Preliminary A+2851™ System

Installation and Troubleshooting Guide

Notes, Notices, and Cautions

NOTE: Indicates important information helping you make better use of your computer.

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

CAUTION: Indicates potential for property damage, personal injury, or death.

Revision History

Revision	Date	Modifications
0.0	8/22/2005	Created from available SITG. Formatted for consistency and highlighted material to modify. Removed sections for Dell components no longer available and added sections for additional Augmentix material.
0.1	10/5/2005	Added Drive Carrier removal steps to Installation steps as necessary. Continued to correct for Augmentix and not Dell content. Added sections for Drive Carrier fans. Added new Agx logo and blue. Added removal of drive carrier fan bracket and opening of card cage access door to pertinent instructions.
0.2	10/18/2005	Removed section for internal tape drive – not supported. Modified formatting and updated table and figure references. Corrected reference to power supply fault LED being red – it's amber.

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1 Introduction

Your high-speed system offers significant service and upgrade features. The system includes the following service features to make troubleshooting and repair easy and effective:

- The Augmentix *A*+SAMP card with the *A*+HPI Software Suite allows monitoring of the environment, hardware, operating system, and application to take predefined corrective actions in the event of a failure. Most outages are the result of transient software failures. The *A*+SAMP card and the *A*+HPI software can detect these failures and bring the system and application back into operation by restarting the failed application, rebooting the server, and/or power-cycling the server.
- The *A*+ Front Panel Display, a slave companion to the *A*+SAMP and controlled and managed by the *A*+HPI software suite, provides event reporting and user interface at the system bezel.
- Redundant, hot-pluggable cooling fans
- Redundant, hot-pluggable power supplies
- System diagnostics, which check for hardware problems (if the system can boot)

System upgrade options are offered, including:

- An additional microprocessor
- Additional system memory
- A variety of PCI, PCI Express (PCIe), and PCI-X expansion-card options (including RAID controller cards)
- An integrated RAID controller that can be activated with an additional memory module, key, and battery

1.1 Other Documents You May Need

⚠ The *A+2851 System Information Guide* provides important safety and regulatory information. Warranty information is included within this document.

- The *A+2851 Getting Started Guide* provides an overview of initial system setup.
- The *A+ Front Panel Display Operator Guide* defines the functions and operations of the Augmentix *A*+ Front Panel Display.
- Documentation for any components you purchased separately provides information to configure and install these options.
- Updates are sometimes included with the system to describe changes to the system, software, and/or documentation.

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

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

1.2 Obtaining Technical Assistance

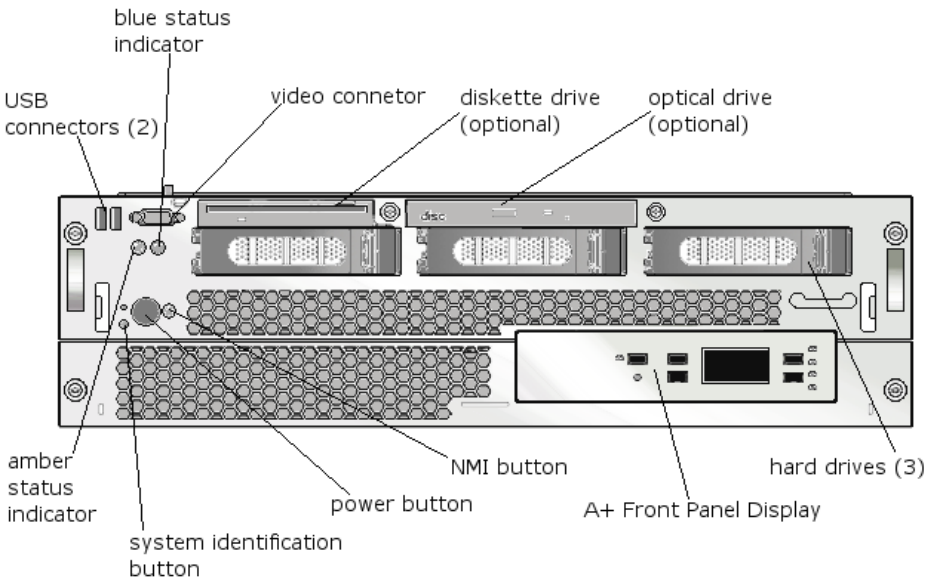
If at any time you do not understand a procedure described in this guide or if your system does not perform as expected, please contact Augmentix support for assistance. See "Getting Help."

2 Indicators, Messages, and Codes

2.1 Front-Panel Indicators and Features

Figure 2-1 shows the front-panel indicators and features of the system. Table 2-1 describes the front-panel features.

Figure 2-1 Front-Panel Features



NOTE: Hard drives bays are numbered 1, 3, and 5 starting at the leftmost drive bay.

Table 2-1 Front-Panel LED Indicators, Buttons, and Connectors

Indicator, Button, or Connector	**Icon**	**Description**
Blue and Amber status indicators		Not operational. The *A*+ Front Panel Display indicates the status.
power-on indicator, power	⏻	The power-on indicator blinks when power is available to the system, but the system is not powered on. The power-on

button		indicator stays lit when system power is on. The power button controls the DC power supply output to the system. **NOTE:** If the system is turned off using the power button and is running an ACPI-compliant operating system, it performs a graceful shutdown before powering off. If the system is not running an ACPI-compliant operating system, the power is turned off immediately after the power button is pressed.
system identification button	ⓘ	Used to locate a particular system within a rack. When button on the front or back panel is pushed, the blue system status indicator on the back blinks until one of the buttons is pushed again.
USB connectors		Connects USB 2.0-compliant devices to the system.
NMI button		Used to troubleshoot software and device driver errors when using certain operating systems. This button can be pressed using the end of a paper clip. Use this button only if directed to do so by qualified support personnel or by the operating system's documentation.
video connector		Connects a monitor to the system.

2.2 SCSI Hard-Drive Indicator Codes

If RAID is activated, two indicators on each of the hard-drive carriers provide information on the status of the SCSI hard drives. RAID can be enabled either by using ROMB on the optional riser card or by using a RAID card connected to the backplane. See Figure 2-2. The SCSI backplane firmware controls the drive power-on/fault indicator.

Table 2-2 lists the drive indicator patterns. Different patterns are displayed as drive events occur in the system. For example, if a hard-drive fails, the "drive failed" pattern appears. After the drive is selected for removal, the "drive being prepared for removal" pattern appears, followed by the "drive ready for insertion or removal" pattern. After the replacement drive is installed, the "drive being prepared for operation" pattern appears, followed by the "drive online" pattern.

NOTE: If RAID is not activated, only the "drive online" indicator pattern appears. The drive-activity indicator also blinks when the drive is being accessed.

Figure 2-2 SCSI Hard-Drive Indicators

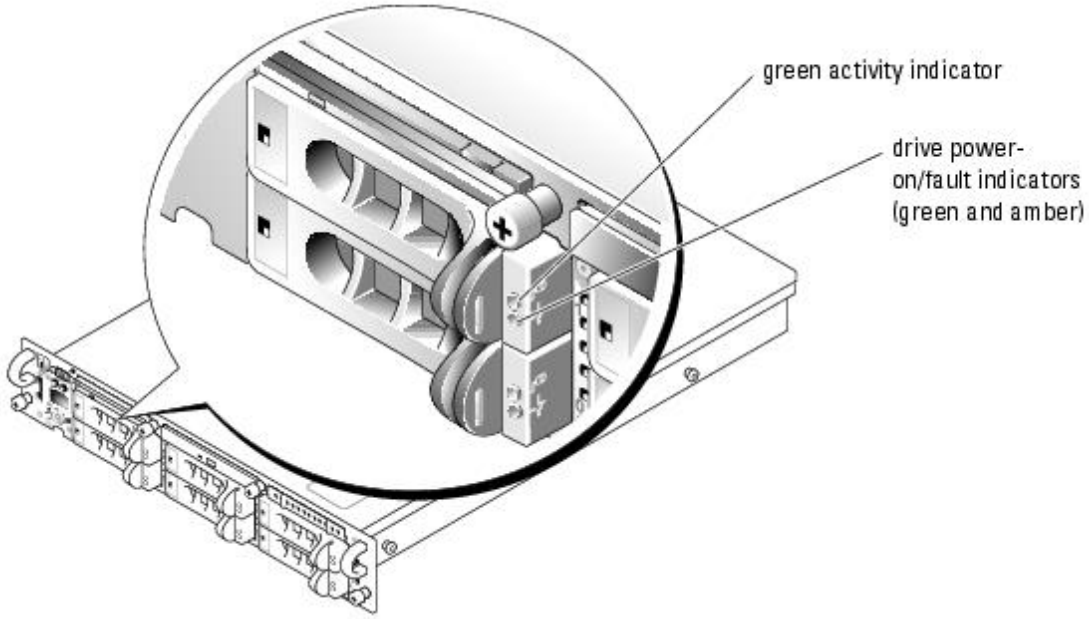


Table 2-2 Hard-Drive Indicator Patterns

Condition	**Indicator Pattern**
Identify drive	The green power-on/fault indicator blinks four times per second.
Drive being prepared for removal	The green power-on/fault indicator blinks two times per second.
Drive ready for insertion or removal	Both drive indicators are off.
Drive being prepared for operation	The green power-on/fault indicator is on.
Drive predicted failure	The power-on/fault indicator slowly blinks green, amber, and off.
Drive failed	The amber power-on/fault indicator blinks four times per second.
Drive rebuilding	The green power-on/fault indicator blinks slowly.
Drive online	The green power-on/fault indicator is on.

2.3 Back-Panel Indicators and Features

Figure 2-3 shows the back-panel features of the system. Table 2-3 describes the back-panel features.

Figure 2-3 Back-Panel Features

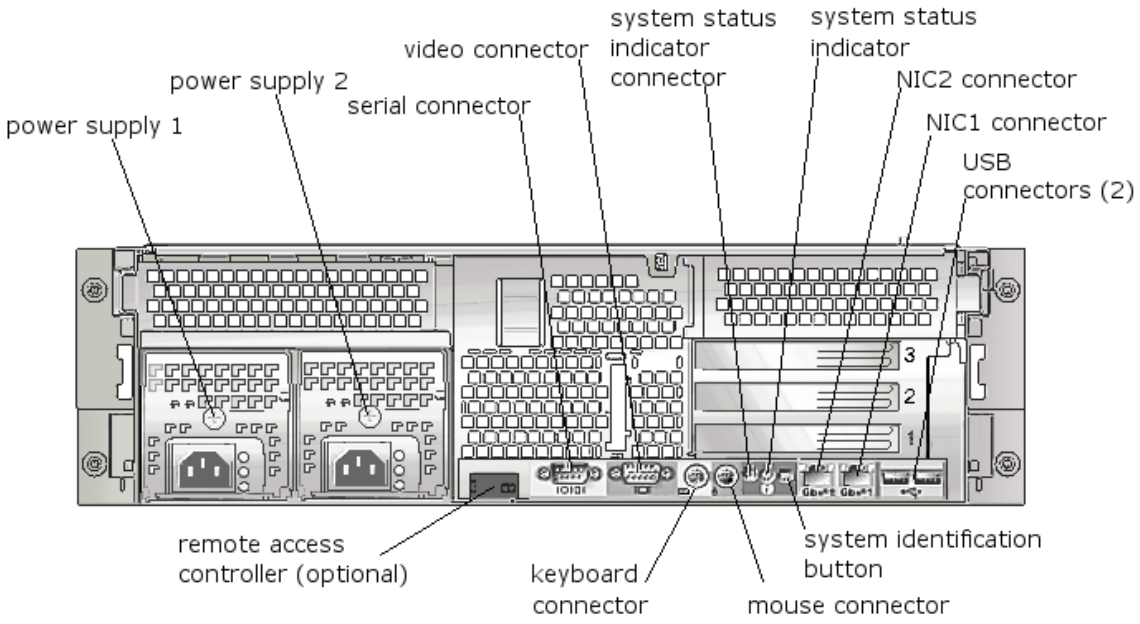


Table 2-3 Back-Panel Features

Component	Description
Power supply indicators	Provides information on power status. See "Power Indicator Codes."
NIC indicators	Provides information on NIC status. See "NIC Indicator Codes."
System status/identification indicator	Signifies when the system is operating correctly or when the system needs attention, and can identify a particular system. See Table 2-4 for system indicator codes.
System status indicator connector	Connects to an indicator that can signify when the system is operating correctly or when the system needs attention.
System identification button	Can be used to identify a particular system.

Table 2-4 System Indicator Codes

Indicator Code	Description
Off	Power is not available to the system
Blinking Amber	The system has detected an error. See your *A+2851 System Installation and Troubleshooting Guide* for more information.
On Blue	Power is on, and the system is operational.
Blinking Blue	The indicator has been activated to identify the system in a rack.
NOTE: While the system is being identified, the blue indicator blinks even though an error has been detected. After the system is identified, the blue indicator stops blinking and the amber indicator resumes blinking.	

2.4 Power Indicator Codes

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

2.4.1 Power-Button Indicator Codes

The power button on the front panel controls the power input to the system's power supplies. The power indicator can provide information on power status. See Figure 2-1. Table 2-5 lists the power button indicator codes.

Table 2-5 Power-Button Indicator Codes

Indicator	Indicator Code
On	Indicates that power is supplied to the system, and the system is operational.
Off	Indicates that no power is supplied to the system.
Blinking	Indicates that power is supplied to the system, but the system is in a standby state.

2.4.2 Redundant Power-Supply Indicator Codes

The indicators on the optional redundant power supplies show whether power is present or whether a power fault has occurred. See Figure 2-4. Table 2-6 lists the power-supply indicator codes.

Figure 2-4 Redundant Power-Supply Indicators

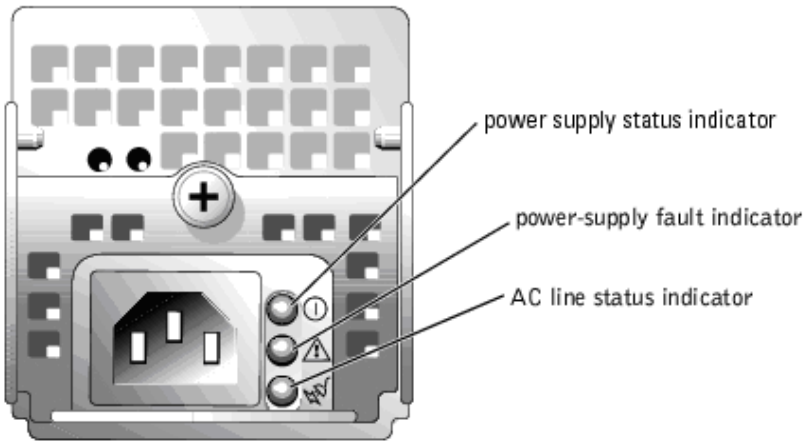


Table 2-6 Power-Supply Indicator Codes

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

2.5 NIC Indicator Codes

Each NIC on the back panel has an indicator that provides information on network activity and link status. See Figure 2-5. Table 2-7 lists the NIC indicator codes on the back panel.

Figure 2-5 NIC Indicators

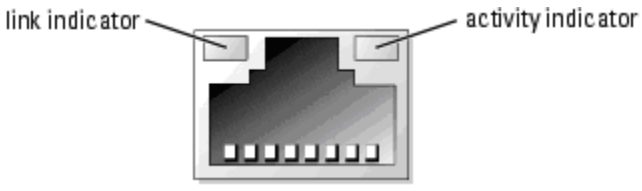


Table 2-7 NIC Indicator Codes

Indicator	Indicator Code
Link and activity indicators OFF	NIC not connected to the network.
Link indicator GREEN	NIC connected to valid link partner on network.
Activity indicator blinking AMBER	Network data being sent or received.

2.6 System Beep Codes

If an error that cannot be reported on the screen occurs during POST, the system may emit a series of beeps that identifies the problem.

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

If a beep code is emitted, write down the series of beeps and then look it up in Table 2-8. If you are unable to resolve the problem by looking up the meaning of the beep code, use system diagnostics to identify the possible cause. If you are still unable to resolve the problem, see "Getting Help."

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

Table 2-8 System Beep Codes

Code	Cause	Corrective Action
1-1-2	CPU register test failure.	Replace microprocessor 1. See "Processors" in "Installing System Board Options." If the problem persists, replace microprocessor 2.
1-1-3	CMOS write/read failure; faulty system board.	See "Getting Help."
1-1-4	BIOS error.	Reflash the BIOS firmware. See "Getting Help."
1-2-1	Programmable interval-timer failure; faulty system board.	See "Getting Help."
1-2-2	DMA initialization failure.	See "Troubleshooting System Memory" in "Troubleshooting Your System."
1-2-3	DMA page register write/read failure.	
1-3-1	Main-memory refresh verification failure.	
1-3-2	No memory installed.	
1-3-3	Chip or data line failure in the first 64 KB of main	

	memory.	
1-3-4	Odd/even logic failure in the first 64 KB of main memory.	
1-4-1	Address line failure in the first 64 KB of main memory.	
1-4-2	Parity failure in the first 64 KB of main memory.	
1-4-3	Fail-safe timer test failure.	
1-4-4	Software NMI port test failure.	
2-1-1 through 2-4-4	Bit failure in the first 64 KB of main memory.	
3-1-1	Slave DMA-register failure.	See "Getting Help."
3-1-2	Master DMA-register failure.	
3-1-3	Master interrupt-mask register failure.	
3-1-4	Slave interrupt-mask register failure.	
3-2-2	Interrupt vector loading failure.	
3-2-4	Keyboard-controller test failure.	See "Troubleshooting the Keyboard" in "Troubleshooting Your System."
3-3-1	CMOS failure.	See "Getting Help."
3-3-2	System configuration check failure.	
3-3-3	Keyboard controller not detected.	
3-3-4	Video memory test failure.	

