

IBM IntelliStation A Pro Type 6217



# Problem Determination and Service Guide



IBM IntelliStation A Pro Type 6217



# Problem Determination and Service Guide

**Note:**

Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 157.

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 **Safety Information** (安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

---

## Guidelines for servicing the computer

This section contains information for trained service technicians.

### Inspecting for unsafe conditions

Use the information in this section to help you identify potential unsafe conditions in an IBM product that you are working on. Each IBM product, as it was designed and manufactured, has required safety items to protect users and service technicians from injury. The information in this section addresses only those items. Use good judgment to identify potential unsafe conditions that might be caused by non-IBM alterations or attachment of non-IBM features or options that are not addressed in this section. If you identify an unsafe condition, you must determine how serious the hazard is and whether you must correct the problem before you work on the product.

Consider the following conditions and the safety hazards that they present:

- Electrical hazards, especially primary power. Primary voltage on the frame can cause serious or fatal electrical shock.
- Explosive hazards, such as a damaged CRT face or a bulging capacitor.
- Mechanical hazards, such as loose or missing hardware.

To inspect the product for potential unsafe conditions, complete the following steps:

1. Make sure that the power is off and the power cord is disconnected.
2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.
3. Check the power cord:
  - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
  - Make sure that the power cord is the correct type, as specified in "Power cords" on page 107.
  - Make sure that the insulation is not frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

### Guidelines for servicing electrical equipment

Observe the following guidelines when servicing electrical equipment:

- Check the area for electrical hazards such as moist floors, nongrounded power extension cords, and missing safety grounds.
- Use only approved tools and test equipment. Some hand tools have handles that are covered with a soft material that does not provide insulation from live electrical current.
- Regularly inspect and maintain your electrical hand tools for safe operational condition. Do not use worn or broken tools or testers.

- Do not touch the reflective surface of a dental mirror to a live electrical circuit. The surface is conductive and can cause personal injury or equipment damage if it touches a live electrical circuit.
- Some rubber floor mats contain small conductive fibers to decrease electrostatic discharge. Do not use this type of mat to protect yourself from electrical shock.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Locate the emergency power-off (EPO) switch, disconnecting switch, or electrical outlet so that you can turn off the power quickly in the event of an electrical accident.
- Disconnect all power before you perform a mechanical inspection, work near power supplies, or remove or install main units.
- Before you work on the equipment, disconnect the power cord. If you cannot disconnect the power cord, have the customer power-off the wall box that supplies power to the equipment and lock the wall box in the off position.
- Never assume that power has been disconnected from a circuit. Check it to make sure that it has been disconnected.
- If you have to work on equipment that has exposed electrical circuits, observe the following precautions:
  - Make sure that another person who is familiar with the power-off controls is near you and is available to turn off the power if necessary.
  - When you are working with powered-on electrical equipment, use only one hand. Keep the other hand in your pocket or behind your back to avoid creating a complete circuit that could cause an electrical shock.
  - When using a tester, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on a suitable rubber mat to insulate you from grounds such as metal floor strips and equipment frames.
- Use extreme care when measuring high voltages.
- To ensure proper grounding of components such as power supplies, pumps, blowers, fans, and motor generators, do not service these components outside of their normal operating locations.
- If an electrical accident occurs, use caution, turn off the power, and send another person to get medical aid.

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## Safety statements

### Important:

Each caution and danger statement in this documentation begins with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* document.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* document under statement 1.

Be sure to read all caution and danger statements in this documentation before performing the instructions. Read any additional safety information that comes with your computer or optional device before you install the device.

Statement 1:



**DANGER**

**Electrical current from power, telephone, and communication cables is hazardous.**

**To avoid a shock hazard:**

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

**To Connect:**

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

**To Disconnect:**

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

Statement 2:



**CAUTION:**

When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

*Do not:*

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

Statement 3:



**CAUTION:**

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

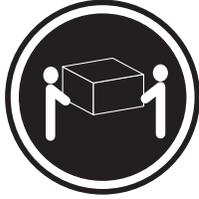


**DANGER**

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

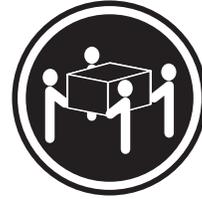
**Statement 4:**



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

**CAUTION:**

Use safe practices when lifting.

**Statement 5:**



**CAUTION:**

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



**Statement 8:**



**CAUTION:**

Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

**Statement 10:**



**CAUTION:**

Do not place any object weighing more than 82 kg (180 lb) on top of rack-mounted devices.



>82 kg (180 lb)



---

## Chapter 1. Introduction

This *Problem Determination and Service Guide* contains information to help you solve problems that might occur in your IBM® IntelliStation® A Pro Type 6217 computer. It describes the diagnostic tools that come with the computer, error codes and suggested actions, and instructions for replacing failing components.

Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You can install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your computer.
- **Field replacement unit (FRU):** FRUs must be installed only by trained service technicians.

For more information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document on the IBM *IntelliStation Documentation CD*.

**Note:** The illustrations in this document might differ slightly from your hardware.

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## Related documentation

In addition to this document, the following documentation also comes with the computer:

- *User's Guide*

This document is in PDF on the IBM *IntelliStation Documentation CD*. It contains general information about the computer.

- *Installation Guide*

This printed document contains setup and installation instructions.

- *Safety Information*

This document is in PDF on the IBM *IntelliStation Documentation CD*. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Warranty and Support Information*

This document is in PDF on the IBM *IntelliStation Documentation CD*. It contains information about the terms of the warranty and about service and assistance.

- *Adaptec SCSI documentation*

This document is in PDF on the *Device Drivers CD*. It contains information and instructions for installing and configuring small computer system interface (SCSI) device drivers and devices.

- Readme files on the *Device Drivers CD*

Several readme files on this CD contain information about the preinstalled device drivers. Other readme files on this CD contain information about the various adapters and devices that might be installed in or attached to the computer.

- IBM *IntelliStation Documentation CD*

This CD contains all of the IBM IntelliStation A Pro Type 6217 documents in Portable Document Format (PDF).

Depending on the computer model, additional documentation might be included on the IBM *IntelliStation Documentation* CD.

The computer might have features that are not described in the documentation that comes with the computer. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information. These updates are available from the IBM Web site. To check for updated documentation and technical updates, complete the following steps:

**Note:** Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Browse by topic** section, click **Publications**.
3. On the Publications page, in the **Brand** field, select **IntelliStation**.
4. In the **Family** field, select **IntelliStation A Pro**.
5. Click **Continue**.

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## Notices and statements in this document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information* document, which is on the IBM *IntelliStation Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

## Features and specifications

The following table provides a summary of the features and specifications of the computer. Depending on the model, some features might not be available, or some specifications might not apply.

Table 1. Features and specifications

<p><b>Microprocessor:</b></p> <ul style="list-style-type: none"> <li>• Supports up to two AMD Opteron microprocessors (two 64-bit memory channels per microprocessor)</li> <li>• 1 MB Level-2 cache</li> <li>• 800 MHz front-side bus (FSB) with data rate of 1.6 GHz</li> </ul> <p><b>Memory:</b></p> <ul style="list-style-type: none"> <li>• Minimum: 1 GB</li> <li>• Maximum: 16 GB (depending on your configuration)</li> <li>• Type: PC2700 (2 GB DIMMs only) and PC3200 double-data-rate (DDR) registered</li> <li>• Connectors: Four or eight dual inline memory module (DIMM) connectors (depending on your configuration)</li> </ul> <p><b>Internal drives:</b></p> <ul style="list-style-type: none"> <li>• Hard disk drive: SCSI or Serial ATA (SATA)</li> <li>• One of the following optical drives: <ul style="list-style-type: none"> <li>– CD-ROM: IDE</li> <li>– CD-RW: IDE</li> <li>– DVD-ROM: IDE</li> <li>– DVD/CD-RW combo: IDE</li> <li>– DVD-RAM Multiburner Plus: IDE</li> </ul> </li> </ul> <p><b>Expansion bays:</b></p> <ul style="list-style-type: none"> <li>• Three slim-high 3.5-inch drive bays (one hard disk drive installed in some models)</li> <li>• Two half-high 5.25-inch bays (optical drive installed in one bay)</li> <li>• One slim-high 3.5-inch removable-media or hard disk drive bay</li> </ul> <p><b>PCI expansion slots:</b></p> <ul style="list-style-type: none"> <li>• Four 100 MHz/64-bit PCI-X slots</li> <li>• One 133 MHz/64-bit PCI-X slot</li> <li>• One PCI Express x16 slot</li> </ul> <p><b>Power supply:</b></p> <p>One 530 watt (115-230 V ac)</p> <p><b>Cooling:</b></p> <p>Five or six speed-controlled fans</p>	<p><b>Integrated functions:</b></p> <ul style="list-style-type: none"> <li>• Broadcom 5703 10/100/1000 Ethernet controller with RJ-45 Ethernet connector</li> <li>• Integrated RAID capability</li> <li>• Two serial ports</li> <li>• One parallel port</li> <li>• Dual port Serial ATA controller</li> <li>• Two IEEE 1394A (FireWire) ports (four-pin on front, six-pin on rear)</li> <li>• Five Universal Serial Bus (USB) ports (two on front and three on rear)</li> <li>• Keyboard port</li> <li>• Mouse port</li> <li>• Audio ports <ul style="list-style-type: none"> <li>– Line out (front and rear)</li> <li>– Mic (front and rear)</li> <li>– Line in (rear only)</li> </ul> </li> <li>• Dual-channel IDE controller</li> </ul> <p><b>Video adapter:</b> (depending on your model)</p> <ul style="list-style-type: none"> <li>• NVIDIA Quadro NVS 280 (DMS-59), PCI Express x16, with 64 MB DDR synchronous dynamic random access memory (SDRAM) video memory and dual analog connectors (or dual digital monitor capability with the purchase of an additional pigtail cable)</li> <li>• NVIDIA Quadro FX 1400 (DVI-I), PCI Express x16, with 128 MB DDR synchronous dynamic random access memory (SDRAM) with dual DVI-I connectors</li> <li>• NVIDIA Quadro FX 3400 (DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM video memory with dual DVI-I connectors</li> <li>• 3DLabs Wildcat Realizm 800 (DVI-I), PCI Express x16, with 512 MB GDDR3 (512-bit Unified) and 128 MB GDDR3 (128-bit direct burst) SDRAM video memory with dual DVI-I connectors</li> </ul> <p><b>Electrical input:</b></p> <ul style="list-style-type: none"> <li>• Sine-wave input (50 or 60 Hz) required</li> <li>• Input voltage and frequency ranges automatically selected</li> <li>• Input voltage low range: <ul style="list-style-type: none"> <li>– Minimum: 90 V ac</li> <li>– Maximum: 137 V ac</li> </ul> </li> <li>• Input voltage high range: <ul style="list-style-type: none"> <li>– Minimum: 180 V ac</li> <li>– Maximum: 265 V ac</li> </ul> </li> <li>• Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> <li>– Minimum: 0.24 kVA</li> <li>– Maximum: 0.86 kVA</li> </ul> </li> </ul>	<p><b>Heat output:</b></p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> <li>• Minimum configuration: 787 Btu (230 watts)</li> <li>• Maximum configuration: 3012 Btu (882 watts)</li> </ul> <p><b>Environment:</b></p> <ul style="list-style-type: none"> <li>• Air temperature: <ul style="list-style-type: none"> <li>– Computer on: 10° to 35°C (50° to 95°F). Altitude: 0 to 2134 m (7000 ft)</li> <li>– Computer off: -40° to +60°C (-40° to 140°F). Maximum altitude: 2133 m (7000 ft)</li> </ul> </li> <li>• Humidity (operating and storage): 8% to 80%</li> </ul> <p><b>Acoustical noise emissions:</b></p> <ul style="list-style-type: none"> <li>• Sound power, idle: 4.7 bel</li> <li>• Sound power, operating: 5.3 bel</li> </ul> <p><b>Size:</b></p> <ul style="list-style-type: none"> <li>• Height: 438 mm (17.25 in.)</li> <li>• Depth: 483 mm (19 in.)</li> <li>• Width: 165 mm (6.5 in.)</li> <li>• Weight: 16.3 kg (36 lb) to 20.8 kg (45.8 lb) depending upon configuration</li> </ul> <p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</li> <li>2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.</li> </ol>
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## Controls, LEDs, and connectors

Figure 1 shows the controls, LEDs, and front connectors on the IntelliStation A Pro Type 6217 computer. See the *User's Guide* for an illustration and description of the connectors on the rear of the computer.

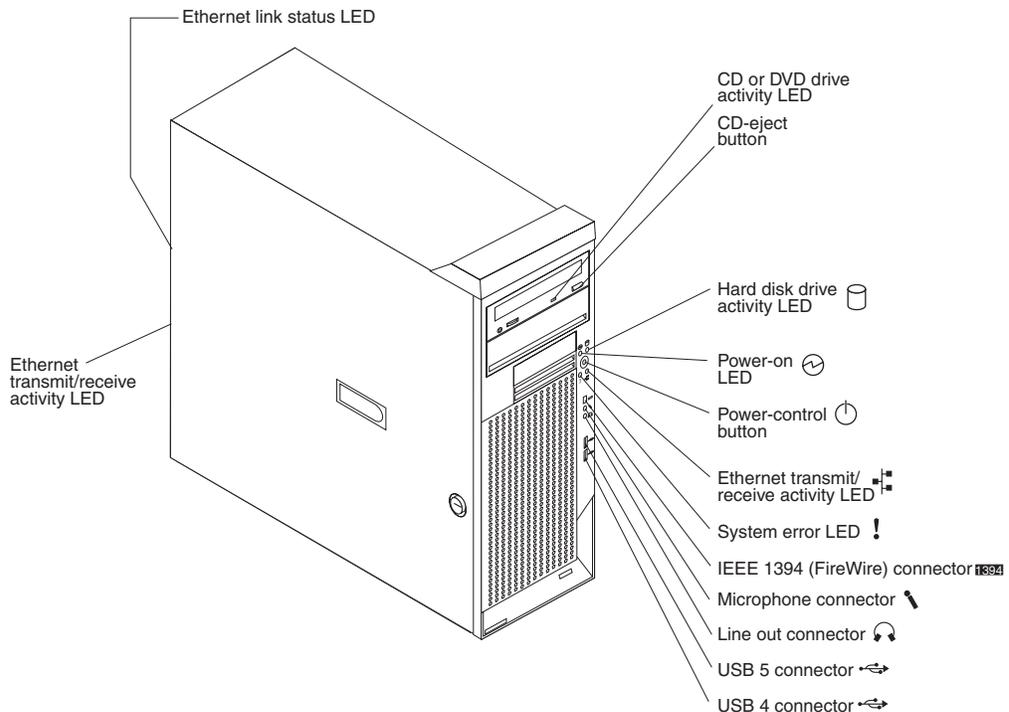


Figure 1. Controls, LEDs, and indicators

### CD or DVD drive activity LED

When this LED is lit, it indicates that the CD or DVD drive is in use.

### CD-eject button

Press this button to insert a CD or DVD into or remove a CD or DVD from the CD or DVD drive.

### Hard disk drive activity LED

When this LED is lit, it indicates that the hard disk drive is in use.

### Power-on LED

When this LED is lit and not flashing, it indicates that the computer is turned on. When this LED is flashing, it indicates that the computer is off and still connected to an ac power source.

### Power-control button

Press this button to turn the computer on or off.

### System-error LED

When this LED is lit, it indicates that a system error has occurred. An LED on the system board is also lit to help isolate the error.

### IEEE 1394A (FireWire) connectors

Use these connectors (four-pin on the front and six-pin on the rear) to connect FireWire devices, such as digital video cameras and external hard disk drives.

**Mic connector (pink)**

Use this connector to connect a microphone to the computer when you want to record voices or other sounds on the hard disk. You can also use this connector (and a microphone) with speech-recognition software.

**Line out connector (green)**

Use this connector to send audio signals from the computer to external devices, such as speakers with built-in amplifiers, headphones, multimedia keyboards, or the audio line-in jack on a stereo system.

**USB connectors**

Use these connectors to connect USB devices to the computer, using redundant Plug and Play technology.

**Ethernet transmit/receive activity LED**

When this LED is lit, it indicates that there is activity between the computer and the network. There are two of these LEDs, one on the front and one on the rear of the computer.

**Ethernet link status LED**

When this LED is lit, it indicates that there is an active connection on the Ethernet port. This LED is on the rear of the computer.

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## Internal LEDs, connectors, and jumpers

The illustrations in this section show the LEDs, connectors, and jumpers on the internal boards. The illustrations might differ slightly from your hardware.

### System-board option connectors

Figure 2 shows the option connectors on the system board.

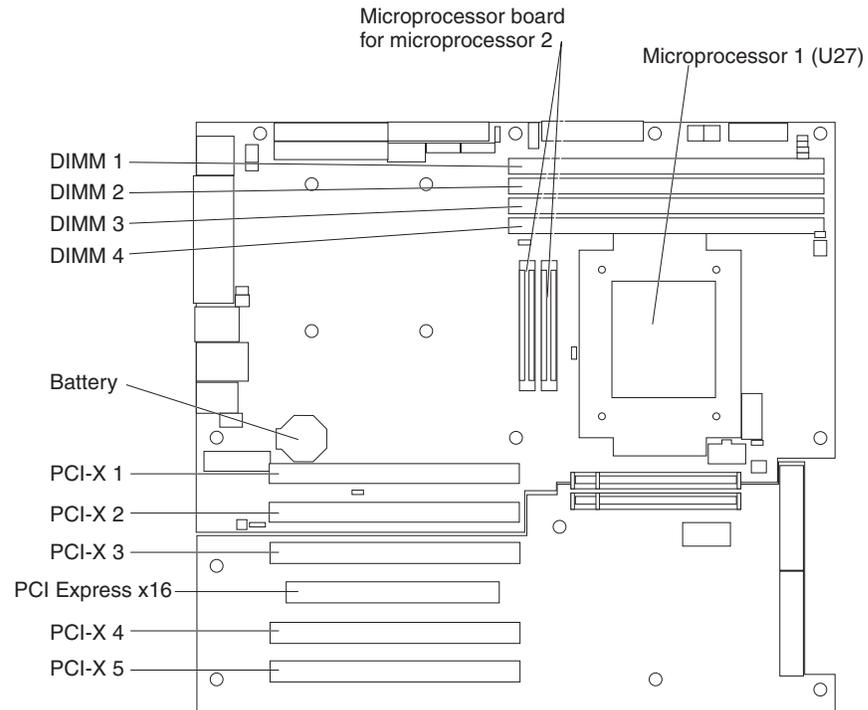


Figure 2. System-board option connectors

## System-board internal connectors

Figure 3 shows the internal connectors and LEDs on the system board.

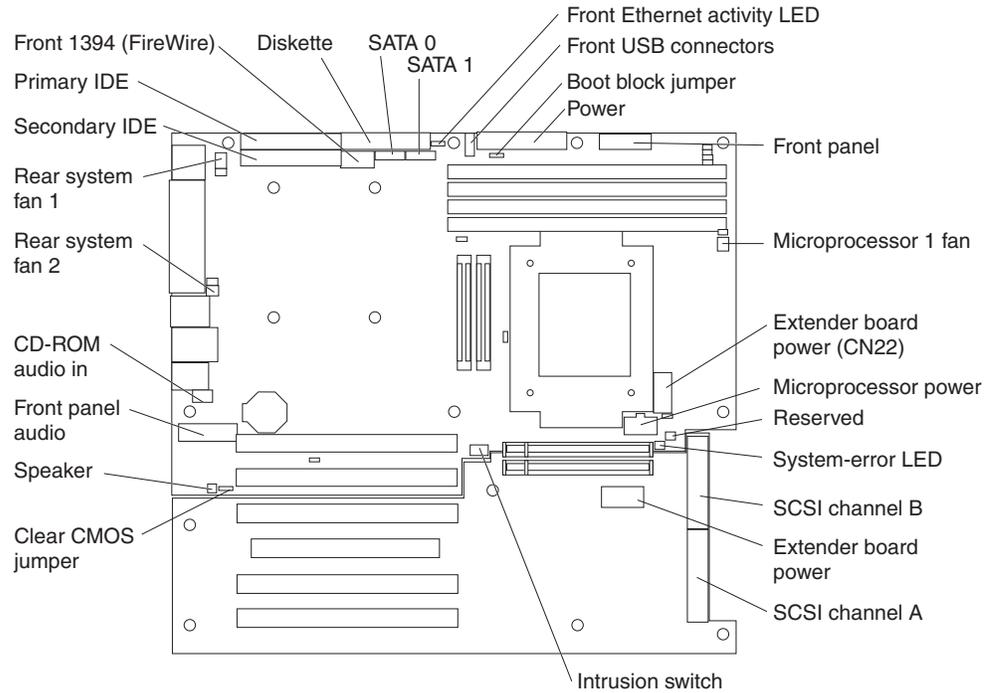


Figure 3. System-board internal connectors

## System-board external connectors

Figure 4 shows the external input/output port connectors on the system board.

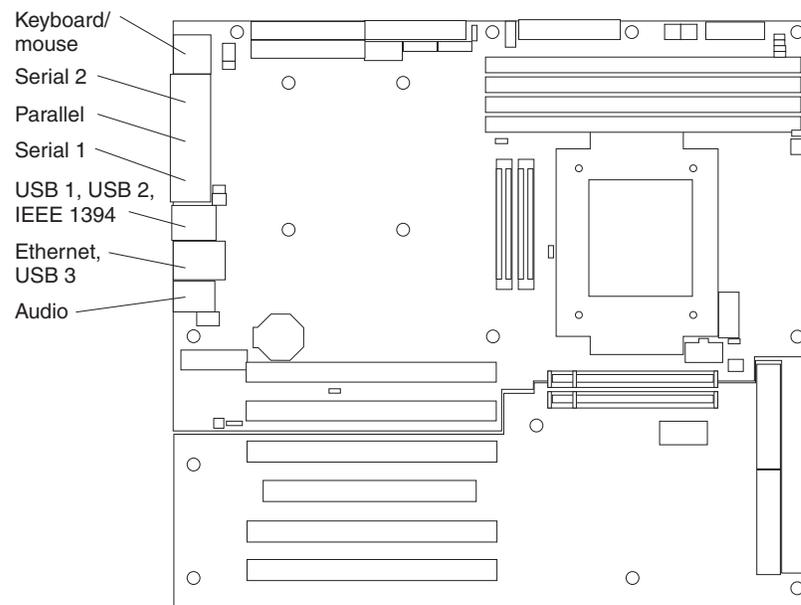


Figure 4. System-board external connectors

## System-board LEDs

Figure 5 shows the system-board LEDs.

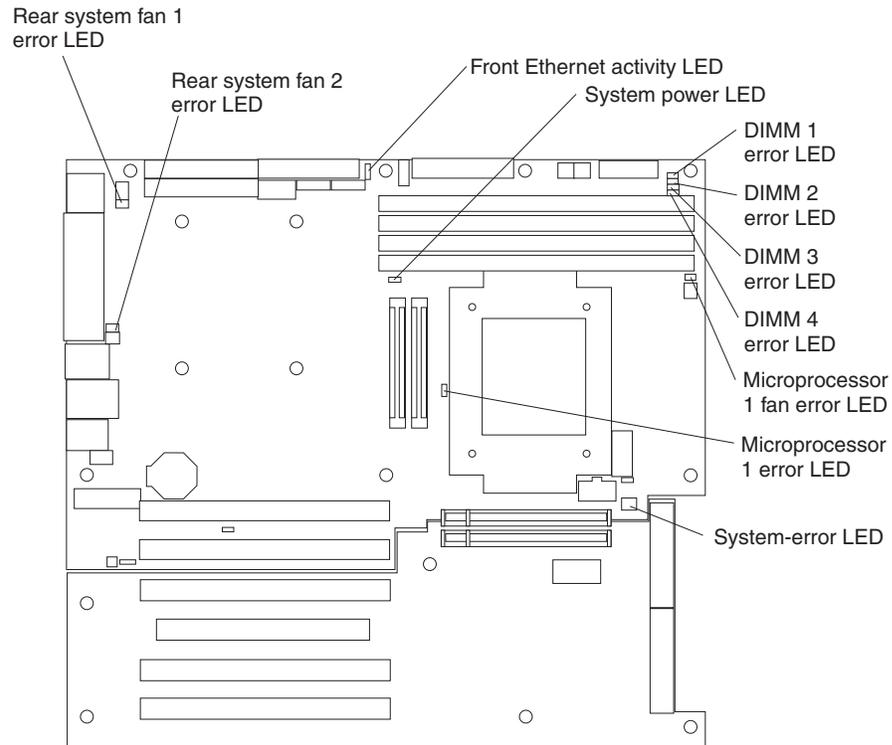


Figure 5. System-board LEDs

Each error LED is lit to indicate a problem with a specific component. After a problem is corrected, the LED will not be lit the next time the computer is restarted. If the problem remains, the LED will continue to be lit. For information about how to correct the problems that are indicated by the error LEDs, see “System board LED errors” on page 50.

## System-board jumpers

Figure 6 shows the jumper blocks on the system board.

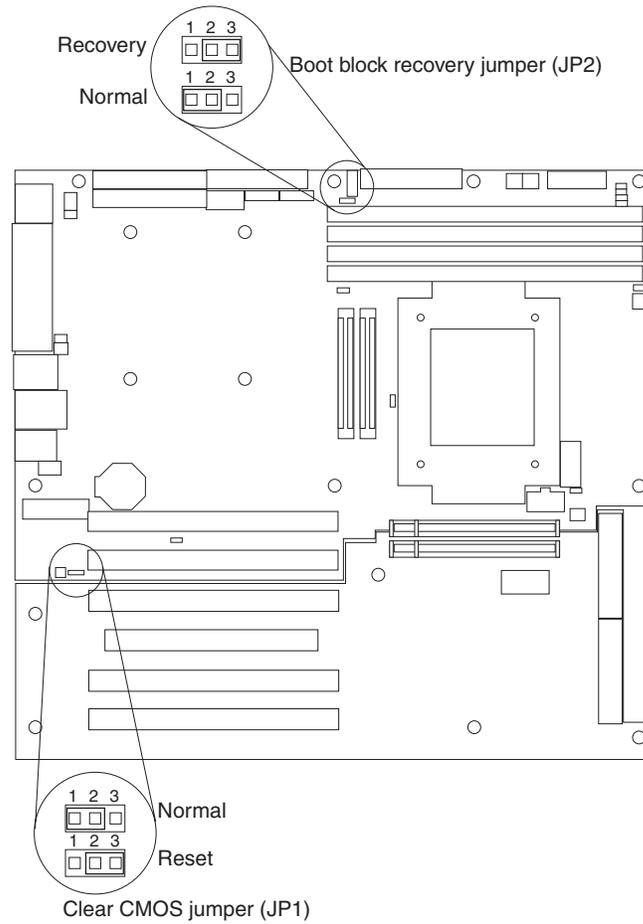
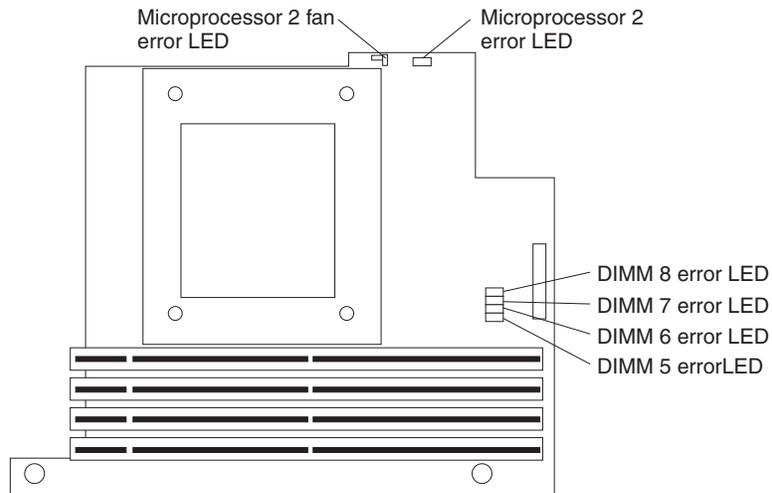


Figure 6. System-board jumpers

Any jumper blocks on the system board that are not shown in the illustration are reserved. For information about BIOS code recovery or the boot block recovery jumper, see “Recovering from a POST/BIOS update failure” on page 58.

## Microprocessor-board LEDs

If the microprocessor board for the second microprocessor has been installed on the system board, there are additional error LEDs on the microprocessor board. Figure 7 shows the error LEDs on the microprocessor board for the second microprocessor.



*Figure 7. Microprocessor-board diagnostic LEDs*

Each error LED is lit to indicate a problem with a specific component. After a problem is corrected, the LED will not be lit the next time the computer is restarted. If the problem remains, the LED will continue to be lit. For information about how to correct the problems that are indicated by the error LEDs, see “Microprocessor board LED errors” on page 53.

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## Chapter 2. Diagnostics

This chapter describes the diagnostic tools that are available to help you solve problems that might occur in the computer.

If you cannot locate and correct the problem using the information in this chapter, see Appendix A, “Getting help and technical assistance,” on page 155 for more information.

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### Diagnostic tools

The following tools are available to help you diagnose and solve hardware-related problems:

- **POST beep codes and error messages**

The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See “Power-on self-test (POST)” for more information.

- **Troubleshooting tables**

These charts list problem symptoms and steps to correct the problem. See “Troubleshooting tables” on page 30 for more information.

- **Diagnostic programs, error codes, and error messages**

The diagnostic programs are the primary method of testing the major components of the computer. The diagnostic programs are stored on a hidden partition on the hard disk. See “Diagnostic programs, error codes, and messages” on page 40 for more information.

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### Power-on self-test (POST)

When you turn on the computer, it performs a series of tests to check the operation of computer components and some optional devices in the computer. This series of tests is called the power-on self-test, or POST.

If a power-on password is set, you must type the password and press Enter, when prompted, for POST to run.

If the POST process completes without detecting any problem, a single beep sounds, and the computer startup is completed.

If the POST process detects a problem, more than one beep might sound, or an error message is displayed. See “Beep code descriptions” and “POST error codes” on page 18 for more information.

### POST beep codes

A beep code is a combination of short and long beeps or a series of short beeps separated by pauses (intervals without sound). For example, a “1-2-3” beep code is one short beep, a pause, two short beeps, a pause, and three short beeps. A beep code other than one beep indicates that POST has detected a problem. To determine the meaning of a beep code, see “Beep code descriptions.” If no beep code sounds, see “No-beep symptoms” on page 17.

#### Beep code descriptions

The following table describes the beep codes and suggested actions to correct the detected problems.

A single problem might cause more than one error message. When this occurs, correct the cause of the first error message. The other error messages usually will not occur the next time POST runs.

**Exception:** If there are multiple error codes or light path diagnostics LEDs that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See “Microprocessor problems” on page 34 for information about diagnosing microprocessor problems.

