IntelliStation A Pro
Type 6224

IBM

Hardware Maintenance Manual and Troubleshooting Guide

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> **Notes**
>
> - Before using this information and the product it supports, read the general information in Appendix B, "Safety information," on page 117, and Appendix C, "Notices," on page 151.
>
> - **The most recent version of this document is available at http://www.ibm.com/pc/support**.

About this document

This document contains basic configuration information, diagnostic information, error codes, error messages, service information, and a symptom-to-FRU index for the IBM® IntelliStation® A Pro Type 6224 computer.

Important: The field replaceable unit (FRU) procedures in this document are intended for trained servicers who are familiar with IBM products. Customer replaceable units (CRUs) can be replaced by the customer. See Chapter 7, "Parts listing, Type 6224," on page 107 to determine whether the component being replaced is a CRU or a FRU. Before servicing an IBM product, be sure to review Appendix B, "Safety information," on page 117.

Important safety information

Be sure to read all caution and danger statements in this book before performing any of the instructions.

Leia todas as instruções de cuidado e perigo antes de executar qualquer operação.

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」。

Prenez connaissance de toutes les consignes de type Attention et

Danger avant de procéder aux opérations décrites par les instructions.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Accertarsi di leggere tutti gli avvisi di attenzione e di pericolo prima di effettuare qualsiasi operazione.

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.

Lea atentamente todas las declaraciones de precaución y peligro ante de llevar a cabo cualquier operación.

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. ***Lávese las manos después de usar el producto.***

Online support

You can download the most current diagnostic, BIOS flash, and device-driver files from http://www.ibm.com/pc/support/.

Contents

Chapter 1. Introduction

The IBM IntelliStation A Pro Type 6224 incorporates many of the latest advances in computing technology and can be expanded and upgraded.

You can obtain up-to-date information about the computer and other IBM computer products at http://www.ibm.com/pc/intellistation/.

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

Related documents

This *Hardware Maintenance Manual and Troubleshooting Guide* is provided in Portable Document Format (PDF). It contains information to help a user solve problems or to provide helpful information to a service technician. The following documents are also relevant to the IntelliStation A Pro Type 6224:

- *User's Guide*

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

  This printed document contains setup and installation instructions.
- *Safety Information*

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

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 was received with the computer. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information. These updates are available from the IBM Web site at http://www.ibm.com/pc/support.

Notices and statements used 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:

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

Features and specifications

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

Table 1. Features and specifications

Microprocessor:
- Supports up to two AMD Opteron microprocessors
- 1 MB Level-2 cache
- 800 MHz front-side bus (FSB) with data rate of 1.6 GHz

Memory:
- Minimum: 1 GB
- Maximum: 16 GB (depending on your configuration)
- Type: PC2700 double-data-rate (DDR) registered
- Connectors: Four or eight dual inline memory module (DIMM) connectors (depending on your configuration)

Internal Drives:
- Hard disk drive: SCSI or Serial ATA (SATA)
- One of the following optical drives:
  - CD-ROM: IDE
  - DVD/CD-RW combo: IDE
  - CD-RW: IDE

Expansion bays:
- Three slim-high 3.5-inch drive bays (one hard disk drive installed in some models)
- Two half-high 5.25-inch bays (optical drive installed in one bay)
- One slim-high 3.5-inch removable-media or hard disk drive bay

PCI expansion slots:
- Four 100 MHz/64-bit PCI-X slots
- One 133 MHz/64-bit PCI-X slot
- One Accelerated Graphics Port (AGP) Pro 110 slot

Power supply:
One 530 watts (115-230 V ac)

Cooling:
Two to three speed-controlled fans

Integrated functions:
- Broadcom 5703 10/100/1000 Ethernet controller with RJ-45 Ethernet connector
- Integrated RAID capability
- Two serial ports
- One parallel port
- Dual port Serial ATA controller
- Two IEEE 1394A (FireWire) ports (four-pin on front, six-pin on rear)
- Five Universal Serial Bus (USB) ports (two on front and three on rear)
- Keyboard port
- Mouse port
- Audio ports
  - Line out (front and rear)
  - Mic (front and rear)
  - Line in (rear only)
- Dual-channel IDE controller

Video adapter: (depending on your model)
- NVIDIA Quadro NVS 280 (LFH-60), AGP 8X, 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)
- NVIDIA Quadro FX 1100 (DVI-I), AGP 8X, with 128 MB DDR SDRAM video memory with dual DVI-I connectors
- NVIDIA Quadro FX 3000 (DVI-I), AGP 8X, with 256 MB DDR 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: 0.24 kVA
  - Maximum: 0.86 kVA

Heat output:
Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 787 Btu (230 watts)
- Maximum configuration: 2780 Btu (815 watts)

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: 5.0 bel
- Sound power, operating: 5.2 bel

Size:
- Height: 438 mm (17.25 in.)
- Depth: 483 mm (19 in.)
- Width: 265 mm (6.5 in.)
- Weight: 16.3 kg (36 lb) to 20.8 kg (45.8 lb) depending upon configuration

Notes:

1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.

2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Controls, LEDs, connectors, and power

This section describes the controls, light-emitting diodes (LEDs), and front connectors on the computer, as well as how to turn the computer on and off.

Controls, LEDs, and connectors

Figure 1 shows the controls, LEDs, and front connectors on the IntelliStation A Pro Type 6224 computer. See "Input/output connectors" on page 56 for an illustration and description of the connectors on the rear of the computer.
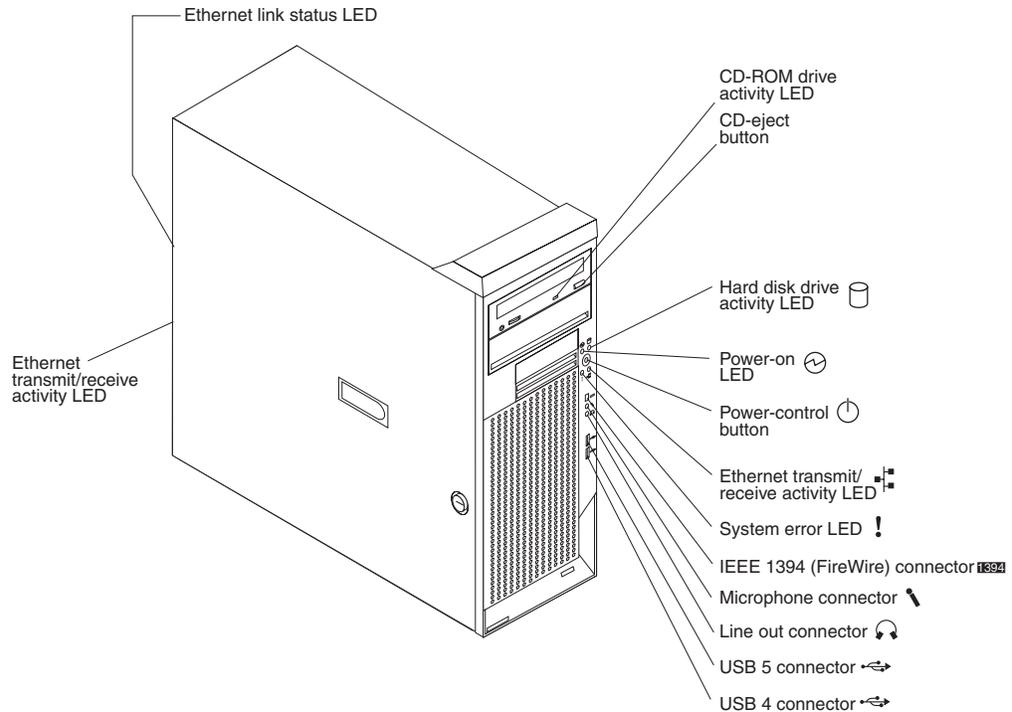
Figure 1. Controls, LEDs, and indicators

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

CD-eject button
>   Press this button to insert a CD into or remove a CD from the CD-ROM drive.