3-4-1	Screen initialization failure.	
3-4-2	Screen-retrace test failure.	
3-4-3	Video ROM search failure.	
4-2-1	No timer tick.	
4-2-2	Shutdown test failure.	
4-2-3	Gate A20 failure.	
4-2-4	Unexpected interrupt in protected mode.	See "Troubleshooting Expansion Cards" in "Troubleshooting Your System."
4-3-1	Improperly installed or faulty memory modules.	See "Troubleshooting System Memory" in "Troubleshooting Your System."
4-3-2	No memory modules installed in bank 1.	Install memory modules in bank 1 of the same type and size. See "Installing Memory Modules" in "Installing System Options."
4-3-3	Faulty system board.	See "Getting Help."
4-3-4	Time-of-day clock stopped.	See "Troubleshooting the System Battery" in "Troubleshooting Your System."
4-4-1	Super I/O chip failure; faulty system board.	See "Getting Help."
4-4-2	BIOS-shadowing failure.	See "Troubleshooting System Memory" in "Troubleshooting Your System."
4-4-3	Microprocessor speed control sequence failure.	See "Troubleshooting the Microprocessors" in "Troubleshooting Your System."
4-4-4	Cache test failure; faulty microprocessor.	

3 Finding Software Solutions

Software problems can be caused by:

- Improper installation or configuration of an application
- Application conflicts
- Input errors
- Interrupt assignment conflicts

Ensure that you are installing the software application according to the software manufacturer's recommended procedures. If a problem occurs after you install the software, you might need to troubleshoot your software application and your system.

See the documentation that accompanied the software or contact the software manufacturer for detailed troubleshooting information.

NOTE: If all of the system diagnostic tests complete successfully, then the problem is most likely caused by the software and not the hardware.

3.1 Before You Begin

- Scan the software media with antivirus software.
- Read the software documentation before you run the installation utility.
- Be prepared to respond to prompts from the installation utility.

  The installation utility may require you to enter information about your system, such as how the operating system is configured, and the type of peripherals that are connected to the system. Have this information available before running the installation utility.

3.2 Troubleshooting Errors and Conflicts

While configuring and running software, problems might occur that are caused by input errors, application conflicts, and/or IRQ assignment conflicts. The problems are sometimes indicated by error messages.

Error messages are generated by system hardware or software. "Indicators, Messages, and Codes" provides information about error messages that are hardware-based. If you receive an error message that is not listed, see your operating system or software program documentation for troubleshooting information.

3.2.1 Input Errors

Pressing a specific key or set of keys at the wrong time may produce unexpected results. See the documentation that came with the software application to ensure that the values or characters you are entering are valid.

Ensure that your operating system is configured properly to run the application. Remember that whenever you change the parameters of the operating system, the changes can conflict with an application's operating requirements. After you configure the operating system, you may need to reinstall or reconfigure a software application so that it can run properly in its new environment.

3.2.2 Application Conflicts

Some applications can leave unnecessary files or data behind after they are deleted from your system. Device drivers can also create application errors. If application errors occur, see your application device driver or operating system documentation for troubleshooting information.

3.2.3 IRQ Assignment Conflicts

Most PCI devices can share an IRQ with another device, but they cannot use an IRQ simultaneously. To avoid this type of conflict, see the documentation for each PCI device for specific IRQ requirements. Table 3-1 lists the IRQ assignment defaults.

Table 3-1 IRQ Assignment Defaults

IRQ Line	**Assignment**
IRQ0	System timer
IRQ1	Keyboard controller
IRQ2	Interrupt controller 1 to enable IRQ8 through IRQ15
IRQ3	*Available*
IRQ4	Serial port 1 (COM1 and COM3)
IRQ5	Remote access controller
IRQ6	Diskette drive controller
IRQ7	*Available*
IRQ8	Real-time clock
IRQ9	ACPI functions (used for power management)

IRQ10	*Available*
IRQ11	*Available*
IRQ12	PS/2 mouse port unless the mouse is disabled through the System Setup program
IRQ13	Math coprocessor
IRQ14	IDE optical drive controller
IRQ15	*Available*

4 Running System Diagnostics

If you experience a problem with your system, run the diagnostics before calling for technical assistance. The purpose of the diagnostics is to test your system's hardware without requiring additional equipment or risking data loss. If you are unable to fix the problem yourself, service and support personnel can use diagnostics test results to help you solve the problem.

To assess a system problem use the system diagnostics.

4.1 System Diagnostic Features

The system diagnostics provide a series of menus and options for particular devices or device groups. The system diagnostics menus and options allow you to:

- Run tests individually or collectively.
- Control the sequence of tests.
- Repeat tests.
- Display, print, or save test results.
- Temporarily suspend testing if an error is detected or terminate testing when a user-defined error limit is reached.
- View help messages that briefly describe each test and its parameters.
- View status messages that inform you if tests are completed successfully.
- View error messages that inform you of problems encountered during testing.

4.2 When to Use the System Diagnostics

If a major component or device in the system does not operate properly, component failure may be indicated. As long as the microprocessor and the system's input/output devices (monitor, keyboard, and diskette drive) are functioning, you can use the system diagnostics to help identify the problem.

4.3 Running the System Diagnostics

The system diagnostics can be run from the utility partition on your hard drive.

NOTICE: Use the system diagnostics to test only your system. Using this program with other systems may cause invalid results or error messages. In addition, use only the program that came with your system (or an updated version of that program).

1. As the system boots, press <F10> during POST.
2. From the utility partition main menu under **Run System Utilities**, select **Run System Diagnostics**.

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

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

4.4 System Diagnostics Testing Options

To select an option from the **Diagnostics** menu, highlight the option and press <Enter>, or press the key that corresponds to the highlighted letter in the option. Table 4-1 provides a brief explanation of testing options.

Table 4-1 System Diagnostics Testing Options

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

Exit to MS-DOS	Exits the diagnostics and returns to the **System Utilities** menu.

4.5 Using the Advanced Testing Options

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

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

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

4.6 Error Messages

When you run a system diagnostics test, you may receive an error message during testing. Record the message and contact Augmentix customer support. See "Getting Help."

5 Troubleshooting Your System

5.1 Safety First—For You and Your System

To perform certain procedures in this document, you must remove the system cover and work inside the system. While working inside the system, do not attempt to service the system except as explained in this guide and elsewhere in your system documentation.

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

5.2 Start-Up Routine

Look and listen during the system's start-up routine for the indications described in Table 5-1.

Table 5-1 Start-Up Routine Indications

Look/listen for:	**Action**
A series of beeps emitted by the system.	See "System Beep Codes" in "Indicators, Codes, and Messages."
Alert messages from the systems management software.	See the systems management software documentation.
The monitor's power indicator.	See "Troubleshooting the Video Subsystem."
The keyboard indicators.	See "Troubleshooting the Keyboard."

The USB diskette drive activity indicator.	See "Troubleshooting a USB Device."
The USB optical drive activity indicator.	See "Troubleshooting a USB Device."
The diskette drive activity indicator.	See "Troubleshooting a Diskette Drive."
The optical drive activity indicator.	See "Troubleshooting an Optical Drive."
The hard-drive activity indicator.	See "Troubleshooting SCSI Hard Drives."
An unfamiliar constant scraping or grinding sound when you access a drive.	See "Getting Help."

5.3 Troubleshooting External Connections

This section provides troubleshooting procedures for external devices attached to the system, such as the monitor, keyboard, or mouse. Loose or improperly connected cables are the most likely source of problems with system peripherals (such as a monitor, printer, keyboard, mouse, or other external device). Before you perform any other procedure, ensure that all external cables are securely attached to the external connectors. See Figure 2-1 for the front-panel connectors on your system and Figure 2-3 for the back-panel connectors.

5.3.1 Troubleshooting the Video Subsystem

5.3.1.1 Problem

- Monitor is not working properly.
- Video memory is faulty.

5.3.1.2 Action

1. Check the system and power connections to the monitor.
2. Run the appropriate online diagnostic test. See "Running System Diagnostics."

   If the tests run successfully, the problem is not related to video hardware. See "Finding Software Solutions."

   If the tests fail, see "Getting Help."

5.3.2 Troubleshooting the Keyboard

5.3.2.1 Problem

- System message indicates a problem with the keyboard.
- Keyboard is not functioning properly.

5.3.2.2 Action

1. Ensure that the keyboard is properly connected to the system.
2. Run the appropriate online diagnostic test. See "Running System Diagnostics."
3. Press each key on the keyboard, and examine the keyboard and its cable for signs of damage.
4. Swap the faulty keyboard with a working keyboard.

   If the problem is resolved, replace the faulty keyboard. See "Getting Help."

   If the problem is not resolved, see "Getting Help."

5.3.3 Troubleshooting the Mouse

5.3.3.1 Problem

- System message indicates a problem with the mouse.
- Mouse is not functioning properly.

5.3.3.2 Action

1. Ensure that the mouse is properly connected to the system.
2. Run the appropriate online diagnostic test. See "Running System Diagnostics."

   If the test fails, continue to the next step.
3. Examine the mouse and its cable for signs of damage.

   If the mouse is not damaged, go to step 5.

   If the mouse is damaged, continue to the next step.
4. Swap the faulty mouse with a working mouse.

   If the problem is resolved, replace the faulty mouse. See "Getting Help."
5. Enter the System Setup program and ensure that the mouse controller is enabled.

   If the problem is not resolved, see "Getting Help."

5.3.4 Troubleshooting Basic I/O Functions

5.3.4.1 Problem

- Error message indicates a problem with the serial port.
- Device connected to the port is not operating properly.

5.3.4.2 Action

1. Enter the System Setup program and ensure that the serial port is enabled.

2. If the problem is confined to a particular application, see the application documentation for specific port configuration requirements that the program may require.
3. Run the appropriate online diagnostic test. See "Running System Diagnostics."

   If the tests run successfully but the problem persists, see "Troubleshooting a Serial I/O Device."

5.3.5 Troubleshooting a Serial I/O Device

5.3.5.1 Problem

- Device connected to the serial port is not operating properly.

5.3.5.2 Action

1. Turn off the system and any peripheral devices connected to the serial port.
2. Swap the serial interface cable with a working cable, and turn on the system and the serial device.

   If the problem is resolved, replace the interface cable. See "Getting Help."
3. Turn off the system and the serial device, and swap the device with a comparable device.
4. Turn on the system and the serial device.

   If the problem is resolved, replace the serial device. See "Getting Help."

   If the problem persists, see "Getting Help."

5.3.6 Troubleshooting a USB Device

5.3.6.1 Problem

- System message indicates a problem with a USB device.
- Device connected to a USB port is not operating properly.

5.3.6.2 Action

1. Enter the System Setup program, and ensure that the USB ports are enabled.
2. Turn off the system and any USB devices.
3. Disconnect the USB devices, and connect the malfunctioning device to the other USB connector.
4. Turn on the system and the reconnected device. If the problem is resolved, the USB connector might be defective. See "Getting Help."
5. If possible, swap the interface cable with a working cable. If the problem is resolved, replace the interface cable. See "Getting Help."

6. Turn off the system and the USB device, and swap the device with a comparable device.
7. Turn on the system and the USB device. If the problem is resolved, replace the USB device. See "Getting Help."
8. If the problem persists, see "Getting Help."

5.3.7 Troubleshooting a NIC

5.3.7.1 Problem

- NIC cannot communicate with network.

5.3.7.2 Action

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Check the appropriate indicator on the NIC connector. See "NIC Indicator Codes" in "Indicators, Messages, and Codes."
    - If the link indicator does not light, check all cable connections.
    - If the activity indicator does not light, the network driver files might be damaged or missing.

      Remove and reinstall the drivers if applicable. See the NIC's documentation.
    - Change the autonegotiation setting, if possible.
    - Use another connector on the switch or hub.

    If you are using a NIC card instead of an integrated NIC, see the documentation for the NIC card.
3. Ensure that the appropriate drivers are installed and the protocols are bound. See the NIC's documentation.
4. Enter the System Setup program and confirm that the NICs are enabled.
5. Ensure that the NICs, hubs, and switches on the network are all set to the same data transmission speed. See the network equipment documentation.
6. Ensure that all network cables are of the proper type and do not exceed the maximum length.

5.4 Inside the System

5.4.1 Lowering and Removing the Bezel

NOTE: For most system access, the bezel will only need to be lowered to its open position, show in Figure 5-2, and need not be completely removed.

1. Unlock the Bezel using the key provided with your system.

2. Using both hands, press the spring latches on both sides of the bezel (shown in Figure 5-1) with the index or middle finger.
3. While continuing to press the spring latches, pull the bezel away from the front panel. The bezel will rotate down along the bottom hinge and rest at a 180 degree angle to the server face plate as shown in Figure 5-2.

Figure 5-1 Bezel Attachment and Security Features

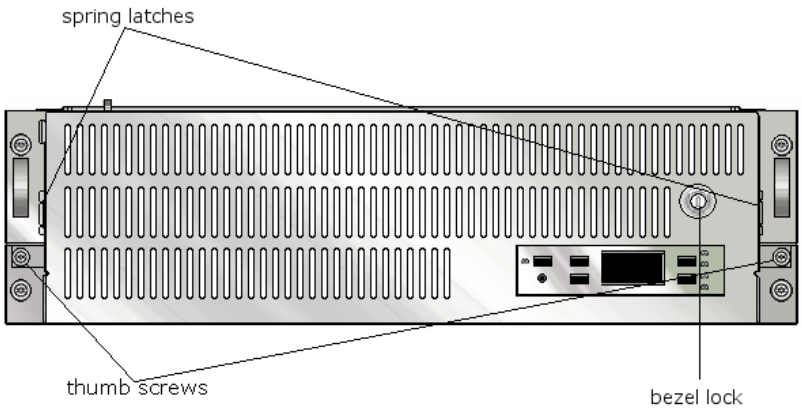
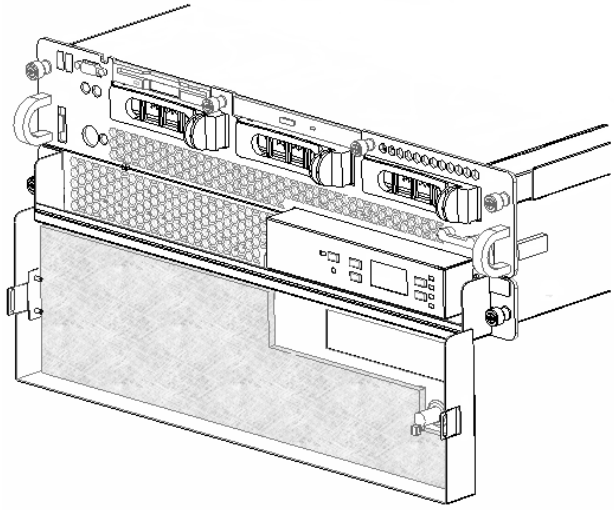


Figure 5-2 Front Bezel Lowered



4. To completely remove the bezel, unscrew the thumbscrews shown in Figure 5-1. Remove the bezel from the server.

5.4.2 Replacing and Raising the Bezel

1. If the bezel has been completely removed from the system, secure the bezel to the front plate using the thumbscrews shown in Figure 5-1.

2. Rotate the secured bezel up towards the server and engage the spring latches on both sides of the bezel (shown in Figure 5-1) to the slots on the front plate.
3. Lock the bezel using the key provided.

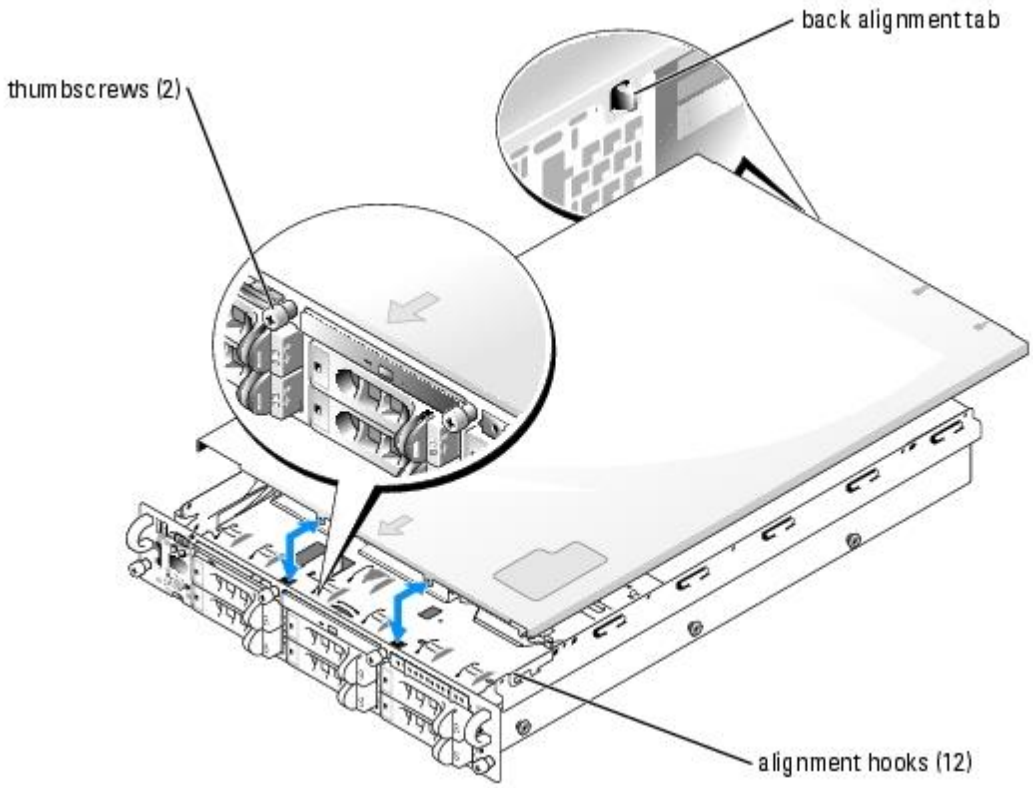
5.4.3 Opening the System

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

To upgrade or troubleshoot the system, remove the system cover to gain access to internal components. The system bezel need not be completely removed to access the system, but must be lowered in order to reach the front plate.

