Dell® PowerEdge® 4100/180 and 4100/200 Systems

SERVICE MANUAL

November 1996 P/N 58562

Chapter 1
System Overview

The Dell® PowerEdge® 4100 systems covered in this manual are high-speed, upgradable server systems, which use the Intel® Pentium® Pro family of microprocessors. PowerEdge 4100 systems incorporate the high-performance peripheral component interconnect (PCI) local bus as well as the extended industry-standard architecture (EISA) expansion bus. These buses are built into the system board, which integrates the microprocessor(s) and other elements of the basic computer system.

PowerEdge 4100 systems may have one or two Pentium Pro microprocessors. The systems have been designed for better serviceability and increased reliability, with optional redundant power supplies, RAID capability, hot-pluggable SCSI hard-disk drives, thermal and power supply monitoring, redundant fans, and ECC memory. The PowerEdge 4100 systems are freestanding or can be rackmounted to integrate your servers. The microprocessor modules are installed in zero insertion force (ZIF) sockets on the system board, which allow you to replace microprocessors faster. Contact Dell for information about Dell-supported microprocessor upgrades.

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

- Dell PowerEdge 4100/180 system — 180 MHz derived from a system clock frequency of 60 MHz
- Dell PowerEdge 4100/200 system — 200 MHz derived from a system clock frequency of 66 MHz

System Features

In addition to the standard features found in a traditional personal computer, Dell PowerEdge 4100 systems include the following new and/or advanced features:

- 256 KB (PowerEdge 4100/180 systems) or 512 KB (PowerEdge 4100/200 systems) of cache memory internal to the Pentium Pro module
- 64 MB of 72-bit wide, buffered, extended data output (EDO) main memory, upgradable to 1024 MB (1 GB)
- Hot-pluggable SCSI backplane supporting up to six hard-disk drives
- Optional, redundant hot-pluggable power supplies

- Error correction code (ECC) feature built into the memory controller on the system board
- Advanced combination EISA and PCI expansion subsystem
- Five PCI and three EISA expansion-card slots (none shared)
- Integrated VGA-compatible video subsystem attached to the PCI bus, with 1 MB video memory standard
- BIOS in upgradable flash memory attached to the EISA bus
- Integrated super I/O controller attached to the EISA bus, provides a bidirectional parallel port, two serial ports, and the diskette drive interface
- Integrated ultra-wide and ultra-narrow SCSI controllers
- Integrated server management circuitry that monitors critical system voltages and temperatures, as well as the operation of the system cooling fans
- CD-ROM drive standard in an externally accessible drive bay
- Recessed power and reset buttons to prevent accidental system interruptions
- New quick-test feature in the system diagnostics

All of these features, except the new quick-test feature, are briefly described in this chapter. (For more information about the Quick Test option in the CD-ROM based diagnostics, see "Running the System Diagnostics" in Chapter 2.) For a complete list of system features, see "Technical Specifications" found later in this chapter.

For information about installing the PowerEdge 4100 systems in a rack, see the "*Dell PowerEdge 4100 and 6100 Systems Rack Kit Installation Guide*" (P/N 40722).

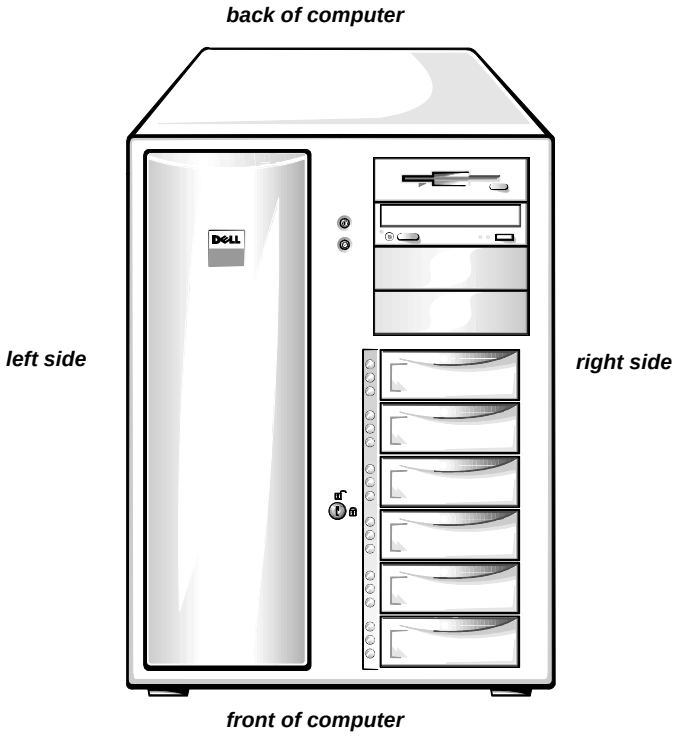


Figure 1-1. Computer Orientation

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

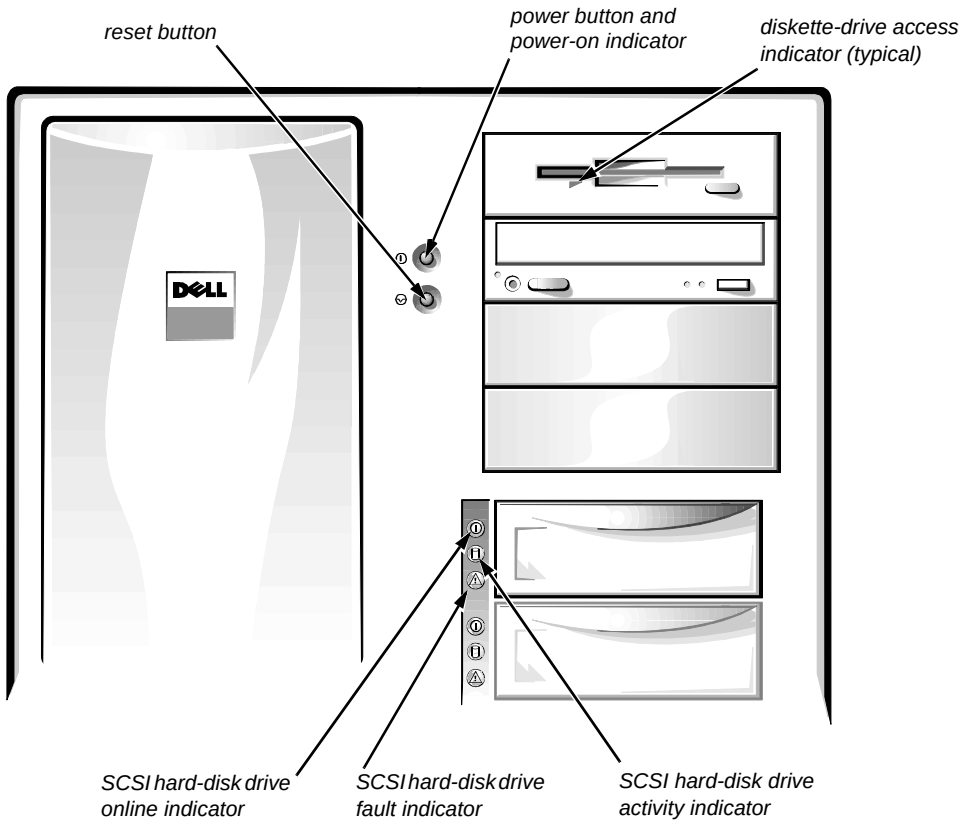


Figure 1-2. Front-Panel Features

CAUTION: To avoid possible data or file structure corruptions, the front-panel reset button should be used only when restarting the system with a key combination fails. Before using the reset button to initiate a hardware reset, close any open application programs and files if possible. If you are using MS-DOS®, the system can be rebooted by pressing <Ctrl><Alt><Del>.

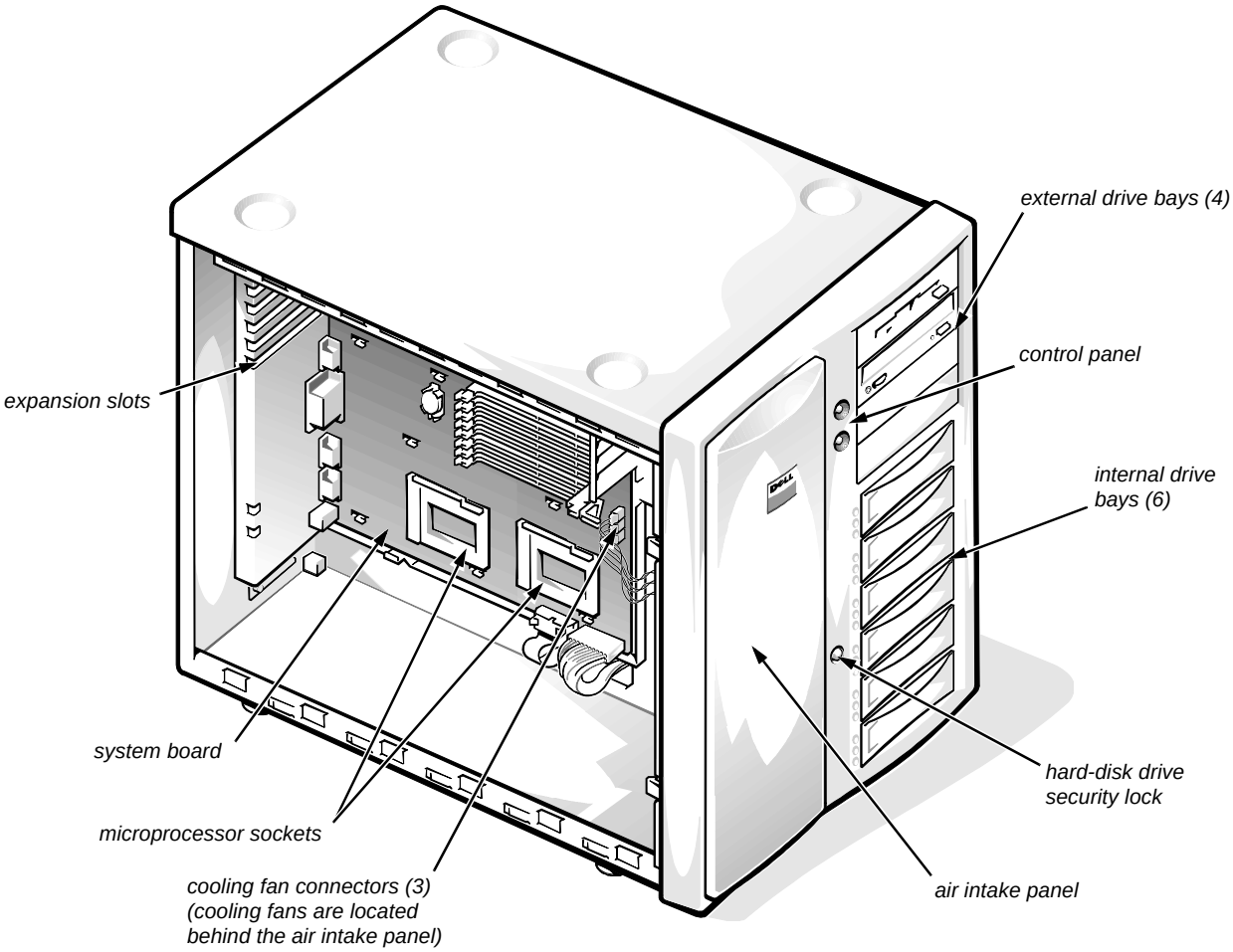


Figure 1-3. Front/Left Internal View

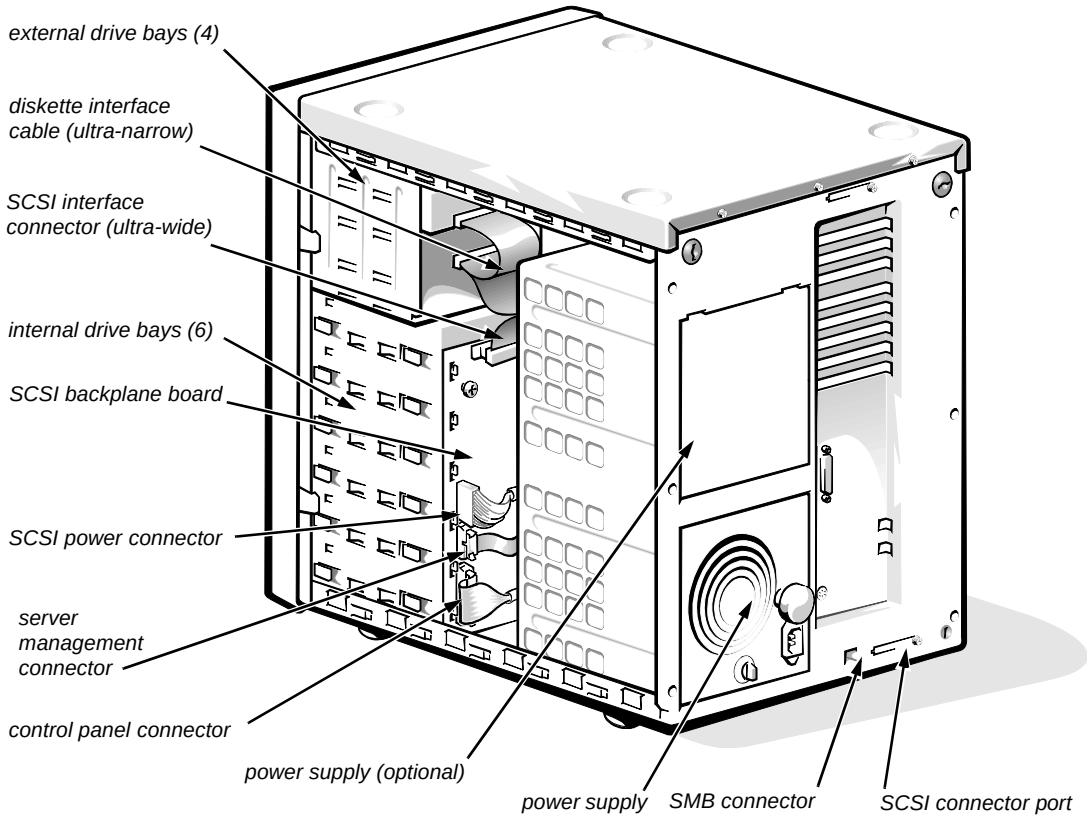


Figure 1-4. Back/Right Internal View

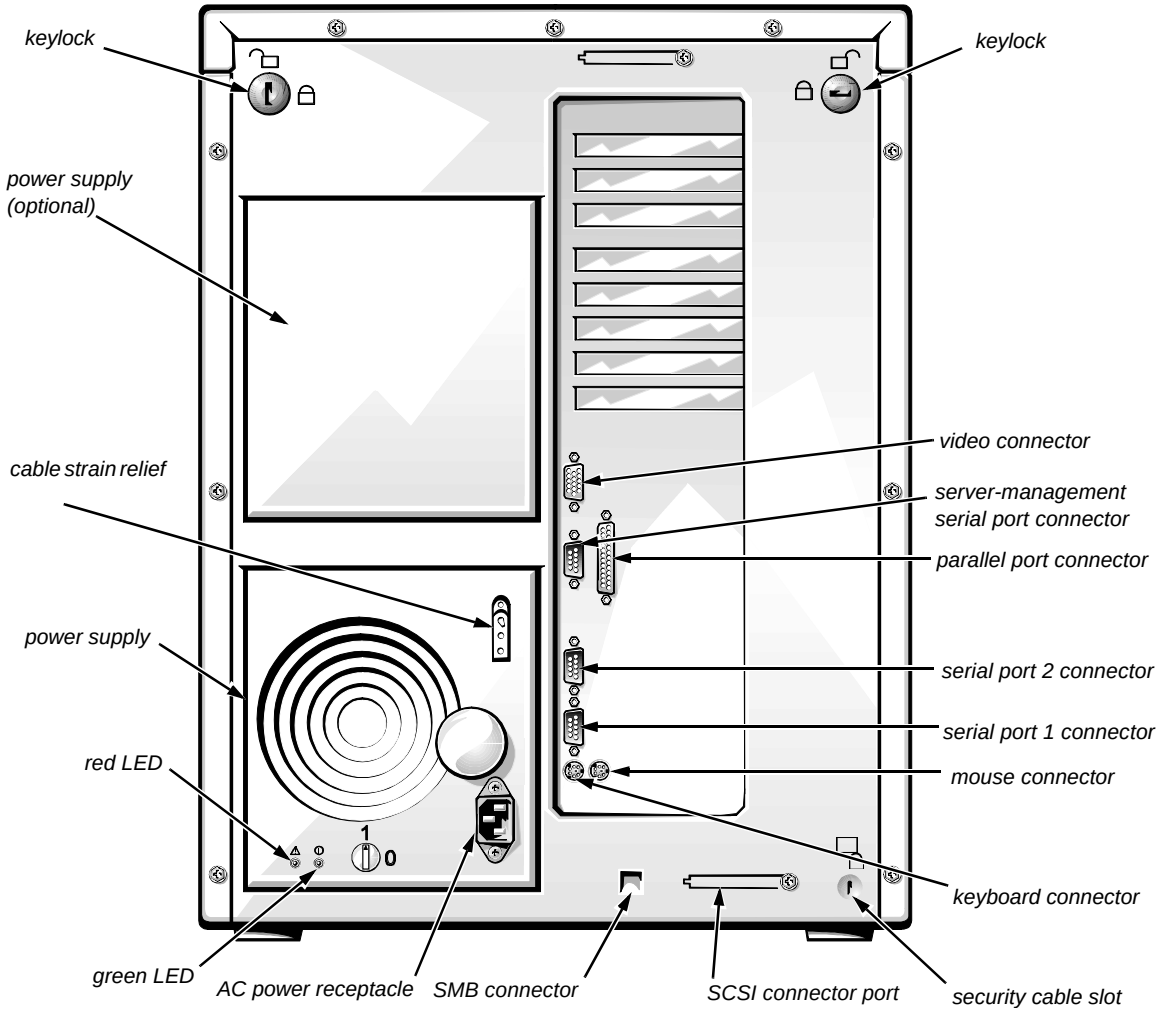


Figure 1-5. I/O Panel

System Memory

The PowerEdge 4100 systems have a minimum of 64 MB of 72-bit-wide, buffered EDO memory. The system memory capacity can be expanded to 1024 MB (1 GB) by using combinations of 32- and 128-MB buffered, EDO dual in-line memory modules (DIMMs) having gold connectors.

The system board has eight 168-pin DIMM sockets. The socket population rules for the DIMMs are as follows:

- Populate the DIMM sockets in order from DIMM A (upper) to DIMM H (lower).
- The DIMMs should be obtained from Dell to guarantee compatibility. All system memory operates at the speed of the slowest DIMM installed.
- DIMMs of both capacities can be installed in the system. However, the larger-capacity DIMMs should be installed in the top sockets, beginning with socket DIMM A, with the smaller-capacity DIMMs installed afterwards in order toward socket DIMM H.

The 72-bit wide, buffered EDO DIMMs support the ECC feature, which detects memory errors and corrects single-bit memory errors. The ECC feature provides more reliable memory and less downtime, and is built into the memory controller on the system board.

