Dell Precision™
WorkStation 410 Systems

SERVICE MANUAL

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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

Dell Precision™ 410 systems are high-speed, upgradable workstations designed around Intel® Pentium® II microprocessors with MMX™ technology. These Dell® systems support the high-performance Peripheral Component Interconnect (PCI) bus and the accelerated graphics port (AGP) bus. Each system also has an Industry-Standard Architecture (ISA) design with one ISA slot that allows you to configure the computer system to your initial requirements and then upgrade it as necessary.

The Pentium II 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 Dell Precision 410 systems operate at a frequency of either 350 MHz or 400 MHz, derived from a system clock frequency of 100 MHz.

System Features

The system includes the following features:

- Dual-processor capability
- Advanced combination PCI expansion and ISA subsystem
- Plug and Play capability
- Enhanced dual-interface enhanced integrated drive electronics (EIDE) subsystem
- SCSI support using two integrated SCSI channels
  - The primary (Adaptec AIC-7890) channel provides Ultra2/Wide low-voltage differential (LVD) (80-MB/sec) support for high-performance SCSI hard-disk drives and an optional redundant array of inexpensive disks (RAID) subsystem.
  - The secondary (Adaptec AIC-7880) channel provides internal Ultra/Narrow and external Ultra/Wide (40-MB/sec) support for SCSI CD-ROM and tape drives, optical drives, scanners, and so forth.
- 16-bit integrated 3D audio controller
- AGP or PCI graphics adapter card with one AGP expansion slot
- Integrated 10/100-Mbps 3Com® PCI Ethernet network interface controller (NIC) with Wakeup On LAN support
- Integrated universal serial bus (USB) controller
- Thermal sensors to shut down the system if it overheats
- Main system memory consisting of 64 MB to 512 MB of unbuffered SDRAM DIMMs, or up to 1024 MB of registered SDRAM DIMMs
- Secondary cache of 512 KB of SRAM in the single-edge contact (SEC) cartridge providing ECC capability
- Self-Monitoring Analysis and Reporting Technology (SMART)-compliant EIDE hard-disk drives and SMART support in the system BIOS, which warns you at system start-up if an EIDE hard-disk drive has become unreliable

For a complete list of system features, see "Technical Specifications," found later in this chapter.

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

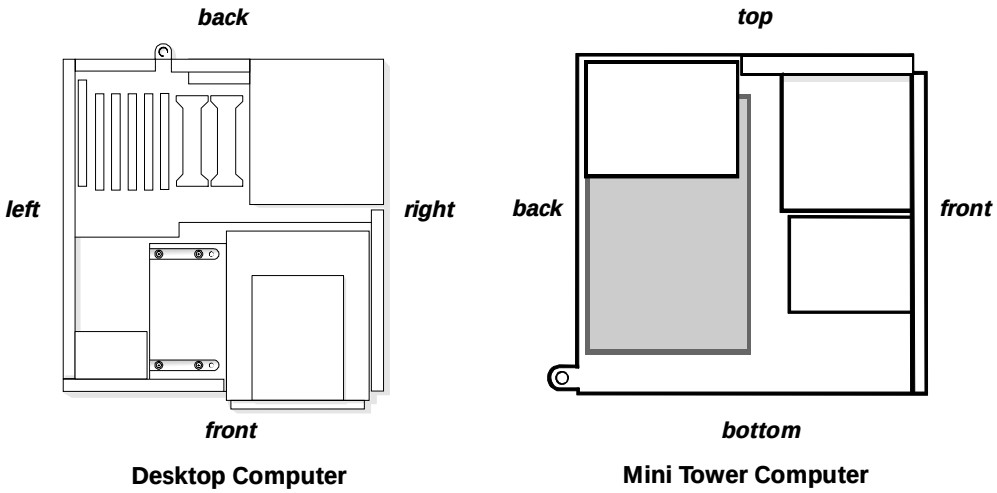


Figure 1-1. Computer Orientation

CAUTION: To avoid possible data or file structure corruptions, the front-panel reset button should be used only when the computer 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.

Figure 1-2 shows the location of some of the key front-panel features on the desktop systems.

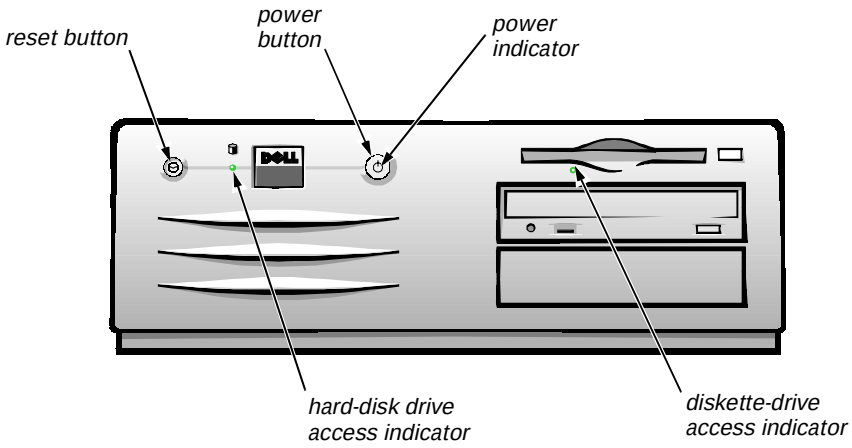


Figure 1-2. Front-Panel Features on the Desktop Computer

Figure 1-3 shows the location of some of the key front-panel features on the mini tower systems.

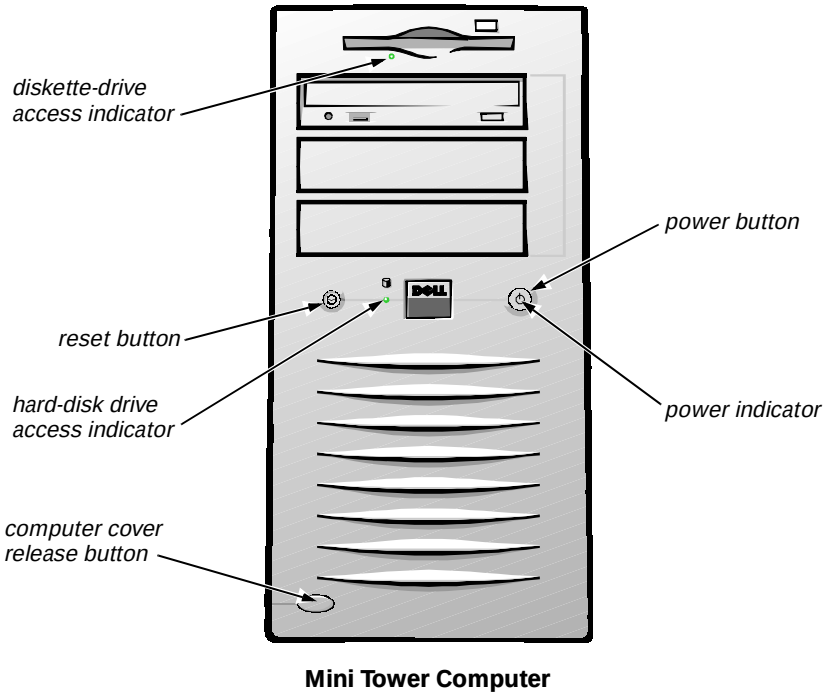


Figure 1-3. Front-Panel Features on the Mini Tower Computer

Figure 1-4 points out many of the desktop system's internal components and back-panel features.

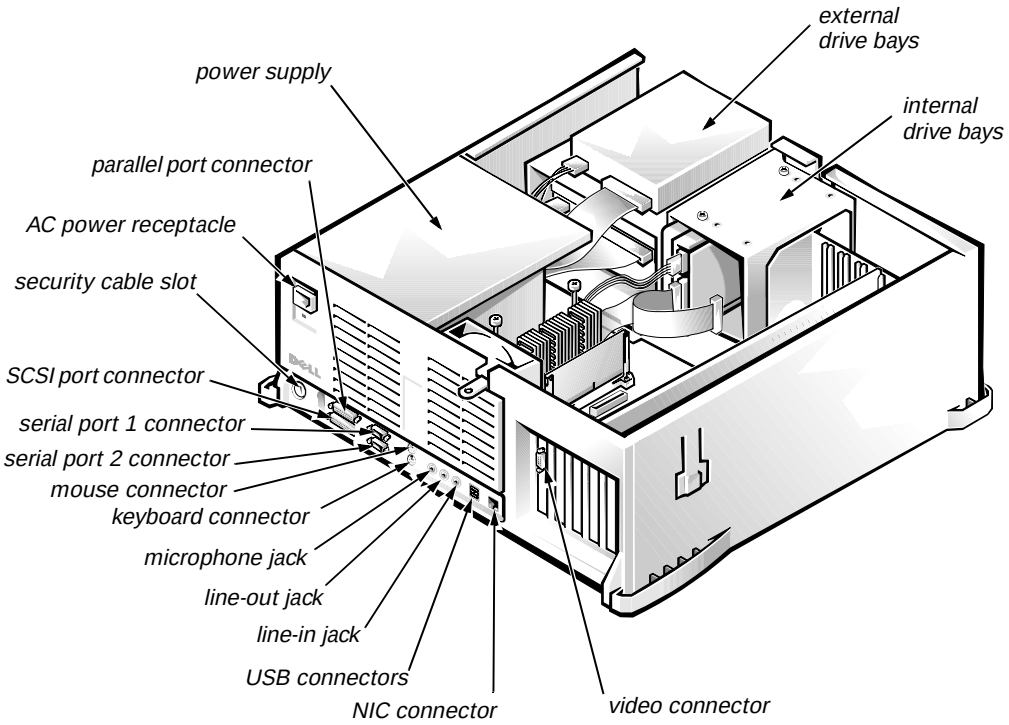


Figure 1-4. Internal View and Back Panel of the Desktop Computer

Figure 1-5 points out many of the mini tower system's internal components and back-panel features.

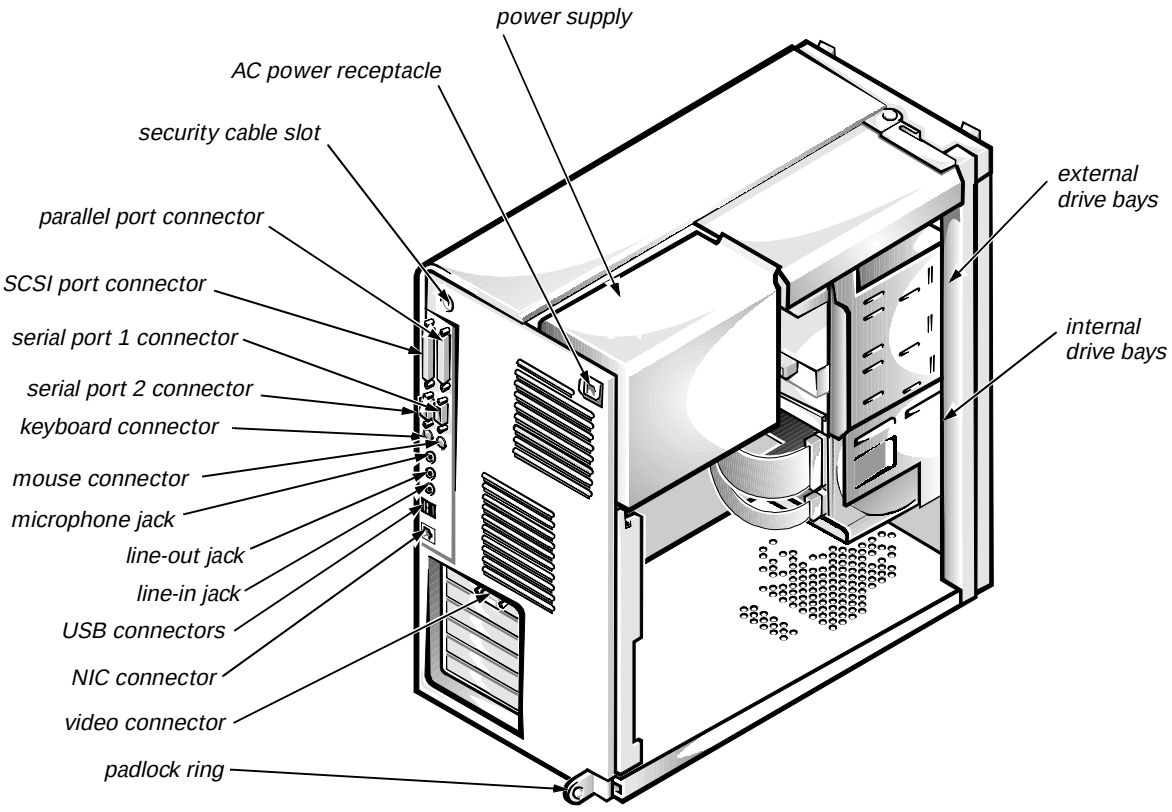


Figure 1-5. Internal View and Back Panel of the Mini Tower Computer

Dual-Processor Capability

With the installation of a second processor SEC cartridge in the secondary SEC cartridge connector on the system board, the computer becomes a dual-processing system. The second processor must be the same type and frequency as the first processor. To take advantage of two processors, dual-processing systems must have multiprocessing operating systems, such as the Microsoft® Windows NT® 4.0 operating system. The Microsoft Windows® 95 operating system does not support dual processing.

Advanced Expansion Subsystem

The Dell Precision 410 systems offer advanced expansion subsystems that can support a mixture of traditional ISA expansion cards (called *legacy* cards), Plug and Play ISA expansion cards, PCI expansion cards, and an AGP card. The operating system or the ISA Configuration Utility (ICU), included with the system, provides a means of avoiding resource conflicts that might arise from such an arrangement.

NOTE: For systems running Windows 95, the functions provided by the ICU are handled by the Device Manager, which can be accessed by double-clicking the System icon in the Control Panel. Windows 95 documentation provides

instructions on using the Device Manager to manage resources and resolve conflicts.

After all legacy cards have been configured by the operating system or with the ICU, the computer 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 computer is rebooted. Chapter 4, "Using the ISA Configuration Utility," in the *Dell Precision WorkStation 410 Mini Tower Systems User's Guide* describes the ICU and provides instructions for using it to configure the computer.

There are seven expansion-card connectors (see Figure 1-6 and Figure 1-7) on the system board. Expansion-card connectors PCI1 through PCI5 support 32-bit PCI expansion cards; expansion-card connector AGP supports a 32-bit AGP expansion card; and expansion-card connector ISA1 can accommodate an 8- or 16-bit ISA expansion card.

NOTES: Connector ISA1 shares expansion-slot space with connector PCI5. Therefore, only one card of either type can be installed in this slot.

PCI4 has a connector extension to support a PCI RAID controller (see Figure 1-15 for the location of the PCI connectors).

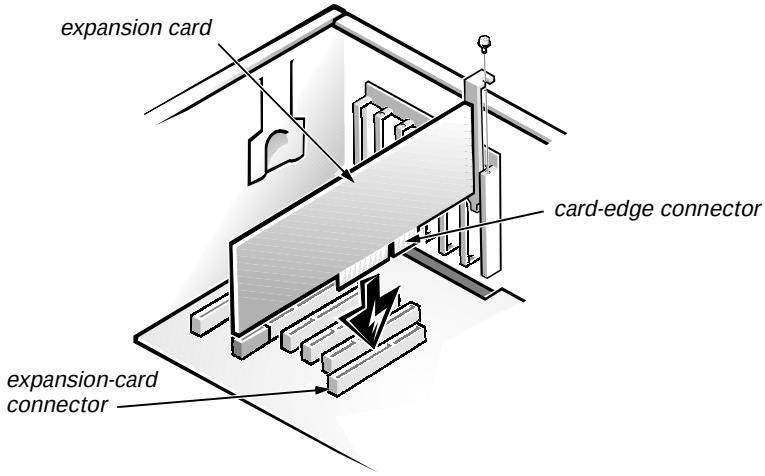


Figure 1-6. Expansion-Card Connectors in the Desktop System

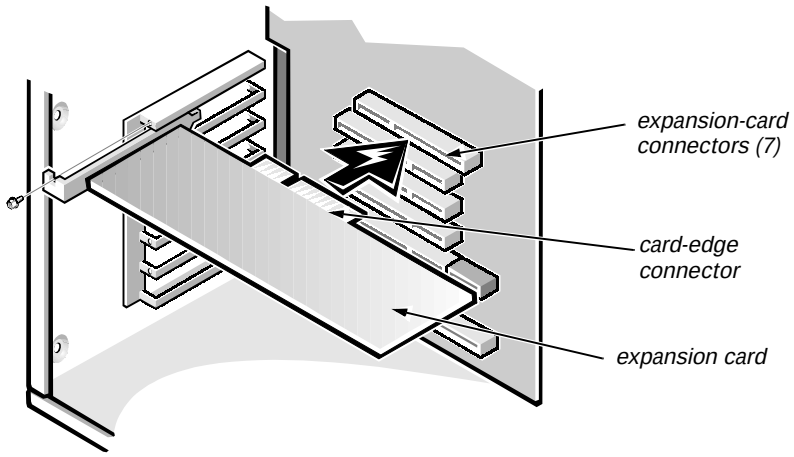


Figure 1-7. Expansion-Card Connectors in the Mini Tower System

Hard-Disk Drive Options

You can install both EIDE and SCSI hard-disk drives in Dell Precision 410 systems. Desktop systems have five drive bays. Mini tower systems have eight drive bays.

Desktop Systems

Dell Precision 410 desktop systems have five drive bays for installing the following types of drives (see Figure 1-8):

- The externally accessible drive bays at the front of the computer consist of one 3.5-inch drive bay (dedicated to a 3.5-inch diskette drive) and two 5.25-inch drive bays that can hold up to two half-height, 5.25-inch devices—typically tape drives or CD-ROM drives. Alternately, 3.5-inch devices can be installed in the 5.25-inch bays using adapters available from Dell.

  NOTE: Because of the length of the bay, you can only install tape backup units or ZIP drives in the lower 5.25-inch bay. You can install a CD-ROM only in the top 5.25-inch bay.

- The two-bay hard-disk drive cage next to the accessible bays can hold up to two 1.6-inch hard-disk drives installed vertically. The drives must be either EIDE hard-disk drives or SCSI hard-disk drives.

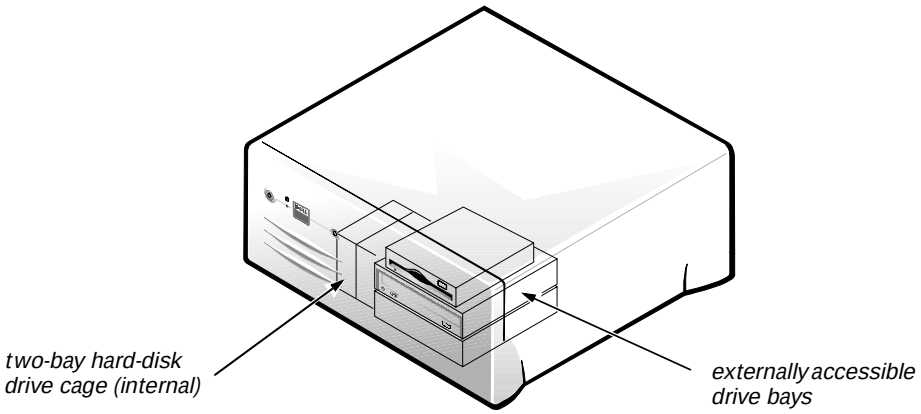


Figure 1-8. Drive Locations in the Desktop Computer

Mini Tower Systems

Dell Precision 410 mini tower systems have eight drive bays for installing the following types of drives (see Figure 1-9):

- The externally accessible drive bays at the front of the computer consist of one 3.5-inch drive bay (dedicated to a 3.5-inch slimline diskette drive) and three 5.25-inch drive bays that can hold up to three half-height, 5.25-inch devices—typically tape drives or CD-ROM drives. Alternately, 3.5-inch devices can be installed in the 5.25-inch bays using adapters available from Dell.
- The four-bay hard-disk drive cage below the externally accessible bays can hold up to four 1-inch or up to two 1-inch and two 1.6-inch hard-disk drives installed vertically. The maximum number of hard-disk drives must be either two enhanced integrated drive electronics (EIDE) hard-disk drives or up to four small computer system interface (SCSI) hard-disk drives.

NOTE: For detailed information about installing SCSI devices, see Chapter 10, "Installing Drives," in the User's Guide*.*

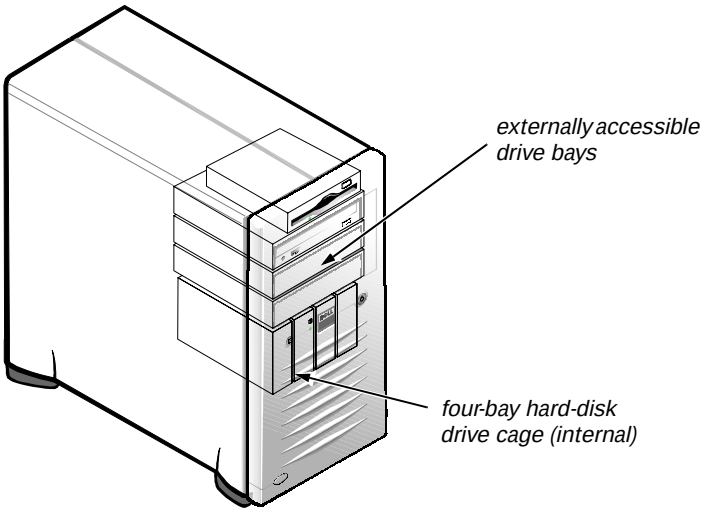


Figure 1-9. Drive Locations in the Mini Tower Computer

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 bus.

The primary EIDE interface (IDE1) supports up to two high-performance EIDE devices. The computer's boot drive should be connected to the primary EIDE interface.

The secondary EIDE interface (IDE2) also supports 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 computer 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 positions described in "Hard-Disk Drive Options" found earlier in this chapter. For detailed information about the data storage subsystem, see Chapter 10, "Installing Drives," in the User's Guide*.*

SCSI Support

SCSI drives are supported by using two integrated SCSI channels:

- The primary (Adaptec AIC-7890) channel provides Ultra2/Wide LVD (80-MB/sec) support for high-performance SCSI hard-disk drives and an optional RAID subsystem.

  NOTE: To achieve 80-MB/sec support, all of the installed SCSI devices must support the Ultra2 specification's 80-MB/sec transfer rate. If they do not, the transfer rate will default to the speed of the slowest device in the SCSI chain.