1. Lower the bezel. See "Lowering and Removing the Bezel."
2. Loosen the two thumbscrews that secure the cover to the chassis. See Figure 5-3.
3. Slide the top cover backward and grasp the cover at both sides.
4. Carefully lift the cover away from the system.

Figure 5-3 Removing the Cover



5.4.4 Closing the System

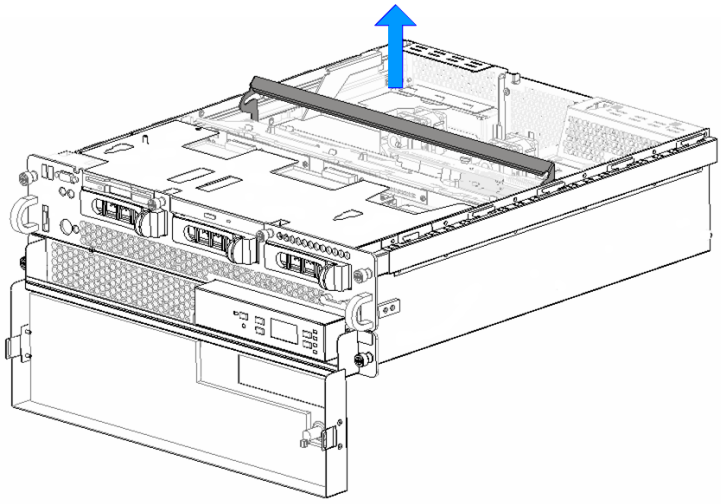
1. Ensure that no tools or parts are left inside the system and that any cables are routed so that they will not be damaged by the cover.
2. Align the cover with the cover alignment hooks on the sides of the chassis, and slide the cover forward. See Figure 5-4.

   When the cover is properly closed, the back alignment tab protrudes from the slot on the back of the cover.
3. Tighten the two thumbscrews that secure the cover to the chassis.
4. Secure the bezel to the front plate. See "Replacing and Raising the Bezel."

5.4.5 Extending and Removing the Drive Carrier

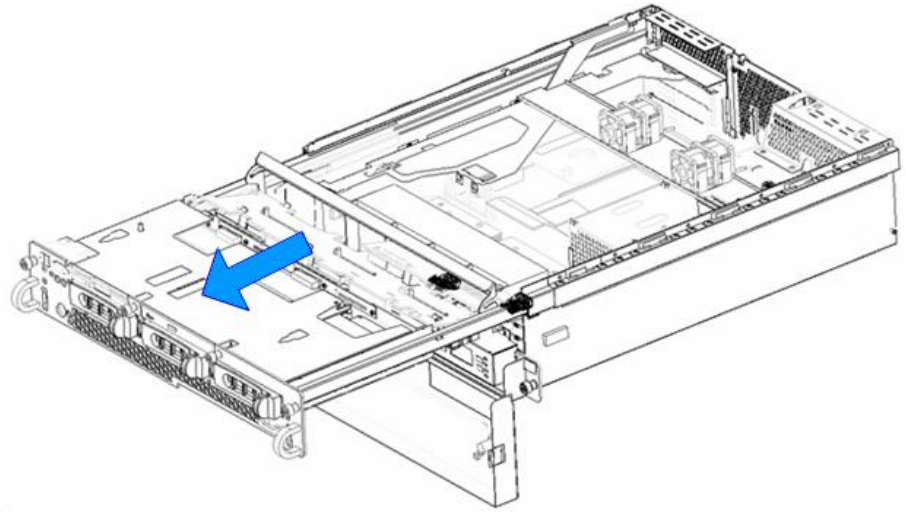
1. Lower the bezel. See "Lowering and Removing the Bezel."
2. Open the system. See "Opening the System."
3. Lift the Drive Carrier lever. See Figure 5-4.

Figure 5-4 Raising the Drive Carrier Lever



4. Pull the lever towards you and slide the Drive Carrier forward to its extended position as shown in Figure 5-5 below.

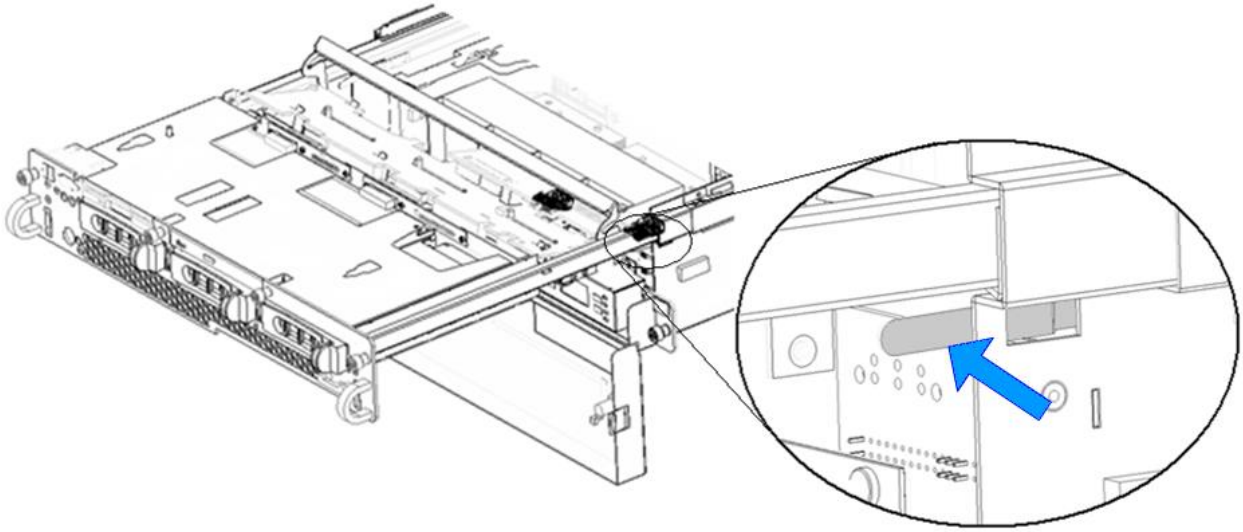
Figure 5-5 Extending the Drive Carrier



To completely remove the Drive Carrier:

5. Disconnect all attached cables, such as the SCSI cable to the PCI Riser card and the cable connecting the Motherboard Interface Board to the *A*+SAMP.
6. Using your index fingers, depress the spring tabs on either side of the Drive Carrier rails. See Figure 5-6 below.

Figure 5-6 Releasing the Drive Carrier from the Chassis



7. Continue to pull the Drive Carrier forward until it disengages from the chassis and carefully place the Drive Carrier aside.

5.4.6 Replacing the Drive Carrier

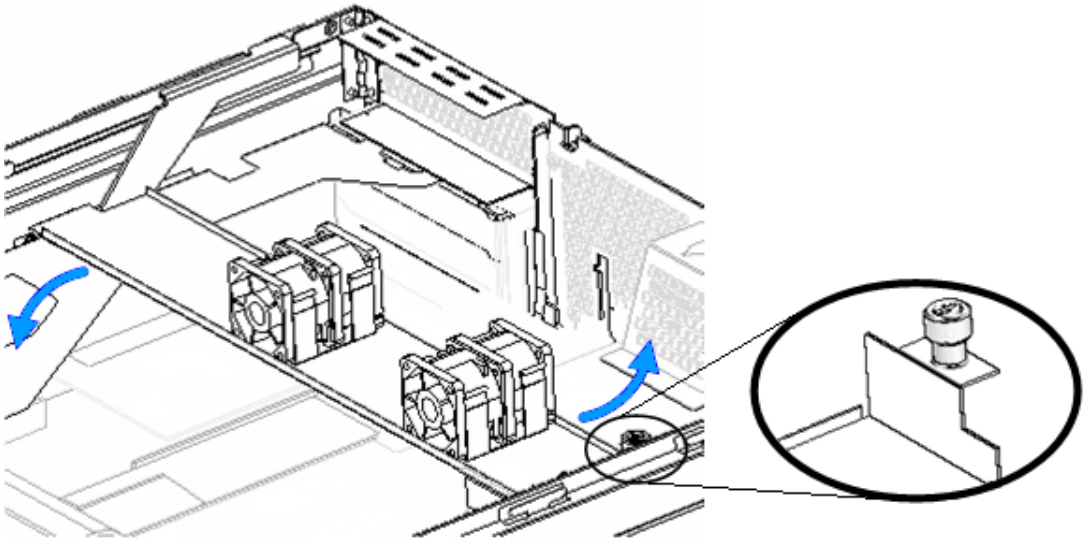
1. If the Drive Carrier has been completely removed, align the Drive Carrier rails with the slides in the chassis.

2. Depress the latches as seen in Figure 5-6 and begin to slide the Drive Carrier back into the chassis.
3. Reconnect all cables and finish sliding the Drive Carrier into the chassis.
4. Lower the lever to lock the Drive Carrier into place.

5.4.7 Removing the Drive Carrier Fan Bracket

1. Disconnect the Drive Carrier fan leads from the cable to the *A*+SAMP. See Figure 6.5.
2. With the Drive Carrier fully extended (see "Extending and Removing the Drive Carrier") unscrew the thumbscrew securing the right-hand side of the bracket to the chassis. See Figure 5-7 below.
3. Rotate the bracket counter-clockwise to release the tab on the left-hand side of the bracket from its notch in the chassis behind the PCI Riser lever, as shown in the figure below.

Figure 5-7 Fan Bracket Removal



4. Lift the bracket out of the chassis and lay it aside.

5.4.8 Replacing the Drive Carrier Fan Bracket

1. With the Drive Carrier fully extended (see "Extending and Removing the Drive Carrier") place the bracket in the chassis, slightly rotated counter-clockwise from its resting position.
2. Insert the tab on the left-hand side of the bracket into the notch in the chassis just behind the PCI Riser lever.
3. Rotate the bracket clockwise until the thumbscrew on the right-hand side is aligned with its hole.
4. Tighten the thumbscrew to secure the bracket to the chassis.

5.5 Troubleshooting the System Battery

5.5.1 Problem

- System message indicates a problem with the battery.
- System Setup program loses system configuration information.
- System date and time do not remain current.

NOTE: If the system is turned off for long periods of time (for weeks or months), the NVRAM may lose its system configuration information. This situation is caused by a defective battery.

5.5.2 Action

1. Re-enter the time and date through the System Setup program.
2. Turn off the system and disconnect it from the electrical outlet for at least one hour.
3. Reconnect the system to the electrical outlet and turn on the system.
4. Enter the System Setup program.

   If the date and time are not correct in the System Setup program, replace the battery. See "System Battery" in "Installing System Options."

   If the problem is not resolved by replacing the battery, see "Getting Help."

NOTE: Some software may cause the system time to speed up or slow down. If the system seems to operate normally except for the time kept in the System Setup program, the problem may be caused by software rather than by a defective battery.

5.6 Troubleshooting Power Supplies

5.6.1 Problem

- System-status indicator is amber.
- Power-supply fault indicators are amber.
- Front-panel status LCD indicates a problem with the power supply.

5.6.2 Action

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Locate the faulty power supply.

   The power supply's fault indicator is lit. See "Redundant Power-Supply Indicator Codes" in "Indicators, Messages, and Codes."

NOTICE: You can hot-plug the power supplies. One power supply must be installed for the system to operate. The system is in the redundant mode when two power supplies are installed. Remove and install only one power supply at a time in a system that is powered on. Operating the system with only one power supply installed and without a power supply blank installed for extended periods of time can cause the system to overheat.

3. Ensure that the power supply is properly installed by removing and reinstalling it. See "Power Supplies" in "Installing System Options."

   NOTE: After installing a power supply, allow several seconds for the system to recognize the power supply and to determine if it is working properly. The power indicator turns green to signify that the power supply is functioning properly. See "Redundant Power-Supply Indicator Codes" in "Indicators, Messages, and Codes."

4. If reseating the power supply did not resolve the problem, remove the faulty power supply. See "Removing a Power Supply" in "Installing System Options."
5. Install a new power supply. See "Replacing a Power Supply" in "Installing System Options."

   If the problem persists, see "Getting Help."

5.7 Troubleshooting System Cooling Problems

5.7.1 Problem

- Systems management software issues a fan-related error message.

5.7.2 Action

Ensure that none of the following conditions exist:

- Ambient temperature is too high.
- External airflow is obstructed.
- Cables inside the system obstruct airflow.
- An individual cooling fan has failed. See "Troubleshooting a Fan."
- Dust filter in bezel is congested. See "Dust Filter" in "Installing System Options."

5.7.3 Troubleshooting a System Fan

5.7.3.1 Problem

- System-status indicator is amber.
- Systems management software issues a fan-related error message.

5.7.3.2 Action

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

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Open the system. See "Opening the System."
3. To examine system fans at the front of the system, extend the Drive Carrier. See "Extending and Removing the Drive Carrier."

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

4. Ensure that the faulty fan is properly seated in its connector and that its handle is closed. See "System Fans" in "Installing System Options."

   NOTE: Wait 30 seconds for the system to recognize the fan and determine whether it is working properly.

5. If the problem is not resolved, install a new fan. See "System Fans" in "Installing System Options."

   If the replacement fan is working properly, replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System."

   If the replacement fan does not operate, see "Getting Help."

5.7.4 Troubleshooting a Drive Carrier Fan

5.7.4.1 Problem

- Systems management software issues a Drive Carrier fan-related error message.

5.7.4.2 Action

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

1. Open the system. See "Opening the System."

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

2. Ensure that the faulty fan is properly connected to the cable that connects it to the *A*+SAMP. See "System Fans" in "Installing System Options."

NOTE: Wait 30 seconds for the system to recognize the fan and determine whether it is working properly.

3. If the problem is not resolved, install a new fan. See "System Fans" in "Installing System Options."

   If the replacement fan is working properly, close the system. See "Closing the System."

   If the replacement fan does not operate, see "Getting Help."

5.8 Troubleshooting System Memory

5.8.1 Problem

- Faulty memory module.
- Faulty system board.
- Front-panel status LCD indicates a problem with system memory.

5.8.2 Action

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

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Turn on the system and attached peripherals.

   If an error messages does not appear, go to step 10.

5.8.2.1 Enter the System Setup program and check the system memory setting.

3. If the amount of memory installed matches the system memory setting, go to step 9.
4. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
5. Ensure that the memory banks are populated correctly. See "Installing Memory Modules" in "Installing System Options."
6. If the memory modules are populated correctly, continue to the next step.
7. Reseat the memory modules in their sockets. See "Installing Memory Modules" in "Installing System Options."
8. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

9. Enter the System Setup program and check the system memory setting.

   If the amount of memory installed does not match the system memory setting, then perform the following steps:

   a. Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.

NOTE: Several configurations for the memory modules exist; see "Installing Memory Modules" in "Installing System Options."

   b. Swap the memory modules in bank 1 with a working pair of modules of the same size, speed, and rank. See "Installing Memory Modules" in "Installing System Options."

   c. Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.

   d. As the system boots, observe the monitor screen and the indicators on the keyboard.

10. Perform the following steps:

    a. Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.

    b. Repeat step a through step d in step 9 for each memory module installed.

       If the problem persists, see "Getting Help."

5.9 Troubleshooting a Diskette Drive

5.9.1 Problem

- Error message indicates a diskette drive problem.

5.9.2 Action

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

1. Enter the System Setup program and verify that the diskette drive is configured correctly.
2. Open or remove the bezel. See "Lowering and Removing the Bezel."
3. Run the appropriate online diagnostic test. See "Running System Diagnostics"
4. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
5. Open the system. See "Opening the System."

6. Ensure that the diskette drive interface cable is securely connected to the diskette drive and the system board.
7. Close the system. See "Closing the System."
8. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
9. Run the appropriate online diagnostic test to see whether the diskette drive works correctly.
10. Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.
11. Remove all expansion cards installed in the system. See "Removing an Expansion Card" in "Installing System Options."
12. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
13. Run the appropriate online diagnostic test to see whether the diskette drive works correctly.

    If the tests run successfully, an expansion card may be conflicting with the diskette drive logic, or an expansion card may be faulty. Continue to the next step.

    If the tests fail, see "Getting Help."
14. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
15. Reinstall one of the expansion cards you removed in step 11. See "Installing an Expansion Card" in "Installing System Options."
16. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
17. Run the appropriate online diagnostic test to see whether the diskette drive works correctly.
18. Repeat step 14 through step 17 until all expansion cards are reinstalled or one of the expansion cards causes the tests to fail.

    If the problem is not resolved, see "Getting Help."

5.10 Troubleshooting an Optical Drive

5.10.1 Problem

- System cannot read data from a CD in an optical drive.
- Optical drive indicator does not blink during boot.

5.10.2 Action

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

1. Try using a different CD that you know works properly.
2. Enter the System Setup program and ensure that the drive's IDE or SCSI controller is enabled.
3. Run the appropriate online diagnostic test. See "Running System Diagnostics."
4. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
5. Open or remove the bezel. See "Lowering and Removing the Bezel."
6. Turn off the system and attached peripherals, and disconnect the system from the electrical
7. Open the system. See "Opening the System."
8. Ensure that the optical-drive interface cable is securely connected to the optical drive and to the controller.
9. Ensure that a power cable is properly connected to the drive.
10. Close the system. See "Closing the System."
11. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

    If the problem is not resolved, see "Getting Help."

5.11 Troubleshooting an External SCSI Tape Drive

5.11.1 Problem

- Defective tape drive
- Defective tape cartridge
- Missing or corrupted tape-backup software or tape drive device driver
- Defective SCSI controller

5.11.2 Action

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

working inside the computer, and protecting against electrostatic discharge.