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

Advanced Expansion Subsystem

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

After all legacy cards have been configured with the EISA Configuration Utility, the system automatically assigns required memory space, IRQ lines, and DMA channels to any installed Plug and Play ISA expansion cards and PCI expansion cards the next time the system is rebooted. Chapter 5, "Using the EISA Configuration Utility," in the *Dell PowerEdge 4100/180 and 4100/200 Systems User's Guide* describes the EISA Configuration Utility and provides instructions for using it to configure the system.

The eight expansion-card slots include three EISA expansion-card connectors and five PCI expansion-card connectors. The expansion-card connectors are located on the system board (see Figure 1-18).

Integrated Server Management

The system board contains integrated server management circuitry that monitors critical system voltages and temperatures, as well as the operation and speed of the system cooling fans. The integrated server management circuitry works in conjunction with the Intel LANDesk® Server Management suite.

Video Controller

The video subsystem is built into the system board and consists of a high-speed, high-resolution, VGA-compatible video subsystem. The video controller is connected to the PCI local bus. The standard video subsystem contains 1 MB of DRAM memory (the video memory size is not upgradable).

Maximum noninterlaced resolutions are 640 x 480 pixels with 16.7 million colors, 800 x 600 pixels with 65,536 colors, and 1024 x 768 pixels with 256 colors.

Integrated SCSI Controllers

A built-in Adaptec 7880 Ultra/Wide SCSI controller provides an ultra-wide fast SCSI interface via a 68-pin connector on the system board. This SCSI controller attaches to the PCI bus to provide a high-performance SCSI bus and also controls the six SCSI hard-disk drives in the SCSI hard-disk drive bays. In the standard Dell PowerEdge 4100 system configuration, the Ultra/Wide SCSI host adapter on the system board controls the SCSI backplane board. When used in combination with an optional PowerEdge Expandable RAID Controller host adapter card, the SCSI backplane board allows you to remove and insert hard-disk drives without shutting down the system. External hard-disk drives are not supported by the built-in SCSI controller.

A built-in Adaptec 7860 Ultra/Narrow SCSI controller provides a SCSI interface via a 50-pin connector to the CD-ROM drive in the externally accessible drive bay and to any other SCSI drives installed in the other two bays.

SCSI Hard-Disk Drives

Six internal hot-pluggable hard-disk drive bays are located under the externally accessible drive bays at the front of the computer (see Figure 1-4). These bays can contain up to six 1- to 1.6-inch-high SCSI hard-disk drives (either fast/wide or ultra [fast] wide).

NOTES: 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 SCSI hard-disk drive bays. For detailed information about installing externally accessible drives, see Chapter 9, "Installing Drives in the External Bays," in the Dell PowerEdge 4100/180 and 4100/200 Systems Installation and Troubleshooting Guide. *For detailed information about installing SCSI hard-disk drives, see Chapter 10, "Installing Drives in the Internal Bays," in the* Installation and Troubleshooting Guide.

Dell supports the drives it furnishes.

SCSI Configuration Guidelines

Although SCSI devices are installed essentially the same way as other devices, their configuration requirements are different. To configure your SCSI subsystem, follow the general guidelines offered in the following subsections.

SCSI ID Numbers

Each device attached to the 7860 Ultra/Narrow SCSI host adapter must have a unique SCSI ID number from 0 to 7. For additional SCSI addressing information, see Chapter 10, "Installing Drives in the Internal Bays," in the *Installation and Troubleshooting Guide*.

When narrow SCSI devices are shipped from Dell, the default SCSI ID numbers are assigned as follows:

- The computer's built-in Ultra/Narrow SCSI host adapter is configured through the BIOS as SCSI ID 7.
- A SCSI CD-ROM drive (installed in an externally accessible drive bay) is configured as SCSI ID 5.
- A SCSI tape drive (if installed) is configured as SCSI ID 6.

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

Devices attached to the Ultra/Wide SCSI host adapter need no ID settings or termination; ID settings and termination are handled automatically by the SCSI backplane.

Device Termination

SCSI logic requires that termination be enabled for the two devices at opposite ends of the SCSI chain and disabled for all devices in between. Therefore, regardless of whether you are installing internal or external devices, use the following guidelines:

- A single SCSI device (such as the standard CD-ROM drive) is terminated.
- If two or more SCSI devices are installed, connect the devices as follows:
  - Attach one of the devices to the end connector on the SCSI cable, and leave the terminator enabled on that device.
  - The other end of the SCSI cable connects to the computer's built-in Ultra/Narrow SCSI host adapter or to an optional SCSI host adapter card, which needs no termination.
  - Disable the terminators on all other devices you attach to the cable.

The standard SCSI CD-ROM drive is configured as the last device on the SCSI cable. Therefore, any additional devices attached to the cable should have their terminators disabled.

See the documentation provided with the SCSI device for information on disabling the device's terminator.

System Unit

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

System Power Supply

The 500-W system power supply can operate from an AC power source of 90 to 265 VAC at 50 or 60 Hz. When the power-supply paralleling board is installed, the power supplies are hot-pluggable. When the red LED on the power supply is lit (except during power-up), it indicates that the power supply has failed (see Figure 1-5). When the green LED is lit, it indicates that +5 VDC is on. 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	+3.135 to +3.465 VDC	15.0 A
+5 VDC	+4.90 to +5.25 VDC	50.0 A
+12 VDC	+11.40 to +12.60 VDC	25.0 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]	+4.85 to +5.36 VDC	0.25 A

[1] *Maximum continuous DC output power shall not exceed 500 W.*

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

Pin Assignments for the DC Power Connectors (Nonredundant Systems)

The power-supply output voltages for nonredundant systems can be measured at the connectors on the back of the power supply (P1, P2, P3, P4, and P5) or at the connectors on the power connector panel (J11, J12, J13, J14, and J15). The following illustrations show both sets of connectors.

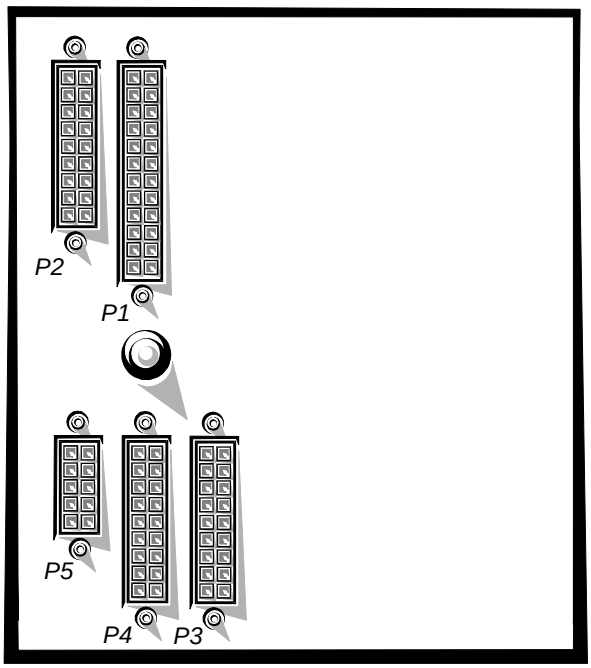


Figure 1-6. Power Supply Connectors

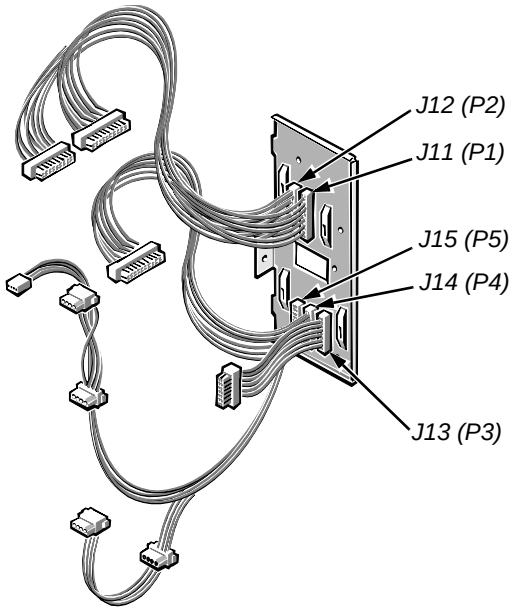
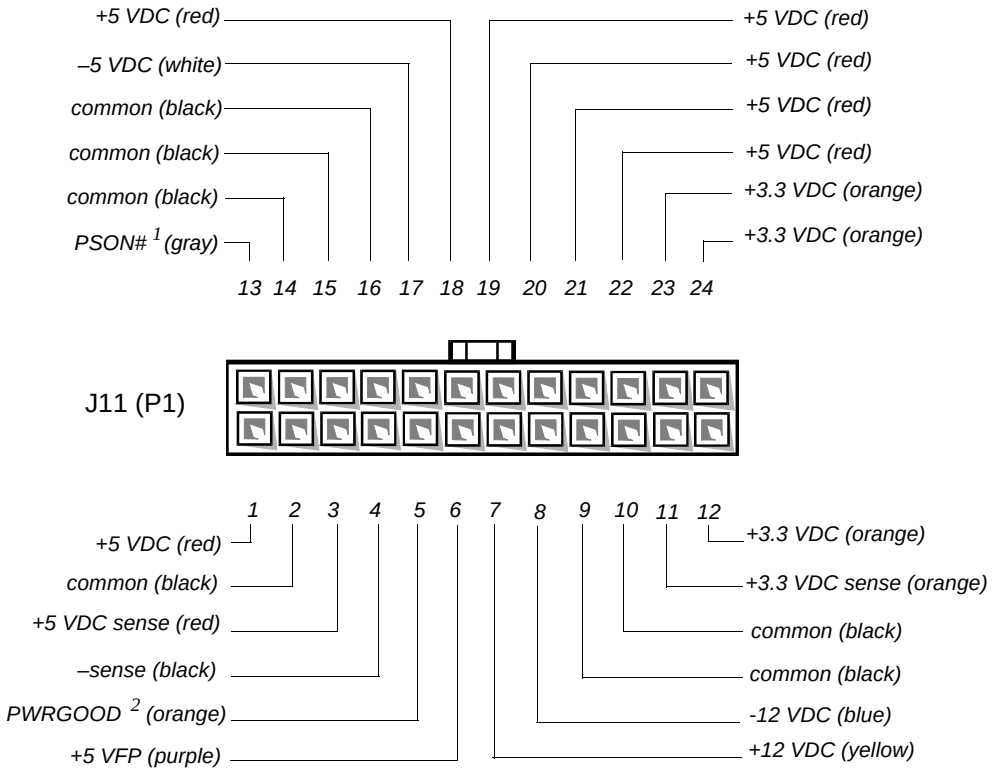


Figure 1-7. Power Connector Panel



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

Figure 1-8. DC Power Connector J11 (P1)

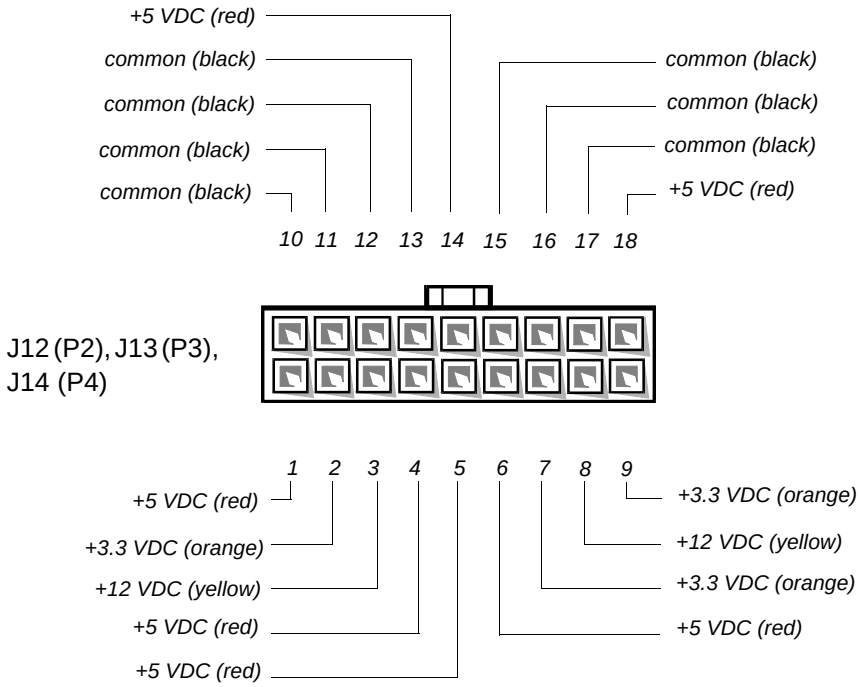


Figure 1-9. DC Power Connectors J12 (P2), J13 (P3), and J14 (P4)

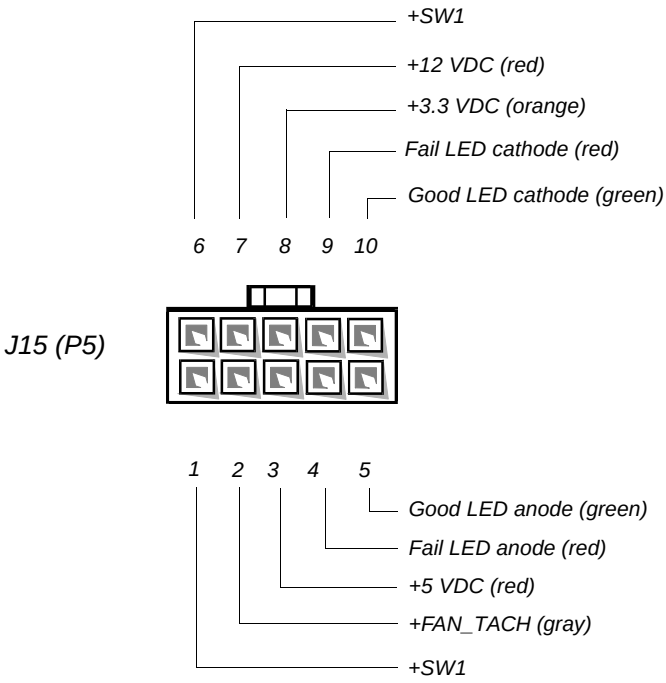


Figure 1-10. DC Power Connector J15 (P5)

DC Power Distribution (Nonredundant System)

Figures 1-11 provides information about DC power distribution for the nonredundant PowerEdge 4100 system.

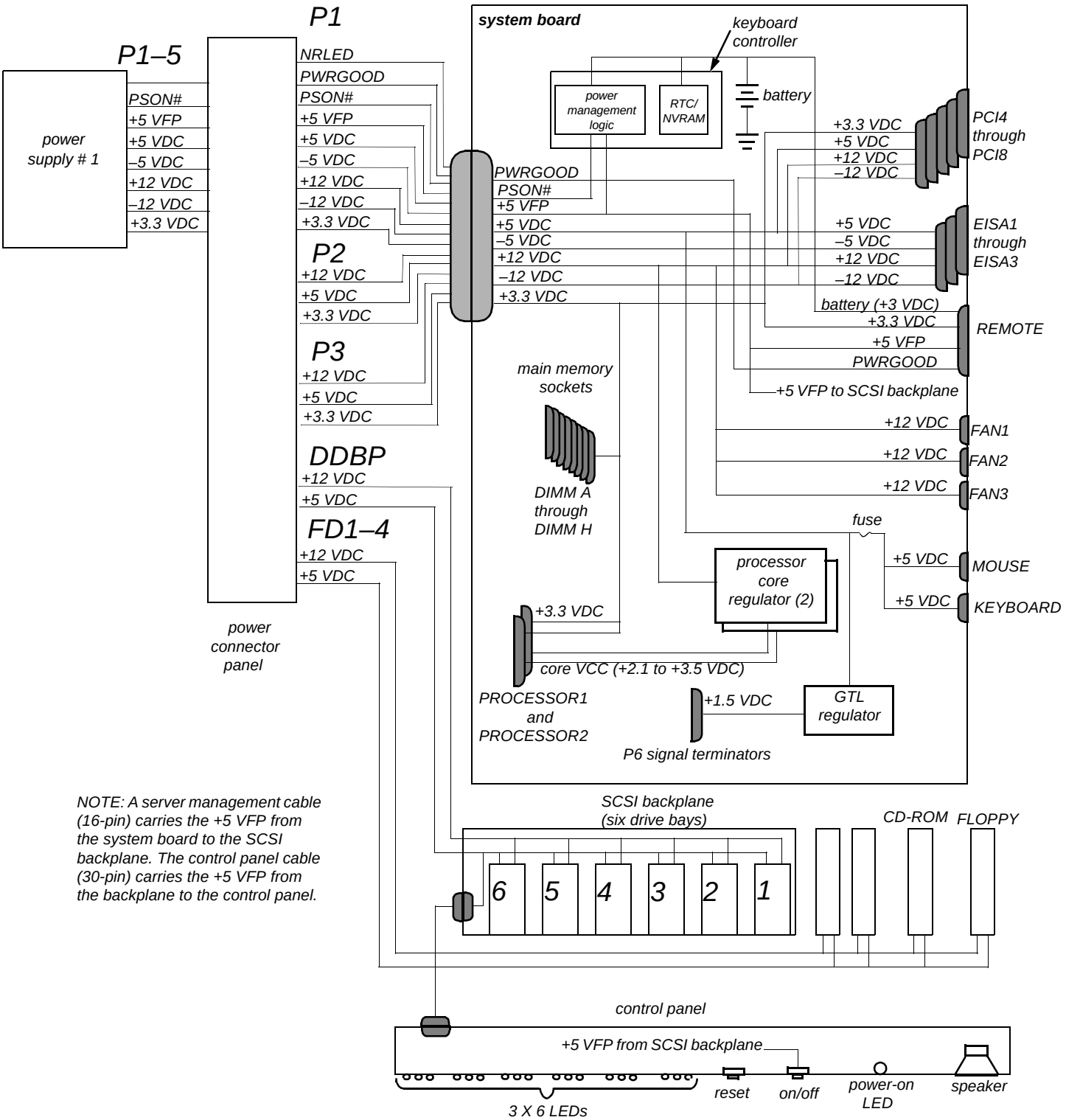


Figure 1-11. Power Distribution (Nonredundant System)

Pin Assignments for the DC Power Connectors (Redundant Systems)

The power-supply output voltages for redundant systems can be measured at the connectors on the power-supply paralleling board (PWR1, PWR2, PWR3, PWRSCSI, and PWRFD) or at the connectors on the end of the wire bundles extending from these connectors (PWR1, PWR2, PWR3, DDBP, and FD1–FD4).