- The secondary (Adaptec AIC-7880) channel provides internal Ultra/Narrow and external Ultra/Wide (40-MB/sec) support for SCSI CD-ROM and tape drives, optical drives, scanners, and so forth.

Audio Controller

The system board has an onboard 16-bit Plug and Play Crystal 3D CS4237B audio controller chip and connectors on the back panel for connecting the computer to external audio devices such as speakers/headphones and microphone. The controller supports all sound functions contained on the Sound Blaster Pro expansion card from Creative Laboratories, Inc.

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

Video Subsystem

The video subsystem consists of either a high-speed, high-resolution AGP or a PCI graphics adapter card. (For more information, see the documentation that came with the graphics adapter card.) AGP greatly improves graphics performance by providing a dedicated bus for a faster interface between the video subsystem and system memory. AGP also allows conventional memory to be used for video-related tasks.

NIC

Dell Precision 410 systems contain an integrated 10/100-Mbps 3Com PCI 3C905b-TX NIC (uses a 3Com 3C917 application-specific integrated circuit [ASIC]). 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.

Chapter 5, "Using the Network Interface Controller," in the *User's Guide* provides instructions for connecting the computer 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 the computer's back panel provide a single connection point for multiple USB-compliant devices. USB-compliant devices can be connected and disconnected while the computer is running.

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

Thermal Protection

If a processor or hard-disk drive exceeds its recommended operating temperature range, a system event triggers a system management interrupt (SMI), which alerts the BIOS. If the Dell ThermalShutdown Service is installed, 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. If the service is unable to shut down the system within approximately 3 minutes, the BIOS powers down the computer. If the ThermalShutdown Service is not installed, the computer turns off immediately.

NOTE: The BIOS powers down the computer in the event of a thermal alert only if the Thermal Power-Off category is set to ENABLED in the System Setup program.

Computer Service

The following subsections provide service-related information about the computer.

System Power Supply

The 300-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

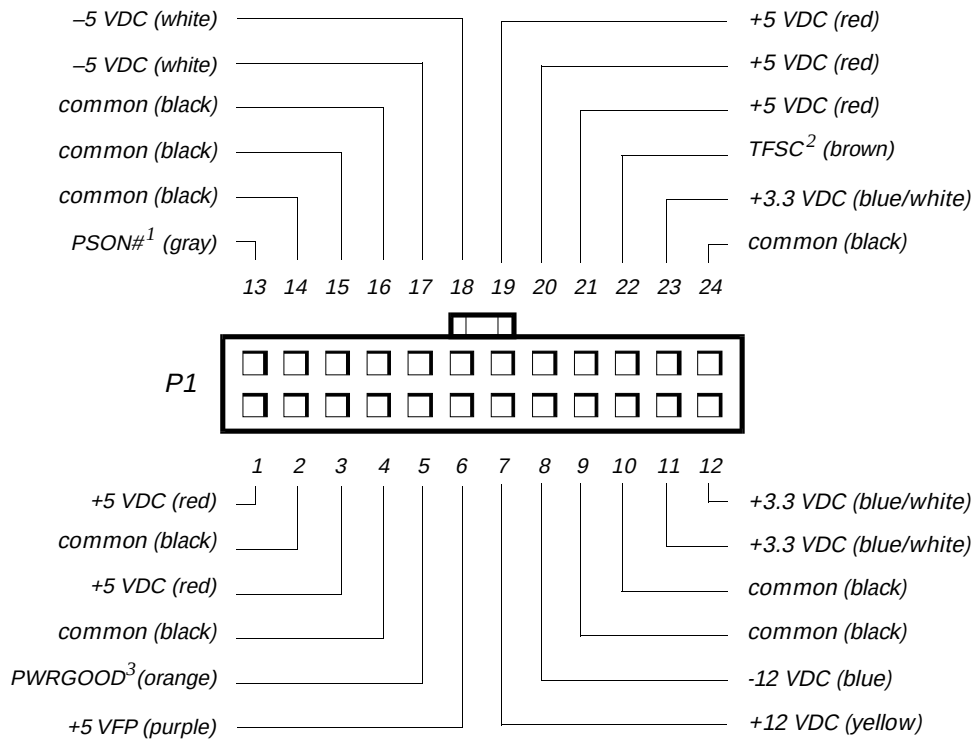
Voltage	Range	Maximum Output Current[1]
+3.3 VDC	+3.15 to +3.45 VDC	18.0 A
+5 VDC	+4.75 to +5.25 VDC	35.0 A
+12 VDC	+11.40 to +12.60 VDC	14.0 A
–12 VDC	–10.80 to –13.20 VDC	0.3 A
–5 VDC	–4.50 to –5.50 VDC	0.3 A
+5 VFP[2]	+4.75 to +5.25 VDC	1.2 A

[1] *Maximum continuous DC output power should not exceed 300 W. Maximum combined load on +5 VDC and +3.3 VDC cannot exceed 200 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. Figures 1-10, 1-11, and 1-12 show the wire side of the connectors.



1 *Pin 13 — 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 22 — 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 operating to indicate that all power-supply output voltages are within the ranges specified in Table 1-1.*

Figure 1-10. DC Power Connector P1

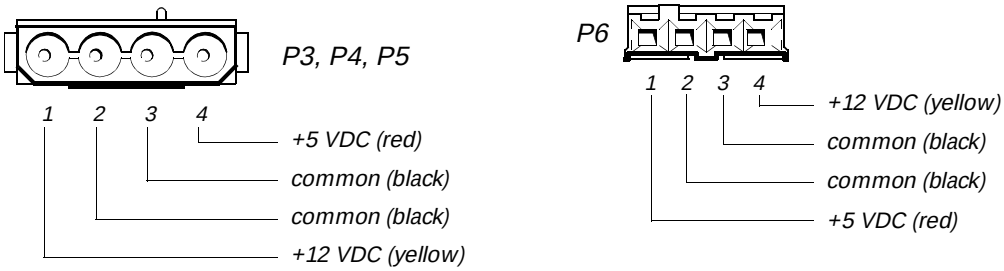


Figure 1-11. DC Power Connectors P3, P4, P5, and P6

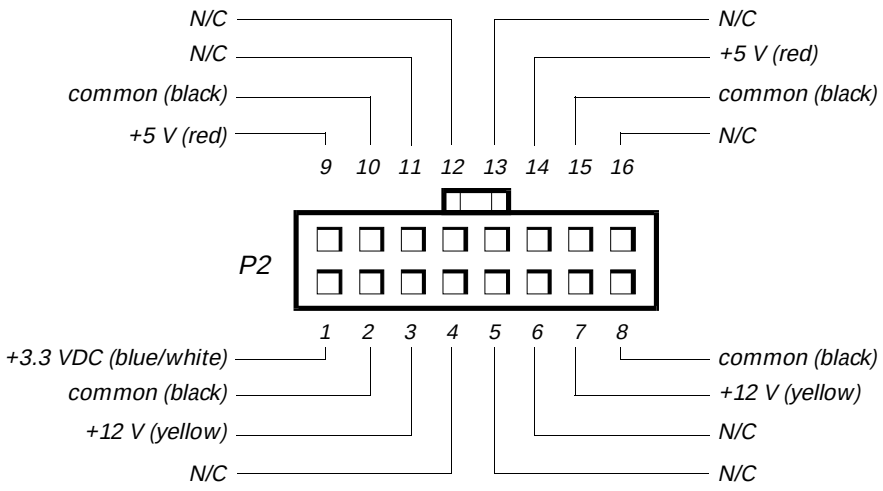


Figure 1-12. DC Power Connector P2

DC Power Distribution

Figures 1-13 and 1-14 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

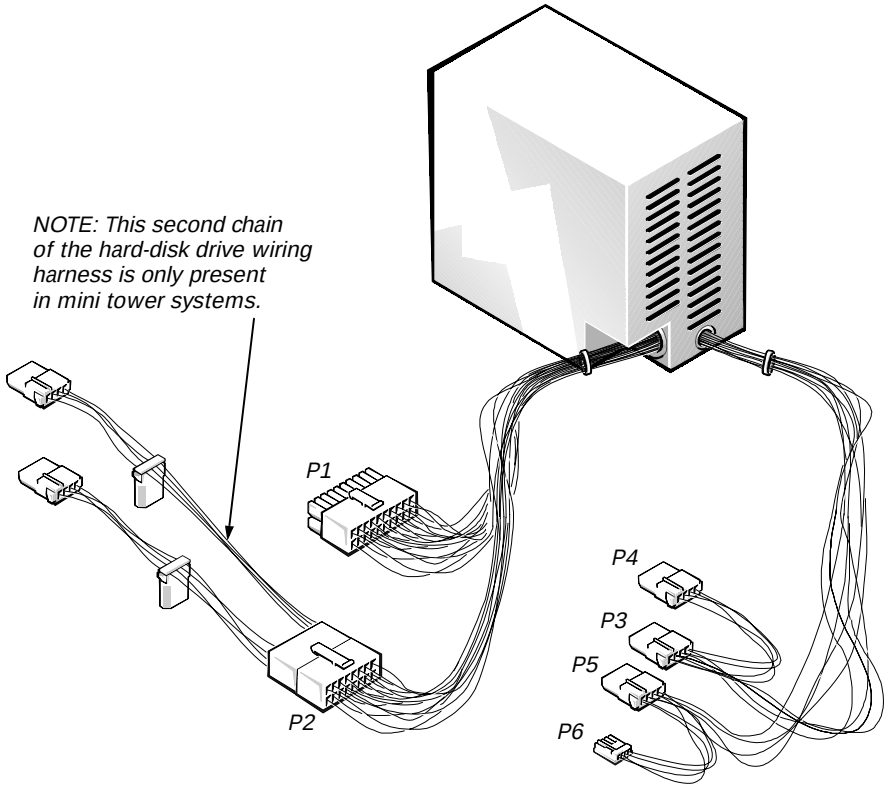
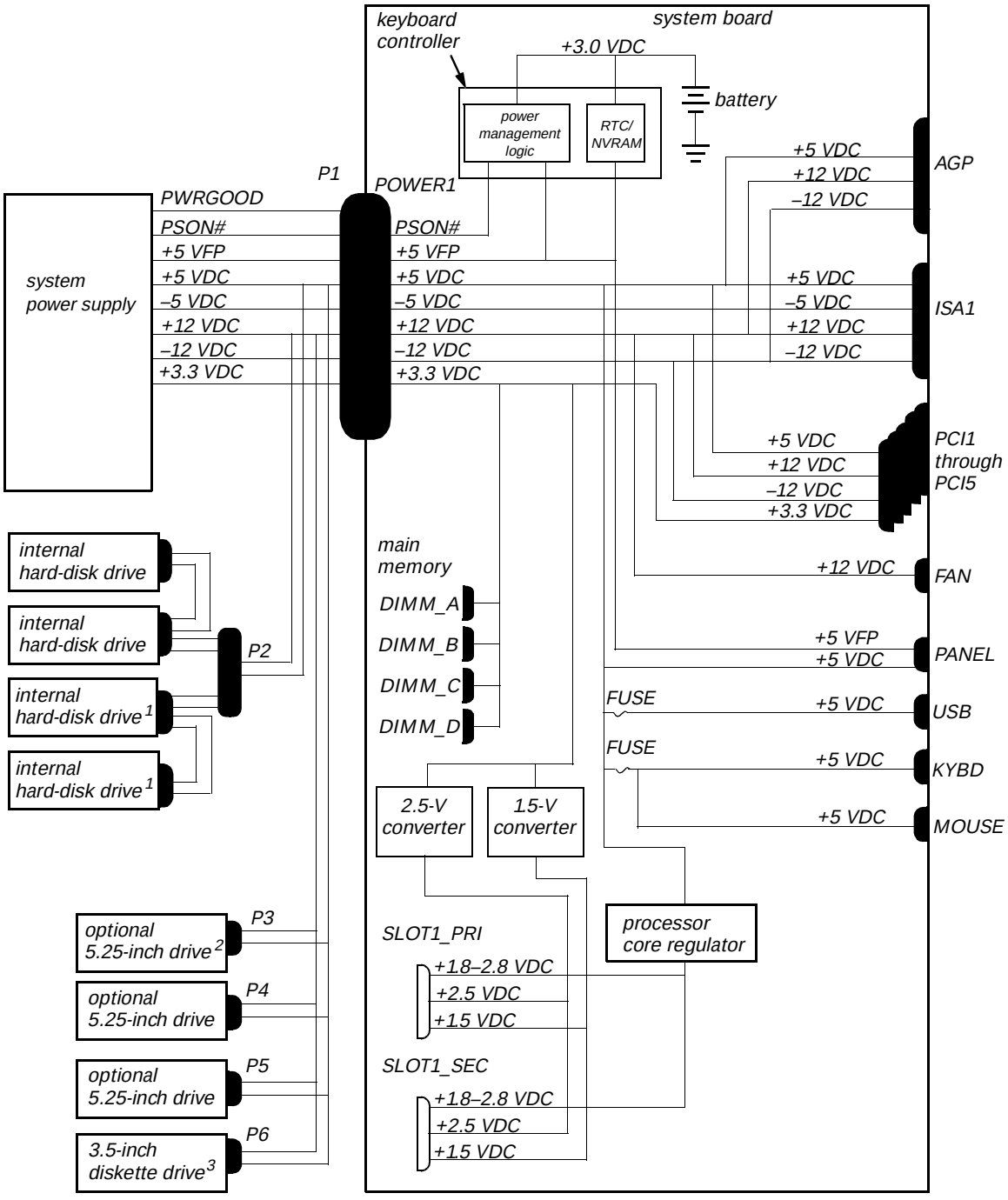


Figure 1-13. DC Power Cables



1 *The mini tower chassis supports the installation of up to four internal hard-disk drives. The desktop chassis supports the installation of up to two internal hard-disk drives.*

2 *The mini tower chassis supports up to three externally accessible 5.25-inch drives. The desktop chassis supports up to two externally accessible 5.25-inch drives.*

3 *In the desktop chassis, power for the 3.5-inch diskette drive is provided by the P6 connector. In the mini tower chassis, power for the 3.5-inch diskette drive is provided through a combination DC power/interface cable which connects to the system board at the DSKT2 connector.*

Figure 1-14. Power Distribution

System Board

The subsections that follow provide service-related information about the system board and its components, which are shown in Figure 1-15.

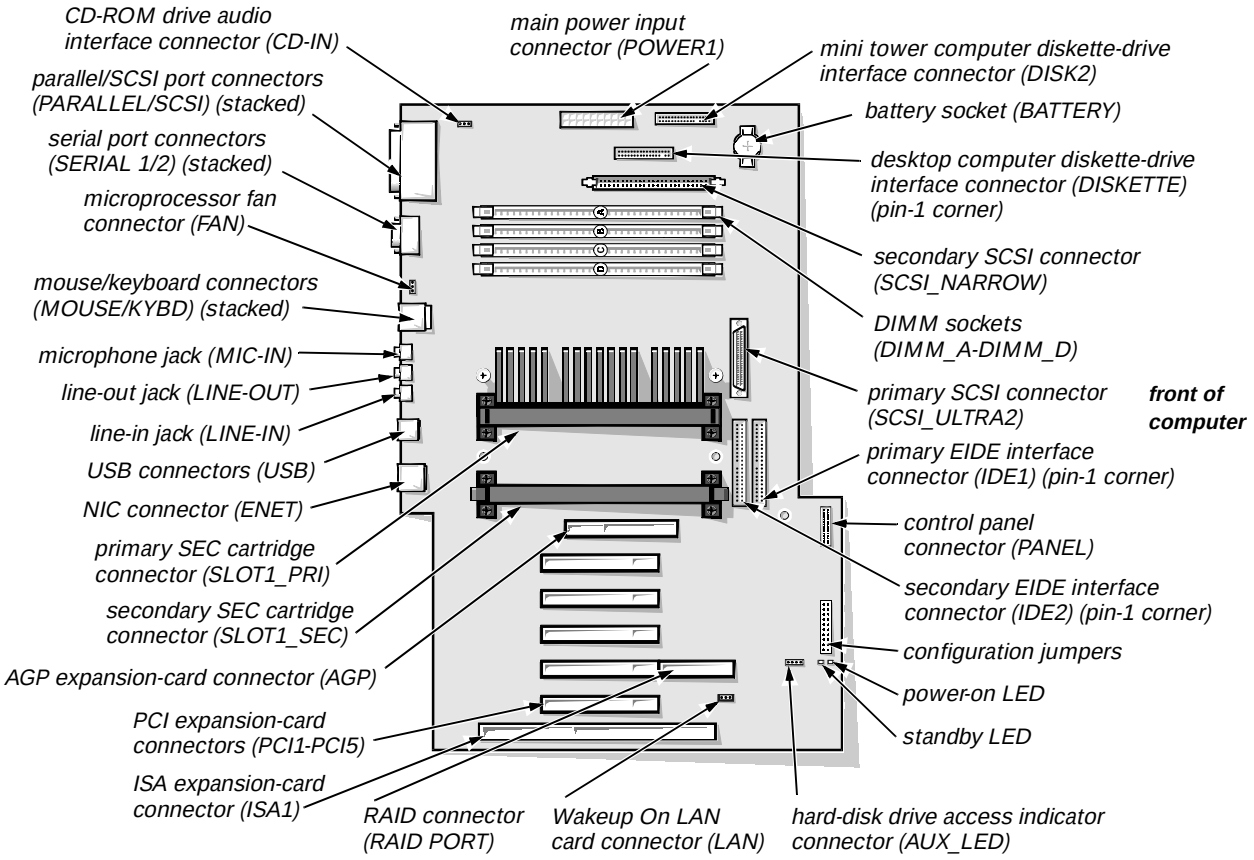


Figure 1-15. System Board Components

Main Memory

The four DIMM sockets on the system board can accommodate combinations of 32-, 64-, and 128-MB DIMMs up to a total memory capacity of 512 MB using unbuffered SDRAM, or it can accommodate combinations of 256-MB registered SDRAM DIMMs up to 1024 MB using registered SDRAM DIMMs.

CAUTION: Unbuffered and registered SDRAM DIMMs cannot be mixed.

- There is no requirement that one socket be filled before another, and empty sockets can be left between installed DIMMs. However, Dell recommends populating the sockets in consecutive order starting with DIMM A.
- DIMM sockets do not have to contain DIMMs of the same size.
- DIMMs of varying sizes may be installed in any order.
- DIMMs are not required to be electrically single-sided as they were in previous models, such as the Dell WorkStation 400 systems.

See “DIMMs” in Chapter 4 or 5 for information on removing and replacing DIMMs.

System Board Jumpers

Figure 1-16 shows the location of the system board jumpers, and Table 1-2 shows the system board jumper settings.

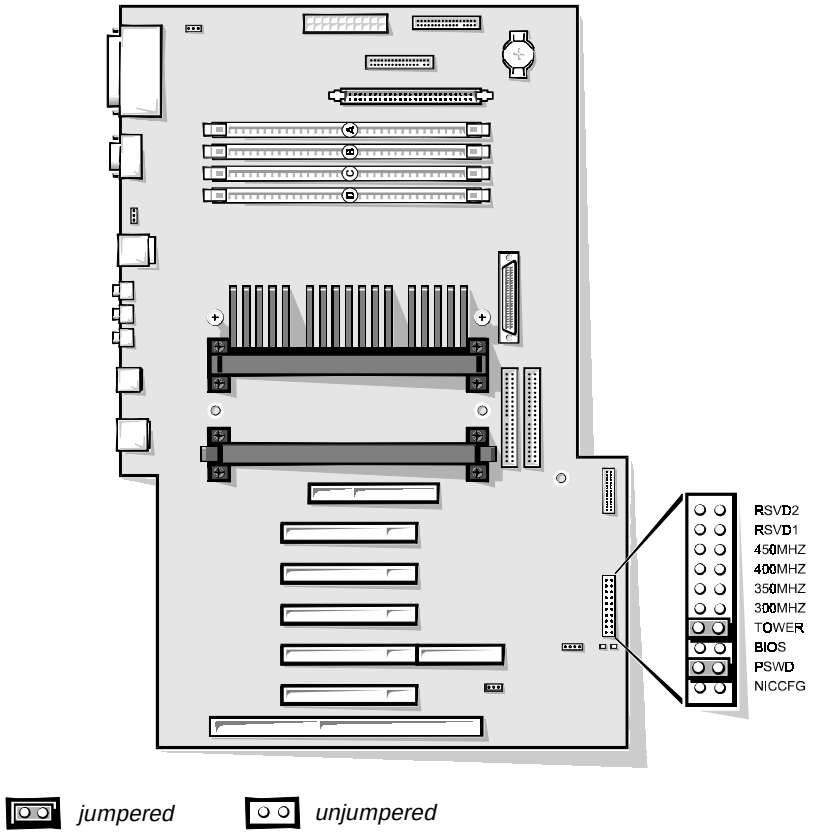


Figure 1-16. Location of System Board Jumpers

System Board Jumper Settings

The following table shows the settings and descriptions for the system board jumpers in Dell Precision 410 systems.

Table 1-2. System-Board Jumper Settings

Jumper	Setting		Description
RSVD2			Reserved (*do not install jumper plug*).
RSVD1			Reserved (*do not install jumper plug*).
450MHZ*			Jumpered when the microprocessor's internal speed is 450 MHz.
400MHZ*			Jumpered when the microprocessor's internal speed is 400 MHz.
350MHZ*			Jumpered when the microprocessor's internal speed is 350 MHz.
300MHZ			Reserved (*do not install jumper plug*).
TOWER			System board is installed in a mini tower chassis *(no longer required)*.
BIOS			Reserved *(do not install jumper plug)*.
PSWD		(default)	Password features enabled.
			Password features disabled.
NICCFG			Reserved *(do not install jumper plug)*.

* *One set of the speed jumper pins must have a jumper plug installed; otherwise, the system will operate at an undetermined speed.*

NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary in the User's Guide*.*

 *jumpered*  *unjumpered*

Interrupt Request Assignments

The following table lists the hardware interrupt request (IRQ) assignments for Dell Precision 410 systems.

Table 1-3. Interrupt Request Assignments

IRQ Line	Used By/Available
IRQ0	System timer
IRQ1	Keyboard controller
IRQ2	Enables IRQ8 through IRQ15
IRQ3 and IRQ4	Serial ports
IRQ5	Available
IRQ6	Diskette drive interface
IRQ7	Parallel port
IRQ8	RTC
IRQ9	Available if ACPI is set to Off in System Setup program
IRQ10	Available
IRQ11	Available
IRQ12	Mouse controller
IRQ13	Math coprocessor
IRQ14	Primary EIDE interface (if Enabled in the System Setup program)
IRQ15	Secondary EIDE interface (if Enabled in the System Setup program)

NOTES: For the full name of an abbreviation or acronym used in the table, see the Glossary in the User's Guide.