Table 2. POST beep codes

Beep code	Description	Action
<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
1-1-3	CMOS write/read test has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
1-1-4	BIOS EEPROM checksum has failed.	<ol style="list-style-type: none"> <li>1. Recover the BIOS code.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
1-2-1	Programmable interval timer test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
1-2-2	DMA initialization has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
1-2-3	DMA page register write/read test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>

Table 2. POST beep codes (continued)

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Beep code	Description	Action
1-3-1	First 64 Kb RAM test has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:                             <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
2-1-1	Secondary DMA register test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
2-1-2	Primary DMA register test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
2-1-3	Primary interrupt mask register test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
2-1-4	Secondary interrupt mask register test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
2-2-2	Keyboard controller test has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:                             <ol style="list-style-type: none"> <li>a. Keyboard</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>a. Keyboard</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

Table 2. POST beep codes (continued)

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Beep code	Description	Action
2-2-3	CMOS power failure and checksum checks have failed.	<ol style="list-style-type: none"> <li>Reseat the following components:                             <ol style="list-style-type: none"> <li>Battery</li> <li>(Trained service technician only) System board</li> </ol> </li> <li>Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>Battery</li> <li>(Trained service technician only) System board</li> </ol> </li> </ol>
2-4-1	Video failed; system believed operable.	<ol style="list-style-type: none"> <li>Reseat the following components:                             <ol style="list-style-type: none"> <li>Video adapter</li> <li>(Trained service technician only) System board</li> </ol> </li> <li>Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>Video adapter</li> <li>(Trained service technician only) System board</li> </ol> </li> </ol>
3-1-1	Timer tick interrupt test has failed.	<ol style="list-style-type: none"> <li>(Trained service technician only) Reseat the system board.</li> <li>(Trained service technician only) Replace the system board.</li> </ol>
3-1-2	Interval timer channel 2 test has failed.	<ol style="list-style-type: none"> <li>(Trained service technician only) Reseat the system board.</li> <li>(Trained service technician only) Replace the system board.</li> </ol>
3-1-3	RAM test has failed above address 0FFFFH.	<ol style="list-style-type: none"> <li>Reseat the following components:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>(Trained service technician only) System board</li> </ol> </li> <li>Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>(Trained service technician only) System board</li> </ol> </li> </ol>

Table 2. POST beep codes (continued)

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Beep code	Description	Action
3-1-4	Time-of-day clock test has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:                             <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
3-2-1	Serial port test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
3-2-2	Parallel port test has failed.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
3-2-3	Math coprocessor test has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:                             <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
3-2-4	Comparison of CMOS memory size against actual has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:                             <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. Battery</li> <li>c. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. Battery</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol>

Table 2. POST beep codes (continued)

<ul style="list-style-type: none"> <li>Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Beep code	Description	Action
3-3-1	A memory size mismatch has occurred.	<ol style="list-style-type: none"> <li>Reseat the following components:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>Battery</li> <li>(Trained service technician only) System board</li> </ol> </li> <li>Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>Battery</li> <li>(Trained service technician only) System board</li> </ol> </li> </ol>
3-3-2	Critical SMBUS error occurred (I2C bus has failed).	<ol style="list-style-type: none"> <li>Disconnect the power cord, wait 30 seconds, and retry.</li> <li>Reseat the following components:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>(Trained service technician only) Microprocessor</li> <li>System board</li> </ol> </li> <li>Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>(Trained service technician only) Microprocessor</li> <li>(Trained service technician only) System board</li> </ol> </li> </ol>
3-3-3	<p>No operational memory in the system.</p> <p><b>Attention:</b> In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank display screen. If this occurs and the <b>Boot Fail Count</b> feature in the Start Options of the Configuration/Setup Utility program is set to <b>Enabled</b> (its default setting), you must restart the computer three times to force the system BIOS to reset the memory connector from <b>Disabled</b> to <b>Enabled</b>.</p>	<ol style="list-style-type: none"> <li>If you just installed memory, make sure that the new memory is correct for your computer.</li> <li>Make sure that a pair of memory DIMMs are installed for each microprocessor; then, restart the computer.</li> <li>Reseat the following components:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>(Trained service technician only) System board</li> </ol> </li> <li>Replace the following components one at a time, in the order shown, restarting the computer each time:                             <ol style="list-style-type: none"> <li>DIMM</li> <li>(Trained service technician only) System board</li> </ol> </li> </ol>

## No-beep symptoms

The following table describes situations in which no beep code sounds when POST is completed.

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
No-beep symptom	Description	Action
No beep during POST.	A system board failure occurred.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
No beep, no video, and system attention LED (if present) is off.	A system board failure occurred.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
No beep, no video, and system attention LED (if present) is on.		See “Solving undetermined problems” on page 65 for more information.

## POST error codes

The following table describes the POST error codes and suggested actions to correct the detected problems.

Table 3. POST error messages

Error codes	Description	Action
<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
062	<p>The computer failed to start on three consecutive attempts.</p> <p>All caches are disabled. Repeatedly turning the computer on and off or resetting the computer might cause this problem.</p>	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program and make sure that all settings are correct. Use the <b>Cache Control</b> selection in the <b>Advanced Setup</b> menu of the Configuration/Setup Utility program to enable the caches.</li> <li>2. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) Microprocessor</li> <li>c. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) Microprocessor</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol> <p><b>Note:</b> When the problem is corrected, be sure to enable the caches.</p>
101, 102, and 106	An error occurred during the system board and microprocessor test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
151	A real-time clock (RTC) error occurred.	<ol style="list-style-type: none"> <li>1. Run the diagnostics program.</li> <li>2. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
161	The real-time clock battery has failed.	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program, select <b>Load Default Settings</b>, make sure that the date and time are correct, and save the settings.</li> <li>2. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
162	<p>A change in device configuration occurred. This error occurs under one or more of the following conditions:</p> <ul style="list-style-type: none"> <li>• A new device has been installed.</li> <li>• A device has been moved to a different location or cable connection.</li> <li>• A device has been removed or disconnected from a cable.</li> <li>• A device is failing and is no longer recognized by the computer as being installed.</li> <li>• An external device is not turned on.</li> <li>• An invalid checksum is detected in the battery-backed memory.</li> </ul>	<ol style="list-style-type: none"> <li>1. Make sure that all external devices are turned on. You must turn on external devices before turning on the computer.</li> <li>2. If you did not add, remove, or change the location of a device, a device is probably failing. Running the diagnostic program might isolate the failing device. See "Using the Enhanced Diagnostics diskette or CD" on page 49.</li> <li>3. Run the Configuration/Setup Utility program, select <b>Load Default Settings</b>, and save the settings.</li> <li>4. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. Failing device</li> <li>c. (Trained service technician only) System board</li> </ol> </li> <li>5. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. Failing device (if the device is a FRU, then the device should be replaced by a trained service technician only).</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
163	The time of day has not been set.	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program, select Load Default Settings, and make sure that the date and time are correct, and save the settings.</li> <li>2. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Battery</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
164	A change in the memory configuration occurred. This message might appear after you add or remove memory.	<ol style="list-style-type: none"> <li>1. If POST error message 289 also occurred, follow the instructions for that error message 289 first.</li> <li>2. If you just installed or removed memory, run the Configuration/Setup Utility program, and save the new configuration settings.</li> <li>3. Reseat the following components:               <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
175	A vital product data (VPD) error occurred.	<ol style="list-style-type: none"> <li>1. Restart the computer.</li> <li>2. Update the firmware.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>
184	The power-on password information stored in the computer has been removed.	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program, select <b>Load Default Settings</b>, and save the settings.</li> <li>2. (Trained service technician only) Reseat the system board.</li> <li>3. (Trained service technician only) Replace the system board.</li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
187	The VPD serial number is not set. <b>Note:</b> The system serial number is set in the VPD EEPROM at the time of manufacturing. If the system board has been replaced, the system serial number will be invalid and must be reset.	<ol style="list-style-type: none"> <li>1. Restart the computer.</li> <li>2. Update the BIOS code to set the serial number.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>
188	A vital product data (VPD) error occurred.	<ol style="list-style-type: none"> <li>1. Restart the computer.</li> <li>2. Update the BIOS code.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board</li> </ol>
189	An attempt has been made to access the computer with an incorrect passwords.	Restart the computer and enter the administrator password; then, run the Configuration/Setup Utility program and change the power-on password.
201	An error occurred during the memory controller test. This error can be caused by: <ul style="list-style-type: none"> <li>• Incorrectly installed memory</li> <li>• A failing memory module</li> <li>• A system board problem</li> </ul>	<ol style="list-style-type: none"> <li>1. If you just installed memory, make sure that the new memory is correct for your computer.</li> <li>2. Reseat the following components: <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board.</li> </ol> </li> </ol>
289	An error occurred during POST memory tests and a DIMM was disabled.	<ol style="list-style-type: none"> <li>1. If you just installed memory, make sure that the new memory is correct for your computer.</li> <li>2. If the DIMM was disabled by the user, run the Configuration/Setup Utility program, select <b>Memory Settings</b> from the <b>Advanced Setup</b> menu option and enable the DIMM.</li> <li>3. Make sure that the memory is installed and seated correctly.</li> <li>4. Reseat the DIMM.</li> <li>5. Replace the DIMM.</li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
301 and 303	An error occurred during the keyboard and keyboard controller test. These error messages also might be accompanied by continuous beeping.	<ol style="list-style-type: none"> <li>1. If you just connected a new mouse or other pointing device, turn off the computer and disconnect that device. Wait at least 5 seconds; then, turn on the computer. If the error message goes away, replace the device.</li> <li>2. Make sure that nothing is resting on the keyboard or pressing on a key.</li> <li>3. Make sure that no key is stuck.</li> <li>4. Make sure that the keyboard cable is connected correctly to the keyboard and to the correct connector on the computer.</li> <li>5. After installing a USB keyboard, run the Configuration/Setup Utility program to enable keyboardless operation and prevent the POST error message from being displayed during startup.</li> <li>6. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Keyboard</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>7. Running the diagnostic tests can isolate the computer component that failed, if the error message remains.</li> <li>8. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Keyboard</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
602	Invalid diskette boot record error.	<ol style="list-style-type: none"> <li>1. Make sure that the diskette drive cables are correctly and securely connected.</li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Diskette</li> <li>b. Diskette drive</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol>

Table 3. POST error messages (continued)

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Error codes	Description	Action
604	An error occurred during a diskette drive test.	<ol style="list-style-type: none"> <li>1. Make sure that the Configuration/Setup Utility program correctly reflects the type of diskette drive that you have installed.</li> <li>2. Make sure that the diskette drive cables are correctly and securely connected.</li> <li>3. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Diskette drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Run the diagnostic tests. If the computer fails the diagnostic tests, replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Diskette drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
662	A diskette drive configuration error occurred.	<ol style="list-style-type: none"> <li>1. If you removed a diskette drive, make sure that the diskette drive setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it and save the setting.</li> <li>2. Make sure that the diskette drive cables are correctly and securely connected.</li> <li>3. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Diskette drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Run the diagnostic tests. If the computer fails the diagnostic tests, replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Diskette drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
962	A parallel port configuration error occurred.	If you changed a hardware option, make sure that the parallel port setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it and save the setting.
1162	The serial port configuration conflicts with another device in the system.	<ol style="list-style-type: none"> <li>1. Make sure that the IRQ and I/O port assignments needed by the serial port are available.</li> <li>2. If all interrupts are being used by adapters, remove an adapter to make an interrupt available to the serial port, or force other adapters to share an interrupt.</li> <li>3. Make sure that the serial port setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it and save the setting.</li> </ol>

Table 3. POST error messages (continued)

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Error codes	Description	Action
1762	Hard disk configuration error.	<ol style="list-style-type: none"> <li>1. Make sure that the hard disk drive is set correctly in the Configuration/Setup Utility program.</li> <li>2. Make sure that the hard disk drive cables are correctly and securely connected.</li> <li>3. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
1962	No valid startup devices were found. The computer cannot find the startup drive or operating system.	<ol style="list-style-type: none"> <li>1. Make sure that the hard disk drive cables are correctly and securely connected.</li> <li>2. Make sure that the drive you want to start from is in the startup sequence.</li> <li>3. Run the Configuration/Setup Utility program, select <b>Startup</b> from the menu options.</li> <li>4. Check the list of startup devices in the <b>Startup device</b> data fields. Is the drive you want to start from in the startup sequence?               <p><b>Yes</b> Exit from this screen; then, select <b>Exit Setup</b> to exit the Configuration/Setup menu. Go to step 5.</p> <p><b>No</b> Follow the instructions on the screen to add the drive; then, save the changes and exit the Configuration/Setup menu. Restart the computer.</p> </li> <li>5. Is an operating system installed?               <p><b>Yes</b> Turn off the computer. Go to step 6.</p> <p><b>No</b> Install the operating system in the computer; then, follow your operating-system instructions to shut down and restart the computer.</p> </li> <li>6. During computer startup, watch for messages indicating a hardware problem.</li> <li>7. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) system board</li> </ol> </li> <li>8. If the error message still appears, run the diagnostics to isolate the problem.</li> <li>9. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
2462	A video memory configuration error occurred.	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program and load the default settings.</li> <li>2. Reseat the video adapter.</li> <li>3. Replace the video adapter.</li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
5962	<p>An IDE CD-ROM configuration error occurred.</p> <p><b>Action:</b></p> <p>If the problem remains, call for service.</p>	<ol style="list-style-type: none"> <li>1. Check the signal and power cable connections to the CD-ROM drive.</li> <li>2. Run the Configuration/Setup Utility program and load the default settings.</li> <li>3. Reseat the following components:               <ol style="list-style-type: none"> <li>a. CD-ROM drive</li> <li>b. Battery</li> <li>c. (Trained service technician only) System board</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. CD-ROM drive</li> <li>b. Battery</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol>
8603	<p>An error occurred during the mouse (pointing device) controller test. The addition or removal of a mouse, or a failing system board can cause this error.</p> <p><b>Note:</b> This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the computer for at least 5 seconds; then, turn it back on.</p>	<ol style="list-style-type: none"> <li>1. Make sure that the keyboard and mouse (pointing device) are attached to the correct connectors. If they are connected correctly, use the following procedure:               <ol style="list-style-type: none"> <li>a. Turn off the computer.</li> <li>b. Disconnect the mouse from the computer.</li> <li>c. Turn on the computer.</li> </ol> </li> <li>2. If the POST error message does not reappear, the mouse is probably failing. See the documentation that comes with the mouse for additional testing information.</li> <li>3. If the POST error message reappears, run the diagnostic tests to isolate the problem. If the diagnostic tests do not find a problem and the POST error message remains, reseat the following components:               <ol style="list-style-type: none"> <li>a. Mouse (pointing device)</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Mouse (pointing device)</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
00012000	Processor machine check error.	<ol style="list-style-type: none"> <li>1. Update the system BIOS code.</li> <li>2. (Trained service technician only) Reseat the microprocessor.</li> <li>3. (Trained service technician only) Replace the microprocessor.</li> </ol>

Table 3. POST error messages (continued)

Error codes	Description	Action
00180300	A PCI adapter has requested memory above 1 MB.	<ol style="list-style-type: none"> <li>1. If the error code indicates a particular PCI or PCI-X slot or device, remove the device.</li> <li>2. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Each adapter</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. Each adapter</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
00180700	xxxxyyyy planar PCI or PCI-X device does not respond or is disabled by user (where xxxx is the PCI or PCI-X vendor ID and yyyy is the PCI or PCI-X device ID).	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program, select <b>Devices and I/O Ports</b>, and make sure that the device is enabled.</li> <li>2. Reseat the following components:               <ol style="list-style-type: none"> <li>a. Failing adapter                   <p><b>Note:</b> If a PCI or PCI-X error LED is lit, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter.</p> </li> <li>b. (Trained service technician only) System board</li> <li>c. Replace the following components one at a time, in the order shown, restarting the computer each time:                   <ol style="list-style-type: none"> <li>1) Failing adapter</li> <li>2) (Trained service technician only) System board</li> </ol> </li> </ol> </li> </ol>
01298001	No update data is available for the microprocessor.	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program to make sure that all microprocessors have the same cache size, speed, type, and technology.</li> <li>2. Update the system BIOS code to a level that supports the microprocessors that are installed in the computer.</li> <li>3. (Trained service technician only) Reseat the microprocessor.</li> <li>4. (Trained service technician only) Replace the microprocessor.</li> </ol>
01298200	Microprocessor speed mismatch.	<ol style="list-style-type: none"> <li>1. Make sure that all microprocessors have the same cache size, speed, type, and technology.</li> <li>2. (Trained service technician only) Reseat the microprocessor.</li> <li>3. (Trained service technician only) Replace the microprocessor.</li> </ol>

Table 3. POST error messages (continued)

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Error codes	Description	Action
19990650	AC power has been restored.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Check the power cables.</li> <li>2. (Trained service technician only) Check for interruption of the power supply.</li> <li>3. (Trained service technician only) Reseat the power supply.</li> <li>4. (Trained service technician only) Replace the power supply.</li> </ol>
Other Numbers	POST found an error.	Follow the instructions on the screen.

## Checkout procedure

The checkout procedure is the sequence of tasks that you should follow to diagnose a problem in the computer.

### About the checkout procedure

Before performing the checkout procedure for diagnosing hardware problems, review the following information:

- Read the safety information beginning on page “Safety” on page vii.
- The diagnostic programs provide the primary methods of testing the major components in the computer, such as the system board, Ethernet controller, video controller, RAM, keyboard, mouse (pointing device), serial ports, hard disk drives, and parallel port. The diagnostic programs are stored on a hidden partition on the computer hard disk. You can also use the programs to test some external devices. If you are not sure whether a problem is caused by the hardware or by the software, you can use the diagnostic programs to confirm that the hardware is working correctly. See “Starting the diagnostic programs and viewing the test log” on page 40.
- When you run the diagnostic programs, a single problem might cause several error messages. When this happens, correct the cause of the first error message. The other error messages usually might not occur the next time you run the diagnostic programs.

**Exception:** If there are multiple error codes or light path diagnostics LEDs that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See “Microprocessor problems” on page 34 for information about diagnosing microprocessor problems.

- Before running the diagnostic programs, you must determine whether the failing computer is part of a shared hard disk drive cluster (two or more computers sharing external storage devices). If it is part of a cluster, you can run all diagnostic programs except the ones that test the storage unit (that is, a hard

disk drive in the storage unit) or the storage adapter that is attached to the storage unit. The failing computer might be part of a cluster if any of the following conditions is true:

- You have identified the failing computer as part of a cluster two or more computers sharing external storage devices).
- One or more external storage units are attached to the failing computer and at least one of the attached storage units is also attached to another computer or unidentifiable device.
- One or more computers are located near the failing computer.

**Important:** If the computer is part of a shared hard disk drive cluster, run one test at a time. Do not run any suite of tests, such as “quick” or “normal” tests, because this might enable the hard disk drive diagnostic tests.

- If the computer is halted and a POST error code is displayed, see “POST error codes” on page 18. If the computer is halted and no error message is displayed, see “Troubleshooting tables” on page 30 and “Solving undetermined problems” on page 65.
- For information about power-supply problems, see “Solving power problems” on page 64.
- For intermittent problems, check the error log; see “Diagnostic programs, error codes, and messages” on page 40.

## Performing the checkout procedure

To perform the checkout procedure, complete the following steps:

1. Is the computer part of a cluster?
  - **No:** Go to step 2.
  - **Yes:** Shut down all failing computers that are related to the cluster. Go to step 2.
2. Complete the following steps:
  - a. Turn off the computer and all external devices.
  - b. Check all cables and power cords.
  - c. Set all display controls to the middle positions.
  - d. Turn on all external devices.
  - e. Turn on the computer. If the computer does not start, see the “Troubleshooting tables” on page 30.
  - f. Check the system board and microprocessor board for LEDs (see “System board LED errors” on page 50 and “Microprocessor board LED errors” on page 53 ).
  - g. Check the following results:
    - Successful completion of POST, indicated by a single beep
    - Successful completion of startup, indicated by a readable display of the operating-system desktop
3. Did a single beep sound and are there readable instructions on the main menu?
  - **No:** Find the failure symptom in “Troubleshooting tables” on page 30; if necessary, see “Solving undetermined problems” on page 65.
  - **Yes:** Run the diagnostic programs (see “Starting the diagnostic programs and viewing the test log” on page 40).
    - If you receive an error, see “Diagnostic error codes” on page 42.
    - If the diagnostic programs were completed successfully and you still suspect a problem, see “Solving undetermined problems” on page 65.

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## Troubleshooting tables

Use the troubleshooting tables to find solutions to problems that have identifiable symptoms.

If you cannot find the problem in these tables, see “Starting the diagnostic programs and viewing the test log” on page 40 to test the computer.

If you have just added new software or a new optional device and the computer is not working, complete the following steps before using the troubleshooting tables:

- Remove the software or device that you just added.
- Run the diagnostic tests to determine whether the computer is running correctly.
- Reinstall the new software or new device.

## CD or DVD drive problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Symptom	Action
CD or DVD drive is not recognized.	<ol style="list-style-type: none"><li>1. Make sure that:<ul style="list-style-type: none"><li>• The IDE channel to which the CD or DVD drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program.</li><li>• All cables and jumpers are installed correctly.</li><li>• The correct device driver is installed for the CD or DVD drive.</li></ul></li><li>2. Run CD or DVD drive diagnostic programs.</li><li>3. Reseat the following components:<ol style="list-style-type: none"><li>a. CD or DVD drive</li><li>b. CD or DVD drive cable</li><li>c. (Trained service technician only) System board</li></ol></li><li>4. Replace the following components one at a time, in the order shown, restarting the computer each time:<ol style="list-style-type: none"><li>a. CD or DVD drive</li><li>b. CD or DVD drive cable</li><li>c. (Trained service technician only) System board</li></ol></li></ol>

## Diskette drive problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The diskette drive activity LED stays lit, or the computer bypasses the diskette drive.	<ol style="list-style-type: none"> <li>1. If there is a diskette in the drive, make sure that: <ul style="list-style-type: none"> <li>• The diskette drive is enabled in the Configuration/Setup Utility program.</li> <li>• The diskette is good and not damaged. (Try another diskette if you have one.)</li> <li>• The diskette is inserted correctly in the drive.</li> <li>• The diskette contains the necessary files to start the computer.</li> <li>• The software is working correctly.</li> <li>• The cable is connected correctly (in the proper orientation).</li> </ul> </li> <li>2. To prevent diskette drive read/write errors, make sure that the distance between monitors and diskette drives is at least 76 mm (3 in.).</li> <li>3. Run the diskette drive diagnostic test.</li> <li>4. Reseat the following components: <ol style="list-style-type: none"> <li>a. Cable</li> <li>b. Diskette drive</li> <li>c. (Trained service technician only) System board</li> </ol> </li> <li>5. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Cable</li> <li>b. Diskette drive</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol>

## General problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
A cover lock is broken, an indicator LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

## Hard disk drive problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive that you removed with a new one.
The computer stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the computer stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.
A hard disk drive passes the diagnostic Fixed Disk Test, but the problem remains.	Run the diagnostic SCSI Fixed Disk Test. <b>Note:</b> This test is not available on computers that have RAID arrays or computers that have IDE or SATA hard disk drives.

## Intermittent problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
A problem occurs only occasionally and is difficult to detect.	<p>Make sure that:</p> <ul style="list-style-type: none"> <li>• All cables and cords are connected securely to the rear of the computer and attached options.</li> <li>• When the computer is turned on, air is flowing from the rear of the computer at the fan grille. If there is no airflow, the fan is not working. This can cause the computer to overheat and shut down.</li> <li>• Make sure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly.</li> </ul>

## Keyboard, mouse, or pointing-device problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
All or some keys on the keyboard do not work.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The keyboard cable is securely connected to the computer, and the keyboard and mouse cables are not reversed.</li> <li>• The computer and the monitor are turned on.</li> </ul> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Keyboard</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
The mouse or pointing device does not work.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The mouse or pointing-device cable is securely connected and the keyboard and mouse cables are not reversed.</li> <li>• The mouse or pointing device drivers are installed correctly.</li> </ul> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Mouse or pointing device</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

## Memory problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The amount of system memory displayed is less than the amount of installed physical memory.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The memory modules are seated correctly.</li> <li>• You have installed the correct type of memory.</li> <li>• If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program.</li> <li>• All banks of memory are enabled. The computer might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.</li> </ul> </li> <li>2. Check the POST error log for error message 289: <ul style="list-style-type: none"> <li>• If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM.</li> <li>• If the DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. Save the settings and restart the computer.</li> </ul> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. DIMM</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

## Microprocessor problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The computer emits a continuous beep during POST, indicating that the startup (boot) microprocessor is not working correctly.	<ol style="list-style-type: none"> <li>1. Make sure that the startup microprocessor is seated correctly.</li> <li>2. (Trained service technician only) Replace the microprocessor.</li> </ol>

## Monitor problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The screen is blank.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The computer power cord is connected to the computer and a working electrical outlet.</li> <li>• The monitor cables are connected correctly.</li> <li>• The monitor is turned on and the brightness and contrast controls are adjusted correctly.</li> </ul> <p><b>Important:</b> In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the <b>Boot Fail Count</b> option in the <b>Start Options</b> of the Configuration/Setup Utility program is set to enabled (its default setting), you must restart the computer three times to force the system BIOS to reset the CMOS values to the default configuration (the memory connector or bank of connectors enabled).</p> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Monitor</li> <li>b. Video adapter (if one is installed)</li> <li>c. (Trained service technician only) System board</li> </ol> </li> </ol>
Only the cursor appears.	See “Solving undetermined problems” on page 65.
The monitor works when you turn on the computer, but the screen goes blank when you start some application programs.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The application program is not setting a display mode that is higher than the capability of the monitor.</li> <li>• You installed the necessary device drivers for the applications.</li> </ul> </li> <li>2. Replace the monitor.</li> </ol>
The monitor has screen jitters, or the screen image is wavy, unreadable, rolling, distorted.	<ol style="list-style-type: none"> <li>1. If the monitor self-tests show that the monitor is working properly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. <p><b>Attention:</b> Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.</p> <p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.).</li> <li>b. Non-IBM monitor cables might cause unpredictable problems.</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Video adapter (if one is installed)</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
Wrong characters appear on the screen.	<ol style="list-style-type: none"> <li>1. If the wrong language is displayed, update the BIOS code with the correct language.</li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Video adapter (if one is installed)</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

## Optional-device problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
An IBM optional-device that was just installed does not work.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The device is designed for the computer (see the ServerProven<sup>®</sup> list at <a href="http://www.ibm.com/pc/compat/">http://www.ibm.com/pc/compat/</a>).</li> <li>• You followed the installation instructions that came with the device and the device is installed correctly.</li> <li>• You have not loosened any other installed device or cables.</li> <li>• You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration.</li> </ul> </li> <li>2. Reseat the device that you just installed.</li> <li>3. Replace the device that you just installed.</li> </ol>
An IBM optional device that used to work does not work now.	<ol style="list-style-type: none"> <li>1. Make sure that all of the option hardware and cable connections for the device are secure.</li> <li>2. If the device comes with test instructions, use those instructions to test the device.</li> <li>3. If the failing device is a SCSI device, make sure that: <ul style="list-style-type: none"> <li>• The cables for all external SCSI options are connected correctly.</li> <li>• The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly.</li> <li>• Any external SCSI device is turned on. You must turn on an external SCSI device before turning on the computer.</li> </ul> </li> <li>4. Reseat the failing device.</li> <li>5. Replace the failing device.</li> </ol>

## Power problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The power-control button does not work, and the reset button, if supported, does work.	<ol style="list-style-type: none"> <li>1. Reseat the following components:             <ol style="list-style-type: none"> <li>a. Control panel assembly</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:             <ol style="list-style-type: none"> <li>a. (Trained service technician only) Control panel assembly</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
The computer does not start.	<ol style="list-style-type: none"> <li>1. Make sure that:             <ul style="list-style-type: none"> <li>• The power cords are correctly connected to the computer and to a working electrical outlet.</li> <li>• The type of memory that is installed is correct.</li> </ul> </li> <li>2. If you just installed an optional device, remove it, and restart the computer. If the computer now starts, you might have installed more devices than the power supply supports.</li> <li>3. If LEDs for microprocessors or VRMs are lit, make sure that:             <ul style="list-style-type: none"> <li>• A VRM is installed if a second microprocessor is installed.</li> <li>• All microprocessors have the same speed.</li> </ul> </li> <li>4. Override the front panel power control button:             <ol style="list-style-type: none"> <li>a. Disconnect the computer power cords.</li> <li>b. Reconnect the power cords.</li> </ol> <p>If the computer does not start, (trained service technician only) replace the system board.</p> </li> <li>5. See “Solving undetermined problems” on page 65.</li> </ol>
The computer does not turn off.	<ol style="list-style-type: none"> <li>1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:             <ol style="list-style-type: none"> <li>a. Press Ctrl+Alt+Delete.</li> <li>b. Turn off the computer by pressing the power-control button for 4 seconds.</li> <li>c. If computer fails POST and the power-control button does not work, disconnect the AC power cord.</li> </ol> </li> <li>2. If the problem remains or if you are using an ACPI-aware operating system, the problem could be with the system board.</li> </ol>

## Printer problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The printer does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> <li>• The printer is turned on and is online.</li> <li>• The printer signal cable is connected to the correct serial or parallel connector on the computer.</li> </ul> <p><b>Note:</b> Non-IBM printer cables might cause unpredictable results.</p> <ul style="list-style-type: none"> <li>• You have assigned the printer port correctly in your operating system or application program.</li> <li>• You have assigned the printer port correctly in the Configuration/Setup Utility program.</li> <li>• You have run the tests that are described in the documentation that comes with the printer.</li> </ul>

## Serial port problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports are disabled.</li> <li>• The serial port adapter (if one is present) is seated correctly.</li> </ul> </li> <li>2. Replace the failing serial port adapter.</li> </ol>
A serial device does not work.	<ol style="list-style-type: none"> <li>1. Make sure that: <ul style="list-style-type: none"> <li>• The device is compatible with the computer.</li> <li>• The serial port is enabled and is assigned a unique address.</li> <li>• The device is connected to the correct connector (see the <i>User's Guide</i>).</li> </ul> </li> <li>2. Reseat the following components: <ol style="list-style-type: none"> <li>a. Failing serial device</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Failing serial device</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

## Software problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
A suspected software problem occurred.	<ol style="list-style-type: none"> <li>1. To determine whether the problem is caused by the software, make sure that: <ul style="list-style-type: none"> <li>• The computer has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, you might have a memory-address conflict.</li> <li>• The software is designed to operate on the computer.</li> <li>• Other software works on the computer.</li> <li>• The software works on another computer.</li> </ul> </li> <li>2. If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and suggested solutions to the problem.</li> <li>3. Contact the place where you purchased the software.</li> </ol>

## Universal Serial Bus (USB) port problems

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>	
Symptom	Action
A USB device does not work.	<p>Make sure that:</p> <ol style="list-style-type: none"> <li>1. Run the USB diagnostics (see “Starting the diagnostic programs and viewing the test log” on page 40).</li> <li>2. Make sure that: <ul style="list-style-type: none"> <li>• The correct USB device driver is installed.</li> <li>• The operating system supports USB devices.</li> <li>• A standard PS/2 keyboard or mouse is not connected to the computer. If it is, a USB keyboard or mouse will not work during POST.</li> </ul> </li> <li>3. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the <i>User’s Guide</i> for more information).</li> <li>4. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.</li> </ol>

## Video problems

See “Monitor problems” on page 35.

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## Diagnostic programs, error codes, and messages

The diagnostic programs are the primary method of testing the major components of the computer. The diagnostic programs are stored on a hidden partition on the computer hard disk. As you run the diagnostic programs, text messages and error codes are displayed on the screen and are saved in the test log. A diagnostic text message or error code indicates that a problem has been detected; to determine what action you should take as a result of a message or error code, see “Diagnostic error codes” on page 42.

You can download the latest version of the diagnostics programs from <http://www.ibm.com/pc/support/> and use the downloaded file to create an IBM Enhanced Diagnostics diskette. See “Creating an Enhanced Diagnostics diskette or CD” on page 49 for instructions. A CD image of the diagnostics is also available for download.

**Note:** When using diagnostics with a USB keyboard and mouse attached, you must first enable USB emulation:

1. Restart the computer and press F1 to start the Configuration/Setup Utility.
2. Select **Devices and I/O Ports**.
3. Select USB Setup.
4. Make sure that the USB keyboard and mouse are enabled.

## Starting the diagnostic programs and viewing the test log

The IBM Enhanced Diagnostics programs isolate problems from the computer hardware and software. The programs run independently of the operating system. This method of testing is generally used when other methods are not accessible or have not been successful in isolating a problem that is suspected to be hardware related.

The test log records data about the system failures and other pertinent information. You can view the test log by running the diagnostic programs through the operating system, by using a diagnostics diskette (see “Using the Enhanced Diagnostics diskette or CD” on page 49) that you have created (see “Creating an Enhanced Diagnostics diskette or CD” on page 49), or by using a diagnostics CD.

To view the test log, complete the following steps.

**Note:** If you are already running the Enhanced Diagnostics program, begin with step 4.

1. Start the Enhanced Diagnostics programs.
  - To start the Enhanced Diagnostics programs in a Windows® operating system, complete the following steps:
    - a. Restart the computer and when the message To start the Product Recovery program is displayed, quickly press F11.
    - b. Select **System utilities**.
    - c. Select **Run diagnostics** to start the diagnostics programs.
  - To start the Enhanced Diagnostics programs in the Red Hat® Linux™ operating systems, complete the following steps:
    - a. Restart the computer.
    - b. When the operating system selection menu is displayed, select **IBM Preload Recovery & Diagnostics**.

- c. Select **Run diagnostics** to start the diagnostics programs.
    - To start the Enhanced Diagnostics programs using a diskette or CD, insert the IBM Enhanced Diagnostics diskette or CD and restart the computer (see “Using the Enhanced Diagnostics diskette or CD” on page 49).
2. Follow the instructions on the screen.
3. When the applicable diagnostics program have completed, select **Utility**.
4. Select **View Test Log** from the list; then, follow the instructions on the screen.

The test log records data about system failures and other pertinent information. The test log will not contain any information until after the diagnostic program has run.
5. Save the test log to a file on a diskette or to the hard disk.

**Notes:**

- a. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette can contain other data.
- b. The system maintains the test-log data only while the Enhanced Diagnostics program is running. When you end the Enhanced Diagnostics program, the test log is cleared.

If the diagnostic programs do not detect any hardware errors but the problem remains during normal computer operations, a software error might be the cause. If you suspect a software problem, see the information that comes with your software.