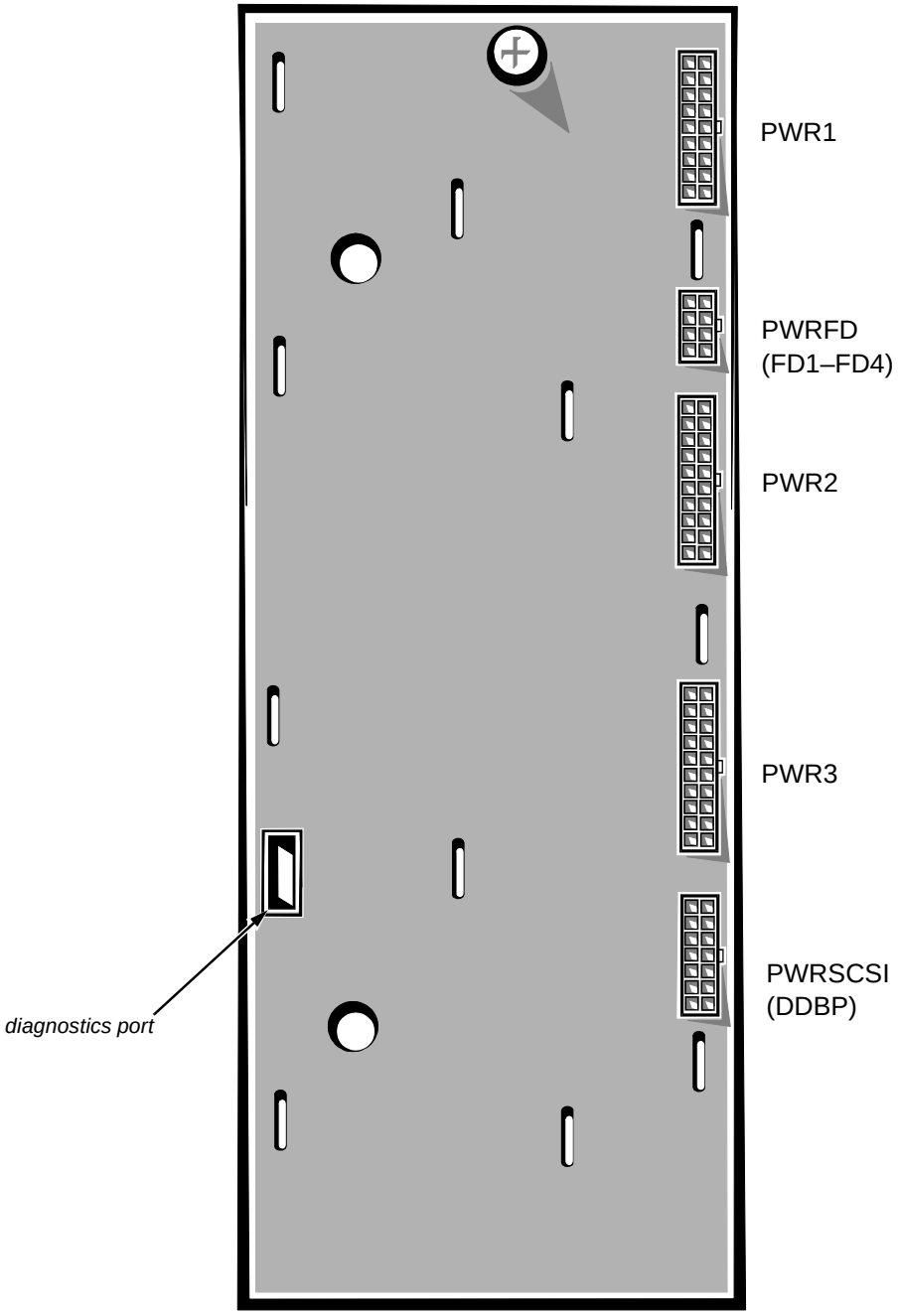


Figure 1-12. Power-Supply Paralleling Board Connectors

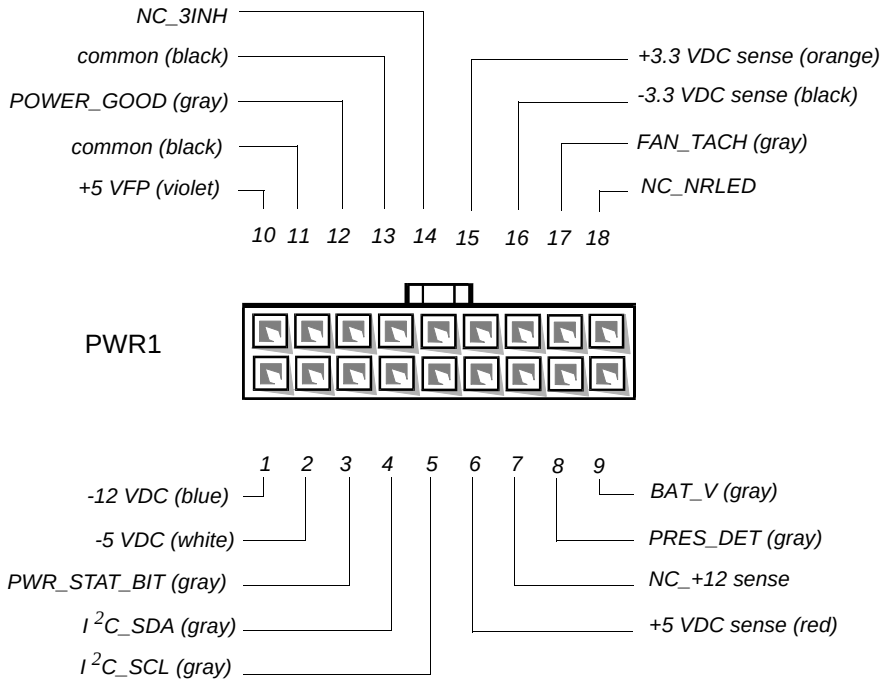


Figure 1-13. DC Power Connector PWR1

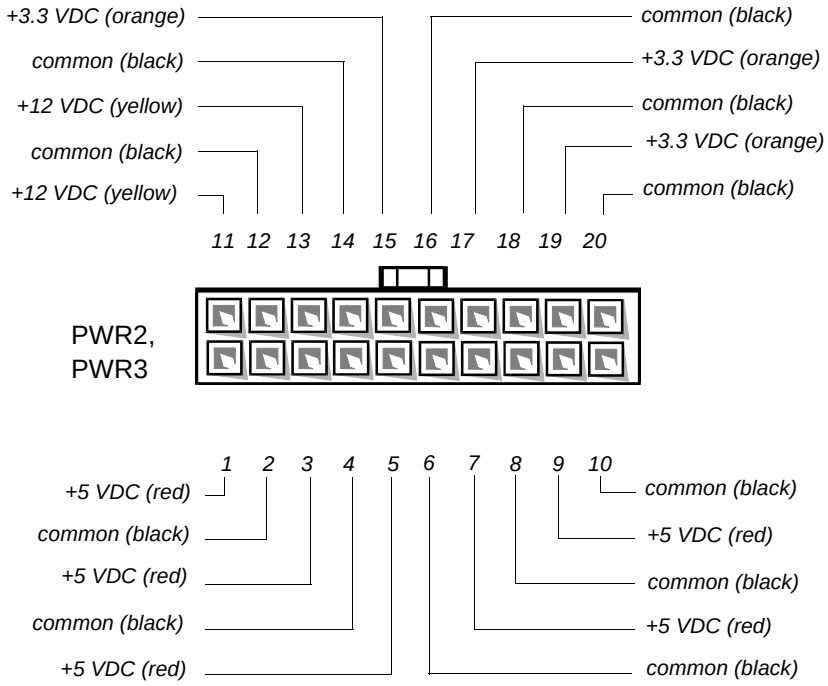


Figure 1-14. DC Power Connector PWR2 and PWR3

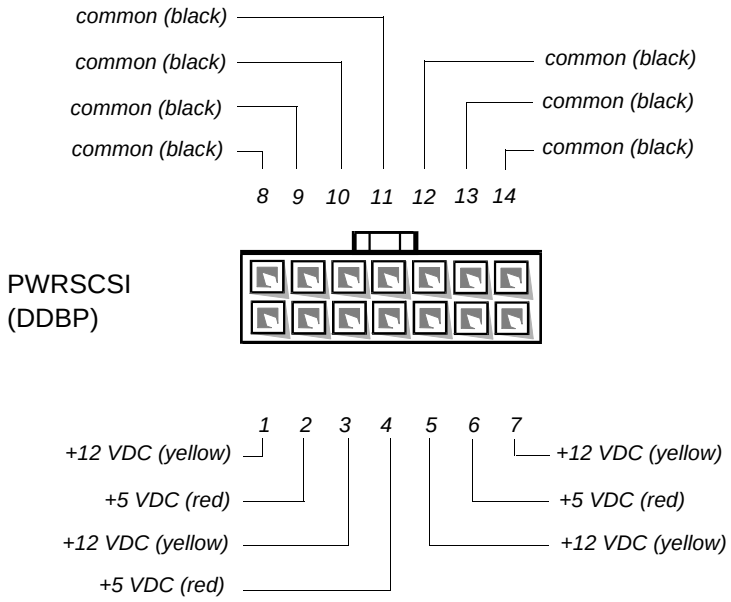
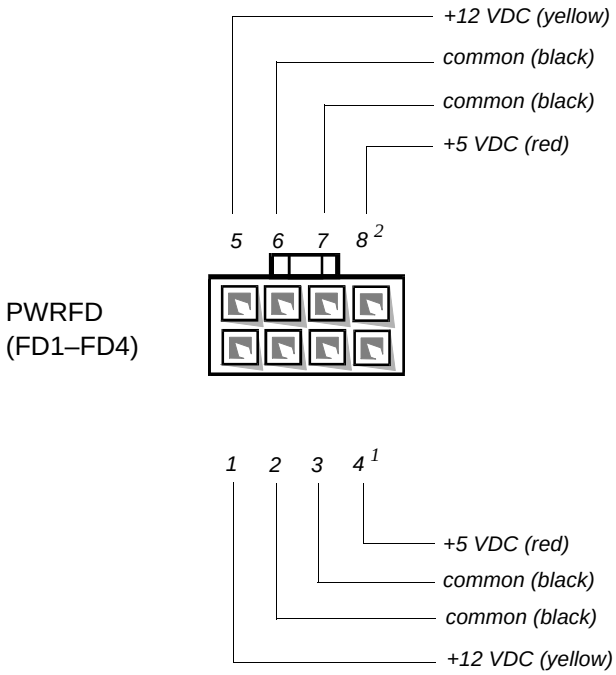


Figure 1-15. DC Power Connector PWRSCSI (DDBP)



1 *Wires 1 through 4 are connected to FD1 and FD2.*

2 *Wires 5 through 8 are connected to FD3 and FD4.*

Figure 1-16. DC Power Connector PWRFD (FD1–FD4)

DC Power Distribution (Redundant System)

Figures 1-17 provides information about DC power distribution for the redundant PowerEdge 4100 system.

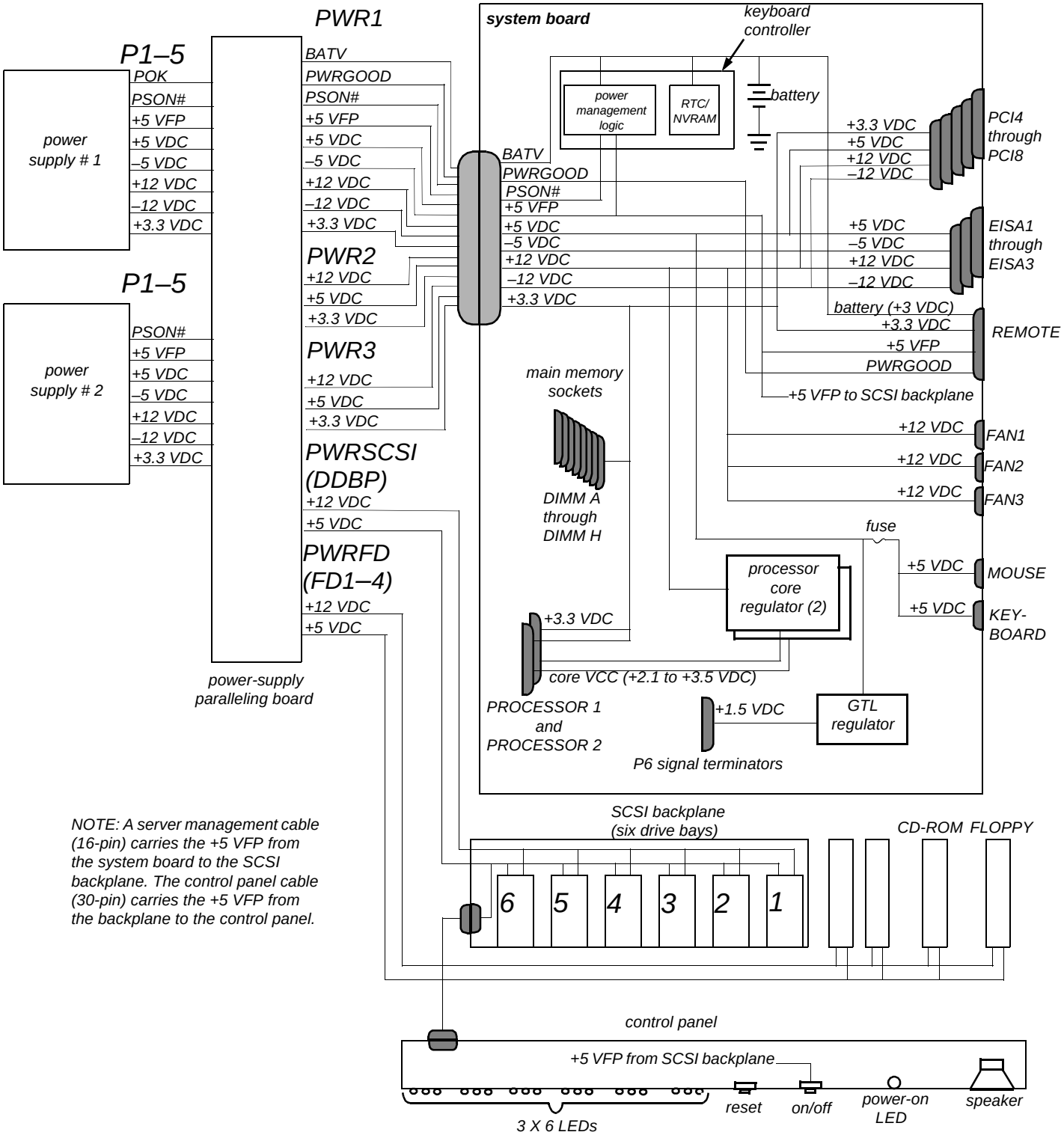


Figure 1-17. Power Distribution (Redundant System)

System Board Layout

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

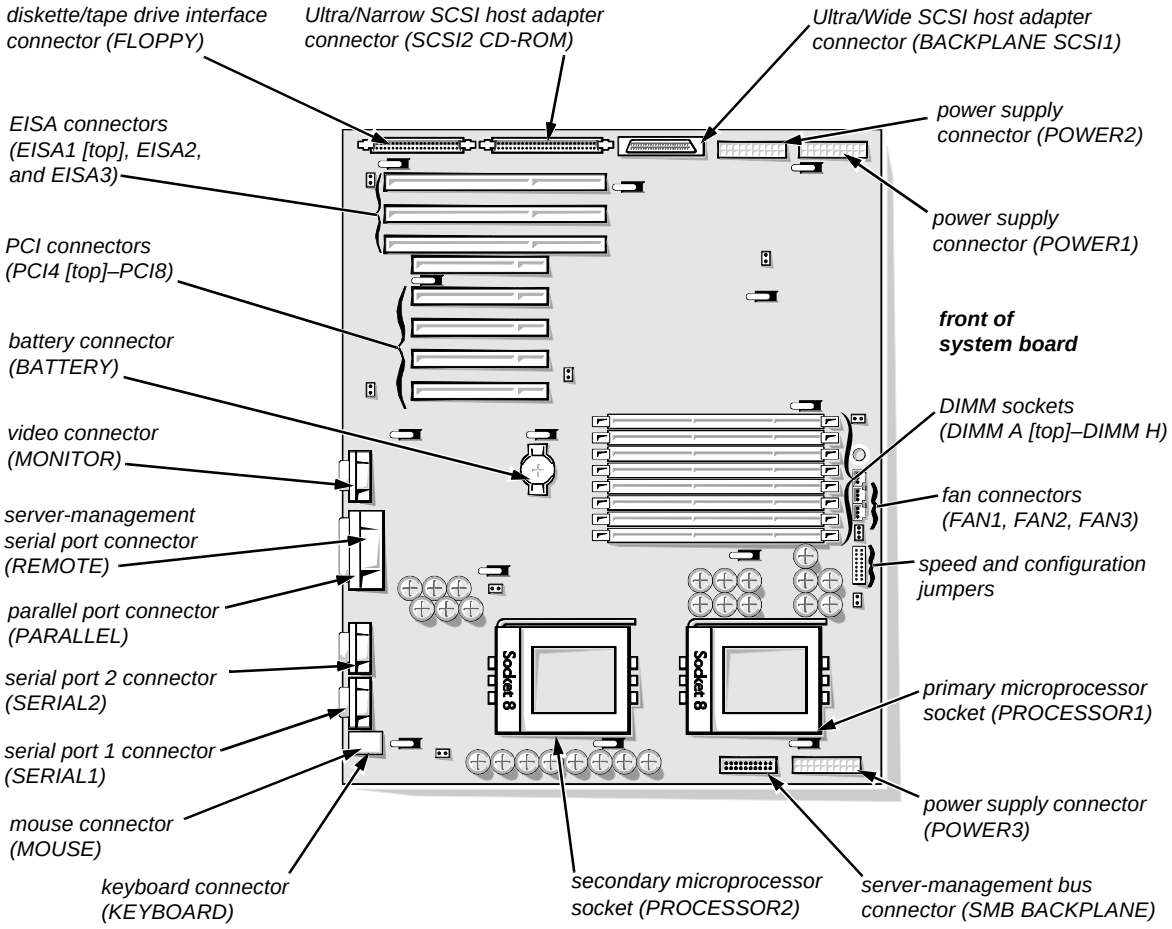


Figure 1-18. System Board Components

Main Memory

The eight DIMM sockets on the system board can accommodate combinations of 32- and 128-MB DIMMs up to a total memory capacity of 1024 MB (1 GB). The system is shipped with high-speed (60-ns) 3.3-V EDO DIMMs installed. When reinstalling DIMMs, use the following guidelines:

- Install a DIMM in socket DIMM A before socket DIMM B, in socket DIMM B before socket DIMM C, and so on.
- If you are installing DIMMs of different sizes, install them in order of decreasing capacity, beginning with socket DIMM A.
- DIMMs need not be installed in pairs, but gold connectors are required.