1. Remove the tape cartridge you were using when the problem occurred, and replace it with a tape cartridge that you know works.
2. Ensure that the SCSI device drivers for the tape drive are installed and are configured correctly. See the documentation that came with your tape drive.
3. Reinstall the tape-backup software as instructed in the tape-backup software documentation.
4. Ensure that the tape drive's interface/DC power cable is connected to the tape drive and SCSI controller card.
5. Verify that the tape drive is configured for a unique SCSI ID number and that the tape drive is terminated or not terminated, based on the interface cable used to connect the drive.

   See the documentation for the tape drive for instructions on selecting the SCSI ID number and enabling or disabling termination.
6. Run the appropriate online diagnostic test. See "Running System Diagnostics."
7. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
8. Ensure that the SCSI controller card is firmly seated in its connector. See "Installing an Expansion Card" in "Installing System Options."
9. Reconnect the system to the electrical outlet, and turn on the system, including attached peripherals.
10. If the problem is not resolved, see the documentation for the tape drive for additional troubleshooting instructions.
11. If you cannot resolve the problem, see "Getting Help" for information on obtaining technical assistance.

5.12 Troubleshooting SCSI Hard Drives

5.12.1 Problem

- Device driver error.
- Hard drive not recognized by the system.

5.12.2 Action

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

NOTICE: This procedure can destroy data stored on the hard drive. Before you continue, back up all files on the hard drive.

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."

   For information about testing the controller, see the SCSI or RAID documentation.

   If the tests fail, continue to the next step.

2. If the integrated SCSI host adapter controls the SCSI hard drives, restart the system and press <Ctrl><a> to enter the SCSI configuration utility program.

   NOTE: If your system has an optional RAID controller card installed, restart the system and press <Ctrl><a> or <Ctrl><m>, depending on the utility. See the documentation supplied with the controller for information about the configuration utility.

3. Ensure that the primary SCSI channel is enabled, and restart the system.
4. Verify that the device drivers are installed and configured correctly. See the operating system documentation.
5. Remove the hard drive and install it in another drive bay.
6. If the problem is resolved, reinstall the hard drive in the original bay. See "Installing a SCSI Hard Drive" in "Installing Drives."

   If the hard drive functions properly in the original bay, the drive carrier could have intermittent problems. Replace the drive carrier. See "Installing a SCSI Hard Drive" in "Installing Drives."

   If the problem persists, the SCSI backplane board has a defective connector. See "Getting Help."

7. Check the SCSI cable connections inside the system:
   a. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
   b. Open the system. See "Opening the System."
   c. Verify that the SCSI cable is securely connected to the SCSI host adapter.

      The SCSI cable may be connected to the SCSI host adapter on the system board or to a SCSI host adapter card installed in an expansion slot.

   d. Close the system. See "Closing the System."
8. Format and partition the hard drive. See the operating system documentation.
9. If possible, restore the files to the drive.

   If the problem persists, see "Getting Help."

5.13 Troubleshooting an Integrated RAID Controller

5.13.1 Problem

- Error message indicates an integrated RAID controller problem.

5.13.2 Action

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

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Enter the System Setup program and ensure that the integrated RAID controller is enabled.
3. Ensure that the RAID controller is configured properly. See the RAID documentation for information about configuration settings.
4. If the problem is not resolved, continue to the next step.
5. Remove the bezel. See "Lowering and Removing the Bezel."
6. Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.
7. Ensure that the following RAID components are properly installed:
   - Memory module
   - Hardware key
   - Battery

   See "Activating the Integrated RAID Controller" in "Installing Drives."
8. Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.
9. If the problem is not resolved, continue to the next step.
10. Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.
11. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier."

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

information.

12. Replace the RAID battery. See "Activating the Integrated RAID Controller" in "Installing Drives."
13. Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.

    If the problem persists, see "Getting Help."

5.14 Troubleshooting a RAID Controller Card

NOTE: When troubleshooting a RAID controller card, also see the documentation for your operating system and the RAID controller.

5.14.1 Problem

- Error message indicates a RAID controller problem.
- RAID controller performs incorrectly or not at all.

5.14.2 Action

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

1. Run the appropriate online diagnostic test. See "Running System Diagnostics"
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Ensure that the controller card is firmly seated in its connector. See "Installing a RAID Controller Card" in "Installing Drives."
4. Ensure that the appropriate cables are firmly connected to their corresponding connectors on the controller card.
5. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

   If the problem persists, see the RAID documentation for more information on troubleshooting.

5.15 Troubleshooting Expansion Cards

NOTE: When troubleshooting an expansion card, see the documentation for your operating system and the expansion card.

5.15.1 Problem

- Error message indicates a problem with an expansion card.
- Expansion card performs incorrectly or not at all.

5.15.2 Action

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

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Ensure that each expansion card is firmly seated in its connector. See "Installing an Expansion Card" in "Installing System Options."
4. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

   If the problem persists, go to the next step.
5. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
6. Remove all expansion cards installed in the system. See "Removing an Expansion Card" in "Installing System Options."
7. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
8. Run the appropriate online diagnostic test.

   If the tests fail, see "Getting Help."
9. For each expansion card you removed in step 6, perform the following steps:
   a. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
   b. Reinstall one of the expansion cards. See "Installing an Expansion Card" in "Installing System Options."
   c. Run the appropriate diagnostic test.

      If the tests fail, see "Getting Help."

5.16 Troubleshooting the Microprocessors

5.16.1 Problem

- Error message indicates a processor problem.
- Front-panel status LCD indicates a problem with the processors or system board.
- The Heatsink is not properly installed for each processor. See "Heatsink" in "Installing System Options."

5.16.2 Action

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

1. Run the appropriate online diagnostic test. See "Running System Diagnostics."
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Ensure that each processor is properly installed. See "Processors" in "Installing System Options."
4. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
5. Run the appropriate online diagnostic test.
6. If the tests fail or the problem persists, continue to the next step.
7. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
8. Remove processor 2, leaving only processor 1 installed. See "Processors" in "Installing System Options."

   To locate the processors, see Figure 9-3.

   If only one processor is installed, see "Getting Help."
9. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
10. Run the appropriate online diagnostic test.

    If the tests complete successfully, go to step 16.
11. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
12. Replace processor 1 with another processor of the same capacity. See "Processors" in "Installing System Options."

13. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
14. Run the appropriate online diagnostic test.

    If the tests complete successfully, replace processor 1. See "Getting Help."
15. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
16. Reinstall the processors that you removed in step 8. See "Processors" in "Installing System Options."
17. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

    If the problem persists, see "Getting Help."

6 Installing System Options

This section describes how to remove and replace the following components:

- Expansion cards
- Memory upgrades
- Microprocessor upgrades

This section also includes instructions for replacing the fans, power supplies, and system battery, if necessary.

6.1 System Fans

The system includes the following hot-pluggable cooling fans:

- Two rear system fans
- Four front system fans
- Two drive carrier fans

6.1.1 Removing a System Cooling Fan

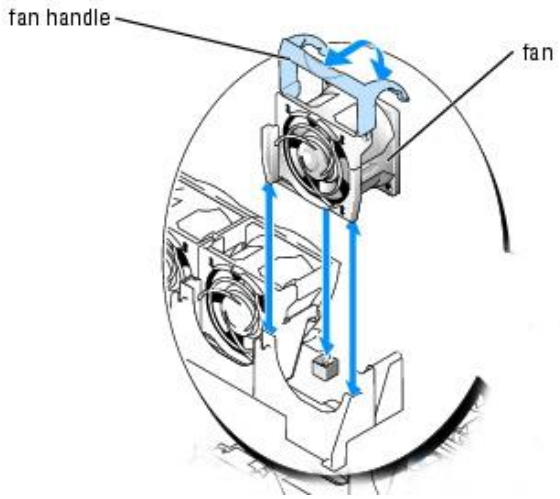
⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

NOTE: The procedure for removing each individual system fan is the same.

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

1. Open the system and, if necessary, extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
2. Raise the fan handle and pull the fan straight up to clear the chassis. See Figure 6-1.

Figure 6-1 Removing and Installing a System Cooling Fan



6.1.2 Replacing a System Cooling Fan

NOTE: The procedure for installing each individual system fan is the same.

1. Ensure that the fan handle is upright and lower the fan into its retention base until the fan is fully seated. Then lower the fan handle until it snaps into place. See Figure 6-1.
2. Replace the Drive Carrier if necessary and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."

6.1.3 Removing a Drive Carrier Fan

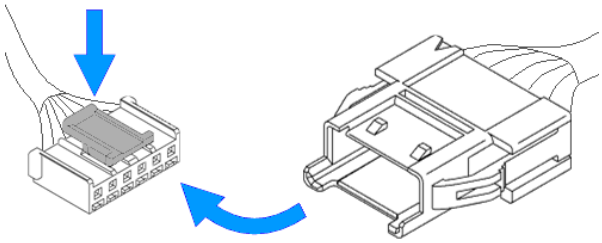
CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

NOTE: The procedure for removing each individual Drive Carrier fan is the same.

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

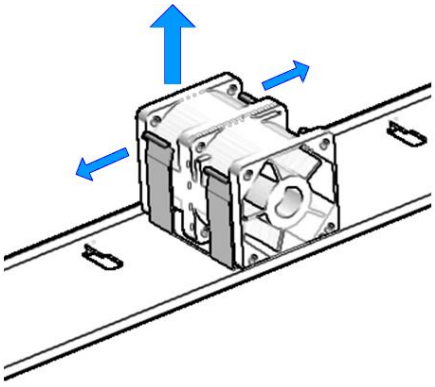
1. Open the system. See "Opening the System" in "Troubleshooting Your System."
2. Disconnect the fan to be serviced from the fan cable (press down on the locking tab of the fan connector and disengage it from the cable connector as shown in Figure 6-2).

Figure 6-2 Drive Carrier Fan Lead Removal



3. Spread the tabs securing one end of the fan and lift the fan partially out of the bracket. See Figure 6-3.
4. Spread the tabs securing the other end of the fan and remove the fan from the bracket.

Figure 6-3 Drive Carrier Fan Removal

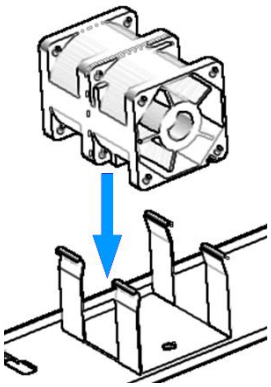


6.1.4 Replacing a Drive Carrier Fan

NOTE: The procedure for installing each individual fan is the same.

1. Place the fan over the fan mounting assembly.
2. Push down on the fan until it snaps into place in the mounting brackets shown in Figure 6-4.

Figure 6-4 Drive Carrier Fan Mounting Assembly



3. Connect the leads to the respective end of the fan cable.
4. Close the system. See "Closing the System" in "Troubleshooting Your System."

6.2 Power Supplies

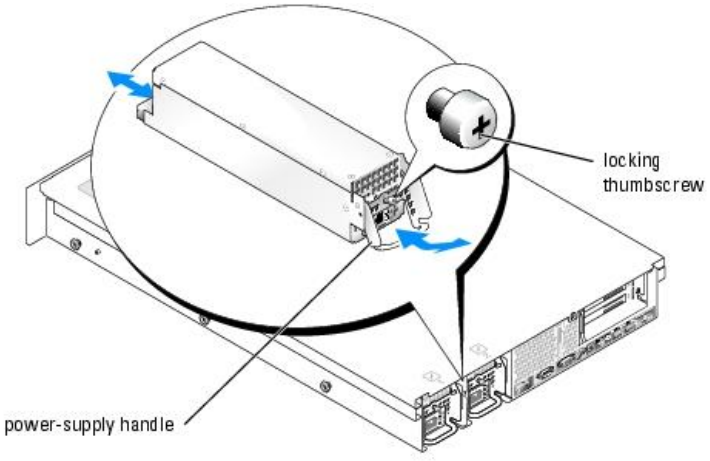
The system is capable of supporting two hot-pluggable power supplies.

6.2.1 Removing a Power Supply

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

1. Loosen the locking thumbscrew.
2. Rotate the power-supply handle up until the power supply is released from the chassis. See Figure 6-6.
3. Pull the power supply straight out to clear the chassis. See Figure 6-6.

Figure 6-5 Removing and Installing a Power Supply



6.2.2 Replacing a Power Supply

1. With the power-supply handle in the extended position, slide the new power supply into the chassis. See Figure 6-8.
2. Rotate the handle down until it is completely flush with the power-supply faceplate, and then tighten the locking thumbscrew. See Figure 6-6.

NOTE: After installing a new power supply, allow several seconds for the system to recognize the power supply and determine whether it is working properly. The power-on indicator will turn green to signify that the power supply is functioning properly. See Figure 2-4.

6.3 Expansion-Card Cage

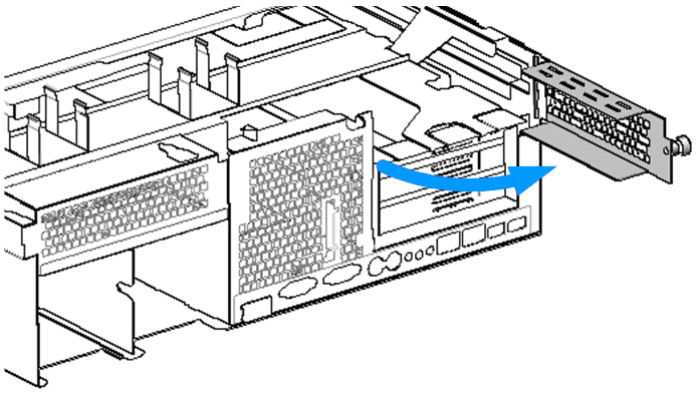
The removable expansion-card cage simplifies many installation procedures by allowing you to remove the riser board and all installed expansion cards in a single step.

6.3.1 Removing the Expansion-Card Cage

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

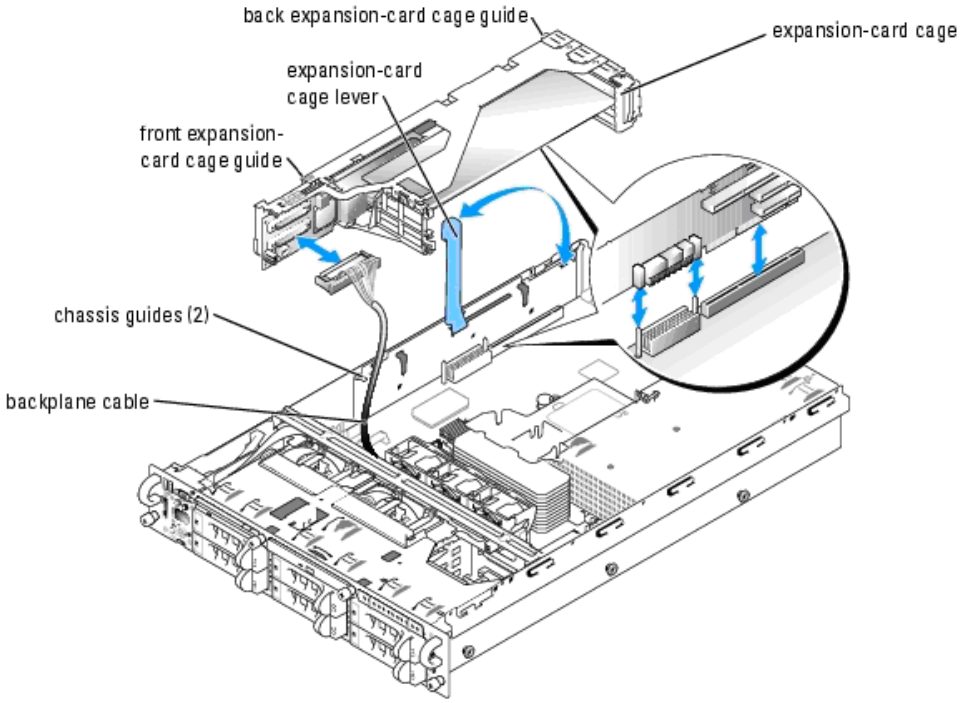
1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
3. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
4. Loosen the thumbscrew of the card cage access door on the rear of the chassis and swing this open as shown in Figure 6-7.

Figure 6-6 Opening the Rear Card Cage Access Door



5. Disconnect all expansion-card cables.
6. Rotate the expansion-card cage lever up to a 90-degree angle until the cage is released from the chassis. See Figure 6-8.

Figure 6-7 Removing and Installing the Expansion-Card Cage



NOTE: The expansion-card cage lever pauses at a 45-degree angle, but is not unlocked. Continue rotating the lever to a 90-degree angle to unlock the cage.

7. Lift the cage straight up to clear the chassis. See Figure 6-8.
8. Disconnect the backplane cable(s) from the riser board.

NOTICE: If two SCSI data cables are connected to the riser card, carefully note their relative locations so that you can reinstall them correctly.

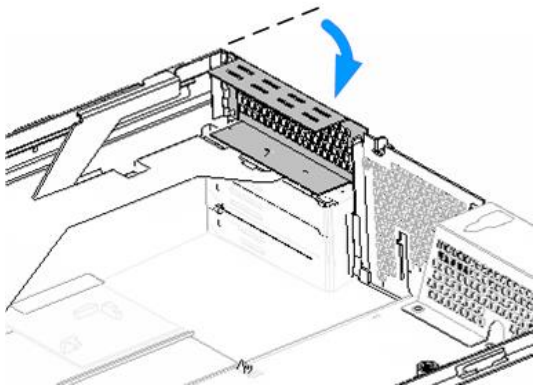
6.3.2 Replacing the Expansion-Card Cage

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

1. Reconnect the backplane cable(s) to the riser board.
2. With the expansion-card cage lever rotated to a 90-degree angle, align the guides on each end of the expansion-card cage with the guides on the chassis wall, and lower the cage. See Figure 6-9.

