IBM IntelliStation M Pro Type 6218

IBM

Problem Determination and Service Guide

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IBM

Note:

Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 137.

Fourth Edition (August 2006)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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 pečítaje 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 trained service technicians

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 70.
   - 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 computer 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.

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

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)
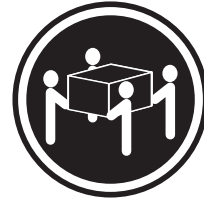
CAUTION:
Use safe practices when lifting.

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.

2

1

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.

Important:

This computer is suitable for use on an IT powers distribution system, whose maximum phase to phase voltage is 240 V under any distribution fault condition.

Chapter 1. Introduction

This *Problem Determination and Service Guide* contains information to help you solve problems that might occur in your IBM® IntelliStation® M Pro Type 6218 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 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.

Related documentation

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

- *Installation Guide*

  This printed document contains instructions for setting up the computer. This document is also in Portable Document Format (PDF) on the IBM *IntelliStation Documentation* CD.

- *User's Guide*

  This document is in PDF on the IBM *IntelliStation Documentation* CD. It contains general information about the computer, including information about features, and how to configure the computer. It also contains detailed instructions for installing, removing, and connecting optional devices that the computer supports.

- *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 getting 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 M Pro Type 6218 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 that is not included in the server documentation. 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, under the **Learn** category, click **Publications**.
3. On the Publications page, in the **Brand** field, select **IntelliStation**.
4. In the **Family** field, select **IntelliStation M Pro**.
5. In the **Type** field, select **6218**.
6. Click **Continue** to display the documents that are available for the computer.

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.

Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor.

Table 1. Features and specifications

Microprocessor:
- Intel® Pentium® processor
- 2 MB Level-2 cache
- 800 MHz front-side bus (FSB)

Memory:
- Minimum: 1 GB
- Maximum: 8 GB
- Type: PC2-4200, dual-data-rate 2 (DDR2) un-buffered error correcting code (ECC)
- Connectors: four dual inline memory module (DIMM) connectors

Internal drives:
- Diskette: 1.44 MB (two mode) (optional)
- Hard disk drive: SATA, SCSI, or SAS
- One of the following drives:
  - DVD/CD-RW combo: IDE
  - CD-RW: IDE

Expansion bays:
- One slim-high 3.5-inch external drive bay, (optional)
- Two half-high 5.25-inch bays (optical drive installed in one bay)
- Two slim-high 3.5-inch internal drive bays (one hard disk drive installed)

PCI expansion slots:
- One PCI Express x1 slot
- One PCI Express x8 slot (x4 electrical)
- One PCI Express x16 slot (support x16 video cards only)
- One 33 MHz/32-bit PCI slot

Power supply:
One 400-watt (115-230 V ac)

Cooling:
- One speed-controlled fan and one power supply fan

Integrated functions:
- Broadcom 5721 10/100/1000 Ethernet controller with RJ-45 Ethernet connector
- Single-channel SCSI provided by a mini-PCI card
- Two serial connectors
- One parallel connector
- Three-port serial ATA controller
- Two IEEE 1394 (FireWire) connectors (four-pin on front, six-pin on rear)
- Eight Universal Serial Bus (USB) connectors (two on front and six on rear)
- Keyboard connector
- Mouse connector
- Audio connectors
  - Line out (front and rear)
  - Mic (front)
  - Line in (rear)
- Single-channel IDE controller

Video adapter: (depending on the model)
- 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)
- ATI FireGL V3100 (DVI-I), PCI Express x16, with 128 MB DDR SDRAM video memory with dual DVI-I and VGA connectors
- NVIDIA FX 1400 (DVI-I), PCI Express x16, with 128 MB DDR SDRAM video memory with dual DVI-I connectors
- ATI FireGL V7100 (DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM video memory with dual DVI-I connectors
- 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

Electrical input:
- Sine-wave input (50 or 60 Hz) required
- Input voltage and frequency ranges automatically selected
- Input voltage low range:
  - Minimum: 90 V ac
  - Maximum: 137 V ac
- Input voltage high range:
  - Minimum: 180 V ac
  - Maximum: 265 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.12 kVA
  - Maximum: 0.58 kVA

Heat output:
Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 433 Btu (127 watts) per hour
- Maximum configuration: 1948 Btu (571 watts) per hour

Environment:
- Air temperature:
  - Computer on: 10° to 35°C (50° to 95°F) Altitude: 0 to 2134 m (7000 ft)
  - Computer off: -40° to +60°C (-40° to 140°F) Maximum altitude: 2133 m (7000 ft)
- Humidity (operating and storage): 8% to 80%

Acoustical noise emissions:
- Sound power, idle: 4.3 bel
- Sound power, operating: 4.9 bel

Size:
- Height: 435 mm (17.12 in.)
- Depth: 445 mm (17.5 in.)
- Width: 178 mm (7 in.)
- Weight: 10.5 kg (23 lb) to 13.5 kg (30 lb) depending upon configuration

Controls, LEDs, and connectors

Figure 1 shows the controls, LEDs, and front connectors on the IntelliStation M Pro Type 6218 computer. See the *User's Guide* for an illustration and description of the input/output connectors on the rear of the computer.

CD or DVD drive activity LED

CD or DVD eject button

AC power LED

Power supply error LED

Power-control button

Power-on LED

Ethernet activity LED

Diskette drive activity LED (optional)

Diskette-eject button (optional)

System error LED

Hard disk drive activity LED

IEEE 1394 (Firewire) connector

USB connector

USB connector

Microphone connector

Line out connector
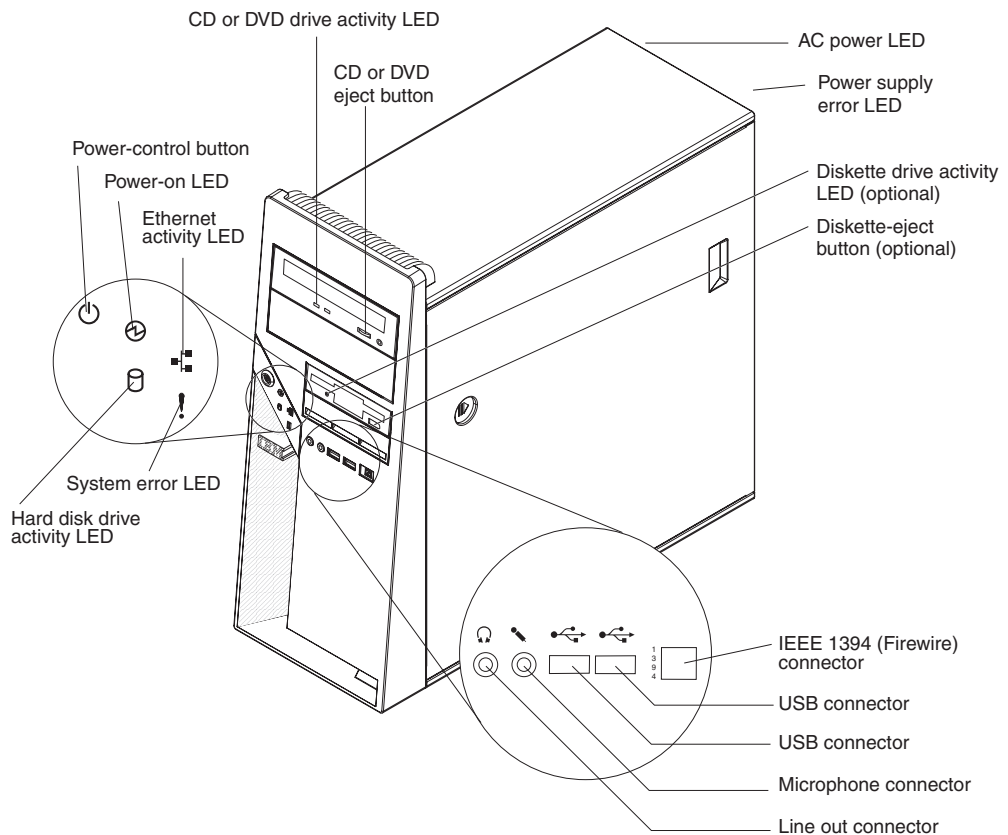
Figure 1. Controls, LEDs, and indicators

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

CD or DVD drive eject button
> Press this button to insert or remove a CD or DVD.

AC power LED
> When this green LED is lit, it indicates that the computer is connected to an ac power source. This LED is on the rear of the computer.

Power-supply error LED
> When this amber LED is lit, it indicates that a power-supply error has occurred. This LED is on the rear of the computer.

Diskette drive activity LED
> When this LED is lit, it indicates that the diskette drive is in use.

Diskette-eject button
> Press this button to release a diskette from the diskette drive.

IEEE 1394 (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.

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

Microphone 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.

System-error LED
>   When this LED is lit, it indicates that a system error has occurred. An LED on the system board might also be lit to help isolate the error. If the system board LED is not lit, check the error log.

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

Ethernet 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.

Power-on LED
>   When this LED is lit, it indicates that the computer is turned on.

Power-control button
>   Press this button to turn the computer on or off.

Ethernet link status LED
>   When this LED is flickering, it indicates that there is an active connection on the Ethernet connector. This LED is on the rear of the computer.

Internal LEDs, connectors, and jumpers

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

System-board option connectors

Figure 2 shows the option connectors on the system board.
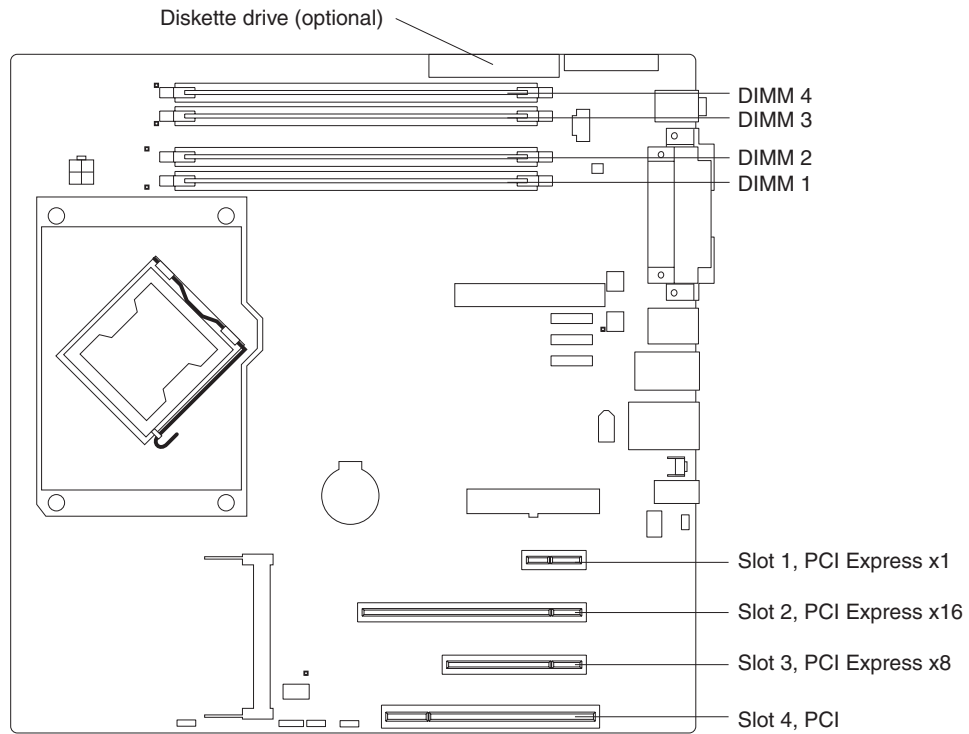
Figure 2. System-board option connectors

System-board internal connectors

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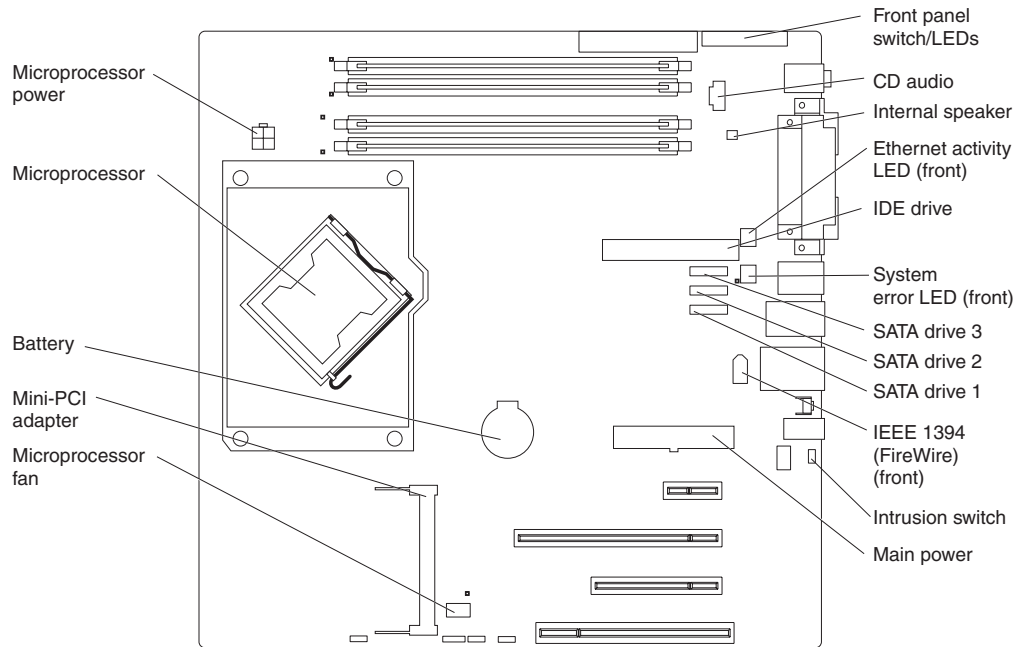
Figure 3. System-board internal connectors

System-board external connectors

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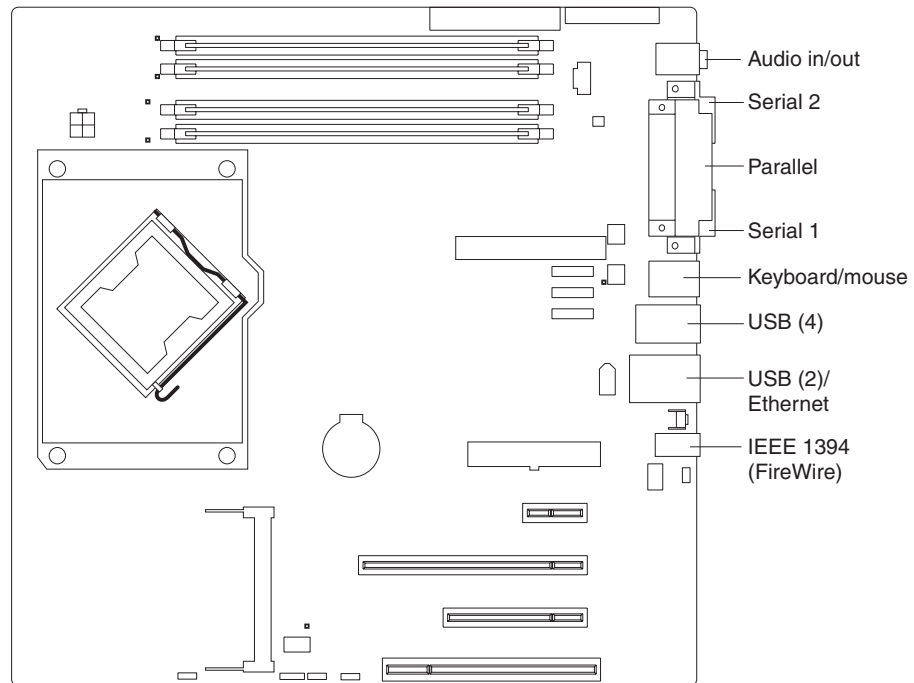
Figure 4. System-board external connectors

System-board LEDs

Figure 5 shows the system-board LEDs.
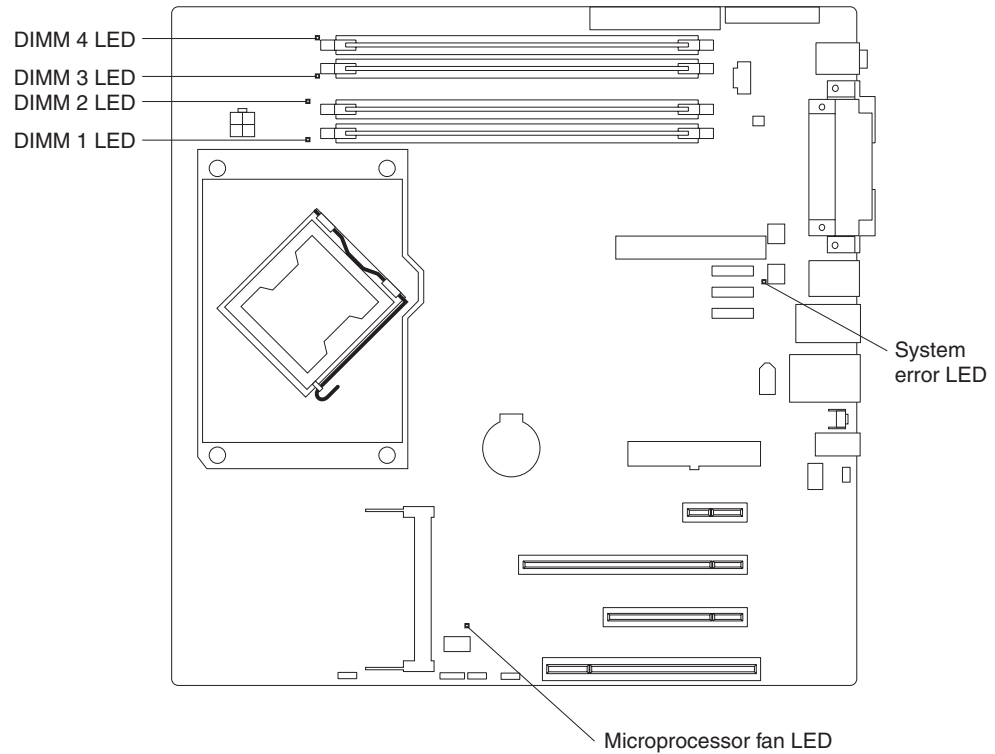
Figure 5. System-board LEDs

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 error LEDs" on page 48.

System-board jumpers

Figure 6 shows the jumper blocks on the system board.

IEEE 1394 (FireWire) enable / disable jumper

Default   Disable

Boot Block Jumper (J1)

Default (pins 1 and 2))   Recover (no jumper)

Clear CMOS Jumper (JBAT1)

Default   Recover
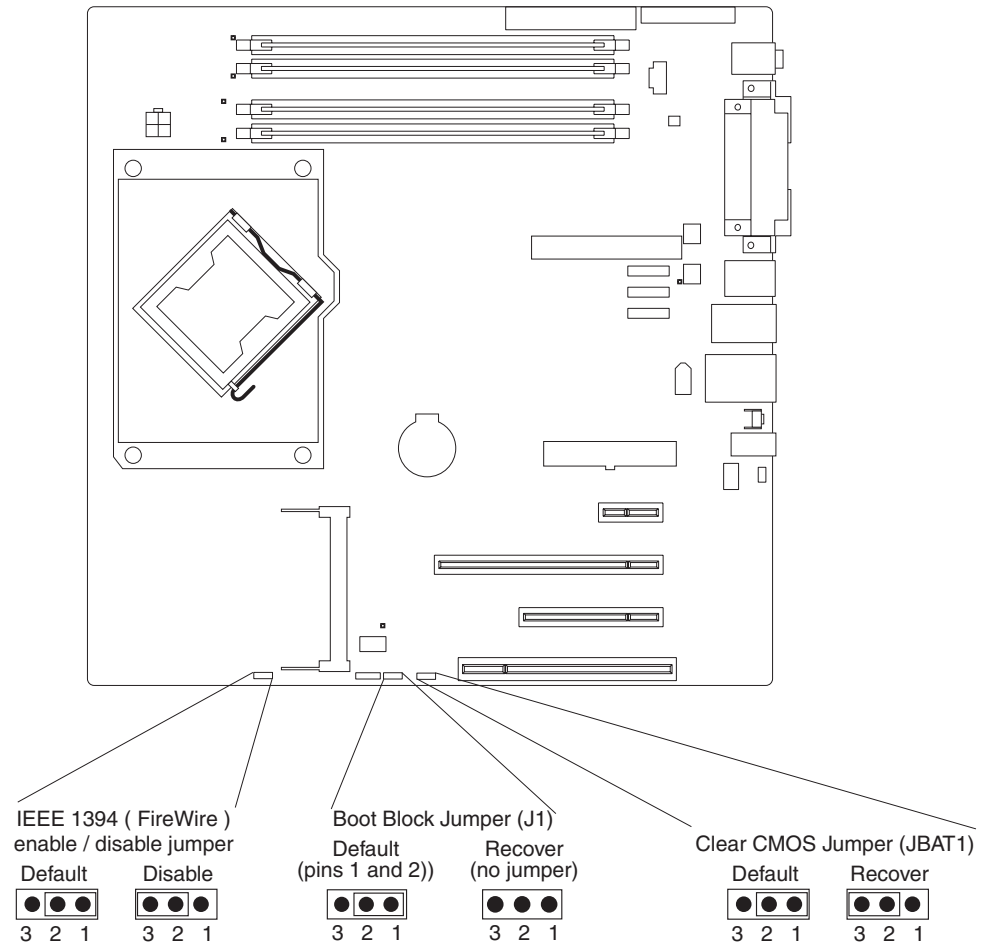
Figure 6. System-board jumpers

Any jumper blocks on the system board that are not shown in the illustration are reserved.

Jumper	Settings
Boot block (J1)	• Normal (default): jumper on pins 1 and 2 • Boot block recovery: no jumper; see "Recovering from a BIOS update failure" on page 54 for more information.
Clear CMOS (JBAT1)	• Keep CMOS data (default): jumper on pins 1 and 2 • Clear CMOS data: jumper on pins 2 and 3 with power cords removed from the computer; see "Erasing a lost or forgotten password (clearing CMOS)" on page 61 for more information.
IEEE 1394, Firewire (J1394)	• IEEE 1394 enabled (default): jumper on pins 1 and 2 • IEEE 1394 disabled: jumper on pins 2 and 3

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 135 for more information.

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 "POST" for more information.

* **Troubleshooting tables**

  These tables list problem symptoms and actions to correct the problems. See "Troubleshooting tables" on page 26 for more information.

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

  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, messages, and error codes" on page 37 for more information.

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 POST is completed without detecting any problems, a single beep sounds, and the computer startup is completed.

If POST 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 17 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. 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 15.

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 that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See "Microprocessor problems" on page 30 for information about diagnosing microprocessor problems.

Table 2. POST beep codes

•	**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," on page 65 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.**

Beep code	Description	Action

1-1-3	CMOS write/read test has failed.	1. Reseat the battery.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Battery
		  b. (Trained service technician only) System board

1-1-4	BIOS ROM checksum has failed.	1. Recover the BIOS code. 2. (Trained service technician only) Replace the system board.
1-2-1	Programmable interval timer test has failed.	(Trained service technician only) Replace the system board.
1-2-2	DMA initialization has failed.	(Trained service technician only) Replace the system board.
1-2-3	DMA page register write/read test has failed.	(Trained service technician only) Replace the system board.
1-2-4	RAM refresh verification has failed.	(Trained service technician only) Replace the system board.

1-3-1	First 64 Kb RAM test has failed.	1. Reseat the DIMM.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. DIMM
		  b. (Trained service technician only) System board

2-1-1	Secondary DMA register test has failed.	(Trained service technician only) Replace the system board.
2-1-2	Primary DMA register test has failed.	(Trained service technician only) Replace the system board.
2-1-3	Primary interrupt mask register test has failed.	(Trained service technician only) Replace the system board.
2-1-4	Secondary interrupt mask register test has failed.	(Trained service technician only) Replace the system board.

Table 2. POST beep codes (continued)

•	**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," on page 65 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.**

Beep code	Description	Action

2-2-2	Keyboard controller test has failed.	1. Reseat the keyboard cable.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Keyboard
		   b. (Trained service technician only) System board

2-2-3	CMOS power failure and checksum checks have failed.	1. Reseat the battery.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Battery
		   b. (Trained service technician only) System board

2-4-1	Video failed; system believed operable.	1. Reseat the video adapter.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Video adapter
		   b. (Trained service technician only) System board

3-1-1	Timer tick interrupt test has failed.	(Trained service technician only) Replace the system board.
3-1-2	Interval timer channel 2 test has failed.	(Trained service technician only) Replace the system board.