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

System Board Jumpers

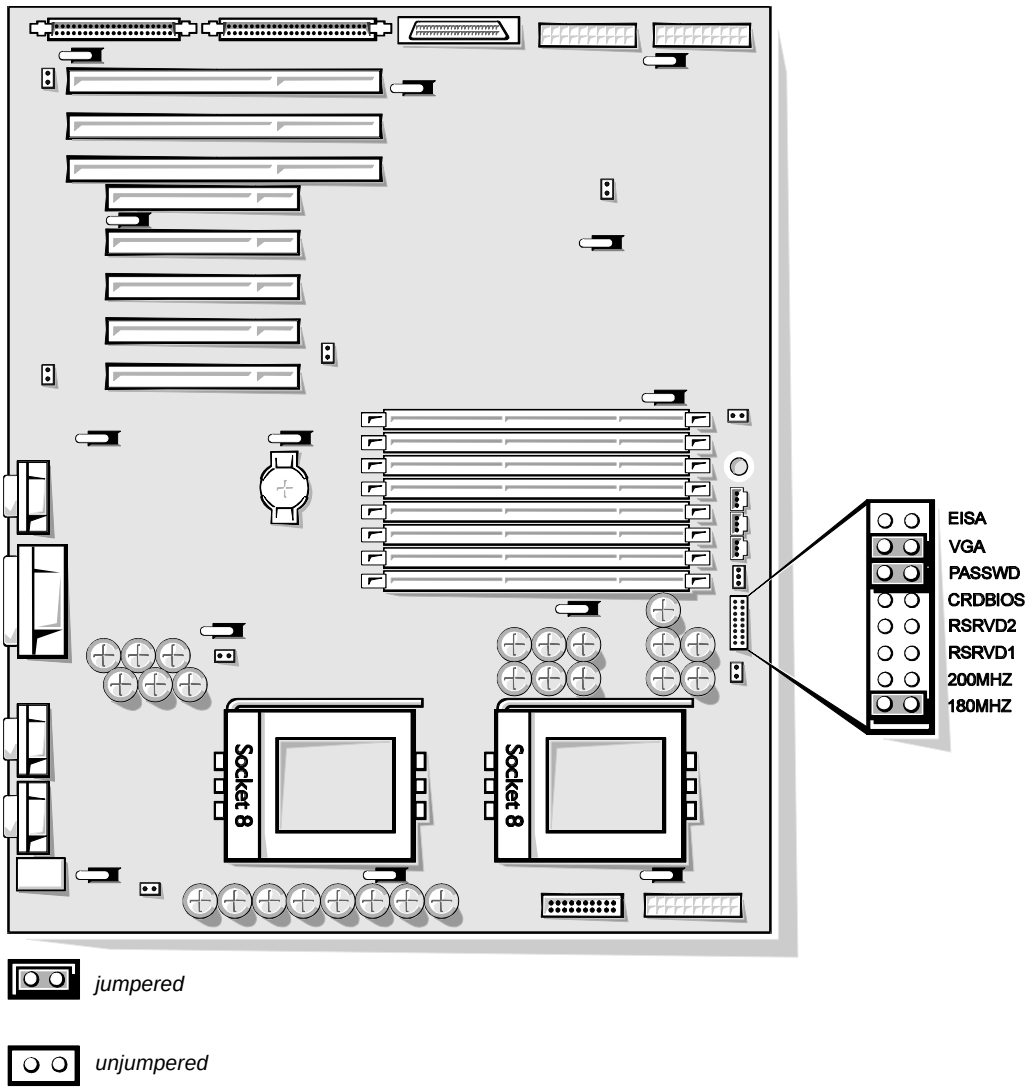


Figure 1-19. System Board Jumpers

Table 1-2. Jumper Descriptions

Jumper	Description	Default Setting
EISA	EISA Configuration Utility	Not installed (utility settings are retained at system boot)
VGA	Integrated video controller	Installed (controller is enabled)
PASSWD	Password enable/disable	Installed (password feature enabled)
CRDBIOS	Reserved	Not installed (reserved; *do not change*)
RSRVD2 RSRVD1	Reserved	Not installed (reserved; *do not change*)
200MHZ	Microprocessor speed	Installed only if the microprocessor's internal speed is 200 MHz
180MHZ	Microprocessor speed	Installed only if the microprocessor's internal speed is 180 MHz

Interrupt Assignments

Table 1-3. Interrupt Assignments

IRQ Line	Used/Available
IRQ0	Generated by system timer
IRQ1	Generated by keyboard controller to indicate that keyboard's output buffer is full
IRQ2	Generated internally by interrupt controller to enable IRQ8 through IRQ15
IRQ3 and IRQ4	Generated by super I/O controller to indicate that device connected to corresponding serial port requires service (IRQ3 for COM2 or COM4; IRQ4 for COM1 or COM3)
IRQ5	Available for use by expansion card unless this IRQ line is used by secondary parallel port
IRQ6	Generated by super I/O controller to indicate that diskette drive requires service
IRQ7	Generated by super I/O controller to indicate that device connected to parallel port requires service
IRQ8	Generated by keyboard controller for each tick of RTC
IRQ9	Available for use by expansion card

Table 1-3. Interrupt Assignments *(continued)*

IRQ Line	Used/Available
IRQ10	Available for use by expansion card
IRQ11	Available for use by expansion card
IRQ12	Generated by keyboard controller to indicate that mouse's output buffer is full
IRQ13	Generated by math coprocessor to indicate coprocessor error
IRQ14	Available for use by expansion card
IRQ15	Available for use by expansion card

DMA Channel Assignments

Table 1-4. DREQ Line Assignments

DREQ Line	Used/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

Technical Specifications

Table 1-5. Technical Specifications

Microprocessor	
Microprocessor type	single or dual Intel Pentium Pro microprocessors
Microprocessor speed	200 MHz internal (66 MHz external) or 180 MHz internal (60 MHz external)
First-level cache	16 KB
Second-level cache	256 KB for 180 MHz; 512 KB for 200 MHz
Math coprocessor	internal to the microprocessor
System Information	
System chip set	Intel Natoma 82440FX set
Data bus width	64 bits
Address bus width	32 bits
Flash EPROM	4 Mbits
Expansion Bus	
Bus types	PCI and EISA
Bus speed	PCI: 30 MHz (180/60 processor); 33 MHz (200/66 processor); EISA: 7.5 MHz (180/60 processor); 8.33 MHz (200/66 processor)
PCI expansion-card connectors	five
EISA expansion-card connectors	three
EISA expansion-card connector size	198 pins
EISA expansion-card connector data width (maximum)	32 bits
PCI expansion-card connector size	120 pins
PCI expansion-card connector data width (maximum)	32 bits

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

System Clocks	
System clock	60 or 66 MHz (matches external processor bus speed)
Diskette/communications ports	24 MHz from the system clock
Memory	
Architecture	72-bit, noninterleaved
DIMM sockets	eight
DIMM capacities	32 and 128 MB, EDO mode
Standard RAM	64 MB
Maximum RAM	1024 MB (1 GB)
BIOS address	F000:0000h–F0000:FFFFh
Drives	
Externally accessible bays	four 5.25-inch bays for half-height diskette drives, tape drives, or CD-ROM drives (one bay for a 3.5-inch diskette drive and one bay for a CD-ROM [standard])
Internally accessible bays	six 1- to 1.6-inch-high SCSI hard-disk drives, hot-pluggable with an optional PowerEdge Expandable RAID Controller host adapter card
System Board Connectors	
Externally accessible:	
Serial (DTE)	two 9-pin connectors; 16550-compatible (UART)
Server Management (serial)	one 9-pin connectors; modem port for embedded server management
Parallel	one 25-hole connector (bidirectional)
Video	one 15-hole connector (on system board or add-in video card)
PS/2-style keyboard	one 6-pin mini-DIN
PS/2-compatible mouse	one 6-pin mini-DIN
Internally accessible:	
Diskette drive	one 34-pin connector
Fan	three 3-pin connectors

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

System Board Connectors *(continued)*	
POWER1	one 18-pin connector: standby power, I^2C, PWRGOOD, and miscellaneous power
POWER2	one 20-pin connector: +3.3 VDC, +5 VDC, or +12 VDC
POWER3	one 20-pin connector: +3.3 VDC, +5 VDC, or +12 VDC
BACKPLANE SCSI1	one 68-pin connector, ultra-wide (fast), to SCSI backplane
SCSI2 CD-ROM	one 50-pin connector, ultra-narrow, to CD-ROM
SMB BACKPLANE	one 16-pin connector (server management) to SCSI backplane
SCSI Backplane Connectors	
SCSI hard-disk drive connection sockets	six 80-pin connectors
SCSI controller	one 68-pin connector
Power	one 14-pin connectors
Video	
Video type	embedded PCI (see *User's Guide* for specifications)
Video memory	1 MB
Key Combinations	
<Ctrl><Alt><Del>	reboots the system (if running MS-DOS)
<F2>	starts System Setup program (during POST only)
Controls and Indicators	
Reset control	push button
Power control	push button
Power indicator	green LED
Diskette drive access indicator	green LED
CD-ROM busy indicator	green LED
SCSI hard-disk drive online indicator	green LED

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

Controls and Indicators *(continued)*	
SCSI hard-disk drive activity indicator	green LED
SCSI hard-disk drive fault indicator	yellow LED
Power-supply 5-VDC online indicator	green LED
Power-supply failure indicator	red LED (flashes at power-on; stays lit in the event of a power failure)
Power	
DC power supply:	
Wattage	500 W
Heat dissipation	600 BTUs (nominal)
Voltage	90 to 265 VAC at 50 or 60 Hz
Backup battery	3-V CR2450N coin cell
Physical	
Height	52.5 cm (21 inches)
Width	39.4 cm (15.75 inches)
Depth	57.5 cm (23 inches)
Weight	45 kg (100 lb) or more, depending on options installed
Environmental	
Temperature:	
Operating	10° to 35°C (50° to 95°F)
Storage	–40° to 65°C (–40° to 149°F)
Relative humidity	8% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz for 30 min
Storage	0.5 G at 3 to 200 Hz for 30 min
Maximum shock:	
Operating	half-sine wave form: 50 G for 2 ms
Storage	half-sine wave form: 110 G for 2 ms; square wave form: 27 G for 15 ms

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

Environmental *(continued)*	
Altitude:	
Operating	–16 to 3048 m (–50 to 10,000 ft)
Storage	–16 to 10,600 m (–50 to 35,000 ft)

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 system diagnostics is located near the end of this chapter.) Dell recommends that you perform the following procedures in the order they are presented in this manual.

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 else the appropriate troubleshooting procedure to use. After the user describes the problem, follow these steps:

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

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

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

   Can the user duplicate the problem?

   Yes. Proceed to step 3.

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

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

   Is the problem a result of user error?

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

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

External Visual Inspection

The external visual inspection consists of a quick inspection of the exterior of the 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 (see Figure 1-5).

   For a serial mouse, the mouse interface cable must be 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 attached to the serial and parallel port connectors are properly connected.**

   Each of the serial and parallel interface cables must be 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 I/O panel and to the connector on the back of the monitor.**

   For proper connection of the video interface cable, see the documentation for the monitor.
6. **Inspect all external monitor controls for any obvious damage or improper settings.**

   For proper settings of the video monitor controls, see the documentation for the monitor.
7. **Inspect the keyboard to ensure that no keys are sticking.**

   If one or more keys are sticking, it may be necessary to replace the keyboard.
8. **Inspect the exterior of the computer, including all controls and indicators, and all user-accessible data storage devices for any signs of physical damage.**

   Does the inspection reveal any problems?

   ***Yes*.** Proceed to the appropriate procedure in Chapter 4, “Removing and Replacing Parts.”

   ***No*.** Proceed to the next section, “Observing the Boot Routine.”

Observing the Boot Routine

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

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

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

1. **If the system is off, turn on all peripherals and the computer. Insert the Dell Server Assistant CD into the CD-ROM drive. Press the reset button or <Ctrl><Alt><Del> to reboot the system.**
2. **Check the power supply fans.**

   Do the fans run normally?

   NOTE: The center fan is normally off, unless another fan has failed or is unplugged, or the temperature of the computer is too high.

   Yes. Proceed to step 3.

   No. Troubleshoot the system power supply.
3. **Watch the Num Lock, Caps Lock, and Scroll Lock indicators on the upper-right corner of the keyboard. After all three indicators flash momentarily, and following a long pause (approximately 30 seconds), 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 computer for any of the following:**

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

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

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

5. **Observe the monitor screen for the Dell Server Assistant Menu.**

   Does the menu appear?

   Yes. See "Running the System 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, follow these steps:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources.**
2. **Remove the left computer cover.**
3. **Verify that all DIMMs and expansion cards as well as the microprocessor(s) and battery are fully seated in their sockets or connectors.**

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

   To maintain proper air flow and prevent the system from overheating, each power supply bay must have either a power supply or the power closeout panel installed.

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

   To reseat a microprocessor, first remove it from its socket and then reinstall it as described in "Microprocessor and Heat Sink" in Chapter 4.

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

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

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

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

5. **Check all cable connectors inside the computer to verify that they are firmly attached to their appropriate connectors.**
6. **Reinstall the computer cover.**
7. **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. Terminate the procedure.

   No. Proceed to the next section, "Eliminating Resource Conflicts," and to "Getting Help" found later in this chapter.

Eliminating Resource Conflicts

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

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

Running the System Diagnostics

The system diagnostics (included on the *Dell Server Assistant* CD) contains tests that aid in troubleshooting all major components of the computer system.

To start the diagnostics, insert the CD into the CD-ROM drive, and then press the reset button on the computer.

Restarting the computer causes the Dell Server Assistant logo screen to appear on the monitor screen, followed by a screen containing icons of the options available. Selecting the Run System Utilities icon brings up a screen with the diagnostics icon. Before the Dell Server Assistant loads, a program tests the portion of main memory (RAM) required for loading the diagnostics. If a main memory error is detected, a message telling you which DIMM has failed appears on the screen.

If no errors are found in main memory, and the Dell Server Assistant loads, select the Run System Utilities icon. Then select the Run System Diagnostics icon by pressing <Enter>. The Diagnostics Menu appears, allowing you to choose the following options or exit to MS-DOS:

- Run All Tests — Runs all tests for a thorough check of the system
- 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 Specific Tests — Tests a particular area or subsystem

Getting Help

If none of the troubleshooting procedures in this chapter or the tests in the system 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 Chapter 11, “Getting Help,” in the *Installation 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 use the CD-based diagnostics to run the appropriate tests to help isolate the source of the problem. See “Running the System 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 a fatal error that prevents the system from completing the boot routine until the indicated condition is corrected.

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

Table 3-1. Beep Codes

Beep Code	Error	Probable Causes
1-2	Invalid expansion-card ROM checksum	Improperly seated expansion card, or system needs to be rebooted.
1-2-2-3	Invalid BIOS ROM checksum	Corrupted BIOS firmware or defective system board.
1-3-1-1	DRAM refresh failure	Defective DIMMs or system board. Reseat DIMMs or replace system board.
1-3-1-3	Keyboard controller error	Defective DIMMs or system board. Reseat DIMMs or replace system board.

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

Beep Code	Error	Probable Causes
1-3-3-1	No DIMM memory installed	Defective DIMMs or system board. Reseat DIMMs or replace system board.
1-3-4-1	DRAM failure	Defective DIMMs or system board. Reseat DIMMs or replace system board.
1-3-4-3	DRAM failure	Defective DIMMs or system board. Reseat DIMMs or replace system board.
1-4-1-1	DRAM failure	Defective DIMMs or system board. Reseat DIMMs or replace system board.
1-4-2-1	CMOS failure	Defective system board.
1-4-3-1	Memory controller or DIMM failure	Defective DIMMs or system board. Reseat DIMMs or replace system board.
2-2-3-1	Unexpected interrupt	Improperly seated expansion card, or system needs to be rebooted.
3-2-2-1 4-2-4-4	Gate A20 failure	Defective system board.
4-2-4-3	Keyboard controller error	Defective DIMMs or system board. Reseat DIMMs or replace system board.

System Error Messages

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

Table 3-2. System Error Messages

Message	Definition	Action
`System battery is dead - Replace and run Setup`	System battery is dead.	Replace battery and run System Setup program.
`System CMOS checksum bad - Run Setup`	Configuration data is corrupted.	Run System Setup program to restore your system configuration.
`Incorrect drive A type - Run Setup` `Incorrect drive B type - Run Setup`	Diskette drive does not match diskette drive type stored in configuration data.	Run System Setup program to restore your system configuration.
`Keyboard error` `Stuck key`	Cable may be loose, or keyboard may be faulty.	Defective keyboard, keyboard cable, or system board.
`System/ Shadow RAM failed at offset:`	One or more DIMMs may be improperly seated or faulty.	Reseat or replace DIMMs.
`Operating system not found`	System did not find bootable operating system.	Use diskette with bootable operating system in drive A, or load bootable operating system from hard-disk drive.
`System cache error - Cache disabled`	Microprocessor chip malfunctioned.	Defective microprocessor or system board.
`System timer error`	Chip on system board malfunctioned.	Defective microprocessor or system board.

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

Message	Definition	Action
`Real-time clock error`	Real-time clock on system board malfunctioned.	Defective microprocessor or system board.
`Keyboard controller error`	Cable may be loose, keyboard may be faulty, or keyboard controller is defective.	Defective keyboard, keyboard cable, or system board.
`EISA configuration NVRAM bad`	EISA jumper may have been accidentally installed.	Ensure EISA jumper is removed; then reboot system and restore EISA configuration.
`EISA configuration error`	EISA configuration data in NVRAM does not match the installed EISA expansion cards.	Ensure EISA expansion cards are seated properly; then run EISA Configuration Utility.
`Invalid CPU speed detected - check jumpers`	Microprocessor speed jumper plug may be absent or installed on wrong jumper pins.	Check the microprocessor speed jumpers.

`Resource conflict Warning: IRQ not initialized`
 	
`Expansion ROM not initialized`
	BIOS detected a resource conflict while configuring Plug and Play ISA or PCI expansion card.	See "Eliminating Resource Conflicts" in Chapter 2.

`System configuration data write error`	System board may be malfunctioning.	Defective system board.
`System memory size has changed - Run Configuration Utility`	DIMM was added or removed. DIMMs are improperly seated.	More memory was added. Make sure DIMMs are properly seated; run EISA Configuration Utility.

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

Message	Definition	Action
`Stepping of CPU1 is less than sA1 - System halted.`	Wrong microprocessor installed in PROCESSOR1 socket.	Replace microprocessor with sA1 stepping or greater.
`Stepping of CPU2 is less than sA1 - System halted.`	Wrong microprocessor installed in PROCESSOR2 socket.	Replace microprocessor with sA1 stepping or greater.
`Stepping of CPU is less than sA1 - System halted.`	Wrong microprocessor installed in system.	Replace microprocessor with correct sA1 stepping or greater.
`Nonidentical CPUs - System halted.`	Cache memory sizes of the two Pentium Pro microprocessors do not match.	Replace one of microprocessors so that cache size of both microprocessors matches.
`Invalid CPU speed detected - Check speed jumpers. System halted.`	The microprocessor speed detected is neither 180 MHz or 200 MHz.	Check microprocessor speed jumpers.

`Power supply paralleling board firmware download failed`
 	
`System backplane firmware download failed`
	Server-management bus cable connection to SCSI backplane board is loose.	Check server-management bus cable connections to system board (labeled “SMB BACKPLANE”) and SCSI backplane (labeled “SMB”). Turn off and then restart system.

`Embedded server management firmware download failed`	Embedded server management memory temporarily corrupted.	Turn off and then restart the system.