The integrated NIC, SCSI, and sound systems will be assigned an interrupt request dynamically during system start-up.

Direct Memory Access Channel Assignments

The following table lists the direct memory access (DMA) channel assignments for Dell Precision 410 systems.

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
DREQ6	Available
DREQ7	Available

NOTE: The integrated audio controller is assigned one or two DMA channels automatically during system start-up.

Technical Specifications

The following table lists the technical specifications for Dell Precision 410 systems.

Table 1-5. Technical Specifications

Microprocessor	
Microprocessor type	Intel Pentium II microprocessor with MMX technology that runs at 350 MHz internally/ 100 MHz externally or at 400 MHz internally/ 100 MHz externally. A slower compatibility speed can be set through the System Setup program.
Internal cache.	32 KB (16-KB data cache; 16-KB instruction cache)
L2 cache.	512-KB pipelined burst, four-way set-associative, write-back ECC SRAM on each SEC cartridge
Math coprocessor	internal to the microprocessor
System Information	
System chip set	Intel 440BX PCIset
Data bus width	64 bits
Address bus width.	32 bits
DMA channels	seven
Interrupt levels.	15
System BIOS chip	2 Mb
Audio controller	16-bit Plug and Play Crystal 3D CS4237B
Primary SCSI controller	Adaptec AIC-7890 Ultra2/Wide LVD (Adaptec 2940 U2W-equivalent)
Secondary SCSI controller	Adaptec AIC-7880 internal Ultra/Narrow and external Ultra/Wide (Adaptec 2940 UW-equivalent)
NIC.	3Com 3C905b-TX Wakeup On LAN-capable (uses a 3Com 3C917 ASIC)
I/O controller	National PC 87309

NOTE: For the full name of an abbreviation used in this table, see the Glossary in the User's Guide.

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

Expansion Bus	
Bus types	PCI, ISA, and AGP
Bus speed	PCI: 33.3 MHz ISA: 8.33 MHz AGP: 66.6 MHz (2X-capable)
PCI expansion-card connectors	five (one PCI connector shares an expansion-card slot with the ISA connector) *NOTE: PCI4 is the only slot that supports an add-in RAID coprocessor card through a 60-pin connector.*
ISA expansion-card connectors	one (the ISA connector shares an expansion-card slot with one of the PCI connectors)
AGP expansion-card connectors	one
PCI expansion-card connector size	120 pins
PCI expansion-card connector data width (maximum)	32 bits
ISA expansion-card connector size	98 pins
ISA expansion-card connector data width (maximum)	16 bits
AGP expansion-card connector size	124 pins
AGP expansion-card connector data width (maximum)	32 bits
RAID extension connector size	60 pins
System Clocks	
System clock	100 MHz
SDRAM memory clock	100 MHz
I/O APIC clock	14 MHz
Diskette/communications ports	48 MHz
USB clock	48 MHz

NOTE: For the full name of an abbreviation used in this table, see the Glossary in the User's Guide.

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

Memory	
Architecture	72-bit ECC SDRAM
DIMM sockets	four
DIMM capacities	32-, 64-, and 128-MB unbuffered, 72-bit SDRAM; 256-MB registered, 72-bit SDRAM
Standard RAM	64 MB
Maximum RAM	1024 MB
	NOTE: The maximum amount of RAM that can be installed using registered 256-MB DIMMs is 1024 MB. The maximum amount of RAM that can be installed using unbuffered DIMMs is 512 MB.
BIOS address.	F000:0000h–F000:FFFFh
Drives	
Externally accessible bays:	
Desktop computers	one 3.5-inch bay dedicated to a 3.5-inch diskette drive; two 5.25-inch bays for tape drives, CD-ROM drives, or other 5.25-inch peripherals
Mini tower computers	one 3.5-inch bay dedicated to a 3.5-inch diskette drive; three 5.25-inch bays for tape drives, CD-ROM drives, or other 5.25-inch peripherals
Internally accessible bays:	
Desktop computers	two 1.6-inch drive bays for EIDE or SCSI hard-disk drives installed vertically
Mini tower computers	two 1.6-inch drive bays and two 1-inch drive bays for EIDE or SCSI hard-disk drives installed vertically

NOTE: For the full name of an abbreviation used in this table, see the Glossary in the User's Guide.

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

Ports and Connectors	
Externally accessible:	
Serial (DTE)	two 9-pin connectors (16550-compatible)
Parallel	one 25-pin connector (bidirectional)
SCSI (Secondary channel)	one 68-pin Ultra/Wide SCSI connector
Video	one 15-pin connector (on graphics adapter card)
PS/2-style keyboard	6-pin mini-DIN connector
PS/2-compatible mouse	6-pin mini-DIN connector
NIC	RJ45 connector
USB	two USB-compliant 4-pin connectors
Audio line-in	1/8-inch miniature audio jack
Audio line-out	1/8-inch miniature audio jack
Audio microphone in	1/8-inch miniature audio jack
Internally accessible:	
EIDE drive	two 40-pin connectors on PCI local bus
Primary SCSI channel	one 68-pin Ultra2/Wide SCSI connector
Secondary SCSI channel	one internal 50-pin Narrow SCSI connector
Diskette drive	one 34-pin connector (used in desktop systems); one 26-pin connector (used in mini tower systems)
CD-ROM drive audio interface	4-pin connector
Wakeup On LAN	3-pin connector
Fan	3-pin connector
Control panel connectors:	
Thermal sensor	3-pin connector
Chassis intrusion	2-pin connector
Speaker	4-pin connector

NOTE: For the full name of an abbreviation used in this table, see the Glossary in the User's Guide.

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

Video	
Video type	AGP or PCI graphics adapter card (see manufacturer's specifications)
Key Combinations	
<Ctrl><Alt><Del>.	restarts (reboots) the system
<F2> or <Ctrl><Alt><Enter>	starts System Setup program (during POST only while Dell logo screen is displayed)
Controls and Indicators	
Reset control	push button
Power control.	push button
Power indicator/sleep mode indicator.	green LED (indicates power) amber LED (indicates sleep mode)
Hard-disk drive access indicator	green LED
Link integrity indicator (on NIC connector).	green LED
Power indicator (on system board)	green LED
Standby power indicator (on system board)	green LED
Network activity indicator (on NIC connector).	yellow LED
Power	
DC power supply:	
Wattage.	300 W
Heat dissipation.	600 BTU/hr (nominal)
Voltage	90 to 135 V at 60 Hz; 180 to 265 V at 50 Hz; autoranging 90 to 265 V
Backup battery	3-V CR2032 coin cell

NOTE: For the full name of an abbreviation used in this table, see the Glossary in the User's Guide.

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

Physical	
Desktop computers:	
Height	16.51 cm (6.5 inches)
Width	43.43 cm (17.1 inches)
Depth	44.19 cm (17.4 inches)
Weight (minimum)	13.28 kg (29.5 lb)
Mini tower computers:	
Height	45.5 cm (17.9 inches)
Width	22.1 cm (8.7 inches)
Depth	42.2 cm (17.8 inches)
Weight (minimum)	16.8 kg (37 lb)
Environmental	
Temperature:	
Operating	10° to 35°C* (50° to 95°F)
Storage	–40° to 65°C (–40° to 149°F)
Relative humidity	20% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz 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)

* *At 35°C (95°F), the maximum operating altitude is 914 m (3000 ft).*

NOTE: For the full name of an abbreviation used in this table, see the Glossary in the User's Guide.

CHAPTER 2
Basic Troubleshooting

This 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 Dell Diagnostics is found at the end of the chapter. Dell recommends that you perform the following procedures in the order they are presented in this chapter.

Initial 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.**

   See the operating system documentation and Appendix D, "Maintaining the System," in the *User's Guide* for 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 computer, 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 computer, the monitor, and all peripherals.**

2. **Verify that all power cables are properly connected to the computer, 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 computer.**

   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 connectors 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 computer 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 monitor connections, see the documentation for the monitor.

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

   For proper settings of the 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 computer, including all controls, indicators, and 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 on the Desktop Chassis."

   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** *Dell Diagnostics Diskette* **into drive A. Turn on all peripherals and the computer. If the computer 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 computer's 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 10 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 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.

   - 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.

   - System error messages

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

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

   Does the Diagnostics Menu appear?

   Yes. See "Running the Dell 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 Dell 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 computer'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, perform the following steps in the sequence indicated.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT

Before you start to work on the system, perform the following steps in the sequence listed:

1. **Turn off the computer and all peripherals.**
2. **Disconnect the computer and peripherals from their AC power sources. Also, disconnect any telephone or telecommunication lines from the computer. Doing so reduces the potential for personal injury or shock.**
3. **If you are disconnecting a peripheral from the computer or are removing a component from the system board, wait 10 to 20 seconds after disconnecting the computer from AC power before disconnecting the peripheral or removing the component to avoid possible damage to the system board.**
4. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as the padlock loop on the back of the chassis. If a wrist grounding strap is not available, touch any unpainted metal surface on the back of the computer or on the computer chassis, such as the power supply, to discharge any static charge from your body before touching anything inside the computer.**

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components. Also avoid touching components or contacts on a card and avoid touching pins on a chip.

5. **Remove the computer cover.**
6. **Verify that the standby LED is not on. If it is on, you may need to wait 10 to 30 seconds for it to go out (see Figure 1-15).**
7. **Verify that all chips, DIMMs, and expansion cards are fully seated in their sockets or connectors.**

WARNING: The processor SEC cartridge/heat sink assembly can get extremely hot. Be sure that the assembly 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 and reinstall it as described in "Microprocessor SEC Cartridge/Heat Sink Assembly" in Chapter 4 or 5.

To reseat a DIMM, remove it from its socket and reinstall it as described in "DIMMs" in Chapter 4 or 5.

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 (see "Expansion Cards" in Chapter 4 or 5 for more information).

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

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

9. **Check all cable connectors inside the computer to verify that they are firmly attached to their appropriate connectors.**

10. **Reinstall the computer cover.**

11. **Reconnect the computer 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.

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

Eliminating Resource Conflicts

Devices within or connected to the computer may require dedicated memory spaces, interrupt levels, or DMA channels, all of which must be allocated during installation of the devices. Because devices may be installed at different times, 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 using the Windows 95 Device Manager or the ISA Configuration Utility (ICU), and reassign the resources as necessary. See "Advanced Expansion Subsystem" in Chapter 1 for information on the Device Manager and the ICU. See "Interrupt Request Assignments" in Chapter 1 to help identify possible conflicts. Also review the documentation provided with any installed expansion cards and other devices for additional interrupt information for the specific devices.

Running the Dell Diagnostics

The Dell 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 computer. Dell recommends that users make several copies of this diskette to ensure that one is always available.

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

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 Dell 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

This 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 run the appropriate tests in the Dell Diagnostics to help isolate the source of the problem. See "Running the Dell Diagnostics" in Chapter 2.

POST 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 an error that may prevent the system from completing the boot routine until the indicated condition is corrected. If the table does not lead to the source of the problem, run the appropriate tests in the Dell Diagnostics to assist in troubleshooting the problem.

Table 3-1. POST Beep Codes

Beep Code	Error	Probable Causes
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	
1-3-1	Main-memory refresh verification failure	Faulty or improperly seated DIMMs or defective system board
1-3-2	No 100-MHz DIMM installed	No 100-MHz DIMM installed or faulty or improperly seated DIMM
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)

Table 3-1. POST Beep Codes *(continued)*

Beep Code	Error	Probable Causes
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
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.

Fatal System Error Messages

Some 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 that a fatal error has occurred. Their definitions and probable causes are listed in Table 3-2.

- `Alert! Primary processor is out of rev. System halted`
- `Alert! Secondary processor is out of rev. System halted`
- `Bad error-correction code (ECC) on disk read`
- `Controller has failed`
- `Data error`
- `ECC memory error`
- `Gate A20 failure`
- `Hard disk controller failure`
- `Hard disk drive read failure`
- `Hard disk failure`
- `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`

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.	
`Alert! Cover was previously removed.`	Cover was previously removed.	Cover was previously removed.
`Alert! Hard disk drive thermal probe failure detected.`	Hard-disk drive thermal probe has failed.	No hard-disk drive thermal probe installed, defective thermal probe, or thermal cable not connected to the control panel.
`Alert! One or more of the Memory DIMMs are out of rev.`	System detected that one or more of the DIMMs are not the correct revision.	DIMMs do not meet Intel's SPD 1.2 specification or 66-MHz DIMMs are installed.
`Alert! Power supply fan failure detected.`	Power supply fan has failed.	The power supply or system board is defective.
`Alert! Previous fan failure.`	System fan failed during the previous operating session.	No fan installed, defective fan, or fan cable not connected.
`Alert! Previous thermal failure.`	The microprocessor exceeded its recommended operating temperature during the previous operating session.	Operating environment is too hot (above 35°C). The system vents may be blocked, causing the system to overheat.
`Alert! Previous voltage failure.`	System voltage exceeded or fell below an acceptable threshold.	Defective power supply.
`Alert! Primary processor is out of rev.`	System detected that the primary processor is not the correct revision. If the system contains more than 512 MB of RAM, this message will be followed by a `System Halted` message.	Processor is a type not supported by Dell.

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

Message	Definition	Probable Causes
`Alert! Processor thermal probe failure detected.`	Processor or system board has failed.	Faulty processor or defective system board.
`Alert! Secondary processor is out of rev.`	System detected that the secondary processor is not the correct revision. If the system contains more than 512 MB of RAM, this message will be followed by a `System Halted` message.	Processor is a type not supported by Dell.
`Alert! Single-bit memory error previously detected in XXXXh.`	Single-bit ECC error was detected during the previous operating session.	Faulty or improperly seated DIMMs or defective system board.
`Alert! System fan was not detected.`	System fan was not detected.	No fan installed, defective fan, or fan cable not connected.
`Alert! Unbuffered and registered SDRAM DIMMs cannot be mixed.`	Mixing of unbuffered and registered SDRAM DIMMs is not supported.	Two different types (unbuffered and registered) of SDRAM DIMMs have been installed together and may not be compatible.
`Alert! Uncorrectable memory error previously detected in XXXXh.`	Multibit ECC error was detected during the previous operating session.	Faulty or improperly seated DIMMs or defective system board.
`Auxiliary Device failure. Verify that mouse and keyboard are securely attached to connectors.`	System detected a mouse failure.	Faulty mouse, or faulty mouse controller or keyboard is attached to the mouse connector.
`Bad command or file name`	Command entered does not exist, is faulty, or is not in pathname specified.	Faulty command and syntax, or incorrect filename.

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

Message	Definition	Probable Causes
`Bad error-correction code (ECC) on disk read`	Diskette drive or hard-disk drive controller detected an uncorrectable read error.	Faulty diskette/tape drive subsystem or hard-disk drive subsystem (defective system board).
`Boot: Couldn't find NTLDR`	A nonbootable diskette formatted with Windows NT was detected in the diskette drive.	A nonbootable diskette is preventing the system from booting. Remove the diskette to boot the system from the hard-disk drive or from a bootable diskette.
`Controller has failed`	Hard-disk drive or associated controller is defective.	Faulty hard-disk drive subsystem or defective system board.
`Data error`	System received unrecoverable data-read error from diskette or hard-disk drive.	Faulty diskette, diskette drive, or hard-disk drive.
`Decreasing available memory`	Read/write failure during POST prevents system from using available memory.	One or more DIMMs are faulty or improperly seated.

`Diskette drive 0 seek failure`
 	
`Diskette drive 1 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 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.
`Diskette subsystem reset failed`	System could not successfully issue reset command to diskette controller.	Faulty diskette/tape drive controller (defective system board).
`Diskette write protected`	Diskette write-protect feature was activated.	Diskette is write-protected.
`Drive not ready`	Diskette is missing from or is improperly inserted in diskette drive.	Missing, defective, unformatted, or improperly inserted diskette.
`ECC memory error`	Uncorrectable multibit ECC memory error is detected.	Faulty or improperly seated DIMMs or defective system board.

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

Message	Definition	Probable Causes
`Gate A20 failure`	Gate A20 of the keyboard controller malfunctioned.	Faulty keyboard controller (defective system board).
`General failure`	Operating system cannot execute command.	Corrupted or improperly installed operating system.

`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 connected hard-disk drive cable, faulty hard-disk controller subsystem (defective system board), or loose power cable.

`Invalid configuration 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 failure`
 	
`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 controller 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`* `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`*	During memory test, value read at *address* was incorrect.	Faulty or improperly seated DIMMs or defective system board.
`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 user pressing <Spacebar>.
`Network card is not present in the system`	System does not detect NIC.	Incorrect NIC drivers installed.
`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.

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

Message	Definition	Probable Causes
`No boot sector on hard-disk drive`	Incorrect configuration settings in System Setup program, or corrupted operating system.	Incorrect configuration settings in System Setup program, or no operating system on hard-disk drive.
`No timer tick interrupt`	Timer on system board is 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 sub-system (defective system board).
`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 sub-system (defective system board).
`Requested sec-tor not found`	System could not find particular sector on disk, or requested sec-tor is defective.	
`Reset failed`	Disk reset operation failed.	Improperly connected diskette/tape drive, hard-disk drive interface cable, or power cable.
`Sector not found`	MS-DOS is unable to locate sector on dis-kette or hard-disk drive.	Defective sectors on dis-kette or hard-disk drive.
`Seek error`	MS-DOS is unable to locate specific track on diskette or hard-disk drive.	Defective diskette or hard-disk drive.
`Seek operation failed`	System could not find particular address mark on disk.	Faulty diskette or hard-disk drive.
`Shutdown failure`	System board chip is faulty.	Defective system board.

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

Message	Definition	Probable Causes
System halted	System locked up because the processor is not the correct revision.	System processor is not a type supported by Dell and more than 512 MB of RAM is installed.
`Terminator/ processor card not installed! System halted!`	System does not have terminator card or secondary processor.	Terminator card or secondary processor is improperly installed or is not installed.
`Time-of-day clock stopped`	System battery is low.	Defective battery or faulty chip (defective system board).
`Time-of-day not set`	Time or Date settings in System Setup program are incorrect, or the system battery does not work.	Incorrect Time or Date settings, or defective system battery.
`Timer chip counter 2 failed`	Timer circuit on system board is malfunctioning.	Defective system board.
`WARNING: Dell's Disk Monitoring System has detected that drive [0/1] on the [0/1] EIDE controller is operating outside of normal specifications. It is advisable to immediately back up your data and replace your hard-disk drive by calling your support desk or Dell Computer Corporation.`	POST queried EIDE drive for status. Drive detected possible error conditions.	Unreliable or defective drive.

`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 on the Desktop Chassis

This chapter provides procedures for removing the components, assemblies, and subassemblies on the Dell Precision 410 desktop systems. If you are servicing a Dell Precision 410 mini tower system, refer to Chapter 5, "Removing and Replacing Parts on the Mini Tower Chassis."

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 computer 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
- #1 and #2 Phillips-head screwdrivers
- 1/4-inch nutdriver
- Tweezers or long-nose pliers

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

Precautionary 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 system from ESD.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT

Before you start to work on the system, perform the following steps in the sequence listed:

1. **Turn off the computer and all peripherals.**
2. **Disconnect the computer and peripherals from their AC power sources. Also, disconnect any telephone or telecommunication lines from the computer. Doing so reduces the potential for personal injury or shock.**
3. **If you are disconnecting a peripheral from the computer or are removing a component from the system board, wait 10 to 20 seconds after disconnecting the computer from AC power before disconnecting the peripheral or removing the component to avoid possible damage to the system board.**
4. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as the padlock loop on the back of the chassis. If a wrist grounding strap is not available, touch any unpainted metal surface on the back of the computer or on the computer chassis, such as the power supply, to discharge any static charge from your body before touching anything inside the computer.**

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components. Also avoid touching components or contacts on a card and avoid touching pins on a chip.

5. **Verify that the standby LED is not on. If it is on, you may need to wait 10 to 30 seconds for it to go out (see Figure 4-17).**

Computer Cover

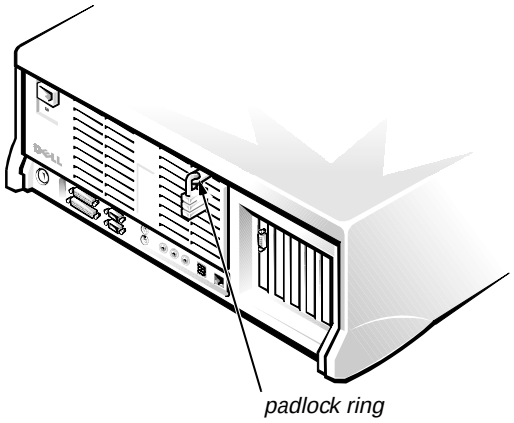


Figure 4-1. Padlock Installed

To remove the computer cover, follow these steps:

1. **Remove the padlock from the padlock ring on the back panel of the computer, if one is installed (see Figure 4-1).**

2. **From the front of the computer, press in the two release buttons (located on the sides of the cover toward the back).**

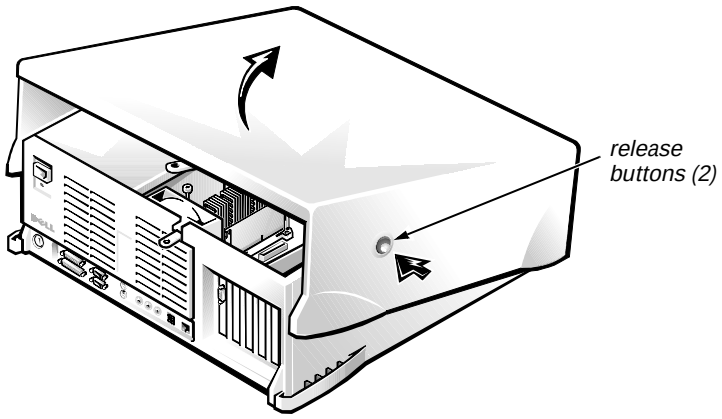


Figure 4-2. Computer Cover Removal

3. **While still pressing the two release buttons, lift the cover at the back, allowing it to pivot up toward you (see Figure 4-2).**

4. **Disengage the plastic hooks that secure the cover to the front of the chassis, and lift the cover away.**

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 computer.

When you boot the system, you will need to reset the chassis intrusion detector by entering the System Setup program and changing the Chassis Intrusion

setting to Not Detected. See Appendix A for information on the System Setup program. If you need further information, see Chapter 3, "Using the System Setup Program," in the *Dell Precision WorkStation 410 Desktop Systems User's Guid*e.