3-1-3	RAM test has failed above address 0FFFFh.	1. Reseat the DIMM.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. DIMM
		   b. (Trained service technician only) System board

3-1-4	Time-of-day clock test has failed.	1. Reseat the battery.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Battery
		   b. (Trained service technician only) System board

3-2-1	Serial port test has failed.	(Trained service technician only) Replace the system board.

Table 2. POST beep codes (continued)

•	**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," on page 65 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.**

Beep code	Description	Action
3-2-2	Parallel port test has failed.	(Trained service technician only) Replace the system board.

3-3-1	A memory size mismatch has occurred.	1. Reseat the following components:
		   a. DIMM
		   b. Battery
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. DIMM
		   b. Battery
		   c. (Trained service technician only) System board

3-3-2	A critical SMBUS error occurred (I2C bus has failed).	1. Disconnect the power cord, wait 30 seconds, and retry.
		2. Reseat the following components:
		   a. DIMM
		   b. (Trained service technician only) Microprocessor
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. DIMM
		   b. (Trained service technician only) Microprocessor
		   c. (Trained service technician only) System board

3-3-3	No operational memory in the system.
	
	Attention: 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 **Boot Fail Count** feature in the **Startup Option** menu 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 memory connector from **Disabled** to **Enabled**.
		1. If you just installed memory, make sure that the new memory is correct for your computer.
		2. Make sure that the DIMMs are installed in pairs; then, restart the computer.
		3. Reseat the DIMMs.
		4. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. DIMMs
		   b. (Trained service technician only) System board

No-beep symptoms

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

- **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," on page 65 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.**

No-beep symptom	Description	Action
No beep during POST.	A system board failure occurred.	1. See "Solving undetermined problems" on page 62. 2. (Trained service technician only) Replace the system board.
No beep, no video, and the system-error LED is off.	A system board failure occurred.	1. See "Solving undetermined problems" on page 62. 2. (Trained service technician only) Replace the system board.
No beep, no video, and the system-error LED is lit.	An undetermined failure has occurred.	See "Solving undetermined problems" on page 62 for more information.

Error logs

The POST error log contains the three most recent error codes and messages that were generated during POST. The system event/error log contains messages that were generated during POST and all system status messages from the service processor.

The system event/error log is limited in size. When the log is full, new entries will not overwrite existing entries; therefore, you must periodically clear the system event/error log through the Configuration/Setup Utility program (the menu choices are described in the *User's Guide*). When you are troubleshooting an error, be sure to clear the system event/error log so that you can find current errors more easily.

Entries that are written to the system event/error log during the early phase of POST show an incorrect date and time as the default time stamp; however, the date and time are corrected as POST continues.

Each system event/error log entry appears on its own page. To move from one entry to the next, use the Up Arrow (↑) and Down Arrow (↓) keys.

When you are troubleshooting PCI or PCI Express slots, note that the error logs report the PCI or PCI Express buses numerically. The numerical assignments vary depending on the configuration. You can check the assignments by running the Configuration/Setup Utility program (see the *User's Guide* for more information).

You can view the contents of the POST error log and the system event/error log from the Configuration/Setup Utility program. For complete information about using the Configuration/Setup Utility program, see the *User's Guide*.

To view the error logs, complete the following steps:
1. Turn on the computer.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1.
3. Select **Error Logs**.
4. Use one of the following procedures:
   - To view the POST error log, select **POST Error Log**.
   - To view the system event/error log, select **System Event/Error Log**

POST error codes

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

Table 3. POST error messages

• **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," on page 65 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

062	The computer failed to start on three consecutive attempts.
	
	All caches are disabled. Repeatedly turning the computer on and off or resetting the computer might cause this problem.
		1. Run the Configuration/Setup Utility program and make sure that all settings are correct. Use the **Cache Control** selection in the **Advanced Setup** menu of the Configuration/Setup Utility program to enable the caches.
		2. Reseat the following components:
		  a. Battery
		  b. (Trained service technician only) Microprocessor
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Battery
		  b. (Trained service technician only) Microprocessor
		  c. (Trained service technician only) System board
		
		Note: When the problem is corrected, be sure to enable the caches.

101, 102, and 106	An error occurred during the system board and microprocessor test.	(Trained service technician only) Replace the system board.

151	A real-time clock (RTC) error occurred.	1. Run the diagnostics program.
		2. Reseat the battery.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Battery
		  b. (Trained service technician only) System board

161	The real-time clock battery has failed.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure that the date and time are correct, and save the settings.
		2. Reseat the battery.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Battery
		  b. (Trained service technician only) System board

Table 3. POST error messages (continued)

•	**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," on page 65 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

162	A change in the device configuration occurred. This error occurs under one or more of the following conditions:
	• A new device has been installed.
	• A device has been moved to a different location or cable connection.
	• A device has been removed or disconnected from a cable.
	• A device is failing and is no longer recognized by the computer as being installed.
	• An external device is not turned on.
	• An invalid checksum is detected in the battery-backed memory.
		1. Make sure that all external devices are turned on. You must turn on external devices before turning on the computer.
		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 "Running the diagnostic programs" on page 37 or "Using the Enhanced Diagnostics diskette or CD" on page 48.
		3. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings.
		4. Reseat the following components:
		  a. Battery
		  b. Failing device
		5. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Battery
		  b. Failing device (if the device is a FRU, the device must be replaced by a trained service technician only).
		  c. (Trained service technician only) System board

163	The time of day has not been set.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure that the date and time are correct, and save the settings.
		2. Reseat the battery.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Battery
		  b. (Trained service technician only) System board

164	A change in the memory configuration occurred. This message might appear after you add or remove memory.	1. If POST error message 289 also occurred, follow the actions for the 289 POST error code first.
		2. If you just installed or removed memory, run the Configuration/Setup Utility program, and save the new configuration settings.
		3. Reseat the DIMMs.
		4. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. DIMMs
		  b. (Trained service technician only) System board

Table 3. POST error messages (continued)

• **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," on page 65 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
184	The power-on password information stored in the computer has been removed.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the battery. 3. Replace the battery. 4. (Trained service technician only) Replace the system board.
187	The VPD serial number is not set. **Note:** 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.	1. Restart the computer. 2. Update the BIOS code to set the serial number. 3. (Trained service technician only) Replace the system board.
189	An attempt has been made to access the computer with an incorrect password three times.	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: • Incorrectly installed memory • A failing memory module • A system board problem	1. If you just installed memory, make sure that the new memory is correct for the computer. 2. Reseat the DIMM. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: 　a. DIMM 　b. (Trained service technician only) System board.
289	An error occurred during POST memory tests and a DIMM was disabled.	1. If you just installed memory, make sure that the new memory is correct for the computer. 2. If the DIMM was disabled by the user, run the Configuration/Setup Utility program and enable the DIMM. 3. Reseat the DIMM. 4. Replace the DIMM.

Table 3. POST error messages (continued)

•	**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," on page 65 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

301 and 303	An error occurred during the keyboard and keyboard controller test. These error messages also might be accompanied by continuous beeping.	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.
		2. Make sure that nothing is resting on the keyboard or pressing on a key.
		3. Make sure that no key is stuck.
		4. Reseat the keyboard cable and make sure that it is connected to the correct connector on the computer.
		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.
		6. Run the diagnostic tests to isolate the computer component that failed.
		7. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Keyboard
		   b. (Trained service technician only) System board

602	An invalid diskette boot record error occurred.	1. Reseat the diskette drive cable.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Diskette drive cable
		   b. Diskette drive
		   c. (Trained service technician only) System board

604	An error occurred during a diskette drive test.	1. Make sure that the Configuration/Setup Utility program correctly reflects the type of diskette drive that is installed.
		2. Reseat the diskette drive cable.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Diskette drive cable
		   b. Diskette drive
		   c. (Trained service technician only) System board

962	A parallel port configuration error occurred.	1. 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 settings. 2. (Trained service technician only) Replace the system board.

Table 3. POST error messages (continued)

• 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," on page 65 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
1162	The serial port configuration conflicts with another device in the system.	1. Make sure that the IRQ and I/O port assignments needed by the serial port are available. 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. 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 settings. 4. (Trained service technician only) Replace the system board.

1762	A hard disk drive configuration error occurred.	1. Make sure that the hard disk drive is set correctly in the Configuration/Setup Utility program.
		
		2. Reseat the hard disk drive cable.
		
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		    a. Hard disk drive
		    b. Hard disk drive cable
		    c. (Trained service technician only) System board

178x	An error occurred during the hard disk drive x test (x = 0 to 3).	1. Reseat the hard disk drive x cable.
		
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		    a. Hard disk drive x
		    b. Hard disk drive cable x
		    c. (Trained service technician only) System board

1801	A PCI adapter has requested memory resources that are not available.	1. Change the order of the adapters in the PCI or PCI Express slots. Make sure that the boot device is positioned early in the scan order (see the *User's Guide* for information about the scan order). 2. Make sure that the settings for the adapter and all other adapters in the Configuration/Setup Utility program are correct. If the memory resource settings are not correct, change them. 3. If all memory resources are being used, remove an adapter to make memory available to the adapter. Disabling the BIOS on the adapter should correct the error. See the documentation that comes with the adapter.

Table 3. POST error messages (continued)

| • 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," on page 65 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

1802	No more I/O space is available for a PCI adapter.	1. If the error code indicates a particular PCI or PCI Express slot or device, remove that device.
		
		2. Reseat each adapter.
		Note: If an error LED is lit on an adapter, 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.
		
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Failing adapter
		  b. (Trained service technician only) System board

1803	A PCI adapter has requested memory above 1 MB.	1. If the error code indicates a particular PCI or PCI Express slot or device, remove the device.
		
		2. Reseat each adapter.
		Note: If an error LED is lit on an adapter, 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.
		
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Failing adapter
		  b. (Trained service technician only) System board

1804	A PCI adapter has requested memory below 1 MB.	1. If the error code indicates a particular PCI or PCI Express slot or device, remove the device.
		
		2. Reseat each adapter.
		Note: If an error LED is lit on an adapter, 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.
		
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Failing adapter
		  b. (Trained service technician only) System board

Table 3. POST error messages (continued)

•	**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," on page 65 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

1805	A PCI option ROM checksum error occurred.	1. Remove the failing adapter.
		2. Reseat each adapter.
		Note: If an error LED is lit on an adapter, 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.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Failing adapter
		  b. (Trained service technician only) System board

1806	A PCI built-in self-test failure occurred.	1. If the error code indicates a particular PCI or PCI Express slot or device, remove that device.
		2. Reseat each adapter.
		Note: If an error LED is lit on an adapter, 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.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Failing adapter
		  b. (Trained service technician only) System board

1807 and 1808	General PCI error	1. Run the Configuration/Setup Utility program, select **Devices and I/O Ports**, and make sure that the device is enabled.
		2. Reseat each adapter.
		Note: If an error LED is lit on an adapter, 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.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Failing adapter
		  b. (Trained service technician only) System board

Table 3. POST error messages (continued)

• **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," on page 65 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

1962	No valid startup devices were found. The computer cannot find the startup drive or operating system.	1. Reseat the hard disk drive cable.
		2. Make sure that the hard disk drive you want to start from is in the startup sequence.
		   a. Run the Configuration/Setup Utility program, select **Start Options**.
		   b. Check the list of startup devices in the **Startup Device** data fields. Is the drive you want to start from in the startup sequence?
		      Yes Exit from this screen; then, select **Exit Setup** to exit the Configuration/Setup menu. Go to step 2c.
		      No Follow the instructions on the screen to add the drive; then, save the changes and exit the Configuration/Setup menu. Restart the computer.
		   c. Is an operating system installed?
		      Yes Turn off the computer. Go to step 2d.
		      No Install the operating system in the computer; then, follow your operating-system instructions to shut down and restart the computer.
		   d. During computer startup, watch for messages indicating a hardware problem.
		   e. If the error message still appears, run the diagnostics to isolate the problem.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		   a. Hard disk drive cable
		   b. Hard disk drive
		   c. (Trained service technician only) System board

2462	A video memory configuration error occurred.	1. Run the Configuration/Setup Utility program and load the default settings. 2. Reseat the video adapter. 3. Replace the video adapter.

Table 3. POST error messages (continued)

• **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," on page 65 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

5962	An IDE CD or DVD drive configuration error occurred.	1. Run the Configuration/Setup Utility program and load the default settings.
		2. Reseat the following components:
		  a. CD or DVD drive cable
		  b. Battery
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. CD or DVD drive
		  b. CD or DVD drive cable
		  c. Battery
		  d. (Trained service technician only) System board

8603	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.
	Note: 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.
		1. Reseat the mouse (pointing device) cable and make sure that it is connected to the correct connector on the computer.
		2. Complete the following steps:
		  a. Turn off the computer.
		  b. Disconnect the mouse (pointing device) from the computer.
		  c. Turn on the computer.
		If the error message does not reappear, the mouse (pointing device) is probably failing. See the documentation that comes with the device for additional testing information.
		3. Run the diagnostic tests to isolate the problem.
		4. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Mouse (pointing device)
		  b. (Trained service technician only) System board

12000	A processor machine check error occurred.	1. Update the system BIOS code. 2. (Trained service technician only) Reseat the microprocessor. 3. (Trained service technician only) Replace the microprocessor.
19990650	AC power has been restored.	1. Reseat the power cord. 2. (Trained service technician only) Check for interruption of the external power. 3. Replace the power cord.
Other numbers	POST found an error.	Follow the instructions on the screen.

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 "Running the diagnostic programs" on page 37 for information about testing 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:

1. Remove the software or device that you just added.
2. Run the diagnostic tests to determine whether the computer is running correctly.
3. 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," on page 65 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.	1. Make sure that:
	  • The IDE channel to which the CD or DVD drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program.
	  • All cables and jumpers are installed correctly.
	  • The correct device driver is installed for the CD or DVD drive.
	2. Run the CD-ROM, CD-RW or DVD drive diagnostic programs.
	3. Reseat the CD or DVD drive cable.
	4. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. CD or DVD drive
	  b. CD or DVD drive cable
	  c. (Trained service technician only) System board

A CD or DVD is not working correctly.	1. Clean the CD or DVD.
	2. Run the CD-ROM, CD-RW or DVD drive diagnostic programs.
	3. Reseat the CD or DVD drive cable.
	4. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. CD or DVD drive
	  b. CD or DVD drive cable

• **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," on page 65 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**

The CD or DVD drive tray is not working.	1. Make sure that the computer is turned on.
	
	2. Insert the end of a straightened paper clip into the manual tray-release opening.
	
	3. Reseat the CD or DVD drive cable.
	
	4. Replace the following components one at a time, in the order shown, restarting the computer each time:
	   a. CD or DVD drive
	   b. CD or DVD drive cable

Diskette 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," on page 65 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**

The diskette drive activity LED stays lit, or the computer bypasses the diskette drive.	1. If there is a diskette in the drive, make sure that:
	   • The diskette drive is enabled in the Configuration/Setup Utility program.
	   • The diskette is good and not damaged. (Try another diskette if you have one.)
	   • The diskette is inserted correctly in the drive.
	   • The diskette contains the necessary files to start the computer.
	   • The software is working correctly.
	   • The cable is connected correctly (in the proper orientation).
	
	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.).
	
	3. Run the diskette drive diagnostic test.
	
	4. Reseat the diskette drive cable.
	
	5. Replace the following components one at a time, in the order shown, restarting the computer each time:
	   a. Diskette drive cable
	   b. Diskette drive
	   c. (Trained service technician only) System board

General 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," on page 65 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
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

- **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," on page 65 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
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. **Note:** This test is not available on computers that have RAID arrays or computers that have IDE or SATA hard disk drives.

Intermittent 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," on page 65 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
A problem occurs only occasionally and is difficult to detect.	Make sure that: • All cables and cords are connected securely to the rear of the computer and attached options. • When the computer is turned on, air is flowing from the front 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. • Make sure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly.

Keyboard, mouse, or pointing-device problems

For problems with a USB, mouse or pointing device, see "USB port problems" on page 35.

• **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," on page 65 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

All or some keys on the keyboard do not work.	1. Make sure that:
	  • The keyboard cable is securely connected to the computer, and the keyboard and mouse cables are not reversed.
	  • The computer and the monitor are turned on.
	2. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. Keyboard
	  b. (Trained service technician only) System board

The mouse or pointing device does not work.	1. Make sure that:
	  • The mouse or pointing-device cable is securely connected and the keyboard and mouse cables are not reversed.
	  • The mouse or pointing device drivers are installed correctly.
	2. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. Mouse or pointing device
	  b. (Trained service technician only) System board

Memory problems

Symptom	Action
• 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," on page 65 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**

The amount of system memory displayed is less than the amount of installed physical memory.	1. Make sure that:
	  • The memory modules are seated correctly.
	  • You have installed the correct type of memory.
	  • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program.
	  • 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.
	2. Check the POST error log for error message 289:
	  • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM.
	  • 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.
	3. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. DIMM
	  b. (Trained service technician only) System board

Microprocessor problems

Symptom	Action
• 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," on page 65 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**
The computer emits a continuous beep during POST, indicating that the startup (boot) microprocessor is not working correctly.	1. (Trained service technician only) Reseat the microprocessor. 2. (Trained service technician only) Replace the microprocessor.

Monitor or video problems

Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the documentation that comes with the monitor for instructions for testing and adjusting the monitor.

- **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," on page 65 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
The screen is blank.	1. Make sure that: • The computer power cord is connected to the computer and a working electrical outlet. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. **Important:** 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 **Boot Fail Count** option in the **Start Options** of the Configuration/Setup Utility program is enabled (its default setting), you must restart the computer three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled). 2. Make sure that damaged BIOS code is not affecting the video; see "Recovering from a BIOS update failure" on page 54. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: a. Monitor b. Video adapter (if one is installed) c. (Trained service technician only) System board
Only the cursor appears.	See "Solving undetermined problems" on page 62.
The monitor works when you turn on the computer, but the screen goes blank when you start some application programs.	1. Make sure that: • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the applications. 2. Replace the monitor.
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, distorted.	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. **Attention:** 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. **Notes:** 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.). b. Non-IBM monitor cables might cause unpredictable problems. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: a. Monitor b. Video adapter (if one is installed) c. (Trained service technician only) System board

• **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," on page 65 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

Wrong characters appear on the screen.	1. If the wrong language is displayed, update the BIOS code with the correct language.
	2. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. Video adapter (if one is installed)
	  b. (Trained service technician only) System board

Optional-device 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," on page 65 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

An IBM optional-device that was just installed does not work.	1. Make sure that:
	  • The device is designed for the computer (see the ServerProven® list at http://www.ibm.com/pc/compat/).
	  • You followed the installation instructions that came with the device and the device is installed correctly.
	  • You have not loosened any other installed device or cables.
	  • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration.
	2. Reseat the device that you just installed.
	3. Replace the device that you just installed.

An IBM optional device that used to work does not work now.	1. Make sure that all of the option hardware and cable connections for the device are secure.
	2. If the device comes with test instructions, use those instructions to test the device.
	3. If the failing device is a SCSI device, make sure that:
	  • The cables for all external SCSI options are connected correctly.
	  • The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly.
	  • Any external SCSI device is turned on. You must turn on an external SCSI device before turning on the computer.
	4. Reseat the failing device.
	5. Replace the failing device.

Power 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," on page 65 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

The power-control button does not work, and the reset button, if supported, does work.	1. (Trained service technician only) Reseat the power switch/LED assembly cable.
	2. Replace the following components one at a time, in the order shown, restarting the computer each time:
	   a. (Trained service technician only) Power switch/LED assembly
	   b. (Trained service technician only) System board

The computer does not start.	1. Make sure that:
	   • The power cords are correctly connected to the computer and to a working electrical outlet.
	   • The type of memory that is installed is correct.
	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.
	3. Override the front panel power control button:
	   a. Disconnect the computer power cords.
	   b. Reconnect the power cords.
	4. See "Solving undetermined problems" on page 62.
	5. (Trained service technician only) If the computer does not start, replace the system board.

The computer does not turn off.	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:
	   a. Press Ctrl+Alt+Delete.
	   b. Turn off the computer by pressing the power-control button for 4 seconds.
	   c. If computer fails POST and the power-control button does not work, disconnect the ac power cord.
	2. If the problem remains or if you are using an ACPI-aware operating system, the problem could be with the system board.

Printer 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," on page 65 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
The printer does not work.	Make sure that: • The printer is turned on and is online. • The printer signal cable is connected to the correct serial or parallel connector on the computer (see "System-board external connectors" on page 7). **Note:** Non-IBM printer cables might cause unpredictable results. • You have assigned the printer port correctly in your operating system or application program. • You have assigned the printer port correctly in the Configuration/Setup Utility program. • You have run the tests that are described in the documentation that comes with the printer.

Serial port 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," on page 65 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

The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	1. Make sure that:
	  • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports are disabled.
	  • The serial port adapter (if one is present) is seated correctly.
	2. Replace the failing serial port adapter.

A serial device does not work.	1. Make sure that:
	  • The device is compatible with the computer.
	  • The serial port is enabled and is assigned a unique address.
	  • The device is connected to the correct connector (see "System-board external connectors" on page 7).
	2. Reseat the failing serial device.
	3. Replace the following components one at a time, in the order shown, restarting the computer each time:
	  a. Failing serial device
	  b. (Trained service technician only) System board

Software 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," on page 65 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

A suspected software problem occurred.	1. To determine whether the problem is caused by the software, make sure that:
	   • The computer has the minimum memory that is 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.
	   • The software is designed to operate on the computer.
	   • Other software works on the computer.
	   • The software works on another computer.
	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.
	3. Contact the place where you purchased the software.

USB port 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," on page 65 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

All or some keys on the USB keyboard do not work.	1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup.
	2. Make sure that the computer and the monitor are turned on.
	3. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the computer.
	4. Replace the following components one at a time, in the order shown, restarting the computer each time:
	   a. Keyboard
	   b. (Trained service technician only) System board

- **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," on page 65 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
The USB mouse or USB pointing device does not work.	1. Make sure that: • The mouse or pointing-device USB cable is securely connected to the computer. • The mouse or pointing device drivers are installed correctly. • Keyboardless operation has been enabled in the Configuration/Setup Utility program. 2. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the computer. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: a. Mouse or pointing device b. (Trained service technician only) System board
A USB device does not work.	1. Run the USB diagnostics (see "Running the diagnostic programs" on page 37). 2. Make sure that: • The correct USB device driver is installed. • The operating system supports USB devices. • 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. 3. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the *User's Guide* for more information). 4. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the computer.

Diagnostic programs, messages, and error codes

The diagnostic programs are the primary method of testing the major components of the computer. 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 39.

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 or CD. See "Creating an Enhanced Diagnostics diskette or CD" on page 47 for instructions.

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 **Start Options**.
3. Make sure that the **Legacy USB Support** option is set to Enable.

Running the diagnostic programs

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.

You can run the diagnostic programs through the operating system, or by using a diagnostics diskette or CD that you have created (see "Using the Enhanced Diagnostics diskette or CD" on page 48 and "Creating an Enhanced Diagnostics diskette or CD" on page 47).

To run the diagnostic programs, complete the following steps.

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 a Red Hat® Linux™ operating system, 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 48).

2. Follow the instructions on the screen.
3. When the applicable diagnostics programs are complete, you can view the results in the test log (see "Viewing the test log" on page 39).

   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.

To determine what action you should take as a result of a diagnostic text message or error code, see the table in "Diagnostic error codes" on page 39.

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 30 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 messages

Diagnostic text messages are displayed while the tests are running. A diagnostic text message contains 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 is not being recognized.

The result is followed by an error code or other additional information about the error.

Viewing the test log

To view the test log when the tests are completed, select **Utility** from the top of the screen and then select **View Test Log**. The test-log data is maintained only while you are running the diagnostic programs. When you exit from the diagnostic programs, the test log is cleared.

To save the test log to a file on a diskette or to the hard disk, click **Save Log** on the diagnostic programs screen and specify a location and name for the saved log file.

Note: 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.

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 messages" on page 38 for more information.