A single problem might cause more than one error message. When this happens, correct the cause of the first error message. The other error messages usually will not occur the next time you run the diagnostic programs.

**Exception:** If there are multiple error codes that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See “Microprocessor problems” on page 34 for information about diagnosing microprocessor problems.

If the computer stops during testing and you cannot continue, restart the computer and try running the diagnostic programs again. If the problem remains, replace the component that was being tested when the computer stopped.

## Diagnostic text message

Diagnostic text messages are displayed while the tests are running. A diagnostic text message contains one of the following results:

*result test\_specific\_string*

where:

**result** is one of the following results:

**Passed**

The test was completed without any errors.

**Failed**

The test detected an error.

**User Aborted**

You stopped the test before it was completed.

**Not Applicable**

You attempted to test a device that is not present in the computer.

**Aborted**

The test could not proceed because of the computer configuration.

**Warning**

The test could not be run. There was no failure of the hardware that was being tested, but there might be a hardware failure elsewhere, or another problem prevented the test from running; for example, there might be a configuration problem, or the hardware might be missing or it is not detected.

***test\_specific\_string***

is an error code or other information about the error.

**Diagnostic error codes**

The following table describes the error codes that the diagnostic programs might generate and suggested actions to correct the detected problems.

If the diagnostic programs generate error codes that are not listed in the table, make sure that the latest levels of BIOS code and firmware are installed.

In the error codes, *x* can be any numeral or letter. However, if the three-digit number in the central position of the code is 000, 195, or 197, *do not* replace a CRU or FRU.

These numbers appearing in the central position of the error code have the following meaning:

- 000** The computer passed the test. Do not replace a CRU or FRU.
- 195** The Esc key was pressed to end the test. Do not replace a CRU or FRU.
- 197** This is a warning error, but it does not indicate a hardware failure; do not replace a CRU or FRU. Take the action that is indicated in the Action column, but do not replace a CRU or FRU. See the description of **Warning** in “Diagnostic text message” on page 41 for more information.

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
Error code	Description	Action
001-197-000 001-198-000	Test aborted.	<ol style="list-style-type: none"> <li>1. Check the test log for messages indicating the cause of the error, and take the indicated action.</li> <li>2. From the diagnostic programs, run Quick Memory Test All Banks; then, if an error is detected, take the indicated action.</li> <li>3. Reinstall and, if necessary, update the BIOS code on the server; then, rerun the test (see “Updating the firmware” on page 143).</li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
001-250-00n	ECC Test logic Failed. See PCDR logs. n = failing CPU. [1 - 4]	<ol style="list-style-type: none"> <li>1. Restart the server.</li> <li>2. Run the diagnostic test again.</li> <li>3. (Trained service technician only) If problem still exists, replace the failing microprocessor.</li> </ol>
001-XXX-000	Failed core tests.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
001-XXX-001	Failed core tests.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Reseat the system board.</li> <li>2. (Trained service technician only) Replace the system board.</li> </ol>
005-XXX-000	Failed video test.	<ol style="list-style-type: none"> <li>1. Make sure that the cable from the video port is correctly connected to the system board.</li> <li>2. Reseat the video adapter.</li> <li>3. Replace the video adapter.</li> </ol>
011-XXX-000	Failed COM1 serial port test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Check the loopback plug connected to the external serial port.</li> <li>2. (Trained service technician only) Check the cable from the external port to the system board.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>
011-XXX-001	Failed COM2 serial post test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Check the loopback plug connected to the external serial port.</li> <li>2. (Trained service technician only) Check the cable from the external port to the system board.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
014-XXX-000	Failed parallel port test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Make sure that the loopback plug is connected correctly to the external parallel port.</li> <li>2. (Trained service technician only) Make sure that Ethernet is not disabled in the Configuration/Setup Utility program and that the BIOS code is at the latest level.</li> <li>3. Run the loopback diagnostics.</li> </ol>
015-XXX-001	Test aborted. Cannot test USB interface while it is in use. <b>Note:</b> If you have USB devices attached, you cannot run the diagnostic program for the USB interface.	<ol style="list-style-type: none"> <li>1. Turn off the computer.</li> <li>2. Replace the USB devices with standard devices.</li> <li>3. Turn on the computer.</li> <li>4. Run the diagnostic test again.</li> <li>5. (Trained service technician only) Reseat the system board.</li> <li>6. (Trained service technician only) Replace the system board.</li> </ol>
015-XXX-015	Failed USB external loopback test.	<ol style="list-style-type: none"> <li>1. Make sure the parallel port is not disabled.</li> <li>2. Run the USB external loopback test again.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>
015-XXX-198	Remote Supervisor Adapter II installed or USB device connected during USB test.	<ol style="list-style-type: none"> <li>1. If Remote Supervisor Adapter II is installed as an option, remove it and rerun the test. <b>Note:</b> If the Remote Supervisor Adapter II is present as a standard installation, do not remove it; the test cannot be run.</li> <li>2. Remove the USB devices and rerun the test.</li> <li>3. (Trained service technician only) Reseat the system board.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>
020-XXX-000	Failed PCI-X interface test.	<ol style="list-style-type: none"> <li>1. Reseat the adapter.</li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Each adapter</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
030-XXX-00N	Failed SCSI interface test.  If N=0, system board; if N>0, SCSI adapter in slot N.	<ol style="list-style-type: none"> <li>1. See the information that comes with the adapter for instructions and test information.</li> <li>2. Run the diagnostic tests.</li> <li>3. Reseat the following components: <ol style="list-style-type: none"> <li>a. Failing adapter</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Failing adapter</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
089-XXX-001	Failed microprocessor test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Make sure that the microprocessor is installed and seated correctly.</li> <li>2. If the computer does not have the latest level of BIOS code installed, update the BIOS code to the latest level.</li> <li>3. Reseat the following components: <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
089-XXX-002	Failed optional microprocessor test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Make sure that microprocessor 2 is installed and seated correctly.</li> <li>2. Make sure that the BIOS code is at the latest level.</li> <li>3. (Trained service technician only) Reseat microprocessor 2.</li> <li>4. (Trained service technician only) Replace microprocessor 2.</li> </ol>
201-198-xxx	Memory test aborted. See PC Doctor logs.	<ol style="list-style-type: none"> <li>1. Restart the server.</li> <li>2. Run the diagnostic test again.</li> <li>3. Reinstall the diagnostic program.</li> <li>4. Refer to the error log for additional information.</li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
201-199-xxx	Unexpected error. Test aborted. See PC Doctor logs.	<ol style="list-style-type: none"> <li>1. Restart the server.</li> <li>2. Run the diagnostic test again.</li> <li>3. Reinstall the diagnostic program.</li> <li>4. Refer to the error log for additional information.</li> </ol>
201-xxx-PBD	Test failed. <ul style="list-style-type: none"> <li>• P = CPU Number [1 - 4].</li> <li>• B = Failing Bank/Pair number.</li> <li>• D = Failing dimm number within Failing CPU # P.</li> <li>• D = 9 = Both dimms in the failing bank/pair of dimms.</li> </ul>	<ol style="list-style-type: none"> <li>1. Reseat the failing DIMM, then; run the memory diagnostic test.</li> <li>2. Replace the failing DIMM(s), then; run the memory diagnostic test.</li> <li>3. (Trained service technician only) System board assembly.</li> </ol>
202-XXX-001	Failed system cache test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Make sure that the microprocessor 1 is installed and seated correctly.</li> <li>2. If the computer does not have the latest level of BIOS code installed, update the BIOS code to the latest level.</li> <li>3. (Trained service technician only) Replace the system board.</li> </ol>
202-XXX-002	Failed system cache test.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Make sure that the microprocessor 2 is installed and seated correctly.</li> <li>2. If the computer does not have the latest level of BIOS code installed, update the BIOS code to the latest level.</li> <li>3. (Trained service technician only) Replace the microprocessor 2 board.</li> </ol>
206-XXX-000	Failed diskette drive test.	<ol style="list-style-type: none"> <li>1. Run the test with another diskette drive.</li> <li>2. Make sure that the cables are correctly connected to the diskette drive.</li> <li>3. Run the test again.</li> <li>4. Replace the diskette drive.</li> <li>5. (Trained service technician only) Replace the system board.</li> </ol>
215-XXX-000	Failed IDE CD or DVD drive test.	<ol style="list-style-type: none"> <li>1. Run the test with another CD or DVD drive.</li> <li>2. Make sure that the cables are correctly connected to the CD or DVD drive and to the system board.</li> <li>3. Run the test again.</li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
217-198-XXX	Could not establish drive parameters.	<ol style="list-style-type: none"> <li>1. Run the test with another CD or DVD drive.</li> <li>2. Make sure that the cables are correctly connected to the CD or DVD drive and to the system board.</li> <li>3. Run the test again.</li> <li>4. Replace the hard disk drive.</li> </ol>
217-XXX-001	Failed BIOS hard disk test.	<ol style="list-style-type: none"> <li>1. Check the cables and power connections to the drive.</li> <li>2. Replace the hard disk drive.</li> <li>3. Run the test again.</li> </ol>
301-XXX-000	Failed keyboard test.	<ol style="list-style-type: none"> <li>1. Make sure that the keyboard cable is connected to the correct port (for example, make sure that it is not connected to the mouse port).</li> <li>2. Replace the keyboard.</li> <li>3. (Trained service technician only) Replace the system board.</li> </ol>
302-XXX-000	Failed mouse test.	<ol style="list-style-type: none"> <li>1. Make sure that the pointing device (mouse) cable is correctly connected to the correct port.</li> <li>2. Replace the pointing device.</li> <li>3. (Trained service technician only) Replace the system board.</li> </ol>
405-XXX-000	Failed Ethernet test on controller on the system board.	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program and make sure that the Ethernet adapter is not disabled and that the BIOS code is at the latest level.</li> <li>2. (Trained service technician only) Reseat the system board.</li> <li>3. (Trained service technician only) Replace the system board.</li> </ol>
405-XXX-00n	<p>Failed Ethernet test on adapter in PCI slot <i>n</i>.</p> <p>For single-port computers <math>n &gt; 0</math>, (adapter in PCI slot <i>n</i>)</p> <p>For dual-port computers <math>n &gt; 1</math>, (adapter in PCI slot <i>n</i>)</p>	<ol style="list-style-type: none"> <li>1. Run the Configuration/Setup Utility program and select <b>PCI Slot/Device Information</b> under the Advanced Setup menu choice. Compare the MAC address of the Ethernet adapter in the PCI slot under the PCI Slot/Device Information to the MAC address of the failing device on the diagnostics screen. If the MAC addresses match, then this is the failing adapter.</li> <li>2. Reseat the Ethernet adapter in slot <i>n</i>.</li> <li>3. Replace the Ethernet adapter in slot <i>n</i>.</li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
405-199-00n	The test failed. No good link! Check loopback plug. For single-port or dual-port computers, n>=0.	<ol style="list-style-type: none"> <li>1. (Trained service technician only) Make sure that the loopback plug is a gigabit loopback plug.</li> <li>2. (Trained service technician only) If the computer is dual-port, connect two loopback plugs to the computer, one in each port.</li> <li>3. (Trained service technician only) Make sure that the loopback plugs are seated firmly in the slots. A green LED blinks on each port when the loopback plugs are seated correctly.</li> <li>4. (Trained service technician only) Replace the loopback plug.</li> </ol>

## Creating an Enhanced Diagnostics diskette or CD

You can create only an IBM Enhanced Diagnostics diskette from the Product Recovery program. You can create an IBM Enhanced Diagnostics diskette or CD from the World Wide Web.

### Notes:

1. To create and use a diskette or CD, you must have a diskette drive or a CD-RW or DVD/CD-RW combo drive installed in the computer.
2. When using diagnostics with a USB keyboard and mouse attached, you must first enable USB emulation. Restart the computer and press F1 to start the Configuration/Setup Utility. Select **Devices and I/O Ports**, then select **USB Setup** and make sure that the USB keyboard and mouse are enabled.

To create an IBM Enhanced Diagnostics diskette from the Product Recovery program partition, complete the following steps:

1. Restart the computer and watch the monitor.
2. When the message To start the Product Recovery Program, Press F11 appears, quickly Press F11.
3. Select **System utilities**.
4. Select **Create IBM Enhanced Diagnostics Diskette**.
5. Follow the instructions on the screen.

To download the latest image of the IBM Enhanced Diagnostics and create a startable Enhanced Diagnostics diskette, complete the following steps:

1. Go to <http://www.ibm.com/pc/support>.
2. Download the diagnostics file for the computer to a hard disk directory (not to a diskette).
3. Go to a DOS prompt, and change to the directory where the file was downloaded.
4. If you are creating a diagnostics diskette, complete the following steps:
  - a. Insert a blank high-density diskette into the diskette drive.
  - b. Type `filename a:` (where *filename* is the name of the file you downloaded from the Web), and press Enter.

The downloaded file is self-extracting when copied to the diskette. When the copy is completed, you have a startable or bootable IBM Enhanced Diagnostics diskette.

To download the latest CD image of the IBM Enhanced Diagnostics from the Web and create a startable Enhanced Diagnostics CD, complete the following steps:

1. Go to <http://www.ibm.com/pc/support>.
2. Download the CD image of the diagnostics file using a writeable optional device (CD-RW or DVD/CD-RW combo drive).

## Using the Enhanced Diagnostics diskette or CD

If a diskette, CD, or DVD drive has been installed in the computer and an Enhanced Diagnostics diskette or CD has been created (see “Creating an Enhanced Diagnostics diskette or CD”), complete the following steps to start the IBM Enhanced Diagnostics using the diagnostics diskette or CD:

**Note:** Before starting the diagnostics CD, make sure that the CD or DVD drive is in the boot order in the Configuration/Setup Utility program.

1. Turn off the computer and any peripheral devices.
2. Insert the IBM Enhanced Diagnostics diskette or CD into the diskette, CD, or DVD drive.
3. Turn on all attached devices; then, turn on the computer.
4. Follow the instructions on the screen.
5. When the tests are completed, view the test log by selecting **Utility** from the top of the screen. You can save the test log to a file on a diskette or to the hard disk.

**Notes:**

- a. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette can contain other data.
  - b. The test-log data is maintained only while the diagnostic programs are active. When you exit from the diagnostic programs, the test log is cleared. Save the test log to a file on a diskette or to the hard disk if you want to refer to it later.
6. When you have completed the diagnostics procedure, remove the diagnostic diskette or CD from the diskette, CD, or DVD drive before restarting the computer.

If the hardware passes the Enhanced Diagnostics but the problem remains during normal computer operations, a software error might be the cause. If you suspect a software problem, see the information that comes with the software package.

## System board LED errors

Each error LED on the system board is lit to indicate a problem with a specific component. After a problem is corrected, the LED will not be lit the next time the computer is restarted.

*Table 4. System board LED errors*

<b>Error LED</b>	<b>Without optional Remote Supervisor Adapter</b>	<b>With optional Remote Supervisor Adapter</b>
DIMM error (D26, D27, D28, D29)	Memory problem (also turns on system error LED on the front bezel)	Memory problem (also turns on system error LED on the front bezel)
Microprocessor 2 error (D32)	Microprocessor 2 problem (also turns on system error LED on the front bezel)	Microprocessor 2 problem (also turns on system error LED on the front bezel)
Fan error (D2, D19, D55)	No function	Fan failure
Hard disk error (LEDs on hot-swap hard disk drives)	Hot-swap hard disk drive failure	Hot-swap hard disk drive failure

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

LED	Description	Action
System fan 2	System fan 2 has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) System fan 2</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) System fan 2</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
System fan 1	System fan 1 has failed.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) System fan 1</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) System fan 1</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
System power	The computer has no power.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) System power supply</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) System power supply</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

LED	Description	Action
DIMM x	A memory failure occurred on DIMM x.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. DIMM x</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. DIMM x</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
Microprocessor 1	Microprocessor 1 is not functioning.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 1</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 1</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
Microprocessor 1 fan	A microprocessor 1 fan failure occurred.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 1 fan sink</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 1 fan sink</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

## Microprocessor board LED errors

<ul style="list-style-type: none"> <li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li> <li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li> <li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li> </ul>		
LED	Description	Action
Microprocessor 2 fan	A microprocessor 2 fan failure occurred.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 2 fan sink</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 2 fan sink</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
Microprocessor 2	Microprocessor 2 is not functioning.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 2</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. (Trained service technician only) Microprocessor 2</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>
DIMM x	A memory failure occurred on DIMM x.	<ol style="list-style-type: none"> <li>1. Reseat the following components:               <ol style="list-style-type: none"> <li>a. DIMM x</li> <li>b. (Trained service technician only) System board</li> </ol> </li> <li>2. Replace the following components one at a time, in the order shown, restarting the computer each time:               <ol style="list-style-type: none"> <li>a. DIMM x</li> <li>b. (Trained service technician only) System board</li> </ol> </li> </ol>

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## Emergency recovery-repair diskettes (Windows)

In some instances, an emergency recovery-repair diskette is helpful. This section describes how to create and use this diskette in Windows.

### Notes:

1. To create and use an emergency recovery-repair diskette, you must add a diskette drive to the computer.

2. When using diagnostics with a USB keyboard and mouse attached, you must first enable USB emulation. Restart the computer and press F1 to start the Configuration/Setup Utility. Select **Devices and I/O Ports**, then select **USB Setup** and make sure that the USB keyboard and mouse are enabled.

## Creating an emergency recovery-repair diskette in Windows

In Windows, you can create a recovery-repair diskette from the c:\ibmtools directory or from the Product Recovery program partition.

To create a recovery-repair diskette from the c:\ibmtools directory, complete the following steps:

1. Start the computer and operating system.
2. Use Windows Explorer to display the directory structure of the hard disk.
3. Open the c:\ibmtools folder.
4. Double-click **rdisk.bat** and follow the instructions on the screen.

To create a recovery-repair diskette from the Product Recovery program partition, complete the following steps:

1. Shut down the operating system and turn off the computer.
2. Wait for at least 5 seconds; then, press and hold the F11 key while you restart the computer. When a menu appears, release the F11 key.
3. Use one of the following procedures:
  - If a menu is displayed in which you can select an operating system, use the arrow keys to select the operating system that is currently installed, press Enter, and then continue with the next step.
  - If an operating-system menu is not displayed, continue with the next step.
4. From the Product Recovery main menu, use the arrow keys to select **System utilities**, and then press Enter.
5. Use the arrow keys to select **Create a Recovery Repair diskette**, and then press Enter.
6. Follow the instructions on the screen.

## Using the recovery-repair diskette in Windows

In some circumstances, files on the hard disk might become damaged so that the F11 prompt is not displayed when you start the computer. If you have attached a diskette drive to the computer and created a recovery-repair diskette, use the following procedure to access the Product Recovery program on the hard disk. For instructions to create a recovery-repair diskette, see "Creating an emergency recovery-repair diskette in Windows." To run the recovery-repair diskette, complete the following steps:

1. Insert the recovery-repair diskette into the diskette drive.
2. Turn off the computer.
3. Turn on the computer, and follow the instructions on the screen.

If the repair operation is completed without error, the F11 prompt will be displayed the next time you restart the computer.

If an error message is displayed during the repair operation and the repair operation cannot be completed, you might have a problem with the Product Recovery

program or the partition that contains the Product Recovery program. Use a *Product Recovery* CD to access the Product Recovery program (see “Product recovery CDs” on page 75).

---

## PC-Doctor for Windows

The computer contains PC-Doctor for Windows, which is designed specifically for the Windows operating environment. Because these diagnostics work with the operating system, they test hardware and analyze certain software components. These diagnostic programs are especially useful for isolating operating-system and device-driver problems.

To use PC-Doctor for Windows, complete the following steps:

1. On the Windows desktop, click **Start → All Programs → PC-Doctor**.
2. Follow the instructions on the screen. Help is available online.

---

## Recovering the operating system and preinstalled software

This section contains instructions for recovering BIOS code, device drivers, the operating system, and other support software.

### Recovering the operating system

The Product Recovery program is on a hidden partition of the hard disk. The Product Recovery program runs independently of the operating system and reinstalls the operating system and preinstalled software.

**Attention:** If you are using FDISK, Disk Management, or another utility to reformat the hard disk, you might see the partition where the Product Recovery program is stored. Do not delete this partition; otherwise, the Product Recovery program will be lost.

If the hard disk drive, including the partition that contains the Product Recovery program, becomes damaged or if you replace the hard disk drive, use the *IBM Product Recovery CD* to recover the preinstalled operating system, application programs, and device drivers (see “Product recovery CDs” on page 75).

To recover the Windows operating system, complete the following steps.

**Note:** The recovery process replaces all information stored on drive C. If possible, back up your data files before starting this process. The recovery process does not affect any other drives.

1. If possible, shut down the operating system.
2. If the computer is still on, turn it off.

**Note:** If the computer will not turn off after you hold down the power-control button for at least 4 seconds, disconnect the power cord and wait a few seconds before reconnecting it.

3. Turn on the computer, and wait for the prompt

To start the Product Recovery program, press F11.

If the DOS command prompt or the F11 prompt is not displayed, see “Using the recovery-repair diskette in Windows” on page 54.

4. Quickly press F11, and wait for the program menu.
5. Select **Full recovery** and follow the instructions on the screen.

6. When recovery is complete, exit from the program.
7. Restart the computer.

To recover the Red Hat Linux operating system, complete the following steps.

**Note:** The recovery process replaces all information stored on drive C. If possible, back up your data files before starting this process.

1. If possible, shut down the operating system.
2. If the computer is still on, turn it off.

**Note:** If the computer will not turn off after you hold down the power-control button for at least 4 seconds, disconnect the power cord and wait a few seconds before reconnecting it.

3. Turn on the computer and wait for the operating system menu to be displayed; then, quickly select **IBM Preload Recovery & Diagnostics**.
4. Select the recovery options that you want and follow the instructions on the screen.

**Note:** To restore the operating system, device drivers, and application programs, select a full recovery.

5. When recovery is complete, exit from the program. The computer restarts automatically.

## Recovering or installing device drivers

Restoring the factory-preinstalled device drivers is part of the Product Recovery program and the *Device Drivers CD*.

Before you can recover or install device drivers, the operating system must be installed on the computer. Make sure that you have the documentation and software media for the device before you start recovering or installing device drivers.

Device drivers for IBM devices and the instructions to install them (readme.txt) are on the *Device Drivers CD* and in the c:\ibmtools\drivers\ directory.

The latest device drivers are also available at <http://www.ibm.com/pc/support/>.

---

## Updating (flash-updating) the BIOS code on the computer

Periodically, IBM might post new levels of BIOS code on the Web. Always check the IBM Support Web site at <http://www.ibm.com/pc/support/> for the latest level of BIOS code, device drivers, documentation, and hints and tips. You can use one of the following methods to update (flash) the BIOS code on the computer:

- Download the BIOS code update file directly to the hard disk.
- Download the BIOS code update file to a diskette (attach an external Universal Serial Bus [USB] portable diskette drive if you have not installed an integrated diskette drive); then, update the BIOS code on the computer.
- Download the BIOS code update file to a CD using a writeable optional device (CD-RW or DVD/CD-RW combo drive); then, start the computer with the CD in the CD-RW or DVD/CD-RW drive to update the BIOS code on the computer.

One file is available for each method. The description next to each file indicates the type of medium to which you can download the file. A readme file is available with instructions for installing the BIOS code update.

To download the BIOS (flash) update files, complete the following steps:

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Downloads** category, click **Downloads & drivers**.
3. In the **Brand** field, select **IntelliStation**.
4. In the **Family** field, select **IntelliStation A Pro**.
5. In the **Type** field, select **6217** and click **Continue**.
6. In the **Filter by category** field, select **BIOS (system)**.
7. Scroll down and select the applicable file for the operating system.
8. Select the file for the type of medium you want to use; then, download the file and install it.
9. Restart the computer.

See the readme file for additional information about how to install the image files.

**Note:** Always reset the Configuration/Setup Utility program to the default values after updating the BIOS code.

## Recovering from a POST/BIOS update failure

**Note:** You can download a file to create the POST/BIOS flash CD from <http://www.ibm.com/pc/support/>.

If power to the computer is interrupted while POST/BIOS code is being updated (flash update), the computer might not restart (reboot) correctly. If this happens, complete the following steps to recover:

1. Read “Safety” on page vii and “Handling static-sensitive devices” on page 80.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the cover and support bracket.
5. Locate the boot block recovery jumper (JP2) on the system board. Figure 8 shows the location of the boot block jumper on the system board.

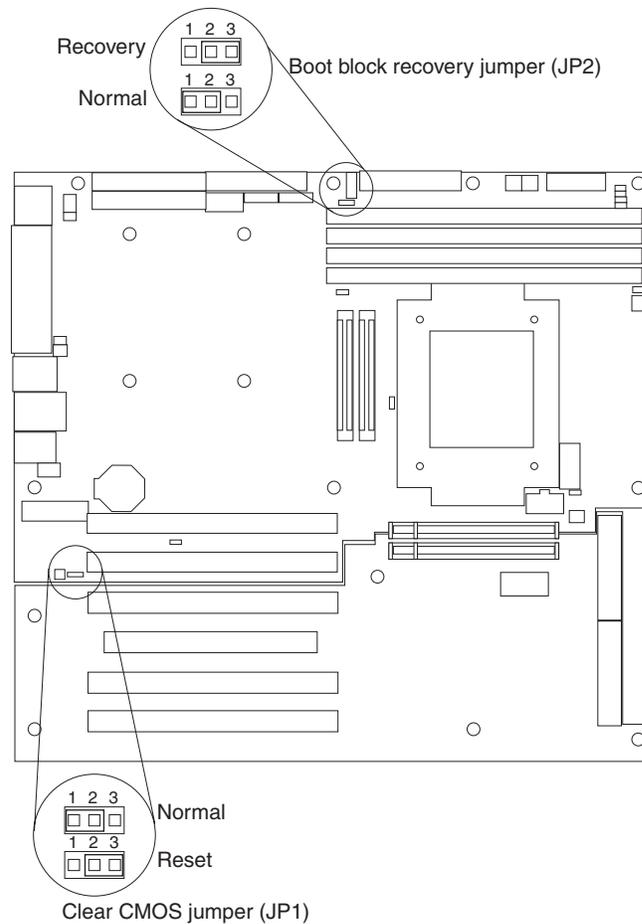


Figure 8. Location of recovery jumpers on system board

6. Remove the boot block recovery jumper from pins 1 and 2.
7. Replace any adapters that were removed; then, replace the support bracket and replace the cover.
8. Connect the computer to a power source, keyboard, monitor, and mouse.
9. Insert the POST/BIOS update (flash) CD into the CD or DVD drive.
10. Turn on the computer and the monitor.

After the update session is completed, the computer will turn off.

11. Remove the CD from the CD or DVD drive.
12. Disconnect all power cords; then, remove the computer cover and support bracket.
13. Return the boot block recovery jumper to pins 1 and 2.
14. Replace the computer cover; then, reconnect all external cables and power cords and turn on the peripheral devices.
15. Turn on the computer to restart the operating system.

---

## Small computer system interface (SCSI) error codes (some models)

For any SCSI error message that you receive when running the SCSISelect Utility program, one or more of the following devices might be causing the problem:

- A failing SCSI device (adapter, drive, controller)
- An incorrect SCSI configuration
- Duplicate SCSI IDs in the same SCSI chain
- A missing or incorrectly installed SCSI terminator
- An incorrect SCSI termination jumper setting
- A defective SCSI terminator
- An incorrectly installed cable
- A defective cable

For any SCSI error message, follow these suggested actions in the order in which they are listed until the problem is solved:

- Make sure that the external SCSI devices are turned on before you turn on the computer.
- Make sure that the cables for all external SCSI devices are connected correctly.
- If an external SCSI device is attached, make sure that the external SCSI termination is set to automatic.
- Make sure that the last device in each SCSI chain is terminated correctly.
- Make sure that the SCSI devices are configured correctly.

If the problem remains, run the diagnostic programs to obtain additional information about the failing device. If the error remains or recurs, call for service.

**Note:** If the computer does not have a SCSI hard disk drive, ignore any message that indicates that the BIOS code is not installed.

---

## Interrupt status port register (ISPR) error procedures

Use interrupt status port register (ISPR) error procedures to help you solve ServeRAID™ problems. A complete list of error codes is listed in “ServeRAID error codes” on page 61.

### **EF10** (Default ISPR)

1. There is no ISPR error.

### **9zxx through Bzxx** (SCSI bus error caused by cables, termination, defective drives, or a similar problem)

1. Isolate between the SCSI subsystem and the controller by disconnecting all SCSI cables from the suspected adapter, and restart the computer.

**Attention:** Do not press F5. Doing so changes the computer configuration. If an ISPR error remains, complete the following steps until the error is corrected:

- a. Reseat the controller.
- b. Replace the controller.

**Note:** If the adapter or controller detects a configuration change. *Do not* select **Save Changes**. Instead, press F10 to bypass any options to this effect.

2. If the ISPR error is EF10 after the cables are disconnect, complete the following steps:

- a. Identify which channel is causing the error according to the second digit (z) of the original ISPR code as indicated in the following table.

**Note:** ServeRAID-6i+ controllers have no channels. A ServeRAID-6i+ controller uses the channel connectors of the integrated SCSI controller.

Table 5. SCSI identifier

SCSI channel code (z)	Descriptions
1	Channel 1
2	Channel 2
3	Channel 1 and 2
4	Channel 3
5	Channel 1 and 3
6	Channel 2 and 3
7	Channel 1, 2, and 3
8	Channel 4
9	Channel 1 and 4
A	Channel 2 and 4
B	Channel 1, 2, and 4
C	Channel 3 and 4
D	Channel 1, 3, and 4
E	Channel 2, 3, and 4
F	Channel 1, 2, 3, and 4

- b. Confirm that the channels that are identified from the error in step 2a are the cause of the error by making sure that the error occurs *only* when the suspected channel is reconnected.
- c. Check the termination of the identified channel.
- d. Make sure that the backplane jumper configuration is correct.
- e. If the computer has hard disk drive status cables, make sure that the cables are connected correctly. Reconnect all cables that you removed in step 1 on page 59.
- f. Disconnect one drive at a time from the channel that was identified in step 2a; then, restart the computer to determine which drive is causing the error.
- g. Reconnect the SCSI cable.
- h. Reconnect the SCSI backplane.

### FFFF or other code not listed

1. Place download jumpers on the controller and try to update (flash) the firmware code on the adapter.
2. Isolate between the SCSI subsystem and the controller by disconnecting all SCSI cables from the suspected adapter, and restart the computer.  
**Attention:** Do not press F5. Doing so changes the computer configuration.  
If the ISPR code is EF10 after the cables are disconnected, complete the following steps until the error is corrected:
  - a. Identify which channel is causing the error by reconnecting cables one at a time and restarting the computer until the error occurs again.
  - b. Check the termination of the identified channel in step 2a.
  - c. Disconnect one drive at a time from the channel identified in step 2a and restart the computer each time to determine which drive is causing the problem.
  - d. Reconnect the SCSI cable to the channel identified in step 2a.
  - e. Reconnect the backplane to the channel identified in step 2a.
3. If original ISPR code remains after all SCSI cables are disconnected and the computer is restarted, complete the following steps until the error is corrected:
  - Reseat the controller.
  - Replace the controller.

---

## ServeRAID error codes

In the following error codes, x can be any number or letter.

<ul style="list-style-type: none"><li>• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.</li><li>• See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).</li><li>• If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.</li></ul>		
Error code	Description	Action
1xxx	A microcode checksum error occurred.	<ol style="list-style-type: none"><li>1. Reseat the ServeRAID controller.</li><li>2. Replace the ServeRAID controller.</li></ol>
2xxx	A code DRAM error occurred.	<ol style="list-style-type: none"><li>1. Install the download jumpers, flash the latest level of BIOS code and firmware for the controller. Then, remove the jumpers.</li><li>2. Reseat the ServeRAID controller.</li><li>3. Replace the ServeRAID controller.</li></ol>
3000-31xx	A code DRAM error occurred.	<ol style="list-style-type: none"><li>1. Install the download jumpers, flash the latest level of BIOS code and firmware for the controller. Then, remove the jumpers.</li><li>2. Reseat the ServeRAID controller.</li><li>3. Replace the ServeRAID controller.</li></ol>
3200	A code DRAM error occurred.	<ol style="list-style-type: none"><li>1. Install the download jumpers, flash the latest level of BIOS code and firmware for the controller. Then, remove the jumpers.</li><li>2. Reseat the ServeRAID controller.</li><li>3. Replace the ServeRAID controller.</li></ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
3300	A ServeRAID-6i+ controller error occurred.	Install the ServeRAID-6i+ controller in an extended PCI expansion slot. See the documentation that comes with the computer and the ServeRAID controller documentation for more information.
3E20	A ServeRAID-6i+ controller error occurred.	<ol style="list-style-type: none"> <li>1. Remove the ServeRAID-6i+ controller from its slot and install it in the proper PCI-X option slot.</li> <li>2. Make sure that the ServeRAID-6i+ controller is supported in this computer.</li> <li>3. Replace the ServeRAID-6i+ controller.</li> <li>4. (Trained service technician only) Replace the system board.</li> </ol>
3E2x	A ServeRAID-6i+ controller error occurred.	<ol style="list-style-type: none"> <li>1. Reseat the ServeRAID controller.</li> <li>2. Flash the latest level of BIOS code and firmware for the controller.</li> <li>3. Replace the ServeRAID-6i+ controller.</li> <li>4. Integrated RAID controller on computer.</li> </ol>
4xxx thru 5xxx	A Code DRAM error occurred.	<ol style="list-style-type: none"> <li>1. Install the download jumpers, flash the latest level of BIOS code and firmware for controller. Then, remove the jumpers.</li> <li>2. Reseat the ServeRAID controller.</li> <li>3. Replace the ServeRAID controller.</li> </ol>
7xxx thru 8xxx	A host/local PCI bus interface error occurred.	<ol style="list-style-type: none"> <li>1. Flash the latest level of BIOS code and firmware for the controller.</li> <li>2. If ServeRAID-6i+ controller, integrated RAID controller on the computer.</li> </ol>
9003	A ServeRAID controller error occurred.	<ol style="list-style-type: none"> <li>1. Flash the latest level of BIOS code and firmware for controller.</li> <li>2. Make sure that the controller is supported for this computer.</li> <li>3. Integrated RAID controller on the computer.</li> </ol>

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Machine Type 6217,” on page 67 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by (Trained service technician only), that step must be performed only by a trained service technician.