3. Rotate the expansion-card cage lever down until the handle is flush with the top of the cage to secure the cage in the chassis. See Figure 6-8.
4. Close the rear Card Cage Access Door and secure it to the chassis by tightening the thumbscrew. See Figure 6-9 below.

Figure 6-8 Closing the Rear Card Cage Access Door



5. Reconnect all expansion-card cables.
6. Replace the Drive Carrier Fan Bracket. See "Replacing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
7. Replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."

6.4 Expansion Cards

The system is available with a PCI-X riser board or an optional PCI-X/PCI Express (PCIe) riser board. The PCI-X riser board provides three PCI-X expansion slots and the PCI-X/PCIe riser board provides one PCI-X expansion slot, one PCIe x4-lane expansion slot, and one PCIe x8-lane expansion slot

6.4.1 Expansion Card Installation Guidelines

6.4.1.1 PCI-X Riser Board Expansion Slots

Slot 1 and slot 2 share the same bus. Slot 3 is on a separate bus. You can install expansion cards of different operating speeds on the same bus; however, the bus will operate at the slowest operating speed of the cards on that bus. For example, if one card on the bus has an operating speed of 66 MHz and the other card has an operating speed of 100 MHz, the bus can operate only at 66 MHz. Also, if a PCI card is installed on the same bus with a PCI-X card, the bus runs in PCI mode.

NOTE: The expansion-card slots are not hot-pluggable.

To identify expansion slots, see Figure 9-4. Table 6-1 lists the operating speed for the PCI-X riser board expansion-card slots.

Table 6-1 PCI-X Riser Board Expansion Slot Speeds

Slot	Operating Speed
1	33, 66, 100, or 133 MHz
2	33, 66, 100, or 133 MHz
3	33, 66, 100, or 133 MHz
NOTE: Slot 3 supports half-length expansion cards only.	

6.4.1.2 Optional PCI-X/PCIe Riser Board Expansion Slots

The optional PCI-X/PCIe riser board provides one PCIe x4-lane slot, one PCIe x8-lane slot, and one PCI-X 100-MHz slot.

NOTE: Although the PCIe x4-lane expansion slot is physically a PCIe x8 connector, it functions only as a PCIe x4-lane slot.

NOTE: The expansion-card slots are not hot-pluggable.

To identify expansion slots, see Figure 9-5. Table 6-2 lists the PCI bus and operating speed for the optional PCI-X/PCI-e riser board expansion-card slots. The three expansion card slots are on separate buses.

Table 6-2 Optional PCI-X/PCIe Riser Board Expansion Slot Speeds

Slot	Operating Speed
1	2GB per second
2	4GB per second
3	33, 66, or 100 MHz
NOTE: Slot 3 supports half-length expansion cards only.	

6.4.2 Installing an Expansion Card

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

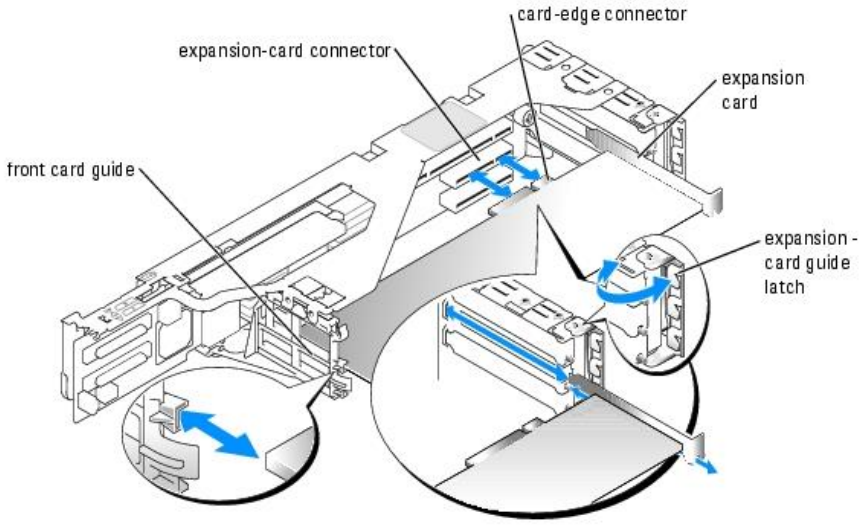
1. Unpack the expansion card and prepare it for installation. For instructions, see the documentation accompanying the card.

2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Disconnect all expansion-card cables.
4. Remove the expansion-card cage. See "Removing the Expansion-Card Cage."
5. Position the expansion-card cage so that the riser board lies horizontally or vertically on your work surface.

NOTE: The horizontal or vertical orientation of the riser board depends on the type of card that you are installing. The horizontal orientation of the riser board shown in Figure 6-10 is for reference only.

6. Open the expansion-card guide latch and remove the filler bracket. See Figure 6-10.
7. Install the expansion card:
    a. If the expansion card is full length, align its front edge with the front card guide. See Figure 6-10.
    b. Position the expansion card so that the card-edge connector aligns with the expansion- card connector on the expansion-card riser board.
    c. Insert the card-edge connector firmly into the expansion-card connector until the card is fully seated.
    d. When the card is seated in the connector, close the expansion-card latch. See Figure 6-10.

Figure 6-9 Installing an Expansion Card



8. Replace the expansion-card cage. See "Replacing the Expansion-Card Cage."
9. Reconnect all expansion-card cables, including those for the new card.

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

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

6.4.3 Removing an Expansion Card

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

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Disconnect all expansion-card cables.
3. Remove the expansion-card cage. See "Removing the Expansion-Card Cage."
4. Position the expansion-card cage so that the riser board lies horizontally on your work surface.
5. Release the expansion card:
    a. Open the expansion-card latch. See Figure 6-10.
    b. Grasp the expansion card by its top corners, and carefully remove it from the expansion- card connector.
6. If you are removing the card permanently, install a metal filler bracket over the empty expansion slot opening and close the expansion-card latch.

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

7. Replace the expansion-card cage. See "Replacing the Expansion-Card Cage."
8. Reconnect all expansion-card cables.

6.4.4 Installing the *A*+SAMP

1. Install the *A*+SAMP as an Expansion card. See "Installing an Expansion Card."
2. Connect the 8 pin housing and the 5 pin housing of the MBIB cable to the *A*+SAMP at J14 and J9 respectively. See "*A*+SAMP Connectors."
3. Connect the Fan Power cable from the Motherboard to the *A*+SAMP at J3. See "*A*+SAMP Connectors."
4. Connect the Drive Carrier fan cable to the *A*+SAMP at J2. See "*A*+SAMP Connectors."

5. Once the *A*+SAMP is installed and the system is closed, connect external power and desired I/O (USB, Ethernet) to the *A*+SAMP at the back panel.

6.4.5 Removing the *A*+SAMP

1. Disconnect all external cables (power, USB, Ethernet) from the SAMP at the back panel.
2. Follow the instructions to remove the *A*+SAMP as an Expansion card. See "Removing an Expansion Card."
3. Disconnect all internal connections to the SAMP (MBIB cable at J14 and J9, Fan power at J3, and Drive Carrier Fans at J2).
4. Completely remove the card from the system as instructed in "Removing an Expansion Card."

6.5 System Memory

The six memory module sockets can accommodate from 256 MB to 16GB of registered ECC PC2-3200 (DDR 2 400) memory. The memory sockets are located on the system board under the memory module shroud adjacent to the power supply bays. See Figure 9-3.

You can upgrade the system memory by installing combinations of 256-, 512-MB, 1-GB, 2-GB, and 4-GB (when available) registered memory modules.

NOTE: The memory modules must be PC2-3200 compliant.

NOTICE: If you remove your original memory modules from the system during a memory upgrade, keep them separate from any new memory modules that you may have. Use only registered ECC DDR II memory modules.

The memory module sockets are arranged in three banks on two channels (A and B). The memory module banks are identified as follows:

- Bank 1: DIMM1_A and DIMM1_B
- Bank 2: DIMM2_A and DIMM2_B
- Bank 3: DIMM3_A and DIMM3_B

6.5.1 General Memory Module Installation Guidelines

- If only one memory module is installed, it must be a 256 MB module installed in socket DIMM_1A.
- If two or more memory modules are installed, they must be installed in pairs of matched memory size, speed, and technology.
- The system supports both single-ranked and dual-ranked memory modules.
- Memory modules marked with a 1R are single ranked and modules marked with a 2R are dual ranked.

- If you install both single-ranked and dual-ranked memory modules, the dual-ranked memory modules must be installed in bank 1, regardless of capacity.

  NOTE: Dual-rank memory modules with less capacity take precedence over single-ranked memory modules with greater capacity.

- If bank 2 contains dual-ranked memory modules, then bank 3 must be unpopulated.
- Dual-ranked memory modules are not supported in bank 3.

6.5.2 Spare Bank Support

If six memory modules of the same size are installed, the memory modules in bank 3 (DIMM3_A and DIMM3_B) can function as a spare bank. The following restrictions apply when configuring memory for spare bank support:

- All six memory modules must be single-rank modules.
- All six memory modules must have the same capacity.

6.5.3 Memory Mirroring Support

The system supports memory mirroring if identical memory modules are installed in bank 1 and bank 2, and no memory modules are installed in bank 3.

Table 6-3 and Table 6-4 show examples of different memory configurations. Table 6-4 lists the various allowable combinations of single- and dual-ranked memory modules

Table 6-3 Sample Memory Configurations

Total Memory	DIMM_1A	DIMM_1B	DIMM_2A	DIMM_2B	DIMM_3A	DIMM_3B
256 MB	256 MB	none	none	none	none	none
1 GB	256 MB	256 MB	256 MB	256 MB	none	none
1 GB	512 MB	512 MB	none	none	none	none
2 GB	512 MB	512 MB	512 MB	512 MB	none	none
2 GB	1 GB	1 GB	none	none	none	none
3 GB	1 GB	1 GB	512 MB	512 MB	none	none
3 GB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB
4 GB	1 GB	1 GB	1 GB	1 GB	none	none
4 GB	1 GB	1 GB	512 MB	512 MB	512 MB	512 MB

6 GB	2 GB	2 GB	1 GB	1 GB	none	none
6 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB
8 GB	2 GB	2 GB	2 GB	2 GB	none	none
8 GB	4 GB	4 GB	none	none	none	none
12 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB
16 GB	4 GB	4 GB	4 GB	4 GB	none	none

Table 6-4 Allowable Memory Module Configurations – Single-Ranked and Dual-Ranked Memory Modules

DIMM1_A	DIMM1_B	DIMM2_A	DIMM2_B	DIMM3_A	DIMM3_B
Single Rank	None	none	none	none	none
Single Rank	Single Rank	none	none	none	none
Dual Rank	Dual Rank	none	none	none	none
Single Rank	Single Rank	Single Rank	Single Rank	none	none
Dual Rank	Dual Rank	Dual Rank	Dual Rank	none	none
Dual Rank	Dual Rank	Single Rank	Single Rank	none	none
Single Rank	Single Rank	Single Rank	Single Rank	Single Rank	Single Rank
Dual Rank	Dual Rank	Single Rank	Single Rank	Single Rank	Single Rank

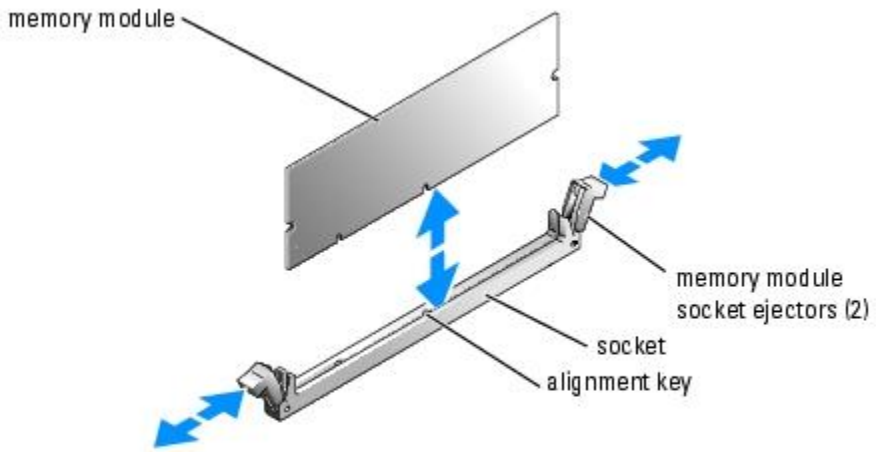
6.5.4 Installing Memory Modules

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

1. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
2. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."

3. Lift up the memory module shroud.
4. Locate the memory module sockets. See Figure 9-3.
5. Press the ejectors on the memory module socket down and out, as shown in Figure 6-11, to allow the memory module to be inserted into the socket.

Figure 6-10 Installing and Removing a Memory Module



6. Align the memory module's edge connector with the alignment key of the memory module socket, and insert the memory module in the socket.

NOTE: The memory module socket has an alignment key that allows you to install the memory module in the socket in only one way.

7. Press down on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the socket.

When the memory module is properly seated in the socket, the ejectors on the memory module socket align with the ejectors on the other sockets that have memory modules installed.

8. Repeat step 3 through step 6 of this procedure to install the remaining memory modules. See Table 6-3 and Table 6-4 for sample memory configurations.
9. Lower the memory module shroud.
10. Replace the Drive Carrier Fan Bracket. See "Replacing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
11. Replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."
12. Press <F2> to enter the System Setup program, and check the **System Memory** setting on the main **System Setup** screen.

The system should have already changed the value to reflect the newly installed memory.

13. If the value is incorrect, one or more of the memory modules may not be installed properly. Repeat step 1 through step 10 of this procedure, checking to ensure that the memory modules are firmly seated in their sockets.
14. Run the system memory test in the system diagnostics. See "Running System Diagnostics."

6.5.5 Removing Memory Modules

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

1. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
2. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
3. Lift up the memory module shroud.
4. Locate the memory module sockets. See Figure 9-3.
5. Press down and out on the ejectors on each end of the socket until the memory module pops out of the socket. See Figure 6-11.
6. Lower the memory module shroud.
7. Replace the Drive Carrier Fan Bracket. See "Replacing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
8. Replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."

6.6 Processors

It is possible to upgrade your processor(s) to take advantage of future options in speed and functionality. Each processor and its associated internal cache memory are contained in a pin grid array (PGA) package that is installed in a ZIF socket on the system board.

6.6.1 Replacing the Processor

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

1. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."

2. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
3. Lift up and remove the memory module shroud.

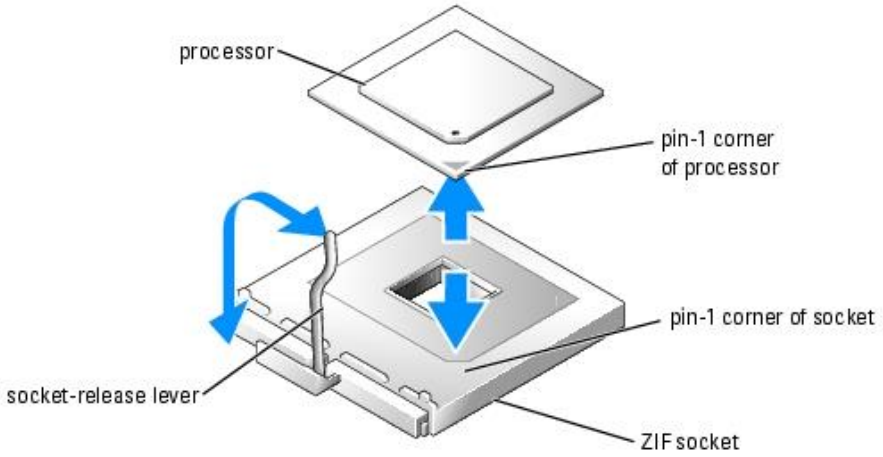
NOTICE: The processor and heatsink can become extremely hot. Be sure the processor has had sufficient time to cool before handling.

4. Remove the heatsink. See "Removing the Heatsink."

NOTICE: Never remove the heatsink from a processor except during maintenance procedures. The heatsink is necessary to maintain proper thermal conditions.

5. Pull the socket-release lever straight up until the processor is released from the socket. See Figure 6-12.

Figure 6-11 Installing and Removing the Processor



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

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

7. Unpack the new processor.

   If any of the pins on the processor appear bent, see "Getting Help."

8. Align the pin-1 corner of the processor with the pin-1 corner of the ZIF socket. See Figure 6-12.

   NOTE: Identifying the pin-1 corners is critical to positioning the processor correctly.

   Identify the pin-1 corner of the processor by locating the tiny gold triangle on one corner of the processor. Place this corner in the same corner of the ZIF socket identified by a corresponding triangle.

9. Install the processor in the socket.

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

   a. If the release lever on the processor socket is not positioned all the way up, move it to that position.

   b. With the pin-1 corners of the processor and socket aligned, set the processor lightly in the socket, making sure all pins are matched with the correct holes in the socket.

      Because the system uses a ZIF processor socket, do not use force, which could bend the pins if the processor is misaligned.

      When the processor is positioned correctly, it drops down into the socket with minimal pressure.

   c. When the processor is fully seated in the socket, rotate the socket release lever back down until it snaps into place, securing the processor.

10. Replace the heatsink. See "Replacing the Heatsink."
11. Replace the memory module shroud.
12. Replace the Drive Carrier Fan Bracket. See "Replacing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
13. Replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."

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

14. Press <F2> to enter the System Setup program, and check that the processor information matches the new system configuration.
15. Run the system diagnostics to verify that the new processor operates correctly.

    See "Running System Diagnostics" for information about running the diagnostics and troubleshooting processor problems.