- **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," on page 65 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
005-XXX-000	Failed video test.	1. Reseat the video adapter. 2. Replace the video adapter.
011-XXX-000	Failed COM1 serial port test.	1. (Trained service technician only) Make sure that the loopback plug is connected correctly to the COM1 serial port. 2. (Trained service technician only) Replace the system board.

- **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," on page 65 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
011-XXX-001	Failed COM2 serial post test.	1. (Trained service technician only) Make sure that the loopback plug is connected correctly to the COM2 serial port. 2. (Trained service technician only) Replace the system board.

014-XXX-000	Failed parallel port test.	1. (Trained service technician only) Make sure that:
		  • The loopback plug is connected correctly to the parallel port.
		  • The parallel port is not disabled in the Configuration/Setup Utility program.
		  • The BIOS code is at the latest level.
		2. (Trained service technician only) Replace the system board.

020-XXX-000	Failed PCI interface test.	1. Reseat the adapter.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Adapter
		  b. (Trained service technician only) System board

035-002-0nn	ServeRAID™ interface timeout.	1. The ServeRAID adapter might not be configured correctly. Obtain the basic and extended configuration status bytes and see the ServeRAID documentation for more information.
		2. Reseat the following components:
		  a. Adapter cable
		  b. ServeRAID adapter
		3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.

035-253-0nn	ServeRAID controller 0nn initialization failure; 0nn = the controller number.	1. Make sure that the ServeRAID adapter is configured correctly. See the ServeRAID documentation for more information.
		2. Reseat the following components:
		  a. Adapter cable
		  b. ServeRAID adapter
		3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.

- **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," on page 65 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

035-253-s99	RAID adapter initialization failure.	1. Make sure that the ServeRAID adapter is configured correctly. See the ServeRAID documentation for more information.
		2. Reseat the following components:
		  a. ServeRAID adapter
		  b. Adapter cable
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. ServeRAID adapter
		  b. Adapter cable
		  c. (Trained service technician only) System board

035-254-0nn	Setup error; unable to allocate memory to run test.	Check the system resources and make more memory available (see "Starting the Configuration/Setup Utility program" on page 126); then, run the test again.

035-255-0nn	Internal error.	1. Reseat the following components:
		  a. SAS hard disk drive cable
		  b. SAS mini-PCI adapter
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. SAS hard disk drive cable
		  b. SAS mini-PCI adapter

035-260-0nn	System to controller interface failure.	1. Reseat the ServeRAID adapter.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. ServeRAID adapter
		  b. (Trained service technician only) System board

035-265-0nn	Adapter Communication error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-266-0nn	Adapter CPU test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.

- **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," on page 65 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
035-267-0nn	Adapter Local RAM test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-268-0nn	Adapter NVSRAM test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-269-0nn	Adapter Cache test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-271-0nn	Adapter XOR engine test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-272-0nn	Adapter Drive test error.	Replace the attached drive.
035-273-0nn	Adapter Drive error.	Replace the attached drive.
035-274-0nn	Adapter Parameters set error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-275-001	Adapter Communication error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-276-001	Adapter CPU test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-277-001	Adapter Local RAM test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-278-001	Adapter NVSRAM test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.

- **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," on page 65 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
035-279-001	Adapter Cache test error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-280-001	Adapter Drive test error.	Replace the attached drive.
035-281-001	Adapter Drive error.	Replace the attached drive.
035-282-001	Adapter Parameters set error.	1. Update the ServeRAID adapter firmware (see "Updating the firmware" on page 125). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-283-001	Adapter Battery error.	Replace the battery module on the ServeRAID adapter.
035-xxx-099	No adapters were found.	Reseat the following components: 1. ServeRAID adapter 2. Adapter cable

035-xxx-s99	Failed RAID test on PCI slot S. S = number of failing PCI slot.	1. Reseat the following components:
		  a. ServeRAID adapter
		  b. Adapter cable
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. ServeRAID adapter
		  b. Adapter cable
		  c. (Trained service technician only) System board

035-xxx-cnn	c = ServeRAID channel number, nn = SCSI ID of failing fixed disk drive.	1. Check the system-event/error log before replacing a FRU. 2. Reseat the hard disk drive on channel C, SCSI ID nn. 3. Replace the hard disk drive on channel C, SCSI ID nn.
035-xxx-snn	S = number of failing PCI slot, nn = SCSI ID of failing fixed disk.	1. Check the system-event/error log before replacing a FRU. 2. Reseat the SCSI disk with ID nn. 3. Replace the SCSI disk with ID nn.

- **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," on page 65 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

089-XXX-001	Failed microprocessor test.	1. (Trained service technician only) Make sure that the microprocessor is installed and seated correctly.
		2. If the computer does not have the latest level of BIOS code installed, update the BIOS code to the latest level.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. (Trained service technician only) Microprocessor
		  b. (Trained service technician only) System board

201-XXX-0nn	Failed memory test.
	Note: Where *nn*: 1=DIMM 1; 2=DIMM 2; 3=DIMM 3; 4=DIMM 4.
		1. Reseat DIMM *nn*.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. DIMM *nn*
		  b. (Trained service technician only) System board

201-XXX-999	Multiple DIMM failure, see the error text.	1. See the error text for the failing DIMMs.
		2. Reseat the failing DIMMs.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. (Trained service technician only) Failing DIMMs
		  b. (Trained service technician only) System board

206-XXX-000	Failed diskette drive test.	1. Run the test with another diskette.
		2. Reseat the diskette drive cables and run the test again.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Diskette drive cable
		  b. Diskette drive
		  c. (Trained service technician only) System board

- **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," on page 65 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

215-XXX-000	Failed IDE CD-ROM, CD-RW or DVD drive test.	1. Run the test with another CD or DVD in the drive.
		2. Reseat the CD or DVD drive cables and run the test again.
		3. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. CD or DVD drive cable
		  b. CD or DVD drive
		  c. (Trained service technician only) System board

217-198-XXX	Could not establish drive parameters.	1. Reseat the following components and run the test again:
		  a. SCSI cable
		  b. SCSI mini-PCI adapter
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. SCSI cable
		  b. SCSI mini-PCI adapter
		  c. Hard disk drive

217-XXX-001	Failed BIOS hard disk test.	1. Reseat the hard disk drive cables and run the test again.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Hard disk drive cable
		  b. Hard disk drive
		  c. (Trained service technician only) System board

301-XXX-000	Failed keyboard test.	1. Make sure that the keyboard cable is securely connected to the computer, and the keyboard and mouse cables are not reversed.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Keyboard
		  b. (Trained service technician only) System board

- **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," on page 65 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

302-XXX-000	Failed mouse test.	1. Make sure that the pointing device (mouse) cable is correctly connected to the computer, and the keyboard and mouse cables are not reversed.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Pointing device (mouse)
		  b. (Trained service technician only) System board

405-XXX-000	Failed Ethernet test on the controller on the system board.	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. 2. (Trained service technician only) Replace the system board.
405-XXX-00n	Failed Ethernet test on the adapter in PCI slot *n*.	1. Run the Configuration/Setup Utility program and select **PCI Slot/Device Information** under the **Advanced Setup** menu option. 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, this is the failing adapter. 2. Reseat the Ethernet adapter in slot *n*. 3. Replace the Ethernet adapter in slot *n.*

Creating an Enhanced Diagnostics diskette or CD

You can create 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, a diskette drive, or a CD or DVD/CD combo drive must be 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 **Start Options** and make sure that the **Legacy USB Support** option is set to Enable.

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 diskette image of the diagnostics file for the computer to a directory on the hard disk drive (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 optical 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" on page 47), complete the following steps to start the IBM Enhanced Diagnostics using the diagnostics diskette or CD:

Note: Before restarting the computer, make sure that the drive that contains the diagnostics diskette or CD is first in the startup sequence 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 appropriate 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, you can:
   - View the Summary test log by pressing F3, or by selecting **Utility** from the top of the screen and selecting **View Test Log**. Press Page Up and Page Down to view the entire log.
   - View the Detailed test log by pressing Tab while in the Summary log. Press Page Up and Page Down to view the entire log.
   - Save the test log to a file on a diskette or to the hard disk by selecting **Utility** from the top of the screen and selecting **Save Test Log**.

     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 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 error LEDs

Figure 7 on page 49 shows the location of the error LEDs on the system board. An 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.
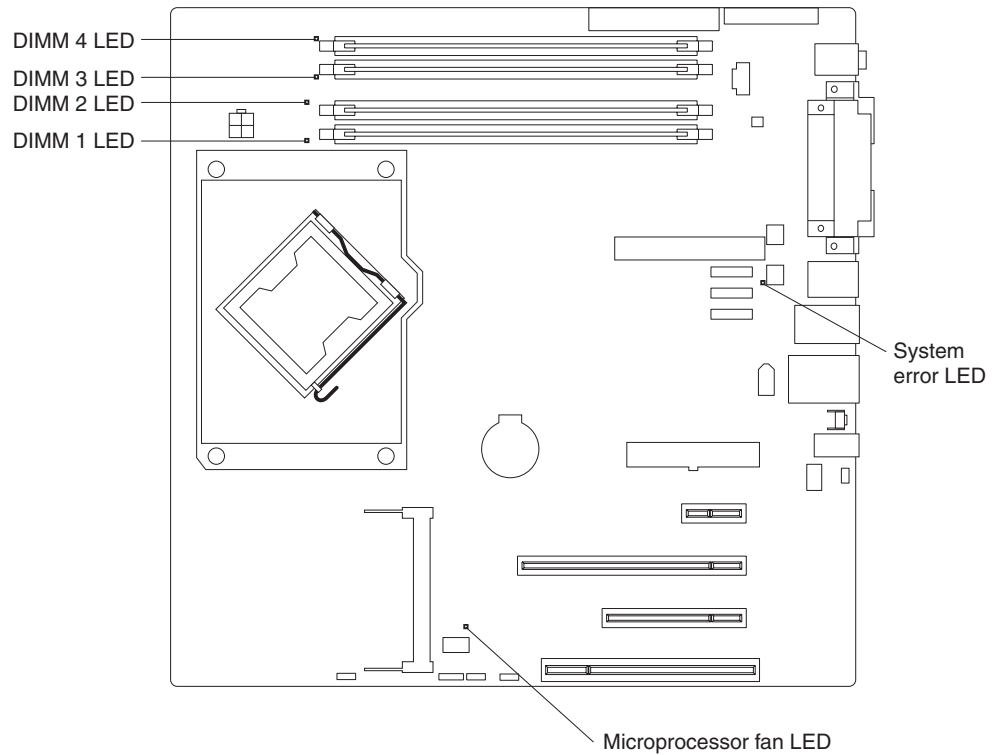
Figure 7. System board error LED locations

Table 4. System board error LED descriptions

• **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," on page 65 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.	1. Reseat DIMM x.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. DIMM x
		  b. (Trained service technician only) System board

Microprocessor fan	Microprocessor fan has failed.	1. Reseat the microprocessor fan cable.
		2. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Microprocessor fan assembly
		  b. (Trained service technician only) System board

Table 4. System board error LED descriptions (continued)

• **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," on page 65 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-error LED	A system error has occurred.	1. If another error LED is also lit, follow the actions for that LED. 2. (Trained service technician only) If no other LED is lit, replace the system board.

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 **Start Options** and make sure that the **Legacy USB Support** option is set to Enable.

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 **rrdisk.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" on page 50. 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 72).

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 72).

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 51.
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 optical device (CD-RW or DVD/CD-RW combo drive); then, start the computer with the CD in the optical 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 **Download** category, click **Downloads and drivers**.
3. In the **Brand** field, select **IntelliStation**.
4. In the **Family** field, select **IntelliStation M Pro**.
5. In the **Type** field, select **6218** and click **Continue**.
6. Scroll down to the **BIOS** category and click the + icon next to the package for the correct operating system to view the available files.
7. Select the check box for each file to be downloaded, then click **Continue**.
8. Follow the instructions on the screen to complete the download and install the downloaded files.
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 BIOS update failure

If power to the computer is interrupted while BIOS code is being updated, the computer might not restart correctly or might not display video. If this happens, complete the following steps to recover:

1. Read the safety information that begins on page vii and "Handling static-sensitive devices" on page 74.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the cover and hard disk drive bracket (if one is installed).
5. Locate the boot block recovery jumper (J1) on the system board (see Figure 8), removing any adapters that impede access to the jumper.
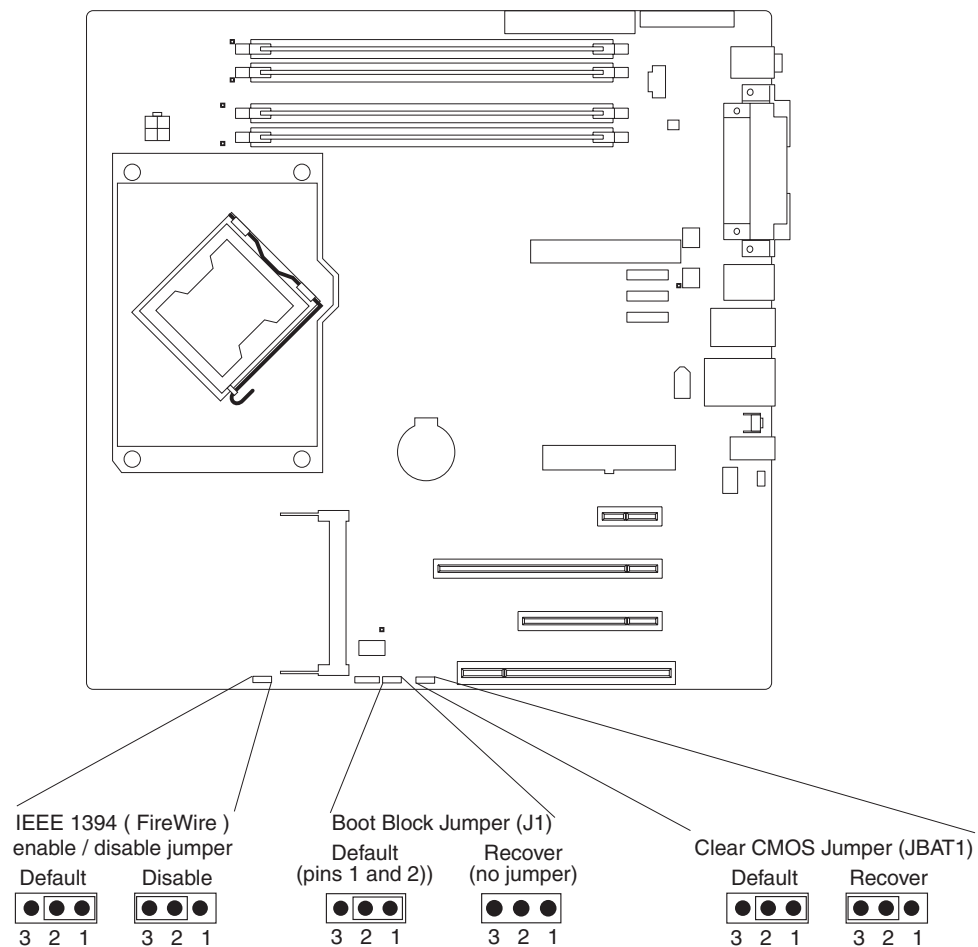
Figure 8. Recovery jumper locations

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

    After the update session is completed, remove the CD from the drive and turn off the computer.

11. Disconnect all power cords; then, remove the computer cover and hard disk drive bracket (if one is installed).

12. Remove any adapters that impede access to the jumper; then, return the boot block recovery jumper to pins 1 and 2.

13. Replace any adapters that were removed; then, replace the hard disk drive bracket (if one was removed) and the cover.

14. Reconnect all external cables and power cords.

15. Turn on the attached devices and 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
- 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.
- 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.

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 58.

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-8i controllers have no channels. A ServeRAID-8i 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 on page 56 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. 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 56.

e. Disconnect one drive at a time from the channel that was identified in step 2a on page 56; then, restart the computer to determine which drive is causing the error.

f. Reconnect the SCSI cable.

g. 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:

   a. Reseat the controller.

   b. Replace the controller.

ServeRAID error codes

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

- **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," on page 65 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
1xxx	A microcode checksum error occurred.	1. Reseat the ServeRAID controller. 2. Replace the ServeRAID controller.
2xxx	A code DRAM error occurred.	1. Install the download jumpers, flash the latest level of BIOS code and firmware for the controller. Then, remove the jumpers. 2. Reseat the ServeRAID controller. 3. Replace the ServeRAID controller.
3000-31xx	A code DRAM error occurred.	1. Install the download jumpers, flash the latest level of BIOS code and firmware for the controller. Then, remove the jumpers. 2. Reseat the ServeRAID controller. 3. Replace the ServeRAID controller.
3200	A code DRAM error occurred.	1. Install the download jumpers, flash the latest level of BIOS code and firmware for the controller. Then, remove the jumpers. 2. Reseat the ServeRAID controller. 3. Replace the ServeRAID controller.
3300	A ServeRAID-8i controller error occurred.	Install the ServeRAID-8i 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-8i controller error occurred.	1. Remove the ServeRAID-8i controller from its slot and install it in the proper PCI-X option slot. 2. Make sure that the ServeRAID-8i controller is supported in this computer. 3. Replace the ServeRAID-8i controller. 4. (Trained service technician only) Replace the system board.
3E2x	A ServeRAID-8i controller error occurred.	1. Reseat the ServeRAID controller. 2. Flash the latest level of BIOS code and firmware for the controller. 3. Replace the ServeRAID-8i controller. 4. Integrated RAID controller on computer.

- **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," on page 65 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
4xxx thru 5xxx	A Code DRAM error occurred.	1. Install the download jumpers, flash the latest level of BIOS code and firmware for controller. Then, remove the jumpers. 2. Reseat the ServeRAID controller. 3. Replace the ServeRAID controller.
7xxx thru 8xxx	A host/local PCI bus interface error occurred.	1. Flash the latest level of BIOS code and firmware for the controller. 2. If ServeRAID-8i controller, integrated RAID controller on the computer.
9003	A ServeRAID controller error occurred.	1. Flash the latest level of BIOS code and firmware for controller. 2. Make sure that the controller is supported for this computer. 3. Integrated RAID controller on the computer.

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.	1. Follow the instructions in "Interrupt status port register (ISPR) error procedures" on page 56
		2. Make sure that the SCSI cable is connected correctly.
		3. Reseat the following components:
		  a. Hard disk drive
		  b. ServeRAID controller
		4. Replace the following components one at a time, in the order shown, restarting the computer each time:
		  a. Hard disk drive
		  b. ServeRAID controller

EFFE	The firmware code is corrupt or the download jumpers are in place.	1. Flash the latest level BIOS code and firmware for the controller. Then, remove the jumpers. 2. Reseat the ServeRAID controller. 3. Replace the ServeRAID controller.

•	**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," on page 65 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
FFFF or other code not listed	A SCSI bus error occurred.	1. Follow the instructions in "Interrupt status port register (ISPR) error procedures" on page 56
		2. Make sure that the SCSI cable is connected correctly.
		3. Reseat the following components:
		a. Hard disk drive
		b. ServeRAID controller
		4. Replace the following components one at a time, in the order shown, restarting the computer each time:
		a. Hard disk drive
		b. ServeRAID controller

Erasing a lost or forgotten password (clearing CMOS)

If the power-on 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 power-on 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 power-on password (see the *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 92 and "Installing the battery" on page 93).
- 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 the safety information that begins on page vii and "Handling static-sensitive devices" on page 74.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the cover and hard disk drive bracket (if one is installed).
5. Locate the CMOS recovery jumper (JBAT1) on the system board (see Figure 8 on page 54), 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 hard disk drive bracket (if one was removed) and the cover.
9. Connect the computer to a power source, keyboard, monitor, and mouse.

   Note: 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 power-on password or set a new power-on password. If you do not change or delete the password, the next time you start the computer the original power-on password will be reinstated.
10. Turn on the computer and start the Configuration/Setup Utility program.
11. Follow the instructions to erase the existing password or to create a new password.
12. Click **Save Settings** and exit the Configuration/Setup Utility program.

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.

Solving undetermined problems

If the diagnostic tests did not diagnose the failure or if the computer 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 35.

Damaged data in CMOS memory or damaged BIOS code can cause undetermined problems. To reset the CMOS data, use the clear CMOS jumper to override the power-on password and clear the CMOS memory; see "Erasing a lost or forgotten password (clearing CMOS)" on page 61. If you suspect that the BIOS code is damaged, see "Recovering from a BIOS update failure" on page 54.

Check the LEDs on the power supply. If the LEDs indicate that the power supply is 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:
   - Power supply
   - System board
   - Microprocessor
   - Memory (with a minimum of two 512 MB DIMMs)
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 computer 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, suspect the system board.

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

Calling IBM for service

See Appendix A, "Getting help and technical assistance," on page 135 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

Figure 9 and Table 6 on page 66 identify the replaceable components that are available for the IntelliStation M Pro Type 6218 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 6218 and click **Search**.
3. Under Document type, select **Parts information** and click **Go**.
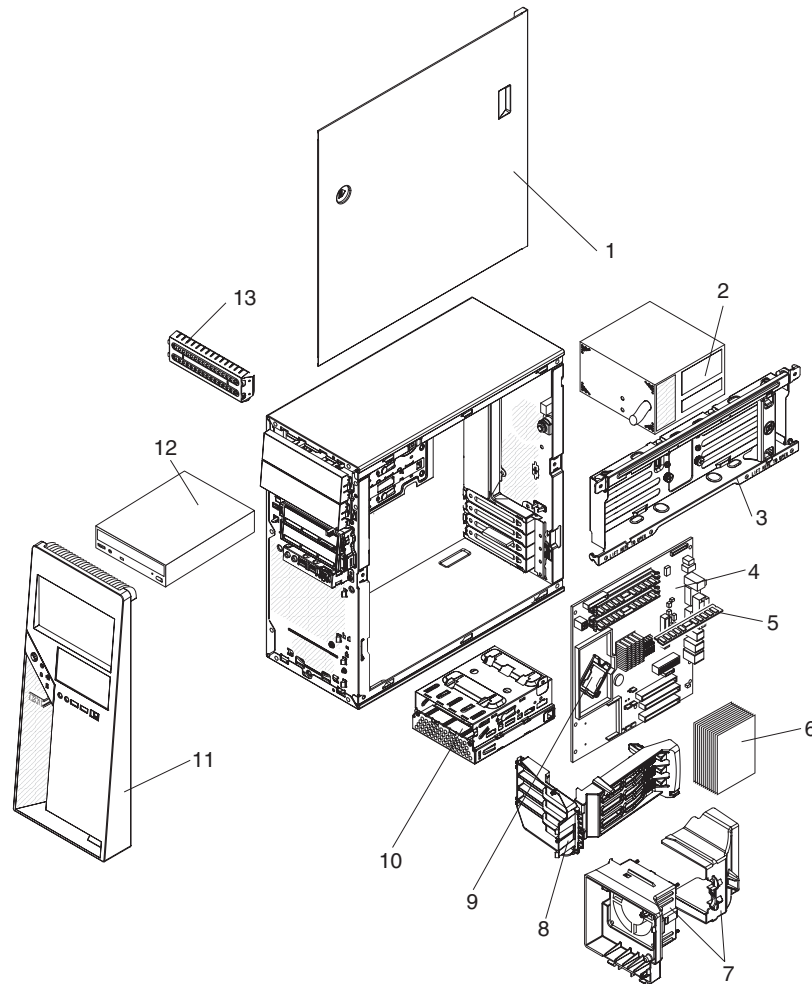
Figure 9. Type 6218 parts

Replaceable 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 may 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 server.
- **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. Part listing, Type 6218