Error code	Description	Action
9xxx thru BZxx	A SCSI bus error was caused by the cables, termination, defective drives, or other components. Z refers to the specific channel or channels that cause the error.	<ol style="list-style-type: none"> <li>1. Follow the instructions in “Interrupt status port register (ISPR) error procedures” on page 59.</li> <li>2. Make sure that the SCSI cable is connected correctly.</li> <li>3. Reseat the following components: <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) SCSI backplane, if one comes on this computer.</li> <li>c. ServeRAID controller</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) SCSI backplane, if one comes on this computer.</li> <li>c. ServeRAID controller</li> </ol> </li> </ol>
EFFE	The firmware code is corrupt or the download jumpers are in place.	<ol style="list-style-type: none"> <li>1. Flash the latest level BIOS code and firmware for the controller. Then, remove the jumpers.</li> <li>2. Reseat the ServeRAID controller.</li> <li>3. Replace the ServeRAID controller.</li> </ol>
FFFF or other code not listed	A SCSI bus error occurred.	<ol style="list-style-type: none"> <li>1. Follow the instructions in “Interrupt status port register (ISPR) error procedures” on page 59.</li> <li>2. Make sure that the SCSI cable is connected correctly.</li> <li>3. Reseat the following components: <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) SCSI backplane, if one comes on this computer</li> <li>c. ServeRAID controller</li> </ol> </li> <li>4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> <li>a. Hard disk drive</li> <li>b. (Trained service technician only) SCSI backplane, if one comes on this computer</li> <li>c. ServeRAID controller</li> </ol> </li> </ol>

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## Erasing a lost or forgotten password (clearing CMOS)

This section applies to lost or forgotten passwords. More information about lost or forgotten passwords is available in Access IBM. If the user or administrator password is lost or forgotten, you can regain access to the computer through one of the following methods:

- If you have forgotten the user password and an administrator password is set, type the administrator password at the power-on prompt; then, start the Configuration/Setup Utility program and change the user password (see the IBM IntelliStation A Pro Type 6217 *User's Guide* on the IBM *IntelliStation Documentation* CD for more information).
- Remove the battery and then reinstall the battery (see "Removing the battery" on page 103 and "Replacing the battery" on page 103).
- Clear CMOS settings by changing the position of the CMOS recovery jumper (JP1).

To set the CMOS recovery jumper and erase a forgotten password, complete the following steps:

1. Read "Safety" on page vii and "Handling static-sensitive devices" on page 80.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the cover and support bracket.
5. Locate the CMOS recovery jumper (JP1) on the system board (see Figure 8 on page 58), removing any adapters that impede access to the jumper.
6. Move the CMOS recovery jumper from pins 1 and 2 to pins 2 and 3.
7. Wait 60 seconds; then, return the CMOS recovery jumper to pins 1 and 2.
8. Replace any adapters that were removed; then, replace the support bracket and replace the side cover.

You can now start the computer one time, and start the Configuration/Setup Utility program, without having to use the power-on password. At this time, you can either delete the old user password or set a new user password. If you do not change or delete the password, the next time you start the computer the original user password will be reinstated.

9. Connect the computer to a power source, keyboard, monitor, and mouse.
10. Turn on the computer. The Configuration/Setup Utility program starts.
11. Follow the instructions to erase the existing password or to create a new password.
12. Select **Save Settings** and press Enter.

---

## Solving power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power-distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition. To diagnose a power problem, use the following general procedure:

1. Turn off the computer, and disconnect all ac power cords.
2. Check for loose cables in the power subsystem. Also check for short circuits, for example, if there is a loose screw causing a short circuit on a circuit board.

3. Remove adapters and disconnect the cables and power connectors to all internal and external devices until the computer is at the minimum configuration required to start the computer (see “Solving undetermined problems”).
4. Reconnect all ac power cords and turn on the computer. If the computer starts successfully, replace adapters and devices one at a time until the problem is isolated.

If the computer does not start from the minimal configuration, replace the components in the minimal configuration one at a time until the problem is isolated.

---

## Solving Ethernet controller problems

See the Ethernet controller documentation on the *Device Drivers* CD for information about problems that might occur with the Ethernet controller.

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## Solving undetermined problems

If the diagnostic tests did not diagnose the failure or if the server is inoperative, use the information in this section.

If you suspect that a software problem is causing failures (continuous or intermittent), see “Software problems” on page 39.

### Notes:

1. Damaged data in CMOS memory can cause undetermined problems.  
To reset the CMOS data, use the password override jumper to override the power-on password and clear the CMOS memory (see “System-board internal connectors” on page 7).
2. Damaged BIOS code can cause undetermined problems.  
If you suspect that the BIOS code is damaged, see “Updating (flash-updating) the BIOS code on the computer” on page 56.

Check the LEDs on all the power supplies. If the LEDs indicate the power supplies are working correctly, complete the following steps:

1. Turn off the computer.
2. Make sure that the computer is cabled correctly.
3. Remove or disconnect the following devices (one at a time) until you find the failure (turn on the computer and reconfigure each time):
  - Any external devices
  - Surge suppressor device (on the computer)
  - Modem, printer, mouse, or non-IBM devices
  - Each adapter
  - Hard disk drives
  - Memory modules. The minimum configuration requirement is 1 GB (two 512 MB DIMMs).

The following minimum configuration is required for the computer to start:

- a. Power supply
- b. System board
- c. One microprocessor
- d. Memory (with a minimum of two 512 MB DIMM)
4. Turn on the computer. If the problem remains, suspect the following components in the following order:
  - Power supply
  - System board

If the problem is solved when you remove an adapter from the server but the problem recurs when you reinstall the same adapter, that adapter might be the cause of the problem; if the problem recurs when you replace the adapter with a different one, the system board might be the problem.

If you think it might be a networking problem and the computer passes all system tests, a network cabling problem that is external to the computer might be causing the problem.

---

## Calling IBM for service

See Appendix A, “Getting help and technical assistance,” on page 155 for information about calling IBM for service.

When you call for service, have as much of the following information available as possible:

- Machine type and model
- Microprocessor or hard disk upgrades
- Failure symptoms
  - Does the computer fail the diagnostic programs? If so, what are the error codes?
  - What occurred? When? Where,? Did it occur on a single or multiple computers?
  - Is the failure repeatable?
  - Has the current computer configuration ever worked?
  - What changes, if any, were made before it failed?
  - Is this the original reported failure, or has this failure been reported before?
- Diagnostic program type and version level
- Hardware configuration (print the screen with the system summary information)
- BIOS code level
- Operating-system type and version level

You can solve some problems by comparing the configuration and software setups between working and nonworking computers. When you compare computers to each other for diagnostic purposes, consider them identical only if all the following factors are exactly the same in all the computers:

- Machine type and model
- BIOS level
- Adapters and attachments, in the same locations
- Address jumpers, terminators, and cabling
- Software versions and levels
- Diagnostic programs type and version level
- Configuration option settings
- Operating-system control-file setup

## Chapter 3. Parts listing, Machine Type 6217

The following parts information is for the A Pro Type 6217 computer. To check for an updated parts listing on the Web, complete the following steps:

1. Go to <http://www.ibm.com/support/>
2. Under **Search technical support**, type 6217 and click **Search**.
3. Under Document type, select **Parts information** and click **Go**.

The following illustration identifies the parts for the IntelliStation A Pro Type 6217. See Table 6 on page 68 to identify the part associated with the numbers in the following illustration.

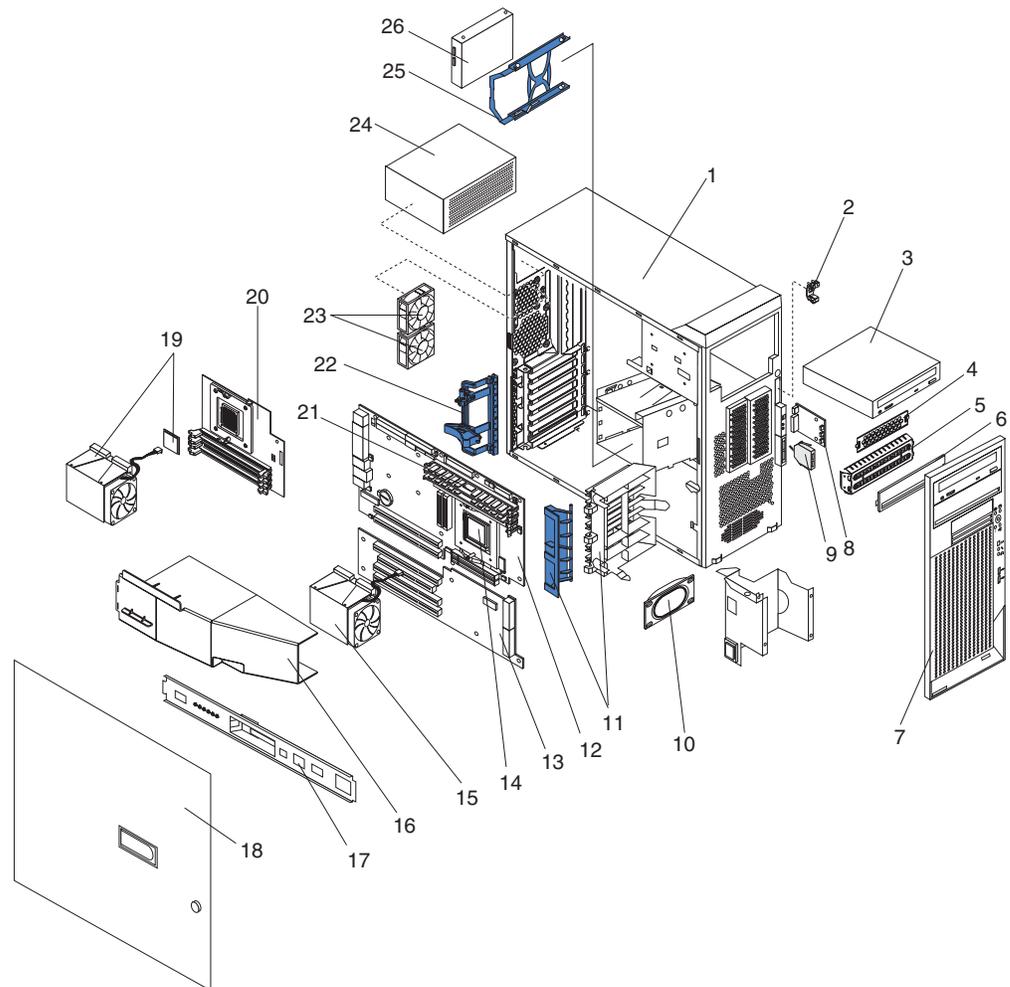


Figure 9. Parts listing, Type 6217

## Replaceable computer units

Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You can install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designed for your computer.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document.

Table 6. CRU and FRU part listing.

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
1	Cover, side/top (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 62x, 68x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x)	49P1965		
1	Cover, side/top (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)	39Y9795		
2	Holder assembly, LEDs (all models)			59P8500
3	CD-ROM, 48X (alternate, CTO)	39M3509		
3	CD-ROM, 48X (alternate, CTO)	39M3511		
3	CD-RW/DVD-RW drive (models 35x, 36x)	26K5383		
3	CD-RW/DVD-RW drive (models 43x, 45x, 46x, 4Cx, 4Dx, 4Fx, 82x, 83x, 85x)	39M3519		
3	CD combo drive, 48X (primary) (models 21x, 22x, 28x, 30x, 33x, 37x, 38x, 62x, 68x, 84x)	39M3539		
3	CD combo drive, 48X (primary) (models 21x, 22x, 28x, 30x, 33x, 37x, 38x, 62x, 68x, 84x)	39M0135		
3	CD combo drive, 48X (alternate) (models 21x, 22x, 28x, 30x, 33x, 37x, 38x, 41x, 62x, 68x, 84x)	26K5379		
3	CD-ROM (optional)	26K5449		
3	Half-high CD-ROM (CTO)	42C0953		
3	Half-high DVD (alternate, models 35x, 36x, 43x, 45x, 46x, 84x)	42C0951		
4	EMC shield, 3.5 (all models)	32P8501		
5	EMC shield, 5.25 (all models)	32P8503		
6	Blank bezel kit (all models)		00N7082	
7	Bezel, front (all models)		13N2954	
8	Card, audio and FireWire (all models)			49P1752
9	Dual USB cable assembly (all models)		26K7340	
10	Speaker (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)			19K4929
10	Speaker (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y9720

Table 6. CRU and FRU part listing. (continued)

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
11	Card guide assembly (all models)	49P1971		
12	System board (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)			25R4949
12	System board (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			42C4474
13	System board extender (all models)			25R4941
14	Microprocessor, 2.2 GHz-1 M, Dual Core (models 62x, 68x)			25R7921
14	Microprocessor option, 2.4 GHz-1 (models 12x, 22x, 28x, 61x)			39R6793
14	Microprocessor, 2.4 GHz-1 M, Dual Core (models 21x, 28x)			39R6838
14	Microprocessor, 2.6 GHz-1 M (models 30x, 33x, 35x, 36x, 37x, 38x, 82x, 87x)			42C4457
14	Microprocessor, 2.6 GHz-2 M (models 82x, 83x, 84x, 85x)			39R6843
14	Microprocessor, 2.6 GHz Opteron (models 30x, 33x, 35x, 36x, 37x, 38x, 82x, 87x)			42C4457
14	Microprocessor option, 2.8 GHz Opteron (models 41x, 42x, 43x, 44x, 45x, 46x, 47x, 4Cx, 4Dx, 4Fx)			42C4459
14	Microprocessor option, 3.0 GHz Opteron (model 52x)			39R6956
15	Fan sink for microprocessor 1 (all models)			25R8840
15	Fan sink for microprocessor 2 (models 21x, 28x, 35x, 36x, 37x, 38x, 43x, 44x, 45x, 46x, 47x, 61x, 68x)			26K7388
16	Baffle (models 21x, 28x, 35x, 36x, 37x, 38x, 43x, 44x, 45x, 46x, 47x, 61x, 68x)	25R8793		
17	Support cam bracket (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)	19K4963		
17	Support cam bracket (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)	39Y9793		
18	Door assembly, sliding (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)		49P1964	
18	Door assembly, sliding (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)		39Y9794	
19	Microprocessor, 2.4 GHz-1 GHz with fan sink (optional)			25K8866
20	Microprocessor board (models 21x, 28x, 35x, 36x, 37x, 38x, 43x, 44x, 45x, 46x, 47x, 61x, 68x)			31R2471
20	Microprocessor board (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			42C4475
20	Extender card (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y6968

Table 6. CRU and FRU part listing. (continued)

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
20	Extender card (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y9701
21	Memory, 2 GB PC3200 (models 37x, 38x)	73P3238		
21	Memory, 2 GB PC3200 (model 4Fx)	39M5805		
21	Memory, 1 GB PC300 (models 21x, 22x, 28x, 30x, 33x, 35x, 36x, 41x, 62x, 68x)	73P3237		
21	Memory, 1 GB (models 4Cx, 4Dx, 52x, 87x, 82x, 83x, 84x, 85x)	39M5802		
21	Memory, 512 MB (model 42x)	39M5799		
22	Retention latch, I/O cards (all models)	13N2955		
23	Fan assembly, 80 x 38 mm fixed speed (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)			25R8831
23	Fan assembly, 80 x 38 mm fixed speed (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y9802
24	Power supply, 530 watt (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)			24R2672
24	Power supply, 530 watt (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y7275
25	Tray assembly (all models)	13N2953		
26	Hard disk drive, 73.4 SCSI, 10K RPM (models 28x, 33x, 38x, 68x)	24P3706		
26	Hard disk drive, 73.4 SCSI, 15K RPM (model 47x)	24P3727		
26	Hard disk drive, 73.4 SCSI, 15K RPM (models 4Fx, 84x)	39R7328		
26	Hard disk drive, 80 GB SATA, 7200 RPM (primary) (models 21x, 22x, 30x, 35x, 36x, 37x, 41x, 42x, 43x, 44x, 45x, 46x, 61x, 62x)	40K6867		
26	Hard disk drive, 80 GB SATA, 7200 RPM (alternate) (models 21x, 22x, 30x, 35x, 36x, 37x, 41x, 42x, 43x, 44x, 45x, 46x, 61x, 62x)	71P7293		
26	Hard disk drive, 160 GB SATA, 7200 RPM (models 4Cx, 4Dx, 82x, 83x, 85x)	39M4507		
	Alcohol wipe (all models)			59P4739
	Bezel release latch (all models)	59P4791		
	Cable, 2-drop (all models)		37L5098	
	Cable, audio (all models)		39Y9797	
	Cable, DVI (CTO)		25R9048	
	Cable, C2 switch/cable (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)		09K9827	
	Cable, CD audio (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 62x, 68x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x)		75H9219	

Table 6. CRU and FRU part listing. (continued)

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
	Cable, dual VGA (models 21x, 30x, 37x, 42x, 44x, 61x, 62x)			73P9598
	Cable, DVD dual VGA (optional)	73P9600		
	Cable, FireWire right (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)		26K7338	
	Cable, FireWire right (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)		39Y9804	
	Cable, front audio (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)			49P1933
	Cable, IDE ATA 66/100 (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			13N2466
	Cable, power board extender (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)		13N2415	
	Cable, SATA (models 21x, 22x, 30x, 35x, 36x, 37x, 41x, 42x, 43x, 44x, 45x, 46x, 61x, 62x)		88P5927	
	Cable, SATA (models 4Cx, 4Dx, 82x, 83x, 85x)		39Y9810	
	Cable, SCSI, U320, 4-drop (models 28x, 33x, 38x, 47x, 68x)		59P2614	
	Cable, SCSI, U320, 4-drop (models 4Fx, 84x)		39Y9785	
	Cable, SCSI, U320 (optional)		39Y9806	
	Cable, USB (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)		39Y9803	
	Cable, VGA pigtail (models 21x, 30x, 37x, 62x)		48P7586	
	Card, NVIDIA Q FX1400 (models 22x, 33x, 36x, 62x) (optional all models)	73P9636		
	Card, NVIDIA Q FX3400 (models 28x, 41x, 43x, 45x)	90P1175		
	Card, FX4500 (models 46x, 47x)	13M8429		
	Card, FX41400 (model 82x)	13M8415		
	Card, FX3500 (models 4Cx, 85x)	13M8457		
	Card, NVS 285 (models 42x, 44x, 61x, 83x)	13M8433		
	Card, 3DLabs Realizm 800 (models 35x, 38x, 68x)	73P9640		
	Card, NVIDIA Q4 280 NVS (models 21x, 30x, 37x)	59P4994		
	Chassis (models 21x, 28x, 35x, 36x, 37x, 38x, 43x, 44x, 45x, 46x, 47x, 61x, 68x)		13N2952	
	Chassis (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)		39Y9799	
	Diskette drive (optional)	39M0101		
	Dongle, DVI-A (models 46x, 47x, 4Cx, 4Dx, 4Fx, 52x, 82x, 84x, 85x, 87x)			25R9043
	Feet (all models)	59P8537		
	Grease wipe (all models)			59P4740
	Handle cap (all models)	49P1968		

Table 6. CRU and FRU part listing. (continued)

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
	Handle support (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)	49P1969		
	Handle support (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)	39Y9796		
	Miscellaneous hardware (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x) <ul style="list-style-type: none"> <li>• Bracket, I/O blank (1)</li> <li>• Bracket, power support (1)</li> <li>• Clamp, SCSI cable (1)</li> <li>• Clip, RFID (1)</li> <li>• Gasket, EMC two-position (1)</li> <li>• Holder, key bracket (1)</li> <li>• Screws, M3.5 third form (7)</li> <li>• Screws, slotted M3x5 (4)</li> <li>• Screws, slotted M3.5 (6)</li> <li>• Spacer, system board (4)</li> <li>• Support, isolator (4)</li> </ul>		09N5764	
	Miscellaneous hardware (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x) <ul style="list-style-type: none"> <li>• Bracket, I/O blank (1)</li> <li>• Bracket, key holder (1)</li> <li>• Screws, M3.5 third form (8)</li> <li>• Spring plate (4)</li> <li>• Screws, slotted M3x5 (8)</li> <li>• Screws, M3.5 Hex (8)</li> <li>• 1/4 inch bumper (4)</li> <li>• Screws, stand-off (6)</li> <li>• Support, isolator (8)</li> <li>• EMC shield (1)</li> <li>• Screw, M3 X 3.6 mm (1)</li> <li>• Blank adapter with SCSI knock-out (1)</li> <li>• Clamp, SCSI cable (3)</li> <li>• Screws, EL (8)</li> <li>• Cable, flat (2)</li> <li>• Screws, M3.5 slotted (8)</li> </ul>		39Y9773	
	Miscellaneous hardware kit (all models) <ul style="list-style-type: none"> <li>• Bracket, I/O (6)</li> <li>• Clip, RFID (1)</li> <li>• Rubber mount grommets (20)</li> <li>• Screws, self-tap M5 (4)</li> <li>• Screws, shoulder (20)</li> <li>• Screws, slotted M3.5 (13)</li> <li>• Standoffs, shaft (2)</li> <li>• Supports, fem-nut (2)</li> </ul>		00N3517	

Table 6. CRU and FRU part listing. (continued)

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
	Miscellaneous parts kit (all models) <ul style="list-style-type: none"> <li>• Bag, red poly (1)</li> <li>• Bracket, slot (1)</li> <li>• Clips, front foot (2)</li> <li>• Pads, front foot (2)</li> <li>• Retainer, card (1)</li> <li>• Screws, M3.0x8, CD support (2)</li> <li>• Screws, M3.0x8 system board mt. (8)</li> <li>• Screws, M3.5x5, with washers (2)</li> <li>• Screws, M3.5x8, pni-mon (2)</li> <li>• Screws, M3.5x12, with washers (2)</li> <li>• Screws, M4.0x6, drv mtg (2)</li> <li>• Screws, M5.0x10, tilt (2)</li> <li>• Screws, top cover (2)</li> <li>• Springs, tilt leg (2)</li> <li>• Standoffs with washers (2)</li> </ul>		00F2113	
	Miscellaneous parts kit (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 62x, 68x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x) <ul style="list-style-type: none"> <li>• Bezel, IBM logo (1)</li> <li>• Brackets, I/O blank tabs (5)</li> <li>• Brackets, ser. num. mount (2)</li> <li>• Clamp assembly (1)</li> <li>• Clamp assembly (1)</li> <li>• Clamps, diskette cable (5)</li> <li>• Clamps, LED cable (5)</li> <li>• Clips, 0.005 EMC (5)</li> <li>• Covers, power switch (2)</li> <li>• Foot, bumper (6)</li> <li>• Kit, tape mounting (2)</li> <li>• Latches, card retainer (5)</li> <li>• Light pipe, shadowbox I/O (4)</li> <li>• Links, wire retainer (2)</li> <li>• Pawls, I cover latch (2)</li> <li>• Screws, M3 x 3.6mm (10)</li> <li>• Screws, M3.5x10 Phillip (10)</li> <li>• Screws, Plastiite 8-16 (10)</li> <li>• Screws, Plastiite M3x8mm (10)</li> <li>• Screws, S/T D/S M3x10 (5)</li> <li>• Screws, self-tap M5 (5)</li> <li>• Screws, slotted M3.5 (10)</li> <li>• Shield, shadowbox (1)</li> <li>• Springs, EMC spring (20)</li> <li>• Springs, I cover latch (2)</li> <li>• Standoffs, shaft (10)</li> </ul>		59P4204	
	Mouse (all models)	39Y9876		
	Power LEDs (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y9798
	Retainer kit, 3.5, 5.25 (models 22x, 28x, 30x, 33x, 35x, 36x, 37x, 38x, 41x, 42x, 43x, 44x, 45x, 46x, 47x, 61x, 62x, 68x)		73P9582	
	Retainer kit, 3.5, 5.25 (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)		39Y9800	
	Retention module (models 4Cx, 4Dx, 4Fx, 82x, 83x, 84x, 85x)			39Y9801

Table 6. CRU and FRU part listing. (continued)

Index	Part description	CRU No. (Tier 1)	CRU No. (Tier 2)	FRU No.
	Service label (all models)	25R7918		
	Switch cover (all models)		09N8012	
	Video adapter, Dual VGA (models 42x, 44x, 4Bx, 61x, 83x)			25R9045
	Video adapter, NVIDIA Quadro FX 1500 (model 52x)			13M8479
	Video adapter, NVIDIA Quadro NVS 285 DDR2 128MB PCIE (CTO)			13M8493
	Video adapter, NVIDIA Quadro FX 4500 X2 SLI PCIE (model 87x)	13M8497		
	Video conversion adapter, DVI-I to standard VGA (models 22x, 28x, 33x, 35x, 36x, 38x, 41x, 43x, 45x, 46x, 47x, 68x)		09N3435	

## Keyboard CRUs

Keyboard	CRU No.
Arabic (253)	39M6990
Arabic/French (462)	39M6991
Belgian/French (120)	39M6992
Belgian/UK (120)	39M6993
Brazilian/Portuguese (275)	39M6994
Bulgarian (442)	39M6995
Chinese/US (467)	39M6996
Czech ABB	39M6997
Danish (159)	39M6998
Dutch (143)	39M6999
English, UK (166)	39M7027
English, US (103P)	39M6989
English, US,-EMEA (103P)	39M7028
French (189)	39M7000
French Canadian (058)	39M7002
French Canadian (445)	39M7001
German (129)	39M7003
Greek (319)	39M7004
Hebrew (212)	39M7005
Hungarian (208)	39M7006
Icelandic (197)	39M7007
Italian (141)	39M7008
Italian (142)	39M7009
Japanese (194)	39M7010
Korean 413)	39M7011

<b>Keyboard</b>	<b>CRU No.</b>
Norwegian (155)	39M7013
Polish (214)	39M7014
Portuguese (163)	39M7015
Romanian (96)	39M7016
Russian (443)	39M7017
Russian/Cyrillic (441)	39M7018
Serbian/Cyrillic (118)	39M7019
Slovic (245)	39M7020
Spanish (172)	39M7021
Spanish, Latin American (171)	39M7012
Swedish/Finnish (153)	39M7022
Swiss, F/G (150)	39M7023
Thailand (191)	39M7024
Turkish (179)	39M7026
Turkish (440)	39M7025
Yugoslavian/Latin (234)	39M7029

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## Product recovery CDs

<b>Operating system / Language / Language code</b>	<b>CRU No.</b>
Windows XP / Chinese / CS	42D2617
Windows XP / Chinese / CT	42D2619
Windows XP / Danish / DK	42D2610
Windows XP / Dutch / NL	42D2611
Windows XP / English / EN	42D2605
Windows XP / Finnish / FI	42D2613
Windows XP / French / FR	42D2606
Windows XP / German / GR	42D2607
Windows XP / Hong Kong / HK	42D2618
Windows XP / Italian / IT	42D2608
Windows XP / Japanese / JP	42D2615
Windows XP / Korean / KR	42D2616
Windows XP / Norwegian / NO	42D2612
Windows XP / Spanish / SP	42D2609
Windows XP / Swedish / SV	42D2614

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## Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

<b>IBM power cord part number</b>	<b>Used in these countries and regions</b>
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel

<b>IBM power cord part number</b>	<b>Used in these countries and regions</b>
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela



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## Chapter 4. Removing and replacing computer components

Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You can install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designed for your computer.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document.

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### Installation guidelines

Before you remove or replace a component, read the following information:

- Read the safety information that begins on page vii and “Handling static-sensitive devices” on page 80. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the computer, monitor, and other devices that you will connect to the computer.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- When you have to access the inside of the computer, you might find it easier to lay the computer on its side.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the computer, open or close a latch, and so on.
- When you are finished working on the computer, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported options for the computer, see <http://www.ibm.com/pc/compat/>.

### System reliability considerations

To help ensure proper system cooling and system reliability, make sure that:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.

- There is adequate space around the computer to allow the computer cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the computer. Do not place objects in front of the fans. For proper cooling and airflow, replace the computer cover before turning on the computer. Operating the computer for extended periods of time (more than 30 minutes) with the computer cover removed might damage computer components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.

## Handling static-sensitive devices

**Attention:** Static electricity can damage the computer and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the computer for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the computer without setting it down. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the computer cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

## Returning a device or component

If you are instructed to return a device or component, follow all packaging instructions that are provided with the replacement part. Use any packaging materials that are supplied to you for shipping.

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## Removing and replacing Tier 1 CRUs

Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.

The illustrations in this document might differ slightly from your hardware.

### Removing the side cover

To remove the side cover, you might find it easier to lay the computer on its side.

To remove the side cover, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices.
3. Disconnect all external cables and power cords.
4. Pull the cover-release latch away from the computer, and push the cover toward the rear of the computer (see Figure 10). Lift the side cover off the computer and set it aside.

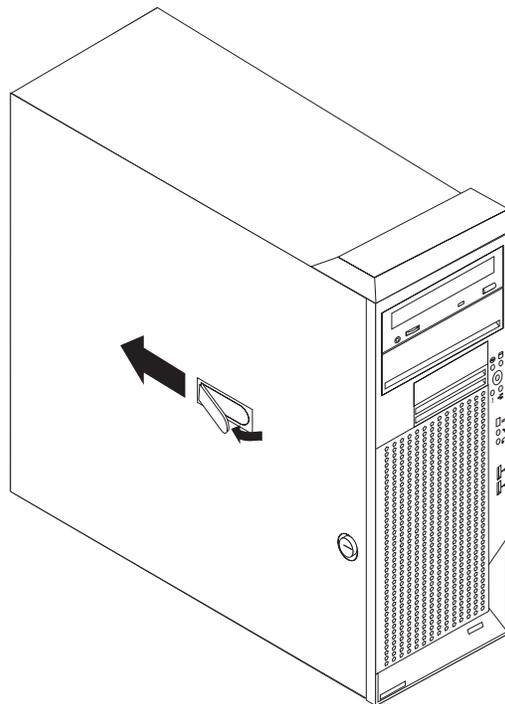


Figure 10. Removing the side cover

**Attention:** For proper cooling and airflow, replace the cover before turning on the computer. Operating the computer with the cover removed might damage computer components.

## Replacing the side cover

To replace the side cover, complete the following steps.

**Note:** The rear adapter-retaining bracket rests against the computer side cover. You might find it easier to lay the computer on its side to replace the side cover.

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have removed all work tools or parts from inside the computer.
2. Make sure that the support bracket is installed (see “Removing the support bracket” on page 83.).
3. Install the side cover by placing it into position on the computer. Make sure that the lip on the bottom of the cover rests on the ledge on the bottom of the chassis before rotating the cover up to the vertical position. Press down on the cover-release latch as you slide the side cover forward (see Figure 11) to lock the side cover.