6.7 Heatsink

6.7.1 Removing the Heatsink

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

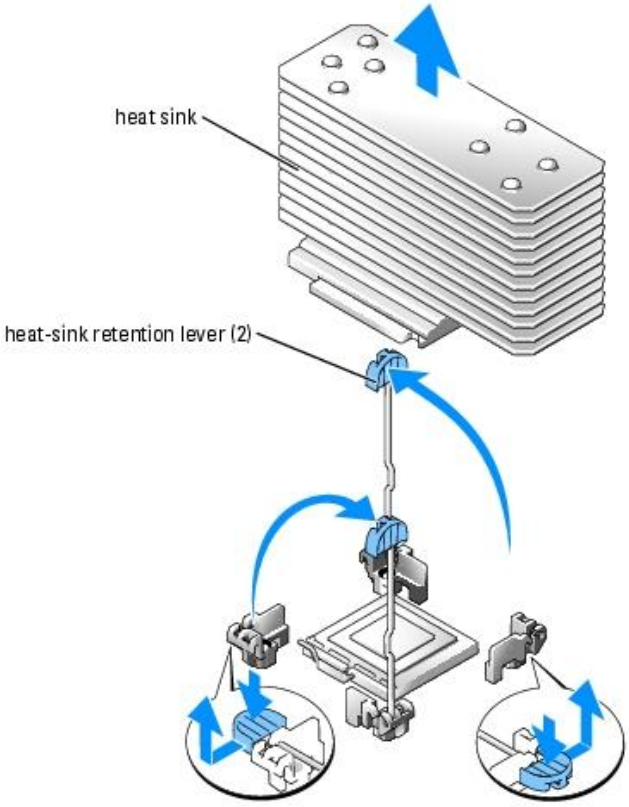
1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
3. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
4. Lift the memory airflow shroud.

NOTICE: The processor and heatsink can become extremely hot. Be sure the processor has had sufficient time to cool before handling.

5. Press the tab on the end of one of the heatsink retention levers to disengage the lever, and then lift the lever 90 degrees. See Figure 6-14.

NOTICE: Never remove the heatsink from a processor unless you intend to remove the processor or you intend to replace the heatsink. The heatsink is necessary to maintain proper thermal conditions.

Figure 6-12 Removing the Heatsink



NOTICE: When removing the heatsink, the possibility exists that the processor might adhere to the heatsink and be removed from the socket. It is recommended that you

remove the heatsink while the processor is slightly warm.

6. Wait 30 seconds for the heatsink to loosen from the processor.
7. Repeat steps 3 and 4 to open the other heatsink retention levers.
8. Remove the heatsink.
    a. If the processor is removed from the socket with the heatsink, twist or slide the processor off of the heatsink. Do not pry the processor off of the heatsink.
    b. Set the heatsink upside down so as not to contaminate the thermal grease.
9. Replace the processor if needed. Refer to "Replacing the Processor."

6.7.2 Replacing the Heatsink

NOTICE: If replacing the processor, use the cooling loop assembly that you removed in steps 6 through 9 above. If replacing the cooling loop assembly, install the new cooling loop assembly.

1. Using a clean lint-free cloth, remove the existing thermal grease from the heatsink. Alcohol wipes can be used to clean the thermal grease.
2. Apply thermal grease to the top of the processor.
3. Place the heatsink on to the processor.
4. Close one of the two heatsink retention levers until it locks. See Figure 6-14.
5. Repeat for the other heatsink retention lever.

6.8 System Battery

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

6.8.1 Replacing the System Battery

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

CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. See your *System Information Guide* for additional information.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

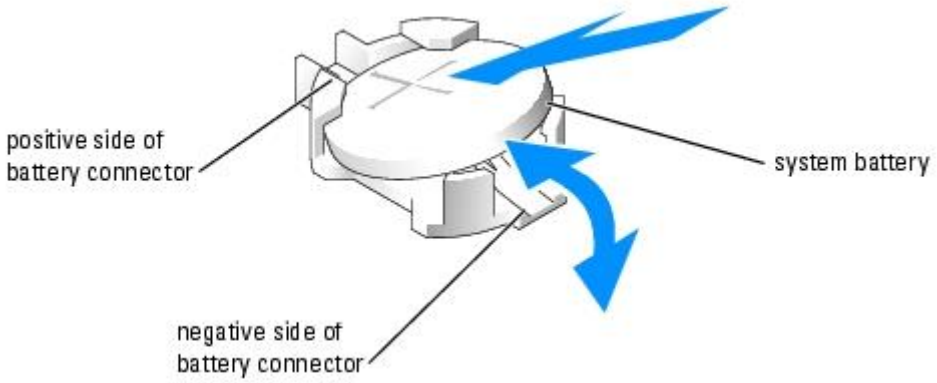
2. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
3. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
4. Lift up the memory airflow shroud.
5. Locate the battery socket. See Figure 9-3.

NOTICE: If you pry the battery out of its socket with a blunt object, be careful not to touch the system board with the object. Ensure that the object is inserted between the battery and the socket before you attempt to pry out the battery. Otherwise, you may damage the system board by prying off the socket or by breaking circuit traces on the system board.

NOTICE: To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

6. Remove the system battery.
    a. Support the battery connector by pressing down firmly on the positive side of the connector.
    b. While supporting the battery connector, press the battery toward the positive side of the connector and pry it up out of the securing tabs at the negative side of the connector.

Figure 6-13 System Battery Removal



NOTICE: To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

7. Install the new system battery.
    a. Support the battery connector by pressing down firmly on the positive side of the connector.
    b. Hold the battery with the "+" facing up, and slide it under the securing tabs at the positive side of the connector.

c. Press the battery straight down into the connector until it snaps into place.

8. Lower the memory airflow shroud.
9. Replace the Drive Carrier Fan Bracket. See "Replacing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
10. Replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."
11. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
12. Enter the System Setup program to confirm that the battery is operating properly.
13. Enter the correct time and date in the System Setup program's **Time** and **Date** fields.
14. Exit the System Setup program.
15. To test the newly installed battery, turn off the system and disconnect it from the electrical outlet for at least an hour.
16. After an hour, reconnect the system to its electrical outlet and turn it on.
17. Enter the System Setup program and if the time and date are still incorrect, see "Getting Help" for instructions on obtaining technical assistance.

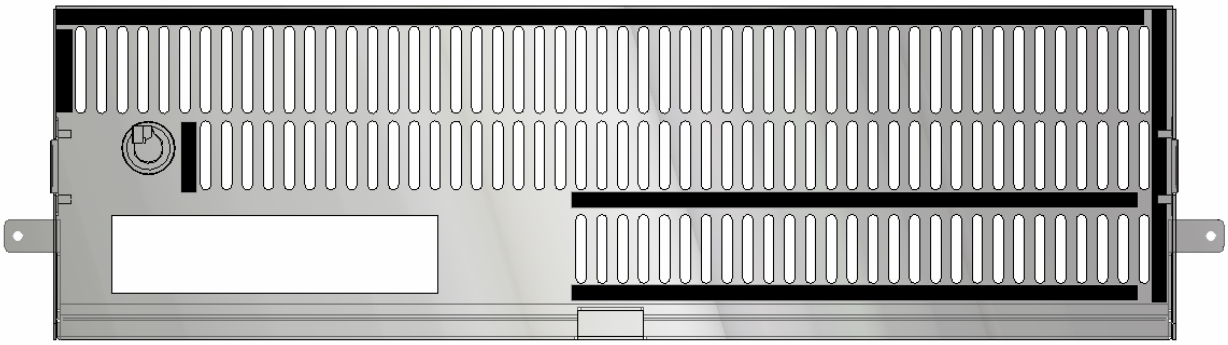
6.9 Dust Filter

The dust filter located in the front bezel allows for the filtration of the air entering the system.

When the filter needs replacing follow this procedure.

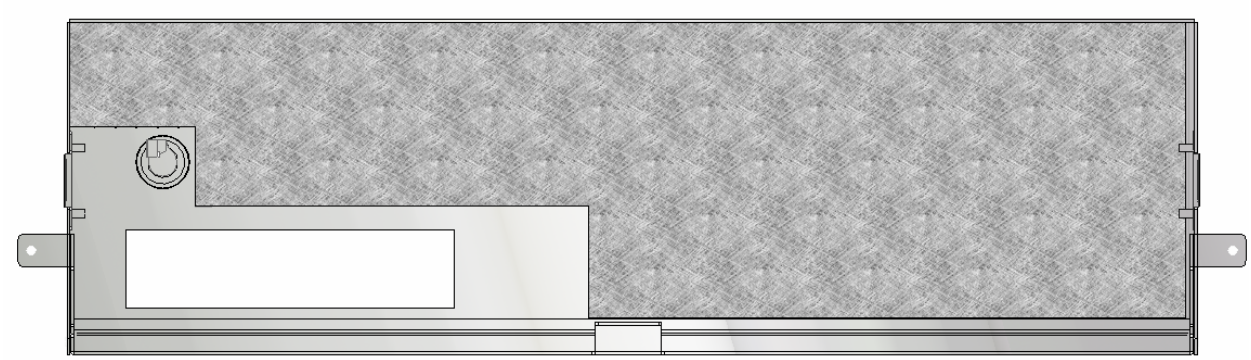
1. Lower the front bezel. See "Lowering and Removing the Bezel."
2. Remove the dust filter adhering to the Velcro tape by pulling it by hand from one side of the bezel.

Figure 6-14 Location of Velcro Tape on Inside of Bezel



3. Locate the new dust filter and place it into the bezel so that the cut out in the filter aligns with the cut out in the bezel. Press the new dust filter so that it sticks to the Velcro tape.

Figure 6-15 Align Dust Filter with Cut Out in Bezel



4. Replace the front bezel. See "Replacing and Raising the Bezel."

7 Installing Drives

Your system contains up to three 1-inch SCSI hard drives. An optional optical drive and an optional diskette drive are mounted on separate trays that slide into the front panel and SCSI backplane board. This section contains instructions for replacing those drive devices.

7.1 SCSI Interface Cables

SCSI interface connectors are keyed for correct insertion. Keying ensures that the pin-1 wire in the cable connects to pin 1 in the connectors on both ends. When you disconnect an interface cable, take care to grasp the cable connector, rather than the cable itself, to avoid stress on the cable.

7.2 SCSI Configuration Information

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

7.2.1 SCSI ID Numbers

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

Set the tape SCSI ID using the jumper and switch settings on the drive to prevent conflict with any other device IDs on the bus. For default SCSI ID settings, refer to the tape drive documentation.

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.

7.2.2 Device Termination

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

7.3 External SCSI Tape Drive

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

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

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Prepare the tape drive for installation.

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

   See "SCSI Configuration Information," for information on setting the drive's SCSI ID number and enabling termination (if required). Change any settings necessary for your system's configuration.
3. Connect the tape drive's interface cable to the external SCSI connector on the controller card.
4. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
5. Perform a tape backup and verification test with the drive as instructed in the software documentation that came with the drive.

7.4 SCSI Hard Drives

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

7.4.1 Before You Begin

Before attempting to remove or install a drive while the system is running, see the RAID documentation and ensure that the system is configured correctly to support hot-pluggable drive removal and insertion.

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

NOTE: You should only use drives that have been tested and approved for use with the SCSI backplane board.

You may need to use different programs than those provided with the operating system to partition and format SCSI hard drives.

NOTICE: Do not turn off or reboot your system while the drive is being formatted. Doing so can cause a drive failure.

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

7.4.2 SCSI Backplane Board Configuration

The hard-drive bays provide space for up to three 1-inch SCSI hard drives. The hard drives connect to a controller on the system board or a RAID controller card through the SCSI backplane board.

The system provides several options for hard drive configurations:

- SCSI controller:
  - Integrated SCSI controller
  - Optional integrated RAID controller. See "Activating the Integrated RAID Controller."
  - RAID controller card. See "Installing a RAID Controller Card."
- Cabling:
  - If a RAID controller card is not installed, connect the appropriate SCSI cables between the SCSI A and/or SCSI B connectors on riser board and the SCSI A or SCSI B connectors on backplane board to use either the integrated SCSI controller or optional integrated RAID controller.
  - If a RAID controller card is installed, cables can be connected from the controller card to SCSIA and/or SCSIB backplane board connector(s). A backplane board connector that is not attached to the RAID controller card will use the integrated SCSI controller or optional integrated RAID controller if it is attached to the riser board.

See Figure 9-6 to locate the connectors on the SCSI backplane board.

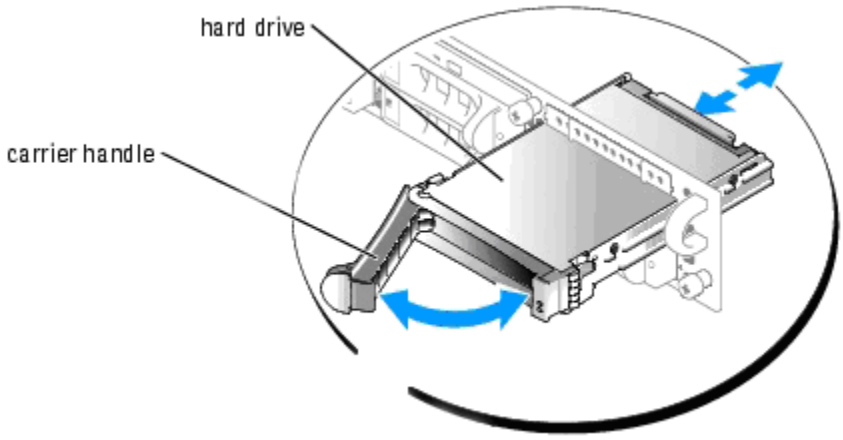
7.4.3 Installing a SCSI Hard Drive

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

NOTICE: Not all operating systems support hot-plug drive installation. See the documentation supplied with your operating system.

1. Remove the bezel. See "Lowering and Removing the Bezel" in "Troubleshooting Your System."
2. Open the hard-drive carrier handle. See Figure 7-1.

Figure 7-1 Installing a SCSI Hard-Drive



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

3. Insert the hard-drive carrier into the drive bay. See Figure 7-1.
4. Close the hard-drive carrier handle to lock it in place.
5. Replace the bezel. See "Replacing and Raising the Bezel" in "Troubleshooting Your System."
6. Install any required SCSI device drivers.
7. If the hard drive is new, run the SCSI controllers test in system diagnostics.

7.4.4 Removing a SCSI Hard Drive

NOTICE: Not all operating systems support hot-plug drive installation. See the documentation supplied with your operating system.

1. Remove the bezel. See "Lowering and Removing the Bezel" in "Troubleshooting Your System."
2. Take the hard drive offline and wait until the SCSI hard-drive indicator codes on the drive carrier signal that the drive may be removed safely. See Table 2-3.

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

   See your operating system documentation for more information on taking the hard drive offline.
3. Open the hard-drive carrier handle to release the drive. See Figure 7-1.
4. Slide the hard drive out until it is free of the drive bay. See Figure 7-1.

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

5. Replace the bezel. See "Replacing and Raising the Bezel" in "Troubleshooting Your System."

7.5 Optical and Diskettes Drives

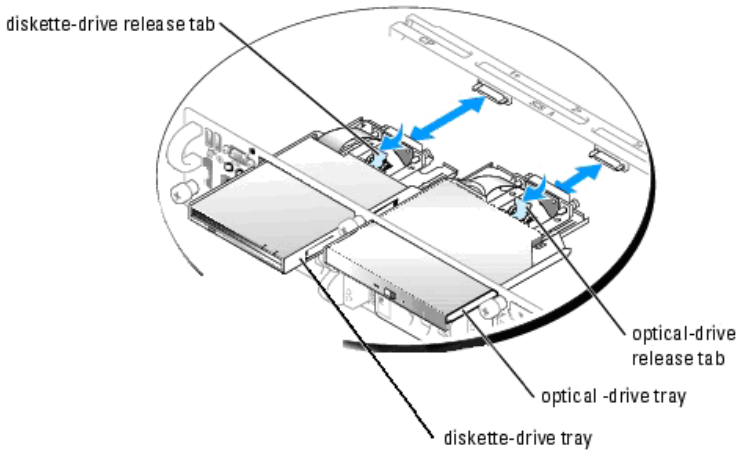
An optional optical drive and an optional diskette drive are mounted on trays that slide in the front panel and connect to the controllers on the system board through the SCSI backplane board.

7.5.1 Removing the Optical Drive or Diskette Drive Tray

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

1. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
2. Remove the bezel. See "Lowering and Removing the Bezel" in "Troubleshooting Your System."
3. Open the system. See "Opening the System" in "Troubleshooting Your System."
4. To remove the optical drive or diskette tray, press forward on the blue tray release tab and slide the drive tray out of the system. See Figure 7-2.

Figure 7-2 Removing and Installing the Optical Drive or Diskette Drive Tray



7.5.2 Installing the Optical Drive or Diskette Drive Tray

1. Align the optical drive or diskette drive tray with its appropriate opening in the front panel.

   The optical drive opening is above hard-drive slot 3 and the diskette drive opening is above hard-drive slot 1 (the hard-drives slots are identified by labels on the front panel of the system).

2. Slide in the drive tray until the tray snaps into place. See Figure 7-2.
3. Close the system. See "Closing the System" in "Troubleshooting Your System."
4. Replace the bezel. See "Replacing and Raising the Bezel" in "Troubleshooting Your System."
5. Reconnect your system and peripherals to their electrical outlets, and turn on the system.

7.6 Activating the Integrated RAID Controller

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

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

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

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the bezel. See "Lowering and Removing the Bezel" in "Troubleshooting Your System."
3. Open the system and extend the Drive Carrier. See "Opening the System" and "Extending and Removing the Drive Carrier" in "Troubleshooting Your System."
4. Remove the Drive Carrier Fan Bracket. See "Removing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
5. Push the ejectors on the RAID memory module connector down and outward to allow the memory module to be inserted into the connector. See Figure 7-3.