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
1	Cover, side (all models)	42C7440		
2	Power supply, 400 watt (all models)			39Y7297
3	Bracket, hard disk drive (all models)		42C7435	
4	System board, primary (all models)			42C1454
4	System board, alternate (all models)			41Y4298
5	Memory, 1 GB, PC2 4200 ECC (models 45x, 47x, 57x, 59x, 84x, CTO)	30R5152		
5	Memory, 512 MB, PC2 4200 ECC (models 10x, 12x, 20x, 22x, 32x, 55x, CTO)	30R5151		
5	Memory, 2 GB, PC2 4200 ECC (optional)	30R5153		
6	Heat sink (all models)			39M6387
7	Fan assembly, microprocessor, with air baffle (all models)	42C749		
8	Adapter retention bracket, front (all models)	39Y8399		
9	Microprocessor, 800/3.0G-2M (models 10x, 12x, CTO)			39M4431
9	Microprocessor, 800/3.2G-2M (models 20x, 28x, CTO)			39M4432
9	Microprocessor, 800/3.4G-2M (models 32x, CTO)			39M4433
9	Microprocessor, 800/3.6G-2M (models 45x, 47x, CTO)			39M4434
9	Microprocessor, 800/3.8G-2M (model 55x, 57x, 59x, CTO)			39M4435
9	Microprocessor, dual-core, 3.2G (models 84x, CTO)			39M6274
9	Microprocessor, dual-core, 3.0G (models 25x, 27x)			40K9218
9	Microprocessor, dual-core, 3.2G (models 35x, 37x)			40K9219
9	Microprocessor, dual-core, 3.4G (models 46x, 48x)			40K9220
9	Microprocessor, dual-core, 3.6G (models 54x, 56x, 58x)			40K9221
9	Microprocessor, dual-core, 3.4G (models 85x, 87x)			40K9222
9	Microprocessor, dual-core, 3.6G (models 92x, 94x)			41Y3680
10	Cage, hard disk drive (all models)	39M0462		
11	Bezel assembly (all models)	39M0469		

Table 6. Part listing, Type 6218 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
12	DVD drive, 48X primary (all models)	39M0135		
12	DVD Combo drive, 48X alternate (all models)	39M3539		
13	EMC shield, 5.25 inch (all models)	42C7434		
	Adapter, 4-port SATA RAID (optional)			39R8810
	Adapter, PRO/1000 GT server ethernet	73P5109		
	Adapter, video, 3DLabs Realizm 800 (models 59x, CTO)	73P9640		
	Adapter, video, ATI FireGL V3100 (models 12x, 32x, CTO)	73P9617		
	Adapter, video, ATI FireGL V7100 (model 47x)	13M8400		
	Adapter, video, NVIDIA Q FX 550 (models 27x, 37x)	13M8461		
	Adapter, video, NVIDIA FX 540 PCI (optional)	13M8437		
	Adapter, video, NVIDIA Q FX 1400 (models 22x, 45x, 57x, 84x, CTO)	73P9636		
	Adapter, video, NVIDIA Q FX 1500 (model 92x)	13M8479		
	Adapter, video, NVIDIA Q FX 3500 (models 48x, 94x)	13M8457		
	Adapter, video, NVIDIA Q NVS 280 (models 10x, 20x, 55x, CTO)	90P1057		
	Adapter, video, NVIDIA NVS 285 (models 25x, 56x)	13M8433		
	Adapter, video, FX 4500 (model 54x)	13M8429		
	Adapter, video, FX 1400 (models 22x, 35x, 45x, 46x, 57x, 58x, 85x, 87x)	13M8415		
	Battery, 3.0 V (all models)	33F8354		
	Front panel 1394 cable assembly (all models)		42C7418	
	Cable, audio (models 25x, 35x, 46x, 54x, 56x, 58x, 85x, 87x)		39Y8421	
	Cable, C2 switch (all models)		42C7412	
	Cable, diskette drive (optional)		39Y8384	
	Cable, Dual VGA (models 10x, 20x, 55x)	73P9598		
	Cable, Dual VGA (models 25x,56x, 5Gx, 9Gx)	25R9045		
	Cable, DVI (optional)		25R9048	
	Cable, IDE (all models)		13N2466	
	Cable, SATA (all models)		39Y9810	
	Cable, SCSI Ultra 320, 3-drop (models 45x, 47x, 59x, CTO)		39M0489	
	Card, front I/O panel (all models)			42C7437
	Chassis, M Pro (all models)			39Y9961
	CD-ROM, 48X (optional)		39M3511	
	DVD drive, 16X (optional)		39M3515	
	DVD drive, 16/48X (optional)		39M3569	
	DVD drive, 48X TSST (optional)		39M3509	
	DVD drive, 16/48X TSST (optional)		39M3517	
	DVD drive, 48X (optional)		39M3519	

Table 6. Part listing, Type 6218 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
	Dongle (models 12x, 22x, 27x, 32x, 35x, 37x, 45x, 46x, 47x, 48x, 54x, 57x, 58x, 59x, 5Gx, 84x, 85x, 87x, 92x, 94x, 9Gx)	25R9043		
	Diskette drive (optional)			33P3343
	Diskette drive, black (optional)			39M0101
	EMC shield, diskette drive (all models)	42C7436		
	Fan duct (all models)	41Y3893		
	Front panel card (all models)	26K1183		
	Half-high Rambo 8 drive (optional)		42C0951	
	Hard disk drive, 36 GB (optional)		39R7326	
	Hard disk drive, 36 GB (optional)		39R7358	
	Hard disk drive, 36 GB SCSI (optional)		26K5680	
	Hard disk drive, 36 GB SCSI (optional)		26K5725	
	Hard disk drive, 36 GB SAS (optional)		26K5726	
	Hard disk drive, 73.4 GB SCSI (models 45x, 47x, 55x, 59x)		24P3706	
	Hard disk drive, 73 GB (optional)		39R7328	
	Hard disk drive, 73 GB (optional)		39R7352	
	Hard disk drive, 73 GB (optional)		39R7360	
	Hard disk drive, 73 GB SAS (optional)		26K5736	
	Hard disk drive, 73 GB SCSI (optional)		26K5681	
	Hard disk drive, 73.4 GB SCSI (models 46x, 48x, 56x)		39R7320	
	Hard disk drive, 80.0 GB SATA, primary (models 10x, 12x, 20x, 22x, 25x, 27x, 32x, 35x, 37x, 57x, 58x, 84x, 85x, 87x, 92x, 94x)		39M4503	
	Hard disk drive, 80.0 GB SATA, alternate (models 10x, 12x, 20x, 22x, 25x, 27x, 32x, 35x, 37x, 57x, 58x, 84x, 85x, 87x, 92x, 94x)		71P7293	
	Hard disk drive, 146 GB (optional)		39R7322	
	Hard disk drive, 146 GB (optional)		39R7330	
	Hard disk drive, 146 GB (optional)		39R7354	
	Hard disk drive, 146 GB (optional)		39R7362	
	Hard disk drive, 146 GB SAS (optional)		26K5737	
	Hard disk drive, 146 GB SCSI (optional)		90P1317	
	Hard disk drive, 146.8 GB SATA (optional)		26K5724	
	Hard disk drive, 146.8 GB SATA (optional)		24P3708	
	Hard disk drive, 160.0 GB SATA, primary (models 54x, 5Gx, 9Gx)		39M4507	
	Hard disk drive, 160.0 GB SATA, alternate (optional)		71P7297	
	Hard disk drive, 250.0 GB SATA, primary (optional)		39M4511	
	Hard disk drive, 250.0 GB SATA, alternate (optional)		71P7313	
	Hard disk drive, 300 GB (optional)		39R7324	
	Hard disk drive, 300 GB (optional)		39R7356	
	Hard disk drive, 300 GB SAS (optional)		26K5738	

Table 6. Part listing, Type 6218 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
	Hard disk drive, 300 GB SCSI (optional)		90P1303	
	Hardware kit (all models); contains: • EMC shield, 4 slot PCI (1) • Foot, bottom (4) • I/O blank (4) • Screw, I/O connector cable (6) • Screws, M3.5 thread rolling (14)		42C7439	
	Kit, retainer clip (all models)	42C7438		
	Mouse assembly, three button, (all models)	39Y9876		
	Power switch/LED assembly (all models)		39M0472	
	Retention module, heat sink (all models)			39M0483
	SAS mini-PCI adapter (optional)		39M6277	
	SCSI mini-PCI adapter (models 45x, 47x, 55x, 59x)		26K5079	
	SCSI adapter (models 25x, 35x, 46x, 54x, 56x, 58x, 85x, 87x)		39Y9936	
	Service label (all models)	39M0482		
	Shield, system board (all models)		39M0475	
	Speaker assembly (all models)	39Y9720		
	Tray, hard disk drive (all models)	41Y3893		

Keyboard CRUs

Keyboard	CRU Number
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 (104)	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

Keyboard	CRU Number
Hebrew (212)	39M7005
Hungarian (208)	39M7006
Icelandic (197)	39M7007
Italian (141)	39M7008
Italian (142)	39M7009
Japanese (194)	39M7010
Korean (413)	39M7011
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
Slovenian (234)	39M7029

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
39M5206	China
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
39M5123	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
39M5130	Denmark
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
39M5151	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
39M5158	Liechtenstein, Switzerland
39M5165	Chile, Italy, Libyan Arab Jamahiriya
39M5172	Israel
39M5095	220 - 240 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, 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

IBM power cord part number	Used in these countries and regions
39M5081	110 - 120 V 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
39M5219	Korea (Democratic People's Republic of), Korea (Republic of)
39M5199	Japan
39M5068	Argentina, Paraguay, Uruguay
39M5226	India
39M5233	Brazil

Product Recovery CDs

CD description	CRU Number
US English, Windows XPP 32 bit (EN)	40K2303
French, Windows XPP 32 bit (FR)	40K2304
German, Windows XPP 32 bit (GE)	40K2305
Italian, Windows XPP 32 bit (IT)	40K2306
Spanish, Windows XPP 32 bit (SP)	40K2307
Danish, Windows XPP 32 bit (DK)	40K2308
Dutch, Windows XPP 32 bit (NL)	40K2309
Norwegian, Windows XPP 32 bit (NO)	40K2310
Swedish, Windows XPP 32 bit (SV)	40K2311
Finnish, Windows XPP 32 bit (FI)	40K2312
Japanese, Windows XPP 32 bit (JP)	40K2313
Korean, Windows XPP 32 bit (KR)	40K2314
Chinese, Windows XPP 32 bit (CS)	40K2315
Chinese, Hong Kong, Windows XPP 32 bit (HK)	40K2316
Chinese, TrationalWindows XPP (V models)	40K2317

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.

See Chapter 3, "Parts listing," on page 65 to determine whether a component is a Tier 1 CRU, Tier 2 CRU, or FRU.

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

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 74. 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.
- If you must start the computer while the cover is removed, make sure that no one is near the computer and that no tools or other objects have been left inside the computer.
- 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.
- 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 guidelines

To help ensure proper system cooling and system reliability, make sure that the following requirements are met::

- 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.
- You do not operate the computer without the air baffle installed. Operating the computer without the air baffle might cause the microprocessor to overheat.

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 down the device. 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, and use any packaging materials for shipping that are supplied to you.

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 73.
2. Turn off the computer and all attached devices.
3. Disconnect all external cables and power cords.
4. Press the cover-release button on the side of the computer, and push the side cover toward the rear of the computer (see Figure 10). Lift the side cover off the computer and set it aside.
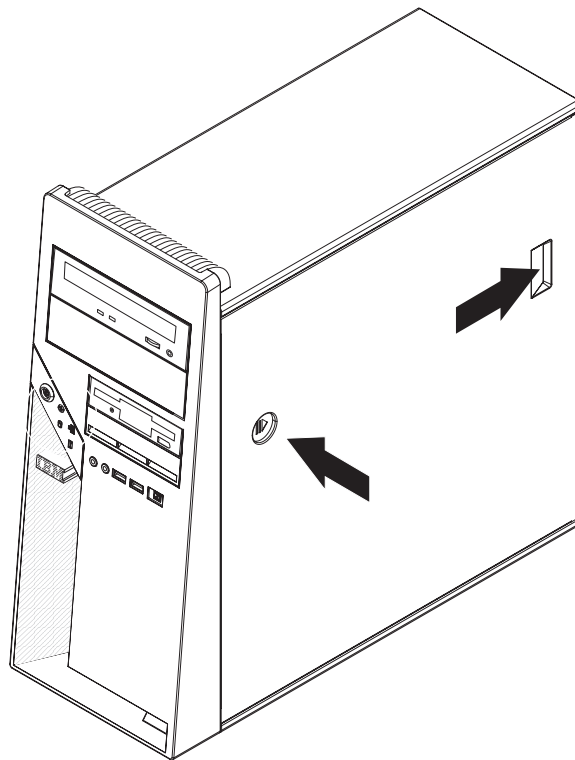
Figure 10. Removing the side cover

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

Installing the side cover

To install 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 install the side cover.

1. Make sure that:
    *   All cables, adapters, and other components are installed and seated correctly.
    *   You have removed all work tools or parts from inside the computer.
2. If you removed the hard disk drive bracket, reinstall it before you install the side cover (see "Installing the hard disk drive bracket" on page 97).
3. If you removed the bezel, reinstall it before you install the side cover (see "Installing the bezel" on page 78).
4. 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. Slide the side cover forward to lock the side cover (see Figure 11).
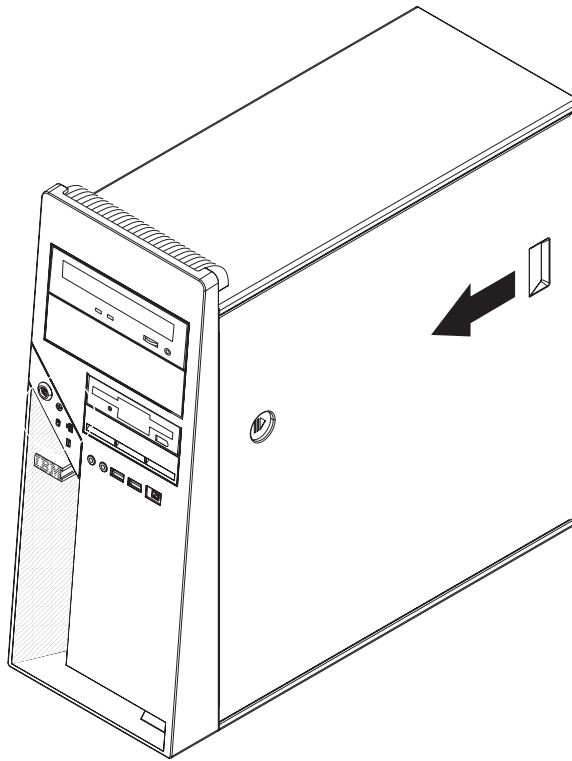
Figure 11. Installing the side cover

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

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

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 73.
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 75).
4. Press the bezel release button and pull the bottom of the bezel away from the chassis; then, lift the bezel up to disengage the top tabs (see Figure 12).

Bezel release button
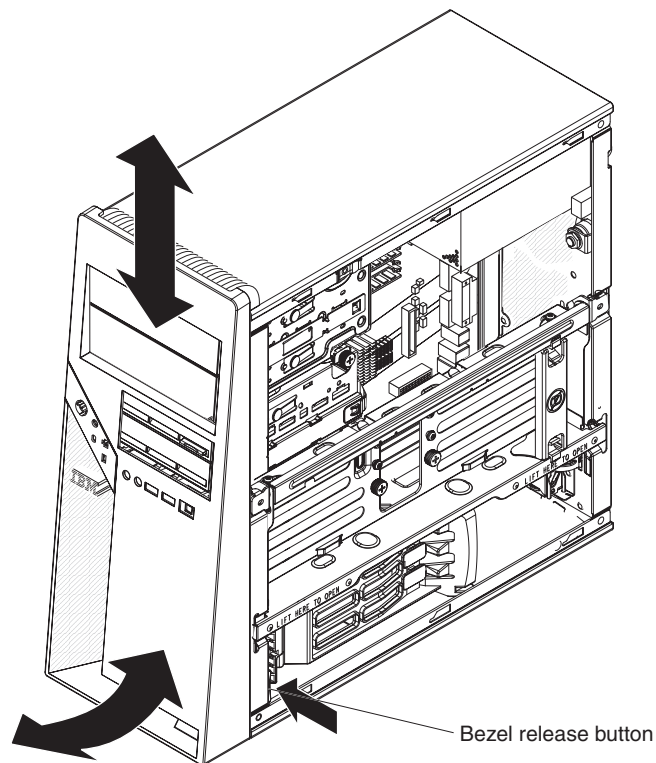
Figure 12. Removing the bezel

5. Remove the bezel from the computer and store it in a safe place.

Installing the bezel

To install the bezel, complete the following steps:

1. Insert the four tabs at the top of the bezel into the matching holes on the computer chassis above drive bay 1 (see Figure 13).

Bezel release button
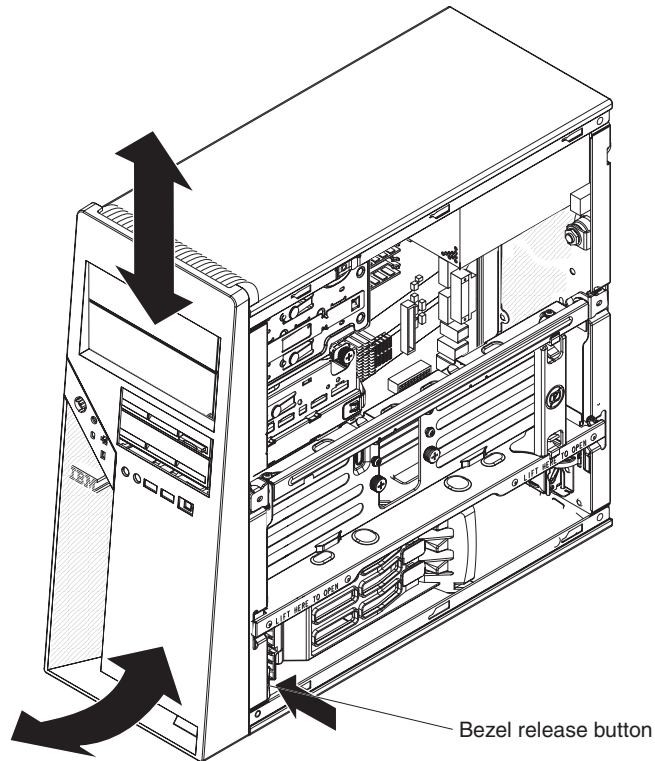
Figure 13. Installing the bezel

2. Push the bottom of the bezel toward the computer until the two tabs at the bottom of the bezel snap into place.
3. Install the side cover (see "Installing the side cover" on page 76.
4. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the computer.

Removing the front adapter-retention bracket

To remove the front adapter-retention bracket, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove the front bezel (see "Removing the bezel" on page 77).

   Note: It might be helpful to lay the computer on its left side for the remainder of this procedure.

6. Remove any full-length adapters that are installed.
7. Disconnect the speaker wire from the system board connector.
8. From the front of the computer, press down and inward on the two retention tabs that secure the top of the adapter-retention bracket to the chassis (see Figure 14).

Release tabs
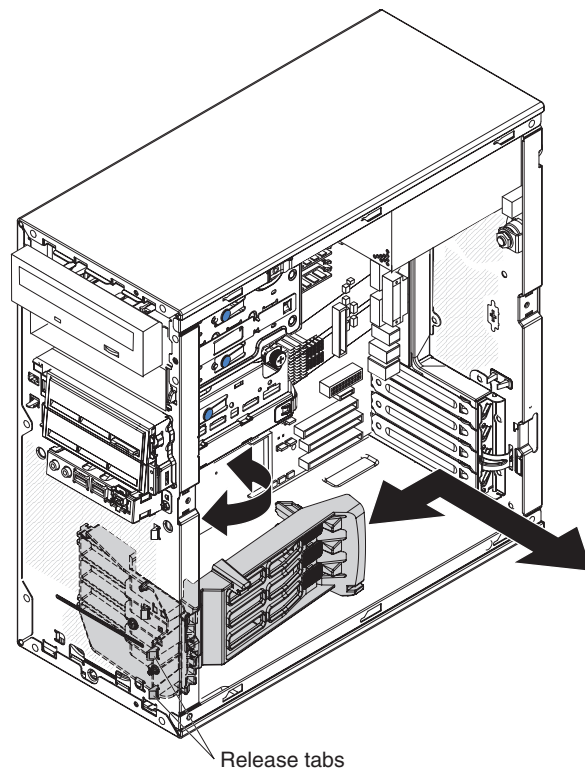
Figure 14. Removing the front adapter-retention bracket

9. Carefully tilt the adapter-retention bracket toward the rear of the computer and disengage the lower retention tabs from the chassis.
10. Pull the speaker wire out of the adapter-retention bracket and remove the retention bracket from the computer.
11. If you are instructed to return the adapter-retention bracket, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the front adapter-retention bracket

To install the front adapter-retention bracket, complete the following steps:

1. Feed the speaker wire through an opening in the bottom of the adapter-retention bracket.

2. Engage the lower retention tabs of the adapter-retention bracket with openings in the chassis and tilt the bracket toward the front of the computer (see Figure 15).
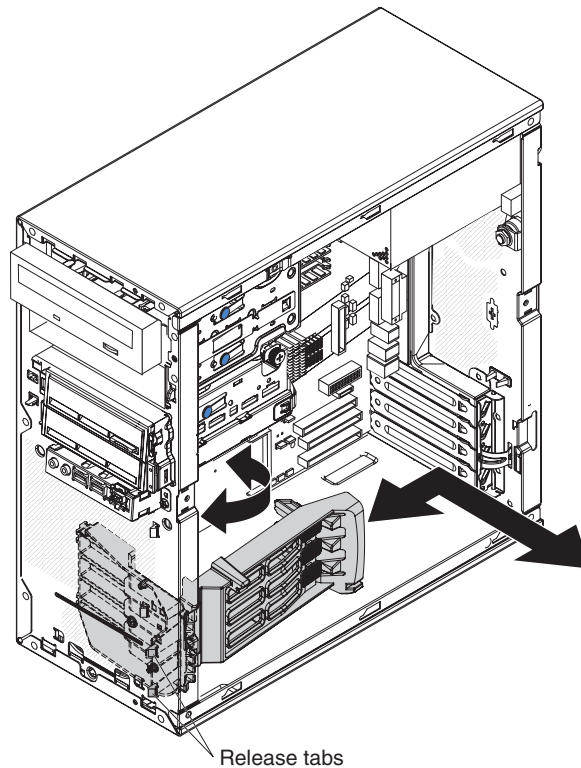
Figure 15. Installing the front adapter-retention bracket

3. Press the two retention tabs at the top of the adapter-retention bracket through the openings in the front of the computer until they lock securely.

4. Reconnect the speaker wire to the system board connector.

5. Install any full-length adapters that were removed.

6. Install the front bezel (see "Installing the bezel" on page 78).

7. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

8. Install the side cover (see "Installing the side cover" on page 76).

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

Removing the microprocessor fan assembly

The microprocessor fan assembly consists of two parts; the fan housing, which is mounted to the front of the computer chassis and contains the fan, and the air baffle, which directs the airflow to the microprocessor. If a procedure requires the removal of the air baffle only, complete steps 1 through 6 of the following procedure.

To remove the microprocessor fan assembly, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove the front bezel (see "Removing the bezel" on page 77).
6. Press the air-baffle release tab toward the handle and pull on the handle to remove the air baffle from the computer (see Figure 16).

Release tab

Handle
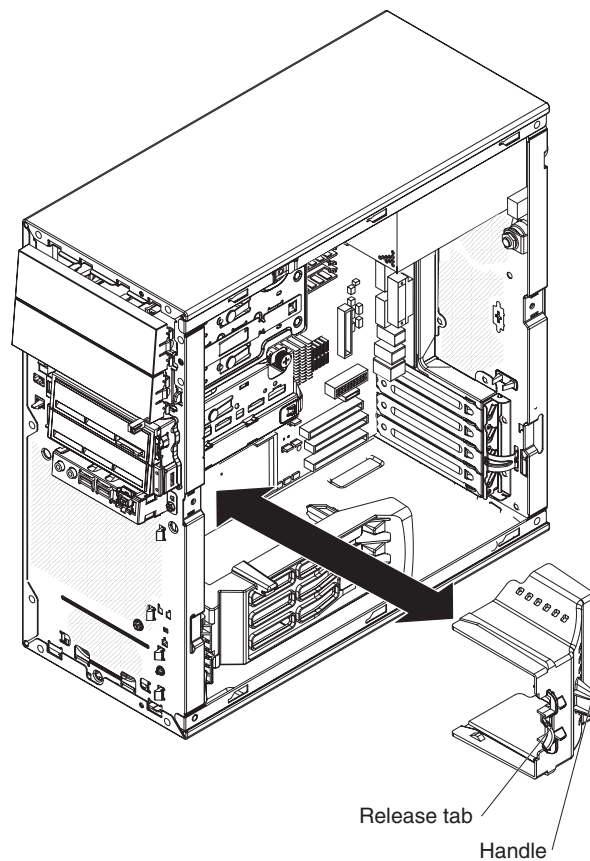
Figure 16. Removing the air baffle

7. Remove the front adapter-retention bracket (see "Removing the front adapter-retention bracket" on page 79).

   Important: When disconnecting cables, note the cable routing and connector labels for use during installation.