NOTES: After removing and replacing the cover, the chassis intrusion detector will cause the following message to be displayed at the next system start-up:

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

If a setup password has been assigned by someone else, contact that person for information on resetting the chassis intrusion detector.

Power and Reset Buttons

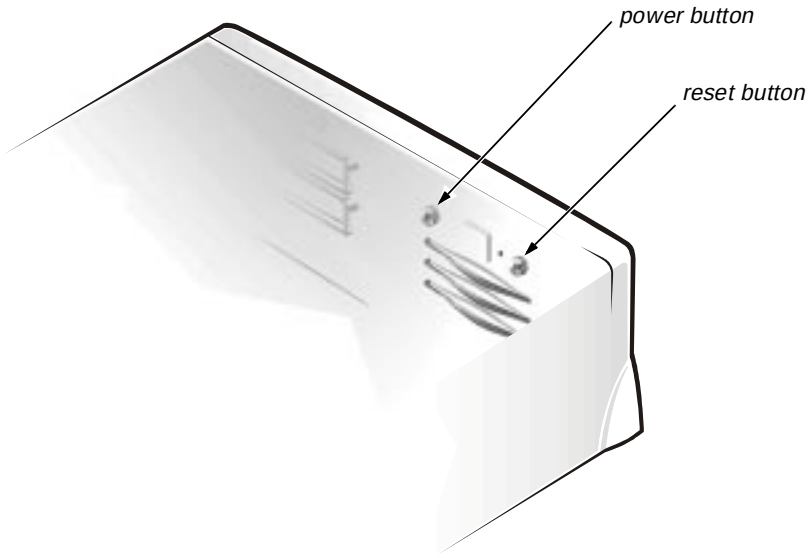


Figure 4-3. Power and Reset Button Removal

To remove the power button, follow these steps:

1. **Remove the computer cover (see Figure 4-2) and place it on your lap with the power button facing the floor.**

   You will need to have access to the inside and outside of the computer cover at the same time. Therefore, you cannot put the cover on a flat surface because you will not be able to push the button out.

2. **From the inside of the computer cover, press down firmly on the largest of the three plastic clips that hold the button in place with your thumb or a small screwdriver.**

3. **Pull outward and down on the button from the outside of the computer cover, unhooking the largest clip as you pull the button away from the computer cover.**

To install a new power button, hook the largest clip in place first. Align the other clips with the corresponding holes in the computer cover. Then press in firmly on the button to latch the other clips in place.

To remove the reset button, follow these steps:

1. **Remove the computer cover (see Figure 4-2) and place it on your lap with the reset button facing the floor.**

2. **From the inside of the computer cover, insert a straightened paper clip or similar tool in one of the two notches on either side of the largest of the three plastic clips.**

3. **Press down firmly in the notch with the paper clip until all of the clips are released.**

4. **If necessary, use the paper clip to push down on the center of the button, extending the button far enough out of the computer cover so you can grasp it with your fingers.**

5. **From the outside of the computer cover, pull the button out and away from the computer cover.**

To insert a new reset button, align the three clips with the corresponding holes in the computer cover. Then press firmly on the button from the outside of the computer cover to latch the button place.

Front-Panel Inserts

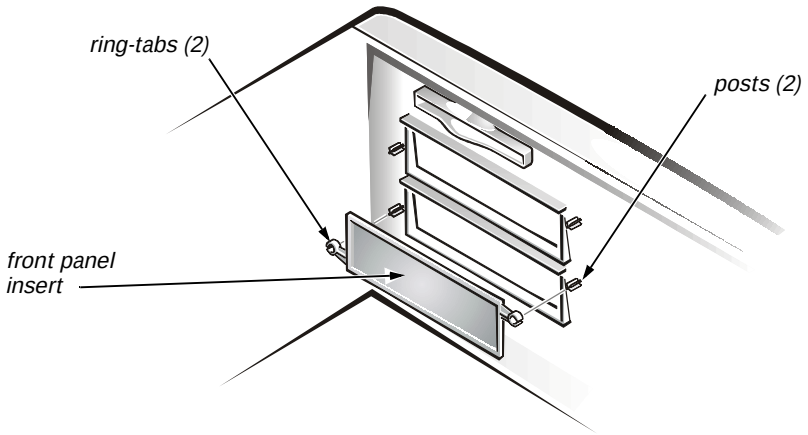


Figure 4-4. 5.25-Inch Front-Panel Insert Removal

To remove a 5.25-inch front-panel insert, work from the outside of the cover. Press in on each end of the insert with your thumbs until the insert snaps free of the cover (see Figure 4-4).

To replace a front-panel insert for a 5.25-inch bay, work from inside the cover. Insert the two ring-tabs (one on each end of the insert) over the posts on the inside of the bay opening, and firmly press both ends of the insert into place.

System Power Supply

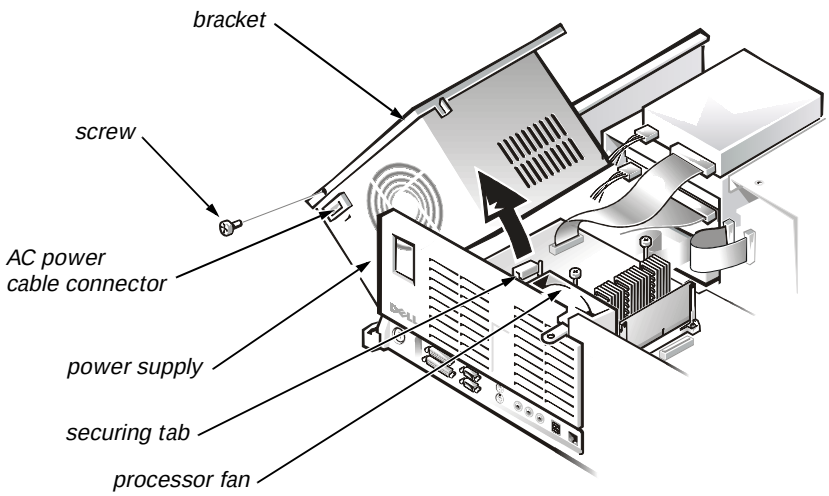


Figure 4-5. System Power-Supply Removal

To remove the system power supply, follow these steps:

1. **Facing the computer from the back, disconnect the AC power cable from the back of the power supply.**
2. **Press the securing tab labeled "RELEASE —>" toward the processor fan, releasing the power supply from the chassis.**
3. **While still pressing the securing tab, rotate the power supply upward to a vertical position (see Figure 4-5).**
4. **Disconnect the DC power cables from the system board and the drives.**
5. **Remove the screw holding the power supply to the bracket (see Figure 4-5).**
6. **Turn the computer so that you are facing the back of the bracket.**
7. **To release the power supply from the bracket, pull out on the large tab in the center of the bracket and push the power supply toward the front of the computer.**
8. **Lift the system power supply from the computer.**

Microprocessor Fan

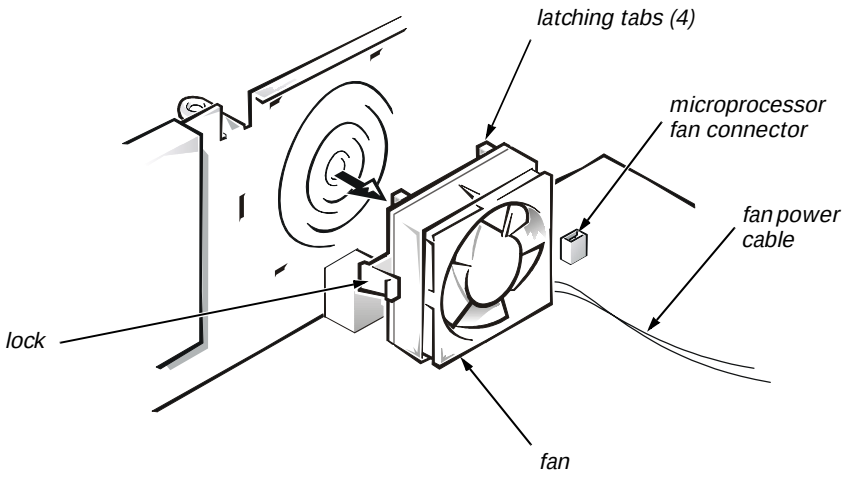


Figure 4-6. Microprocessor Fan Removal

To remove the microprocessor fan, follow these steps:

1. **Unlatch and rotate the power supply up to a vertical position (see Figure 4-5).**
2. **Disconnect the fan power cable from the microprocessor fan connector on the system board (see Figure 4-6).**
3. **Gently pull the plastic lock, and push the fan to the right to disengage the four latching tabs holding the fan to the back of the chassis.**
4. **Pull the fan forward to remove it.**

Drives

Figure 4-7 shows an example of drive hardware that can be installed in the Dell Precision 410 desktop systems. Refer to this figure when you perform any of the procedures in the following subsections.

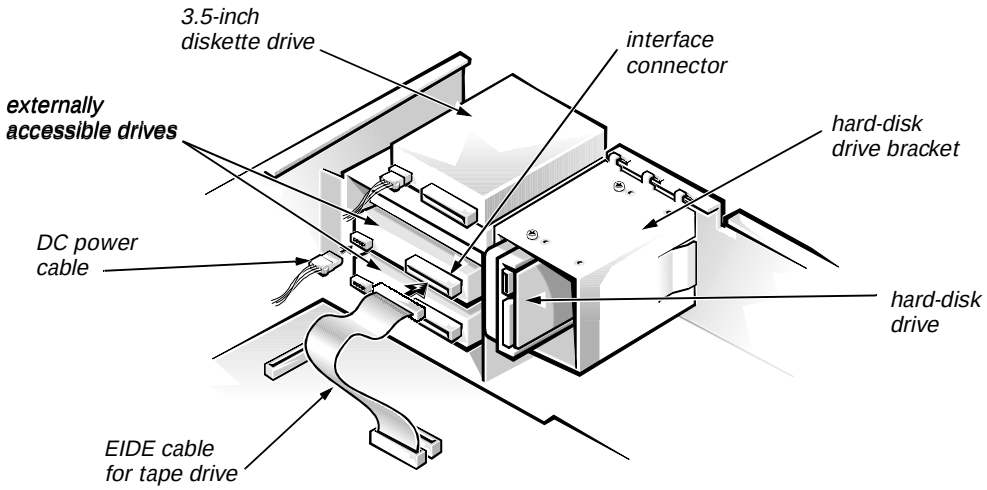


Figure 4-7. Drive Hardware

Externally Accessible Drive Assemblies

The Dell Precision 410 desktop systems can accommodate up to three externally accessible drive assemblies: the 3.5-inch diskette drive and up to two 5.25-inch drives.

3.5-Inch Diskette Drive Assembly

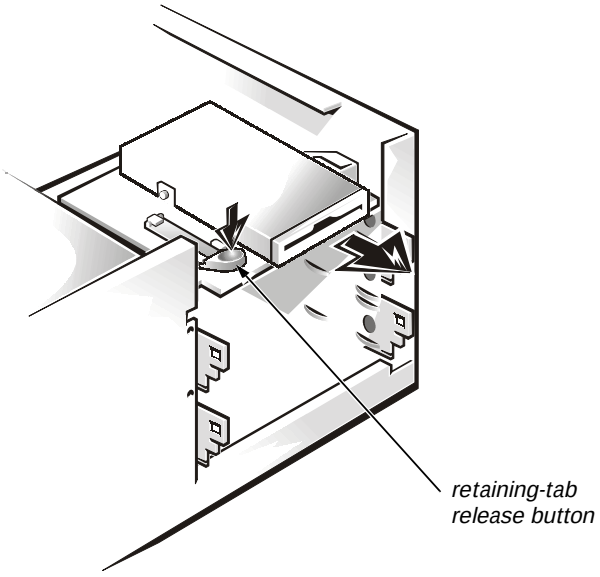


Figure 4-8. 3.5-Inch Diskette Drive Assembly Removal

To remove the 3.5-inch diskette drive assembly, follow these steps:

1. **Rotate the system power supply up and out of the system (see Figure 4-5).**
2. **Disconnect the DC power cable from the back of the diskette drive.**
3. **Disconnect the interface cable from the system board.**

   Note the routing of the DC power and interface cables through the chassis as you disconnect them. It is important to route the cables properly when you replace them to prevent them from being pinched or crimped.
4. **Press down on the retaining-tab release button (see Figure 4-8) and pull the drive assembly forward to remove it from the chassis.**

5. **Remove the screw holding the diskette drive to the bracket (see Figure 4-9).**

6. **Lift the diskette drive up and away from the retaining tabs.**

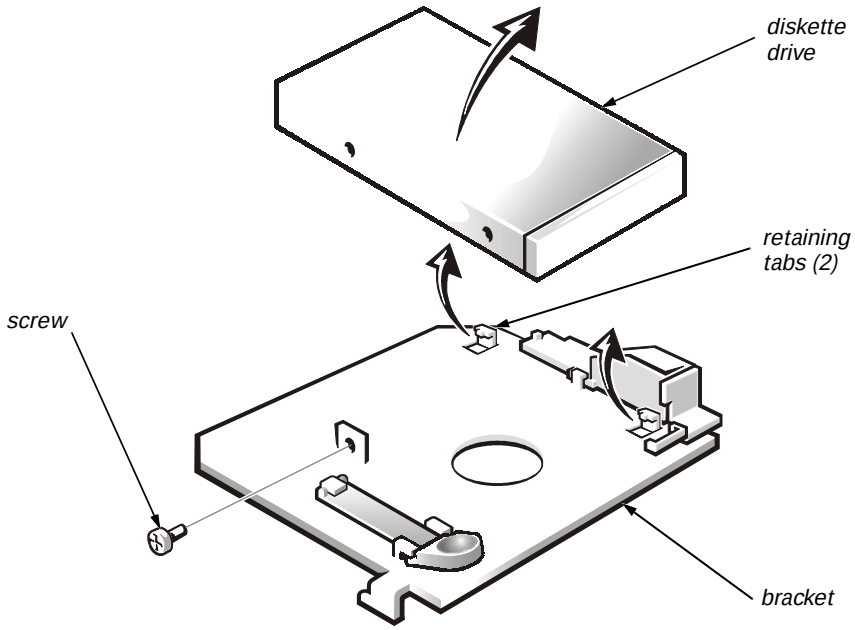


Figure 4-9. 3.5-Inch Diskette Drive Removal

When you replace the 3.5-inch diskette drive on the bracket, be sure that the two retaining tabs on the right side of the bracket engage the mounting holes in the side of the 3.5-inch diskette drive. Then replace the screw that holds the diskette drive to the bracket. To replace the 3.5-inch diskette drive assembly in the chassis, slide the bracket tabs into the guides on the chassis until the bracket snaps into place.

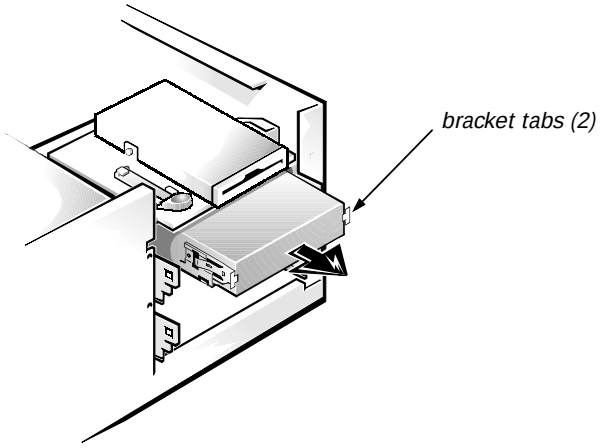


Figure 4-10. 5.25-Inch Drive Assembly Removal

To remove the 5.25-inch drive assembly, follow these steps:

1. **Rotate the system power supply up and out of the system (see Figure 4-5).**
2. **Disconnect the DC power cable from the back of the drive.**
3. **Disconnect the interface cable(s) from the system board.**

   Note the routing of the DC power and interface cables through the chassis as you disconnect them from the system board. It is important to route the cables properly when you replace them to prevent them from being pinched or crimped.

4. **Squeeze the metal bracket tabs that extend from each side of the drive bracket toward each other, and pull the drive assembly out of the bay (see Figure 4-10).**

5. **Unscrew the four screws that secure the drive to the bracket (see Figure 4-11).**

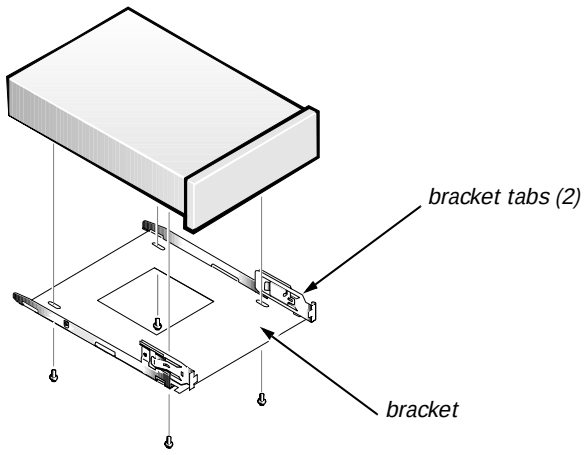


Figure 4-11. 5.25-Inch Drive Removal

To replace the 5.25-inch drive on the bracket, locate the four screw holes around the drive's perimeter. Fit the bracket over the drive, and then tilt the front of the drive up so that the bracket drops down into place. To ensure proper installation, all screw holes should be aligned and the tabs on the front of the bracket should be flush with the front of the drive.

Internal Drive Assemblies in the Hard-Disk Drive Bracket

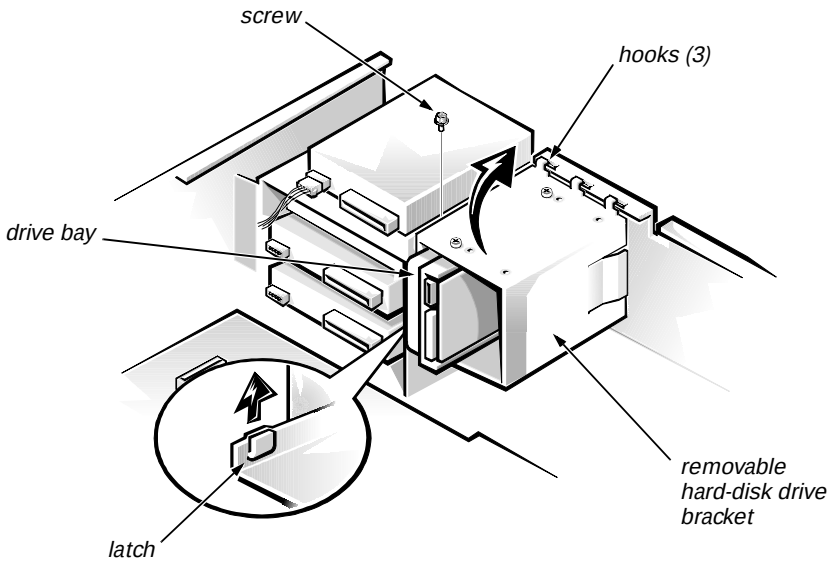


Figure 4-12. Removing the Hard-Disk Drive Bracket

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

1. **If any hard-disk drives are already installed in the bracket, disconnect the DC power cable and interface cable from each drive.**
2. **Remove the screw holding the drive bracket to the drive bay (see Figure 4-12).**
3. **Lift up on the drive bracket to disengage it from the latch on the drive bay and the three hooks on the front of the chassis (see Figure 4-12).**

Hard-Disk Drive

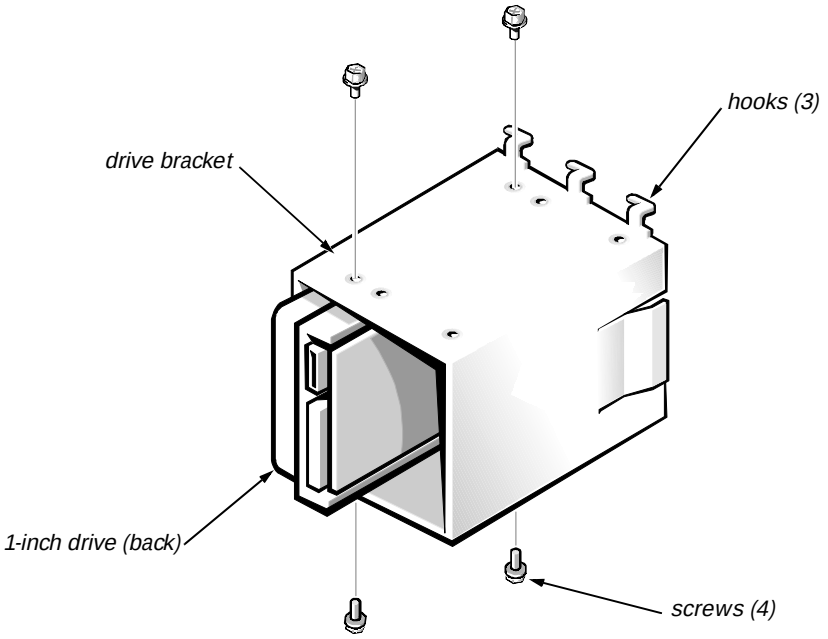


Figure 4-13. Hard-Disk Drive Removal

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

1. **Remove the hard-disk drive bracket (see Figure 4-12).**
2. **Remove the four screws that attach the hard-disk drive to the hard-disk drive bracket (see Figure 4-13).**
3. **Slide the drive out of the hard-disk drive bracket.**

When you replace the hard-disk drive bracket, insert the hooks in the slots on the front of the chassis and slide the bracket to the right. Then lower the bracket to the bottom of the chassis, making sure that the latch on the drive bay is engaged (see Figure 4-12). Replace the screw holding the drive bracket to the drive bay.

NOTE: If you are replacing more than one hard-disk drive in the bracket, do not fully tighten any of the screws that hold the drives in the bracket until all of the drives have been placed into the bracket. This prevents the bracket from compressing, which could make it difficult to insert additional drives.