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

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

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

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

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

IEEE 1394A (FireWire) connectors
> Use these connectors (four-pin on the front and six-pin on the rear) to connect FireWire devices, such as digital video cameras and external hard disk drives.

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

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

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

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

Computer power features

When the computer is connected to an ac power source but is not turned on, the operating system does not run, and all core logic is shut down; however, the computer can respond to remote requests to turn on the computer. The power-on LED flashes to indicate that the computer is connected to an ac power source but is not turned on.

Turning on the computer

Approximately 20 seconds after the computer is connected to ac power, the power-control button becomes active, and you can turn on the computer and start the operating system by pressing the power-control button.

Notes:

1. Turn on all external devices, such as the monitor, before turning on the computer.
2. The power-on LED on the front of the computer is lit when the computer is on and while it is being turned on.

The computer can also be turned on in either of the following ways:

- If a power failure occurs while the computer is turned on, the computer will restart automatically when power is restored.
- When you connect the computer to power for the first time, the Wake on LAN® feature can turn on the computer. If the computer was previously turned on, it must be turned off correctly for the Wake on LAN feature to turn on the computer.

Turning off the computer

When you turn off the computer and leave it connected to ac power, the computer can respond to requests, such as a remote request to turn on the computer. To remove all power from the computer, you must disconnect it from the power source.

Some operating systems require an orderly shutdown before you turn off the computer. See the operating-system documentation for information about shutting down the operating system.

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.
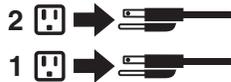
The computer can be turned off in any of the following ways:

- You can turn off the computer through the operating system. If this feature is supported by the operating system, it will turn off the computer after performing an orderly shutdown of the operating system.

- You can press the power-control button on the front of the computer to start an orderly shutdown of the operating system and turn off the computer, if the operating system supports this feature.

  Note: After turning off the computer, wait at least 5 seconds before you press the power-control button to turn on the computer again.

- You can press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the computer. You can use this feature to turn off the computer if the operating system stops functioning.

Chapter 2. Configuring the computer

Detailed information about configuring the computer is in the IBM IntelliStation A Pro Type 6224 *User's Guide* on the IBM *IntelliStation Documentation* CD.

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

The following configuration programs are available to configure the computer:
- Configuration/Setup Utility program
- Broadcom NetXtreme Gigabit Ethernet Boot Agent
- Adaptec® HostRAID™ configuration programs
  - Adaptec RAID Configuration Utility programs (for Serial ATA RAID)
  - SCSISelect Utility program (for SCSI RAID)
- ServeRAID™ Manager
- Ethernet controller configuration
- SCSISelect Utility program (some models)

Starting the Configuration/Setup Utility program

Complete the following steps to start the Configuration/Setup Utility program:

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

Chapter 3. Diagnostics

This chapter provides basic troubleshooting information to help solve some common problems that might occur with 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 115 for more information.

General checkout

Follow the checkout procedure for diagnosing hardware problems. Review the following information before performing the checkout procedure:

- Read Appendix B, "Safety information," on page 117.
- The system diagnostic programs are stored on a hidden partition on the computer hard disk. These programs are the primary method of testing the major components of the computer: the system board, Ethernet controller, video controller, RAM, keyboard, mouse (pointing device), serial ports, hard disk drives, and parallel port. You can also use them to test some external devices. If you are not sure whether a problem is caused by the hardware or by the software, you can use the diagnostic programs to confirm that the hardware is working correctly.
- When you run the diagnostic programs, a single problem might cause several error messages. If you receive several error messages, correct the cause of the first error message. The other error messages might not occur the next time you run the diagnostic programs.
- Before running the diagnostic programs, you must determine whether the failing computer is part of a shared hard disk drive cluster (two or more computers sharing external storage devices). If you suspect that it is part of a cluster, you can run all diagnostic programs except the ones that test the storage unit (that is, a hard disk drive in the storage unit) or the storage adapter that is attached to the storage unit. The failing computer might be part of a cluster if any of the following conditions is true:
  - The customer identifies the failing computer as part of a cluster.
  - One or more external storage units are attached to the failing computer and at least one of the attached storage units is also attached to another computer or unidentifiable device.
  - One or more computers are located near the failing computer.
- **Important:**
  1. For computers that are part of a shared hard disk drive cluster, run one test at a time. Do not run any suite of tests, such as "quick" or "normal" tests, because this could enable the hard disk drive diagnostic tests.
  2. If more than one error code is displayed, correct the first error. The other error codes might not occur the next time you run the diagnostic programs.
  3. If the computer is suspended and a POST error code is displayed, see "POST error codes" on page 86.
  4. If the computer is suspended and no error message is displayed, see "Error symptoms" on page 92 and "Undetermined problems" on page 104.
  5. For information about power-supply problems, see "Power checkout" on page 23.

6. For intermittent problems, check the error log; see "Diagnostic programs and error messages" on page 12.

Complete the following steps to perform the checkout procedure:

001 **IS THE COMPUTER PART OF A CLUSTER?**

YES. Schedule maintenance for the computer. Shut down all computers related to the cluster. Run the storage test.

NO. Go to step **002** .

002 **IF THE COMPUTER IS NOT PART OF A CLUSTER:**
1. Check the system board and microprocessor board for LEDs (see "Diagnostic LEDs" on page 17).
2. Turn off the computer and all external devices.
3. Check all cables and power cords.
4. Set all display controls to the middle position.
5. Turn on all external devices.
6. Turn on the computer.
7. Watch the screen for POST errors, and record any POST error messages that are displayed on the screen. If an error is displayed, look up the first error (see "POST error codes" on page 86).
8. Run the diagnostic programs (see "Starting the diagnostic programs and viewing the test log" on page 13).

003 **DID THE DIAGNOSTIC PROGRAMS START ?**

NO. Find the failure symptom in "Error symptoms" on page 92.

YES. Run the diagnostic programs (see "Starting the diagnostic programs and viewing the test log" on page 13).

If you receive an error, see Chapter 6, "Symptom-to-FRU index," on page 83.

If the diagnostics were completed successfully and you still suspect a problem, see "Undetermined problems" on page 104.

If the computer does not turn on, see "Error symptoms" on page 92.

Diagnostic tools overview

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

- **POST beep codes and error messages**

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

- **Error charts**

  These charts list problem symptoms and steps to correct the problem. See "Error charts" for more information.

- **Diagnostic programs**

  The diagnostic programs are stored on a hidden partition on the computer hard disk. These programs are the primary method of testing the major components of the computer. See "Diagnostic programs and error messages" on page 12 for more information.