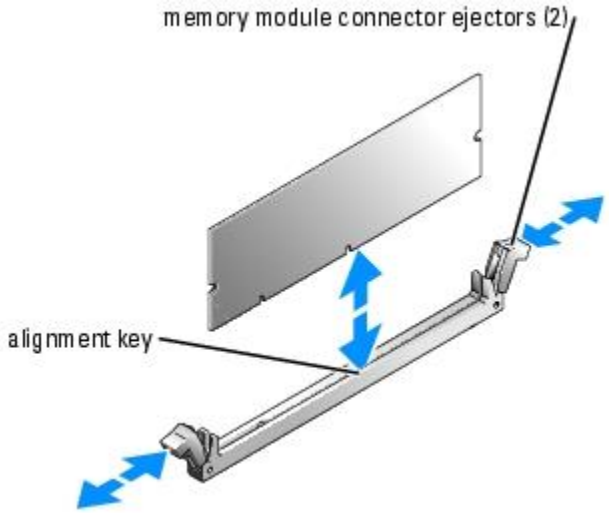
   See Figure 9-4 or Figure 9-5 to locate the RAID memory module connector on the expansion-card riser board.
6. Align the memory module's edge connector with the alignment key, and insert the memory module in the connector. See Figure 7-3.

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

   NOTE: The RAID controller memory module must be a 256MB, registered DDR2 (PC3200) memory module, rated to run at 400 MHz or faster.

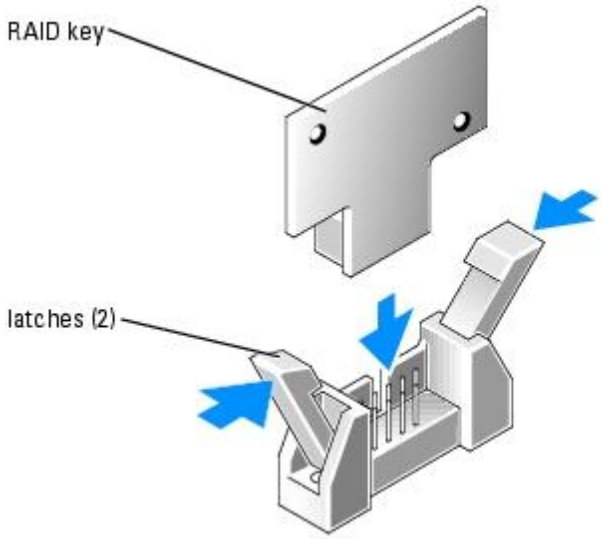
7. Press on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the connector.

Figure 7-3 Installing the RAID Controller Memory Module



8. Lift up the memory airflow shroud and locate the RAID hardware key connector on the system board. See Figure 9-3.
9. Push the ejectors on the RAID hardware key connector down and outward to allow the key to be inserted into the connector. See Figure 7-4.
10. Insert the RAID hardware key into its connector on the system board and secure the key with the latches on each end of the connector. See Figure 7-4.
11. Gently press on the hardware key with your thumbs while pulling up on the ejectors with your index fingers to lock the hardware key into the connector.
12. Lower the memory airflow shroud.

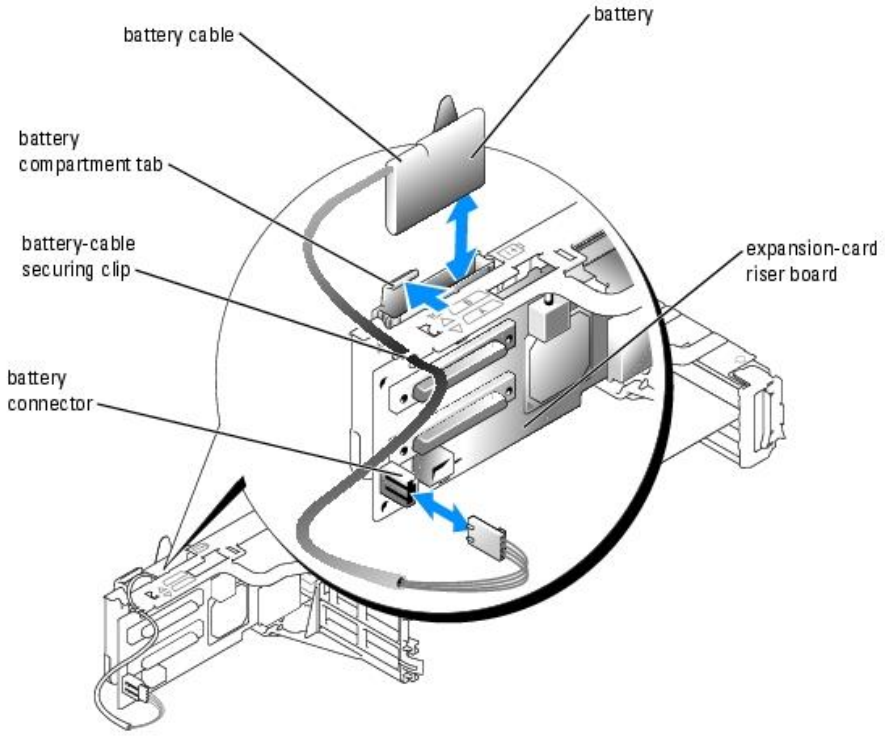
Figure 7-4 Installing the RAID Hardware Key



13. Gently pull and hold open the RAID battery compartment tab, route the RAID battery cable through the bottom opening, and then lower the RAID battery into the compartment. See Figure 7-5.
14. Route the battery cable through the battery-cable securing clip and connect the battery cable to the RAID battery cable connector on the expansion-card riser board. See Figure 7-5.

    See Figure 9-4 or Figure 9-5 to locate the RAID battery cable connector on the expansion-card riser board.

Figure 7-5 Removing and Installing the RAID Battery



15. Replace the Drive Carrier Fan Bracket. See "Replacing the Drive Carrier Fan Bracket" in "Troubleshooting Your System."
16. Replace the Drive Carrier and close the system. See "Replacing the Drive Carrier" and "Closing the System" in "Troubleshooting Your System."
17. Reconnect the system to its electrical outlet and turn on the system, including any attached peripherals.
18. Enter the System Setup program and verify that the setting for the SCSI controller has changed to reflect the presence of the RAID hardware. Change settings of the SCSI controller to enable RAID mode. Restart the system and press `y` to confirm the changes.
19. Install the RAID software.

    See the RAID documentation for more information.

7.7 Installing a RAID Controller Card

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

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

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

   For instructions, see the documentation accompanying the card.

2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

3. Open the system. See "Opening the System" in "Troubleshooting Your System."

4. Install the RAID controller card. See "Installing an Expansion Card" in "Installing System Options."

5. Connect SCSI interface cables supplied with the card to the SCSIA and/or SCSIB connectors on the SCSI backplane board.

   NOTE: Cables can be connected from the RAID controller card to SCSIA and/or SCSIB backplane board connector(s). A backplane board connector that is not attached to the RAID controller card uses the integrated SCSI controller or optional integrated RAID controller if it is attached to the riser board.

   To identify the connector on the RAID controller card, see documentation for the card. See Figure 9-6 to locate the SCSI controller connectors on the SCSI backplane board.

   Route the SCSI cables over the SCSI backplane board to the expansion-card cage.

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

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

7. Close the system. See "Closing the System" in "Troubleshooting Your System."

8. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

9. Install any required SCSI device drivers.

10. Test the SCSI devices.

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

7.8 Configuring the Boot Device

If you plan to boot the system from a hard drive, the drive must be attached to the primary (or boot) controller. The device that the system boots from is determined by the boot order specified in the System Setup program.

The System Setup program provides options that the system uses to scan for installed boot devices.

8 Getting Help

Technical Support Service

Augmentix customer support is available to answer your questions about Augmentix hardware.

To contact Augmentix customer support, please call 1-866-556-0088 ext. 303 or email support@augmentix.com.

9 Jumpers and Connectors

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

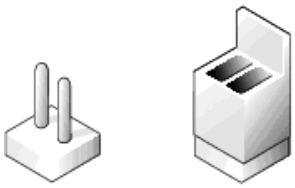
9.1 Jumpers—A General Explanation

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

9.1.1 Jumpers

Jumpers are small blocks on a circuit board with two or more pins emerging from them. Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit. To change a jumper setting, pull the plug off its pin(s) and carefully fit it down onto the pin(s) indicated. Figure 9-1 shows an example of a jumper.

Figure 9-1 Example Jumpers



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

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

Figure 9-2 shows the location and default settings of the system jumper blocks. See Table 9-1 for information about the system jumper designations, default settings, and functions.

9.2 System Board Jumpers

Figure 9-2 shows the location of the configuration jumpers on the system board. Table 9-1 lists the settings for the jumpers.

NOTE: Lift up the memory module airflow shroud for easy access to the jumpers.

Figure 9-2 System Board Jumpers

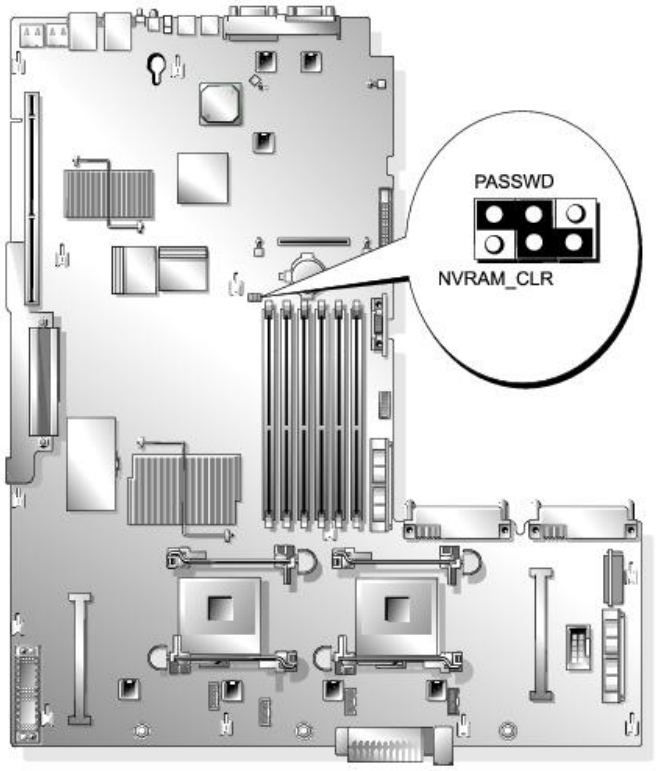


Table 9-1 System Board Jumper Settings

Jumper	Setting	Description
PASSWD	 (default)	The password feature is enabled.
		The password feature is disabled.
NVRAM_CLR	 (default)	The configuration settings are retained at system boot.
		The configuration settings are cleared at the next system boot. (If the configuration settings become corrupted to the point

		where the system will not boot, install the jumper and boot the system. Remove the jumper before restoring the configuration information.)

9.3 System Board Connectors

See Figure 9-3 and Table 9-2 for the location and description of system board connectors.

Figure 9-3 System Board Connectors

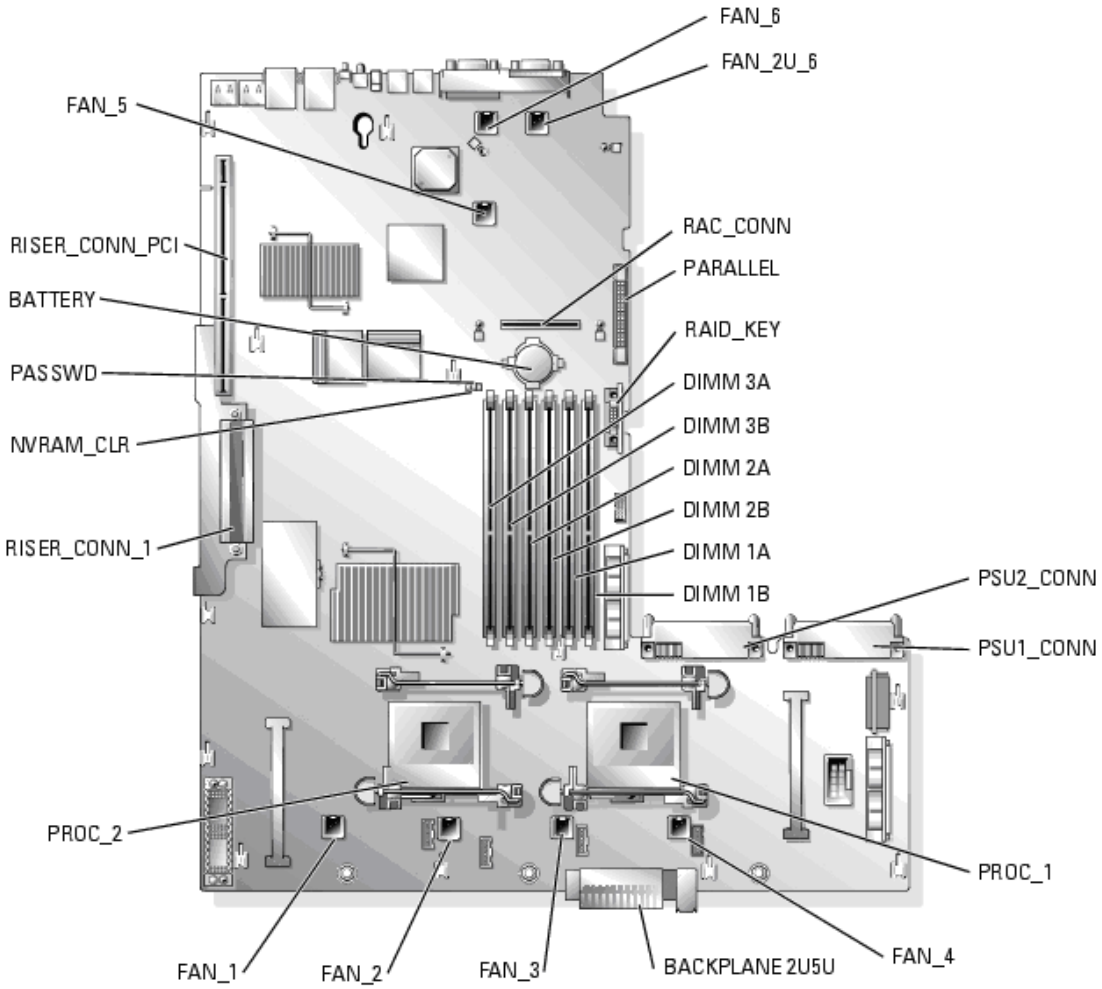


Table 9-2 System Board Connectors

Connector	Description
BACKPLANE 2U5U	Backplane connector
BATTERY	System battery

DIMM *nX*	Memory modules (6), where *n* is the slot in the bank and *X* is the bank
FAN_*n*	Cooling fans: • 1 — optional microprocessor 2 • 2, 3, 4 — microprocessor 1 • 5, 2U_6 — system fans
PROC *n*	Microprocessors (2)
PSU*n*_CONN	Power supply connectors (2)
RAID_KEY	Hardware key for optional integrated RAID controller
RISER_CONN_1	Riser board connector
RISER_CONN_PCI	Riser board PCI bus connector
PARALLEL	Parallel connector

9.4 Expansion-Card Riser-Board Components and PCI Buses

Figure 9-4 shows the components on the PCI-X expansion-card riser board, including the expansion-card slots and buses. Table 6-1 lists the PCI bus and operating speed for each expansion-card slot. Figure 9-5 shows the components on the optional PCI-X/PCIe expansion-card riser board, including the expansion-card slots and buses. Table 6-2 lists the PCI bus and operating speed for each expansion-card slot.

Figure 9-4 PCI-X Expansion-Card Riser Board Components

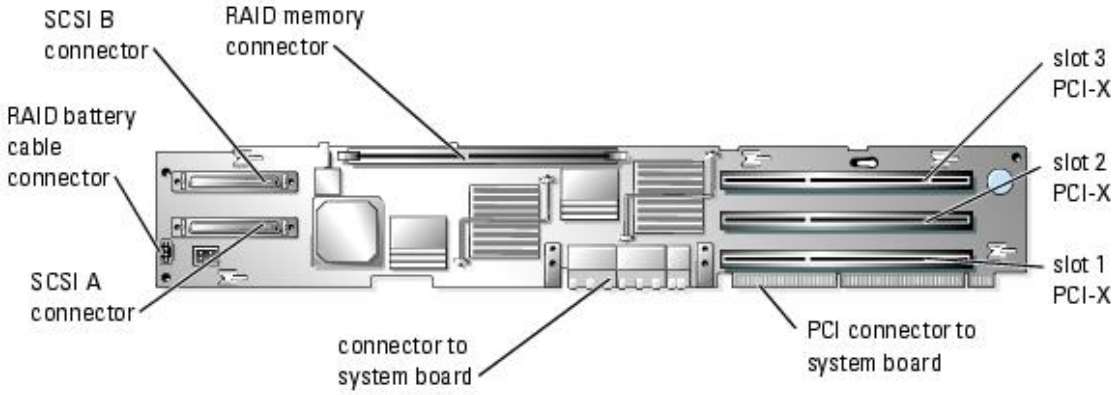
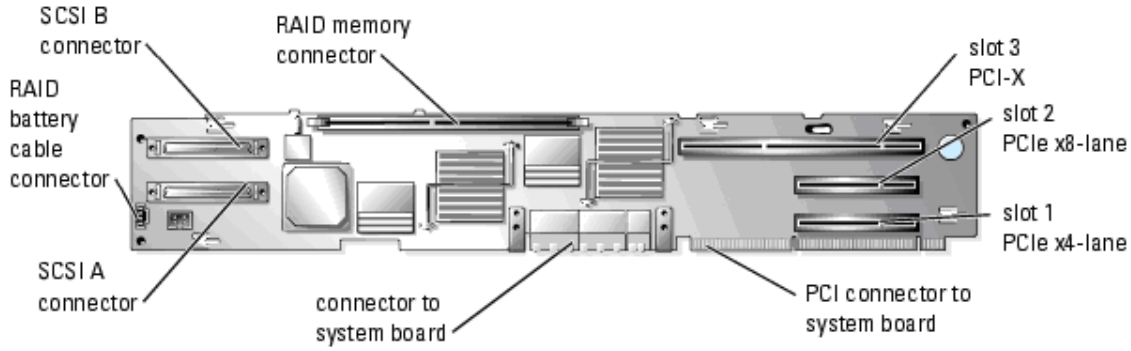


Figure 9-5 shows the components on the optional PCI-X/PCIe expansion-card riser board, including the expansion-card slots and buses. Table 6-2 lists the PCI bus and operating speed for each expansion-card slot.