Card Guide

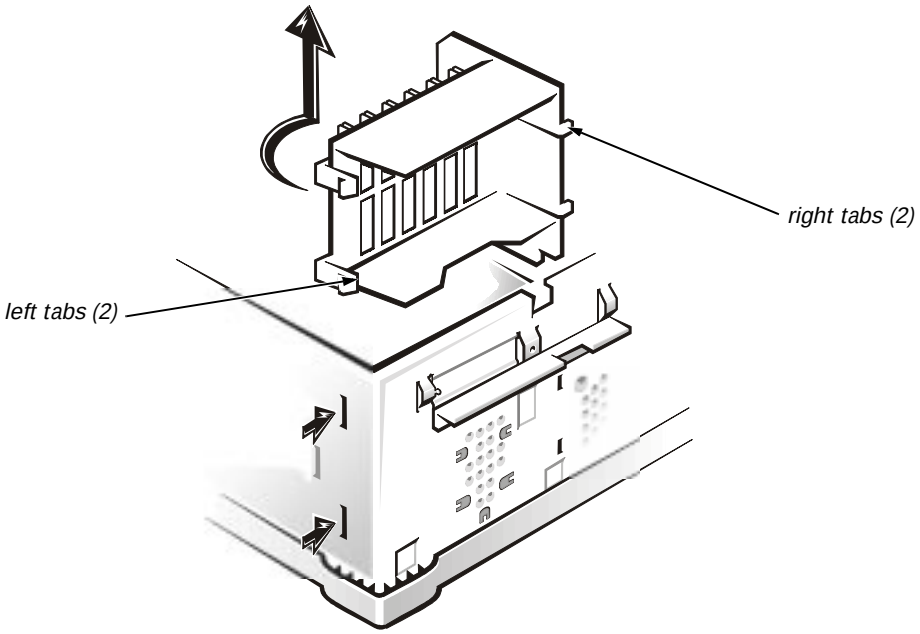


Figure 4-14. Card Guide Removal

To remove the card guide, follow these steps:

1. **Remove the hard-disk drive bracket (see Figure 4-12).**
2. **Face the computer from the front. From the outside of the chassis, press in with your fingers on the two tabs on the left side of the card guide (see Figure 4-14). This will release the left tabs of the card guide from the chassis.**
3. **Rotate the released side of the card guide away from the chassis. The left side of the card guide will swing away from the chassis.**
4. **With the left side of the card guide away from the chassis, you can then pull the card guide back and out of the chassis, which releases the two right tabs.**

NOTE: Some older PCI and other types of cards may be so long that you cannot remove the card guide until you first remove the cards. Most newer cards are not long enough to interfere with card guide removal.

Speaker

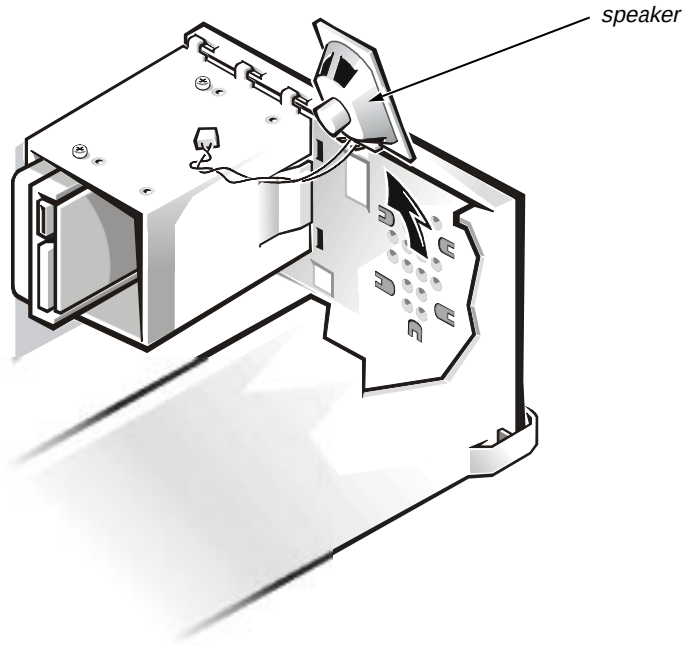


Figure 4-15. Speaker Removal

To remove the speaker, follow these steps:

1. **Remove the card guide (see Figure 4-14).**
2. **Disconnect the speaker cable connector from the control panel (see Figure 4-16).**
3. **Lift the speaker out of the retaining slots on the front of the chassis (see Figure 4-15).**

Control Panel

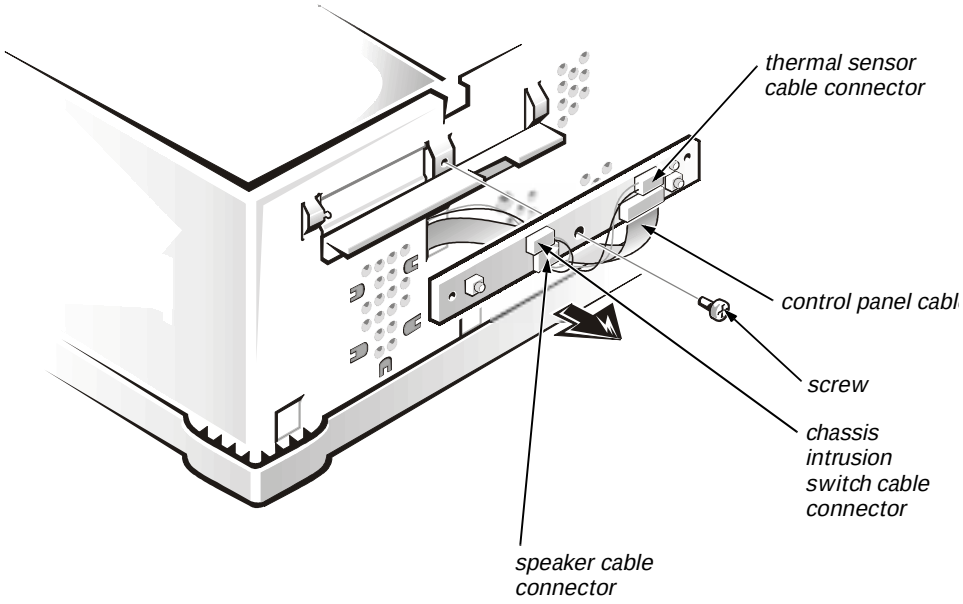


Figure 4-16. Control Panel Removal

To remove the control panel, follow these steps:

1. **Disconnect the control panel cable from the PANEL connector on the system board (see Figure 4-17 for the location of the PANEL connector).**
2. **Remove the card guide (see Figure 4-14).**
3. **Disconnect the speaker cable connector, the chassis intrusion switch cable connector, and the thermal sensor cable connector from the control panel (see Figure 4-16).**
4. **Remove the mounting screw that secures the control panel to the chassis.**
5. **Pull out on the control panel to detach it from the chassis.**

System Board Components

The subsections that follow contain procedures for removing system board components, which are shown in Figure 4-17.

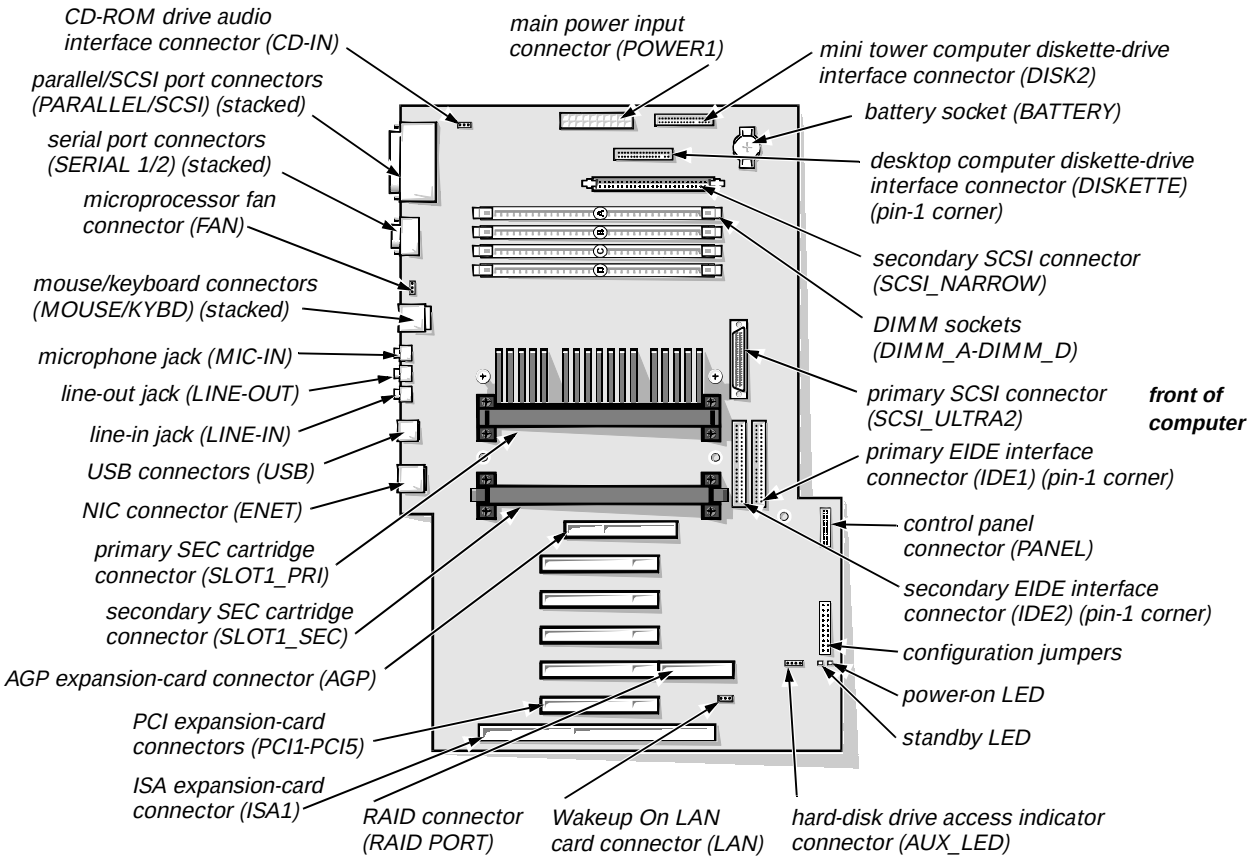


Figure 4-17. System Board Components

Expansion Cards

There are seven expansion-card connectors on the system board (see Figure 4-18). Expansion-card connectors PCI1 through PCI5 support 32-bit PCI expansion cards; expansion-card connector AGP supports a 32-bit AGP expansion card; and expansion-card connector ISA1 can accommodate an 8- or 16-bit ISA expansion card.

NOTES: Connector ISA1 shares expansion-card slot space with connector PCI5. Therefore, only one card of either type can be installed in this slot.

PCI4 has a connector extension to support a PCI RAID controller (see Figure 4-17 for the location of the PCI connectors).

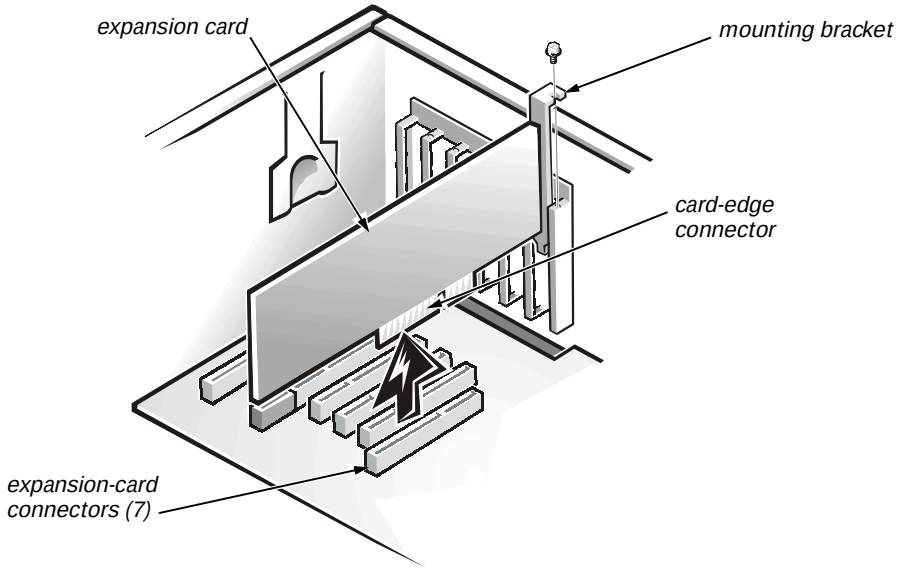


Figure 4-18. Removing an Expansion Card

Follow this general procedure to remove an expansion card:

1. **If necessary, disconnect any cables connected to the card.**
2. **Unscrew the mounting bracket (see Figure 4-18) of the card you want to remove.**
3. **Grasp the card by its outside corners, and ease it out of its connector.**
4. **If you are removing the card permanently, install a metal filler bracket over the empty card-slot opening.**

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

DIMMs

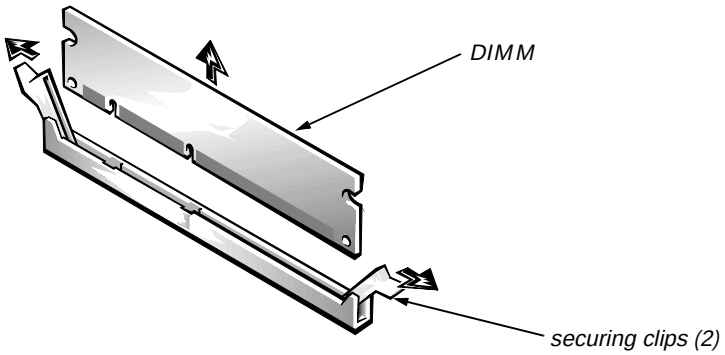


Figure 4-19. DIMM Removal

To remove a DIMM, follow these steps:

1. **Unlatch and rotate the power supply up to a vertical position (see Figure 4-5).**
2. **Push outward on the DIMM socket securing clips (see Figure 4-19) until the DIMM is released from its socket.**
3. **Lift the DIMM away from the socket.**

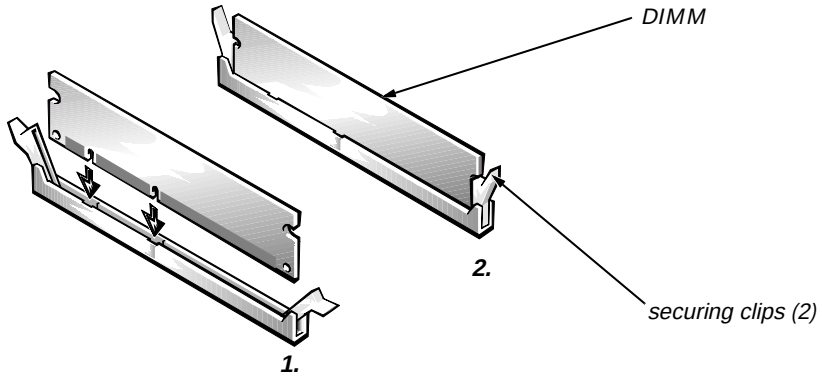


Figure 4-20. DIMM Installation

To replace a DIMM, press the DIMM fully into the socket (see step 1 of Figure 4-20) while closing the securing clips to lock the DIMM into the socket (see step 2 of Figure 4-20).

Microprocessor SEC Cartridge/Heat Sink Assembly

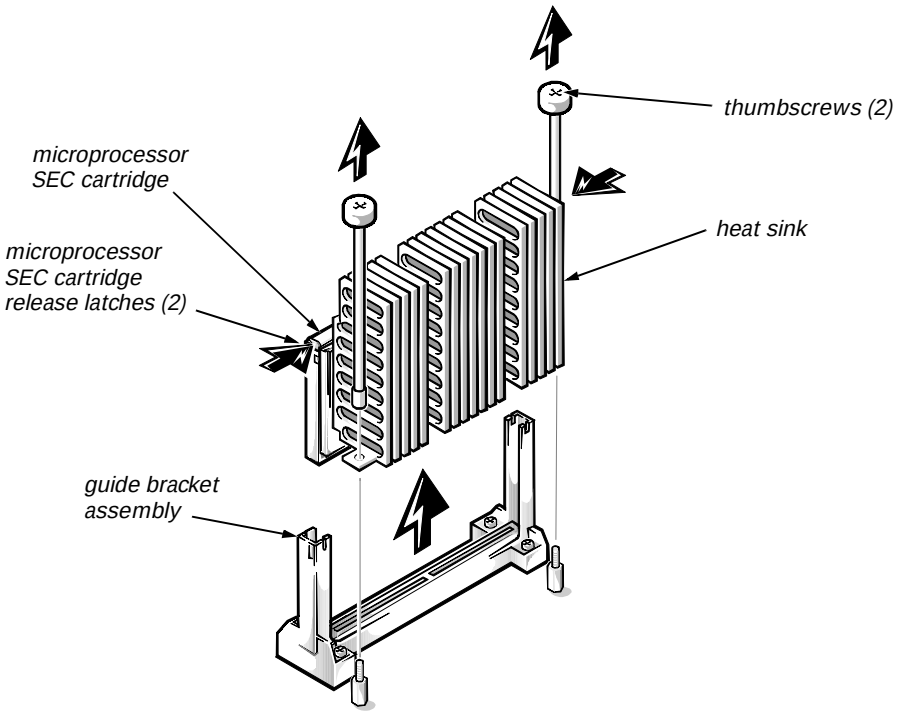


Figure 4-21. Microprocessor SEC Cartridge/Heat Sink Removal

To remove a microprocessor SEC cartridge/heat sink assembly, follow these steps:

WARNING: The microprocessor SEC cartridge/heat sink assembly can get extremely hot. Be sure that the assembly has had sufficient time to cool before you touch it.

1. **Unscrew and remove the two thumbscrews that secure the heat sink to the system board.**
2. **Press the microprocessor SEC cartridge release latches inward until they snap into position.**
3. **Grasp the microprocessor SEC cartridge firmly, and pull straight up on the cartridge to remove it from the guide bracket assembly (see Figure 4-21).**

   You must use up to 15 pounds of force to disengage the microprocessor SEC cartridge from its connector.

To install a microprocessor SEC cartridge/heat sink assembly, first verify that the cartridge release latches are pulled out. Then slide the cartridge into the guide bracket assembly, with the heat sink toward the bottom of the chassis, and firmly seat the assembly. You must use up to 25 pounds of force to seat the cartridge in its connector. Install the two thumbscrews that secure the heat sink to the system board.

Terminator Card

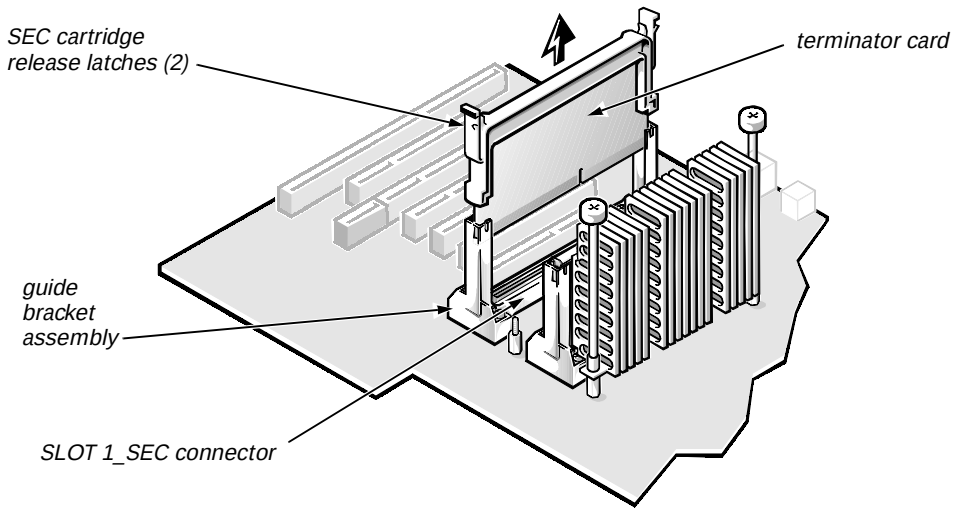


Figure 4-22. Terminator Card Removal

If you are installing a secondary microprocessor SEC cartridge/heat sink assembly, you need to remove the terminator card from the SLOT1_SEC connector on the system board.

1. **Press the microprocessor SEC cartridge release latches inward until they snap into position (see Figure 4-22).**
2. **Pull the terminator card straight out to remove it from the connector.**

System Battery

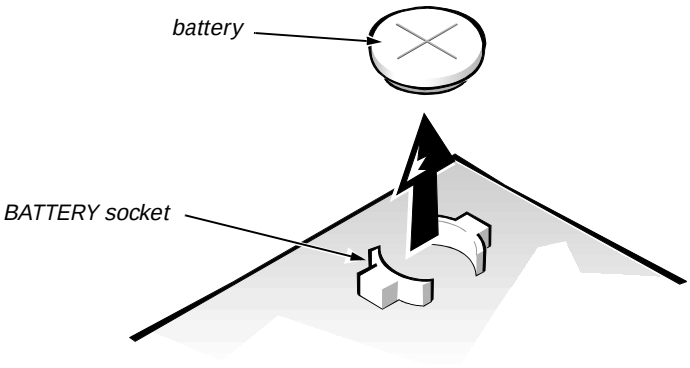


Figure 4-23. System Battery Removal

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.

To remove the system battery, follow these steps:

1. **If possible, enter the System Setup program and print the System Setup screens.**
2. **Rotate the power supply up until it locks (see Figure 4-5).**
3. **Remove the system battery (see Figure 4-23).**

   Carefully pry the system battery out of its socket with your fingers or with a blunt, nonconducting object, such as a plastic screwdriver.

When you replace the system battery, orient the new battery with the "+" facing up. Insert the battery into its socket and snap it into place.