- **Symptom-to-FRU index**

  This index lists problem symptoms and steps to correct each problem. See Chapter 6, "Symptom-to-FRU index," on page 83 for more information.

Power-on self-test

When you turn on the computer, the power-on self-test (POST) performs a series of tests to check the operation of system components and some of the installed options.

Notes:

1. If you have a user password set, you must type the password and press Enter, when prompted, before the operating system will start.

2. A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages usually will be resolved the next time you run the test.

POST beep codes

POST generates beep codes to indicate successful completion or the detection of a problem.

- One short beep indicates the successful completion of POST.
- More than one beep indicates that POST detected a problem. For more information, see "Beep symptoms" on page 84.

POST error messages

POST error messages can appear when a problem is detected during startup. For a complete list of POST messages, see "POST error codes" on page 86.

Error charts

Use the error charts to find solutions to problems that have definite symptoms (see "Error symptoms" on page 92).

Diagnostic programs and error messages

The system diagnostic programs are stored on a hidden partition on the computer hard disk. These programs are the primary method of testing the major components of the computer.

You can also download the latest version of the diagnostics programs from http://www.ibm.com/pc/support/ and use the downloaded file to create an IBM Enhanced Diagnostics diskette. See "Creating an Enhanced Diagnostics diskette" on page 14 for instructions.

Notes:

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

Diagnostic error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing complex problems indicated by error messages should be performed by trained service personnel.

Sometimes the first error to occur causes additional errors. In this case, the computer displays more than one error message. Always follow the suggested action instructions for the *first* error message that appears.

Error codes that might be displayed are listed at "Diagnostic error codes" on page 89.

The diagnostic text message format is as follows:

result test_specific_string

where:

result   is one of the following results:

> **Passed**
> This test was completed without any errors.
>
> **Failed**
> This test discovered 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**
> A possible problem was reported during the test (for example, a device that was to be tested is not installed).

test_specific_string
> is an error code or other information about the error.

Starting the diagnostic programs and viewing the test log

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

The test log records data about system failures and other pertinent information. You can view the test log by running the diagnostic programs through the operating system or by using a diagnostics diskette (see "Using the Enhanced Diagnostics diskette" on page 14) that you have created (see "Creating an Enhanced Diagnostics diskette" on page 14).

Complete the following steps to view the test log.

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

1. Start the Enhanced Diagnostics programs.
    - To start the Enhanced Diagnostics programs in a Windows® operating system, complete the following steps:
        a. Restart the computer and when the message `To start the Product Recovery program` is displayed, quickly press F11.
        b. Select **System utilities**.
        c. Select **Run diagnostics** to start the diagnostics programs.
    - To start the Enhanced Diagnostics programs in Red Hat® Linux™ operating systems, complete the following steps:
        a. Restart the computer.
        b. When the operating system selection menu is displayed, select **IBM Preload Recovery & Diagnostics.**
        c. Select **Run diagnostics** to start the diagnostics programs.
    - To start the Enhanced Diagnostics programs using a diskette, insert the IBM Enhanced Diagnostics diskette and restart the computer (see "Using the Enhanced Diagnostics diskette" on page 14).
2. Run the applicable diagnostics program and when the Diagnostic Programs screen appears, select **Utility**.
3. Select **View Test Log** from the list; then, follow the instructions on the screen.

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

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

Creating an Enhanced Diagnostics diskette

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

Notes:

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

Complete the following steps to create an IBM Enhanced Diagnostics diskette from the Product Recovery program partition:

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.

Complete the following steps to download the latest image of the IBM Enhanced Diagnostics and create a startable Enhanced Diagnostics diskette:

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

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

Using the Enhanced Diagnostics diskette

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

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

Notes:

a. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette can contain other data.

b. The system maintains the test-log data only while the Enhanced Diagnostics program is running. When you end the Enhanced Diagnostics program, the test log is cleared.

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 from the diskette 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.

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 a diskette, you must add a diskette drive to the computer.

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

Creating an emergency recovery-repair diskette in Windows

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

Complete the following steps to create a recovery-repair diskette from the c:\ibmtools directory:

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.

Complete the following steps to create a recovery-repair diskette from the Product Recovery program partition:

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 15. Complete the following steps to run the recovery-repair diskette:

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 111).

Diagnostic error message tables

For descriptions of the error messages that might appear when you run the diagnostic programs, see "Diagnostic error codes" on page 89.

Note: Depending on the configuration, some of the error messages might not appear when you run the diagnostic programs.

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.

Complete the following steps to use PC-Doctor for Windows:

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

Diagnostic LEDs

The system board and microprocessor board have LEDs that help isolate errors.

System-board diagnostic LEDs

Figure 2 shows the diagnostic LEDs on the system board.
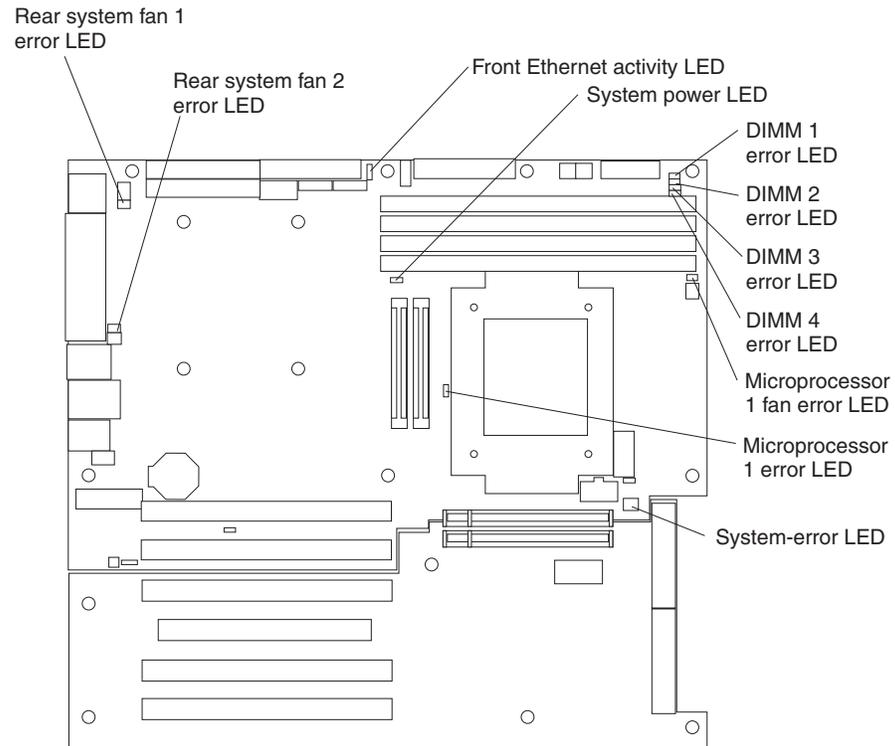
Figure 2. System-board diagnostic LEDs

Each error LED is lit to indicate a problem with a specific component. After a problem is corrected, the LED will not be lit the next time the computer is restarted. If the problem remains, the LED will continue to be lit. For information about how to correct the problems indicated by the error LEDs, see "System board error LEDs" on page 91.