Chapter 4
Removing and Replacing Parts

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

- You have performed the steps in “Precautionary Measures” found later in this chapter.
- You have removed the computer covers.
- You can replace or reinstall a part by performing the removal procedure in reverse order unless additional information is provided.

Recommended Tools

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

- Small flat-blade screwdriver
- Wide flat-blade screwdriver
- Number 1 and number 2 Phillips-head screwdrivers
- Chip-removal tool
- 1/4-inch nutdriver
- Tweezers or long-nose pliers
- Small plastic scribe

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 computer system from ESD.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT: Only service technicians trained by Dell should perform the following procedures. Before you start to work on the computer, perform the following steps in the sequence listed.

1. **Turn off the computer and any attached peripherals.**
2. **Disconnect the computer and any attached peripherals from their power sources to reduce the potential for personal injury.**
3. **Disconnect any communications cables.**
4. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as a part of the back panel, on the computer chassis.**

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

Computer Covers

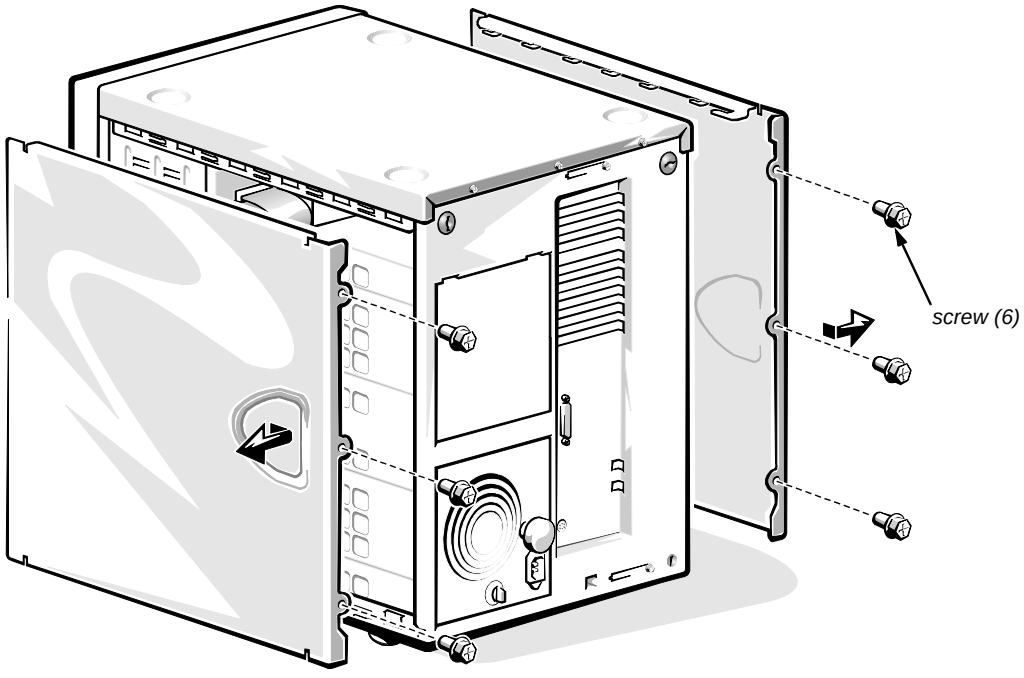


Figure 4-1. Computer Covers Removal

To remove a computer cover, follow these steps:

1. **Turn the cover's keylocks on the back panel of the computer to the unlocked position (see Figure 4-2)**.

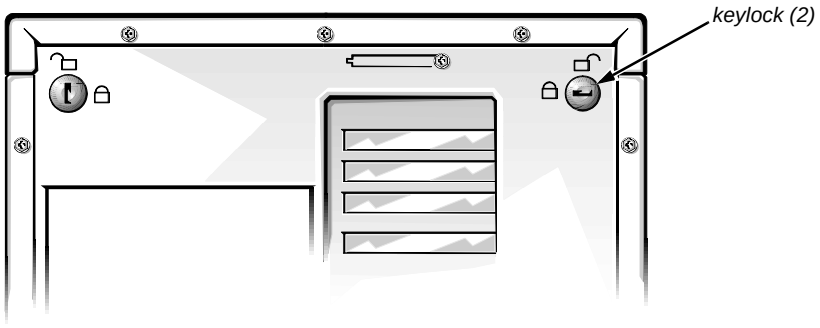


Figure 4-2. Keylocks on Computer's Back Panel

2. **Loosen the three screws along the back edge of the cover (see Figure 4-1).**
3. **Slide the cover toward the back of the computer an inch or so. Then grasp the top of the cover at both ends, and lift it straight away from the chassis.**

Front Bezel

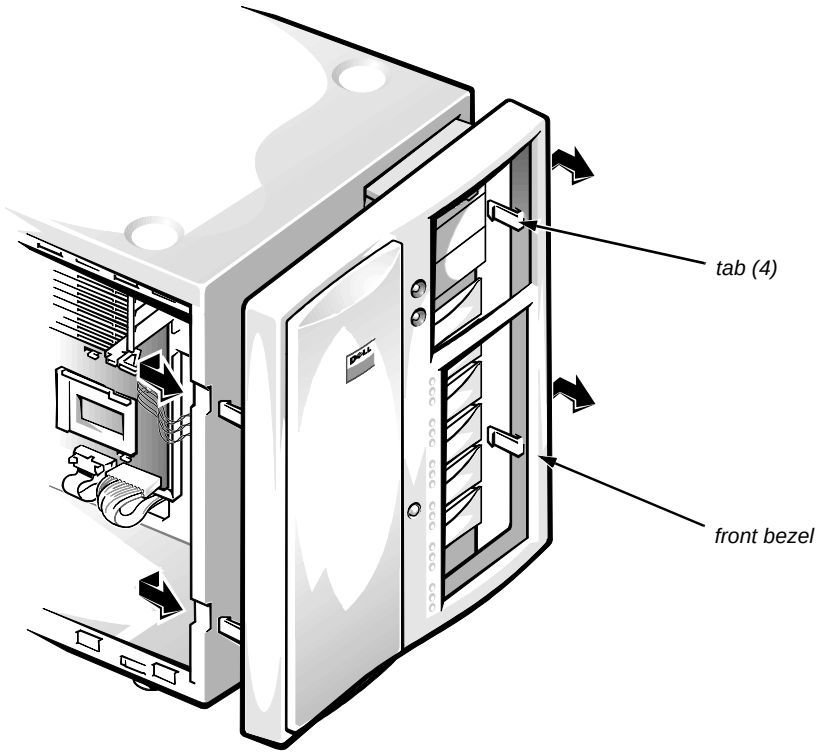


Figure 4-3. Front Bezel Removal

To remove the front bezel, follow these steps:

1. **Remove the computer covers.**
2. **Release the two tabs on each side of the bezel.**
3. **Slide the front bezel toward the front of the computer.**

Drives

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

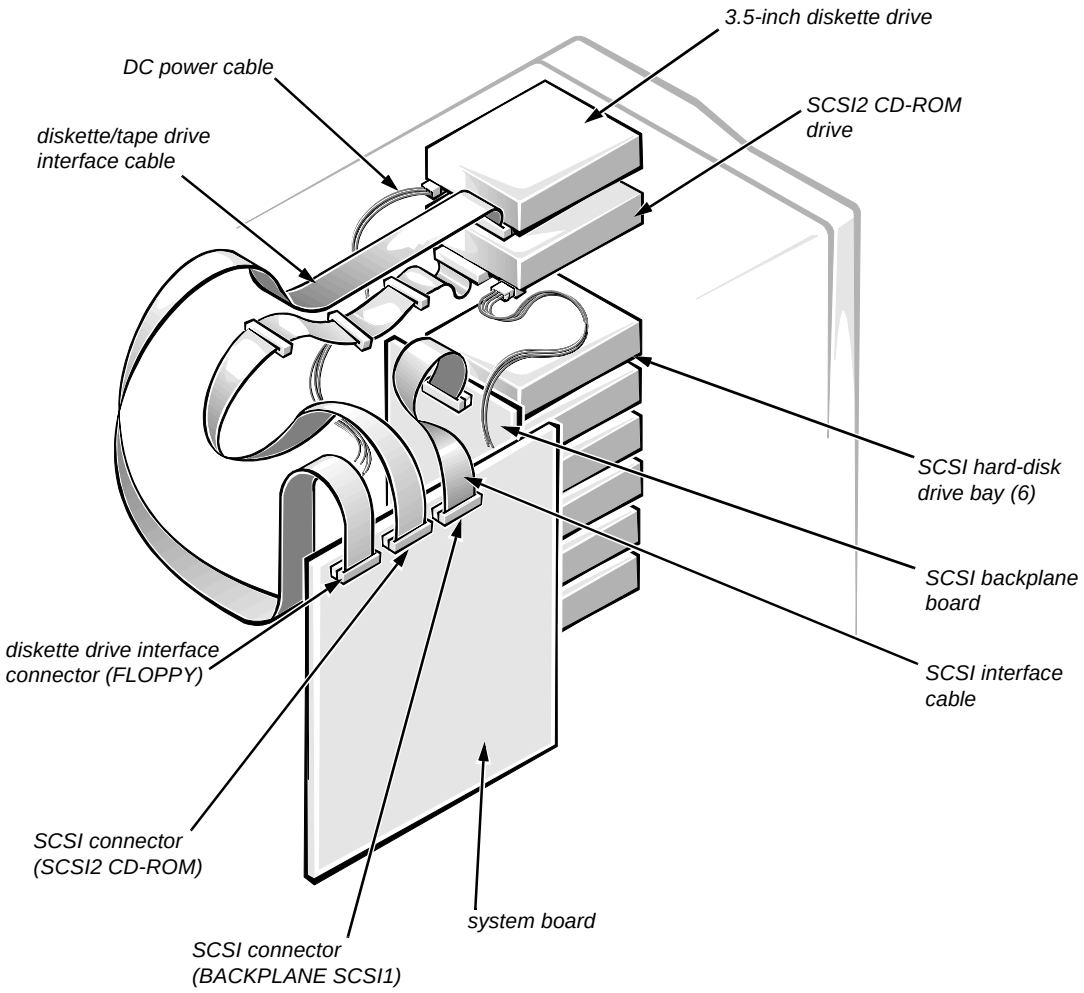


Figure 4-4. Drive Hardware

Front-Panel Inserts

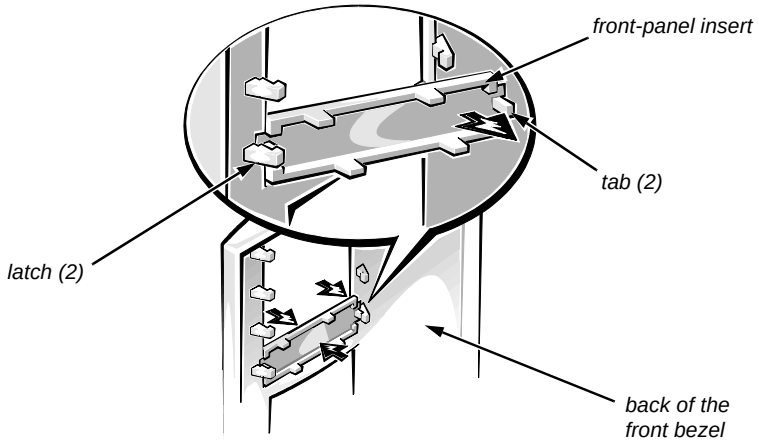


Figure 4-5. Front-Panel Insert Removal

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

1. **Remove the front bezel.**
2. **From the back of the front bezel, press against the center of the insert until the tabs come loose from the bezel.**
3. **Pull the insert out of the bezel.**

To replace a front-panel insert, position the insert over the bay opening from the inside of the front bezel and carefully press the insert into place. A tab on each side of the insert snaps into a corresponding latch on the inside of the front bezel.

Externally Accessible Drives

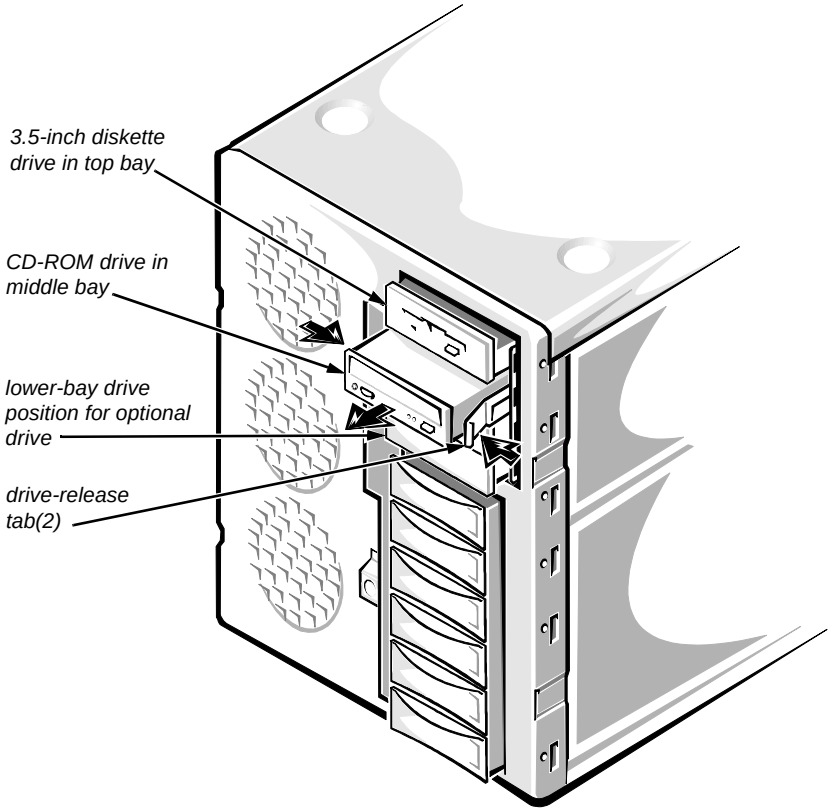


Figure 4-6. Externally Accessible Drives Removal

All of the externally accessible drives have drive-mounting rails. To remove a drive assembly from one of the externally accessible drive bays, follow these steps:

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

   Be sure to record the power connector number and interface cable connector identification.

2. **Press inward (toward center of drive) on the two drive-release tabs, and slide the drive out of the bay.**

3. **Remove the drive-mounting rails from the drive (see Figure 4-7).**

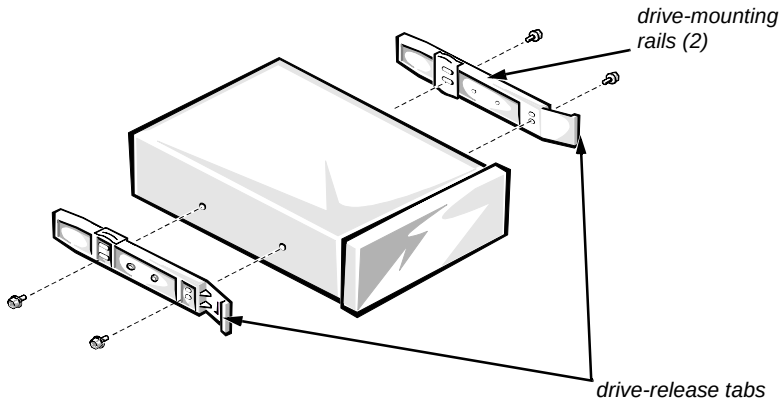


Figure 4-7. Drive-Mounting Rails Removal

4. **If the drive is a SCSI drive, record the setting of the SCSI address jumpers and SCSI bus termination jumper.**

   Some drives use an adapter between the SCSI cable and the drive connector. Check the back of the old drive for an adapter. If present, remove the adapter and retain it for use on the new drive.

   When reinstalling the SCSI drive, set the SCSI address jumpers and the SCSI bus termination jumpers to the settings you recorded.

Hard-Disk Drives

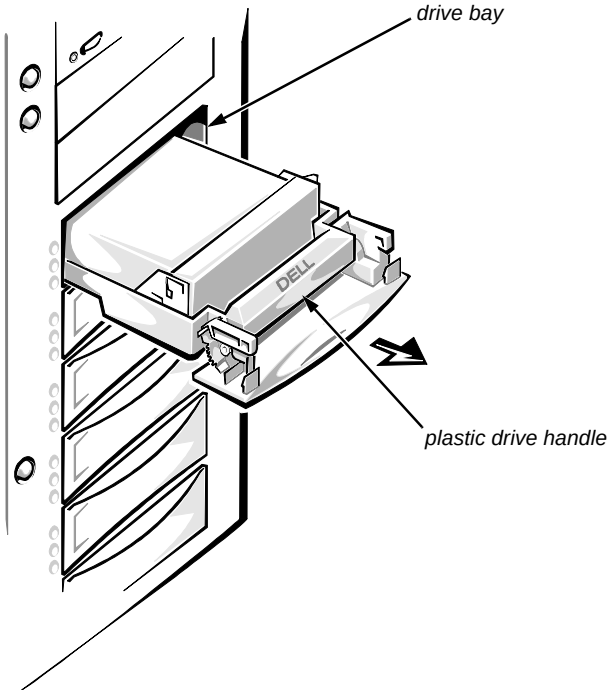


Figure 4-8. Hard-Disk Drive Carrier Removal

The hard-disk drives are mounted inside a hard-disk drive carrier. The hard-disk drive carrier must be removed before a hard-disk drive can be removed. To remove a hard-disk drive, follow these steps:

NOTES: Wait 20 seconds for the hard-disk drive to spin down before removing the hard-disk drive carrier.

Hard-disk drives can be removed with the power on if a PowerEdge Expandable RAID Controller host adapter card is installed.

1. **If a PowerEdge Expandable RAID Controller host adapter card is installed in the computer, wait until the three indicators are off, and then proceed to Step 2 (refer to Chapter 6, "Installing SCSI Hard-Disk Drives," in the *User's Guide* for more information). If this host adapter card is not installed in the computer, turn off the system before proceeding to Step 2.**
2. **Release the carrier by pulling down on the plastic drive handle.**
3. **Slide the drive carrier toward the front of the computer until it is free of the drive bay.**
4. **Turn the drive carrier over, and place it on a flat work surface.**

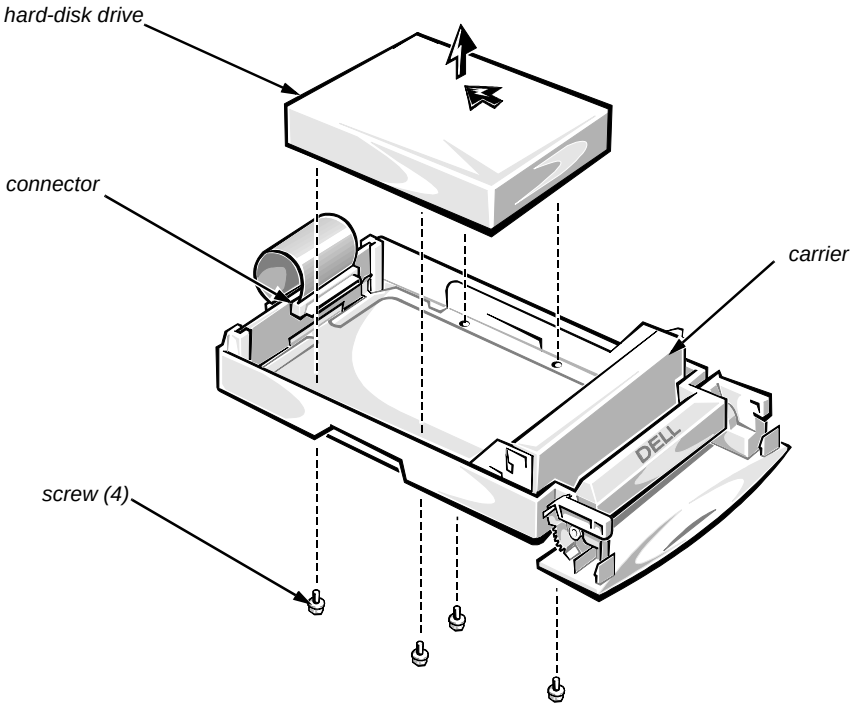


Figure 4-9. Hard-Disk Drive Removal

5. **Remove the four mounting screws that attach the hard-disk drive to the carrier.**
6. **Disconnect the hard-disk drive from the connector on the back of the carrier, and lift the drive from the carrier.**

> **CAUTION: When disconnecting the hard-disk drive from the connector, grasp the connector, not the cable, to avoid damaging the connector.**

After you replace the drive and reinstall the carrier in the bay, turn on the system. The online indicator (green) lights, indicating power is being supplied to the hard-disk drive. With the controller connected, the activity LED is activated when the controller spins up the drive.