8. Disconnect the fan power cable from the system board (see "System-board internal connectors" on page 7 for the location of the microprocessor fan connector).

9. From the front of the computer, press down and inward on the two retention tabs that secure the top of the fan housing to the chassis (see Figure 17).
.

Release tabs
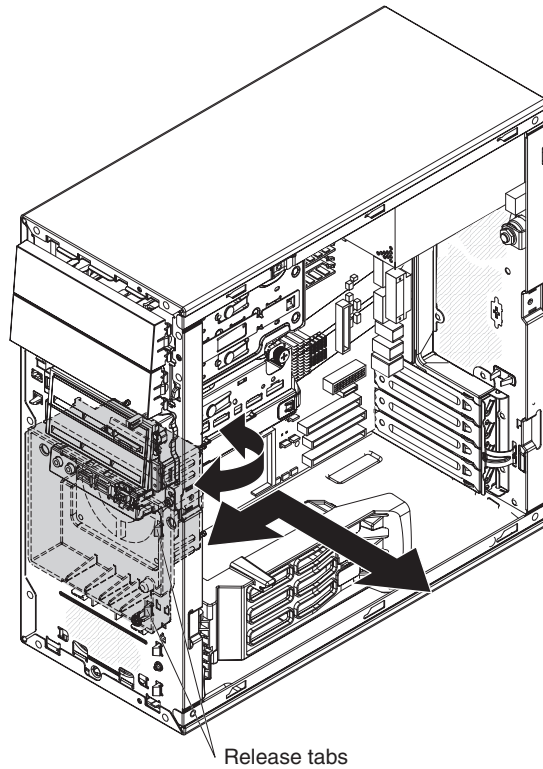
Figure 17. Removing the fan housing

10. Carefully tilt the fan housing toward the rear of the computer and disengage the lower retention tabs from the chassis.

11. Lift the fan housing up and out of the chassis.

    Note: If the computer is lying on its side, the internal speaker can slide out of its retaining tabs when the fan housing is removed. If the speaker is loose, remove it from the computer and store it in a safe place until it can be reinstalled.

12. If you are instructed to return the microprocessor fan assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the microprocessor fan assembly

To install the microprocessor fan assembly, complete the following steps:

1. Reinstall the internal speaker if it was removed.

2. Engage the lower retention tabs of the fan housing with openings in the chassis and tilt the housing toward the front of the computer.

3. Press the two retention tabs at the top of the fan housing through the openings in the front of the computer until they lock securely (see Figure 18).

Release tabs
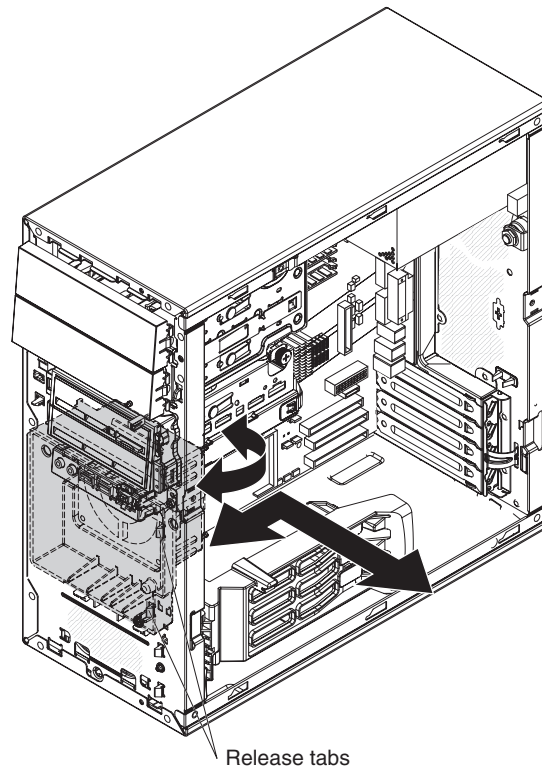
Figure 18. Installing the fan housing

4. Reconnect the fan power cable to the system board (see "System-board internal connectors" on page 7 for the location of the microprocessor fan connector).

5. Install the front adapter-retention bracket (see "Installing the front adapter-retention bracket" on page 80).

6. Position the air-baffle over the end of the fan housing and the edge of the heat sink; then, press it in place until it locks securely (see Figure 19 on page 84).

Release tab

Handle
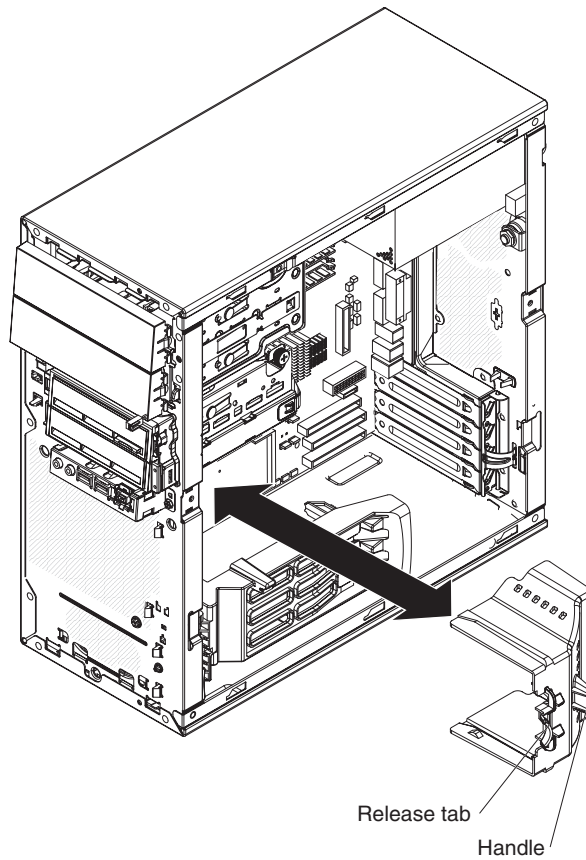
Figure 19. Installing the air baffle

7. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

8. Install the bezel if it was removed (see "Removing the bezel" on page 77).

9. Install the side cover (see "Installing the side cover" on page 76).

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

Removing an adapter

Note: This section describes the removal of adapters in PCI slots 1 through 4 on the system board. See "Removing a mini-PCI adapter" on page 106 for information about removing a mini-PCI adapter from the mini-PCI connector on the system board.

To remove an adapter, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Locate the slot containing the adapter to be removed. See "System-board option connectors" on page 6 for an illustration of the adapter slot locations.
6. Disconnect any cables to the adapter or any cables that impede access to the adapter.
7. For full-length adapters, rotate the front adapter-retention bracket to the fully open (unlocked) position (see Figure 20).
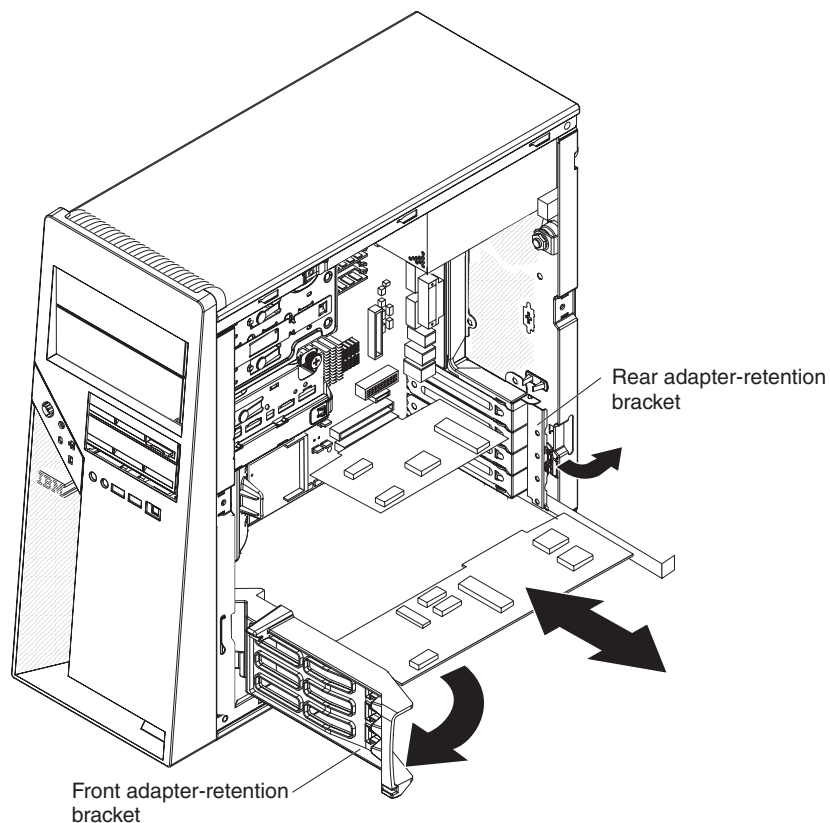
Figure 20. Removing an adapter

8. For all adapters, rotate the rear adapter-retention bracket to the fully open (unlocked) position.

   Note: Some adapters in your computer might be secured with an expansion-slot screw. If a screw is present, remove it before proceeding to the next step.

9. Grasp the adapter and pull it out of the slot.

   Attention: Expansion-slot covers must be installed in all empty slots. This maintains the electronic emissions standards of the computer and ensures proper ventilation of computer components.

10. If you are instructed to return the adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

11. If the adapter is not being replaced, install an expansion-slot cover in the expansion-slot opening.

Installing an adapter

For information about the types of adapters that your computer supports and other information that you might consider when installing an adapter, see the *User's Guide* on the IBM *IntelliStation Documentation CD*. See "System-board option connectors" on page 6 for an illustration of the adapter slot locations.

To install an adapter, complete the following steps:

1. Check 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.

2. Follow the instructions that come with the adapter to set jumpers or switches, if any.

   Attention: Avoid touching the components and gold-edge connectors on the adapter.

3. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter (see Figure 21).
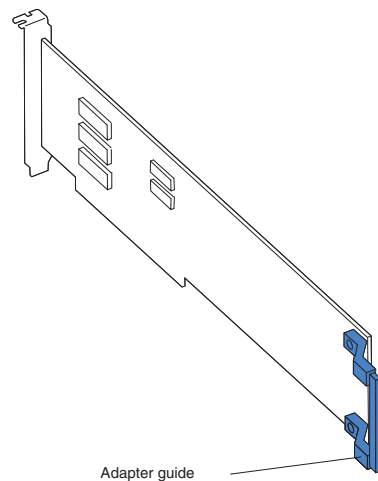
Adapter guide

Figure 21. Adapter guide location

4. Make sure that the rear adapter-retention bracket is rotated to the fully open (unlocked) position and, for full-length adapters, the front adapter-retention bracket is rotated to the fully open (unlocked) position (seeFigure 22 on page 88).
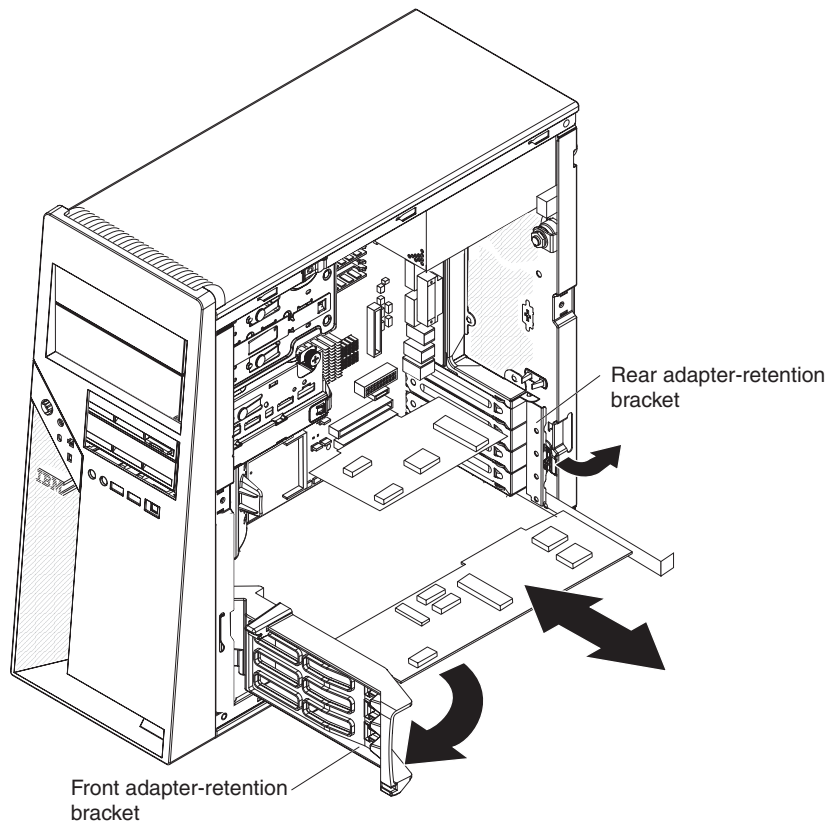
Figure 22. Installing an adapter

5. Carefully grasp the adapter by the top edge or upper corner and move the adapter directly from the static-protective package to the adapter slot. Align the adapter with the expansion slot guides; then, press the adapter *firmly* into the expansion slot.

   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.

6. Rotate the rear adapter-retention bracket to the closed (locked) position.

7. Connect any required cables to the adapter. Make sure that they do not block the flow of air from the fan.

8. If you have installed a full-length adapter, press down on the top tab of the front adapter-retention bracket to lock it in place.

   Note: If any adapter in your computer is large or has heavy cables attached to it, you can secure the adapter with a screw. Insert one backup expansion-slot screw through the top of each adapter bracket into the screw hole and secure the adapter before proceeding to the next step.

9. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

10. Install the side cover (see "Installing the side cover" on page 76).

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

Removing a DIMM

To remove a DIMM, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. For easier access to the memory modules on the system board, it might be easier to remove the drive cage from the computer (see Figure 23):
   a. Loosen the thumbscrew at the rear of the drive cage.
   b. Slide the drive cage to the rear to disengage it from the upper clips and lift the cage out of the computer.

      Note: You might have to disconnect the power cables from the drives before you lift the cage all the way out of the computer.
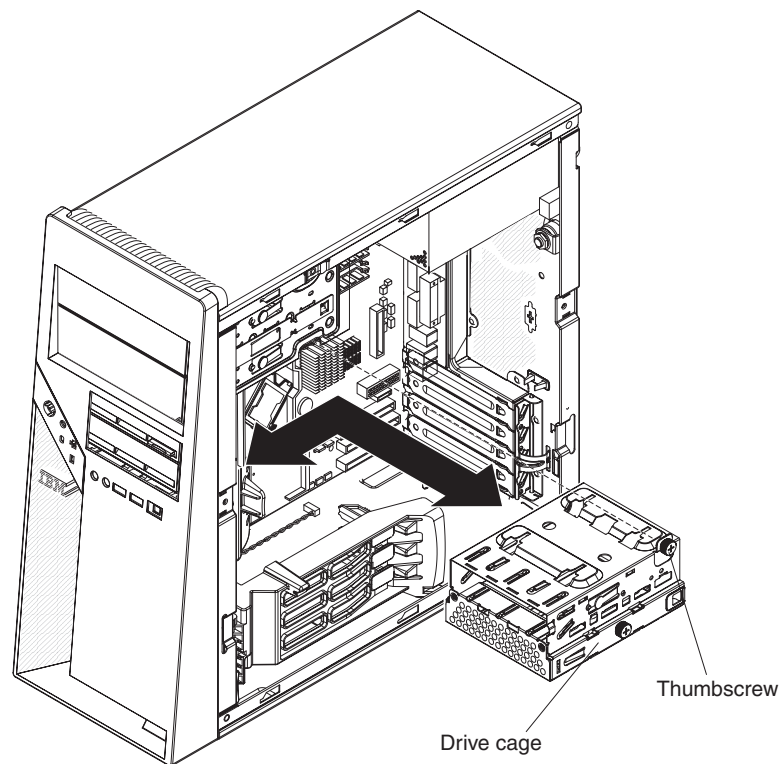
Figure 23. Removing the drive cage

6. Disconnect any cables that impede access to the DIMMs.
7. Locate the DIMM connector with the DIMM to be replaced (see "System-board option connectors" on page 6 for DIMM slot locations).

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.

8. Carefully open the retaining clips on each end of the DIMM connector and remove the DIMM (see Figure 24).
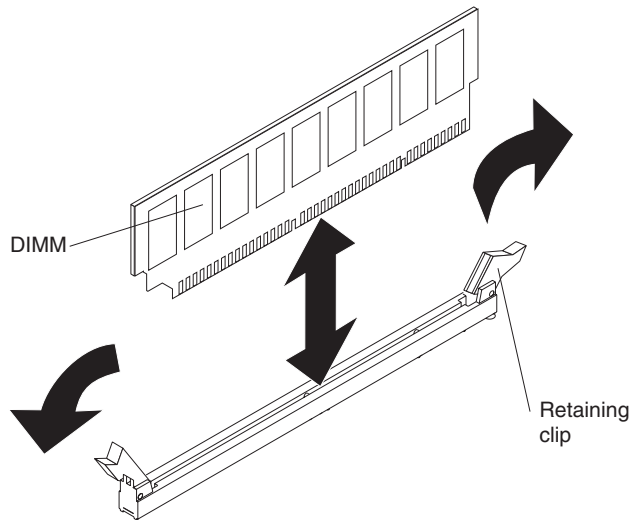
Figure 24. Removing a DIMM

9. If you are instructed to return the DIMM, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a DIMM

To install a DIMM, complete the following steps:

1. Make sure that the retaining clips on each end of the DIMM connector are fully open.
2. Touch the static-protective package that contains the new DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.
3. Turn the DIMM so that the contacts align correctly with the connector.
4. Insert the DIMM into the connector (see Figure 25 on page 91). 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 reinsert it.
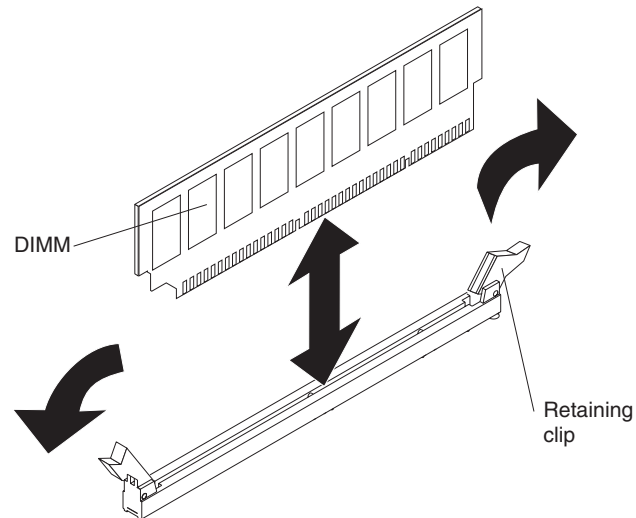
Figure 25. Installing a DIMM

5. Reinstall the drive cage if it was removed (see Figure 26).

   a. Place the drive cage into position and slide it forward to engage the upper clips.

   b. Tighten the thumbscrew at the rear of the drive cage.

   c. Reconnect the power cables to the drives in the cage if any were disconnected.
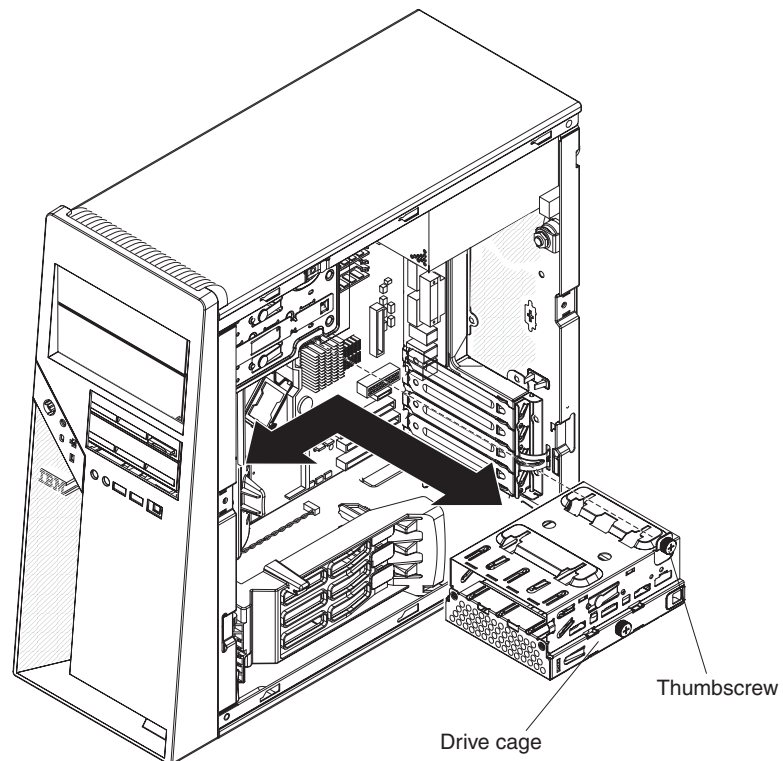
Figure 26. Installing the drive cage

6. Reconnect any cables that were disconnected during removal.

7. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).
8. Install the side cover (see "Installing the side cover" on page 76).
9. Reconnect the external cables and power cords; then, turn on the attached devices and 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 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove any adapters that impede access to the battery.
6. Remove the battery:
   a. Use a fingernail to press the top of the battery clip away from the battery (see Figure 27). The battery pops up when released.
   b. Use your thumb and index finger to lift the battery from the socket.
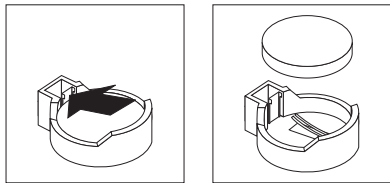
Figure 27. Removing the battery

Installing the battery

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. 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 (see Figure 28) until it clicks into place. Make sure that the battery clip holds the battery securely.
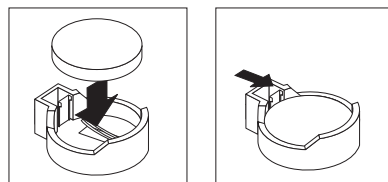
Figure 28. Installing the battery

2. Reinstall any adapters that were removed.
3. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).
4. Install the side cover (see "Installing the side cover" on page 76).

5. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.
6. Start the Configuration/Setup Utility program and reset the configuration:
   - Set the system date and time.
   - Set passwords if necessary.
   - Save the configuration.

Removing the internal speaker

The internal speaker is on the front panel of the computer, behind the front adapter-retention bracket.

To remove the speaker, complete the following steps:
1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove the front bezel (see "Removing the bezel" on page 77).

   Note: It might be helpful to lay the computer on its left side for the remainder of this procedure.
6. Remove any full-length adapters that are installed.
7. Disconnect the speaker wire from the system board connector.
8. Remove the front adapter-retention bracket (see "Removing the front adapter-retention bracket" on page 79).
9. Remove the microprocessor fan assembly (see "Removing the microprocessor fan assembly" on page 81).
10. Slide the speaker out of its retaining tabs toward the top of the computer and lift it out of the computer.
11. If you are instructed to return the speaker, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the internal speaker

To install the speaker, complete the following steps:
1. Slide the speaker into the retaining tabs in the front of the computer.
2. Install the microprocessor fan assembly (see "Installing the microprocessor fan assembly" on page 83).
3. Install the front adapter-retention bracket (see "Installing the front adapter-retention bracket" on page 80).
4. Reconnect the speaker wire to the system board connector.
5. Install any full-length adapters that were removed.
6. Install the front bezel (see "Installing the bezel" on page 78).
7. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).
8. Install the side cover (see "Installing the side cover" on page 76).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

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 the hard disk drive bracket

The hard disk drive bracket is installed on some models to provide a drive bay (bay 5) for an additional hard disk drive. When working with some devices, such as hard disk drives, adapters, and memory modules, you must first remove the hard disk drive bracket to access the device.

To remove the hard disk drive bracket, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover ("Removing the side cover" on page 75)
4. Disconnect the signal and power cables from the hard disk drive that is installed in the tray.