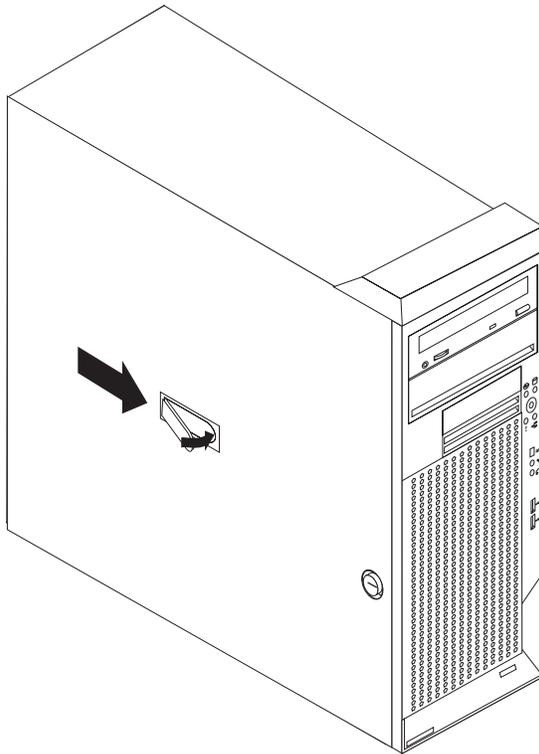


Figure 11. Installing the side cover

4. Reconnect the external cables and power cords to the computer; then, connect the power cords to electrical outlets.
5. Turn on the attached devices; then, turn on the computer.

**Attention:** For proper cooling and airflow, replace the cover before turning on the computer. Operating the computer with the cover removed might damage computer components.

## Removing the support bracket

When working with some devices, such as hard disk drives, adapters, and memory modules, you must first remove the support bracket to access the device.

To remove the support bracket, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Remove the side cover (“Removing the side cover” on page 81).
3. Pull out on the rear end of the support bracket approximately 150 mm (6 in.) (see Figure 12).
4. Disengage the front end of the support bracket from the computer and set the bracket aside.

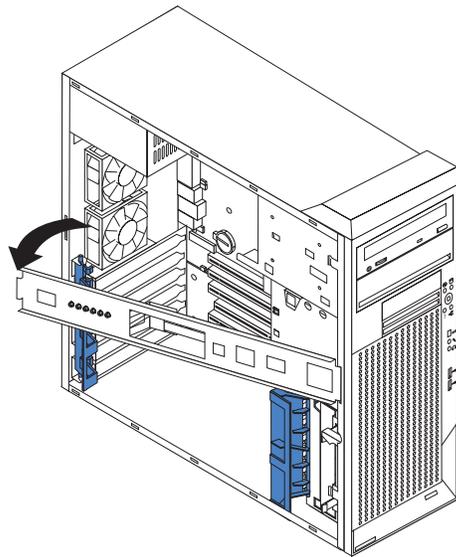


Figure 12. Support bracket

## Replacing the support bracket

To replace the support bracket, complete the following steps:

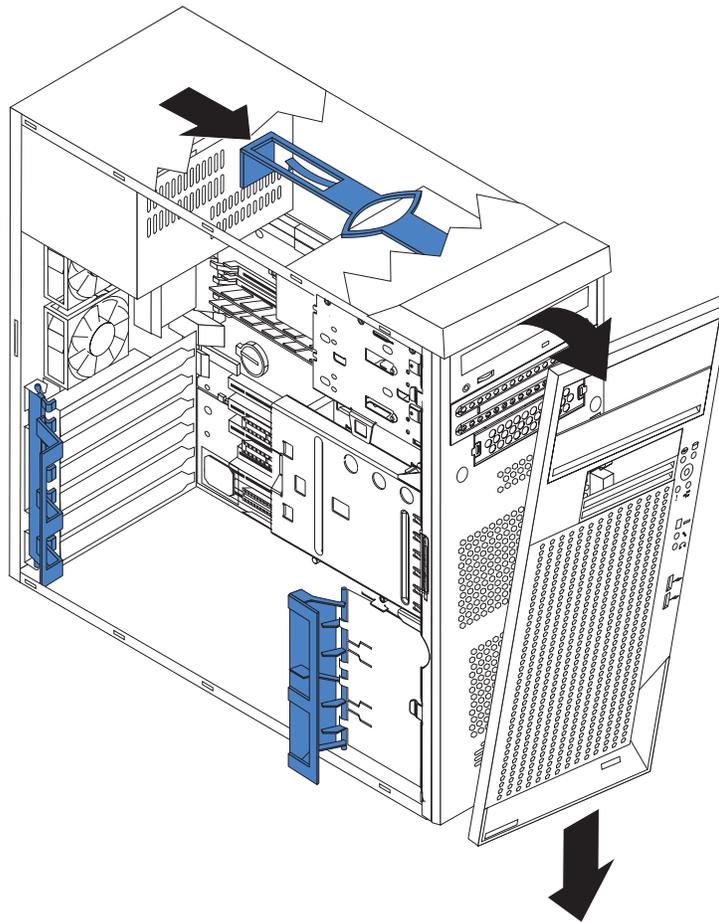
1. Insert one end of the support bracket into the support bracket hinge on one end of the computer and then insert the other end of the support bracket into the other support bracket hinge on the other end of the computer and make sure that it is secure.
2. Replace the side cover (see “Removing the side cover” on page 81).

## Removing the bezel

When working with some devices, such as additional optical drives, you must first remove the bezel to access the device.

To remove the bezel, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Unlock the side-cover lock.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Locate the bezel-release lever; then, press the bezel-release lever toward the front of the computer.



5. Pull the top of the bezel away from the chassis; then, push the bezel down to disengage the bottom tabs.
6. Remove the bezel from the computer and store the bezel in a safe place.

## Replacing the bezel

To replace the bezel, complete the following steps:

1. Insert the two tabs on the bottom of the bezel into the matching holes on the computer chassis.
2. Push the top of the bezel toward the computer until the two tabs at the top of the bezel snap into place.

## Removing an adapter

To remove an adapter, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Remove the support bracket (see “Removing the support bracket” on page 83).
5. For full-length adapters, rotate the rear adapter-retention bracket to the open (unlocked) position and remove it from the computer. Rotate the front adapter-retention bracket to the open position. If you are replacing a smaller adapter, remove only the rear adapter-retention bracket.
6. Disconnect the cables from the adapter that you are replacing and remove the adapter from the computer. Place the adapter on a static-protective surface; then, store it in a safe place.

## Replacing an adapter

The following notes describe the types of adapters that the computer supports and other information that you must consider when removing and installing an adapter. See “System-board option connectors” on page 6 for an illustration of the adapter slot locations.

- Read the documentation that comes with the operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on the adapter, follow the instructions that come with the adapter.
- The computer comes with adapter connectors or *slots*. The video adapter is installed in the PCI Express x16 slot.
- The computer supports PCI-X adapters, 3.3 V PCI adapters, and universal PCI adapters.
- None of the PCI-X slots are hot-plug slots.
- You can install 64-bit or 32-bit adapters in PCI-X slots 1, 2, 3, 4, and 5.
- You can install full-length adapters in PCI-X slots 1, 3, 4, and 5; PCI-X slot 2 supports two-third length adapters.

**Note:** If you install the 3Dlabs Wildcat Realizm 800 video adapter in the PCI Express x16 slot, it will overlap slot 4. Therefore, you will not be able to install an adapter in slot 4.

- If you install a ServeRAID 6i+ adapter, it must be installed in slot 3.
- The computer scans the PCI Express x16 slot and PCI-X expansion slots to assign system resources. Then, it starts the PCI devices in the following order, if you have not changed the default startup sequence: PCI Express x16 slot; PCI-X expansion slot 1; system-board integrated drive electronics (IDE), Serial ATA (SATA), or small computer system interface (SCSI) devices; and then PCI-X slots 2 through 5.
- For a list of supported options for the computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for the computer.

To install an adapter, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.

2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Determine which PCI-X slot you will use for the new or replacement adapter. Review the instructions that come with the adapter for any requirements, restrictions, or cabling instructions. It might be easier to route cables before you install the adapter.
5. For full-length adapters, rotate the rear adapter-retention bracket to the open (unlocked) position and remove it from the computer. Rotate the front adapter-retention bracket to the open position. If you are installing or replacing a smaller adapter, remove only the rear adapter-retention bracket.
6. If there is an adapter already installed in the slot, detach its cables, if any; then, remove the adapter and place it on a static-protective surface.  
If the slot is empty, remove the expansion-slot cover. From the rear of the computer, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.  
**Attention:** Expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions standards of the computer and ensures proper ventilation of computer components.
7. Follow the instructions that come with the adapter to set jumpers or switches, if any.
8. Remove the new or replacement adapter from the static-protective package, carefully grasp the adapter by the top edge or upper corners, and align it with the expansion slot guides (see Figure 13 on page 87); then, press the adapter *firmly* into the expansion slot. Move the adapter directly from the static-protective package to the adapter slot. Avoid touching the components and gold-edge connectors on the adapter.  
**Attention:** Make sure that the adapter is correctly seated in the expansion slot before you turn on the computer. Incomplete installation of an adapter might damage the system board or the adapter.

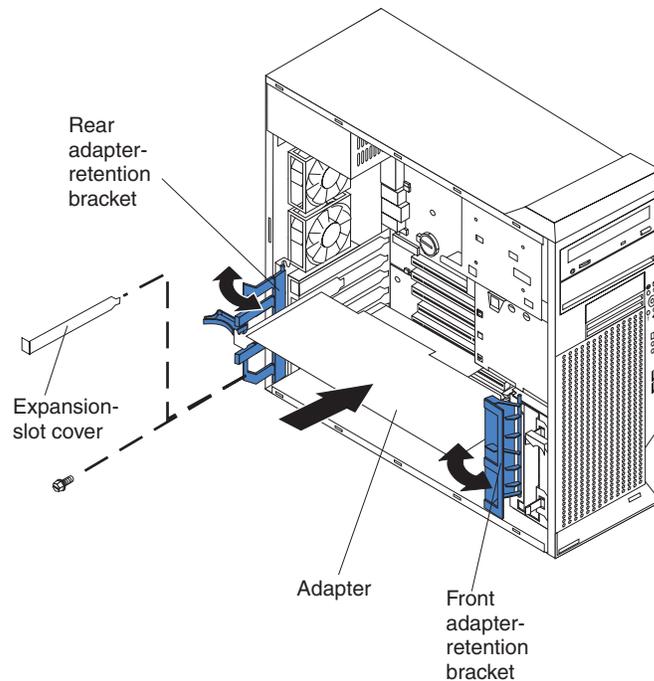


Figure 13. Adapter placement

9. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans. If you are installing an optional SCSI adapter, see “Cabling an optional SCSI adapter” for additional information.
10. If you have another adapter to install, repeat steps 4 through 9.
11. If you have installed a full-length adapter, rotate the front adapter-support bracket to the closed (locked) position.

**Note:** If any adapter in the computer is large or has heavy cables attached to it, you can secure the adapter with a screw: insert one backup expansion-slot screw (stored on the frame-support bracket) through the top of each adapter bracket into the screw hole and secure the adapter before proceeding to the next step. If you use a screw to secure an adapter, you will have to secure all adapters with screws. You cannot use both the screws and the retention brackets to secure adapters. You must use one method or the other.

12. Reinstall the rear adapter-retention bracket; then, rotate the bracket to the closed (locked) position.

**Note:** The rear retention bracket rests against the computer side cover. You might find it easier to lay the computer on its side to replace the side cover.

13. Replace the support bracket (see “Removing the support bracket” on page 83).
14. Replace the side cover (see “Removing the side cover” on page 81).
15. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

## Cabling an optional SCSI adapter

You can install an optional SCSI adapter in the computer to control the internal hard disk drives and provide additional RAID capabilities. With a SCSI adapter installed, you can configure the internal hard disk drives into disk arrays. You can also cable a SCSI adapter to external hard disk drives. See the SCSI adapter option

documentation for complete instructions for installing a SCSI adapter in the computer and for additional information about SCSI adapters.

The following notes describe information that you must consider when cabling an optional SCSI adapter.

- The SCSI cables that are used by the integrated SCSI controller cannot be used with an optional SCSI adapter.
- If you install a ServeRAID 6i+ adapter, it must be installed in slot 3; no cabling is required for this adapter.

To cable an optional SCSI adapter, complete the following steps:

1. Install the SCSI adapter.
2. Connect the SCSI-signal cable to the adapter and to one or more of the signal-cable connectors on the rear of the SCSI devices.

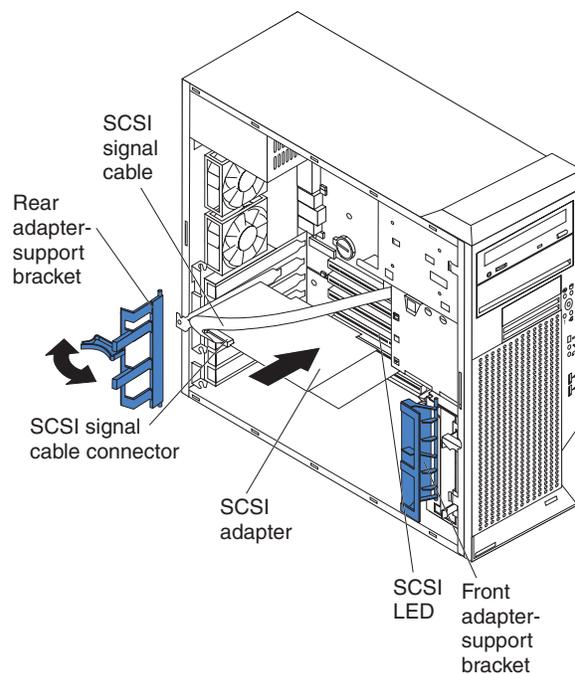


Figure 14. SCSI signal cable placement

3. Complete the installation of the optional SCSI adapter.

## Internal drives

This section describes the removal and installation of internal drives.

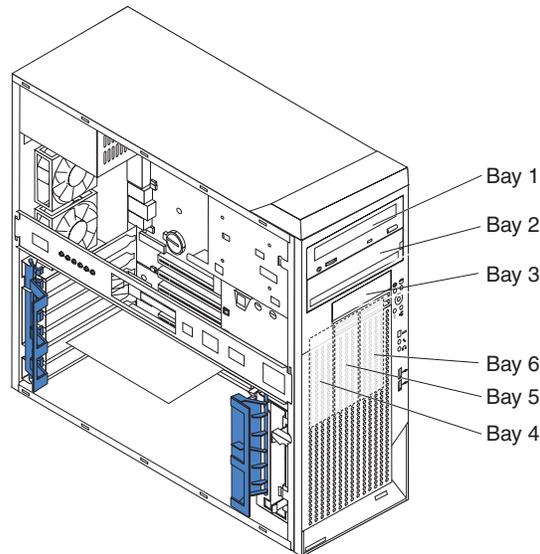


Figure 15. Internal drive bays

The following notes describe the types of drives that the computer supports and other information that you must consider when replacing internal drives.

- You can install removable-media drives in bays 1, 2, and 3 only.
- You can install a 3.5-in. slim-high or 5.25-in. half-high removable-media drive, such as a tape backup drive, in bay 2.
- You can install a SCSI diskette drive or a 3.5-in slim-high SCSI hard disk drive in bay 3. You cannot install an IDE drive in bay 3.
- To install a 3.5-in. drive in a 5.25-in. bay, you must use the 5.25-in. conversion kit.
- The IntelliStation A Pro computer supports only one diskette drive: either a diskette drive in bay 3 or a USB drive connected to the USB connector on the front of the computer.
- Two Serial ATA hard disk drive connectors are on the system board.
- When SCSI drives are installed, set the drive jumpers either to disable auto-start or to delay startup, to prevent overtaxing the system power supply by all drives trying to spin up at once.
- If you have SCSI hard disk drives and SATA hard disk drives in the same computer, note the following HostRAID considerations for hard disk drives:
  - You can enable HostRAID on only one subsystem (SCSI or SATA).
  - If HostRAID is enabled on a subsystem, you can install boot hard disk drives on that subsystem only.

If you fail to observe these restrictions, the computer will usually disable the BIOS for the last subsystem that is loaded, which typically is SCSI.

For more information about HostRAID, see the *User's Guide* on the IBM IntelliStation Documentation CD.

### Removing the drive in bay 1 or 2

To remove the drive in bay 1 or 2, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Remove the front bezel (see “Removing the bezel” on page 84).
5. Remove the support bracket (see “Removing the support bracket” on page 83).
6. Disconnect the cables from the drive that you are replacing.
7. Release the drive from the bay by pressing the blue latch on the side of the drive and pull the drive out of the computer.
8. Remove the blue clip from the side of the drive and install the clip on the replacement drive. Store the old drive in a safe place.

## Replacing the drive in bay 1 or 2

To install a drive in bay 1 or 2, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
3. Check the instructions that come with the drive to determine whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.
4. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
5. Remove the side cover (see “Removing the side cover” on page 81).
6. Remove the front bezel (see “Removing the bezel” on page 84).
7. Remove the support bracket (see “Removing the support bracket” on page 83).
8. If the bay does not have a drive installed, use a screwdriver to pry the filler panel and EMC shield away from the computer (see Figure 16).

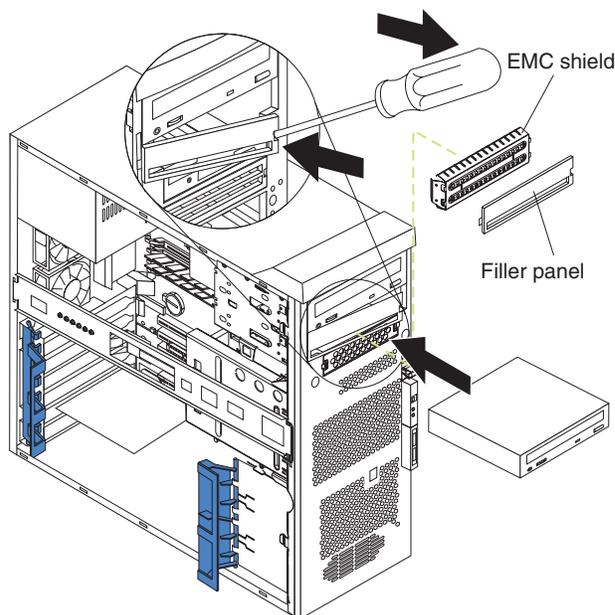


Figure 16. Preparing to install a drive in bay 2

9. If the bay already contains a drive:
  - a. Disconnect the cables from the drive.
  - b. Release it from the bay by pressing the blue latch on the side of the drive.
  - c. Pull the drive out of the computer.
  - d. Remove the blue clip from the side of the drive you have removed and install it on the replacement drive

**Note:** If you are installing a drive that contains a laser, review the following safety precaution.

**Statement 3**



**CAUTION:**

When laser products (such as CD-ROMs, DVD-ROM drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



**DANGER**

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product

Laser Klasse 1

Laser Klasse 1

Luokan 1 Laserlaite

Appareil À Laser de Classe 1

10. Touch the static-protective package containing the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
11. Follow the instructions that come with the drive to set jumpers or switches, if any.

**Note:** You might find it easier to install the new drive into the opening on the front and then attach the cables.

12. If you are installing a 3.5-in. drive in bay 2, attach a 5.25-in. conversion kit to the 3.5-in. drive.

13. Remove the clip from the side of the drive cage of bays 1 and 2 by sliding the clip to the left; then, snap the clip into the screw holes on the side of the drive or conversion kit (with the blue side of the clip facing outward) (see Figure 17).

**Note:** If you are replacing an existing drive, remove the drive clips from the drive you have removed and install them on the new drive.

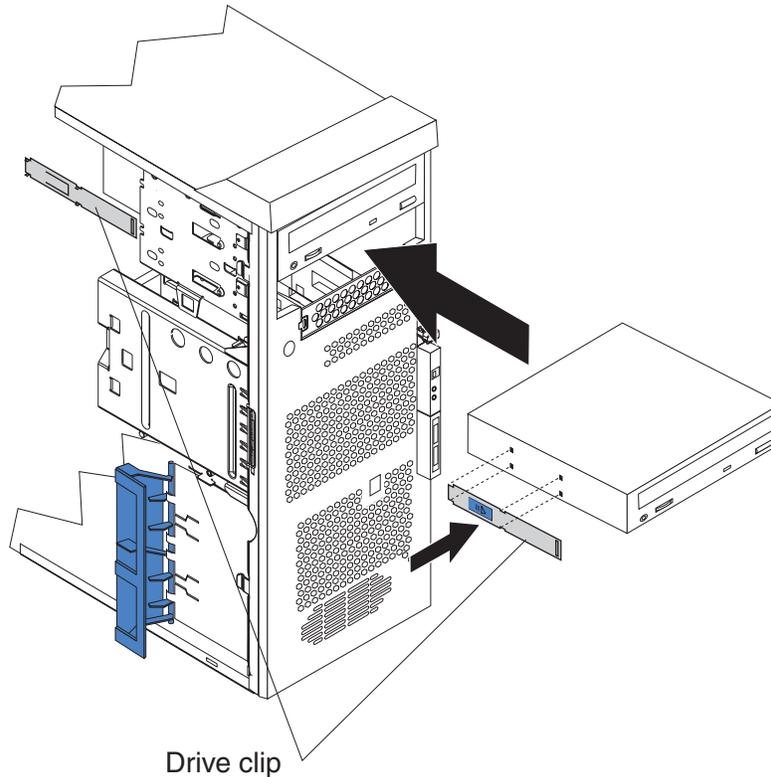


Figure 17. Drive clips on removable-media drives

14. Push the drive into the bay.
15. Determine whether the drive is an IDE or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable IDE or SCSI connector on the system board. See “Power and signal cables for internal drives” on page 98 for additional information about cabling drives and “System-board internal connectors” on page 7 for the location of IDE and SCSI connectors on the system board. If there are open connectors on the cables connecting existing IDE or SCSI drives, you can use these cables to connect the new drive.
16. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor.
17. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
18. If you have other options to install or remove, do so now.
19. Replace the support bracket (see “Removing the support bracket” on page 83).
20. Replace the bezel (see “Removing the bezel” on page 84).
21. Replace the side cover (see “Removing the side cover” on page 81).

22. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

### **Removing the drive in bay 3**

To remove the drive in bay 3, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Remove the front bezel (see “Removing the bezel” on page 84).
5. Remove the support bracket (see “Removing the support bracket” on page 83).
6. Disconnect the cables from the drive that you are replacing.
7. Rotate the drive cage up.
8. Remove the drive:
  - a. If the drive is secured with screws, remove the screws and set them in a safe place.
  - b. If the drive is secured with a tool-less clip (see Figure 17 on page 92), remove the clip and set it aside to install on the new drive.

### **Replacing the drive in bay 3**

To install a drive in bay 3, complete the following steps:

**Note:** Only a 3.5-in. SCSI device can be installed in bay 3.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Make sure that you have all the cables and other equipment specified in the documentation that comes with the drive.
3. Check the instructions that come with the drive to determine whether you need to set any switches or jumpers on the drive. Make sure that you set the SCSI ID for the drive.
4. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
5. Remove the side cover (see “Removing the side cover” on page 81).
6. Remove the front bezel (see “Removing the bezel” on page 84).
7. Remove the support bracket (see “Removing the support bracket” on page 83).
8. Rotate the drive cage up.

9. If the bay is empty, use a screwdriver to pry the filler panel and EMC shield away from the computer.

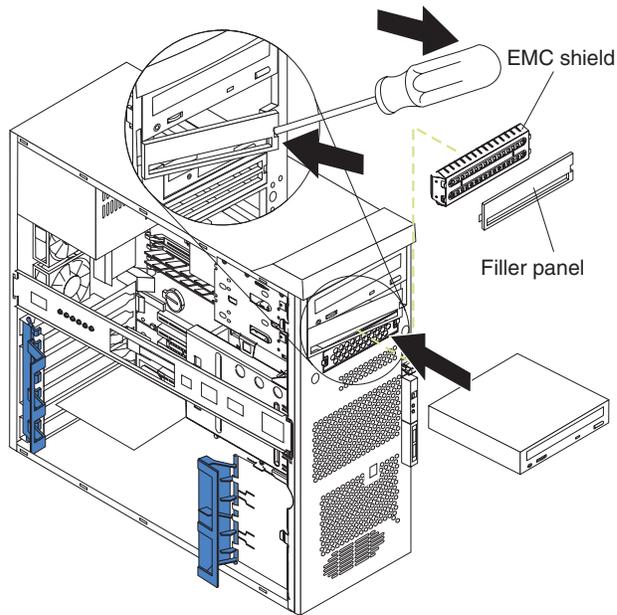


Figure 18. Installing a drive in bay 3

10. If the bay contains a drive, remove it:
  - a. If the drive is secured with screws, remove the screws and set them in a safe place.
  - b. If the drive is secured with a tool-less clip, remove it and set it aside to install on the new drive.

**Note:** If you are installing a drive that contains a laser, review the following safety precaution.

**Statement 3**



**CAUTION:**

When laser products (such as CD-ROMs, DVD-ROM drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



**DANGER**

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product

Laser Klasse 1

Laser Klass 1

Luokan 1 Laserlaite

Appareil À Laser de Classe 1

11. Touch the static-protective package containing the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
12. Follow the instructions that come with the drive to set jumpers or switches, if any.

**Notes:**

- a. You might find it easier to install the new drive into the opening on the front and then attach the cables.
  - b. If you are installing a hard disk drive, you might need to temporarily disconnect the front-panel cable from the system board. You can reconnect the front-panel cable after you have finished installing the hard disk drive.
13. Push the drive into the bay; then, use the one screw to attach the drive to the drive cage.

**Note:** It is not necessary to secure the drive with two screws.

14. Connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable connector on the system board (if you are installing a diskette drive in bay 3, connect the other end of the cable to the diskette connector on the system board). See “Power and signal cables for internal drives” on page 98 for additional information about cabling drives and “System-board internal connectors” on page 7 for the location of

diskette and SCSI connectors on the system board. If there are open connectors on the cables connecting existing SCSI drives, you can use these cables to connect the new drive.

15. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor.
16. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
17. Lower the drive cage.
18. Replace the support bracket (see “Removing the support bracket” on page 83).
19. Replace the bezel (see “Removing the bezel” on page 84).
20. Replace the side cover (see “Removing the side cover” on page 81).
21. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

## Removing the hard disk drive in bay 4, 5, or 6

### Notes:

1. Bays 4, 5, and 6 are in the drive cage. The drive cage is near the front adapter-support bracket.
2. When installing hard drives, you might find it easier to work with the computer lying on its side.

To remove the drive in bay 4, 5, or 6, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices; then, disconnect all power cords and external cables.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Remove the support bracket (see “Removing the support bracket” on page 83).
5. Disconnect the cables from the drive that you are replacing.
6. Grasp the drive cage and rotate the cage out of the computer until it locks into place with the drive-cage retention tab (see Figure 19 on page 97).

The open ends of the drive slots and installed drives will face you. Make sure that the drive cage locks into place over the drive-cage retention tab by rotating the drive cage all the way out of the computer.

7. Slide the existing drive out of the drive bay.
8. Remove the drive from the drive tray by gently pulling both sides of the drive tray outward until the mounting pins are disengaged from the holes on the drive; then, lift the drive out of the drive tray.

## Replacing the hard disk drive in bay 4, 5, or 6

To install a drive in bay 4, 5, or 6, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
3. Select the bay in which you want to install the drive.
4. Check the instructions that come with the drive to determine whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.

5. Turn off the computer and all attached devices; then, disconnect all power cords and external cables.
6. Remove the side cover (see “Removing the side cover” on page 81).
7. Remove the support bracket (see “Removing the support bracket” on page 83).
8. Grasp the drive cage and rotate the cage out of the computer until it locks into place with the drive-cage retention tab (see Figure 19).

**Note:** You might need to disconnect the power cables from the drives before you rotate the cage all the way.

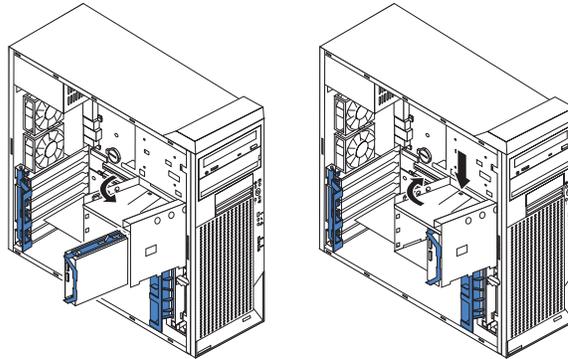


Figure 19. Rotating the drive cage

The open ends of the drive slots and installed drives will face you. Make sure that the drive cage locks into place over the drive-cage retention tab by rotating the drive cage all the way out of the computer.

9. If you are installing a new drive in an empty bay, slide the existing drive tray out of the drive bay.
10. If you are replacing a drive:
  - a. Slide the existing drive out of the drive bay.
  - b. Remove the drive from the drive tray by gently pulling both sides of the drive tray outward until the mounting pins are disengaged from the holes on the drive; then, lift the drive out of the drive tray.
11. Touch the static-protective package containing the new drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
12. Set any jumpers or switches on the new drive according to the documentation that comes with the drive.
13. Attach the new drive to the drive tray. Place the drive on the drive tray and align the holes on the drive with the mounting pins on the drive tray (see Figure 20 on page 98). Gently pull both sides of the drive tray outward and insert the mounting pins into the holes on the drive.

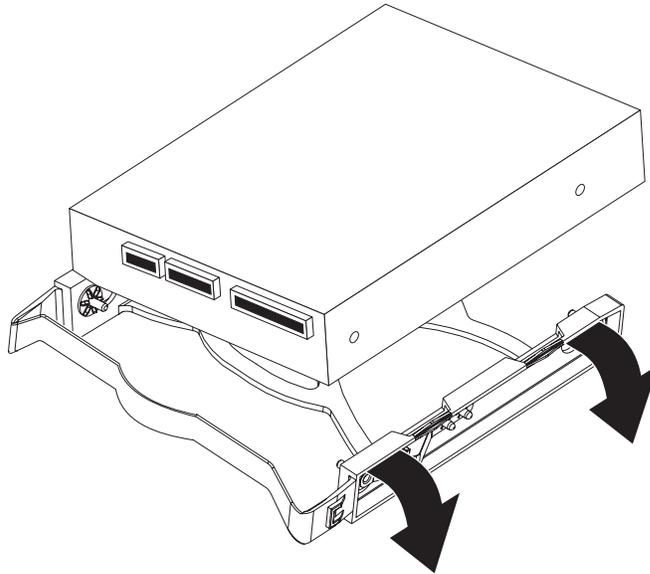


Figure 20. Attaching the drive to the drive tray

14. Slide the drive into the drive bay until the drive snaps into place.
15. Determine whether the drive is a Serial ATA or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable Serial ATA or SCSI connector on the system board. If there are open connectors on the cables connecting existing Serial ATA or SCSI drives, you can use these cables to connect the new drive. See “Power and signal cables for internal drives” for additional information about cabling drives and “System-board internal connectors” on page 7 for the location of Serial ATA and SCSI connectors on the system board.
16. Route the signal cable so that it does not block the airflow to the rear of the drives or over any microprocessor.
17. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
18. Push the drive cage outward, and press in on the drive-cage release tab. Rotate the cage part-way into the computer; then, reconnect any power cables you disconnected in step 8 on page 97 and rotate the cage the rest of the way back into the computer. Make sure that the drives and cables do not strike the microprocessor fan sink.
19. Replace the support bracket (see “Removing the support bracket” on page 83).
20. Replace the side cover (see “Removing the side cover” on page 81).
21. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

## Power and signal cables for internal drives

The computer uses cables to connect IDE, Serial ATA, and SCSI devices to the power supply and to the system board. (See “System-board internal connectors” on page 7 for the location of system-board connectors.) Review the following information before connecting power and signal cables to internal drives:

- The drives that are preinstalled in the computer come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive, or label the cables.

- When you install a drive, make sure that one of the drive connectors of the signal cable is connected to the drive and that the connector at the other end of the signal cable is connected to the system board.
- When you install a drive, set the jumpers either to disable auto-start or to delay startup, to prevent the system power supply from being overtaxed by all drives trying to spin up at once.
- The computer has two IDE buses, primary and secondary. Each of these buses supports up to two IDE devices. The primary IDE bus uses connector IDE1 on the system board and the secondary IDE bus uses connector IDE2.
- If you have only one IDE device on a cable, it must be set as a master device.
- If two IDE devices are used on a single cable, one must be designated as the master device and the other as the subordinate device; otherwise, the computer might not recognize some of the IDE devices. The master and subordinate designation is determined by switch or jumper settings on each IDE device.

The following cables are provided:

- **Power cables:** Four-wire power cables connect the drives to the power supply. At the end of these cables are plastic connectors that can be attached to different drives; these connectors vary in size. With Serial ATA drives, you can use either a four-wire power cable or a five-wire Serial ATA power cable, but do not use both at the same time (use one or the other).
- **Signal cables:** Signal cables typically are flat cables, also called ribbon cables, that connect IDE, SATA, SCSI, and diskette drives to the system board. Two or three types of signal cable come with the computer:

- **IDE:** The wider IDE signal cable has three connectors. One of these connectors is attached to the drive, one is a spare, and the third is attached to the primary or secondary IDE connector on the system board. The spare connector can be used to connect additional IDE drives to the computer.