Microprocessor-board diagnostic LEDs

If a microprocessor board has been installed on the system board, there are additional error LEDs on the microprocessor board. Figure 3 shows the error LEDs on the microprocessor board.
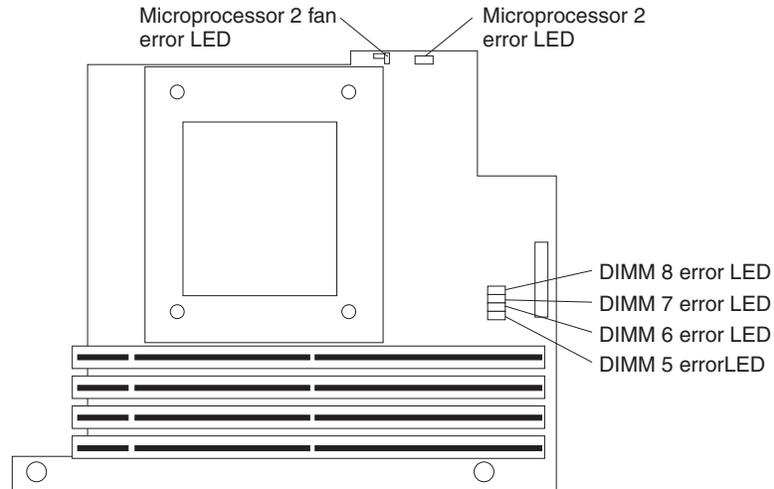
Figure 3. Microprocessor-board diagnostic LEDs

Each error LED is lit to indicate a problem with a specific component. After a problem is corrected, the LED will not be lit the next time the computer is restarted. If the problem remains, the LED will continue to be lit. For information about how to correct the problems indicated by the error LEDs, see "Microprocessor board LEDs" on page 92.

Troubleshooting the Ethernet controller

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

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 111).

Complete the following steps to recover the Windows operating system.

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 16.
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.

Complete the following steps to recover the Red Hat Linux operating system.

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/.

Small computer system interface (SCSI) messages (some models)

If the computer has an Ultra320 SCSI adapter and you receive a SCSI error message, see "SCSI error codes" on page 103.

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

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

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

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

Complete the following steps to download the BIOS (flash) update files:

1. Go to http://www.ibm.com/pc/support/.
2. In the **Downloads** category, click **Downloads & drivers**.
3. In the **Brand** field, select **IntelliStation**.
4. In the **Family** field, select **IntelliStation A Pro**.
5. In the **Type** field, select **6224** and click **Continue**.
6. In the **Filter by category** field, select **BIOS (system)**.
7. Scroll down and select the applicable file for the operating system.
8. Select the file for the type of medium you want to use; then, download the file and install it.
9. Restart the computer.

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

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

Recovering from a POST/BIOS update failure

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

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

1. Read Appendix B, "Safety information," on page 117 and "Handling static-sensitive devices" on page 25.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the cover and support bracket.
5. Locate the boot block recovery jumper (JP2) on the system board. Figure 4 shows the location of the boot block jumper on the system board.
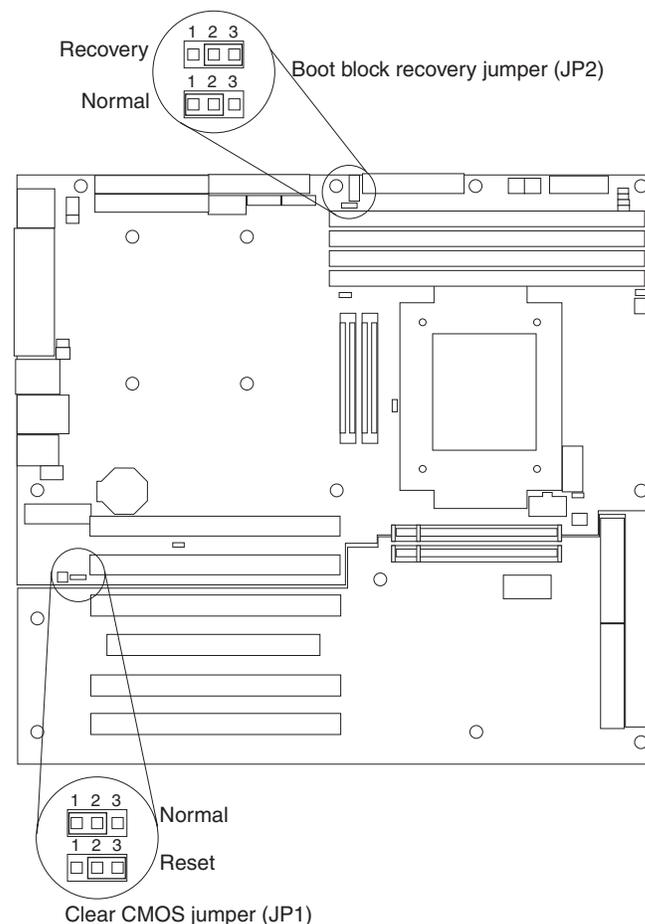

Figure 4. Location of recovery jumpers on system board

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

10. Turn on the computer and the monitor.

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

12. Remove the CD from the CD-ROM drive.

13. Disconnect all power cords; then, remove the computer cover and support bracket.

14. Return the boot block recovery jumper to pins 1 and 2.

15. Replace the computer cover; then, reconnect all external cables and power cords and turn on the peripheral devices.

16. Turn on the computer to restart the operating system.

Erasing a lost or forgotten password (clearing CMOS)

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

- If you have forgotten the user password and an administrator password is set, type the administrator password at the power-on prompt; then, start the Configuration/Setup Utility program and change the user password (see the IBM IntelliStation A Pro Type 6224 *User's Guide* on the IBM *IntelliStation Documentation* CD for more information).
- Remove the battery and then reinstall the battery (see "Replacing the battery" on page 53).
- Clear CMOS settings by changing the position of the CMOS recovery jumper (JP1).

Complete the following steps to set the CMOS recovery jumper and erase a forgotten password:

1. Read Appendix B, "Safety information," on page 117 and "Handling static-sensitive devices" on page 25.

2. Turn off the computer and all attached devices.

3. Disconnect the power cord.

4. Remove the cover and support bracket.

5. Locate the CMOS recovery jumper (JP1) on the system board (see Figure 4 on page 21), removing any adapters that impede access to the jumper.

6. Move the CMOS recovery jumper from pins 1 and 2 to pins 2 and 3.

7. Wait 60 seconds; then, return the CMOS recovery jumper to pins 1 and 2.

8. Replace any adapters that were removed; then, replace the support bracket and replace the side cover.

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

9. Connect the computer to a power source, keyboard, monitor, and mouse.

10. Turn on the computer. The Configuration/Setup Utility program starts.

11. Follow the instructions to erase the existing password or create a new password.

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

Power checkout

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.

A general procedure for troubleshooting power problems is as follows:

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 page 104).
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 FRUs of the minimal configuration one at a time until the problem is isolated.

To use this method, you must know the minimum configuration that is required for the computer to start (see page 104).

Chapter 4. Customer replaceable units

This chapter provides instructions for installing and replacing certain hardware components in the computer. These instructions are intended for users who are experienced with setting up IBM computer hardware. For a list of supported options for the computer, go to http://www.ibm.com/pc/support/; then, navigate to the list of options for the computer.