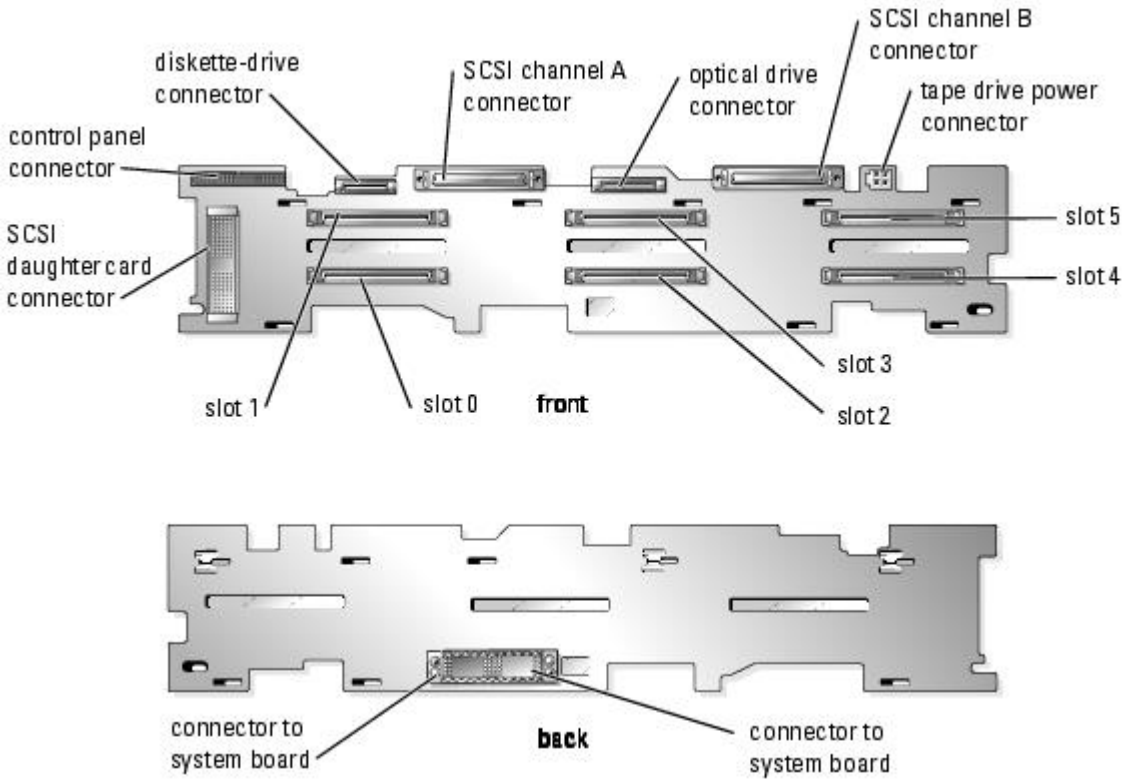
Figure 9-5 Optional PCI-X/PCIe Expansion-Card Riser Board Components



9.5 SCSI Backplane Board Connectors

Figure 9-6 shows the location of the connectors on the SCSI backplane board.

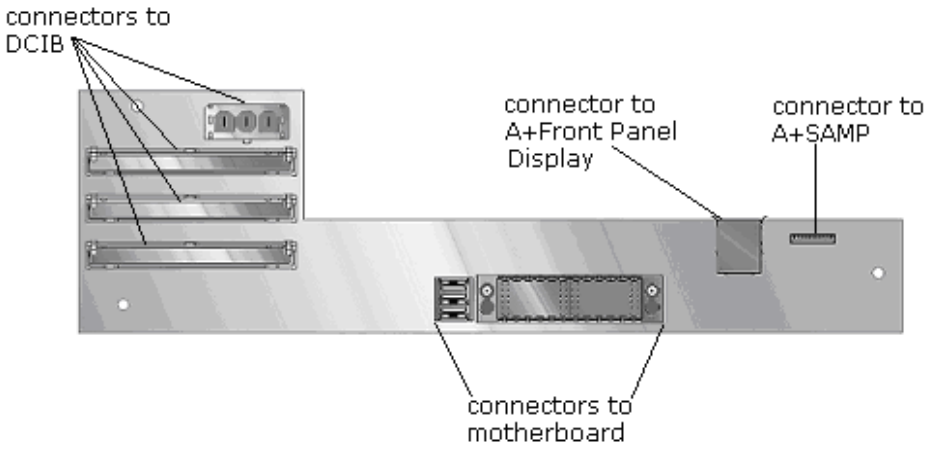
Figure 9-6 SCSI Backplane Board Components



9.6 MBIB Connectors

Figure 9-7 shows the location of the connectors on the Motherboard Interface Board.

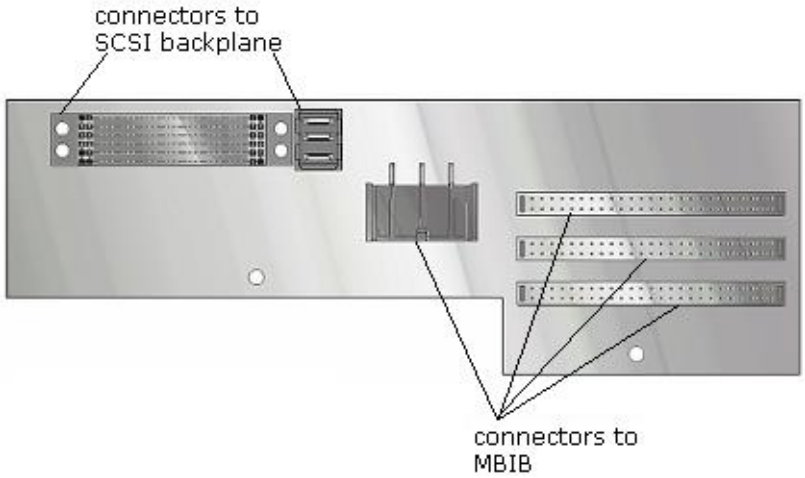
Figure 9-7 MBIB Connectors



9.7 DCIB Board Connectors

Figure 9-8 shows the location of the connectors on the Drive Carrier Interface Board.

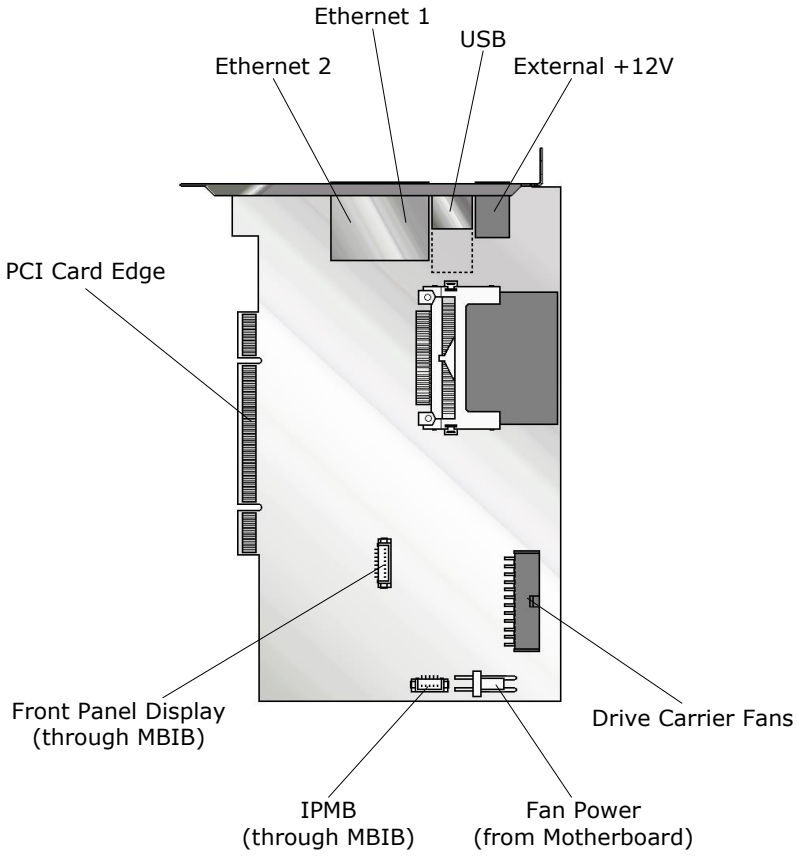
Figure 9-8 DCIB Connectors



9.8 *A*+SAMP Connectors

Figure 9-9 shows the location of the connectors on the *A*+SAMP.

Figure 9-9 *A*+SAMP Connectors



9.9 Disabling a Forgotten Password

The system's software security features include a system password and a setup password. The password jumper enables these password features or disables them and clears any password(s) currently in use.

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

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system. See "Opening the System" in "Troubleshooting Your System."
3. Lift up the memory module shroud.
4. Remove the jumper plug from the password jumper.

   See Figure 9-2 to locate the password jumper (labeled "PASSWD") on the system board.

5. Close the system. See "Closing the System" in "Troubleshooting Your System."
6. Reconnect your system and peripherals to their electrical outlets, and turn on the system.

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

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

7. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
8. Open the system. See "Opening the System" in "Troubleshooting Your System."
9. Install the jumper plug on the password jumper.
10. Lower the memory module shroud.
11. Close the system. See "Closing the System" in "Troubleshooting Your System."
12. Reconnect your system and peripherals to their electrical outlets, and turn on the system.
13. Assign a new system and/or setup password. To assign a new password use the System Setup program.

10 I/O Connectors

I/O connectors are the gateways that the system uses to communicate with external devices, such as a keyboard, mouse, printer, or monitor. This section describes the various connectors on your system. If you reconfigure the hardware connected to the system, you may also need the pin number and signal information for these connectors. Figure 10-1 illustrates the connectors on the system.

Figure 10-1 I/O Connectors

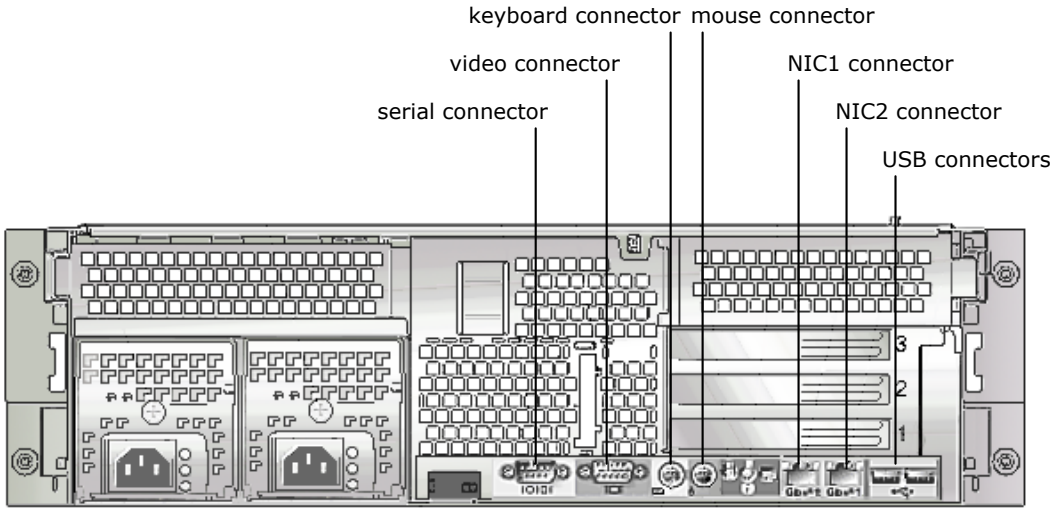


Table 10-1 shows the icons used to label the connectors on the system.

Table 10-1 I/O Connector Icons

Icon	Connector	Icon	Connector
	Serial connector		Video connector
	Mouse connector		USB connector
	Keyboard connector		NIC connector

10.1 Serial Connector

Serial connectors support devices such as external modems, printers, and mice that require serial data transmission. The serial connector uses a 9-pin D-subminiature connector.

10.1.1 Serial Connector Autoconfiguration

The integrated serial connector is designated COM1 by default. When an expansion card containing a serial connector with this designation is added, the autoconfiguration feature remaps the integrated serial connector to the next available designation. New and remapped COM connectors share the same IRQ setting. COM1 and COM3 share IRQ4, while COM2 and COM4 share IRQ3.

NOTE: If two COM connectors share an IRQ setting, you may not be able to use them both at the same time. In addition, if you install one or more expansion cards with serial connectors designated as COM1 and COM3, the integrated serial connector is disabled.

Before adding a card that remaps the COM connectors, check the documentation that came with the software to make sure that the software can accommodate the new COM connector designation.

Figure 10-2 illustrates the pin numbers for the serial connector and Table 10-2 defines the pin assignments for the connector.

Figure 10-2 Serial Connector Pin Numbers

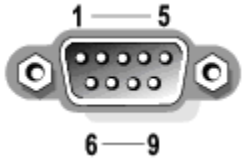


Table 10-2 Serial Connector Pin Assignments

Pin	Signal	I/O	Definition
1	DCD	I	Data carrier detect
2	SIN	I	Serial input
3	SOUT	O	Serial output
4	DTR	O	Data terminal ready
5	GND	N/A	Signal ground
6	DSR	I	Data set ready
7	RTS	O	Request to send

8	CTS	I	Clear to send
9	RI	I	Ring indicator
Shell	N/A	N/A	Chassis ground

10.2 PS/2-Compatible Keyboard and Mouse Connectors

The PS/2-compatible keyboard and mouse cables attach to 6-pin, miniature DIN connectors. Figure 10-3 illustrates the pin numbers for these connectors and Table 10-3 defines the pin assignments for these connectors.

Figure 10-3 PS/2-Compatible Keyboard and Mouse Connector Pin Numbers

Table 10-3 Keyboard and Mouse Connector Pin Assignments

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

10.3 Video Connector

You can attach a VGA-compatible monitor to the system's integrated video controller using a 15-pin high-density D-subminiature connector on the system front or back panel. Figure 10-4 illustrates the pin numbers for the video connector and Table 10-4 defines the pin assignments for the connector.

NOTE: Installing a video card automatically disables the system's integrated video controller.

Figure 10-4 Video Connector Pin Numbers

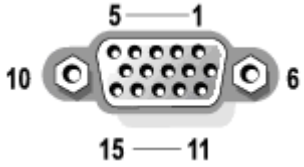


Table 10-4 Video Connector Pin Assignments

Pin	Signal	I/O	Definition
1	RED	O	Red video
2	GREEN	O	Green video
3	BLUE	O	Blue video
4	NC	N/A	No connection
5–8, 10	GND	N/A	Signal ground
9	VCC	N/A	Vcc
11	NC	N/A	No connection
12	DDC data out	O	Monitor detect data
13	HSYNC	O	Horizontal synchronization
14	VSYNC	O	Vertical synchronization
15	NC	N/A	No connection

10.4 USB Connectors

The system's USB connectors support USB-compliant peripherals such as keyboards, mice, and printers and may also support USB-compliant devices such as diskette drives and optical drives. Figure 10-5 illustrates the pin numbers for the USB connector and Table 10-5 defines the pin assignments for the connector.

NOTICE: Do not attach a USB device or a combination of USB devices that draw a maximum current of more than 500 mA per channel or +5 V. Attaching devices that exceed this threshold may cause the USB connectors to shut down. See the documentation that accompanied the USB devices for their maximum current ratings.

Figure 10-5 USB Connector Pin Numbers

Table 10-5 USB Connector Pin Assignments

Pin	Signal	I/O	Definition
1	Vcc	N/A	Supply voltage
2	DATA	I	Data in
3	+DATA	O	Data out
4	GND	N/A	Signal ground

10.5 Integrated NIC Connectors

Each of the system's integrated NIC's function as a separate network expansion card while providing fast communication between servers and workstations. Figure 10-6 illustrates the pin numbers for the NIC connector and Table 10-6 defines the pin assignments for the connectors.

Figure 10-6 NIC Connector

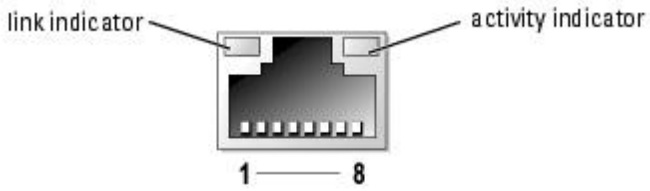


Table 10-6 NIC Connector Pin Assignments

Pin	Signal	I/O	Definition
1	TD+	O	Data out (+)
2	TD–	O	Data out (–)

3	RD+	I	Data in (+)
4	NC	N/A	No connection
5	NC	N/A	No connection
6	RD–	I	Data in (–)
7	NC	N/A	No connection
8	NC	N/A	No connection

10.5.1 Network Cable Requirements

The NIC supports a UTP Ethernet cable equipped with a standard RJ45-compatible plug. Observe the following cabling restrictions.

NOTICE: To avoid line interference, voice and data lines must be in separate sheaths.

- Use Category 5 or greater wiring and connectors.
- Do not exceed a cable run length (from a workstation to a hub) of 100 m (328 ft).

For detailed guidelines on operation of a network, see "Systems Considerations of Multi-Segment Networks" in the IEEE 802.3 standard.