System Board

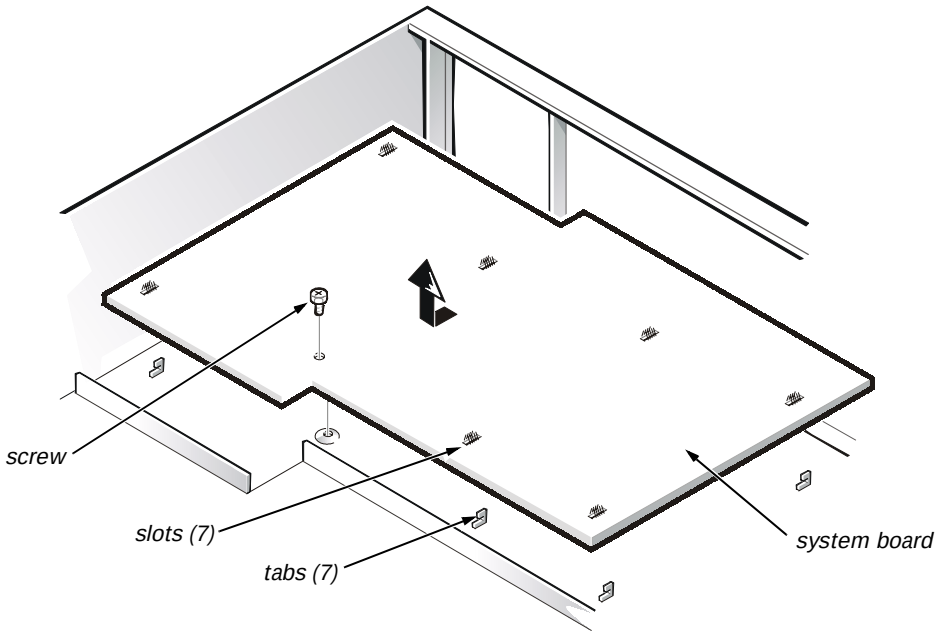


Figure 4-24. System Board Removal

To remove the system board, follow these steps:

1. **Place the computer on a flat surface.**
2. **Disconnect all cables from their connectors at the back of the computer.**
3. **Unlatch and rotate the power supply up to a vertical position (see Figure 4-5).**
4. **Disconnect all cables from the system board.**
5. **Remove the microprocessor fan (see Figure 4-6).**
6. **If a 5.25-inch drive is installed in the lower of the two external bays, remove it or pull it forward far enough to not interfere with the system board removal (see Figure 4-10).**
7. **Remove the screw that secures the system board to the bottom of the chassis (see Figure 4-24).**
8. **Slide the system board toward the front of the chassis until it stops.**
9. **Carefully lift the system board out of the chassis (be sure to lift evenly and not twist the system board).**

If you are replacing a system board, remove the DIMMs, the primary microprocessor SEC cartridge/heat sink assembly, and the terminator card or secondary microprocessor assembly, and install them on the replacement board.

When you reinstall the system board, before you slide the system board back to lock it in position, push down near each slot to engage the grounding clip onto its corresponding tab. Push evenly on both sides of the system board as you slide it into position (do not twist the system board).

CHAPTER 5
Removing and Replacing Parts on the Mini Tower Chassis

This chapter provides procedures for removing the components, assemblies, and subassemblies in the Dell Precision 410 mini tower systems. If you are servicing a Dell Precision 410 desktop system, refer to Chapter 4, "Removing and Replacing Parts on the Desktop Chassis."

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 computer 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
- #1 and #2 Phillips-head screwdrivers
- 1/4-inch nutdriver
- Tweezers or long-nose pliers

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

Precautionary 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 system from ESD.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT

Before you start to work on the system, perform the following steps in the sequence listed:

1. **Turn off the computer and all peripherals.**
2. **Disconnect the computer and peripherals from their AC power sources. Also, disconnect any telephone or telecommunication lines from the computer. Doing so reduces the potential for personal injury or shock.**
3. **If you are disconnecting a peripheral from the computer or are removing a component from the system board, wait 10 to 20 seconds after disconnecting the computer from AC power before disconnecting the peripheral or removing the component to avoid possible damage to the system board.**
4. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as the padlock loop on the back of the chassis. If a wrist grounding strap is not available, touch any unpainted metal surface on the back of the computer or on the computer chassis, such as the power supply, to discharge any static charge from your body before touching anything inside the computer.**

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components. Also avoid touching components or contacts on a card and avoid touching pins on a chip.

5. **Verify that the standby LED is not on. If it is on, you may need to wait 10 to 30 seconds for it to go out (see Figure 5-17).**

Computer Cover

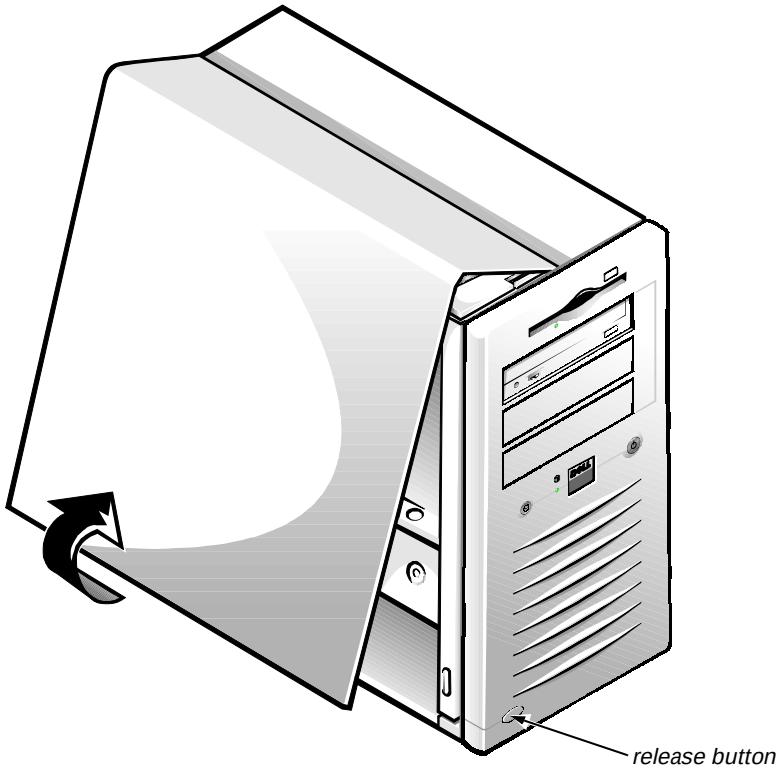


Figure 5-1. Computer Cover Removal

To remove the computer cover, follow these steps:

1. **Remove the padlock from the padlock ring on the back panel of the computer, if one is installed (see Figure 5-2).**

2. **Facing the left side of the computer, press the release button at the bottom-left corner of the front bezel (see Figure 5-1).**

3. **Lift the bottom of the cover, allowing it to pivot up toward you.**

4. **Disengage the tabs that secure the cover to the top of the chassis, and lift the cover away.**

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 computer.

When you boot the system, you will need to reset the chassis intrusion detector by entering the System Setup program and changing the Chassis Intrusion setting to Not Detected. See Appendix A for information on the System Setup program. If you need further information, see Chapter 3, "Using the System Setup Program," in the *User's Guide*.

NOTES: After removing and replacing the cover, the chassis intrusion detector will cause the following message to be displayed at the next system start-up:

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

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

Front Bezel

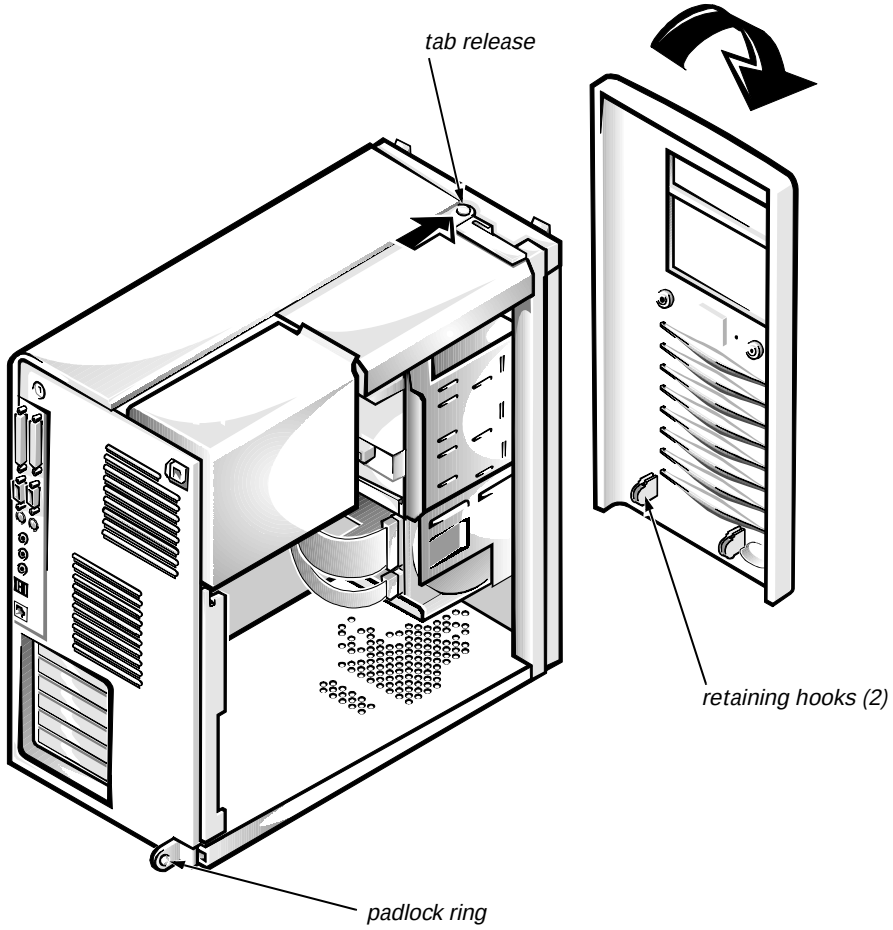


Figure 5-2. Front Bezel Removal

To remove the front bezel, follow these steps:

1. **Press the tab release marked with the icon (see Figure 5-2).**
2. **While still pressing the tab release, tilt the bezel away from the chassis.**
3. **Disengage the two retaining hooks at the bottom of the bezel, and pull the bezel away from the chassis.**

Power and Reset Buttons

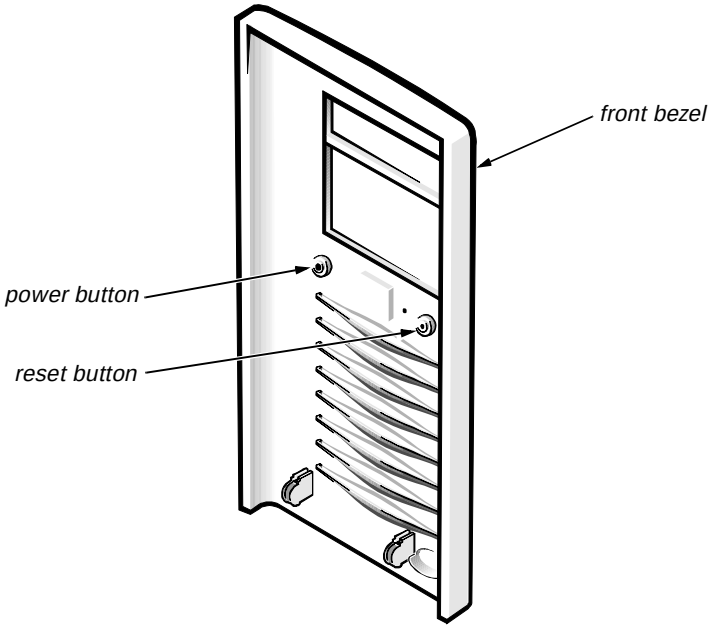


Figure 5-3. Power and Reset Button Removal

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

1. **Lay the front bezel (see Figure 5-3) on a flat work surface, with the back of the bezel facing up.**

2. **To remove the power button or the reset button, use a small screwdriver and push in the two or three plastic clips that hold the button to the bezel.**

   When these clips are released, the button comes free from the bezel.

Front-Panel Inserts

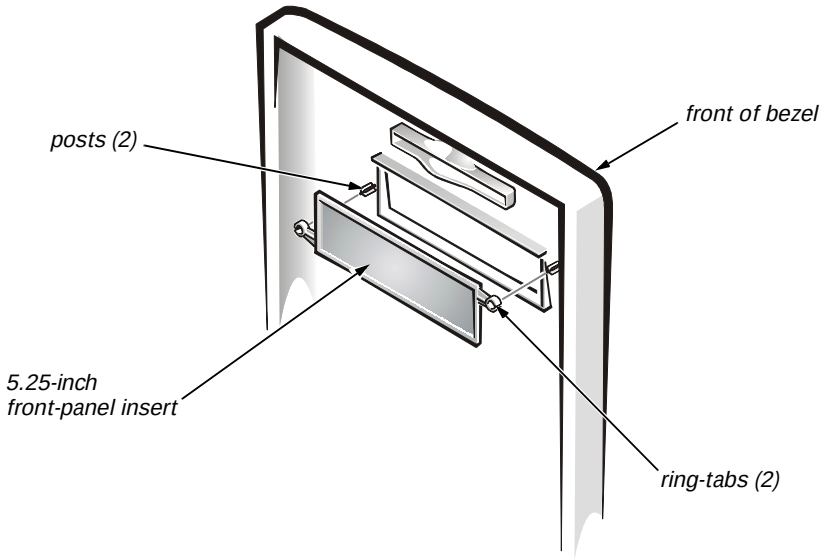


Figure 5-4. 5.25-Inch Front-Panel Insert Removal

To remove a 5.25-inch front-panel insert, follow these steps:

1. **Hold the bezel (see Figure 5-4) with the front facing you.**
2. **From the front of the bezel, use your thumbs to press inward on the insert until it snaps free of the bezel.**

To replace a 5.25-inch front-panel insert, position the two ring-tabs over the posts on the inside of the bay opening, and then press the ring tabs over the posts.

Card Guide

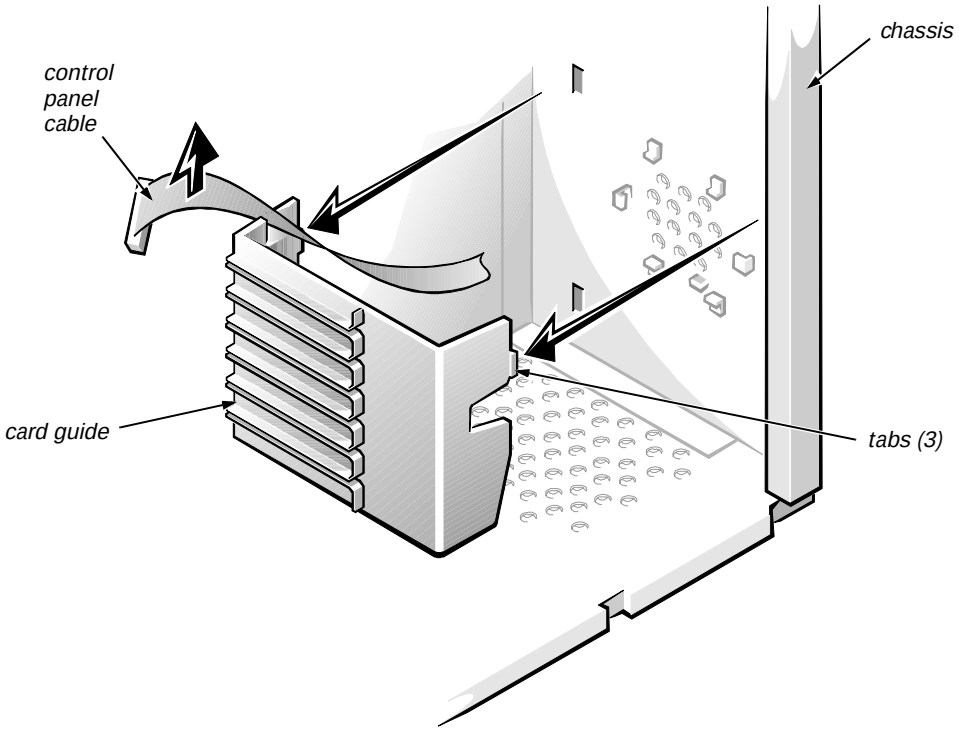


Figure 5-5. Card Guide Removal

To remove the card guide, follow these steps:

1. **Press in with your thumb on the outer side of the card guide (see Figure 5-5). This will release the outer tab from the chassis.**
2. **Pull the released side of the card guide away from the chassis. The outer side of the card guide will swing away from the chassis.**
3. **Slide the control panel cable up out of the slot in the card guide.**
4. **With the outer side of the card guide away from the chassis, you can then pull the card guide back and out of the chassis, which releases the inner two tabs.**

NOTE: Some older PCI and other types of cards may be so long that you cannot remove the card guide until you first remove the cards. Most newer cards are not long enough to interfere with card guide removal.

Control Panel

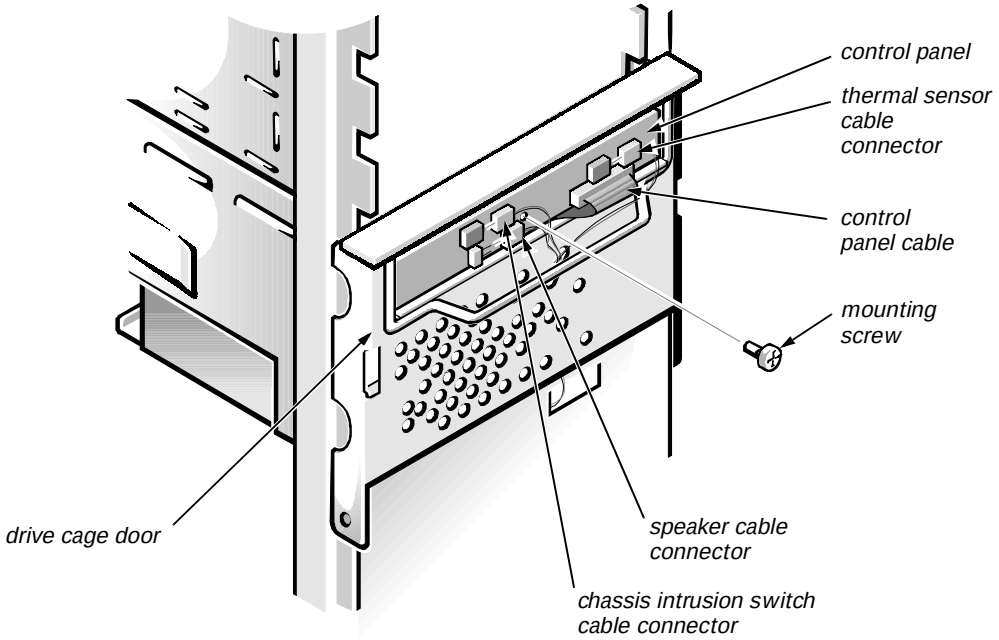


Figure 5-6. Control Panel Removal

To remove the control panel, follow these steps:

1. **Disconnect the control panel cable from the PANEL connector on the system board (see Figure 5-17 for the location of the PANEL connector).**

2. **Remove the card guide. Be sure to remove the control panel cable from the slot on the inner side of the card guide (see Figure 5-5).**

   Note the routing of the control panel cable as you remove it from the chassis. It is important to route the cable properly when you replace it to prevent it from being pinched or crimped.

3. **Disconnect the speaker cable connector, the chassis intrusion switch cable connector, and the thermal sensor cable connector from the control panel (see Figure 5-6).**

4. **Remove the mounting screw that secures the control panel to the chassis.**

5. **Remove the control panel cable.**

   Open the drive cage door, pull the control panel cable through the opening in the front wall, and carefully remove the cable from the routing tab in the drive cage door.

6. **Pull out on the control panel to detach it from the chassis.**

Speaker

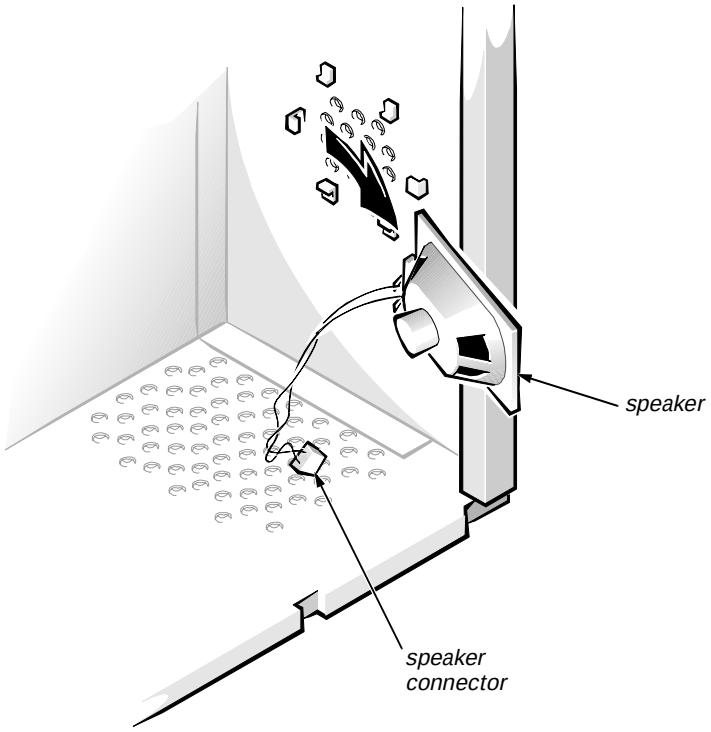


Figure 5-7. Speaker Removal

To remove the speaker, follow these steps:

1. **Remove the card guide (see Figure 5-5).**
2. **Disconnect the speaker cable connector from the control panel (see Figure 5-6).**
3. **Lift the speaker out of the retaining slots on the front of the chassis (see Figure 5-7).**

Drives

Figure 5-8 shows an example of drive hardware that can be installed in the Dell Precision 410 mini tower system. Refer to this figure when you perform any of the procedures in the following subsections.

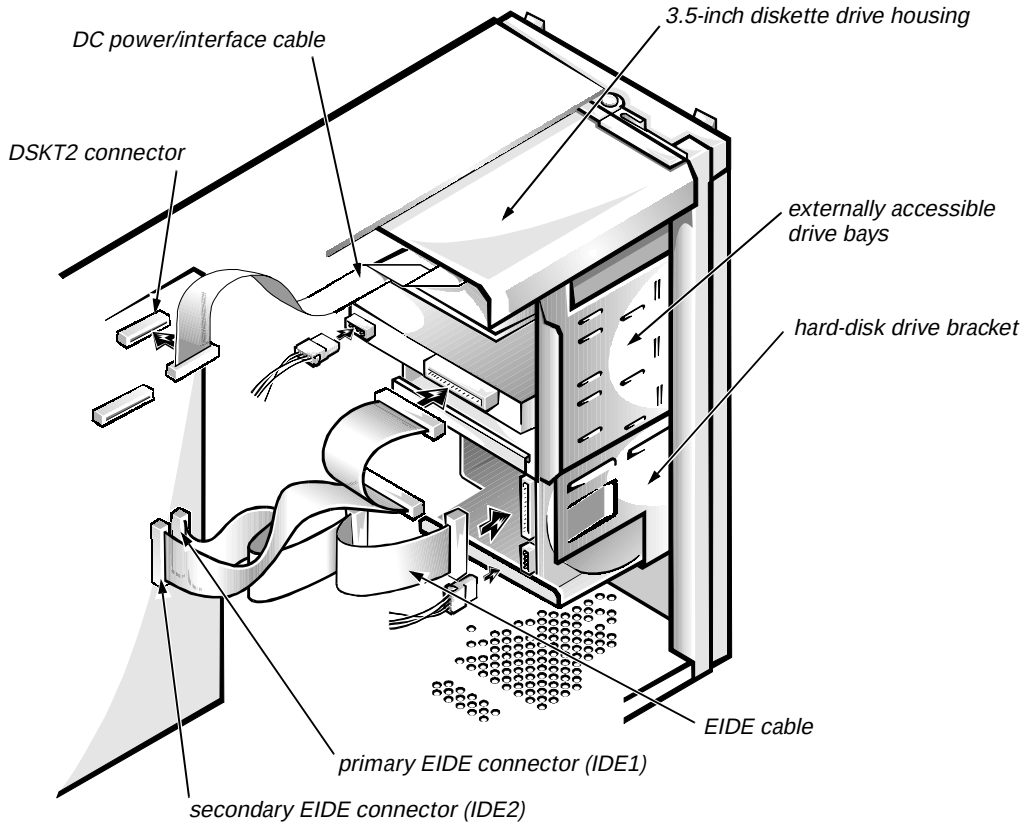


Figure 5-8. Drive Hardware

Externally Accessible Drive Assemblies

The Dell Precision 410 mini tower system can accommodate up to four externally accessible drive assemblies: the 3.5-inch diskette drive and up to three 5.25-inch drives.