Installation guidelines

Before you begin installing options in the computer, read the following information:

- Read the safety information in Appendix B, "Safety information," on page 117, and the guidelines in "Handling static-sensitive devices." This information will help you work safely with the computer and options.
- Make sure that you have an adequate number of properly grounded electrical outlets for the computer, monitor, and other devices that you will connect to the computer.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- When you need to access the inside of the computer to install options, 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.

System reliability considerations

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

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

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- 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.

Major components of the computer

Figure 5 shows the major components in the A Pro Type 6224 computer.
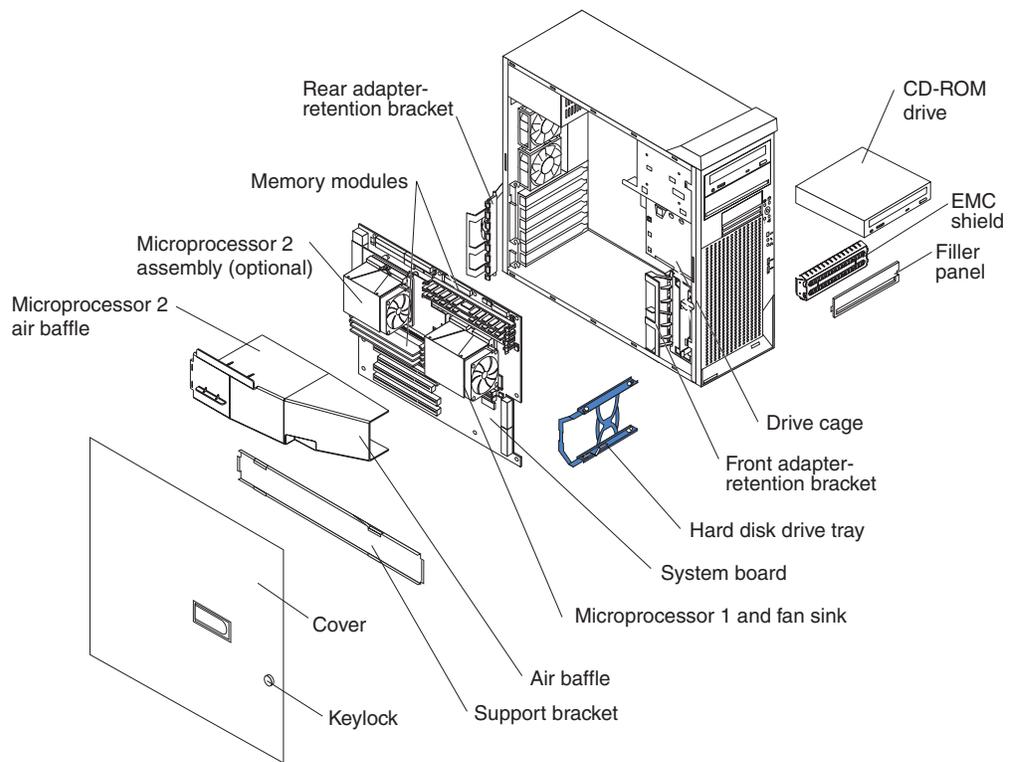
Figure 5. Major components

Replacing the side cover

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

Complete the following steps to remove the side cover of the computer:

1. Read the safety information in Appendix B, "Safety information," on page 117, and the guidelines in "Handling static-sensitive devices" on page 25.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 5).
3. Disconnect all external cables and power cords.
4. Pull the cover-release latch away from the computer, and push the cover toward the rear of the computer (see Figure 6). Lift the side cover off the computer and set it aside.
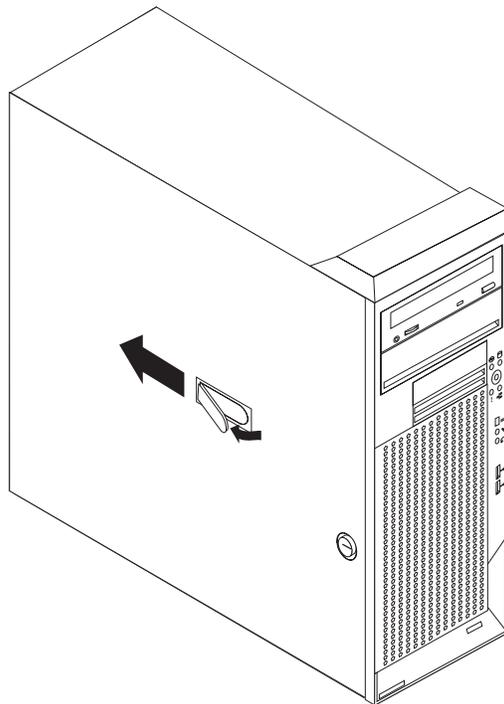
Figure 6. Removing the side cover

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

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 replace the side cover.

Complete the following steps to replace the side cover:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have removed all work tools or parts from inside the computer.
2. Make sure that the support bracket is installed (see "Replacing the support bracket" on page 29.).

3. Install the side cover by placing it into position on the computer. Make sure that the lip on the bottom of the cover rests on the ledge on the bottom of the chassis before rotating the cover up to the vertical position. Press down on the cover-release latch as you slide the side cover forward (see Figure 7) to lock the side cover.
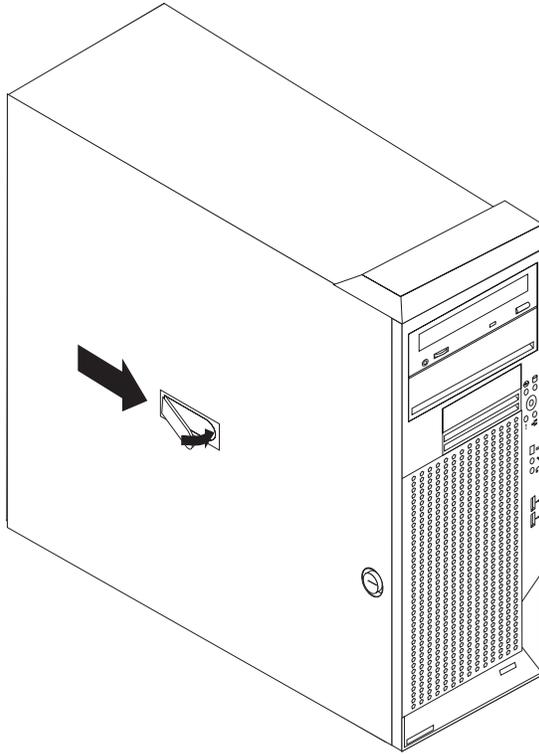
Figure 7. Installing the side cover

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

Replacing the support bracket

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

Complete the following steps to remove the support bracket:

1. Read the safety information in Appendix B, "Safety information," on page 117, and the guidelines in "Handling static-sensitive devices" on page 25.

2. Remove the side cover ("Replacing the side cover" on page 27).

3. Pull out on the rear end of the support bracket approximately 150 mm (6 in.) (see Figure 8).

4. Disengage the front end of the support bracket from the computer and set the bracket aside.
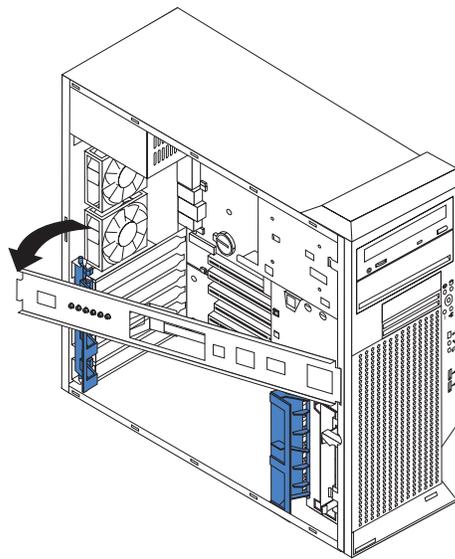
Figure 8. Support bracket

To reinstall the support bracket, reverse the previous steps.