SCSI Backplane Board

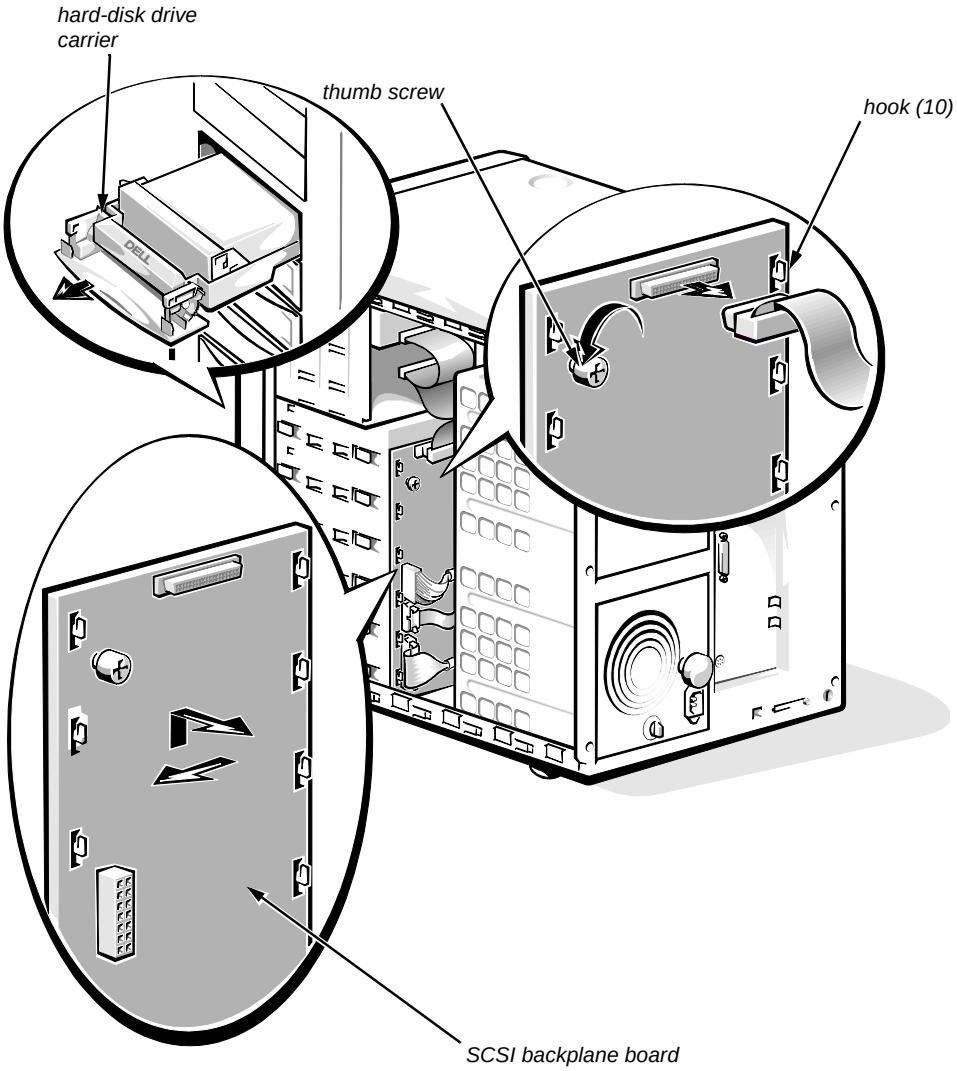


Figure 4-10. SCSI Backplane Board Removal

To remove the SCSI backplane board, follow these steps:

1. **Disconnect the hard-disk drive carrier connectors from the SCSI backplane board by sliding each carrier toward the front of the computer approximately 1 inch.**
2. **Disconnect all cables from the SCSI backplane board.**
3. **Unscrew the thumb screw.**
4. **Disengage the board from the ten hooks holding the board to the computer chassis, and lift the board away from the computer.**

   An insulator (similar to the one for the power-supply paralleling board in Figure 4-12) is attached to the back of the SCSI backplane board with two adhesive strips.

Power Supply

The computer may have one or two power supplies.

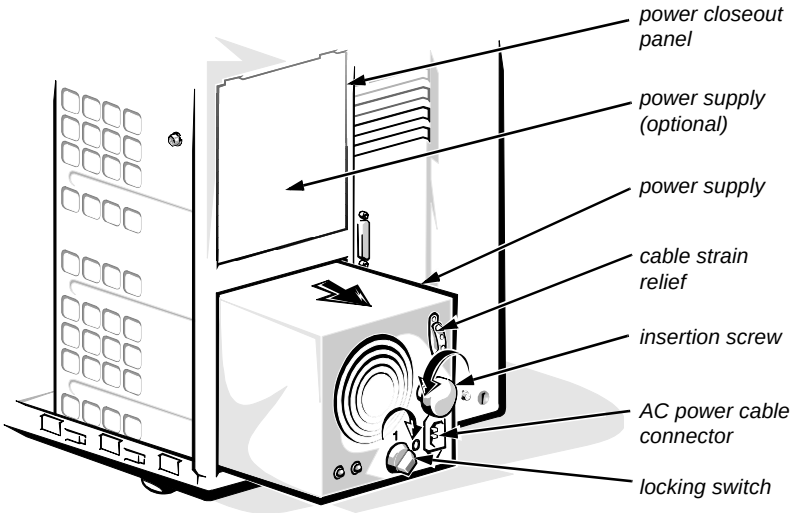


Figure 4-11. Power Supply Removal

To remove a power supply, follow these steps:

WARNING: In a redundant system, you can remove and replace a power supply without turning off the system. When doing so, be careful not to touch any of the connectors on the power-supply paralleling board.

CAUTION: To maintain proper airflow and prevent the system from overheating, each power supply bay must have either a power supply or a power closeout panel installed.

1. **Turn the locking switch on the power supply to the Off position (marked by a "0").**
2. **Unhook the cable strain relief to free the AC power cable.**
3. **Disconnect the AC power cable from the power outlet; then disconnect the other end of the cable from the power supply.**
4. **Turn the insertion screw counterclockwise to release the power supply.**
5. **Slide the power supply out of the chassis.**

To replace a power supply, perform these steps in reverse order.

Power-Supply Paralleling Board

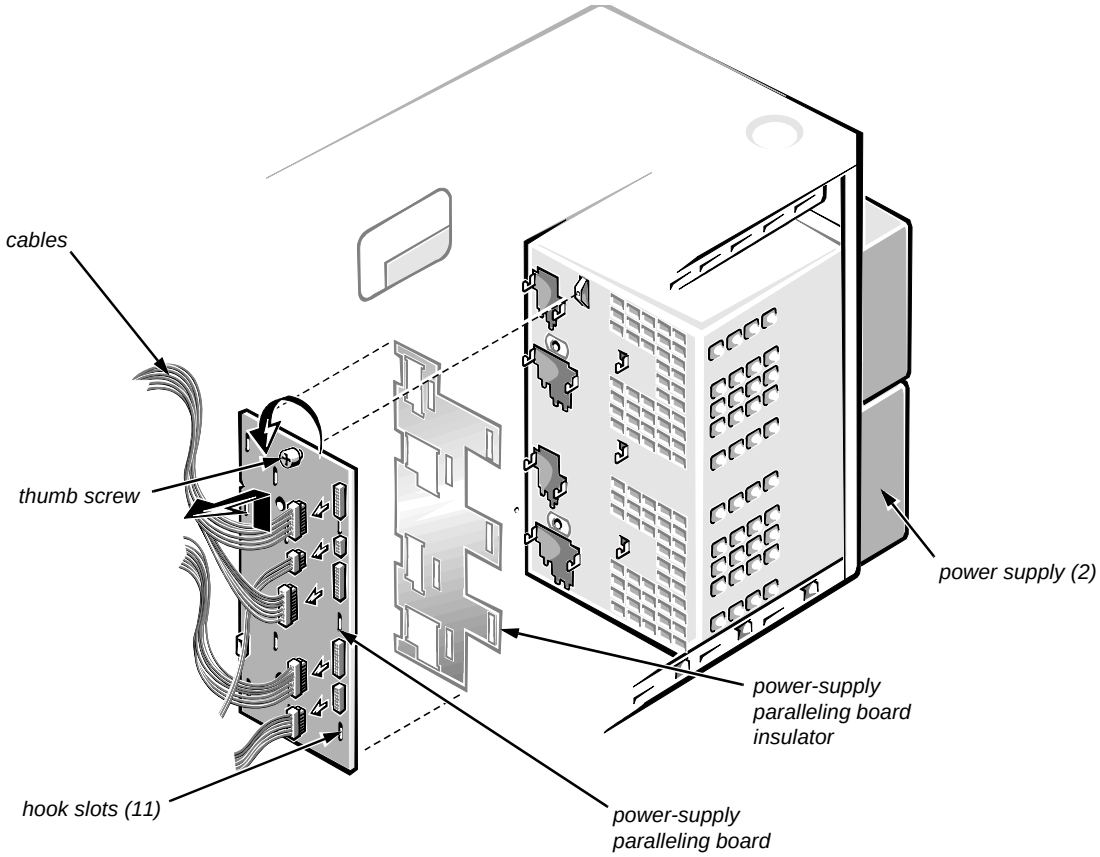


Figure 4-12. Power-Supply Paralleling Board Removal (Redundant Systems)

To remove a power-supply paralleling board, follow these steps:

WARNING: Disconnect both power supplies from their AC power source to prevent the possibility of getting shocked.

1. **Disconnect the power supplies from the power-supply paralleling board by sliding each power supply toward the back of the computer approximately 1 inch.**
2. **Disconnect all cables from the power-supply paralleling board.**
3. **Unscrew the thumb screw.**
4. **Disengage the board from the eleven hooks holding it to the computer chassis, and then lift the board away from the computer.**

Power Connector Panel

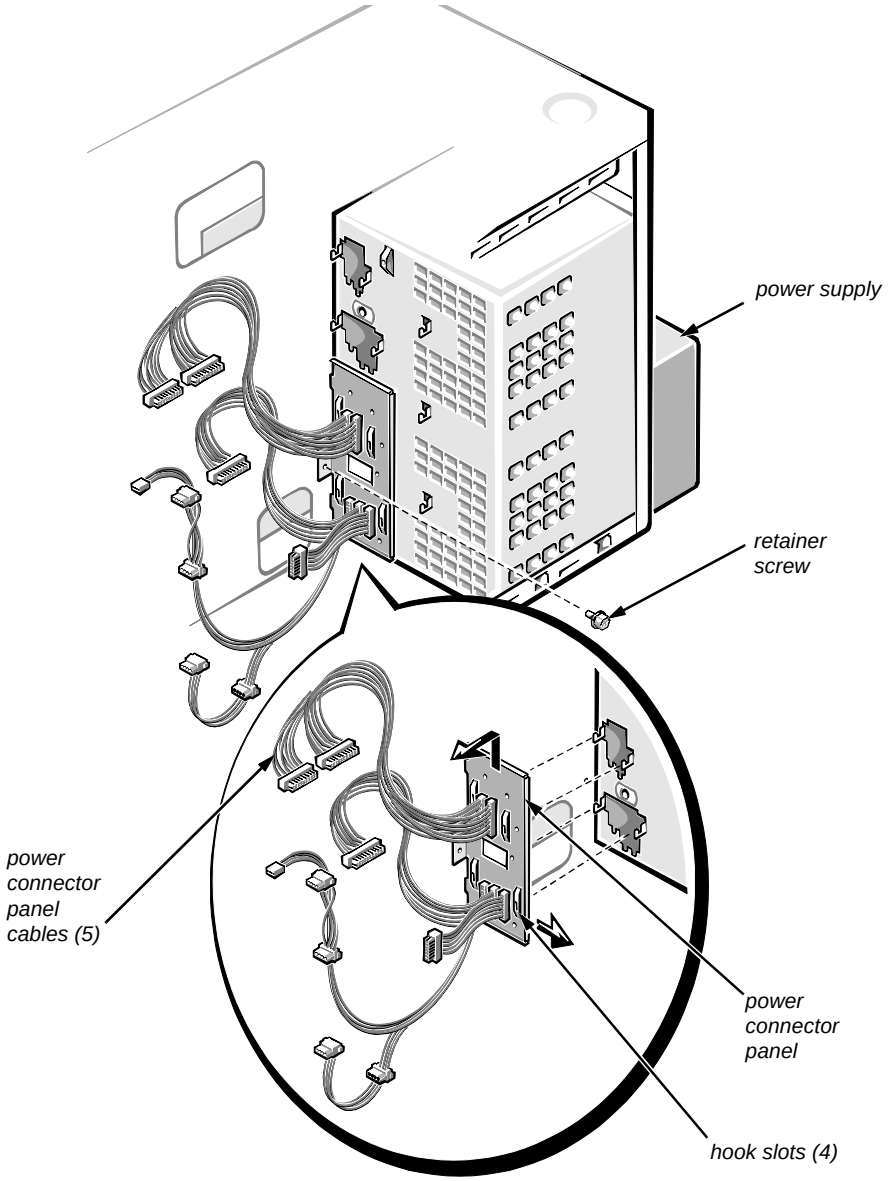


Figure 4-13. Power Connector Panel Removal (Nonredundant Systems)

To remove the power connector panel, follow these steps:

1. **Disconnect the power supply from the power connector panel by sliding the power supply toward the back of the computer approximately 1 inch.**
2. **Disconnect all power connector panel cables (from the system board, the SCSI backplane board, and so forth).**
3. **Unscrew the retainer screw.**
4. **Disengage the panel from the four hooks holding it to the computer chassis, and then lift the panel away from the computer.**

Control Panel

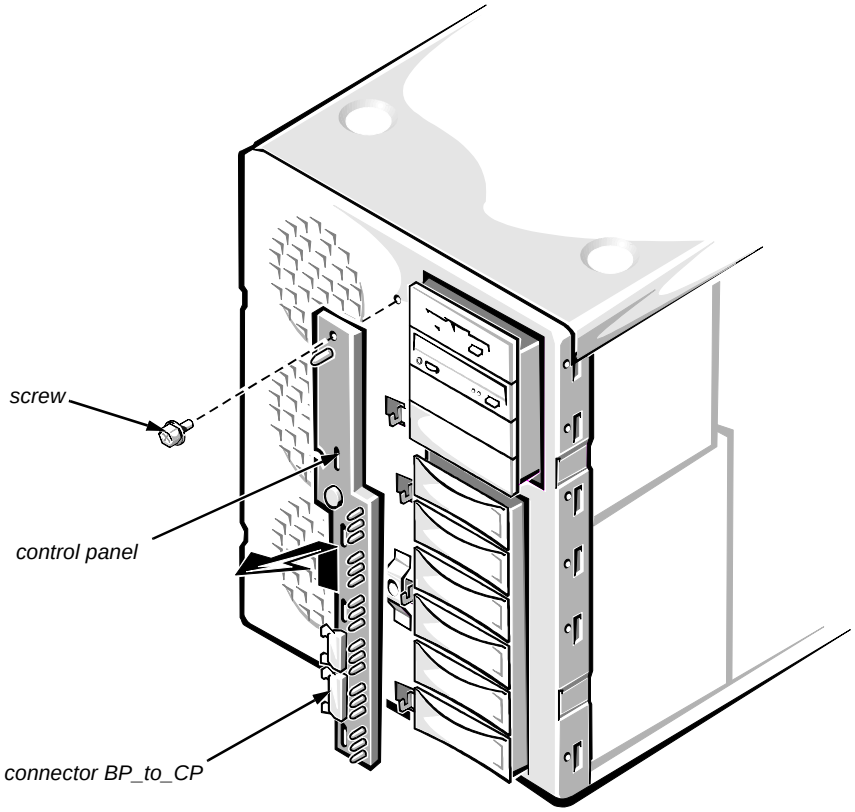


Figure 4-14. Control Panel Removal

To remove the control panel, follow these steps:

1. **Remove the screw holding the control panel to the chassis.**
2. **Disconnect the cable from connector BP_to_CP.**
3. **Disengage the panel from the four hooks holding the panel to the computer chassis, and lift the panel away from the computer.**

Cooling Fans

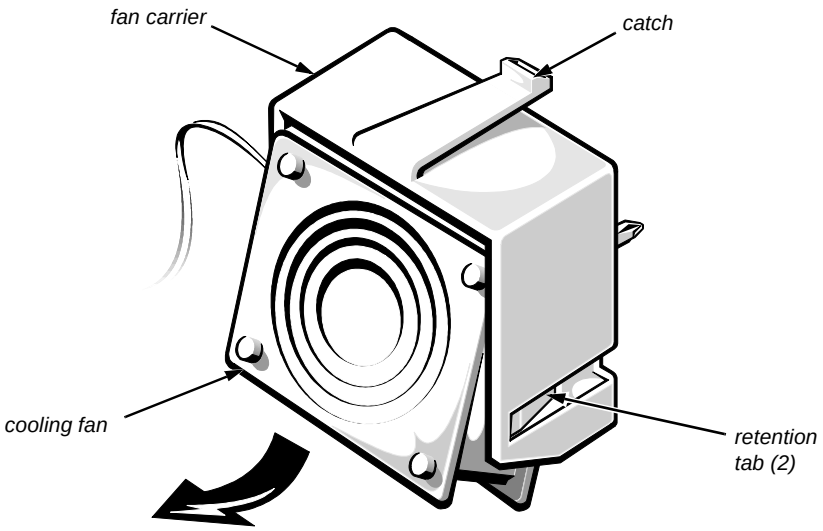


Figure 4-15. Cooling Fan Removal

To remove a cooling fan, follow these steps:

NOTES: This procedure can be performed with the computer turned on.