3.5-Inch Diskette Drive Assembly

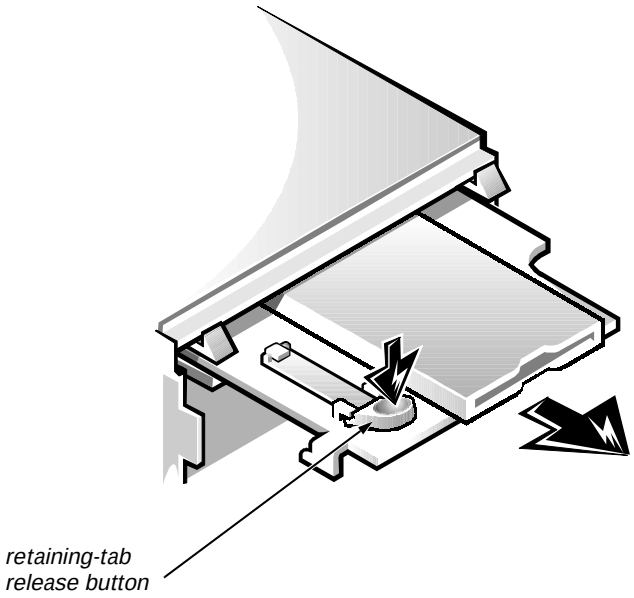


Figure 5-9. 3.5-Inch Diskette Drive Assembly Removal

To remove the 3.5-inch diskette drive assembly, follow these steps:

1. **Disconnect the DC power/interface cable from the system board.**

   Note the routing of the DC power/interface cable through the chassis as you remove it from the system board. It is important to route the cable properly when you replace it to prevent it from being pinched or crimped.

2. **Press the retaining-tab release button (see Figure 5-9) and pull the drive assembly forward to remove it.**

3. **Press down on the drive release lever (see Figure 5-10).**

4. **Holding the drive release lever down, slide the drive to the right, pulling it out from under the hook and away from the retaining tabs.**

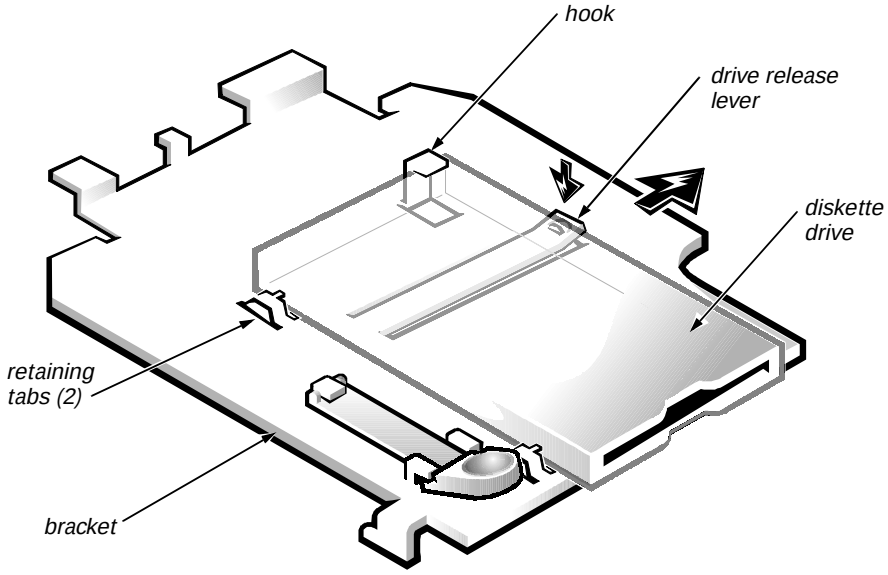


Figure 5-10. 3.5-Inch Diskette Drive Removal

When you replace the 3.5-inch diskette drive on the bracket, be sure that the two retaining tabs on the left side of the bracket engage the mounting holes in the side of the 3.5-inch diskette drive.

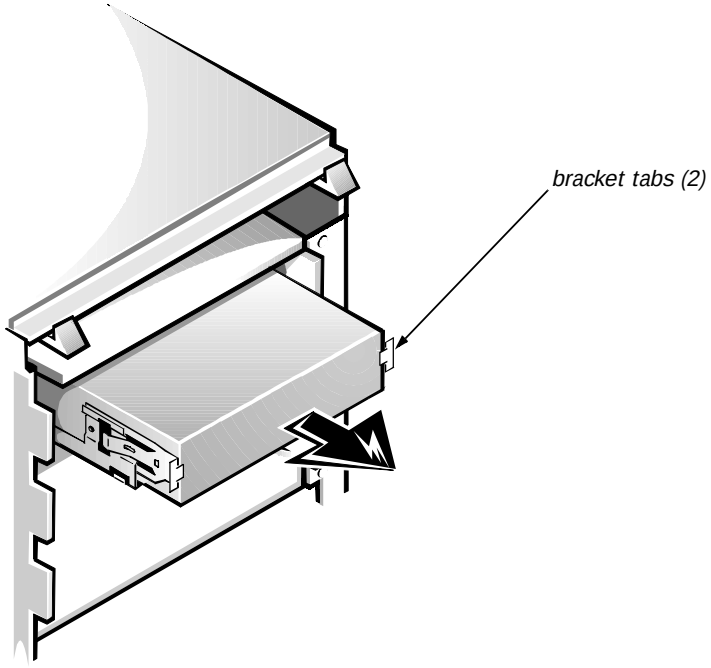


Figure 5-11. 5.25-Inch Drive Assembly Removal

To remove a 5.25-inch drive assembly from one of the drive bays, follow these steps:

1. **Disconnect the DC power cable and the interface cable from the back of the drive.**
2. **Press the two bracket tabs (one on each side of the drive), and slide the drive assembly forward to remove it (see Figure 5-11).**

3. **To remove the drive from the bracket, turn the drive/bracket assembly upside down and unscrew the four screws that secure the drive to the bracket (see Figure 5-12).**

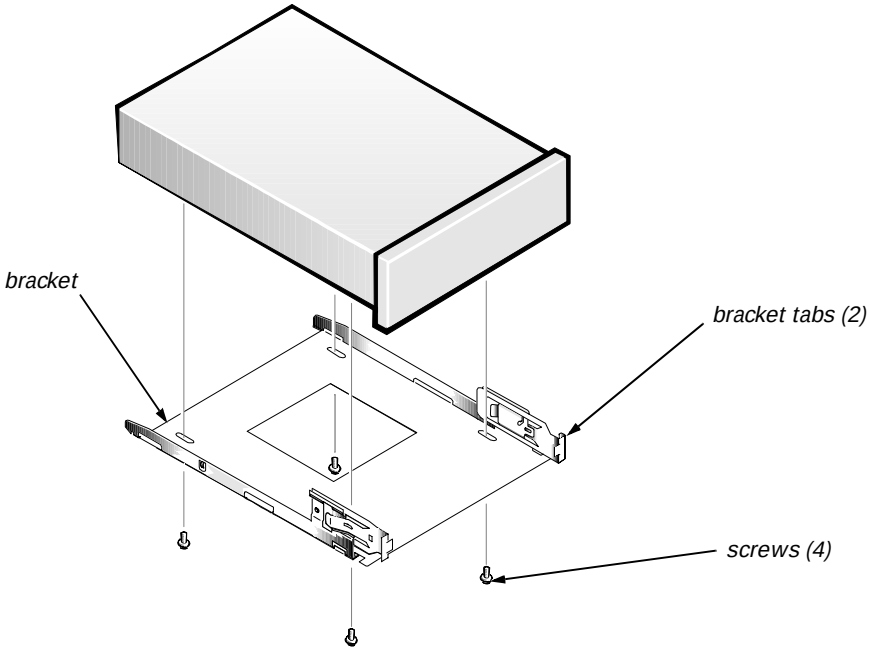


Figure 5-12. 5.25-Inch Drive Removal

When you replace the 5.25-inch drive, align the front of the drive flush with the bracket tabs at the front of the bracket. Insert the four screws, and tighten them in the order stamped on the bottom of the 5.25-inch drive bracket.

Internal Drive Assemblies in the Hard-Disk Drive Bracket

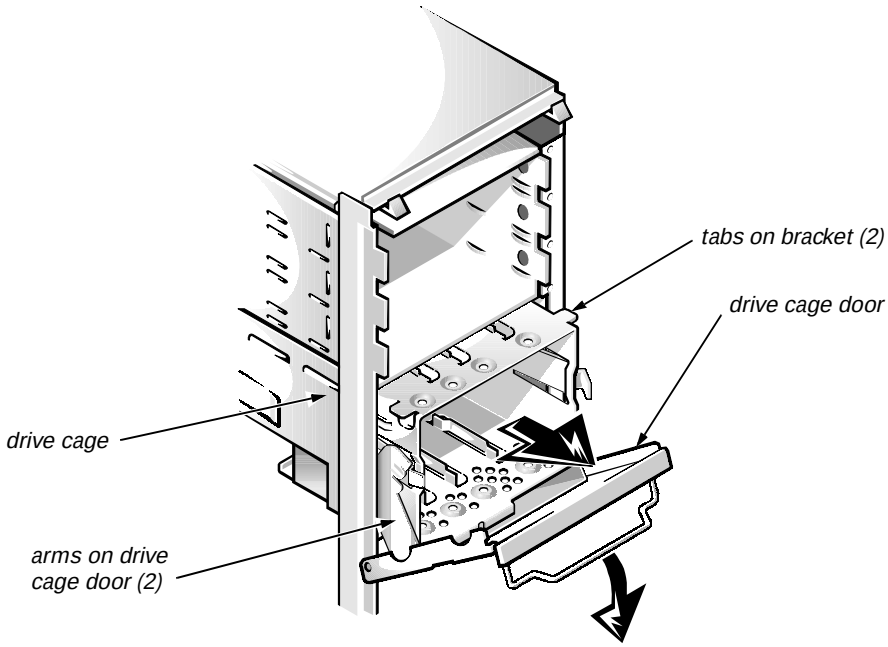


Figure 5-13. Removing the Hard-Disk Drive Bracket

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

1. **Open the drive cage door.**

   If any hard-disk drives are already installed in the bracket, disconnect the DC power cable and interface cable from each drive.

   Grasp the handle of the drive cage door on the front of the chassis, and pull out and down until the arms on the drive cage door (see Figure 5-13) disengage from the tabs on the bracket. This action pulls the bracket out of the drive cage about 1 to 3 inches.

2. **Remove the bracket from the drive cage.**

   When removing the bracket from the drive cage, you should remove it slowly and cautiously, using two hands to support the weight of the bracket. The bracket can be quite heavy, especially if it is populated with drives.

Hard-Disk Drive

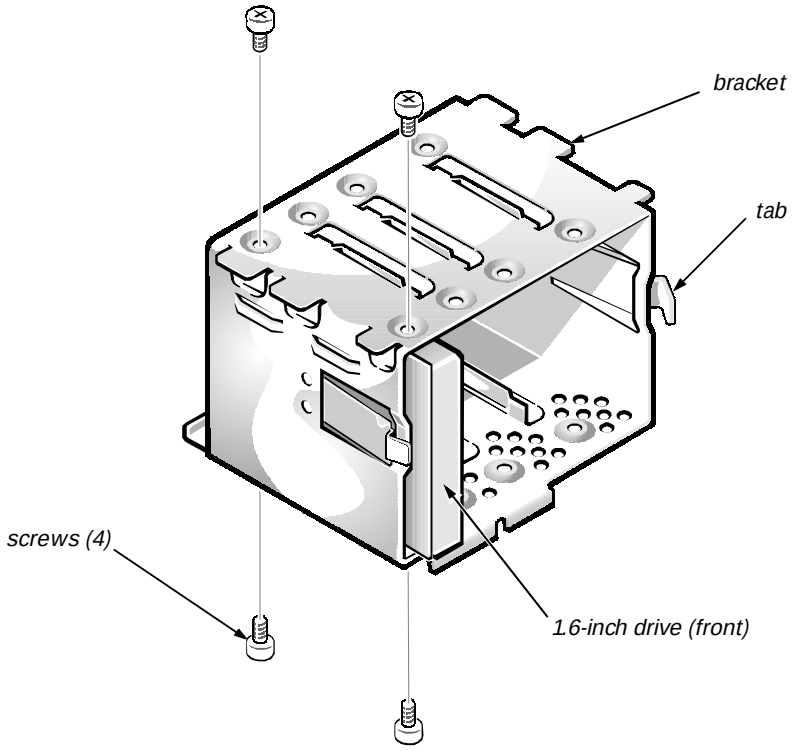


Figure 5-14. Hard-Disk Drive Removal

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

1. **Remove the hard-disk drive bracket (see Figure 5-13).**
2. **Remove the four screws that attach the hard-disk drive to the hard-disk drive bracket (see Figure 5-14).**
3. **Slide the drive out of the hard-disk drive bracket.**

When you replace the hard-disk drive bracket, be sure that it is pushed fully into the system and snapped into position before you close the drive cage door (See Figure 5-13).

If you are replacing more than one hard-disk drive in the bracket, do not fully tighten any of the screws that hold the drives in the bracket until all of the drives have been placed into the bracket. This prevents the bracket from compressing, which could make it difficult to insert additional drives.

When you are ready to replace the front bezel, be sure to fold the drive cage door handle down to avoid interference with the front bezel.

System Power Supply

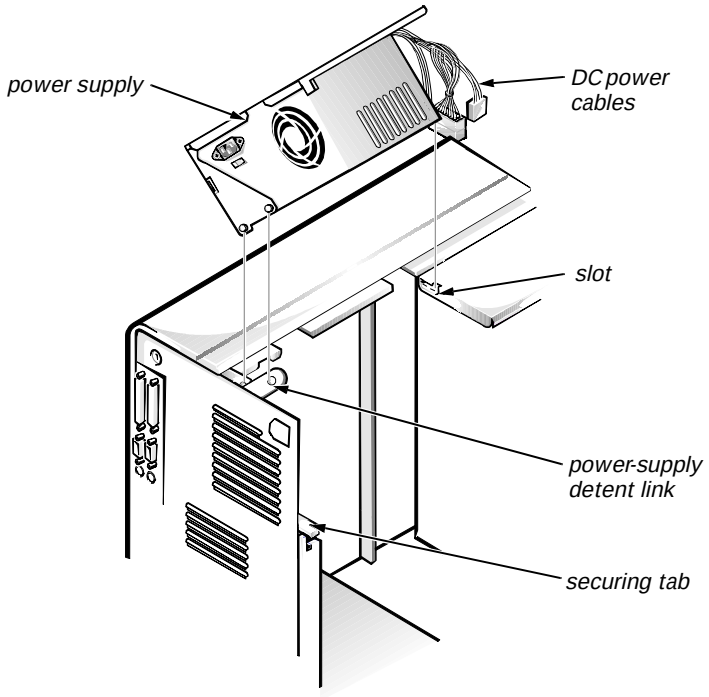


Figure 5-15. System Power-Supply Removal

To remove the system power supply, follow these steps:

1. **Disconnect the AC power cable from the back of the power supply.**
2. **Free the system power supply from the securing tab labeled "RELEASE —>," and rotate it upward until it locks (see Figure 5-15).**

   Press the securing tab to release the power supply.
3. **Disconnect the DC power cables from the system board and the drives.**

   Note the routing of the DC power cables underneath the tabs in the chassis as you remove them from the system board and drives. It is important to route these cables properly when you replace them to prevent them from being pinched or crimped.
4. **Facing the left side of the computer, move the front end of the system power supply toward you, and lift it to disengage the power supply from the slot in the chassis.**
5. **Lift the system power supply from the computer.**

When you reinstall the power supply, place the power-supply detent link over the pin on the power supply as you position the power supply in the chassis opening.

Microprocessor Fan

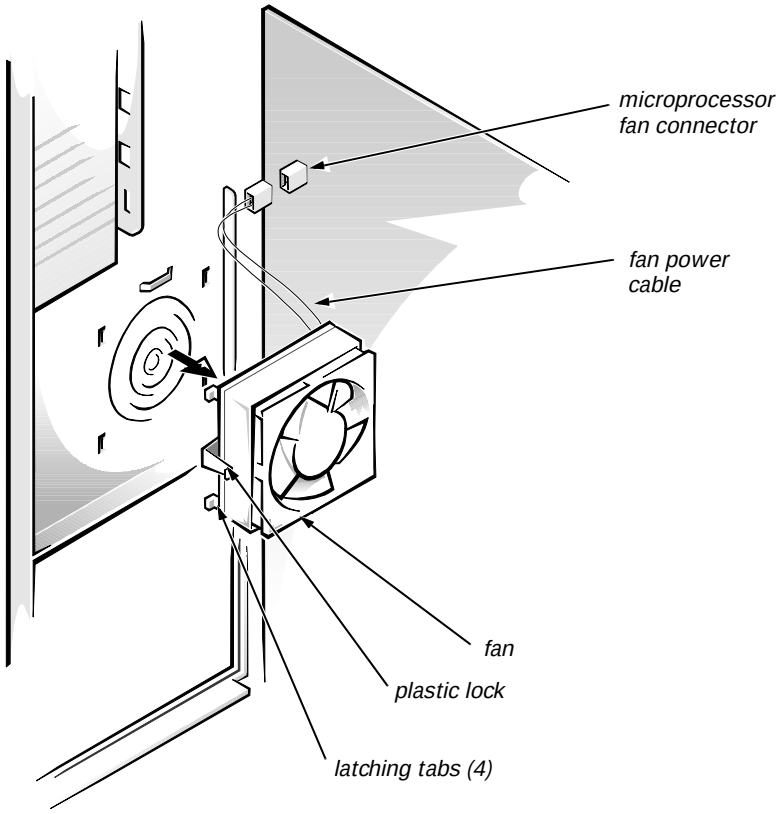


Figure 5-16. Microprocessor Fan Removal

To remove the microprocessor fan, follow these steps:

1. **Rotate the power supply up until it locks (see Figure 5-15).**
2. **Disconnect the fan power cable from the microprocessor fan connector (see Figure 5-16).**
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. **Pull the fan forward to remove it.**

System Board Components

The subsections that follow contain procedures for removing system board components, which are shown in Figure 5-17.

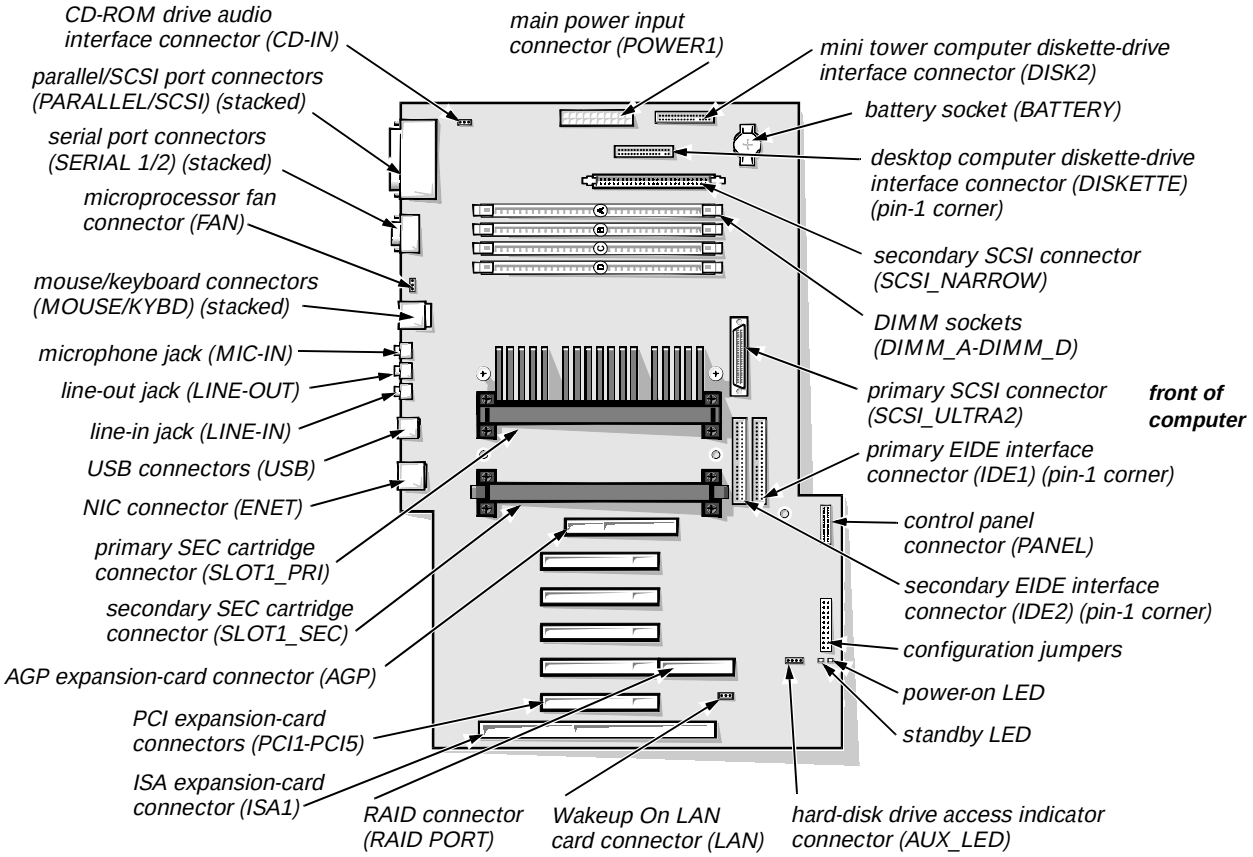


Figure 5-17. System Board Components

Expansion Cards

There are seven expansion-card connectors on the system board (see Figure 5-18). Expansion-card connectors PCI1 through PCI5 support 32-bit PCI expansion cards; expansion-card connector AGP supports a 32-bit AGP expansion card; and expansion-card connector ISA1 can accommodate an 8- or 16-bit ISA expansion card.