Replacing the bezel

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

Complete the following steps to remove the bezel:

1. Unlock the side-cover lock.
2. Remove the side cover (see "Replacing the side cover" on page 27).
3. Locate the bezel-release lever; then, press the bezel-release lever toward the front of the computer.
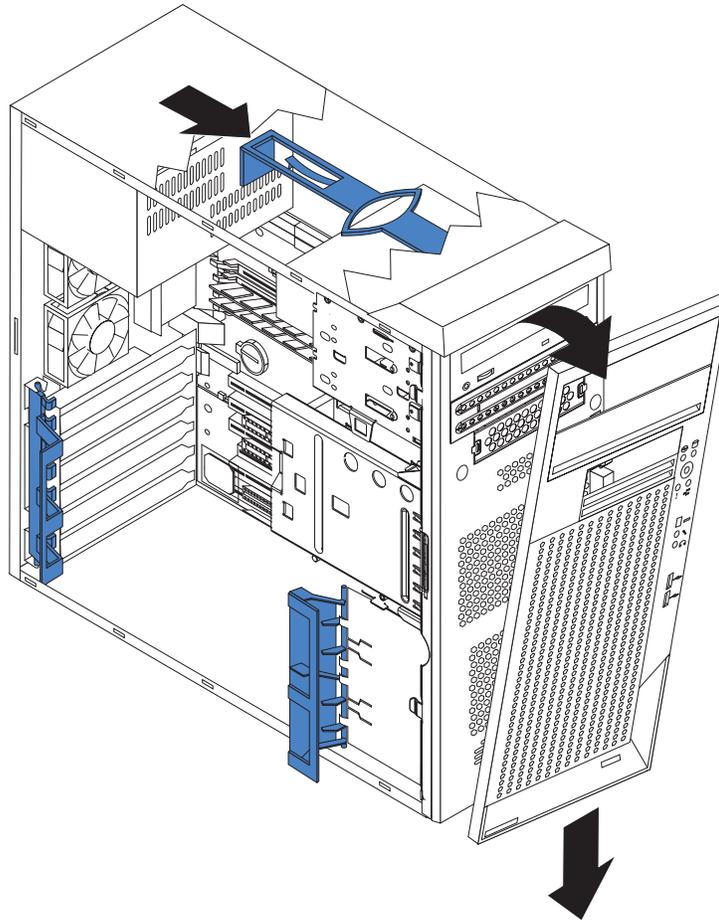
4. Pull the top of the bezel away from the chassis; then, push the bezel down to disengage the bottom tabs.
5. Remove the bezel from the computer and store the bezel in a safe place.

To install the bezel, complete the following steps:

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

Installing and removing an adapter

The following notes describe the types of adapters that the computer supports and other information that you must consider when installing an adapter. See "System-board option connectors" on page 76 for an illustration of the adapter slot locations.

- Read the documentation that comes with the operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on the adapter, follow the instructions that come with the adapter.
- The computer comes with adapter connectors or *slots*. The Accelerated Graphics Port (AGP) video adapter is installed in the AGP slot. You can install up to five additional adapters in the computer in PCI-X slots 1, 2, 3, 4, and 5.
- The computer supports PCI-X adapters, 3.3 V PCI adapters, and universal PCI adapters.
- None of the PCI-X slots are hot-plug slots.
- You can install 64-bit or 32-bit adapters in PCI-X slots 1, 2, 3, 4, and 5.
- You can install full-length adapters in PCI-X slots 1, 3, 4, and 5; you can install a full-length adapter in PCI-X slot 2 only if it does not have a full-length adapter attached to it.

  Exception: If the computer has an NVIDIA Quadro FX 3000 adapter installed in the AGP slot, some wide adapters might not fit in PCI-X slot 3, and no adapter can be installed in PCI-X slot 4.

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

Complete the following steps to install an adapter in the computer:

1. Read the safety information in Appendix B, "Safety information," on page 117, and the guidelines in "Handling static-sensitive devices" on page 25.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 5); then, disconnect all external cables and power cords.
3. Remove the side cover (see "Replacing the side cover" on page 27).
4. Determine which PCI-X slot you will use for the new or replacement adapter. Review the instructions that come with the adapter for any requirements, restrictions, or cabling instructions. It might be easier to route cables before you install the adapter.
5. For full-length adapters, rotate the rear adapter-retention bracket to the open (unlocked) position and remove it from the computer. Rotate the front adapter-retention bracket to the open position. If you are installing or replacing a smaller adapter, remove only the rear adapter-retention bracket.
6. If there is an adapter already installed in the slot, detach its cables, if any; then, remove it and place it on a static-protective surface.

If the slot is empty, remove the expansion-slot cover. From the rear of the computer, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.

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

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

8. Remove the adapter from the static-protective package, carefully grasp the adapter by the top edge or upper corners, and align it with the expansion slot guides (see Figure 9); then, press the adapter *firmly* into the expansion slot. Move the adapter directly from the static-protective package to the adapter slot. Avoid touching the components and gold-edge connectors on the adapter.

Attention: Make sure that the adapter is correctly seated in the expansion slot before you turn on the computer. Incomplete installation of an adapter might damage the system board or the adapter.
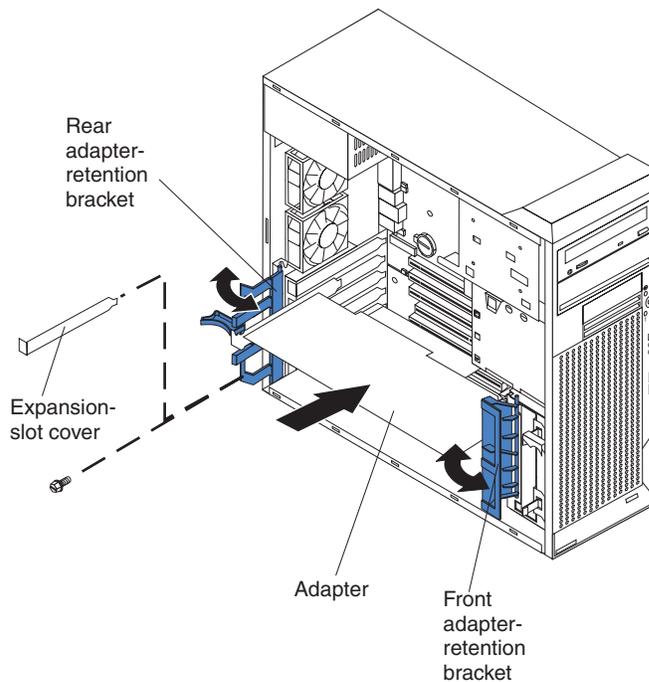
Figure 9. Adapter placement

9. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans. If you are installing an optional SCSI adapter, see "Cabling an optional SCSI adapter" on page 33 for additional information.