   Note: To remove the hard disk drive from the tray, see "Removing a drive in bay 5" on page 104.
5. Remove the two screws that fasten the top edge of the hard disk drive bracket to the chassis (see Figure 29 on page 96).
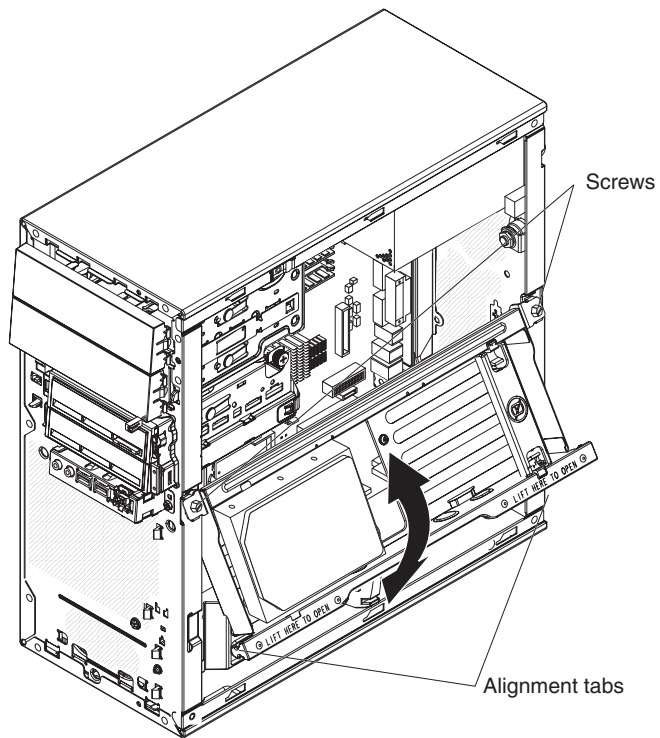
Figure 29. Removing the hard disk drive bracket

6. Grasp the lower edge of the hard disk drive bracket and disengage it from the chassis; then, lift the top edge of the tray from the chassis and remove the tray from the computer.

7. If you are instructed to return the hard disk drive bracket, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the hard disk drive bracket

To install the hard disk drive bracket, complete the following steps:

1. Place the top edge of the hard disk drive bracket into place on the chassis; then, rotate the tray downward until it engages in the chassis (see Figure 30).
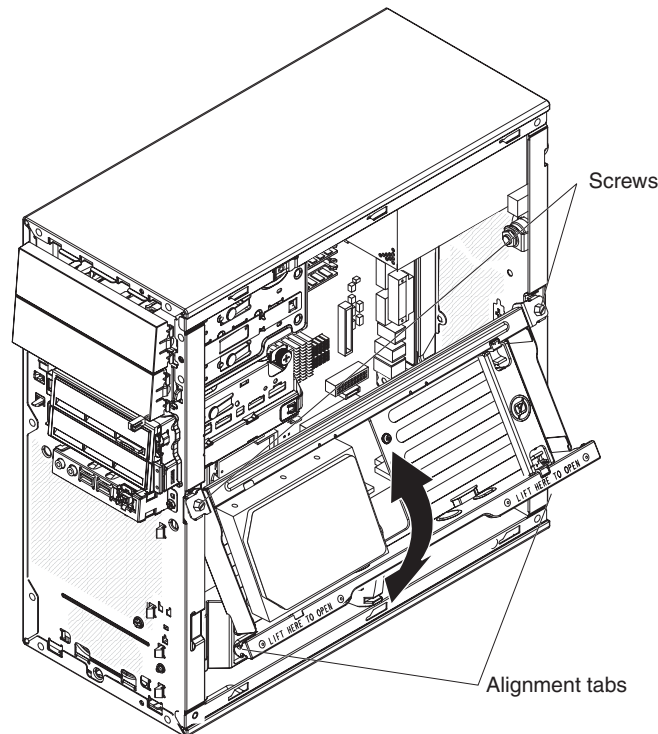
Figure 30. Installing the hard disk drive bracket

2. Install the two screws that fasten the top edge of the hard disk drive bracket to the chassis.
3. Reconnect the signal and power cables to the hard disk drive that is installed in the tray.

   Note: If you removed the hard disk drive while removing the tray, install it now (see"Installing a drive in bay 5" on page 105.

4. Install the side cover (see "Installing the side cover" on page 76).
5. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the computer.

Removing and installing internal drives

This section describes the removal and installation of internal drives (see Figure 31 for the location of the drive bays). See the *User's Guide* for more information about the types of drives that the computer supports.

Bay 1
Bay 2
Bay 3
Bay 4

Bay 5
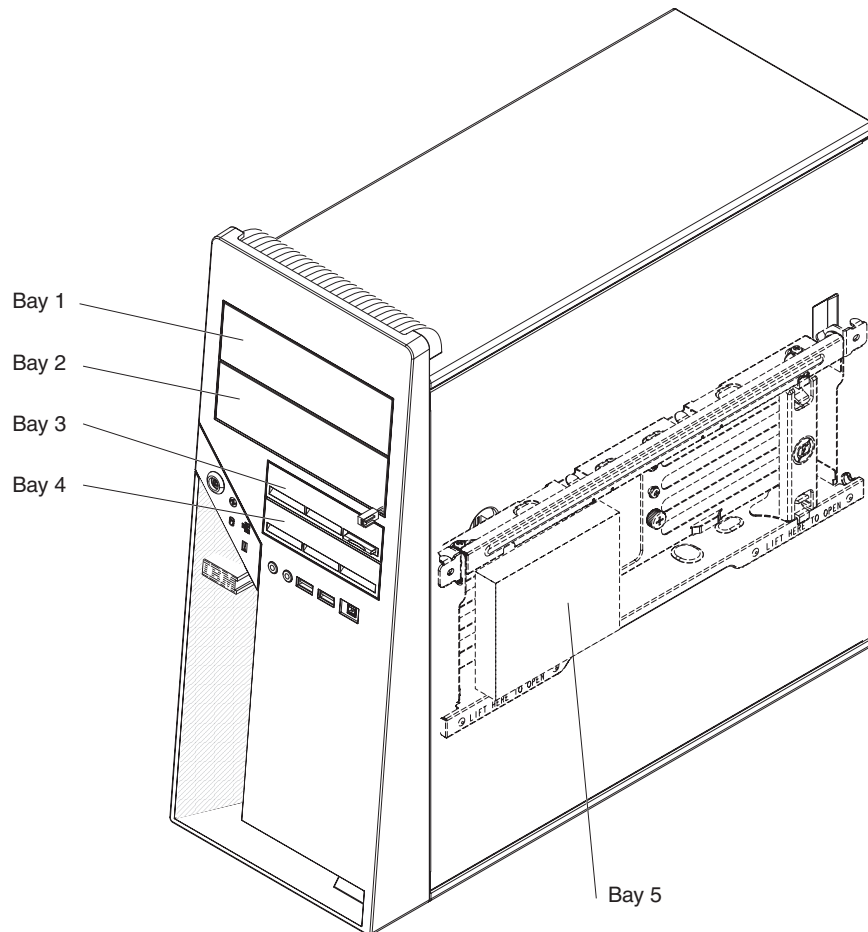
Figure 31. Internal drive bay locations

Removing a drive in bay 1 or 2

To remove 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 73.
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 75).
4. Remove the front bezel (see "Removing the bezel" on page 77).
5. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
6. Disconnect the cables from the drive that you are removing.
7. Release the drive from the bay by pressing the blue release button on the side of the drive; then, pull the drive out of the computer (seeFigure 32 on page 99).

Drive retainer clip

Release buttons
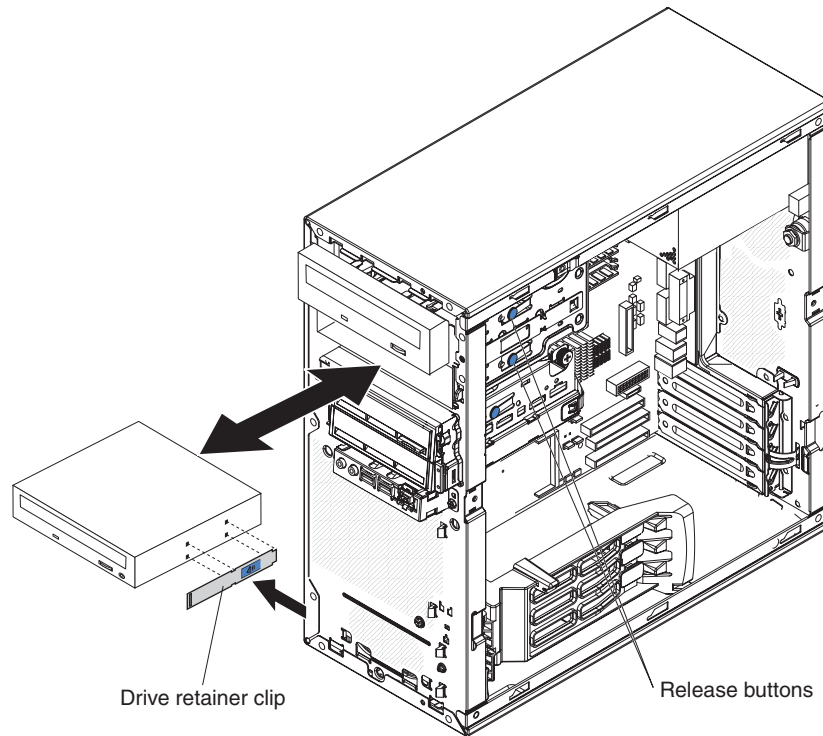
Figure 32. Removing a drive from bay 1 or 2

8. Remove the blue drive retainer clip from the side of the drive and install it on the replacement drive.

9. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a drive in bay 1 or 2

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

1. If you are replacing a removed drive with a new drive, make sure that:

   • You have all the cables and other equipment specified in the documentation that comes with the new drive.

   • You check the instructions that come with the new 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 select the SCSI ID for that device.

   • You have removed the blue drive retainer clip on the side of the old drive and have it available for installation 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

2. Touch the static-protective package that contains 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.

3. Follow the instructions that come with the drive to set jumpers, switches, or SCSI ID, if any.

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

4. 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.

5. Install the blue drive retainer 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 33 on page 101).

Drive retainer clip   Release buttons
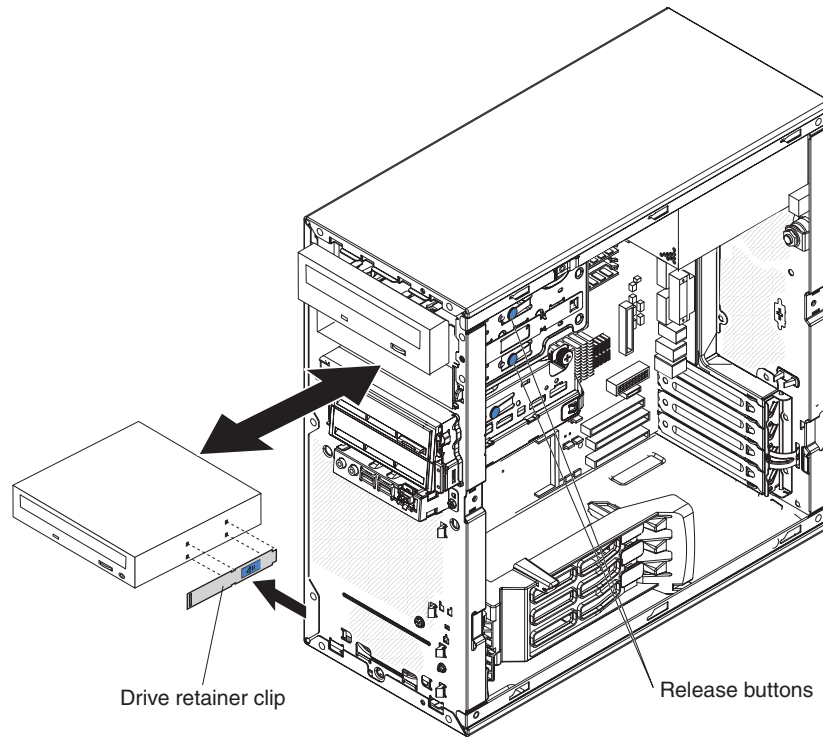
Figure 33. Installing a drive in bay 1 or 2

6. Push the drive into the front of the bay until it clicks into place.
7. Reconnect the cables to the drive.

    Note: Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor.

8. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).
9. Install the bezel (see "Removing the bezel" on page 77).
10. Install the side cover (see "Installing the side cover" on page 76).
11. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing a drive in bay 3 or 4

To remove a drive in bay 3 or 4, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. If you are removing a diskette drive, remove the front bezel (see "Removing the bezel" on page 77).
5. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
6. Disconnect the cables from the drive that you are removing.

7. To remove the drive, use one of the following procedures (see Figure 34):
   - For a diskette drive in bay 3, press the blue latch on the side of the drive cage and pull the drive out of the front of the computer.
   - For a hard disk drive in bay 3, remove the two mounting screws on the side of the bay and pull the drive out of the rear of the drive cage.
   - For a hard disk drive in bay 4, loosen the thumbscrew on the side of the drive cage; then, grasp the handle of the drive tray at the rear of the drive and carefully pull the drive out of the rear of the drive cage.

Hard disk drive tray

Drive retainer clip
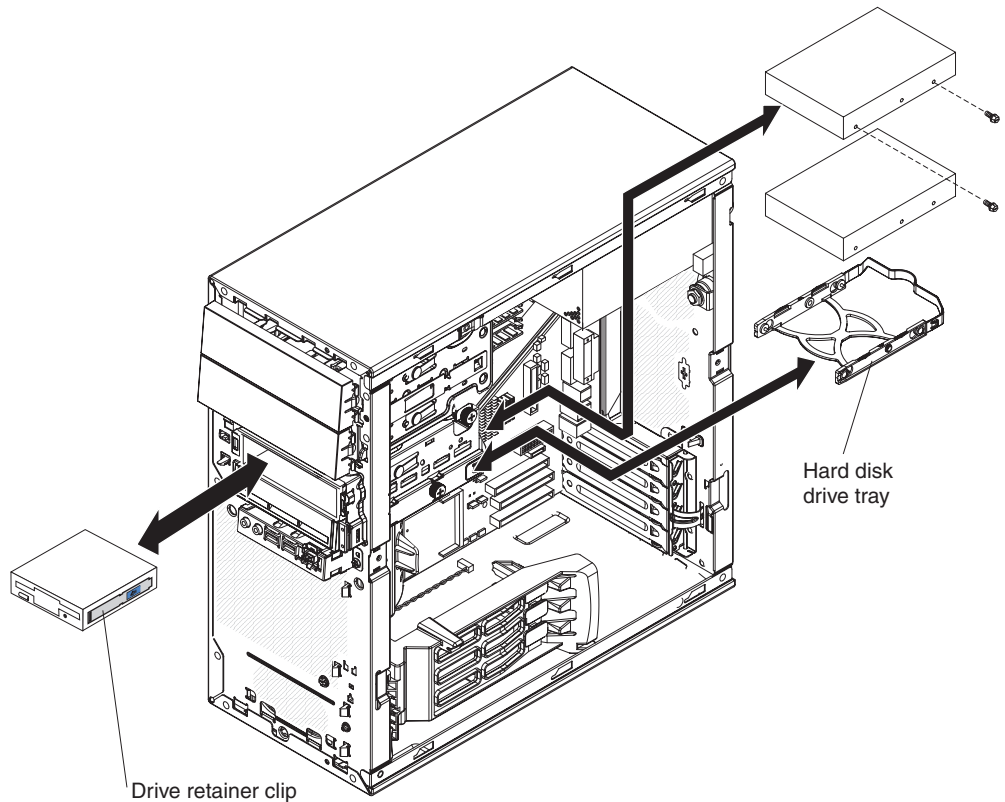
Figure 34. Removing a drive from bay 3 or 4

8. If you are replacing the removed drive with a new drive, remove the drive tray or retainer clip from the old drive and store it in a safe place.
9. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a drive in bay 3 or 4
To install a drive in bay 3 or 4, complete the following steps:
1. If you are replacing a removed drive with a new drive, make sure that:
   - You have all the cables and other equipment specified in the documentation that comes with the new drive.
   - You check the instructions that come with the new 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 select the SCSI ID for that device.
   - You have removed the drive tray or blue drive retainer clip from the old drive, and have it available for installation on the new drive.

2. 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.

3. Follow the instructions that come with the drive to set jumpers, switches, or SCSI ID, if any.

4. To insert the drive, use one of the following procedures (see Figure 35):

   • For a diskette drive in bay 3, Install the blue drive retainer clip into the screw holes on the side of the drive; then, push the drive into the front of the bay until it clicks into place.

   • For a hard disk drive in bay 3, push the drive into the rear of the bay; then, install the two screws through the side of the drive cage.

   • For a hard disk drive in bay 4, install the hard disk drive tray onto the drive; then, push the drive into the rear of the bay until it clicks into place and tighten the thumbscrew on the side of the drive cage.
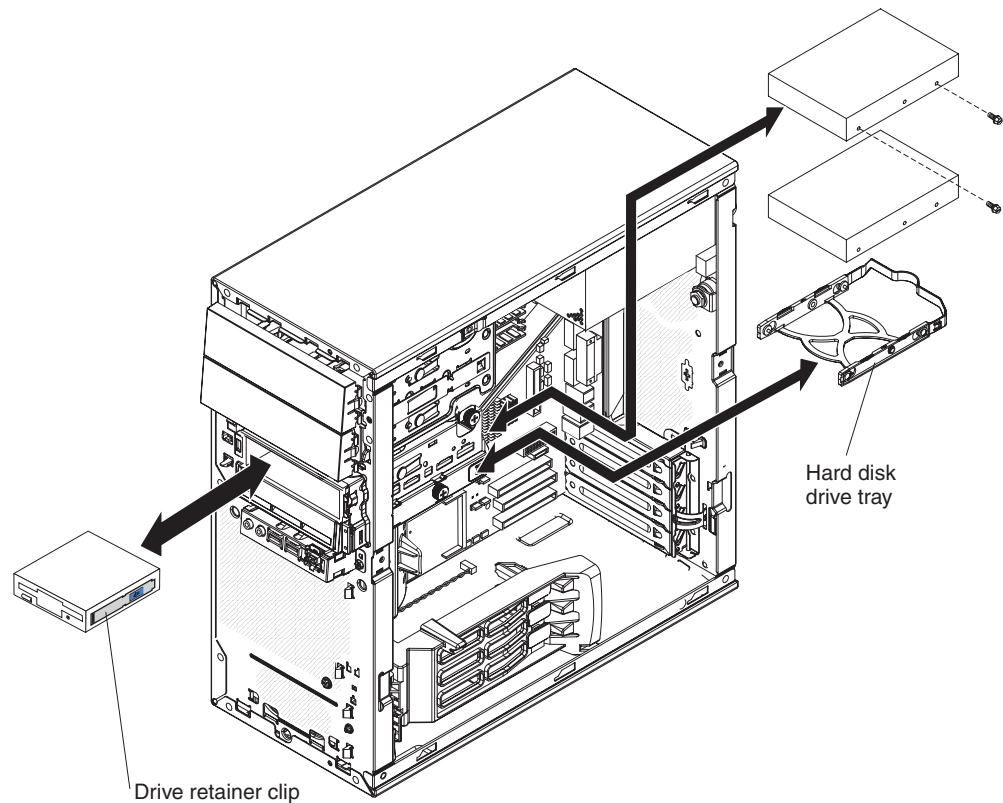
Figure 35. Installing a drive in bay 3 or 4

5. Reconnect the cables to the drive.

   Note: Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor.

6. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

7. Install the bezel, if it was removed (see "Installing the bezel" on page 78).

8. Install the side cover (see "Installing the side cover" on page 76).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing a drive in bay 5

To remove a drive in bay 5, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75)
4. Disconnect the signal and power cables from the hard disk drive.
5. Remove the thumbscrew at the rear of the drive.
6. Lift the rear of the drive out of the hard disk drive bracket; then, slide the shoulder screws at the front of the drive out of the guide slots in the hard disk drive bracket (see Figure 36).

Guide slots

Thumbscrew
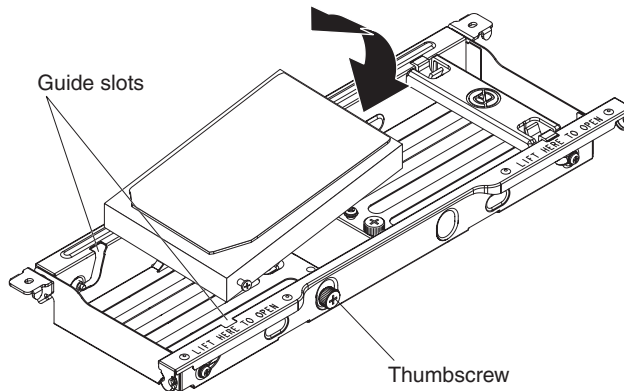
Figure 36. Removing a drive from bay 5

7. If you are replacing the hard disk drive with a new drive, remove the two shoulder screws, one on each side, at the front of the drive and store them for reuse (see Figure 37 on page 105).
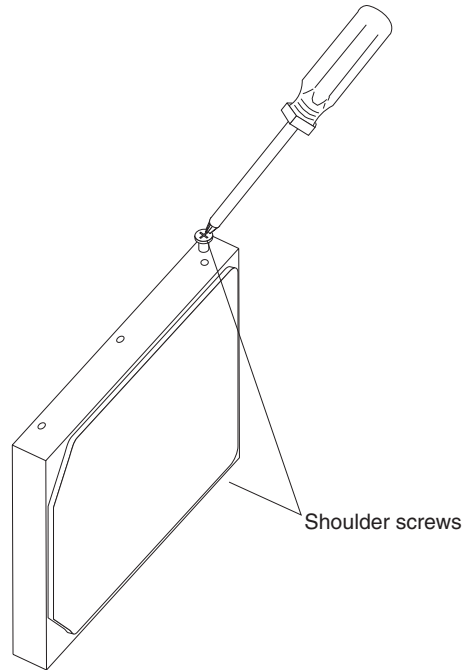
Figure 37. Bay 5 hard disk drive shoulder screws

.

8. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a drive in bay 5

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

1. If you are replacing a removed hard disk drive with a new drive, install the two shoulder screws, one on each side, at the front of the new drive (see Figure 37).

2. Position the hard disk drive so that the shoulder screws are aligned with the guide slots in the hard disk drive bracket and slide the front of the drive into the slots (see Figure 38).
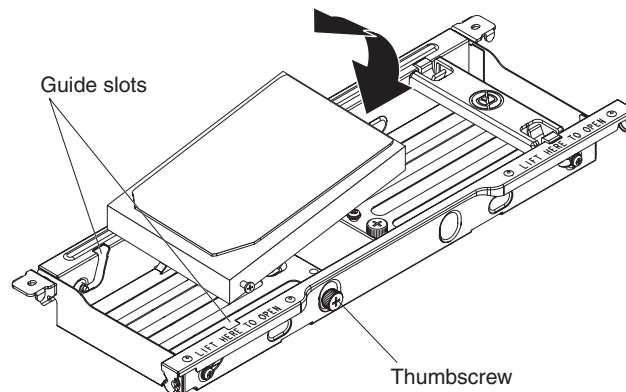
Figure 38. Installing a drive in bay 5

3. Lower the rear of the drive into position in the tray and install the thumbscrew at the rear of the drive.

4. Reconnect the signal and power cables to the hard disk drive in the tray.
5. Install the side cover (see "Installing the side cover" on page 76).
6. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the computer.

Removing a mini-PCI adapter

Note: This section describes the removal of a mini-PCI adapter from the mini-PCI connector on the system board. See "Removing an adapter" on page 85 for information about removing an adapter from PCI slots 1 through 4 on the system board.

To remove a mini-PCI adapter, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove any long adapters that might impede access to the mini-PCI adapter.
6. Disconnect the signal cable from the mini-PCI adapter.
7. Gently pull up on the connector end of the mini-PCI adapter until it disengages from the plastic standoffs. If the standoffs come away from the system board with the SCSI card, gently pull them out of the SCSI card and push them back into their apertures on the system board (see Figure 39).