NOTES: Connector ISA1 shares expansion-card slot space with connector PCI5. Therefore, only one card of either type can be installed in this slot.

PCI4 has a connector extension to support a PCI RAID controller (see Figure 5-17 for the location of the PCI connectors).

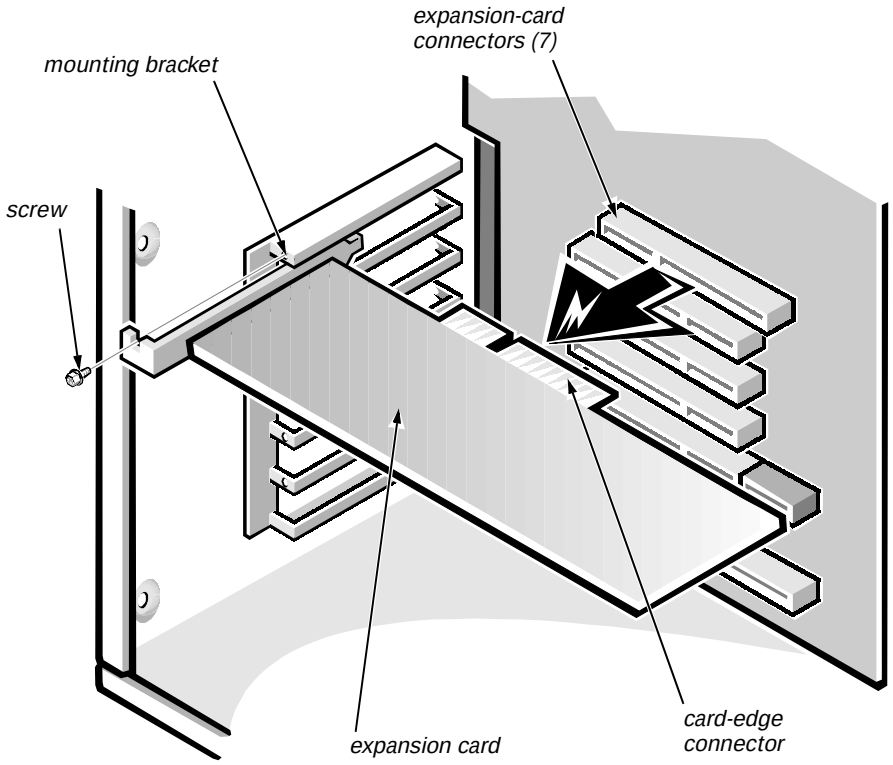


Figure 5-18. Removing an Expansion Card

Follow this general procedure to remove an expansion card:

1. **If necessary, disconnect any cables connected to the card.**
2. **Unscrew the mounting bracket (see Figure 5-18) of the card you want to remove.**
3. **Grasp the card by its outside corners, and ease it out of its connector.**

4. **If you are removing the card permanently, install a metal filler bracket over the empty card-slot opening.**

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

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

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

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

6. **To reset the chassis intrusion detector, enter the System Setup program and reset Chassis Intrusion to Not Detected.**

See Chapter 3, "Using the System Setup Program," in the *User's Guide* for instructions.

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

DIMMs

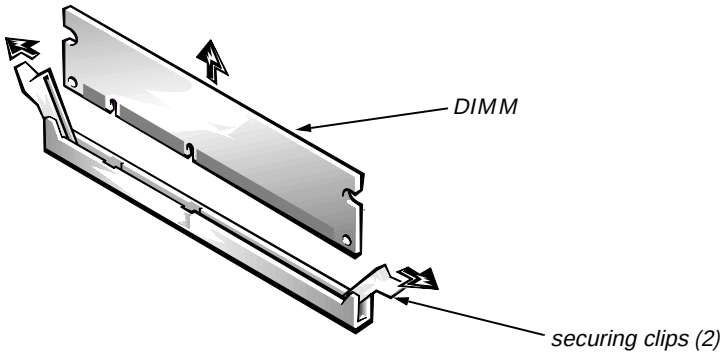


Figure 5-19. DIMM Removal

To remove a DIMM, follow these steps:

1. **Unlatch and rotate the power supply up until it locks (see Figure 5-15).**
2. **Push outward on the DIMM socket securing clips (see Figure 5-19) until the DIMM is released from its socket.**
3. **Lift the DIMM away from the socket.**

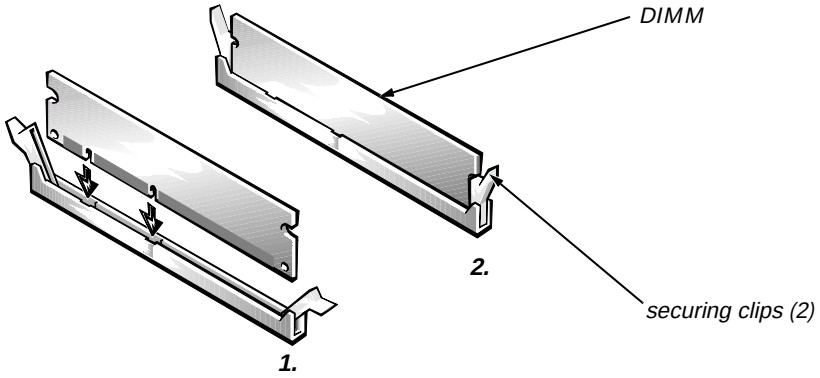


Figure 5-20. DIMM Installation

To replace a DIMM, press the DIMM fully into the socket (see step 1 of Figure 5-20) while closing the securing clips to lock the DIMM into the socket (see step 2 of Figure 5-20).

Microprocessor SEC Cartridge/Heat Sink Assembly

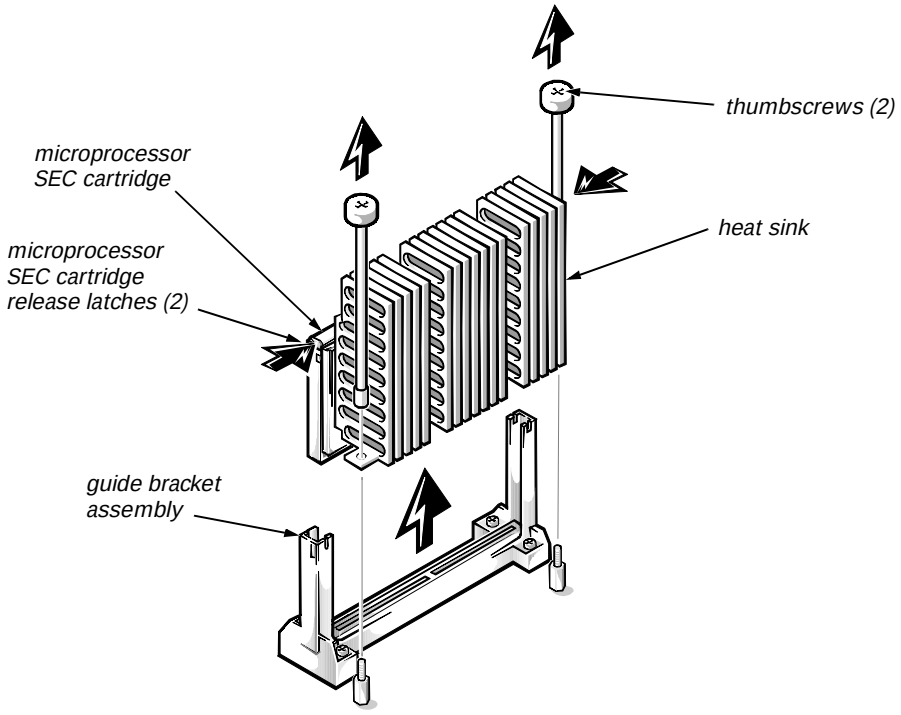


Figure 5-21. Microprocessor SEC Cartridge/Heat Sink Removal

To remove a microprocessor SEC cartridge/heat sink assembly, follow these steps:

WARNING: The microprocessor SEC cartridge/heat sink assembly can get extremely hot. Be sure that the assembly has had sufficient time to cool before you touch it.

1. **Unscrew and remove the two thumbscrews that secure the heat sink to the system board.**
2. **Press the microprocessor SEC cartridge release latches inward until they snap into position.**
3. **Grasp the microprocessor SEC cartridge firmly, and pull straight up on the cartridge to remove it from the guide bracket assembly (see Figure 5-21).**

   You must use up to 15 pounds of force to disengage the microprocessor SEC cartridge from its connector.

To install a microprocessor SEC cartridge/heat sink assembly, first verify that the cartridge release latches are pulled out. Then slide the cartridge into the guide bracket assembly, with the heat sink toward the bottom of the chassis, and firmly seat the assembly. You must use up to 25 pounds of force to seat the cartridge in its connector. Install the two thumbscrews that secure the heat sink to the system board.

Terminator Card

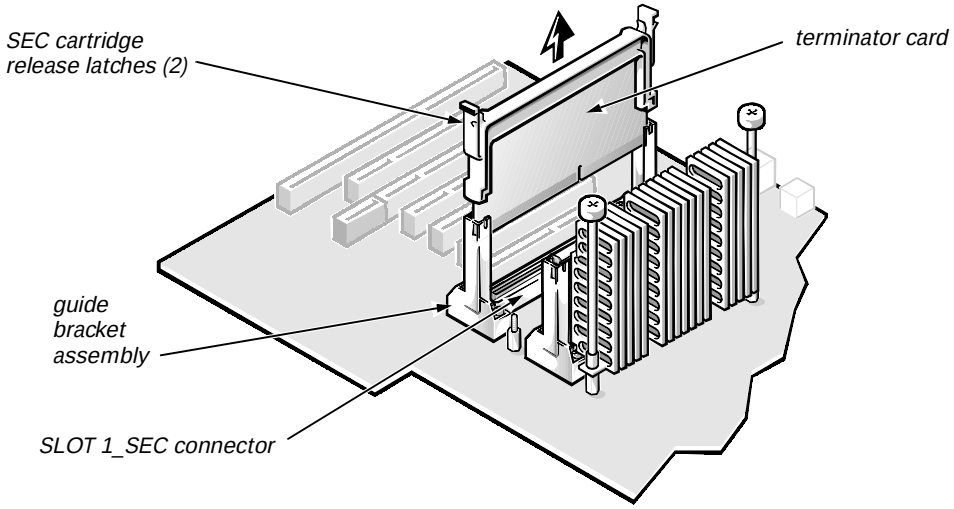


Figure 5-22. Terminator Card Removal

If you are installing a secondary microprocessor SEC cartridge/heat sink assembly, you need to remove the terminator card from the SLOT1_SEC connector on the system board.

1. **Press the microprocessor SEC cartridge release latches inward until they snap into position (see Figure 5-22).**
2. **Pull the terminator card straight out to remove it from the connector.**

System Battery

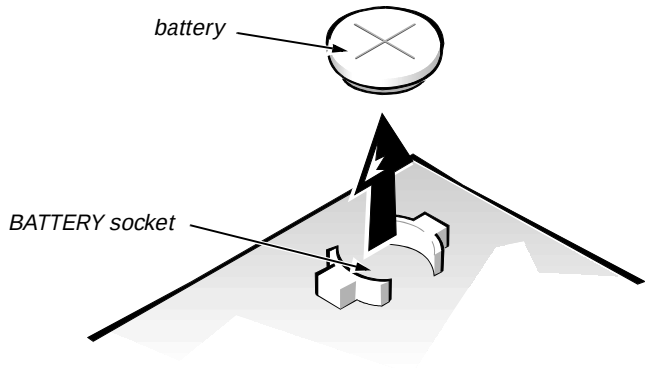


Figure 5-23. System Battery Removal

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.

To remove the system battery, follow these steps:

1. **If possible, enter the System Setup program and print the System Setup screens.**
2. **Rotate the power supply up until it locks (see Figure 5-15).**
3. **Remove the system battery (see Figure 5-23).**

   Carefully pry the system battery out of its socket with your fingers or with a blunt, nonconducting object, such as a plastic screwdriver.

When you replace the system battery, orient the new battery with the "+" facing up. Insert the battery into its socket and snap it into place.

System Board

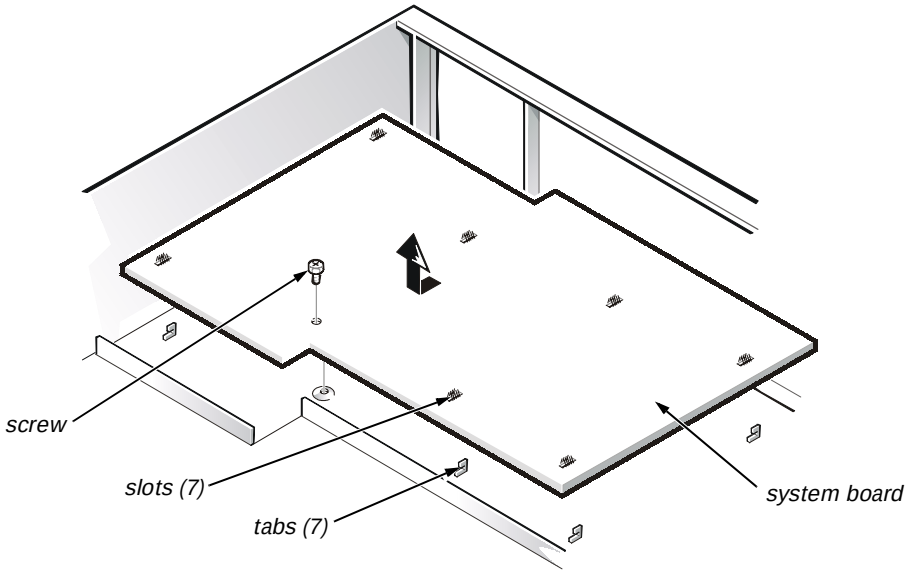


Figure 5-24. System Board Removal

To remove the system board, follow these steps:

1. **Place the computer on its side on a flat surface.**
2. **Disconnect all cables from their connectors at the back of the computer.**
3. **Unlatch and rotate the power supply until it locks (see Figure 5-15).**
4. **Disconnect all cables from the system board.**
5. **Remove the microprocessor fan (see Figure 5-16).**
6. **Remove the screw that secures the system board to the bottom of the chassis (see Figure 5-24).**
7. **Slide the system board toward the front of the chassis until it stops.**
8. **Carefully lift the system board out of the chassis (be sure to lift evenly and not twist the system board).**

If you are replacing a system board, remove the DIMMs, the primary microprocessor SEC cartridge/heat sink assembly, and the terminator card or secondary microprocessor assembly, and install them on the replacement board.

When you reinstall the system board, before you slide the system board back to lock it in position, push down near each slot to engage the grounding clip onto its corresponding tab. Push evenly on both sides of the system board as you slide it into position (do not twist the system board).

APPENDIX A
System Setup Program

This 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. **During the boot routine, the message** `F2 = Setup` **appears on the screen. When the message appears, *immediately* press the <F2> key.**

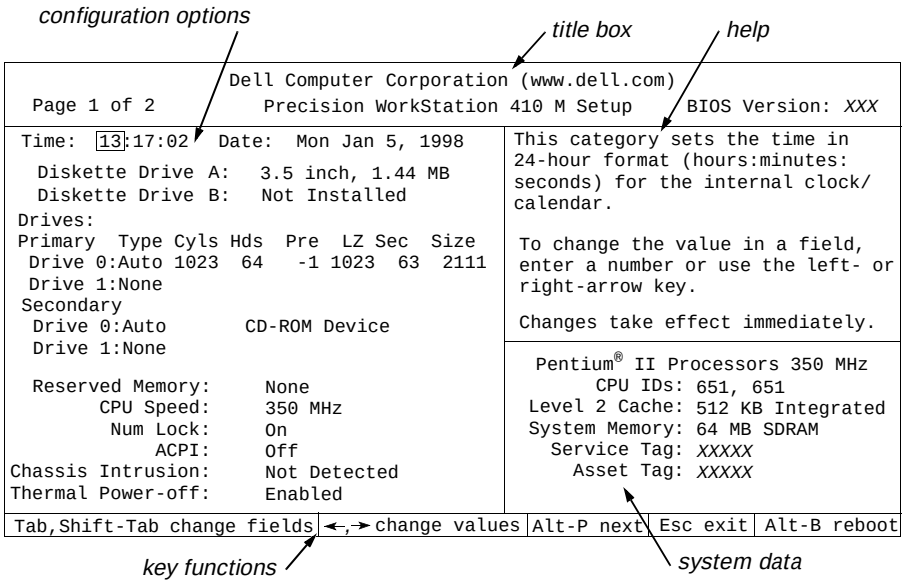
NOTE: An alternate way to enter the System Setup program is to press the <Ctrl><Alt><Enter> keys instead of the <F2> key.

The message `Entering Setup` appears and is soon replaced by Page 1 of the System Setup screens.

If you wait too long to press the <F2> key, the `F2 = Setup` message disappears and your operating system begins to load into memory. If this situation occurs, *let the system complete the load operation*; then shut it down and try again.

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

System Setup Screens



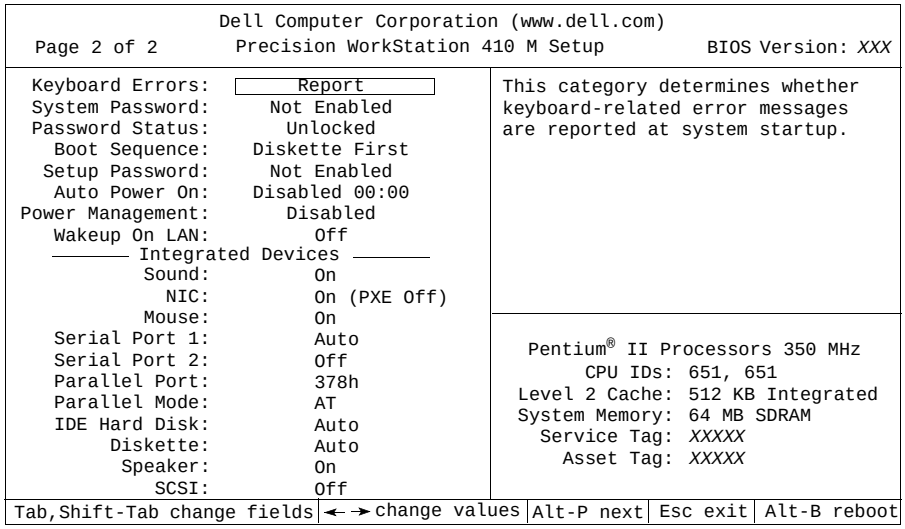


Figure A-1. System Setup Screens

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.
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.*
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.
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.
ACPI	Controls the Advanced Configuration and Power Interface. If the operating system supports ACPI and ACPI is toggled to On, pressing the power button momentarily places the system in a power-saving mode. You can turn the system completely off by pressing and holding the power button for more than 4 seconds. When ACPI is activated (On), IRQ9 is not available for use by expansion cards.

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

Category	Function
Chassis Intrusion	Chassis Intrusion displays the status of the system's chassis intrusion detector. If the chassis is opened, the setting changes from Not Detected to Detected, and the following message is displayed during the boot routine at system start-up: `Alert! Cover was previously removed.` To clear this field and allow future intrusions to be detected, make sure that the chassis cover is closed, and then enter the System Setup program during the system's POST. At Chassis Intrusion, use the left- or right-arrow key to choose Reset. This action changes the setting to its default, Not Detected. If a setup password has been set, only the person who set the password can clear the Chassis Intrusion message.
Thermal Power-off	When enabled, sets a timer to shut down the system approximately 3 minutes after the system BIOS detects an overtemperature condition for a processor or hard-disk drive. **CAUTION: Disabling Thermal Power-off may allow the system to overheat and be damaged.**
Keyboard Errors	Enables or disables reporting of keyboard errors during the POST.
System Password	Displays current status of system's password security feature. Also is 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 the system boots from diskette (if present) or hard-disk drive.
Setup Password	Restricts access to the System Setup program.
Auto Power On	Allows you to turn your computer system on automatically on certain days of the week at a preset time.

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 that 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.*
Wakeup On LAN	Determines whether the Wakeup On LAN feature is set.
Sound	Determines whether the integrated audio controller is set to On (default) or Off. When Sound is set to Off, no sounds are emitted from any attached external speakers or from the on-board speaker, except for beep codes. Set Sound to Off if you want to use a sound expansion card instead of the integrated audio controller or if you need the resources used by the controller.
NIC	Determines the on-board NIC setting. The setting choices are On, On (PXE Off), or Off. The default setting is On (PXE Off), which means that the NIC is enabled but not set to boot the system remotely from a network server.
Mouse	Enables or disables the built-in PS/2-compatible mouse port. Disabling the mouse allows an expansion card to use IRQ 12.
Serial Port 1 Serial Port 2	Configures the system's built-in serial ports. These categories may be set to Auto (default) to automatically configure a port, to a specific designation (COM1 or COM3 for Serial Port 1; COM2 or COM4 for Serial Port 2), or to Off.
Parallel Port	Configures the 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.

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

Category	Function
Parallel Mode	Controls whether the system's built-in parallel port acts as an AT-compatible (unidirectional) or PS/2-compatible (bidirectional) port. The system also supports ECP mode for Windows 95.
IDE Hard Disk	Enables the system's built-in EIDE hard-disk drive interface.
Diskette	Enables the system's built-in diskette controller.
Speaker	Determines whether system sounds (other than beep codes) are emitted by the on-board speaker.
SCSI	Controls the system's built-in SCSI controllers. SCSI settings are Off (default), Secondary Only, Primary Only, and Primary and Secondary.
System Data	These fields display information about the system. They are not selectable.
Microprocessor	Displays the type and speed of the microprocessor(s) installed in the computer.
CPU ID	Displays the ID number of the microprocessor. This information can help Dell technical assistance engineers identify which version of microprocessor is installed in the computer.
Level 2 Cache	Displays the size of level-2 cache memory in the microprocessor.
System Memory	Displays the entire amount of installed memory detected in the system, except for memory on EMS expansion cards. *NOTE: After adding memory, check System Memory to confirm that the new memory is installed correctly and is recognized by the system.*
Service Tag	Displays the system's five-character service tag number.
Asset Tag	Displays the customer-programmable asset tag number up to ten characters if one is assigned.

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