10. If you have another adapter to install, repeat steps 4 through 9.

11. If you have installed a full-length adapter, rotate the front adapter-support bracket to the closed (locked) position.

Note: If any adapter in the computer is large or has heavy cables attached to it, you can secure the adapter with a screw: insert one backup expansion-slot screw (stored on the frame-support bracket) through the top of each adapter bracket into the screw hole and secure the adapter before proceeding to the next step. If you use a screw to secure an adapter, you will have to secure all

adapters with screws. You cannot use both the screws and the retention brackets to secure adapters. You must use one method or the other.

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

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

13. If you have other options to install, do so now; otherwise, continue with step 14.

14. Replace the support bracket (see "Replacing the support bracket" on page 29).

15. Replace the side cover (see "Replacing the side cover" on page 27).

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

To remove an adapter, reverse the preceding steps.

Cabling an optional SCSI adapter

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

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

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

Complete the following steps to cable an optional SCSI adapter:

1. Install the SCSI adapter.

2. Connect the SCSI-signal cable to the adapter and to one or more of the signal-cable connectors on the rear of the SCSI devices.
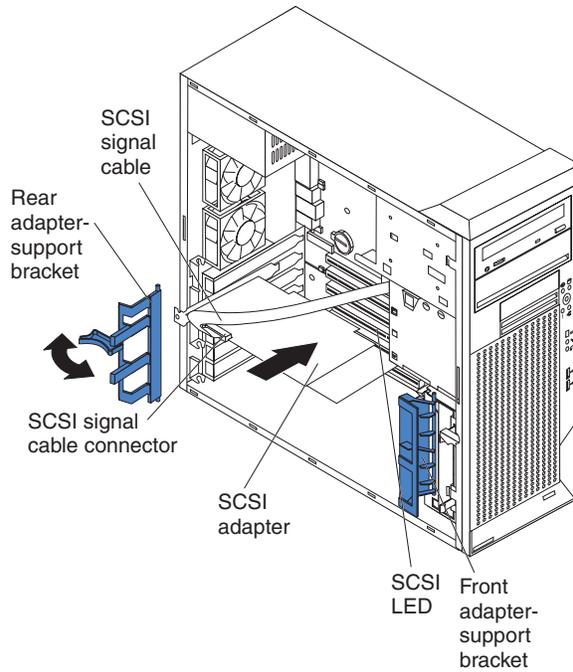
Figure 10. SCSI signal cable placement

3. Complete the installation of the optional SCSI adapter.

Internal drives

This section describes the installation and removal of internal drives.
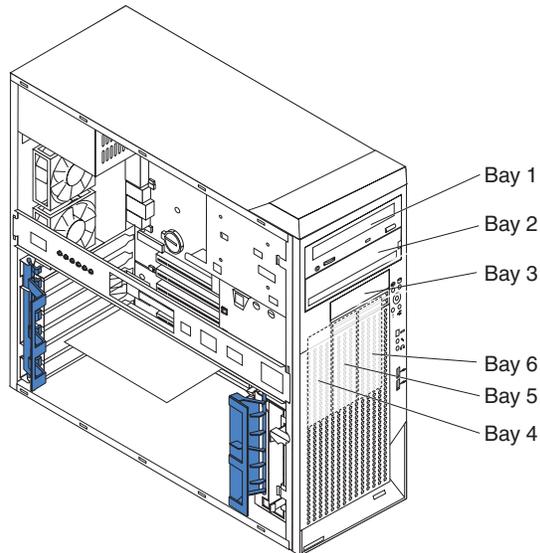
Figure 11. Internal drive bays

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

- The IntelliStation A Pro computer comes with an IDE optical drive (CD-ROM, CD-RW, or DVD/CD-RW combo drive) in bay 1 and a hard disk drive in bay 4.

- You can install removable-media drives in bays 1, 2, and 3 only. Tape drives, diskette drives, CD-ROM, DVD/CD-RW, and DVD-ROM drives are examples of removable-media drives.
- You can install a 3.5-in. slim-high or 5.25-in. half-high removable-media drive, such as a tape backup drive, in bay 2.
- You can install a SCSI diskette drive or a 3.5-in slim-high SCSI hard disk drive in bay 3. You cannot install an IDE drive in bay 3.
- To install a 3.5-in. drive in a 5.25-in. bay, you must use the 5.25-in. conversion kit.
- The IntelliStation A Pro computer supports only one diskette drive: either a diskette drive in bay 3 or a USB drive connected to the USB connector on the front of the computer.
- If you plan to install a Microsoft® Windows XP 32-bit operating system on a SCSI drive, you must have a diskette drive attached during installation to be able to load the SCSI driver.
- Two Serial ATA hard disk drive connectors are on the system board.
- When SCSI drives are installed, set the drive jumpers either to disable auto-start or to delay startup, to prevent overtaxing the system power supply by all drives trying to spin up at once.
- If you have SCSI hard disk drives and SATA hard disk drives in the same computer, note the following HostRAID considerations for hard disk drives:
  - You can enable HostRAID on only one subsystem (SCSI or SATA).
  - If HostRAID is enabled on a subsystem, you can install boot hard disk drives on that subsystem only.

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

  For more information about HostRAID, see the *User's Guide* on the IBM *IntelliStation Documentation* CD.
- The electromagnetic interference (EMI) integrity and cooling of the computer are protected by having all bays and PCI-X slots covered or occupied. When you install a drive or PCI-X adapter, save the EMC shield and filler panel from the bay or the PCI-X adapter slot cover in the event you later remove the drive or adapter.
- For a complete list of supported options for the computer, go to http://www.ibm.com/pc/; then, select your country and navigate to the list of options for the computer.

Replacing a drive in bays 1 or 2

Complete the following steps to install and remove a drive in bays 1 or 2:

1. Read the safety information in Appendix B, "Safety information," on page 117, the guidelines in "Handling static-sensitive devices" on page 25, and the documentation that comes with the drive.
2. Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
3. Check the instructions that come with the drive to determine whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.
4. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
5. Remove the side cover (see "Replacing the side cover" on page 27).

6. Remove the front bezel (see "Replacing the bezel" on page 30).

7. Remove the support bracket (see "Replacing the support bracket" on page 29).

8. If the bay does not yet contain a drive, use a screwdriver to pry the filler panel and EMC shield away from the computer (see Figure 12 on page 37).

9. If the bay already contains a drive:

    a. Detach its cables.

    b. Release it from the bay by pressing the blue latch on the side of the drive.

    c. Pull the drive out of the computer.

    d. Remove the blue clip from the side of the drive you have removed and install it on the replacement drive

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

Statement 3

CAUTION:
When laser products (such as CD-ROMs, DVD-ROM drives, fiber optic devices, or transmitters) are installed, note the following:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

> **Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:**
>
> **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**
> Class 1 Laser Product
> Laser Klasse 1
> Laser Klass 1
> Luokan 1 Laserlaite
> Appareil À Laser de Classe 1

Figure 12. Preparing to install a drive in bay 2

10. Touch the static-protective package containing the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.

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

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

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

13. Remove the clip from the side of the drive cage of bays 1 and 2 by sliding the clip to the left; then, snap the clip into the screw holes on the side of the drive or conversion kit (with the blue side of the clip facing outward) (see Figure 13 on page 38).