Plastic
standoff
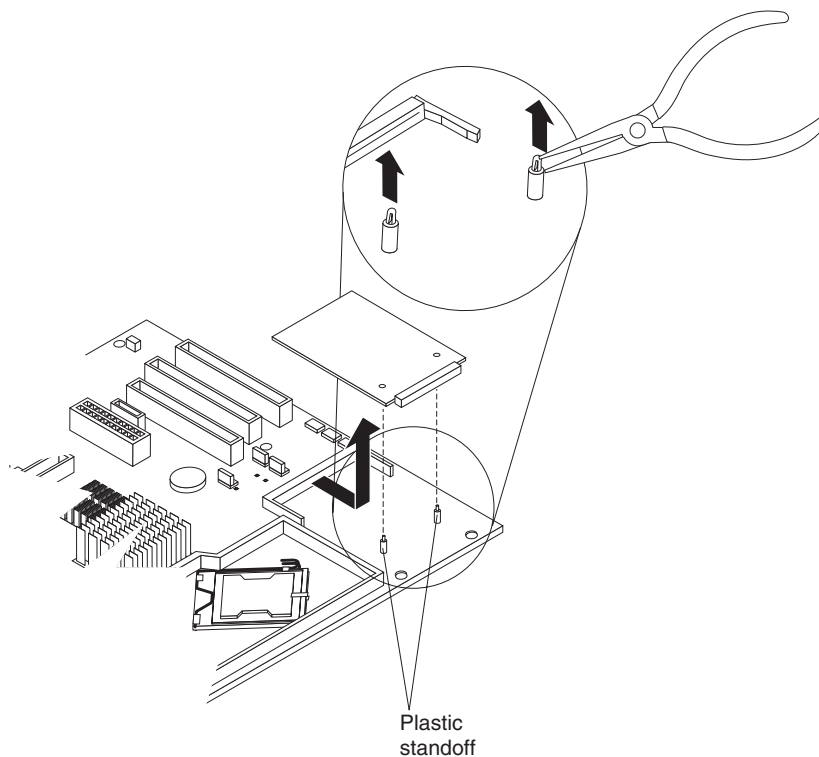
Figure 39. Removing the mini-PCI adapter

Note: You can also gently pinch the top of each standoff using needle-nose pliers and then pull the mini-PCI adapter away.

8. Carefully pull the mini-PCI adapter toward the front of the computer to remove it from the mini-PCI connector on the system board.

9. Lift the mini-PCI adapter out of the computer.

10. If you are instructed to return the mini-PCI adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a mini-PCI adapter

To install a mini-PCI adapter, complete the following steps:

1. Insert the front edge of the mini-PCI adapter into the mini-PCI connector on the system board.

2. Lower the rear (connector) edge onto the plastic standoffs and gently press down on the connector until the standoffs securely snap into the mini-PCI adapter (see Figure 40).

Plastic
standoff
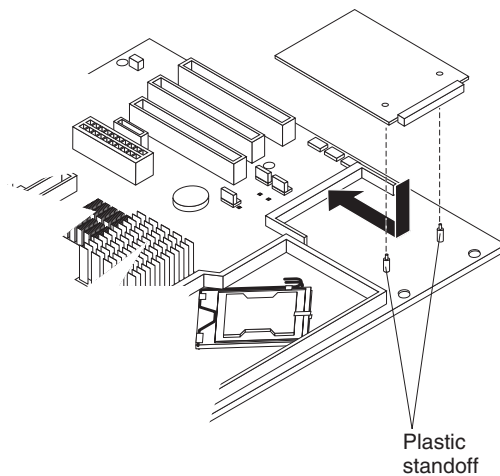
Figure 40. Installing a mini-PCI adapter

3. Reconnect the signal cable to the mini-PCI adapter.

4. Install any long adapters that were removed.

5. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

6. Install the side cover (see "Installing the side cover" on page 76).

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

Removing the power switch/LED assembly

To remove the power switch/LED assembly, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove the front bezel (see "Removing the bezel" on page 77).

   Note: It might be helpful to lay the computer on its left side for the remainder of this procedure.

6. Remove the drive cage from the computer (see Figure 23 on page 89):
   a. Loosen the thumbscrew at the rear of the drive cage.
   b. Slide the drive cage to the rear to disengage it from the upper clips and lift the cage out of the computer.

   Note: You might have to disconnect the power cables from the drives before you lift the cage all the way out of the computer.

7. Disconnect the power switch/LED assembly cable from the front I/O panel card.
8. Disconnect the front Ethernet activity LED cable from the system board (see "System-board internal connectors" on page 7 for the connector location).
9. From the front of the computer, press up and inward on the two retaining tabs that secure the bottom of the power switch/LED assembly to the chassis (see Figure 41).
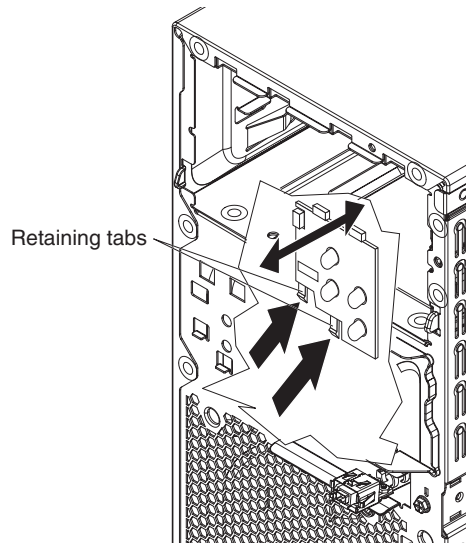
Figure 41. Removing the power switch/LED assembly

10. Disengage the upper retaining tabs from the chassis; then, carefully lift the power switch/LED assembly and cables out of the computer.

11. If you are instructed to return the power switch/LED assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the power switch/LED assembly

To install the power switch/LED assembly, complete the following steps:

1. Insert the upper retaining tabs of the power switch/LED assembly into the openings in the chassis; then, press on the bottom edge of the assembly until the lower retention tabs click into place (see Figure 42).

Retaining tabs
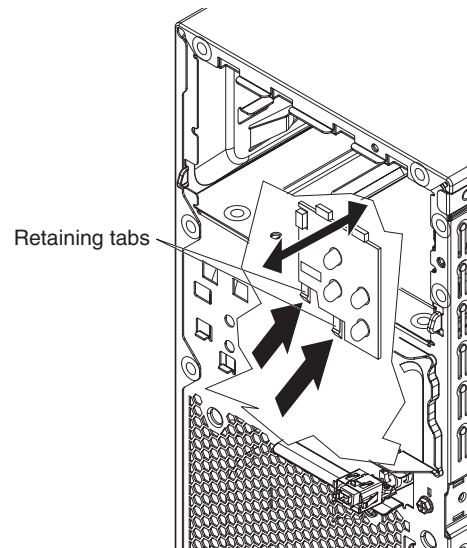
Figure 42. Installing the power switch/LED assembly

2. Reconnect the front Ethernet activity LED cable to the system board (see "System-board internal connectors" on page 7 for connector location).

3. Reconnect the power switch/LED assembly cable to the front I/O panel card.

4. Reinstall the drive cage if it was removed (see Figure 26 on page 91):

   a. Place the drive cage into position and slide it forward to engage the upper clips.

   b. Tighten the thumbscrew at the rear of the drive cage.

   c. Reconnect the power cables to the drives in the cage if any were disconnected.

5. Install the front bezel (see "Installing the bezel" on page 78).

6. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

7. Install the side cover (see "Installing the side cover" on page 76).

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

Removing and replacing FRUs

FRUs must be installed only by trained service technicians.

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

Removing the front I/O panel

To remove the front I/O panel, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).
5. Remove the front bezel (see "Removing the bezel" on page 77).

   Note: It might be helpful to lay the computer on its left side for the remainder of this procedure.

6. Remove the drive cage from the computer (see Figure 23 on page 89):

   a. Loosen the thumbscrew at the rear of the drive cage.

   b. Slide the drive cage to the rear to disengage it from the upper clips and lift the cage out of the computer.

   Note: You might have to disconnect the power cables from the drives before you lift the cage all the way out of the computer.

7. Disconnect the internal IEEE 1394 (FireWire) cable and front-panel cable from the system board (see "System-board internal connectors" on page 7 for connector locations).
8. Disconnect the power switch/LED assembly cable from the back of the I/O card.
9. Remove the I/O panel screw on the front of the computer (see Figure 43).
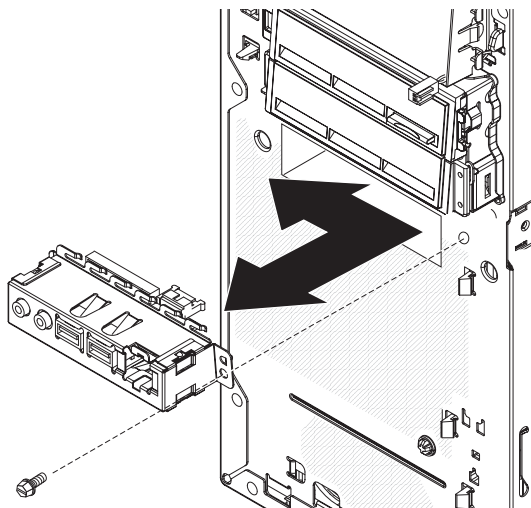
Figure 43. Removing the front I/O panel

10. Slide the I/O panel toward the right side of the computer (up, if the computer is on its side) to disengage it from the computer front panel; then, carefully pull the I/O panel, card, and cables out of the opening in the front panel.

11. If you are instructed to return the front I/O panel, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the front I/O panel

To install the front I/O panel, complete the following steps:

1. Carefully feed the IEEE 1394 (FireWire) cable and front-panel cable into the opening in the front of the computer.

2. Insert the I/O panel into the opening in the front of the computer and slide the panel to the left so that the clips on the left edge engage the opening (see Figure 44).
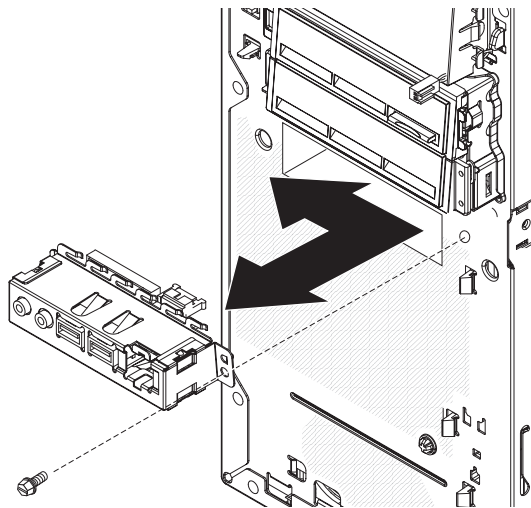
Figure 44. Installing the front I/O panel

3. Install the I/O panel screw on the front of the computer.

4. Reconnect the power switch/LED assembly cable to the back of the I/O card.

5. Reconnect the internal IEEE 1394 (FireWire) cable and front-panel cable to the system board (see "System-board internal connectors" on page 7 for connector locations).

6. Reinstall the drive cage (see Figure 26 on page 91):

   a. Place the drive cage into position and slide it forward to engage the upper clips.

   b. Tighten the thumbscrew at the rear of the drive cage.

   c. Reconnect the power cables to the drives in the cage if any were disconnected.

7. Install the front bezel (see "Installing the bezel" on page 78).

8. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

9. Install the side cover (see "Installing the side cover" on page 76).

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

Removing the microprocessor and heat sink

To remove the microprocessor and heat sink, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.

2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.

3. Turn the computer on its side so that it is lying flat, with the cover facing up.

4. Remove the side cover (see "Removing the side cover" on page 75).

5. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).

6. Remove the air baffle from the microprocessor fan assembly (see "Removing the microprocessor fan assembly" on page 81).

7. Disconnect any cables that impede access to the heat sink and microprocessor.

   Attention: The heat-sink retention lever is spring-loaded when the heat sink is in place. Releasing the lever too quickly or allowing it to spring upward can damage the heat sink and surrounding components.

8. Remove the heat sink from the microprocessor (see Figure 45):
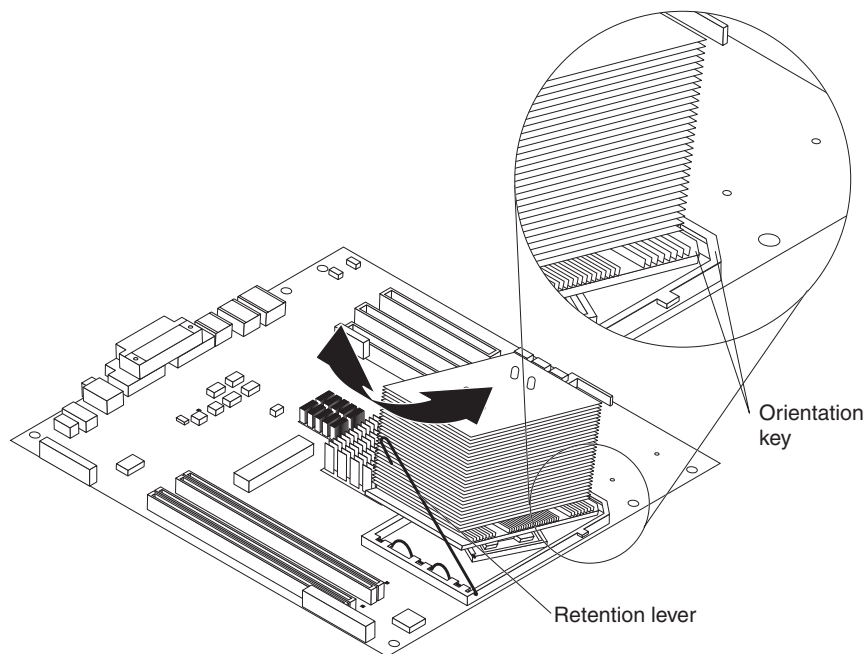
Figure 45. Removing the heat sink

   a. Release the heat-sink retention lever by pressing down on the end, moving it to the left and slowly releasing it to the open (up) position.

   Important: Be careful when handling the microprocessor and heat sink. If the microprocessor and heat sink will be reused, do not contaminate the thermal material between them.

b. Tip the top of the heat sink up (away from the system board) while sliding it away from the lower flange of the retention module; then, remove it from the computer. After removal, place the heat sink on its side on a clean, flat surface.

Note: The heat sink is keyed to a 45-degree angle in one corner of the retention module to maintain proper orientation during installation.

Attention: The microprocessor socket lever is spring-loaded when the microprocessor is in place. Releasing the lever too quickly or allowing it to spring upward can damage the microprocessor and surrounding components.

9. Release the microprocessor socket lever by pressing down on the end, moving it to the right, and slowly releasing it to the open (up) position (see Figure 46).

Socket cover

Lever
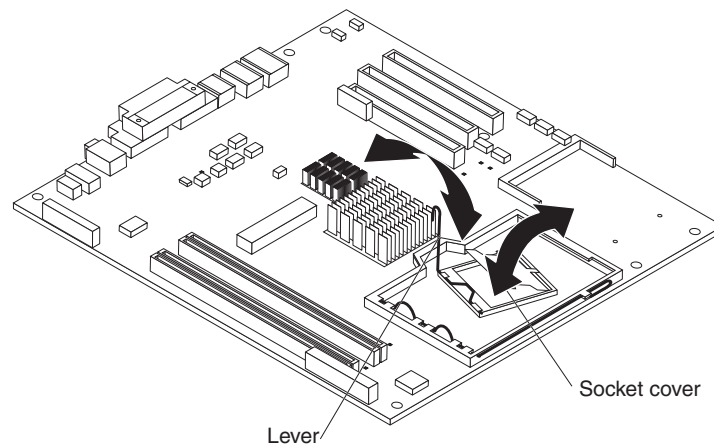
Figure 46. Opening the microprocessor socket

10. Open the microprocessor socket cover by lifting up the tab on the top edge.

Attention: Use the vacuum tool provided with the replacement part to remove the microprocessor. Dropping the microprocessor during removal can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

11. Remove the microprocessor using the vacuum tool and the following procedure (see Figure 47 on page 114).

Vacuum tool

Microprocessor
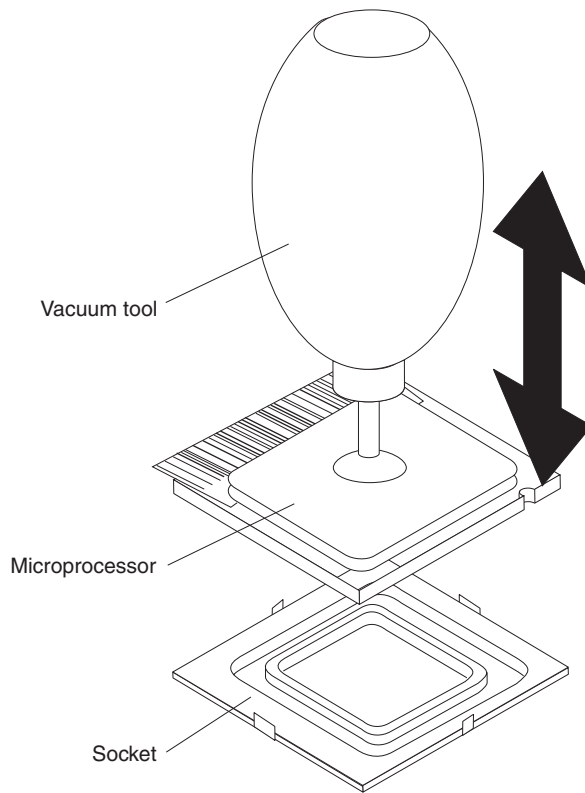
Socket

Figure 47. Removing the microprocessor

   a. Squeeze and hold the bladder of the tool; then, place the suction cup on
      the microprocessor and release the bladder.
   b. Using the tool, carefully lift the microprocessor straight up and out of the
      socket, and place it on a static-protective surface.
   c. Squeeze the bladder of the tool to release the microprocessor from the
      suction cup.
12. If you are instructed to return the microprocessor and heat sink, follow all
    packaging instructions, and use any packaging materials for shipping that are
    supplied to you.

Installing the microprocessor and heat sink

To install the microprocessor and heat sink, complete the following steps:

1. Make sure that the microprocessor socket lever and cover are in the fully open position.

   Attention: Use the vacuum tool provided with the replacement part to install the microprocessor. Dropping the microprocessor during installation can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

2. Install the microprocessor using the vacuum tool and the following procedure (see Figure 48).
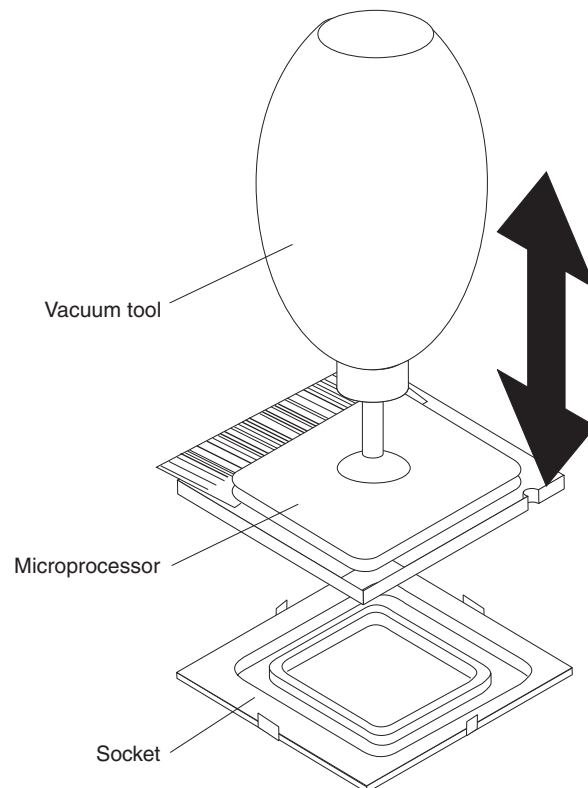
Figure 48. Installing the microprocessor

   a. Squeeze and hold the bladder of the tool; then, place the suction cup on the microprocessor and release the bladder.

   b. Using the tool, carefully place the microprocessor into the socket.

   c. Squeeze the bladder of the tool to release the microprocessor from the suction cup.

   Note: To maintain proper orientation between the microprocessor and the microprocessor socket during installation, observe the following information (see Figure 49 on page 116):

   - The microprocessor has two notches that are keyed to two tabs on the sides of the socket.
   - A triangle-shaped indicator on one corner of the microprocessor points to a 45-degree angle on one corner of the socket.
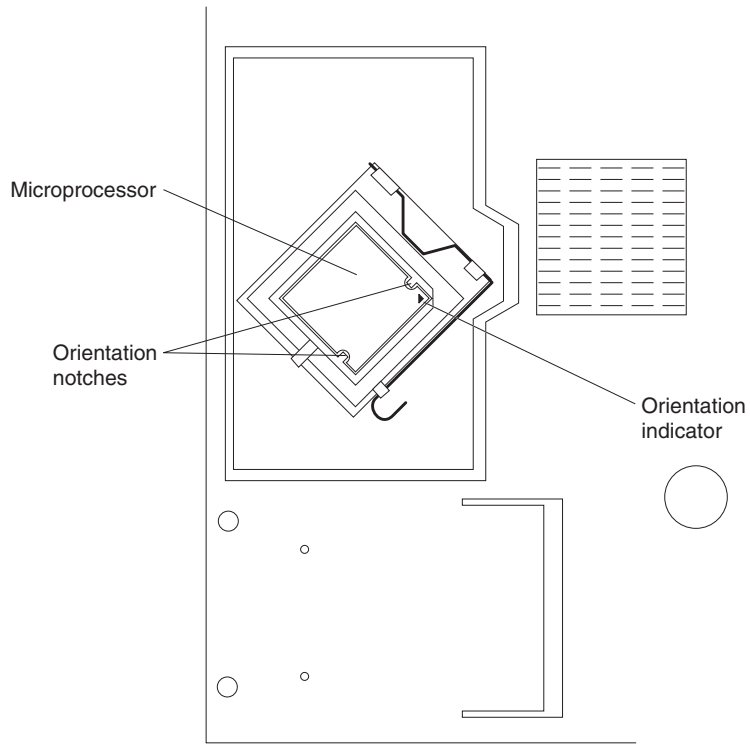
Figure 49. Microprocessor orientation

3. Close the microprocessor socket cover; then, close the microprocessor socket lever and lock it securely in place (seeFigure 50).
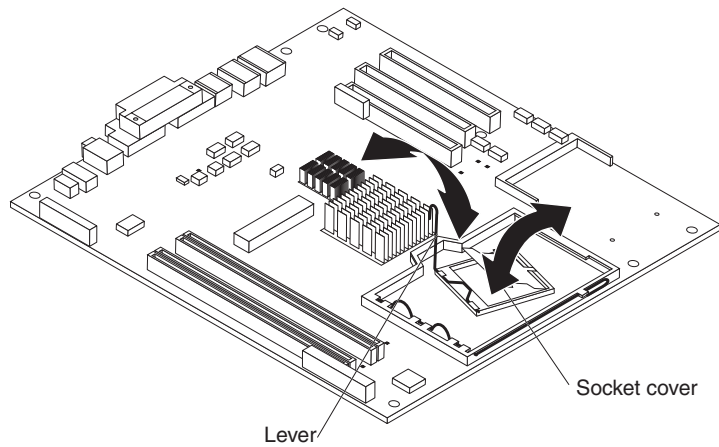
Figure 50. Closing the microprocessor socket

4. Install the heat sink (see Figure 51):

Orientation key
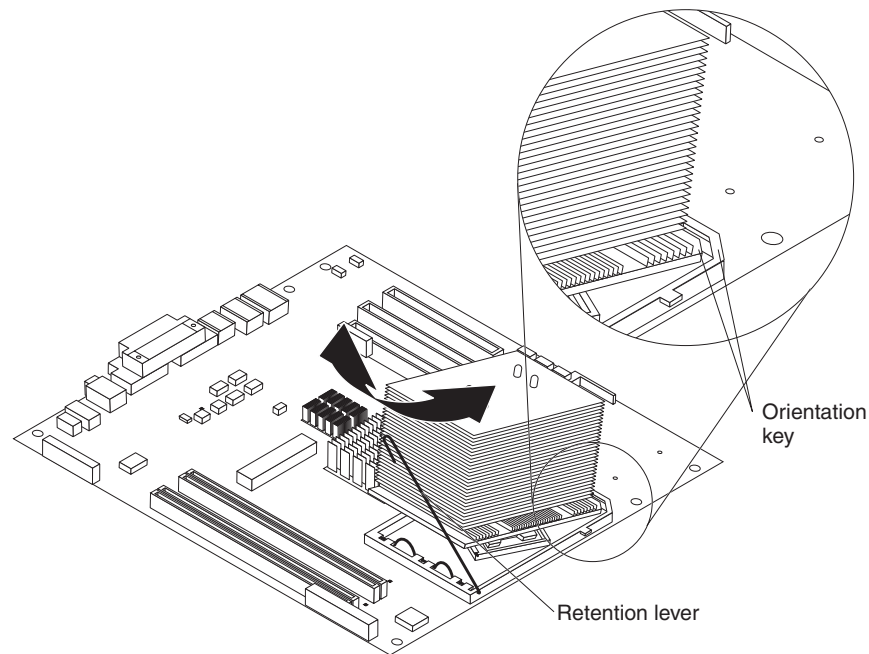
Retention lever

Figure 51. Installing the heat sink

    a. Make sure that the heat-sink retention lever is in the fully open position.

