acts as an AT-compatible (unidirectional) or PS/2-compatible (bidirectional) port.
IDE Hard Disk	Enables system's built-in EIDE hard-disk drive interface.
Diskette	Enables system's built-in diskette controller.
USB	Enables (On) or disables (Off [default]) the USB connectors. *NOTE: This category appears only on GXpro systems containing the 10/100-Mbps Ethernet NIC.*
Speaker	Enables on-board speaker.

Table A-1. System Setup Categories *(continued)*

Category	Function
Microprocessor	Displays type of microprocessor installed.
Level 2 Cache	Displays size of level-2 cache memory in microprocessor.
System Memory	Displays entire amount of installed memory detected in system, except for memory on EMS expansion cards. If EDO DIMMs are installed, EDO is displayed next to this category.
Service Tag	Displays system's five-character service tag number.
Asset Tag	Displays the asset tag number up to ten characters if one is assigned.

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