**Note:** The optical drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is connected to the system board. The black connector is connected to the master IDE device. The gray middle connector is connected to the subordinate IDE device.

- **Serial ATA:** The narrower, black signal cable has two connectors. One is connected to the SATA drive, and the other is connected to the connector on the system board. Each SATA drive comes with a cable. If you install an additional SATA drive, you will need an additional cable.
- **SCSI:** The following cables can be used to attach SCSI devices to the integrated SCSI controller on the system board:
  - An Ultra320 twisted ribbon cable connects the internal Ultra320 SCSI hard disk drive to the SCSI connector on the system board. This cable has four additional connectors for attaching more internal SCSI devices.
  - A round SCSI cable connects external SCSI devices to the integrated SCSI controller (SCSI B) on the system board. For more information about connecting SCSI devices, see the SCSI documentation.

## Removing a DIMM

To remove DIMMs, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.

3. Remove the side cover (see “Removing the side cover” on page 81).
4. Remove the support bracket (see “Removing the support bracket” on page 83).
5. For easier access to the memory modules on the system board, rotate the drive cage out of the computer until it locks into place. You might need to disconnect the power cables from the drives before you rotate the cage all the way.

**Note:** If you are installing memory modules on the microprocessor board for a second microprocessor in the computer, it is not necessary to move the drive cage.

6. If you are replacing DIMMs for microprocessor 1, and a second microprocessor is installed on the computer, remove the microprocessor 2 air baffle:
  - a. Lift up on the large end of the baffle until it releases.
  - b. Slide the baffle toward the front of the computer; then, lift the baffle out of the computer.
7. Locate the DIMM connector with the failing DIMM.
8. Gently open the retaining clips on each end of the DIMM connector and remove the DIMM.

## Replacing a DIMM

The following notes describe the types of dual inline memory modules (DIMMs) that the computer supports and other information that you must consider when removing and installing DIMMs:

- The computer must have at least one pair of DIMMs installed in the DIMM connectors for each microprocessor installed.
- The system board contains four DIMM connectors for microprocessor 1. The computer comes with one pair of DIMMs installed in the DIMM connectors on the system board.
- If you install a second microprocessor, the board that comes with the microprocessor option (microprocessor board) contains four DIMM connectors for microprocessor 2. You must install at least one pair of DIMMs in the DIMM connectors on the microprocessor board.
- You can add a second pair of DIMMs for either microprocessor at any time. It is not necessary to add a second pair of DIMMs for microprocessor 1 before adding a second pair of DIMMs for microprocessor 2.
- The DIMM options that are available for the computer are 512 MB, 1 GB, and 2 GB. The PC2700 DIMMs are available in 2 GB only. The computer supports a minimum of 1 GB and a maximum of 16 GB of system memory.

**Note:** Although your computer supports a maximum of 16 GB of system memory, the Microsoft® Windows XP operating systems recognize and support a maximum of 4 GB of system memory.

- The computer comes with two 512 MB or 1 GB memory DIMMs installed.
- Install only 2.5 V, 184-pin, double-data-rate (DDR), PC2700 (2 GB DIMMs only) or PC3200, registered, buffered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2700 or PC3200 SDRAM buffered DIMM specification. For a list of supported options for the computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for the computer.
- DIMMs must be installed in matched pairs. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match other pairs. You can mix compatible DIMMs from various manufacturers.

- The first pair of DIMMs on the system board are installed in DIMM connectors 1 and 2. If you install a second pair of DIMMs for microprocessor 1, install the pair in DIMM connectors 3 and 4. Table 7 shows the system board DIMM installation sequence.

*Table 7. DIMM installation sequence on system board*

Installation sequence on system board	
DIMMs	Slots
First pair of DIMMs	1, 2
Second pair of DIMMs	3, 4

- If you install a second microprocessor (microprocessor 2), install the first pair of DIMMs for the microprocessor in DIMM connectors 5 and 6 on the microprocessor board. If you install a second pair of DIMMs for the microprocessor, install the pair in DIMM connectors 7 and 8 on the microprocessor board. See “Replacing the second microprocessor (microprocessor 2 and fan sink)” on page 117 for more information about the microprocessor option. Table 8 shows the microprocessor board DIMM installation sequence.

*Table 8. DIMM installation sequence on microprocessor board*

Installation sequence on microprocessor board	
DIMMs	Slots
First pair of DIMMs	5, 6
Second pair of DIMMs	7, 8

- The computer supports two-way memory interleaving across the memory banks for each microprocessor.
- The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS will display the total amount of installed memory and the amount of configured memory. To obtain a full 16 GB or more of usable memory, you must install a second microprocessor and memory.
- When you restart the computer after adding or removing DIMMs, the computer displays a message that the memory configuration has changed.

To install a pair of DIMMs, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 81).
4. Remove the support bracket (see “Removing the support bracket” on page 83).
5. For easier access to the memory modules on the system board, rotate the drive cage out of the computer until it locks into place. You might need to disconnect the power cables from the drives before you rotate the cage all the way.

**Note:** If you are installing memory modules on the microprocessor board for a second microprocessor on the computer, it is not necessary to move the drive cage.

6. If you are installing DIMMs for microprocessor 1, and you have installed a second microprocessor on the computer, remove the microprocessor 2 air baffle:
  - a. Lift up on the large end of the baffle until it releases.
  - b. Slide the baffle toward the front of the computer; then, lift the baffle out of the computer.
7. Locate the DIMM connectors. Determine the connectors into which you will install the DIMMs. See the notes at the beginning of this section for the installation sequence.
8. Gently open the retaining clips on each end of the DIMM connectors you have selected and, if necessary, remove any existing DIMMs.
9. Touch the static-protective package containing the new DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.
10. Turn the DIMM so that the contacts align correctly with the connector.
11. Insert the DIMM into the connector (see Figure 21). Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and then reinsert it.

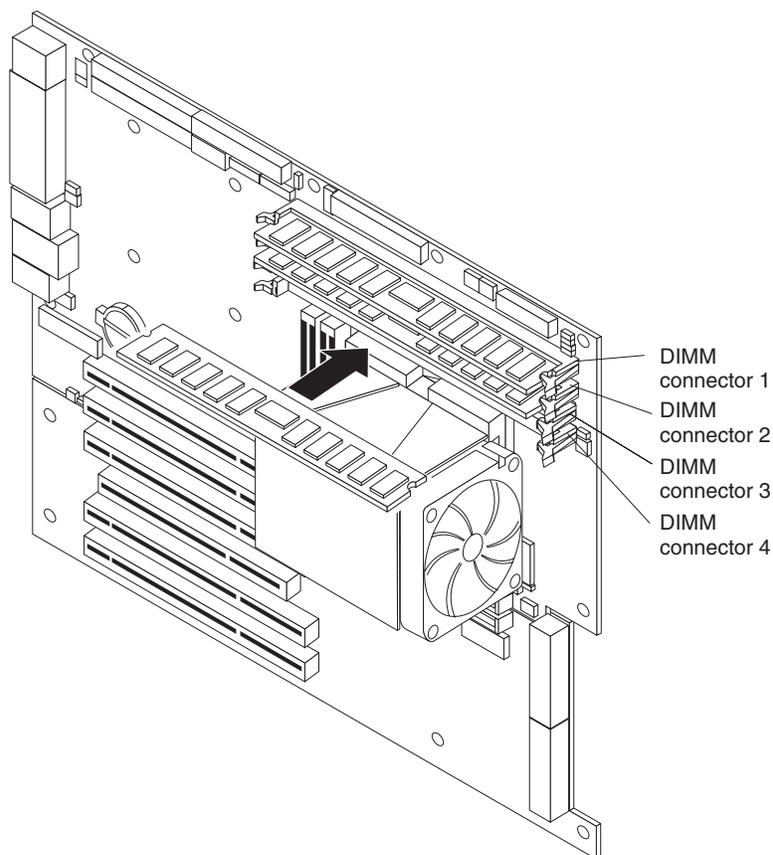


Figure 21. Installation of DIMMs 1-4

12. Repeat steps 8 through 11 for the second DIMM in the pair.

13. If you moved the drive cage out of the way in step 5, push the drive cage outward and press in on the drive-cage release tab. Rotate the cage part-way into the computer, reconnect any power cables you disconnected from the drives, and rotate the cage the rest of the way back into the computer.
14. If you removed the air baffle for the optional second microprocessor in step 6, replace the air baffle (see step 13 on page 121).
15. Replace the support bracket (see “Removing the support bracket” on page 83).
16. Replace the side cover (see “Removing the side cover” on page 81).
17. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the battery

To remove the battery, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices. Disconnect all external cables and power cords; then, remove the computer cover and the support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
3. Remove the battery:
  - a. Use a fingernail to press the top of the battery clip away from the battery (see Figure 22). The battery pops up when released.
  - b. Use your thumb and index finger to lift the battery from the socket.

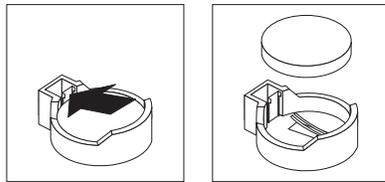


Figure 22. Removing the battery

## Replacing the battery

**Important:** In computers containing the optional microprocessor board, the battery must be replaced by a trained service technician who is familiar with IBM products.

The following notes describe information that you must consider when replacing the battery in the computer:

- When replacing the battery, you must replace it with a lithium battery of the same type from the same manufacturer.
- To order replacement batteries, call 1-800-426-7378 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM marketing representative or authorized reseller.
- After you replace the battery, you must reconfigure the system and reset the system date and time.
- To avoid possible danger, read and follow the following safety statement.

**Statement 2:**



**CAUTION:**

When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

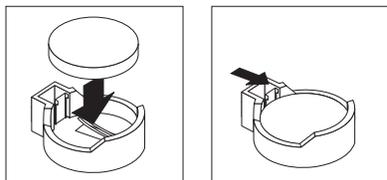
*Do not:*

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

**Dispose of the battery as required by local ordinances or regulations.**

To install the battery, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Follow any special handling and installation instructions that come with the replacement battery.
3. Turn off the computer and all attached devices. Disconnect all external cables and power cords; then, remove the computer cover and the support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
4. Insert the new battery:
  - a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.
  - b. Press the battery down into the socket (Figure 23) until it clicks into place. Make sure that the battery clip holds the battery securely.



*Figure 23. Installing the battery*

5. Replace the support bracket (see “Removing the support bracket” on page 83).
6. Replace the cover and connect the cables.
7. Turn on the computer.
8. Start the Configuration/Setup Utility program and set configuration parameters.
  - Set the system date and time.
  - Set passwords if necessary.
  - Save the configuration.

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## Removing and replacing Tier 2 CRUs

You can install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your computer.

The illustrations in this document might differ slightly from your hardware.

### Removing an external SCSI cable

To remove an external SCSI cable, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all peripheral devices. Disconnect all power cords; then, disconnect all external signal cables from the computer.
3. Remove the computer cover (see “Removing the side cover” on page 81).
4. Remove the support bracket (see “Removing the support bracket” on page 83).
5. Open the front adapter-retention bracket and remove the rear adapter-retention bracket from the PCI-X slots (see “Replacing an adapter” on page 85 for instructions). You might also have to remove longer adapters for access to the SCSI connectors on the system board.
6. Remove the standoff screws securing the cable to the chassis.
7. Disconnect the cable from the system board connector.
8. Remove the cable.
9. Remove the standoff screws securing the cable to the chassis.
10. Disconnect the cable from the system board connector.
11. Remove the cable.

### Replacing an external SCSI cable

To install an external SCSI connector on the rear of the computer, install an external SCSI interface option. For a list of supported external SCSI interface options for the computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for the computer.

The external SCSI interface option contains a SCSI cable with a connector at one end and on the other end another connector or an expansion-slot cover with an embedded connector.

To install and route the SCSI cable, complete the following steps:

1. Turn off the computer and all peripheral devices. Disconnect all power cords; then, disconnect all external signal cables from the computer.
2. Remove the computer cover (see “Removing the side cover” on page 81).
3. Remove the support bracket (see “Removing the support bracket” on page 83).
4. Open the front adapter-retention bracket and remove the rear adapter-retention bracket from the PCI-X slots (see “Replacing an adapter” on page 85 for instructions). You might also have to remove longer adapters for access to the SCSI connectors on the system board.
5. If you are removing an existing SCSI cable:
  - a. Remove the standoff screws securing the cable to the chassis.
  - b. Disconnect the cable from the system board connector.
  - c. Remove the cable.

6. To attach the cable, connect the SCSI signal cable end labeled "PLANAR" to the connector for SCSI channel B on the system board. See "System-board internal connectors" on page 7 for the location of the SCSI channel B connector.
7. Route the SCSI cable between the chassis and PCI-X slot 5 to the back of the computer. Make sure the cable does not block the flow of air to the microprocessors or hard disk drives.
8. Attach the external connector to the rear of the computer.
  - If the external end of the SCSI cable has a standard SCSI connector, insert the external SCSI connector on the SCSI cable into the knockout opening and secure it with the attached screws.
  - If the external end of the SCSI cable has an expansion-slot cover with an embedded connector, insert the expansion-slot cover with the embedded connector into the slot opening.
9. Replace any adapters you removed in step 4. Close the front adapter-retention bracket and replace the rear adapter-retention bracket.
10. Replace the support bracket (see "Removing the support bracket" on page 83).
11. Replace the cover (see "Removing the side cover" on page 81).
12. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.
13. Use the SCSISelect program to configure SCSI channel B (see "Using the Configuration/Setup Utility program" on page 143).

## Cabling the computer

If the computer cables and connector panel have color-coded connections, match the color of each cable end with the color of the corresponding connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on.

**Attention:** To prevent damage to equipment, connect the power cord last.

Depending on the video adapter installed in the computer and the monitor you want to use, you might have to use special video cables that convert signals or provide an additional connection point for dual-monitor capability. See the *User's Guide* on the IBM *IntelliStation Documentation* CD and the documentation that comes with the monitor for additional information.

## Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

IBM power cord part number	Used in these countries and regions
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea

IBM power cord part number	Used in these countries and regions
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Maceo, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil

<b>IBM power cord part number</b>	<b>Used in these countries and regions</b>
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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## Removing and replacing FRUs

A field-replacement unit (FRU) must be installed only by trained service technicians.

The illustrations in this document might differ slightly from your hardware.

### Removing a microprocessor 1 and fan sink

To remove the fan-sink assembly and the microprocessor, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Turn the computer on its side so that it is lying flat, with the cover facing up.
4. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
5. Remove the air baffle (see Figure 27 on page 114 for the location of the air baffle).
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
6. Rotate the drive cage out of the way.
7. Disconnect the fan sink cable, noting its location.
8. Disconnect any cables that impede access to the microprocessor.

**Note:** The illustrations in this document might differ slightly from your hardware.

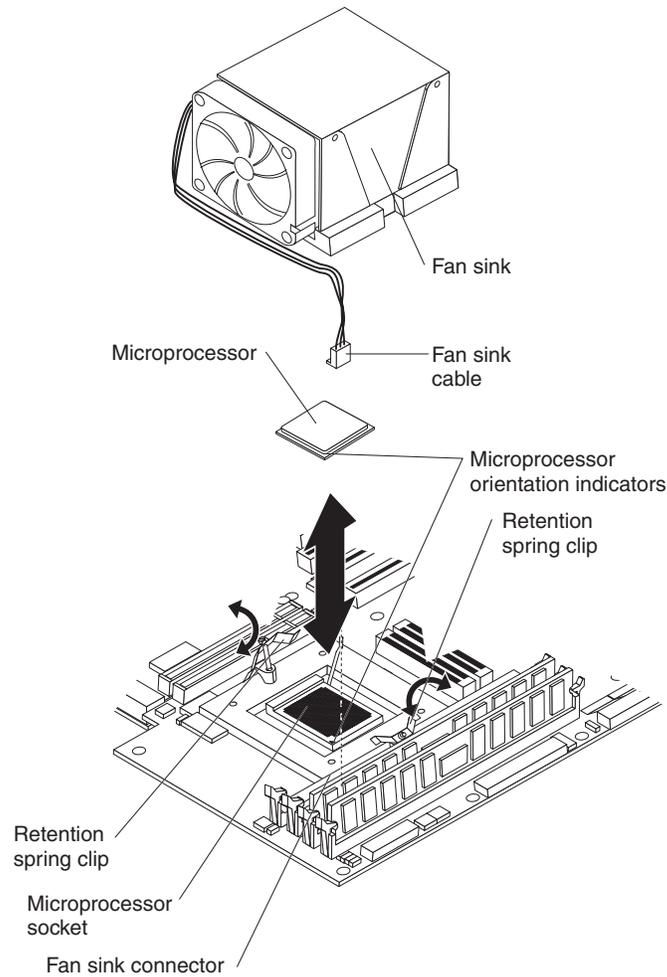


Figure 24. removing the fan sink

9. Loosen the two captive screws (in the leaf spring enclosures) on either side of the fan sink.
10. With the two captive screws loosened, rotate the leaf-spring assemblies outward and out of the notches on the fan-sink assembly.

**Attention:** Before attempting to remove the fan sink from the microprocessor, note that the heat-conducting grease between the fan sink and the microprocessor might have formed a strong bond. Do not force the components apart; doing so can damage the microprocessor pins. Loosening one screw fully before loosening the other screw will help to break the thermal bond that adheres the fan sink to the microprocessor.

11. Lift the fan sink up and out of the computer, gently twisting it if necessary to loosen it from the microprocessor.

**Important:**

- a. Fan sink 1 and fan sink 2 are not interchangeable. Installing fan sink 2 on microprocessor 1 will impede movement of the drive cage.
- b. Be careful when handling the adhesive material on the microprocessor. If the adhesive material on the microprocessor will be reused, do not contaminate it. If replacement adhesive material is provided with the replacement part, be sure to remove all traces of existing adhesive material from the microprocessor before applying the new adhesive material.

12. Rotate the release lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (90°).

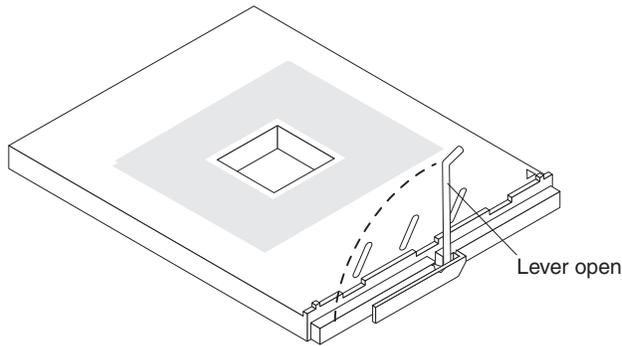


Figure 25. Opening the microprocessor-release lever

**Attention:** Make sure that the release lever on the microprocessor socket is in the fully open position before you remove the microprocessor from the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board or microprocessor board.

13. Pull the microprocessor out of the socket.

## Replacing microprocessor 1 and fan sink

Before you begin, obtain the following items:

- A Phillips-head screwdriver
- A flat-blade screwdriver or a nut driver

To install a microprocessor and fan sink, complete the following steps.

**Important:** When installing a microprocessor make sure that the orientation indicator on the microprocessor is aligned with the orientation indicator on the microprocessor socket.

1. Lift the microprocessor-release lever (see Figure 25) to the fully open position (90°).

**Attention:** You must make sure that the release lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor and microprocessor socket.

2. Install the new microprocessor:
  - a. Touch the static-protective package containing the new microprocessor to any unpainted metal surface on the computer; then, remove the microprocessor from the package.
  - b. Position the microprocessor over the microprocessor socket as shown in Figure 26 on page 113. Carefully press the microprocessor into the socket.

**Attention:** To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.

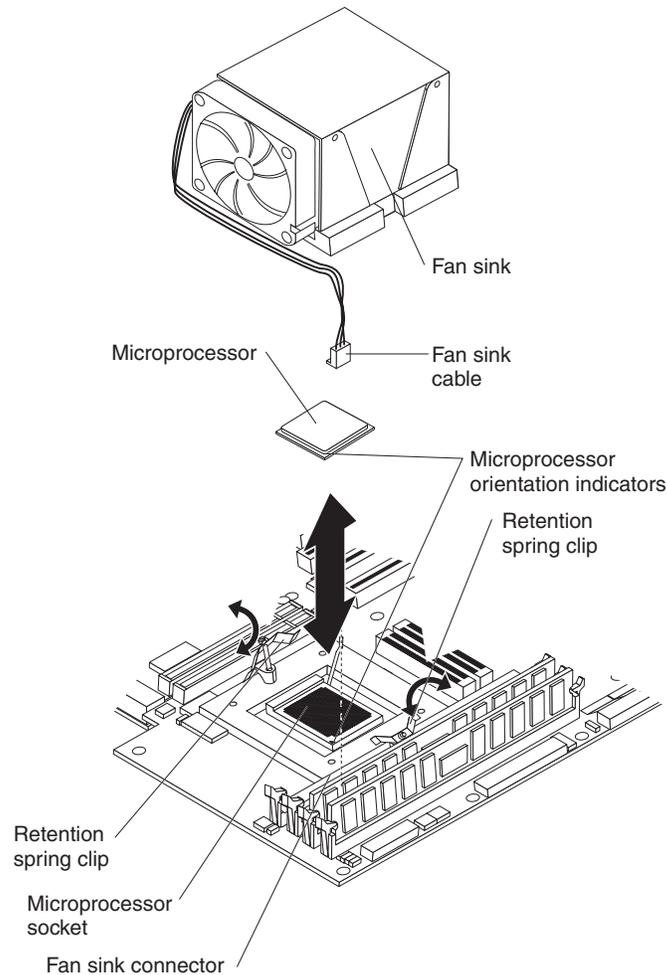


Figure 26. Installing microprocessor 1 and fan sink

3. Close the microprocessor-release lever to secure the microprocessor.

**Attention:**

- Do not disturb or contaminate the gray thermal material on the bottom of the new fan sink. Doing so damages its heat-conducting capability and exposes the new microprocessor to overheating.
- If you need to remove the fan sink after installing it, see “Removing a microprocessor 1 and fan sink” on page 110.

4. Install the fan sink (see Figure 26).
  - a. Make sure that the two retention spring clips on the microprocessor retention bracket are open and rotated to either side as shown in the previous illustration.
  - b. Remove the fan sink from its package and remove the cover from the bottom of the fan sink. Make sure that the thermal material is still on the bottom of the fan sink.
  - c. Remove the release liner and orient the fan sink above the microprocessor.
  - d. Make sure that you install the fan sink toward the rear of the computer so that the front of the fan sink and the fan-sink screws do not come in contact with any electrical components on the board.
  - e. Press the fan sink into place; then, connect the fan-sink cable to the microprocessor fan connector on the board (see Figure 26).

- f. Raise the retention spring clips into position on each side of the fan sink.  
Start both screws into the fan-sink socket; then, tighten both screws. Do not overtighten the screws.
5. Rotate the drive cage back into the computer.
6. Reconnect any cables that were disconnected earlier.
7. Install the microprocessor air baffle, if you removed it earlier.

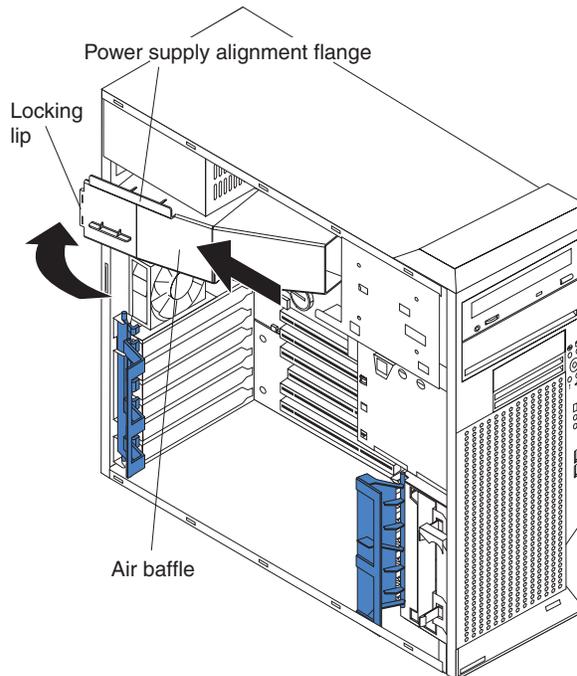


Figure 27. Installing the baffle

- a. Orient the air baffle as shown and align it with the side of the power supply.
- b. Insert the small end of the baffle into the computer toward the front of the computer.
- c. Lower the larger end of the baffle until the side flange rests on the power supply.
- d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, lift and pull, and press down on the large end of the baffle until it clicks into place.
8. Replace the support bracket (see "Removing the support bracket" on page 83).
9. Replace the side cover (see "Removing the side cover" on page 81).
10. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the second microprocessor (microprocessor 2 and fan sink)

Before you begin, obtain the following items:

- A Phillips-head screwdriver
- A flat-blade screwdriver or a nut driver

To remove the second microprocessor on the microprocessor board, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and all attached devices.
3. Disconnect all external cables and power cords; then, remove the side cover (see “Removing the side cover” on page 81)
4. Remove the support bracket (see “Removing the support bracket” on page 83).
5. Remove the air baffle.
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
6. Disconnect the fan sink cable, noting its location.

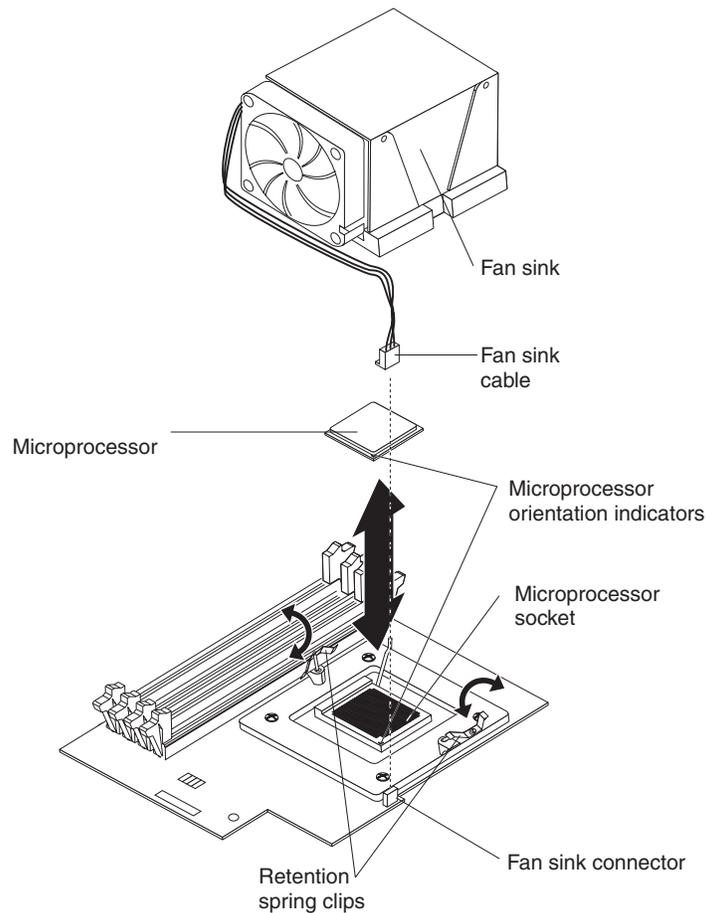


Figure 28. Connector locations on microprocessor board

7. Disconnect any cables that impede access to the microprocessor.
8. Loosen the two captive screws (in the leaf spring enclosures) on either side of the fan sink.

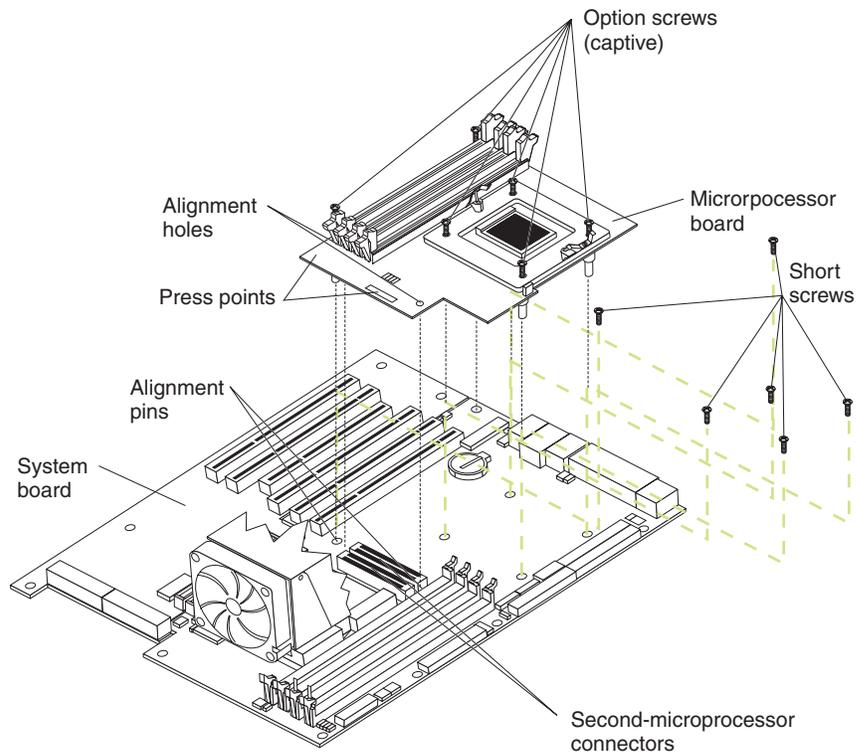


Figure 29. Location of screws on microprocessor board

9. With the two captive screws loosened, rotate the leaf-spring assemblies outward and out of the notches on the fan-sink assembly.

**Attention:** Before attempting to remove the fan sink from the microprocessor, note that the heat-conducting grease between the fan sink and the microprocessor might have formed a strong bond. Do not force the components apart; doing so can damage the microprocessor pins. Loosening one screw fully before loosening the other screw will help to break the thermal bond that adheres the fan sink to the microprocessor.

10. Lift the fan sink up and out of the computer, gently twisting it if necessary to loosen it from the microprocessor.

**Important:**

- a. Fan sink 1 and fan sink 2 are not interchangeable. Installing fan sink 2 on microprocessor 1 will impede movement of the drive cage.
  - b. Be careful when handling the adhesive material on the microprocessor. If the adhesive material on the microprocessor will be reused, do not contaminate it. If replacement adhesive material is provided with the replacement part, be sure to remove all traces of existing adhesive material from the microprocessor before applying the new adhesive material.
11. Rotate the release lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (90°).

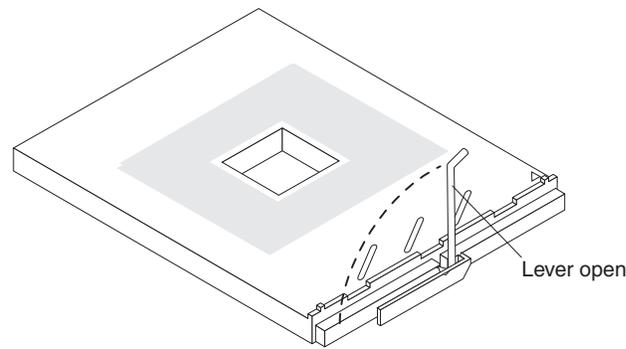


Figure 30. Opening the microprocessor-release lever

**Attention:** Make sure that the release lever on the microprocessor socket is in the fully open position before you remove the microprocessor from the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, system board, or microprocessor board.

12. Pull the microprocessor out of the socket.

## Replacing the second microprocessor (microprocessor 2 and fan sink)

The computer supports a second microprocessor. The second microprocessor comes on a separate microprocessor board, with its own memory modules.

**Note:** When installing options, you might find it easier to work with the computer lying on its side.

The following notes describe information that you must consider when removing or installing a second microprocessor in the computer.

- Microprocessor 1 and 2 must be identical (for example, the clock speed, cache size, clock frequencies, and number of cores).
- The microprocessor option kit comes with a microprocessor board, a microprocessor socket, the microprocessor, a fan sink, and a microprocessor air baffle. The necessary screws and the microprocessor socket are preinstalled on the microprocessor board.
- Each microprocessor contains a memory controller for the memory modules that are associated with it.
- You must install at least one pair of matched DIMMs on the microprocessor board with the microprocessor. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match other pairs. See “Replacing a DIMM” on page 100 for information about the installation order and the type of DIMMs that are supported.
- With more than one microprocessor, the computer can operate as a symmetric multiprocessing (SMP) computer. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors. This enhances performance for database and other applications.
- To use SMP, obtain an SMP-capable operating system. For a list of supported operating systems, go to <http://www.ibm.com/pc/us/compat/>.

- Read the documentation that comes with the microprocessor to determine whether you need to update the computer basic input/output system (BIOS) code. The most current level of BIOS code for the computer is available from <http://www.ibm.com/pc/support/>.
- For a list of supported microprocessor options for the computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for the computer

To install a second microprocessor, complete the following steps.