       Important: Be careful when handling the microprocessor and heat sink. Do not contaminate the thermal material between them.

    b. Slide the bottom edge of the heat sink under the lower flange of the retention module; then, place the top of the heat sink onto the top of the retention module.

       Note: The bottom edge of the heat sink is keyed to a 45-degree angle in one corner of the retention module to maintain proper orientation.

    c. Close the heat-sink retention lever and lock it securely in place.

5. Reconnect any cables that were disconnected during removal.

6. Install the air baffle onto the microprocessor fan assembly (see "Installing the microprocessor fan assembly" on page 83).

7. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

8. Install the side cover (see "Installing the side cover" on page 76).

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

Removing the power supply

When you remove or install a power supply, observe the following precautions.

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.

To remove the power supply, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 73.

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 75).

4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).

   Note: It might be helpful to lay the computer on its left side for the remainder of this procedure.

5. Disconnect the cables from the power supply to the system board and all internal components.

6. Remove the power-supply retaining screws from the rear of the computer (see Figure 52 on page 119).
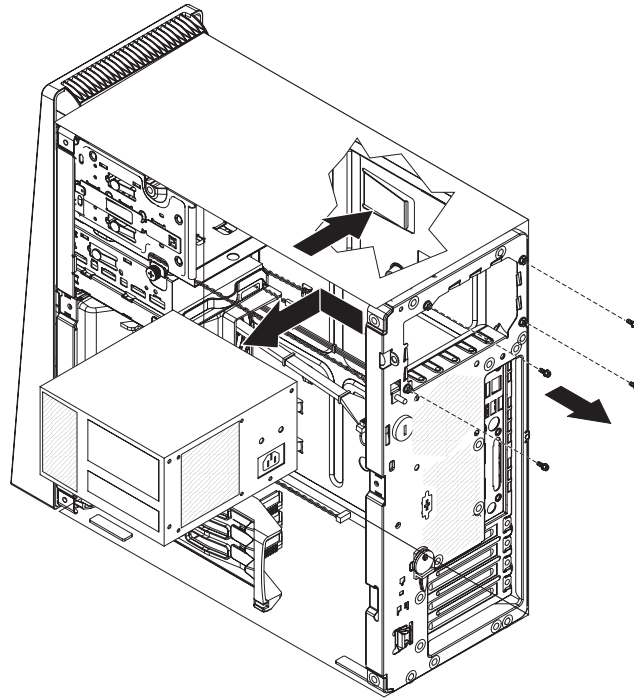
Figure 52. Removing the power supply

7. Press in on the power-supply retaining tab and slide the power supply toward the front of the computer until it clears the mounting bracket.
8. Carefully lift the power supply out of the computer.
9. If you are instructed to return the power supply, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the power supply

Important:

This computer is suitable for use on an IT powers distribution system, whose maximum phase to phase voltage is 240 V under any distribution fault condition.

To install the power supply, complete the following steps:

1. Place the power supply into the chassis and slide it toward the rear of the computer until the power-supply retaining tab clicks into place (see Figure 53).
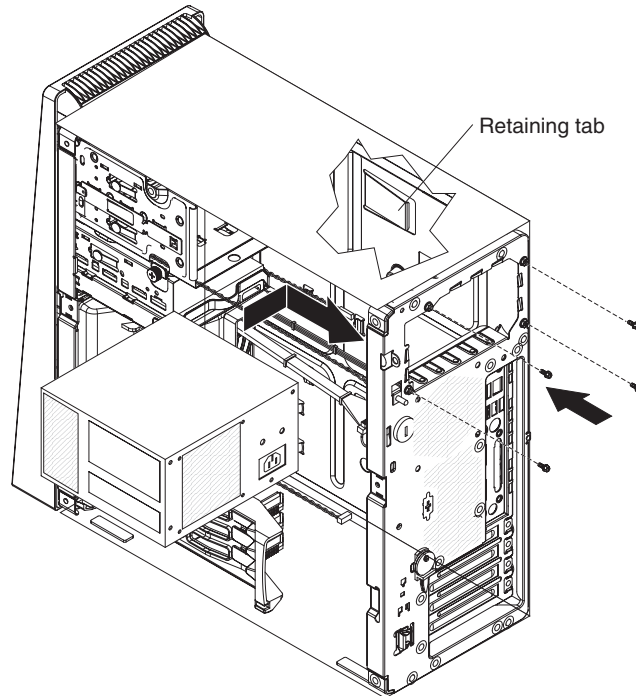
Retaining tab

Figure 53. Installing the power supply

2. Install the power-supply retaining screws from the rear of the computer.
3. Reconnect the cables from the power supply to the system board and all internal components.
4. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).
5. Install the side cover (see "Installing the side cover" on page 76).
6. Reconnect the external cables and power cords; then, turn on the attached devices and 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 73.
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 75).
4. Remove the hard disk drive bracket, if one is installed (see "Removing the hard disk drive bracket" on page 95).

   Note: It might be helpful to lay the computer on its left side for the remainder of this procedure.

5. Remove the air baffle from the microprocessor fan assembly (see "Removing the microprocessor fan assembly" on page 81).

   Important: When disconnecting cables, note the cable routing and connector labels for use during installation.

6. Remove the drive cage from the computer (see Figure 23 on page 89):
   a. Loosen the thumbscrew at the rear of the drive cage.
   b. Slide the drive cage to the rear to disengage it from the upper clips and lift the cage out of the computer.

   Note: You might have to disconnect the power cables from the drives before you lift the cage all the way out of the computer.

7. Disconnect the cables.

   Note: Installed adapters might have to be removed before some cables can be disconnected.

8. Remove any installed adapters (see "Removing an adapter" on page 85).
9. Remove the mini-PCI adapter, if one is installed (see "Removing a mini-PCI adapter" on page 106).
10. Remove the microprocessor and heat sink (see "Removing the microprocessor and heat sink" on page 112).
11. Remove the memory modules (see "Removing a DIMM" on page 89).
12. Remove the battery (see "Removing the battery" on page 92).
13. Remove the seven screws that secure the system board (see Figure 54 on page 122).
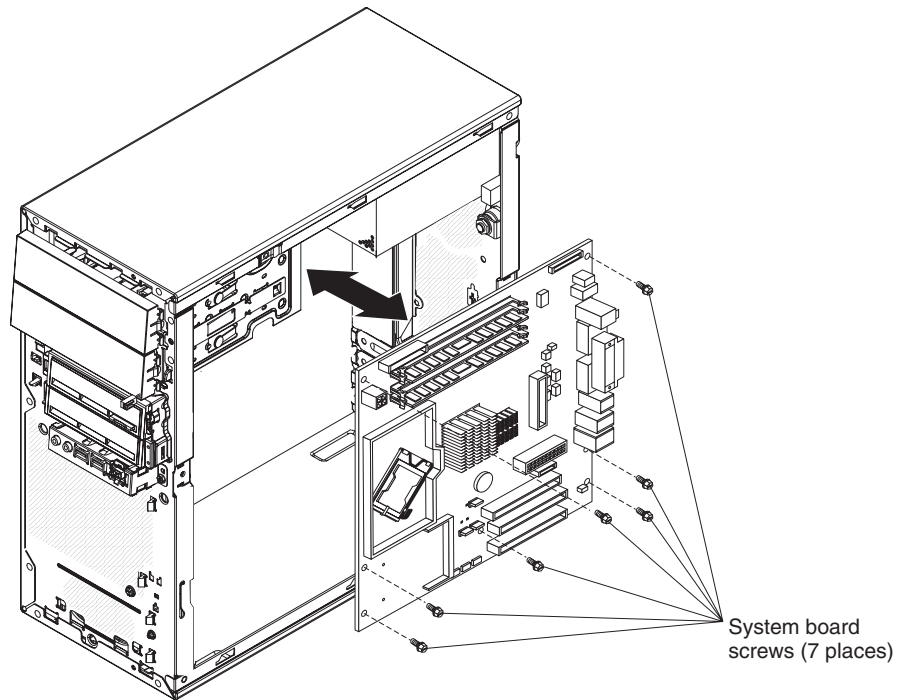
Figure 54. Removing the system board

14. Slide the system board toward the front of the computer to disengage it from the slots in the computer chassis; then, lift the system board out of the computer.

15. If you are instructed to return the system board, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the system board

To install the system board, complete the following steps:

1. Position the system board so that it is aligned with the slots in the computer chassis; then, slide the system board toward the rear of the computer until it locks securely into place.

2. Install the seven screws that secure the system board (see Figure 55).

System board screws (7 places)
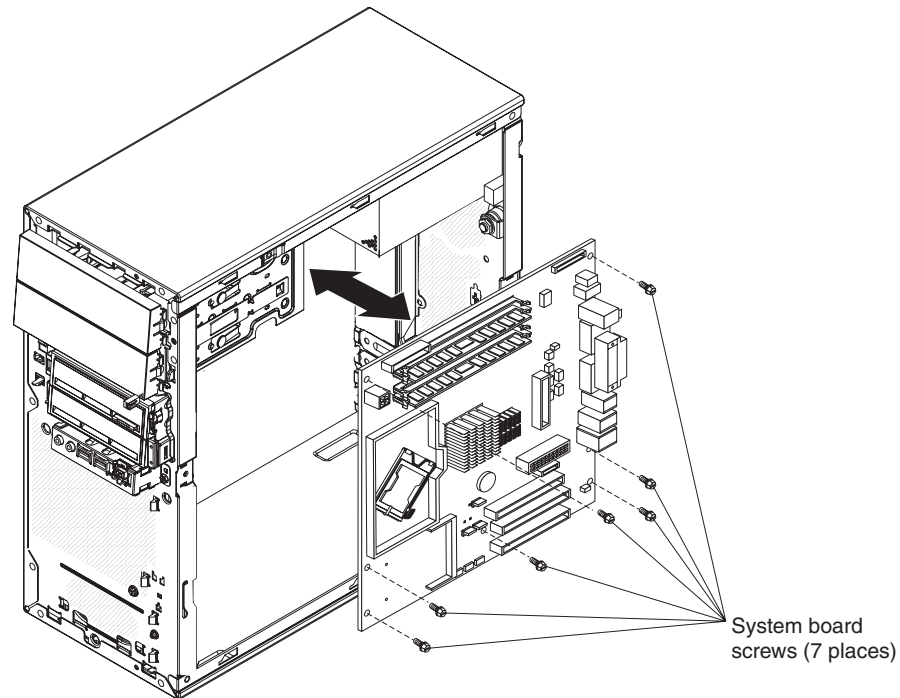
Figure 55. Installing the system board

3. Install the memory modules (see "Installing a DIMM" on page 90).

4. Install the microprocessor and heat sink (see "Installing the microprocessor and heat sink" on page 115).

5. Install the mini-PCI adapter, if one was removed (see "Installing a mini-PCI adapter" on page 107).

6. Install any adapters (see "Installing an adapter" on page 87) and reconnect any cables that were removed or disconnected.

7. Reinstall the drive cage (see Figure 26 on page 91).

   a. Place the drive cage into position and slide it forward to engage the upper clips.

   b. Tighten the thumbscrew at the rear of the drive cage.

   c. Reconnect the power cables to the drives in the cage if any were disconnected.

8. Install the air baffle onto the microprocessor fan assembly (see "Installing the microprocessor fan assembly" on page 83).

9. Install the hard disk drive bracket, if one was removed (see "Installing the hard disk drive bracket" on page 97).

10. Install the side cover (see "Installing the side cover" on page 76).

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

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 *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 http://www.ibm.com/support/.

Updating the firmware

The firmware for the computer is periodically updated and is available for download on the Web. Go to http://www.ibm.com/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 is 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.

Configuring the computer

The following configuration programs are available to configure the computer:

- **Configuration/Setup Utility program**

  The Configuration/Setup Utility program is part of the basic input/output system (BIOS) code in the computer. You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, set passwords, and set the chassis-intrusion detector. For more information about using this utility program, see "Starting the Configuration/Setup Utility program" on page 126.

- **Boot Menu program**

  The Boot Menu program is part of the BIOS code in the computer. Use it to temporarily assign a device to be first in the startup sequence, overriding the startup sequence that is set in the Configuration/Setup Utility program. For information about how to start the Boot Menu, see "Using the Boot Menu program" on page 127.

- **Broadcom NetXtreme Gigabit Ethernet Boot Agent**

  The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS code in the computer. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in the startup sequence. You enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program. For information, see "Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent" on page 127.

- **Adaptec HostRAID configuration programs**
  - **Adaptec RAID Configuration Utility programs (for Serial ATA RAID)**

    Use the Array Configuration Utility within the Adaptec RAID Configuration Utility programs, to configure the integrated Serial ATA (SATA) controller with integrated RAID and the devices attached to it. The SATA HostRAID program is part of the BIOS code in the computer. Use this utility program to define the HostRAID configuration format, or verify SATA hard drives. For information about using this utility program, see "Using the Adaptec HostRAID configuration programs" on page 128.
  - **SCSISelect Utility program (for SCSI RAID)**

    Use the SCSI HostRAID feature of the SCSISelect Utility program to configure the integrated SCSI controller with integrated RAID, and the devices that are attached to it. For information about using this utility program, see "Using the SCSISelect Utility program (for SCSI RAID)" on page 129.
  - **SAS/SATA Configuration Utility program (for SAS RAID)**

    With the SAS/SATA Configuration Utility program, you can configure the devices that are connected to the optional SAS adapter. Use this program to change default values, resolve configuration conflicts, and perform a low-level format on a SAS hard disk drive. For information about using this utility program, see "Using SAS/SATA Configuration Utility program (for Serial Attached SCSI RAID)" on page 130.
- **ServeRAID Manager**

  ServeRAID Manager is available as a stand-alone program and as an IBM Director extension. If a ServeRAID controller is installed in the computer, use ServeRAID Manager to define and configure the disk-array subsystem before you install the operating system. For information about using this program, see "Using ServeRAID Manager" on page 132.
- **Broadcom NetXtreme Gigabit Ethernet controller configuration**

  To configure the integrated Gigabit Ethernet controller, see "Configuring the Broadcom NetXtreme Gigabit Ethernet controller" on page 133.
- **SCSISelect Utility program (some models)**

  With the SCSISelect Utility program, you can configure the devices that are connected to the optional SCSI adapter. Use this program to change default values, resolve configuration conflicts, and perform a low-level format on a SCSI hard disk drive. For information about how to start this utility, see "Starting the SCSISelect Utility program (some models)" on page 134.

See the *User's Guide* on the IBM *IntelliStation Documentation* CD for detailed instructions for using the configuration programs.

The following sections provide the instructions for starting the utility programs.

Starting the Configuration/Setup Utility program

Configuration/Setup is a menu-driven utility that is part of the BIOS code in the computer. You can use it to:
- Configure serial connector assignments
- Change the startup sequence
- Enable USB keyboard and mouse support
- Resolve configuration conflicts
- Set the date and time
- Set an administrator password

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, Press F12 for Boot Menu` 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.

Using the Boot Menu program

The Boot Menu program is a built-in, menu-driven configuration utility program that you can use to temporarily redefine the first startup device without changing settings in the Configuration/Setup Utility program.

To use the Boot Menu program to change the startup sequence of the computer, complete the following steps:

1. Turn off the computer.

2. Restart the computer.

3. Press F12.

4. Select the startup device.

The next time the computer is started, it returns to the startup sequence that is set in the Configuration/Setup Utility program.

Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS code in the computer. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in the 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 **Planar Ethernet** and use the Right Arrow (→) key to set it to **Enabled**.

3. Set the Network-Planar device as the first startup device under the **Startup Option → Startup Sequence Options** menu choice in the Configuration/Setup Utility program.

4. Select **Save Settings** and press Enter.

Using the Adaptec HostRAID configuration programs

Notes:

1. HostRAID is not supported on SCO 6.0 and UnixWare 7.14 operating systems.
2. For SAS and Ultra320 SCSI models, SATA HostRAID must be set to disabled.

Use the Adaptec RAID Configuration Utility programs and SCSISelect Utility (also referred as IBM ServeRAID-8e), to add RAID level-0 and level-1 functionality to the integrated SATA controller and the integrated SCSI controller. RAID level-0 is striping where the drives are seen as a single volume, and increases performances. RAID level-1 is mirroring where the contents of one drive are copied to the other drive to increase hard drive availability. 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 the RAID configuration and associated devices.

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

- The integrated SCSI controller with integrated SCSI RAID (in SCSI models) and the integrated SATA (in 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 adapter, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.
- If you install a different type of RAID adapter in the computer, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

Using the Adaptec RAID Configuration Utility program (for Serial ATA RAID)

Use the Array Configuration Utility within the Adaptec RAID Configuration Utility program to add RAID level-0 and level-1 functionality to the integrated SATA controller. The Array Configuration Utility is part of the BIOS code in the computer. For additional information about using the Adaptec RAID Configuration Utility programs, see the documentation on the *IBM ServeRAID-8e (Adaptec HostRAID) Support* CD. If this CD does not come with the computer, you can download it from http://www.ibm.com/support/.

The integrated SATA RAID feature (SATA HostRAID) comes disabled by default. You must enable it and install the device drivers before you can use it. The SATA RAID feature configuration utilities, devices drivers, and information are available on the IBM *ServeRAID-8e (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.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1. If you have set a supervisor password, you are prompted to type the password.
3. Select **Devices and I/O Ports**.
4. Scroll down and select **SATA RAID Enable**.
5. Select **Enabled**.
6. Press Esc, and select **Yes** to save the 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 RAID level-1 configuration. If you install a RAID adapter in the computer, use the configuration method described in the instructions that come with the adapter to view or change settings for the attached devices.

See the documentation on the IBM *ServeRAID-8e (Adaptec HostRAID) Support* CD for additional information about using the Array Configuration Utility program to create, configure, and manage arrays. If the CD did not come with the computer, you can download the IBM *ServeRAID-8e (Adaptec HostRAID) Support* CD from http://www.ibm.com/support/.

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

1. Turn on the computer.
2. When the prompt `<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. When asked to select the RAID level, select **RAID-1**.
7. (Optional) Type an identifier for the array.
8. When asked for the array build method, select **Quick Int**.
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 screen, 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 program to add RAID level-0 and level-1 functionality to the integrated SCSI controller. This utility is part of the BIOS code in the computer.

The integrated SCSI RAID feature (SCSI HostRAID) comes disabled by default. You must enable it 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-8e (Adaptec HostRAID) Support* CD. If this CD does not come with the computer, you can download it from http://www.ibm.com/support/.

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

1. Turn on the computer.
2. When the prompt `Press <CTRL><A> for SCSISelect Utility` appears, press Ctrl+A. If you have set a supervisor password, you are prompted to type the password.
3. Use the arrow keys to select the channel for which you want to change settings, and press Enter.
4. Select **Configure/View SCSI Controller Setting**, and select **HostRAID**.
5. Select **Enabled**.
6. Press Esc, and 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. If you install a RAID adapter in the 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-8e (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 RAID level-1 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. When asked to select the RAID type, select **RAID-1**.
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 review 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 SAS/SATA Configuration Utility program (for Serial Attached SCSI RAID)

Use the SAS/SATA Configuration Utility within the Adaptec RAID Configuration Utility program to add RAID level-0 and level-1 functionality to the SAS controller. The SAS/SATA Configuration Utility is part of the BIOS code in the computer. For additional information about using the Adaptec RAID Configuration Utility programs, see the documentation on the IBM *ServeRAID-8e (Adaptec HostRAID) Support* CD. If this CD does not come with the computer, you can download it from http://www.ibm.com/support/.

The SAS HostRAID feature comes disabled by default. You must enable it and install the device drivers before you can use it. The SAS HostRAID feature configuration utilities, devices drivers, and information are available on the IBM *ServeRAID-8e (Adaptec HostRAID) Support* CD.

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

1. Turn on the computer and watch the monitor screen.
2. When the message `Press <CTRL><A> for SAS/SATA Configuration Utility` appears, press Ctrl+A.
3. Select **SerialSelect Utility**.
4. Select **Controller Configuration**.
5. Select **RAID support**.
6. Select **Enabled**.

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

See the documentation on the IBM *ServeRAID-8e (Adaptec HostRAID) Support* CD, for additional information about using the Array Configuration Utility program to create, configure, and manage arrays. If the CD did not come with the computer, you can download the IBM *ServeRAID-8e (Adaptec HostRAID) Support* CD from http://www.ibm.com/support/.

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

1. Turn on the computer and watch the monitor screen.
2. When the message `Press <CTRL><A> for SAS/SATA 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. When asked to select the RAID level, select **RAID-1**.
7. (Optional) Type an identifier for the array.
8. When asked for the array build method, select **Quick Int**.
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 SAS controller, complete the following steps:

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

Using ServeRAID Manager

Note: RAID is not supported on SCO 6.0 and UnixWare 7.14 operating systems.

Use the ServeRAID Manager program to:
- Configure arrays
- View the RAID configuration and associated devices
- Monitor operation of RAID controllers

To perform some tasks, you can run ServeRAID Manager as an installed program. To configure the SCSI controller and perform an initial RAID configuration on the computer, you must run ServeRAID Manager in a Startable-CD mode, as explained in the following section. If you install a RAID adapter in the 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 in the **IBM ServeRAID Support** CD, or additional information about RAID technology and instructions for using ServeRAID Manager to configure the SCSI controller. Additional information abut 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 the 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 the 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 the operating system.
6. Click **Apply**. 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 the custom configuration: To use the 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 applicable tab in the right pane, and 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, complete the following steps:

   a. Click the **Spares** tab.

   b. Select the physical drive you want to designate as the hot-spare drive, and 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**. 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 Broadcom NetXtreme 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, see http://www.ibm.com/support/.

Starting the SCSISelect Utility program (some models)

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

1. Turn on the computer.

2. When the `<<< 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 make the selection, and press Enter.

4. When the `Would you like to configure the SCSI controller or run the SCSI disk utility?` prompt appears, make the selection, and press Enter.

5. Use the arrow keys to make the selection, and press Enter.

6. Follow the instructions on the screen to change the settings of the selected items, and press Enter.

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 server or IntelliStation system or optional device, and whom to call for service, if it is necessary.

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 *Problem Determination and Service Guide* on the IBM *IntelliStation Documentation* CD that comes with your system or on the IBM support Web site.
- Go to the IBM support Web site at http://www.ibm.com/pc/support/ 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 @server and IntelliStation systems also describes the diagnostic tests that you can perform. Most @server and IntelliStation 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 @server or IntelliStation 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/pc/support/ and follow the instructions. Also, some documents are available through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/ cgibin/pbi.cgi.

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 @server and IntelliStation systems, optional devices, services, and support. The address for IBM xSeries® and BladeCenter® information is http://www.ibm.com/eserver/xseries/. The address for IBM IntelliStation information is http://www.ibm.com/pc/us/intellistation/.

You can find service information for IBM systems and optional devices at http://www.ibm.com/pc/support/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with 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).

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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Chipkill	ThinkPad
EtherJet	Tivoli
e-business logo	Tivoli Enterprise
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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.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

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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Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

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This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.
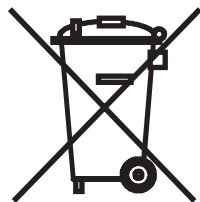
Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as

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注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。
この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

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.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, 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.

Electronic emission notices

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.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN

55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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.

Taiwanese Class A warning statement

警告使用者：
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

Chinese Class A warning statement

声　　明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に
基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を
引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求
されることがあります。

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
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

IBM power cord part number	Used in these countries and regions
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
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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