The middle fan is normally turned off by server management; this fan is turned on only if one of the other fans fails.

1. **Remove the left computer cover.**
2. **Disconnect the cooling fan's power cable from its respective FAN connector on the system board.**
3. **Press down the catch on the fan carrier, and remove the fan carrier from the chassis.**
4. **Remove the cooling fan from the fan carrier by releasing the two fan retention tabs inside the carrier.**

System Board Components

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

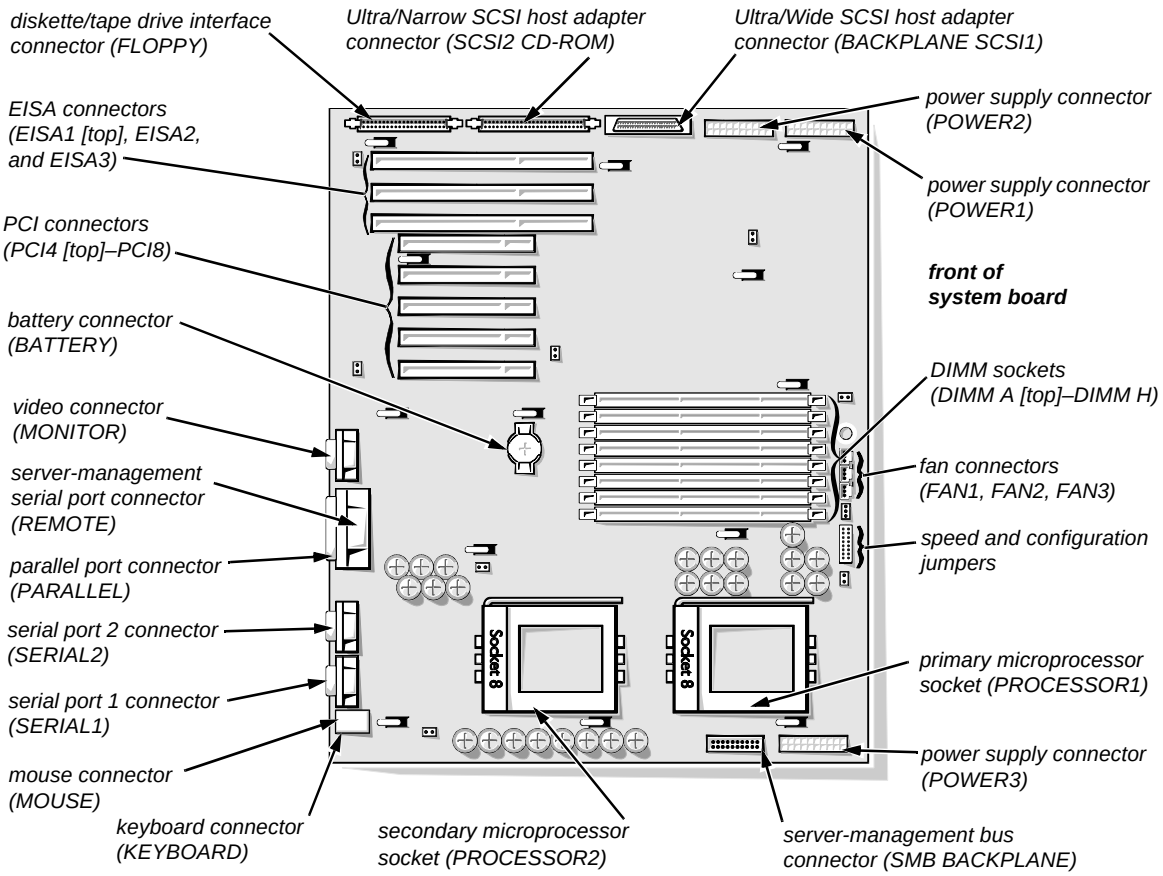


Figure 4-16. System Board Components

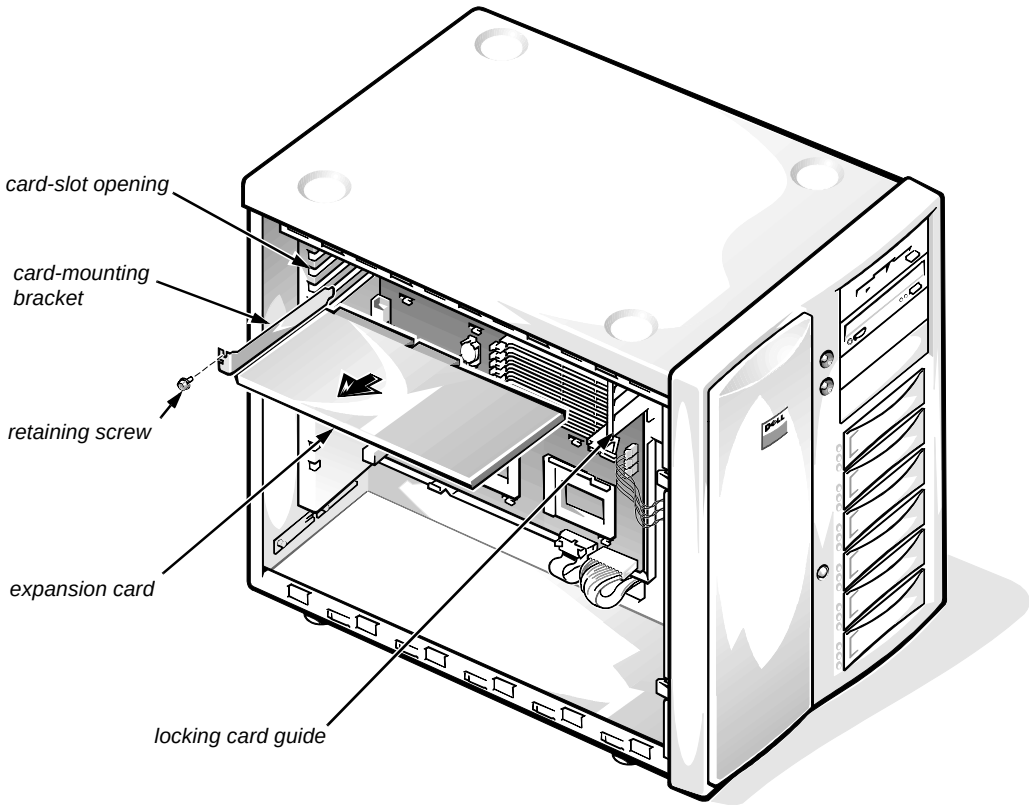


Figure 4-17. Expansion Card Removal

To remove an expansion card, follow these steps:

1. **Remove the left computer cover.**
2. **Disconnect any cables connected to the expansion card.**
3. **Remove the retaining screw from the card-mounting bracket.**
4. **If the card is a full-length expansion card, unlock the locking cam on the locking card guide.**
5. **Grasp the expansion card by its corners, and carefully remove it from the expansion-card connector.**

DIMMs

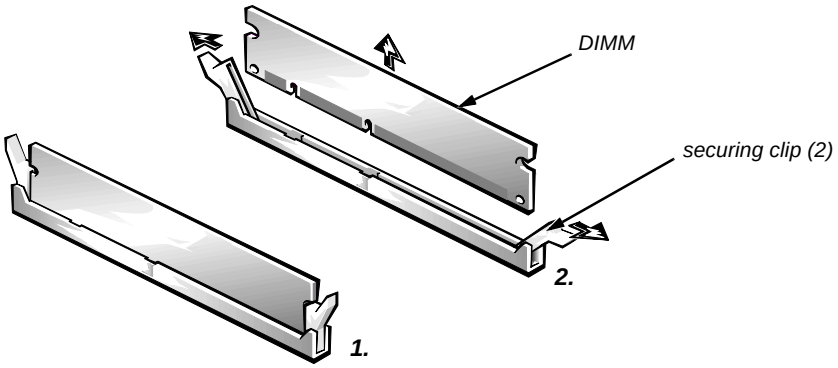


Figure 4-18. DIMM Removal

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

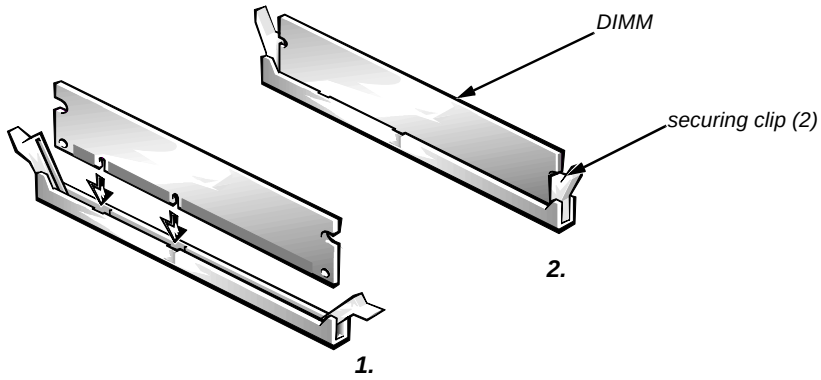


Figure 4-19. DIMM Installation

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

Microprocessor and Heat Sink

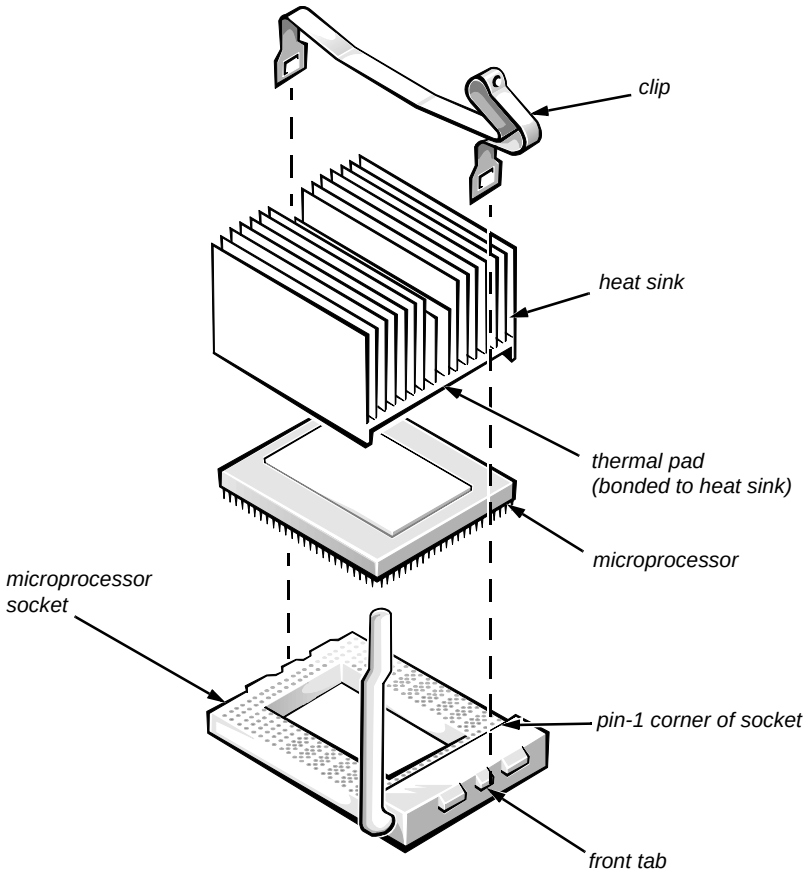


Figure 4-20. Microprocessor Configuration

The computer may have two microprocessors. To remove a microprocessor and heat sink, follow these steps:

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

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

   Press down on the folded part of the clip with a small screwdriver to release the clip (see Figure 4-21).

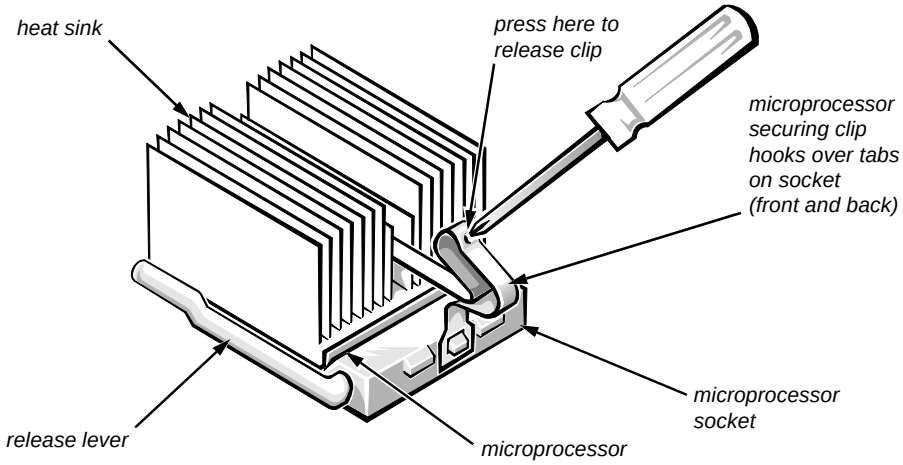


Figure 4-21. Microprocessor Securing Clip

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

> **CAUTION: Be careful not to bend any of the pins when removing the microprocessor chip from its socket. Bending the pins can permanently damage the microprocessor chip.**

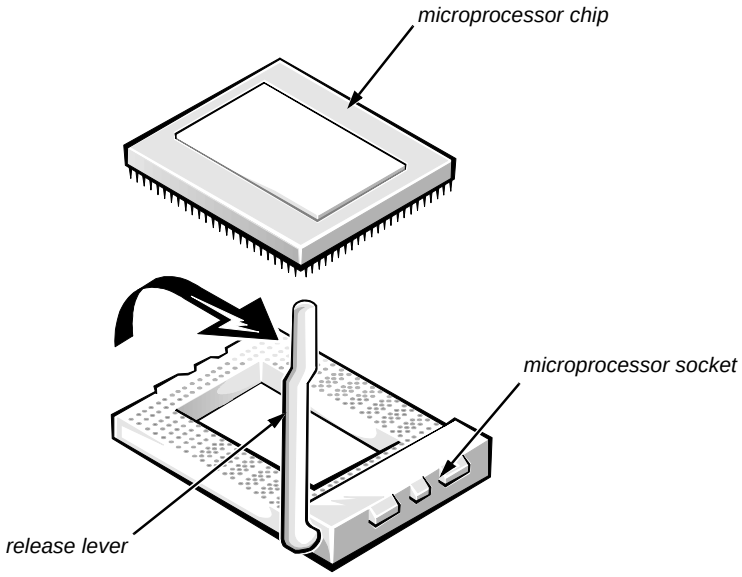


Figure 4-22. Removing a Microprocessor

4. Lift the microprocessor out of its socket.

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

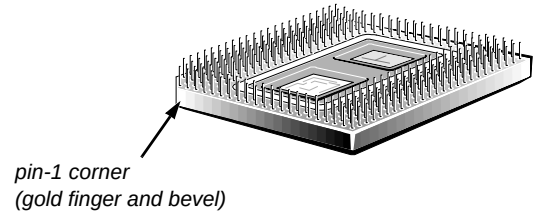


Figure 4-23. Pin-1 Identification

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

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

System Battery

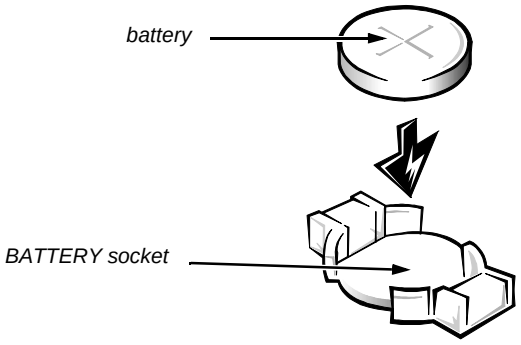


Figure 4-24. System Battery Removal

To remove the system battery, follow these steps:

1. **If possible, enter the System Setup program, and make a printed copy of the system setup screens.**
2. **Remove the left computer cover.**

   See "Computers Covers" found earlier in this chapter.
3. **Remove the battery.**

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

To *replace* the system battery, follow these steps.

WARNING: The new battery can explode if installed incorrectly. Be careful to replace the battery as instructed in the following procedure. In addition, replace the old battery only with one of the same or an equivalent type, as recommended by the manufacturer. Discard the old battery according to the manufacturer's instructions.

1. **Orient the new battery with the "+" facing up. Insert the battery into its socket, and snap it into place.**
2. **Start the System Setup program, and reset the Time and Date categories.**

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

System Board

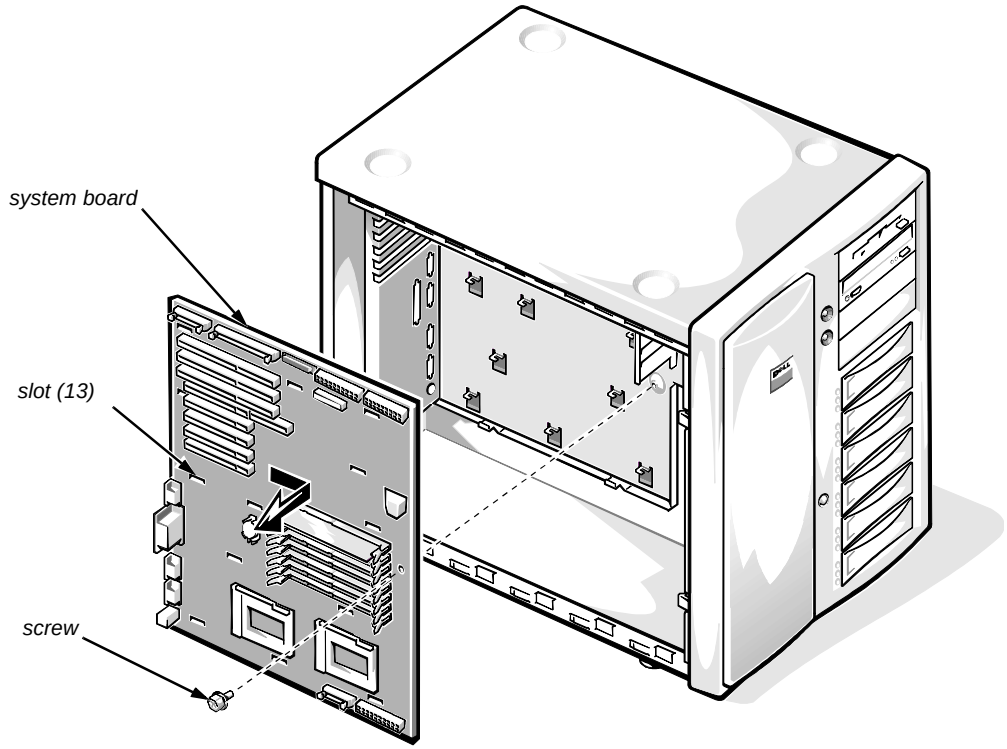


Figure 4-25. System Board Removal

To remove the system board, follow these steps:

1. **Disconnect all cables from their connectors at the back of the system unit.**
2. **Remove all expansion cards.**
3. **Disconnect all cables from the system board.**
4. **Remove the system board as follows:**
   a. Remove the screw that secures the system board to the vertical wall of the computer chassis.
   b. Slide the system board toward the front of the computer approximately 1/2 inch to release the board from the 13 slots in the computer chassis.
   c. Lift the system board out of the computer.