1. Touch the static-protective package containing the microprocessor board to any unpainted metal surface on the computer. Then, remove the microprocessor board from the package.
2. Remove the six indicated screws from the system board.

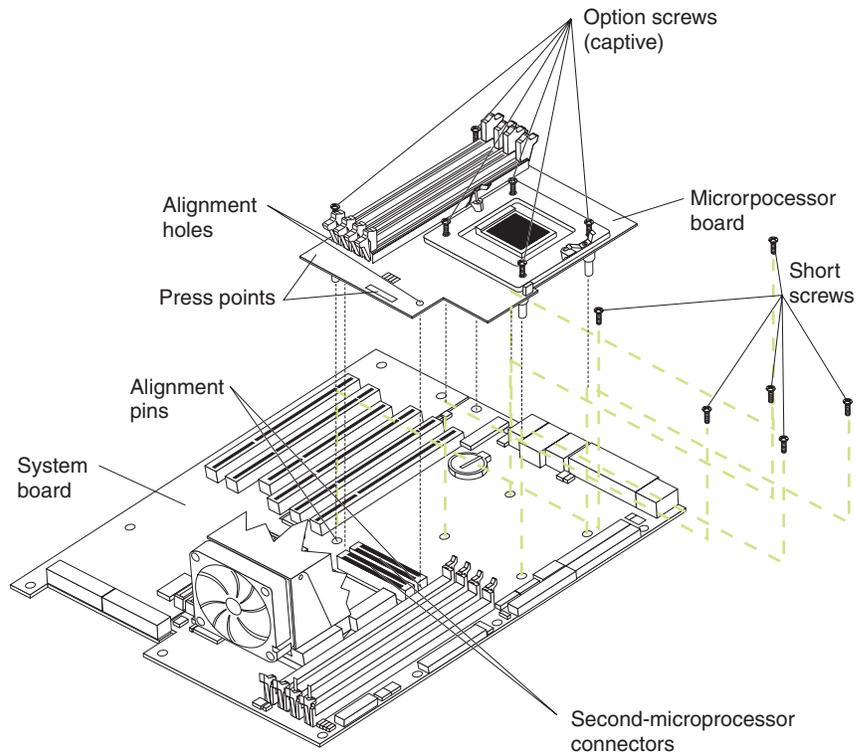


Figure 31. Installing the microprocessor board

3. Position the alignment holes in the microprocessor board over the two plastic alignment pins on the system board (see Figure 31); then, lower the microprocessor board onto the alignment pins.

**Notes:**

- a. When lowering the microprocessor board onto the two plastic alignment pins, it might help to hold it by one of the DIMM slot tabs and one of the retention spring clips.
- b. The screws on the microprocessor board are spring-loaded. When the microprocessor board is correctly in place, the screws will stick straight down and align with the six screw holes on the system board.
- c. Make sure that the connectors on the underside of the microprocessor board line up with the second-microprocessor connectors on the system board.

**Attention:** When you tighten the screw on the microprocessor board that is closest to the rear fan in the computer, you might have to push the rear fan slightly to the side.

4. Tighten the four screws on the fan-sink socket; then, tighten the two screws on the corners of the microprocessor board to secure the microprocessor board to the system board.
5. Press down on the barcode label and the indicated corner to make sure that the microprocessor board is firmly seated in the connectors on the system board.
6. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if any is present.
7. Lift the microprocessor-release lever (see Figure 30 on page 117) to the fully open position (90°).

**Attention:** You must make sure that the release lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and microprocessor board.

8. Install the new microprocessor:
  - a. Touch the static-protective package containing the new microprocessor to any unpainted metal surface on the computer; then, remove the microprocessor from the package.
  - b. Position the microprocessor over the microprocessor socket as shown in Figure 32 on page 120. Carefully press the microprocessor into the socket.

**Attention:** To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.

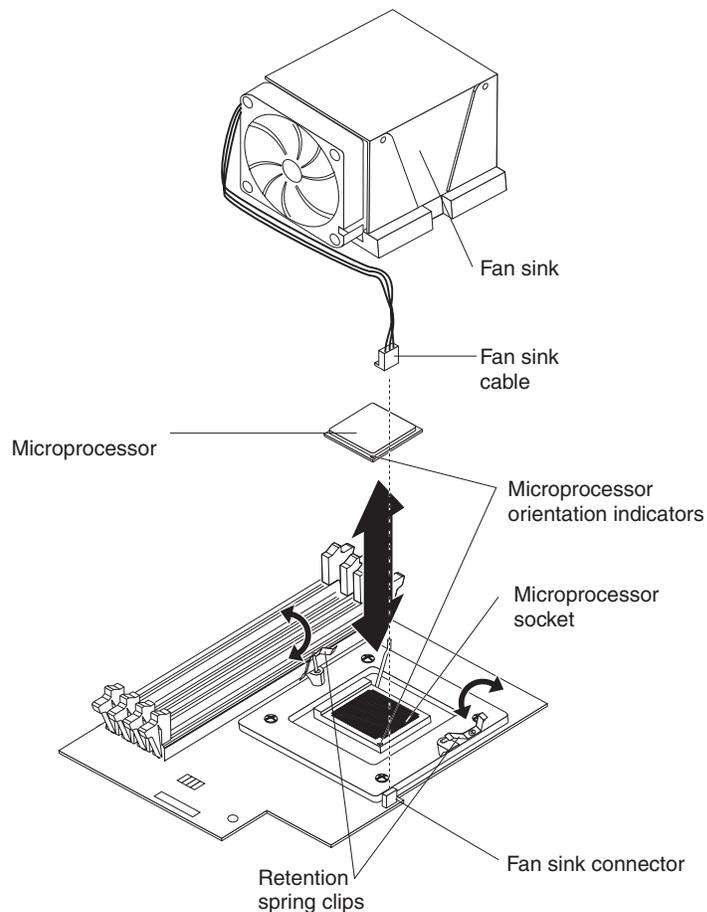


Figure 32. Installing a microprocessor and fan sink

9. Close the microprocessor-release lever to secure the microprocessor.

**Attention:**

- Do not disturb or contaminate the gray thermal material on the bottom of the new fan sink. Doing so damages its heat-conducting capability and exposes the new microprocessor to overheating.
- If you need to remove the fan sink after installing it, see the instructions below.

10. Install the fan sink (see Figure 32).
  - a. Make sure that the two retention spring clips on the microprocessor retention bracket (on the microprocessor board) are open and rotated to either side as shown in the illustration above.
  - b. Remove the fan sink from its package and remove the cover from the bottom of the fan sink. Make sure that the thermal material is still on the bottom of the fan sink.
  - c. Remove the release liner and orient the fan sink above the microprocessor.
  - d. Make sure that you install the fan sink toward the rear of the computer so that the front of the fan sink and the fan-sink screws do not come in contact with any electrical components on the microprocessor board.
  - e. Press the fan sink into place; then, connect the fan-sink cable to the microprocessor fan connector on the microprocessor board (see Figure 32 for the location of the connector).

- f. Raise the retention spring clips into position on each side of the fan sink.  
Start both screws into the fan-sink socket; then, tighten both screws. Do not overtighten the screws.
11. Install at least one pair of supported DIMMs on the microprocessor board. See “Replacing a DIMM” on page 100 for information about the installation order and the type of supported DIMMs.

**Note:** If replacing the microprocessor board, move the DIMMs that you removed from the old board to the new board.

12. Reconnect any cables that you disconnected earlier.
13. Install the microprocessor air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.

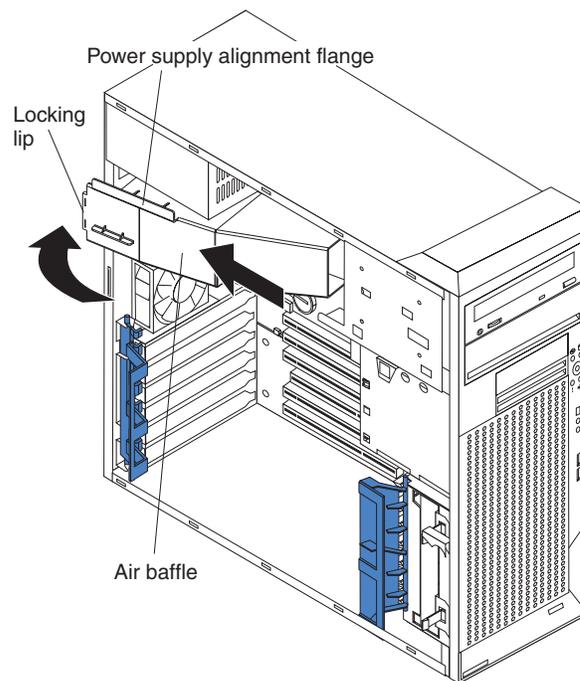


Figure 33. Installing the baffle

- b. Insert the small end of the baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the baffle until it clicks into place.
14. Replace the support bracket (see “Replacing the support bracket” on page 83).
  15. Replace the side cover (see “Replacing the side cover” on page 82).
  16. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the microprocessor board

To remove the microprocessor board, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Turn the computer on its side so that it is lying flat, with the cover facing up.
4. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
5. Remove the air baffle.
6. Disconnect all cables from the microprocessor board.
7. Remove all DIMMs from the microprocessor board and set them in a safe, static-protective place.
8. Remove the fan sink and microprocessor from the microprocessor board (see “Removing the second microprocessor (microprocessor 2 and fan sink)” on page 114) and set them in a safe, static-protective place.

**Attention:** Before attempting to remove the fan sink from the microprocessor, be sure to read all the instructions at “Replacing the second microprocessor (microprocessor 2 and fan sink)” on page 117.

9. Fully loosen the six captive screws connecting the microprocessor board to the system board. Four of these screws also secure the fan sink retention module.

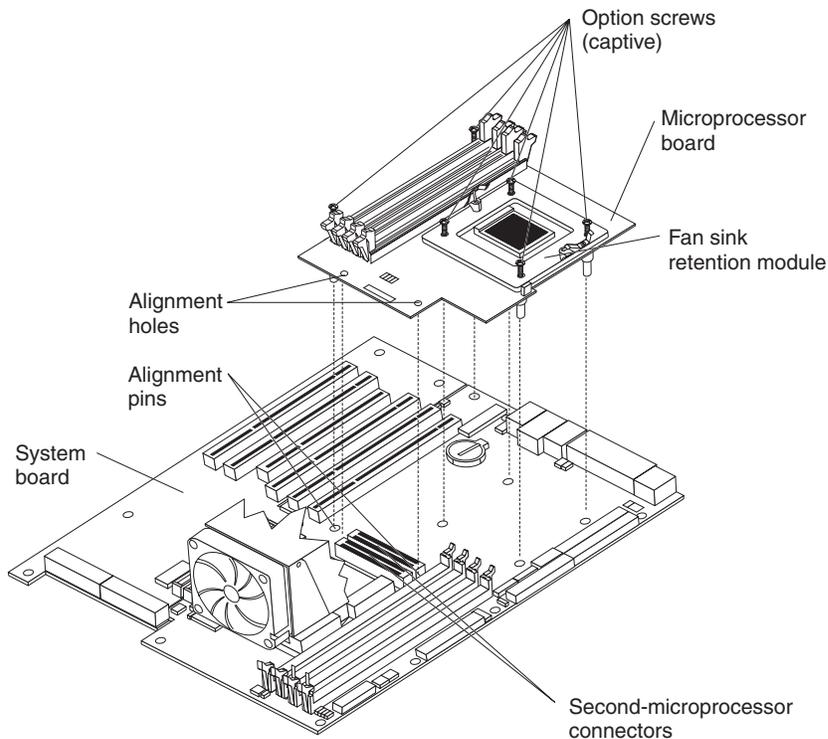


Figure 34. Removing the microprocessor board

10. Disconnect the microprocessor board from the system board by grasping the pull points on microprocessor board (at the two corners of the board nearest microprocessor 1). This will free the board from the second-microprocessor connectors and the two plastic alignment pins. The alignment pins will stay with either the system board or the microprocessor board.

**Note:** If the pins remain attached to the microprocessor board, remove them, using needle-nosed pliers if necessary, and push them back into place on the system board for later reinstallation of the microprocessor board.

## Replacing the microprocessor board

To install the microprocessor board, complete the following steps.

**Important:** When installing a microprocessor, make sure that the orientation indicator on the microprocessor is aligned with the orientation indicator on the microprocessor socket.

1. Touch the static-protective package containing the microprocessor board to any unpainted metal surface on the computer. Then, remove the microprocessor board from the package.
2. Remove the six short screws from the system board (see Figure 34 on page 122 for the location of the six short screws).
3. Position the alignment holes in the microprocessor board over the two plastic alignment pins on the system board; then, lower the microprocessor board onto the alignment pins (see Figure 34 on page 122).

**Notes:**

- a. When lowering the microprocessor board onto the two plastic alignment pins, it might help to hold it by one of the DIMM slot tabs and one of the retention spring clips.
  - b. The screws on the microprocessor board are spring-loaded. When the microprocessor board is correctly in place, the screws will stick straight down and align with the six screw holes on the system board.
  - c. Make sure that the connectors on the underside of the microprocessor board line up with the second-microprocessor connectors on the system board.
4. Tighten the four screws on the fan-sink socket; then, tighten the two screws on the corners of the microprocessor board to secure the microprocessor board to the system board.

**Attention:** When you tighten the screw on the microprocessor board that is closest to the rear fan in the computer, you might have to push the rear fan slightly to the side.

5. Press down on the barcode label and the indicated corner to make sure that the microprocessor board is firmly seated in the connectors on the system board.
6. Reconnect any cables that were disconnected earlier.
7. Replace the air baffle.
8. Replace the support bracket (see “Replacing the support bracket” on page 83).
9. Replace the side cover (see “Replacing the side cover” on page 82).
10. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the speaker

**Important:** Before you begin, make sure that you have a flat work surface available next to the computer on which you can set down the drive cage (see step 8 on page 124).

To remove the speaker, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.

**Note:** Removing the speaker might be easier if the computer is turned on its side.

3. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
4. Remove the front bezel (see “Removing the bezel” on page 84).
5. Remove the air baffle.
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
6. Remove all adapters and set them on a static-protective surface.

**Attention:** Note the location of all connectors and cable routings before disconnecting them.
7. Disconnect the front fan and intrusion switch cables.
8. Disconnect from the hard disk drives any cables, such as the SCSI cable, that are too short to allow the drive cage to rest on a clean work surface at the side of the computer.

**Note:** The illustrations in this document might differ slightly from your hardware.

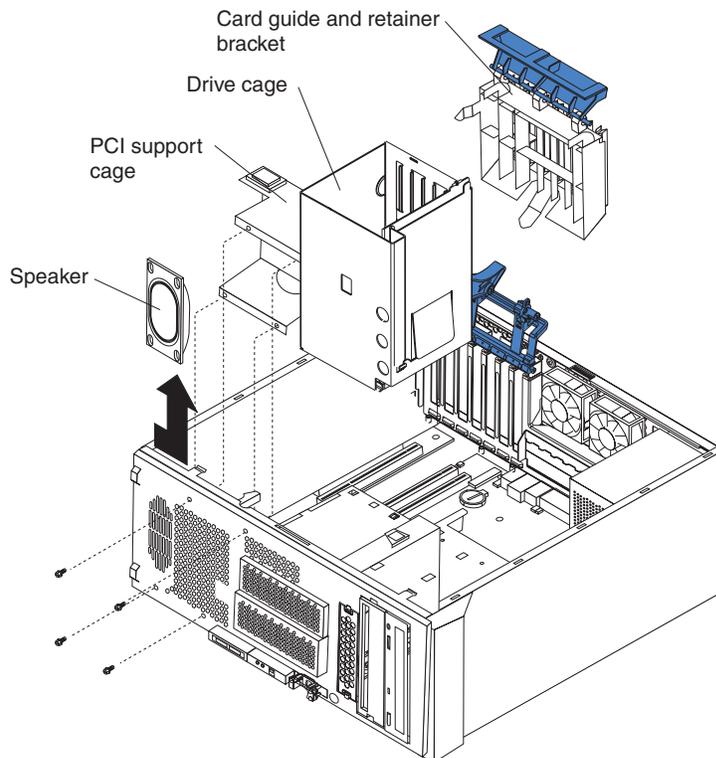


Figure 35. Speaker replacement

9. Remove the four screws that secure the drive cage and PCI support cage to the chassis and set the screws in a safe place.

**Important:** When the screws are removed, the drive cage is not secure.

10. Disengage the two alignment pins on the drive cage from the chassis and the PCI support cage.
11. Pull the drive cage away from the chassis and carefully set it on a clean work surface.

**Important:** When the drive cage is removed from the chassis, the PCI support cage is not secure.

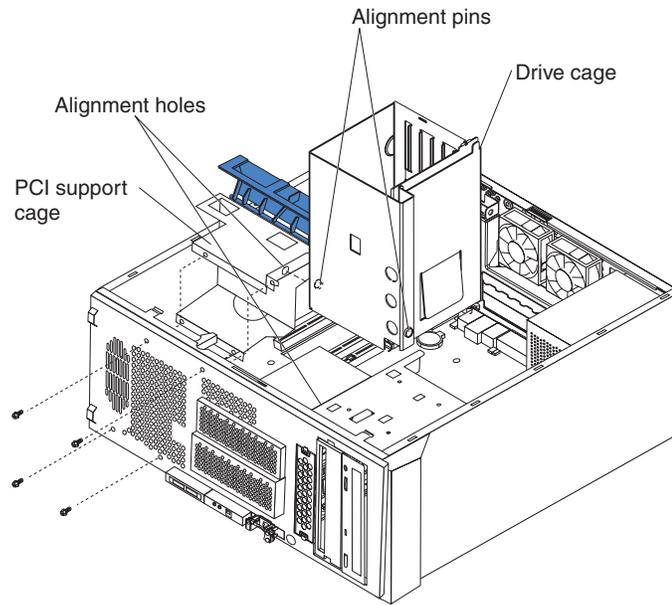
12. Remove the PCI support cage from the chassis and set it aside.
13. Disconnect the speaker cable from the system board.
14. Slide the speaker out of the retaining hooks on the chassis and remove it from the computer, making sure that the cable follows freely.

## Replacing the speaker

To install the speaker, complete the following steps.

**Note:** When installing the drive cage, it might be easier to insert the top alignment pin into the chassis first; then, slightly tilt the PCI support cage to insert the bottom alignment pin.

1. Touch the static-protective package containing the speaker to any unpainted metal surface on the computer. Then, remove the speaker from the package.
2. Slide the speaker down onto the retaining hooks on the chassis and connect the speaker cable to the system board.
3. Place the PCI support cage into the chassis. Make sure that the speaker, front fan, and intrusion switch cables are routed above the bottom plate of the PCI support cage.
4. Loosely attach the PCI support cage using the three screws closest to the bottom of the chassis (do not tighten them completely).
5. Install the drive cage in its upright position.
  - a. Position the drive cage above the side of the computer with the drive connectors pointing outward.
  - b. Insert the lower drive cage alignment pin into the corresponding hole in the PCI support cage.



- c. While gently applying pressure against the PCI support cage, slide the upper drive cage alignment pin into the housing, and rest the drive bay on the drive cage release tab.
6. Insert the last screw into the PCI support cage and tighten all four screws.
7. Reconnect any cables that you disconnected earlier.
8. Install any adapters that you removed.
9. Replace the air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.
  - b. Insert the small end of the air baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.
10. Replace the bezel (see “Replacing the bezel” on page 84).
11. Replace the support bracket (see “Replacing the support bracket” on page 83).
12. Replace the side cover (see “Replacing the side cover” on page 82).
13. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the fan assembly

To remove a rear fan, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.

**Note:** Removing a fan assembly might be easier if the computer is turned on its side.

3. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
4. Remove the air baffle.
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
5. Disconnect the fan cable from the system board, making a note of where the cable was connected for later installation.

**Note:** It is not necessary to remove the microprocessor board, if present. However to reach the fan cable on the system board, it might be easier to use an instrument such as a flat-blade screwdriver to assist with disconnecting and connecting the fan cable.

**Note:** The illustrations in this document might differ slightly from your hardware.

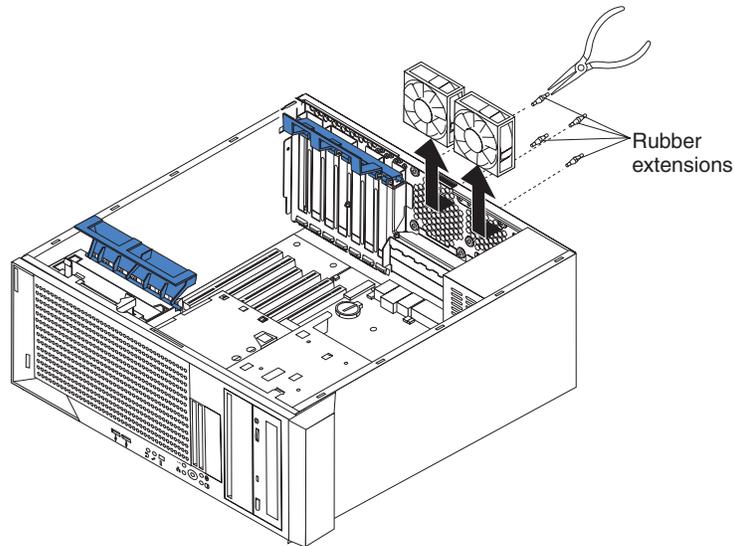


Figure 36. Fan assembly replacement

6. Pull the fan assembly slightly toward the interior of the chassis, stretching one of the rubber grommets.
7. From the outside of the chassis, grasp the grommet and stretch it; then, pull the grommet through either the hole in the chassis or the hole in the fan assembly.

**Note:** The grommets can also be removed by using side cutters.

8. Repeat steps 6 and 7 for the remaining three grommets.
9. Pull the fan up and out of the chassis.

## Replacing the fan assembly

To install the fan assembly, complete the following steps.

**Note:** Installing a fan assembly might be easier if the computer is turned on its side.

1. Touch the static-protective package containing the fan assembly to any unpainted metal surface on the computer. Then, remove the fan assembly from the package.
2. From inside of the chassis, align the fan assembly grommets with the holes in the chassis; then, pull the grommets through the holes in the chassis, using an instrument such as needle-nosed pliers.
3. If necessary, use an instrument such as a flat-blade screwdriver to assist in connecting the fan cable to the system board.
4. Replace the air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.
  - b. Insert the small end of the air baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.
5. Replace the support bracket (see “Replacing the support bracket” on page 83).
6. Replace the side cover (see “Replacing the side cover” on page 82).
7. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the control panel assembly

To remove the control panel assembly, complete the following steps.

**Note:** Removing the control panel assembly might be easier if the computer is turned on its side.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
4. Remove the bezel (see “Removing the bezel” on page 84).
5. Remove the air baffle.
  - a. Lift up on the large end of the air baffle until it releases.

- b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
6. Rotate the drive cage up until it locks in position.
7. Slide the hard disk drives out of the drive cage and set them in a safe place, disconnecting any drive cables that impede this procedure. Note the placement of the drives and cables for later reinstallation.
8. Disconnect the three control panel assembly cables from the system board.

**Note:** The illustrations in this document might differ slightly from your hardware.

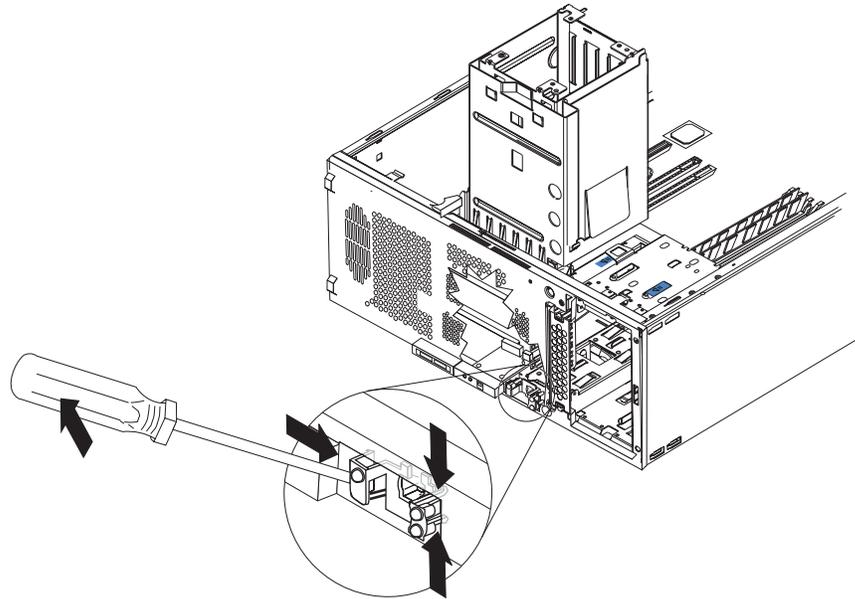


Figure 37. Control panel assembly replacement

9. From the outside of the chassis, use a flat-blade screwdriver to press up on the lower tab of the control panel assembly until the bottom of the assembly detaches from the chassis.
10. From inside the chassis, squeeze together the two latches at the top of the assembly until it detaches from the chassis; then, pull the control panel assembly out of the chassis through the front, making sure that the cables follow freely.

## Replacing the control panel assembly

To install the control panel assembly, complete the following steps:

1. Touch the static-protective package containing the control panel assembly to any unpainted metal surface on the computer. Then, remove the control panel assembly from the package.
2. From the front of the chassis:
  - a. Route the cables for the two lower LEDs (the system error LED and Ethernet activity LED) into the smaller, lower opening for the control panel.
  - b. Route the remaining cables through the larger opening for the control panel.
  - c. Slide the control panel assembly into the front panel opening until it snaps firmly into place.
  - d. Reconnect the three control panel assembly cables to the system board.

- e. Reinstall the hard disk drives that were removed from the drive cage.

**Note:** Be sure to install the drives in the same bay from which you removed them.

3. Press the drive cage release tab and pivot the drive cage into the chassis until it locks into place.
4. Replace the air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.
  - b. Insert the small end of the air baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.
5. Replace the front bezel (see “Replacing the bezel” on page 84).
6. Replace the support bracket (see “Replacing the support bracket” on page 83).
7. Replace the side cover (see “Replacing the side cover” on page 82).
8. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the audio card/FireWire assembly

To remove the audio card/FireWire assembly, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
4. Remove the bezel (see “Removing the bezel” on page 84).
5. Remove the air baffle.
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
6. Rotate the drive cage up.
7. Slide the hard disk drives out of the drive cage and set them in a safe place, disconnecting any drive cables that impede this procedure. Note the placement of the drives and cables for later reinstallation.
8. Disconnect the audio card/FireWire assembly cables from the system board.

**Note:** The illustrations in this document might differ slightly from your hardware.

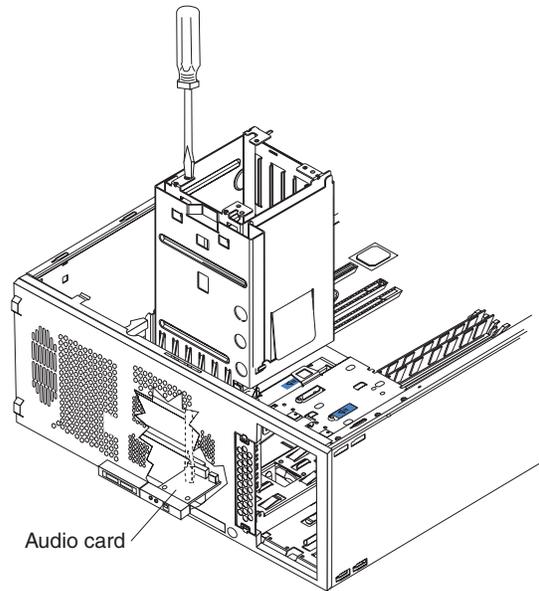


Figure 38. Audio card/FireWire assembly replacement

9. Insert a long-blade screwdriver through the empty drive cage and loosen the two screws that secure the audio card/FireWire assembly to the chassis.
10. Reach under the drive cage and remove the two screws; then, gently pull the audio card/FireWire assembly out of the computer.

## Replacing the audio card/FireWire assembly

To install the audio card/FireWire assembly, complete the following steps:

1. Touch the static-protective package containing the audio card/FireWire assembly to any unpainted metal surface on the computer. Then, remove the audio card/FireWire assembly from the package.
2. From the inside of the chassis, slide the connectors for the new assembly through the openings in the front panel.
3. Insert a long-blade screwdriver through the empty drive cage and tighten the two screws to secure the audio card/FireWire assembly to the chassis.
4. Reconnect the cables to the audio card/FireWire assembly to the system board.
5. Reinstall the hard disk drives you removed from the drive cage and reconnect the drive cables.

**Note:** Be sure to install the drives in the same bay from which you removed them.

6. Press the drive-cage release tab and rotate the drive back into the chassis.
7. Replace the air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.
  - b. Insert the small end of the air baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.

8. Replace the front bezel (see “Replacing the bezel” on page 84).
9. Replace the support bracket (see “Replacing the support bracket” on page 83).
10. Replace the side cover (see “Replacing the side cover” on page 82).
11. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the front USB connector assembly

To remove the front USB connector assembly, complete the following steps:

**Note:** Removing the front USB connector assembly might be easier if the computer is turned on its side.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
4. Remove the front bezel (see “Removing the bezel” on page 84).
5. Remove the air baffle.
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.
6. Rotate the drive cage up until it locks in position.
7. Slide the hard disk drives out of the drive cage and set them in a safe place, disconnecting any drive cables that impede this procedure. Note the placement of the drives and cables for later reinstallation.
8. Disconnect the cable for the front USB connector assembly from the system board.

**Note:** The illustrations in this document might differ slightly from your hardware.

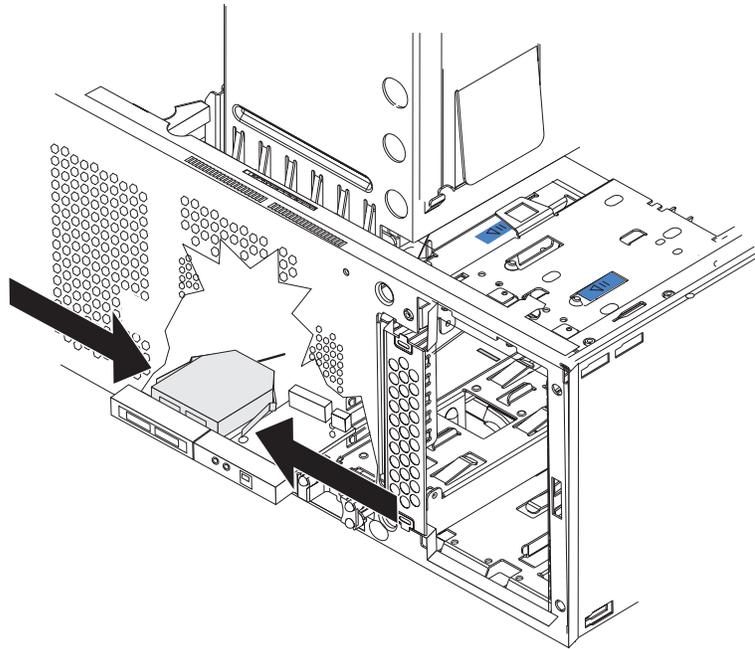


Figure 39. Front USB connector assembly replacement

9. From the inside of the chassis, place your fingers on the two tabs on the front USB connector assembly and squeeze them together to detach the assembly from the computer; then, pull the assembly toward the inside of the chassis and remove it.

## Replacing the front USB connector assembly

**Note:** When replacing the front USB connector assembly:

1. Route the cable so that it does not impede movement of the drive cage.
2. It might be helpful to use a flat-blade screw driver from the outside to help snap the connector into place.

To install the front USB connector assembly, complete the following steps:

1. Touch the static-protective package containing the front USB connector assembly to any unpainted metal surface on the computer. Then, remove the front USB connector assembly from the package.
2. From inside of the chassis, slide the front USB connector assembly forward through the front panel (while at the same time squeezing the two tabs on the sides of the assembly) until the assembly snaps into place on the chassis.
3. Route the front USB connector assembly cable and connect it to the system board.

4. Reinstall the hard disk drives that you remove earlier back into the drive cage and reconnect the drive cables.

**Note:** Be sure to install the drives in the same bay from which you removed them.

5. Press the drive cage release tab and rotate the drive cage back into the computer.
6. Replace the air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.
  - b. Insert the small end of the air baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.
7. Replace the front bezel (see “Replacing the bezel” on page 84).
8. Replace the support bracket (see “Replacing the support bracket” on page 83).
9. Replace the side cover (see “Replacing the side cover” on page 82).
10. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the power supply

To remove the power supply, complete the following steps:

**Note:** Removing the power supply might be easier if the computer is turned on its side.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).

**Note:** The illustrations in this document might differ slightly from your hardware.

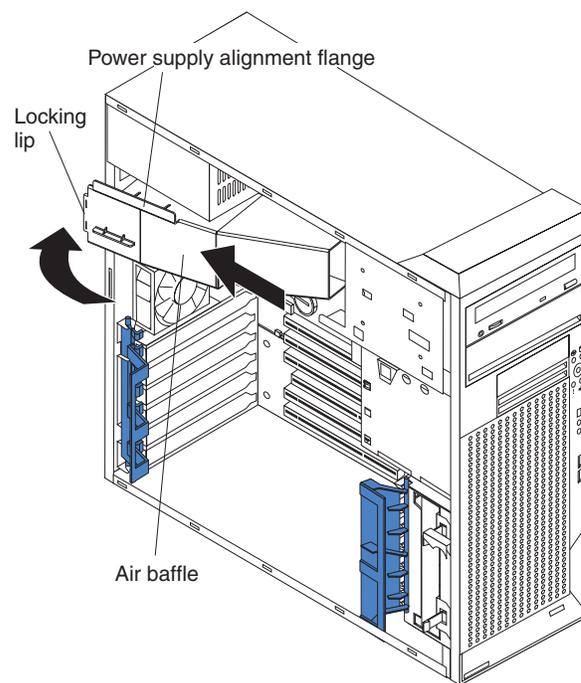


Figure 40. Removing the air baffle

4. Remove the air baffle (if present).
  - a. Lift up on the large end of the air baffle until it releases.
  - b. Slide the air baffle toward the front of the computer; then, lift it out of the computer.

**Statement 8:**



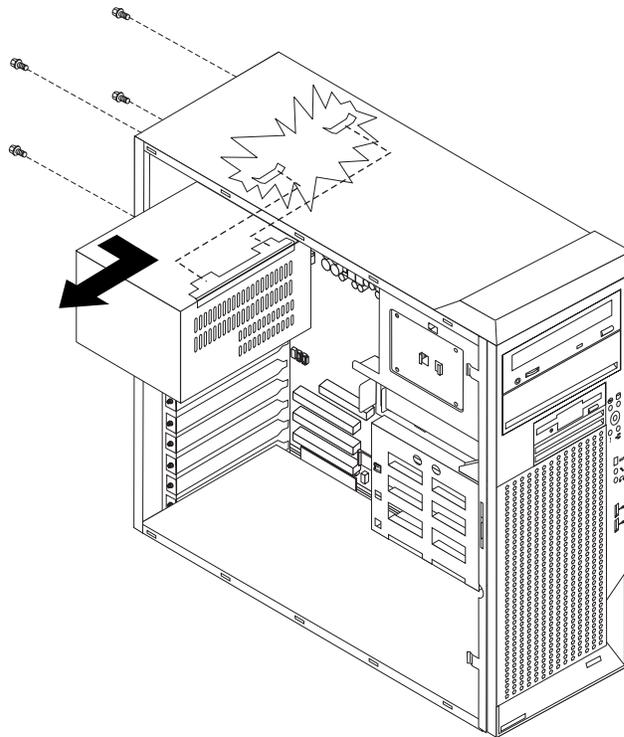
**CAUTION:**

Never remove the cover on a power supply or any part that has the following label attached.



**Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.**

5. Disconnect the internal power supply cables to the drives and the system board.
6. Remove the four screws that secure the power supply to the chassis.
7. Slide the power supply toward the front of the computer to disengaging the hooks from the slots on the chassis; then, lift it out of the computer.



*Figure 41. Removing the power supply*

## Replacing the power supply

1. Touch the static-protective package containing the power supply to any unpainted metal surface on the computer. Then, remove the power supply from the package.
2. Insert the power supply into the chassis and slide it forward to engage the hooks on the power supply to the slots on the chassis.

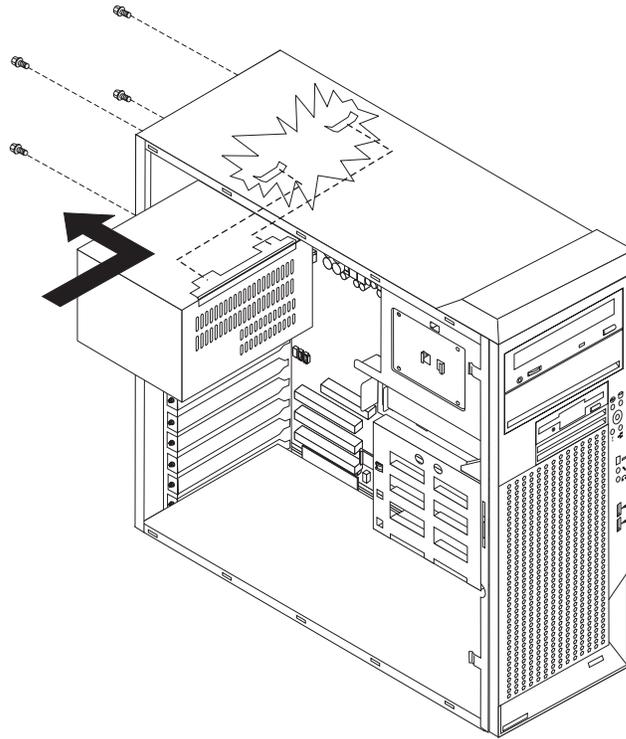


Figure 42. Replacing the power supply

3. Insert and tighten the four screws to secure the power supply to the chassis.
4. Reconnect the internal power supply cables to the drives and the system board.
5. Replace the air baffle.
  - a. Orient the air baffle as shown and align it with the side of the power supply.
  - b. Insert the small end of the air baffle into the computer toward the front of the computer.
  - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
  - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.
6. Replace the front bezel (see “Replacing the bezel” on page 84).
7. Replace the support bracket (see “Replacing the support bracket” on page 83).
8. Replace the side cover (see “Replacing the side cover” on page 82).
9. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

## Removing the system board

To remove the system board, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 79.
2. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
3. Turn the computer on its side so that it is lying flat, with the cover facing up.
4. Remove the cover and support bracket (see “Removing the side cover” on page 81 and “Removing the support bracket” on page 83).
5. Make a note of where the cables are connected, then disconnect all cables on the system board.
6. Rotate the drive cage up.

**Note:** The drive cage will lock in the open position. To lower the drive cage, press in on the blue flap on the side of the drive cage.

7. If there is a drive installed in bay 3, slide it out through the front far enough so that it will not impede the removal of the system board.
8. Remove any of the following components and put them in a safe, static-protective place:
  - Adapters (make a note of the slots from which you remove the adapters)
  - Air baffle, if present
  - Microprocessor board (for microprocessor 2), if present
  - Microprocessor 1 and fan-sink 1 assembly

**Important:**

- a. Fan sink 1 and fan sink 2 are not interchangeable. Installing fan sink 2 on microprocessor 1 will impede movement of the drive cage.
  - b. Be careful when handling the adhesive material on the microprocessor. If the adhesive material on the microprocessor will be reused, do not contaminate it. If replacement adhesive material is provided with the replacement part, be sure to remove all traces of existing adhesive material from the microprocessor before applying the new adhesive material.
- DIMMs for microprocessor 1 (see “Removing a DIMM” on page 99).

**Notes:**

- a. If any installed items impede your ability to easily access the system board, remove them before proceeding.
- b. The illustrations in this document might differ slightly from your hardware.

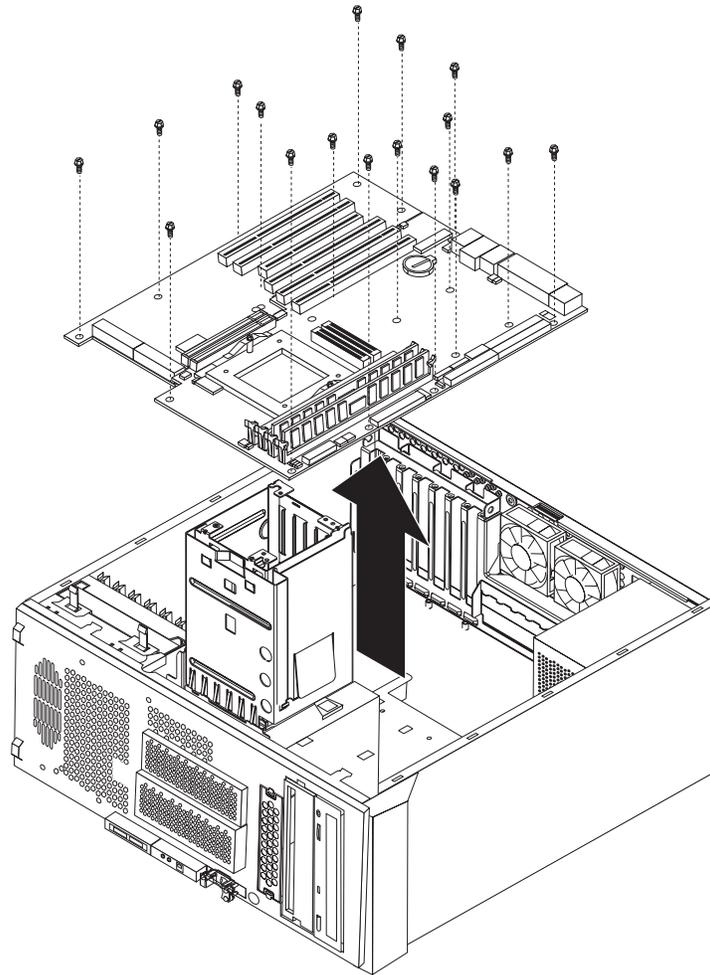


Figure 43. System board removal

9. Remove the four screws at the fan sink retention module for microprocessor one and set them in a safe place.
10. If the optional microprocessor board had not been installed, remove the six screws at the location where it would be installed and set them in a safe place.
11. Remove the remaining screws that holding the system board to the chassis and set them in a safe place.
12. While gently pushing in on the rear I/O panel from outside the chassis, slide the system board toward the front of the chassis until the rear I/O panel is free of the chassis.
13. Carefully lift the system board and extender out of the chassis.

**Attention:** When lifting the system board out of the chassis, make sure that you provide support to the main system board and the extender board.

## Replacing the system board

To install the system board, complete the following steps:

1. Touch the static-protective package containing the system board to any unpainted metal surface on the computer. Then, remove the system board from the package.
2. Position the system board in the computer so that the holes on the system board align with the holes in the chassis, and the I/O panel aligns with the I/O panel opening in the rear of the chassis.
3. While gently sliding the system board toward the rear of the chassis, press the rear I/O panel clips onto the flange surrounding the I/O panel opening in the chassis until the clips are fully seated on the opening flange.
4. If the microprocessor board was not installed previously, insert the six screws that were removed in step 10 on page 139 of the removal procedure.
5. Reconnect the cables that were disconnected earlier.
6. Install microprocessor 1.
7. If removed, install the fan sink retention module for microprocessor 1.
8. Install the microprocessor board for microprocessor 2.
9. Install the components that were removed in step 8 on page 138 of the removal procedure and reconnect all cables to the system board.

### Notes:

- a. If you are reinstalling the microprocessor board, be sure to do so after all of the necessary system board cables have been connected. Once the microprocessor board has been installed, it will be difficult to connect some of these cables.
  - b. When reinstalling the components in the computer, make sure that you route all cables so that they are not exposed to excessive strain.
  - c. Fan sink 1 and fan sink 2 are not interchangeable. Installing fan sink 2 on microprocessor 1 will impede movement of the drive cage.
  - d. Be careful when handling the adhesive material on the microprocessor. If you intend to reuse the adhesive material on the microprocessor, do not contaminate it. If replacement adhesive material is provided with the replacement part, be sure to remove all traces of existing adhesive material from the microprocessor before applying the new adhesive material.
10. If there is a drive partially installed in bay 3, push the drive completely into the drive bay.
  11. Rotate the drive cage into the computer.
  12. Replace the air baffle.
    - a. Orient the air baffle as shown and align it with the side of the power supply.
    - b. Insert the small end of the air baffle into the computer toward the front of the computer.
    - c. Lower the larger end of the air baffle until the side flange rests on the power supply.
    - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the air baffle until it clicks into place.
  13. Replace the front bezel (see “Replacing the bezel” on page 84).
  14. Replace the support bracket (see “Replacing the support bracket” on page 83).
  15. Replace the side cover (see “Replacing the side cover” on page 82).

16. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.
17. Update the computer with the latest level of firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image.



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## Chapter 5. Configuration information and instructions

This chapter provides information about updating the firmware and using the configuration utilities.

Detailed information about configuring the computer is in the IBM IntelliStation A Pro Type 6217 *User's Guide* on the IBM *IntelliStation Documentation CD*.

The latest information on these programs and the most recent device-driver files are available at [www.ibm.com/pc/support](http://www.ibm.com/pc/support).

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### Updating the firmware

The firmware for your computer is periodically updated and is available for download on the Web. Go to <http://www.ibm.com/pc/support/> to get the latest level of firmware, such as BIOS code, vital product data (VPD) code, and device drivers.

When replacing devices in the computer, you might have to either update the computer with the latest version of the firmware stored on the system board or restore the pre-existing firmware from a diskette or CD image. The firmware code is stored as follows:

- BIOS code and the diagnostics programs are stored in ROM on the system board.
- Ethernet firmware is stored in ROM on the Ethernet controller on the system board.
- Major components contain VPD code. You can select to update the VPD code during the BIOS code update procedure.

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### Configuring the computer

The following configuration programs are available to configure your computer:

- Configuration/Setup Utility program
- Broadcom NetXtreme Gigabit Ethernet Boot Agent
- Adaptec® HostRAID™ configuration programs
  - Adaptec RAID Configuration Utility programs (for Serial ATA RAID)
  - SCSISelect Utility program (for SCSI RAID)
- ServeRAID Manager
- Ethernet controller configuration
- SCSISelect Utility program (some SCSI models)

This section contains basic information about these programs. For detailed information about these programs, see “Configuring the computer” in the *User's Guide* on the IBM *IntelliStation Documentation CD*.

### Using the Configuration/Setup Utility program

Use the Configuration/Setup Utility program to:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords

- Set the startup characteristics of the computer and the order of startup devices
- View and clear error logs
- Change interrupt request (IRQ) settings
- Enable USB legacy keyboard and mouse support
- Resolve configuration conflicts

Go to <http://www.ibm.com/pc/support/> to get the latest version of the BIOS code.

## Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the computer and watch the monitor screen. If the computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use LEDs are turned off, and restart the computer.
2. When the message Press F1 for Configuration/Setup appears on the screen during startup, press F1. (This prompt appears on the screen for only a few seconds. You must press F1 quickly.) If you have set both a user password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu.
3. Follow the instructions on the screen.

## Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. You can press F1 to display help information for a selected menu item. Depending on the version of the BIOS code in your computer, some menu choices might differ slightly from these descriptions.

- **System Summary**

Select this choice to view configuration information, including the type, speed, and cache size of the microprocessor and the amount of installed memory. When you make configuration changes through other options in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary. This choice is on the full and limited Configuration/Setup Utility menus.

- **System Information**

Select this choice to view the machine type and model of the computer, the serial number, the system board identifier, and the revision level and issue date of the BIOS code stored in the electrically erasable programmable ROM (EEPROM). When you make changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information. This choice is on the full Configuration/Setup Utility menu only.

- **Devices and I/O Ports**

Select this choice to set keyboard operating characteristics such as keyboard speed or numlock state and to enable or disable the PS/2 mouse, diskette controller, integrated SCSI controller, serial ATA controller, Ethernet controllers, legacy diskette drive, 1394 (FireWire) and standard ports (such as serial and parallel). **Enable** is the default setting for all controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the integrated SCSI controller and no SCSI adapter is installed, the computer will have no SCSI capability. If you disable the integrated Ethernet controller and no Ethernet adapter is installed, the computer will have no Ethernet capability.

**Note:** To use a diskette on your computer, you must add a diskette drive to the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Devices and I/O Ports** → **Disable Legacy Diskette A**).

This choice is on the full Configuration/Setup Utility menu only.

- **Date and Time**

Select this choice to set the date and time in the computer, in 24-hour format (*hour:minute:second*).

This choice is on the Configuration/Setup Utility menu only.

- **Startup**

Select this choice to view or change the start options. Changes in the start options take effect when you start the computer.

The startup sequence specifies the order in which the computer checks devices to find a boot record. The computer starts from the first boot record that it finds.

**Note:** You can enable the computer to start from the network by enabling the BroadCom NetXtreme Gigabit Ethernet Boot Agent to configure the network as the first startable device in the startup sequence.

You can select to run POST in the quick mode or display the diagnostic screen.

This choice is on the full Configuration/Setup Utility menu only.

- **Advanced Setup**

Select this choice to change values for advanced hardware features, such as PCI configuration and hardware monitor.

**Important:** the computer might malfunction if these options are incorrectly configured. Follow the instructions on the screen carefully.

This choice is on the full Configuration/Setup Utility menu only.

- **Installed OS**

Select this choice to specify the operating system on the computer.

- **Reset Configuration Data**

Select this choice to clear the extended system configuration data (ESCD) area.

- **4 GB Memory Hole Adjust**

Select this choice to specify how the memory hole size will be determined.

- **Multiprocessor Specification**

Select this choice to set the multiprocessor specification revision level. Some operating systems require version 1.1 for compatibility.

- **MP table uses PCI entries**

Select this choice to configure the multiprocessor table with PCI-interrupt entries.

- **Fan Speed Control**

Select this choice to view or change the fan-speed control setting. Disabling the built-in fan speed control forces the computer fans to full-speed at all times.

- **Chipset Configuration**

**Attention:** Do not make changes to the Chipset Feature unless directed to do so by an IBM authorized service representative.

Select this choice to modify settings that control features of the core chip set on the system board.

- **PCI configuration**

Select this choice to view the system resources that are used by the installed PCI or PCI-X devices.

- **Hardware Monitor**

Select this choice to display the computer temperature and voltage status, and fan speeds.

- **POST Error Log**

Select this choice to view the three most recent error codes and messages that were generated during POST, and to view the DMI log. Select **Clear error log** to clear the POST error log.

- **System Security**

Select this choice to set a user password or a supervisor (administrator) password. See “Passwords” for more information.

- **Power Management**

Select this choice to enable or disable system power settings, including automatic power-on settings such as Wake on LAN®.

- **Save Settings**

Select this choice to save the changes you have made in the settings.

- **Restore Settings**

Select this choice to cancel the changes you have made in the settings and restore the previous settings.

- **Load Default Settings**

Select this choice to cancel the changes you have made in the settings and restore the factory settings.

- **Exit Setup**

Select this choice to exit from the Configuration/Setup Utility program. If you have not saved the changes you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

**Note:** Always reset the Configuration/Setup Utility program to the default values (select **Load Default Settings**) after updating the BIOS code.

## Passwords

From the **System Security** choice, you can set, change, and delete a user (power-on) password and an administrator password. The **System Security** choice is on the full Configuration/Setup menu only.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the user password or the administrator password.

If you set both a user password and an administrator password, you can type either password at the password prompt that appears as you start the computer. However, if you want to change the settings in the Configuration/Setup Utility program, you must type the administrator password to access the full Configuration/Setup Utility menu. If you type the user password, you have access to only the limited Configuration/Setup Utility menu.

Keep a record of your password in a secure place. If you forget the user or administrator password, you can regain access to the computer through one of the following methods:

- If you have forgotten the user password and an administrator password is set, type the administrator password at the power-on prompt. Start the Configuration/Setup Utility program and change the user password.
- Clear CMOS settings by changing the position of the CMOS recovery jumper (JP1). See “Erasing a lost or forgotten password (clearing CMOS)” on page 64 for instructions.
- Remove the battery and then reinstall the battery (see “Removing the battery” on page 103 and “Replacing the battery” on page 103).

## Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS code in your computer. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in your startup sequence. You enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program.

To enable the Broadcom NetXtreme Gigabit Ethernet boot agent, complete the following steps:

1. From the Configuration/Setup Utility main menu, select **Devices and I/O Ports** and press Enter.
2. Select **System Board Ethernet PXE/DHCP** and use the Right Arrow (→) key to set it to **Enabled**.
3. Select **Save Settings** and press Enter.

## Using the Adaptec HostRAID configuration programs

Use the Adaptec RAID Configuration Utility programs and SCSISelect Utility (also referred to as IBM ServeRAID-7e) to add RAID levels 0 and 1 functionality to the integrated Serial ATA controller and the integrated SCSI controller. Be sure to use these programs as described in this document. Use these programs to:

- Configure a redundant array of independent disks (RAID) array
- View or change your RAID configuration and associated devices

Consider the following information when using the Adaptec RAID Configuration Utility programs and SCSISelect Utility program to configure and manage arrays:

- The integrated SCSI controller with integrated SCSI RAID (SCSI models) and the integrated Serial ATA controller (SATA models) with integrated SATA RAID supports RAID levels 0 and 1 with the option of having a hot-spare drive. Installing an optional ServeRAID controller provides additional RAID levels.
- Hard disk drive capacities affect how you create arrays. Drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- To update the firmware and BIOS code for an optional ServeRAID controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.
- If you install a different type of RAID controller in your computer, use the configuration method described in the instructions that come with that RAID controller to view or change SCSI settings for attached devices.

## Using the Adaptec RAID Configuration Utility programs (for Serial ATA RAID)

Use the Array Configuration Utility within the Adaptec RAID Configuration Utility programs to add RAID levels 0 and 1 functionality to the integrated Serial ATA (SATA) controller. This utility is a part of the BIOS code in your computer. For additional information about using the Adaptec RAID Configuration Utility programs, see the documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD*. If this CD did not come with your computer, you can download the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* from <http://www.ibm.com/pc/support/>.

The integrated Serial ATA RAID feature (SATA HostRAID) comes disabled by default. You must enable the SATA RAID feature and install the device drivers before you can use it. The SATA RAID feature configuration utilities, device drivers, and information are available on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD*.

**Enabling the Serial ATA HostRAID feature:** To enable the SATA RAID feature, complete the following steps:

1. Turn on the computer and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1. If you have set a supervisor password, you are prompted to type the password.
3. Select **Advanced Setup**.
4. Scroll down and select **HostRAID**.
5. Use the left and right arrow keys to select **SATA**.
6. Press Esc three times; then, select **Yes** to save your changes.

**Using the Serial ATA HostRAID feature:** The instructions in this section are for using the Array Configuration Utility program to access and perform an initial level-1 RAID configuration. If you install a RAID adapter in your computer, use the configuration method described in the instructions that come with that adapter to view or change settings for the attached devices.

See the documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about using the Array Configuration Utility program to create, configure, and manage arrays. If this CD did not come with your computer, you can download the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* from <http://www.ibm.com/pc/support/>.

**Configuring the controller:** To use the Array Configuration Utility program to configure a level-1 RAID array, complete the following steps:

1. Turn on the computer and watch the monitor screen.
2. When the message Press <CTRL><<A> for Adaptec RAID Configuration Utility appears, press Ctrl+A.
3. Select **Array Configuration Utility (ACU)**.
4. Select **Create Array**.
5. From the list of ready drives, select the two drives that you want to group into the array.
6. Select **RAID-1** when asked to select the RAID level.
7. (optional) Type an identifier for the array.
8. Select **Quick Int** when asked for the array build method.

9. Follow the instructions on the screen to complete the configuration, and select **Done** to exit.
10. Restart the computer.

*Viewing the configuration:* To view information about the Serial ATA controller, complete the following steps:

1. Start the Array Configuration Utility.
2. From the Array Configuration Utility window, select **Manage Arrays**.
3. Select an array and press Enter.
4. Press Esc to exit the program.

### **Using the SCSISelect Utility program (for SCSI RAID)**

Use the SCSISelect Utility to add RAID levels 0 and 1 functionality to the integrated SCSI controller. This utility is part of the BIOS code in your computer.

The integrated SCSI RAID feature (SCSI HostRAID) comes disabled by default. You must enable the SCSI RAID feature and install the device drivers before you can use it. The SCSI RAID configuration utilities, device drivers, and information are available on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD*. If this CD did not come with your computer, you can download the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* from <http://www.ibm.com/pc/support/>.

**Enabling the SCSI HostRAID feature:** To enable the SCSI RAID feature, complete the following steps:

1. Turn on the computer and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1. If you have set a supervisor password, you are prompted to type the password.
3. Select **Advanced Setup**.
4. Scroll down and select **HostRAID**.
5. Use the left and right arrow keys to select **SCSI**.
6. Press Esc three times; then, select **Yes** to save your changes.
7. When the message Press <CTRL><A> for SCSISelect Utility appears, press Ctrl+A. If you have set a supervisor password, you are prompted to type the password.
8. Use the arrow keys to select the channel for which you want to change settings and press Enter.
9. Select **Configure/View SCSI Controller Setting**; then, select **HostRAID**.
10. Select **Enabled**.
11. Press Esc; then, select **Yes** to save the changes.

**Using the SCSI HostRAID feature:** The instructions in this section describe how to access the SCSI RAID feature from the SCSISelect Utility program and perform an initial RAID level-1 configuration on your computer. If you install a RAID adapter in your computer, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

See the documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about how to use the SCSI HostRAID feature.

*Configuring the controller:* To use the SCSI HostRAID feature to configure a level-1 RAID array, complete the following steps:

1. From the SCSISelect main menu, select **Configure/View HostRAID Settings**.

2. From the list of ready drives, type C to create an array.
3. Select **RAID-1** when asked to select the RAID type.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Select **Create new RAID-1**.
6. Type an identifier for the array.
7. Select **Yes** to create the array.
8. Press Esc to exit the utility.
9. Restart the computer.

*Viewing the configuration:* You can use the SCSISelect Utility program to view information about the integrated SCSI controller. From the list of available arrays, select an array and press Enter. Press Esc to exit the utility.

## Using ServeRAID Manager

Use the ServeRAID Manager program to:

- Configure arrays
- View your RAID configuration and associated devices
- Monitor operation of your RAID controllers

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the SCSI controller and perform an initial RAID configuration on your computer, you must run ServeRAID Manager in a Startable-CD mode, as described in the instructions in this section. If you install a RAID adapter in your computer, use the configuration method described in the instructions that come with the adapter to view or change SCSI settings for attached devices.

See the ServeRAID documentation on the **IBM ServeRAID Support** CD or additional information about RAID technology and instructions for using ServeRAID Manager to configure your SCSI controller. Additional information about ServeRAID Manager is also available from the **Help** menu. For information about a specific object in the ServeRAID Manager tree, select the object and click **Actions** → **Hints and tips**.

### Configuring the controller

By running ServeRAID Manager in Startable CD mode, you can configure the controller before you install your operating system. The information in this section assumes that you are running ServeRAID Manager in Startable CD mode.

To run the ServeRAID Manager program in startable-CD mode, turn on the computer; then, insert the *IBM ServeRAID Support* CD into the CD-ROM drive. If the ServeRAID Manager program detects an unconfigured controller and ready drives, the program automatically starts the Configuration wizard.

In the Configuration wizard, you can select *Express configuration* or *Custom configuration*. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array and creating a RAID level-1 logical drive. If you select custom configuration, you can select the two physical drives that you want to group into an array and create a hot-spare drive.

**Using express configuration:** To use Express configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller that you want to configure.
2. From the toolbar, click **Create**.
3. Click **Express configuration**.
4. Click **Next**. The “Configuration summary” window opens.
5. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Modify arrays** or **Modify logical drives**.

**Note:** Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system.

6. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
7. Exit from the ServeRAID Manager program and remove the CD from the CD-ROM drive.
8. Restart the computer.

**Using custom configuration:** To use custom configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller that you want to configure.
2. From the toolbar, click **Create**.
3. Click **Custom configuration**.
4. Click **Next**. The “Create arrays” window opens.
5. Click the appropriate tab in the right pane; then, from the list of ready drives, select the two drives you want to move to the array.
6. Click the icon to add the drives to the array.
7. If you want to configure a hot-spare drive, complete the following steps:
  - a. Click the **Spares** tab.
  - b. Select the physical drive you want to designate as the hot-spare drive; then, click the icon to add the drive.
8. Click **Next**. The “Configuration summary” window opens.
9. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Back**.
10. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
11. Exit from the ServeRAID Manager program, and remove the CD from the CD-ROM drive.
12. Restart the computer.

### Viewing the configuration

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

To display available actions for an item, click the item in the ServeRAID Manager tree and click **Actions**.

## Configuring the Gigabit Ethernet controller

The Ethernet controller is integrated on the system board. It provides an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet port in the computer supports auto-negotiation, the controller detects the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operates at that rate and mode.

You do not have to set any jumpers or configure the controller. However, you must install a device driver to enable the operating system to address the controller. For device drivers and information about configuring the Gigabit Ethernet controller, go to <http://www.ibm.com/pc/support/>

## Using the SCSISelect Utility program (some SCSI models)

Use the SCSISelect Utility program to configure SCSI devices.

### Starting the SCSISelect Utility program

To start the SCSISelect utility program, complete the following steps:

1. Turn on the computer.
2. When the prompt <<< Press <CTRL><A> for SCSISelect Utility! >>> prompt appears, press Ctrl+A. If you have set an administrator password, you are prompted to type the password.
3. Use the arrow keys to select a choice for which you want to change settings, and press Enter.
4. When the prompt Would you like to configure the SCSI controller or run the SCSI disk utility? appears, make your selection and press Enter.
5. Use the arrow keys to select a choice from the menu.
6. Follow the instructions on the screen to change the settings of the selected items, and press Enter.

### SCSISelect menu choices

The following choices are on the SCSISelect Utility menu:

- **Configure/View SCSI Controller Settings**

Select this choice to view or change SCSI controller settings. To reset the SCSI controller to its default values, press F6 and follow the instructions on the screen.

You can view or change the following controller settings:

- **SCSI Controller ID**

Select this choice to view the SCSI controller ID, which is typically 7.

- **SCSI Controller Termination**

This choice is set to **Enabled** and cannot be changed.

- **Boot Device Configuration**

Select this choice to configure bootable-device parameters. You must know the SCSI ID of the device that you want to configure.

- **SCSI Device Configuration**

Select this choice to configure SCSI-device parameters. You must know the SCSI ID of the device that you want to configure.

The sync transfer rate is the transfer rate for Ultra SCSI devices. For Ultra3 SCSI LVD devices, the maximum rate is 160 MBps; for Ultra2 SCSI LVD devices, 80 MBps; for Fast SCSI devices, 20 MBps.

– **Advanced Configuration**

Select this choice to view or change the settings for advanced configuration options.

• **SCSI Disk Utilities**

Select this choice to view the SCSI IDs assignments or to format a SCSI device. Select a device from the list and read the instructions on the screen carefully before making a selection.

If you press Ctrl+A before a selected drive is ready, an Unexpected SCSI Command Failure screen might appear. Restart the computer and watch the SCSISelect messages as each drive spins up. When the selected drive is ready, press Ctrl+A.



---

## Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system or optional device, and whom to call for service, if it is necessary.

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### Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* or *Problem Determination and Service Guide* on the IBM Documentation CD that comes with your system.

**Note:** For some IntelliStation models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.

- Go to the IBM support Web site at <http://www.ibm.com/servers/eserver/support/xseries/index.html> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

---

### Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/servers/eserver/support/xseries/index.html> and follow the instructions. Also, some documents are available through the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

---

## Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM systems, optional devices, services, and support. The address for IBM System x and xSeries information is <http://www.ibm.com/systems/x/>. The address for IBM IntelliStation information is <http://www.ibm.com/intellistation/>.

You can find service information for IBM systems and optional devices at <http://www.ibm.com/servers/eserver/support/xseries/index.html>.

---

## Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with System x and xSeries servers, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, see <http://www.ibm.com/services/>, or see <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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## Hardware service and support

You can receive hardware service through IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. See <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

---

## Appendix B. Notices

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## Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

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Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

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## Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility.

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and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

In the Netherlands, the following applies.



For Taiwan: Please recycle batteries.



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## Electronic emission notices (Class A)

**Important:** The notices in this section apply to computer models 4Bx, 4Cx, 4Dx, 4Fx, 4Gx, 82x, 83x, 84x, 85x, 8Gx, ACI, DBx, DCx, DDx, CTO, H2x, H3x, H5x, and MCI (where x can be any letter from A-Z).

### Federal Communications Commission (FCC) statement

**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

#### Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

### Australia and New Zealand Class A statement

**Attention:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

### United Kingdom telecommunications safety requirement

#### Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

## European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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### Federal Communications Commission (FCC) statement

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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Responsible party:

International Business Machines Corporation  
New Orchard Road  
Armonk, NY 10504  
Telephone: 1-919-543-2193



Tested To Comply  
With FCC Standards

FOR HOME OR OFFICE USE

### Industry Canada Class B emission compliance statement

This Class B digital apparatus complies with Canadian ICES-003.

### Avis de conformité à la réglementation d'Industrie Canada

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