If you are replacing a system board, remove the DIMMs, the microprocessor(s), and the expansion card from the old system board and install them on the replacement board.

Appendix A
System Setup Program

This appendix describes the System Setup program, which is used to set or change the system configuration information stored in NVRAM on the system board.

To enter the System Setup program, press <F2> during the power-on self-test (POST).

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

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

System Setup Screens

The System Setup program is a menu-driven program. Use the left- and right-arrow keys to move between the following four menus:

- Main menu — Provides settings for the basic system configuration
- Advanced menu — Provides detailed settings for some system features
- Security menu — Provides settings for password status, diskette access, virus check reminder, and system backup reminder
- Exit menu — Provides settings for saving and loading the configurations and options

In addition to the initial menu selections, some selections have submenus. These selections are identified by an arrow to the left of the selection.

Screen Conventions

Information on the System Setup screens is organized in four boxed areas (see Figure A-1):

- Title box — Contains information about the system and menu selections
- Configuration options and system data box — Lists configuration categories (left column) and settings or information (right column)
- Help box — Displays item-specific help for the category whose field is currently highlighted
- Key functions box — Lists the System Setup keys and their functions

Key Functions

Table A-1 lists the System Setup keys and their functions.

Table A-1. Key Functions

Key Combination	Function
<F1> or <Alt><h>	Displays the general help window
<Esc>	Displays the Exit menu, or the parent menu if you are in a submenu
Left-arrow key or right-arrow key	Selects a different menu
Up-arrow key or down-arrow key	Moves the cursor up or down
<Tab>	Moves the cursor to the next field
<Shift><Tab>	Moves the cursor to the previous field
<Home> or <End>	Moves the cursor to the top or bottom of the window
<F5> or <->	Selects a lower value for the field
<F6> or <+> or <Spacebar>	Selects a higher value for the field
<F9>	Sets the default configuration values for the current menu
<Alt><d>	Loads the default System Setup values for all menus
<F10>	Loads previously stored configuration values for the current menu
<Enter>	Executes a command or selects a submenu
<Alt><r>	Refreshes the screen

Screen Color Combinations

In addition to its text, a field's color identifies the type of information it contains, as follows:

- Black on cyan — Headers and footers, including the title box at the top of the screen and the key functions box at the bottom of the screen.
- Blue on white — Configuration information that cannot be changed by the user, such as category titles.
- Black on white — Fields that can be changed by the user, but are not selected. Also used for help messages.
- Bright white on white — The highlight color for a category title that is selected. Also used to highlight the function keys in the key functions box.
- White on black — The highlight color for an input field that is selected.

Main Menu

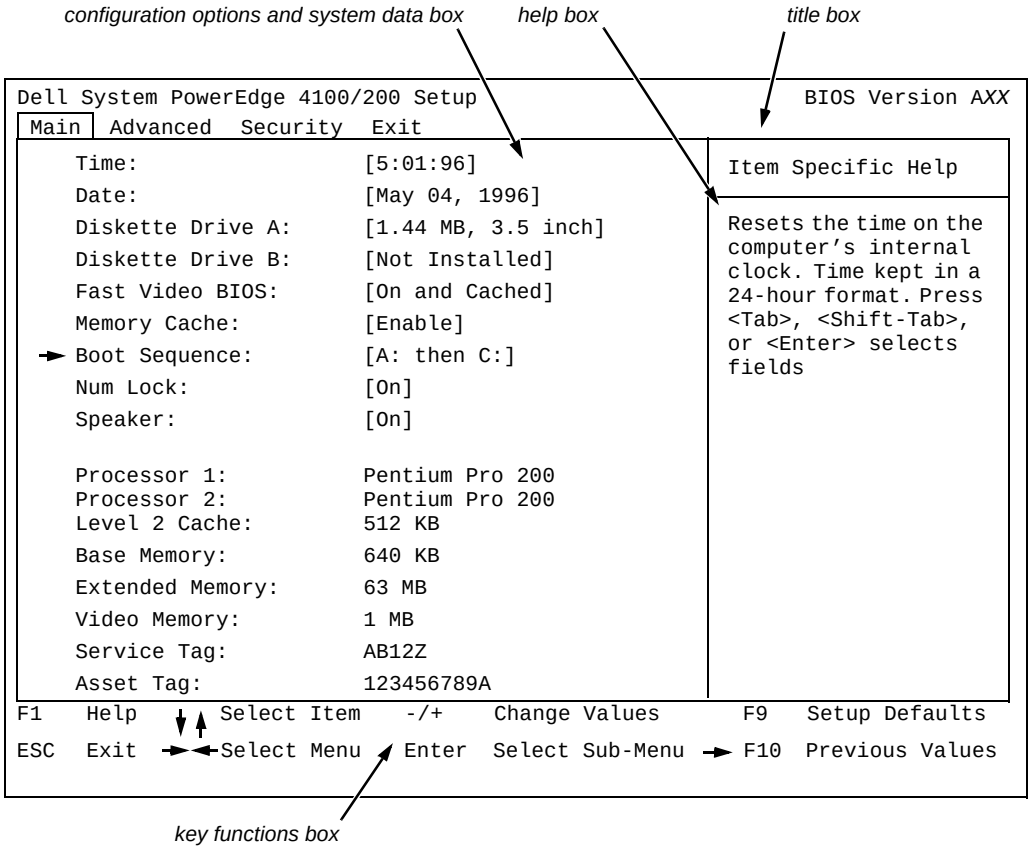


Figure A-1. Main Menu

Table A-2. Main Menu Categories

Category	Function
Time	Resets time on system's internal clock.
Date	Resets date on system's internal calendar.
Diskette Drive A or Diskette Drive B	Identifies type of diskette drives installed. Category options always match physical locations of drives in system. Tape drives are *not* reflected in these categories.
Fast Video BIOS	Enables shadowing and caching the BIOS for the video controller.
Memory Cache	Enables or disables the cache memory in the microprocessor.
Boot Sequence	Displays a submenu. See the next subsection, "Boot Options Submenu."
Num Lock	Determines whether keyboard's Num Lock mode is activated at boot.
Speaker	Enables or disables the system speaker.
Processor 1	Displays type of microprocessor installed in PROCESSOR1 socket.
Processor 2	Displays type of microprocessor installed in PROCESSOR2 socket.
Level 2 Cache	Displays amount of level-2 cache memory in the microprocessor.
Base Memory	Displays amount of memory available to MS-DOS programs that do not use extended or expanded memory.
Extended Memory	Displays amount of memory available as extended memory.
Video Memory	Displays amount of video memory installed on the system board.
Service Tag	Displays system's five-character service tag number.
Asset Tag	Displays the asset tag number, up to ten characters, if one is assigned.

Boot Options Submenu

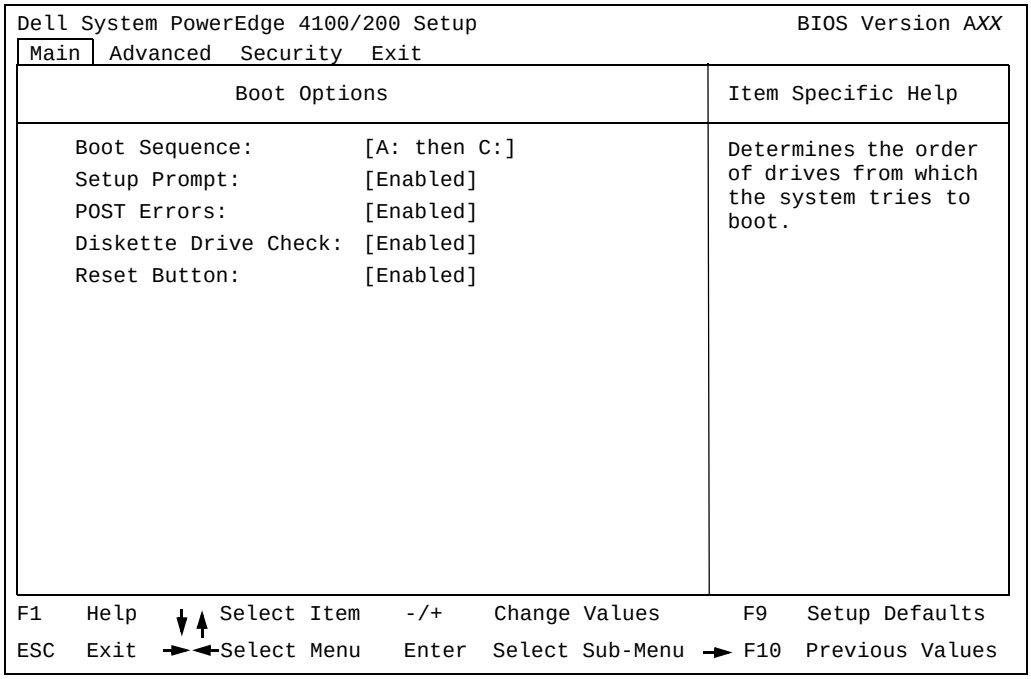


Figure A-2. Boot Options Submenu

Table A-3. Boot Options Submenu Categories

Category	Function
Boot Sequence	Determines the sequence in which the drives are searched to find the boot program after power-on
Setup Prompt	Enables or disables the "Press <F2> to enter Setup" message during boot
Post Errors	Enables or disables the "Press <F1> to resume, <F2> to enter Setup" message during boot
Diskette Drive Check	Enables or disables checking for type of diskette drive during boot
Reset Button	Enables or disables the reset button on the front bezel

Advanced Menu

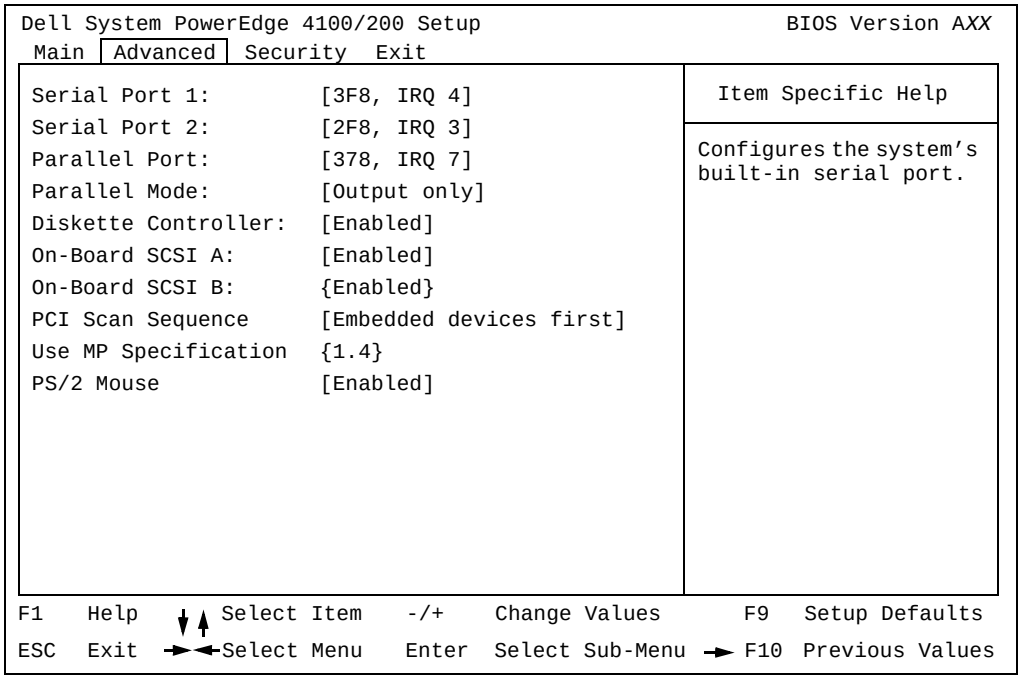


Figure A-3. Advanced Menu

Table A-4. Advanced Menu Categories

Category	Function
Serial Port 1 or Serial Port 2	Configures system's built-in serial ports.
Parallel Port	Configures system's built-in parallel port. The port's I/O address may be set to: 278H, IRQ5; 3BCH, IRQ7; 378H, IRQ7. Otherwise, the port may be disabled.
Parallel Mode	Controls whether system's built-in parallel port acts as an AT-compatible (Output Only), PS/2-compatible (Bidirectional), or ECP (extended capabilities port).
Diskette Controller	Enables system's built-in diskette controller.
On-Board SCSI A	Enables or disables the built-in SCSI 7880 Ultra/Wide controller and determines if it is scanned as a boot drive.
On-Board SCSI B	Enables or disables the built-in SCSI 7860 Ultra/Narrow controller and determines if it is scanned as a boot drive.
PCI Scan Sequence	Determines the sequence the PCI devices are scanned to find a boot device (default is Embedded devices first).
Use MP Specification	Determines the microprocessor-specification revision level: either 1.1 or 1.4 (default).
PS/2 Mouse	Enables or disables the built-in mouse controller.

Security Menu

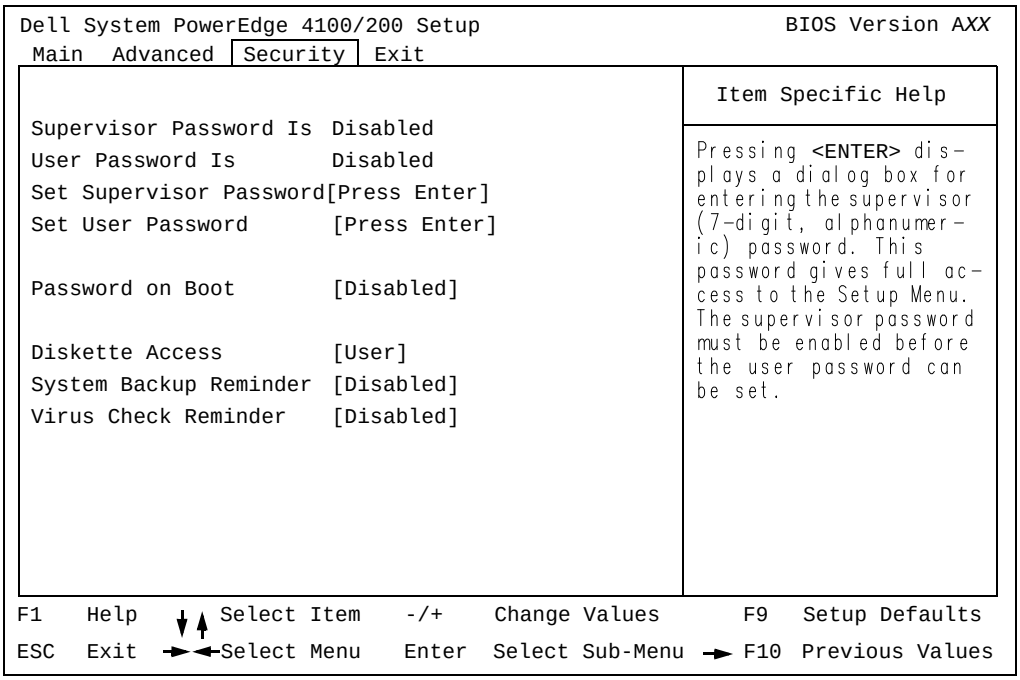


Figure A-4. Security Menu

Table A-5. Security Menu Categories

Category	Function
Supervisor Password Is	Displays current status of the supervisor password (enabled or disabled). See "Using the Supervisor Password Feature" in Chapter 4 of the *User's Guide*.
User Password Is	Displays current status of user password (enabled or disabled). See "Using the User Password Feature" in Chapter 4 of the *User's Guide*.
Set Supervisor Password	Displays a dialog box for entering a new user password (up to seven alphanumeric characters). See "Using the Supervisor Password Feature" in Chapter 4 of the *User's Guide*.
Set User Password	Displays a dialog box for entering a new user password (up to seven alphanumeric characters). See "Using the User Password Feature" in Chapter 4 of the *User's Guide*.
Password on Boot	Allows you to require the entry of a supervisor password before the boot process of the system can be completed. Requires use of a supervisor password.
Diskette Access	Restricts access to the diskette drive. Requires use of a supervisor password.
System Backup Reminder	Enables or disables a system-backup reminder message at boot.
Virus Check Reminder	Enables or disables a virus-check reminder message at boot.

Exit Menu

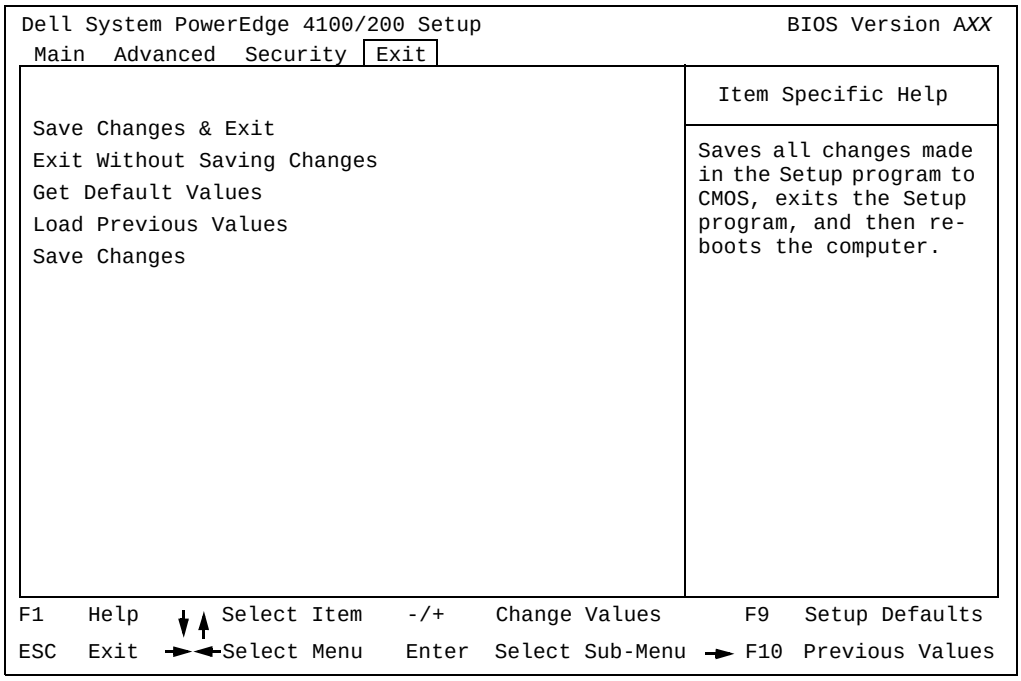


Figure A-5. Exit Menu

Table A-6. Exit Menu Categories

Category	Function
Save Changes and Exit	Saves the changes you have made before you exit the System Setup program. The next time you boot up, the BIOS configures your system according to the selections stored in CMOS.
Exit Without Saving Changes	Exits the System Setup program without saving any of the changes you have made.
Get Default Values	Loads the default values for each menu in the System Setup program.
Load Previous Values	Loads the values previously stored in CMOS for each menu.
Save Changes	Stores your changes in CMOS, but does not exit the System Setup program.

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