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

Drive clip

Figure 13. Drive clips on removable-media drives

14. Push the drive into the bay.

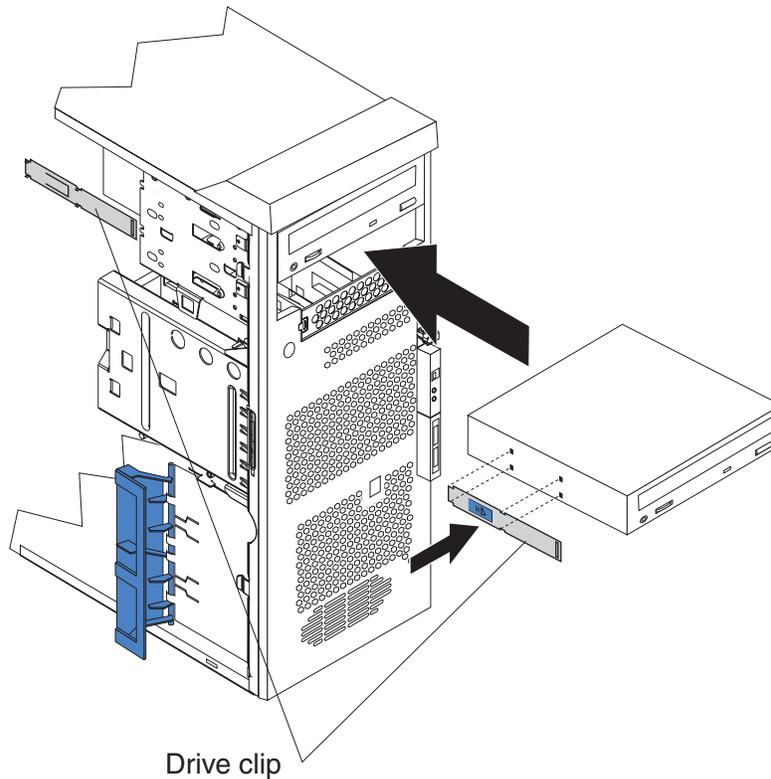15. Determine whether the drive is an IDE or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable IDE or SCSI connector on the system board. See "Power and signal cables for internal drives" on page 44 for additional information about cabling drives and "System-board internal connectors" on page 77 for the location of IDE and SCSI connectors on the system board. If there are open connectors on the cables connecting existing IDE or SCSI drives, you can use these cables to connect the new drive.

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

17. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

18. If you have other options to install or remove, do so now.

19. Replace the support bracket (see "Replacing the support bracket" on page 29).

20. Replace the bezel (see "Replacing the bezel" on page 30).

21. Replace the side cover (see "Replacing the side cover" on page 27).

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

To remove a drive from bays 1 or 2, reverse the preceding steps.

Replacing a drive in bay 3

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

Complete the following steps to install a drive in bay 3:

1. Read the safety information in Appendix B, "Safety information," on page 117, the guidelines in "Handling static-sensitive devices" on page 25, and the documentation that comes with the drive.
2. Make sure that you have all the cables and other equipment specified in the documentation that comes with the drive.
3. Check the instructions that come with the drive to determine whether you need to set any switches or jumpers on the drive. Make sure that you set the SCSI ID for that device.
4. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
5. Remove the side cover (see "Replacing the side cover" on page 27).
6. Remove the front bezel (see "Replacing the bezel" on page 30).
7. Remove the support bracket (see "Replacing the support bracket" on page 29).
8. Rotate the drive cage up.
9. If the bay is empty, use a screwdriver to pry the filler panel and EMC shield away from the computer.
10. If the bay contains a drive, remove it:
    a. If the drive is secured with screws, remove the screws and set them in a safe place.
    b. If the drive is secured with a tooless clip, remove it and set it aside to install on the new drive.

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

Statement 3

⚠️

CAUTION:
When laser products (such as CD-ROMs, DVD-ROM drives, fiber optic devices, or transmitters) are installed, note the following:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

⚠️

DANGER

> **Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:**
>
> **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**
> Class 1 Laser Product
> Laser Klasse 1
> Laser Klass 1
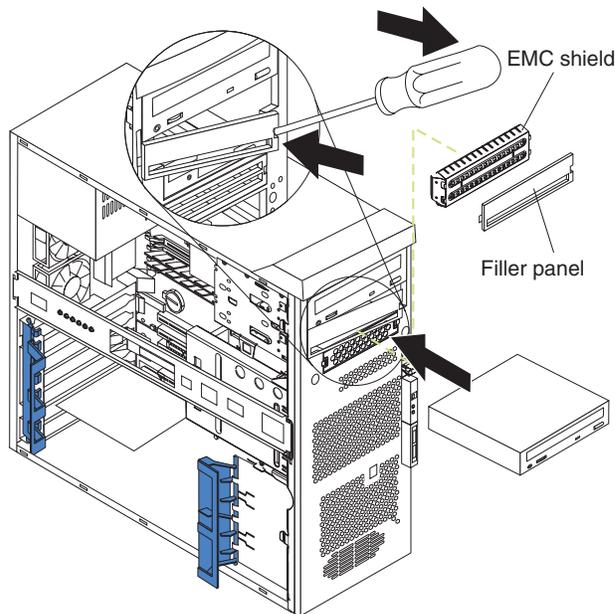> Luokan 1 Laserlaite
> Appareil À Laser de Classe 1

Figure 14. Preparing to install a drive in bay 3

11. Touch the static-protective package containing the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.

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

    Notes:

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

    b. If you are installing a hard disk drive, you might need to temporarily disconnect the front-panel cable from the system board. You can reconnect the front-panel cable after you have finished installing the hard disk drive.

13. Push the drive into the bay; then, use the one screw to attach the drive to the drive cage.

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

14. Connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable connector on the system board (if you are installing a diskette drive in bay 3, connect the other end of the cable to the diskette connector on the system board). See "Power and signal cables for internal drives" on page 44 for additional information about cabling drives and "System-board internal connectors" on page 77 for the location of diskette and SCSI connectors on the system board. If there are open connectors on the cables connecting existing SCSI drives, you can use these cables to connect the new drive.

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

16. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

17. If you have other options to install or remove, do so now.

18. Lower the drive cage.

19. Replace the support bracket (see "Replacing the support bracket" on page 29).

20. Replace the bezel (see "Replacing the bezel" on page 30).

21. Replace the side cover (see "Replacing the side cover" on page 27).

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

To remove a drive from bay 3, reverse the preceding steps.

Replacing a hard disk drive in bay 4, 5, or 6

Bays 4, 5, and 6 are in the drive cage. The drive cage is near the front adapter-support bracket.

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

Complete the following steps to install a drive in bay 4, 5, or 6:

1. Read the safety information in Appendix B, "Safety information," on page 117, the guidelines in "Handling static-sensitive devices" on page 25, and the documentation that comes with the drive.

2. Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.

3. Select the bay in which you want to install the drive.
4. Check the instructions that come with the drive to determine whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.
5. Turn off the computer and all attached devices (see "Turning off the computer" on page 5); then, disconnect all power cords and external cables.
6. Remove the side cover (see "Replacing the side cover" on page 27).
7. Remove the support bracket (see "Replacing the support bracket" on page 29).
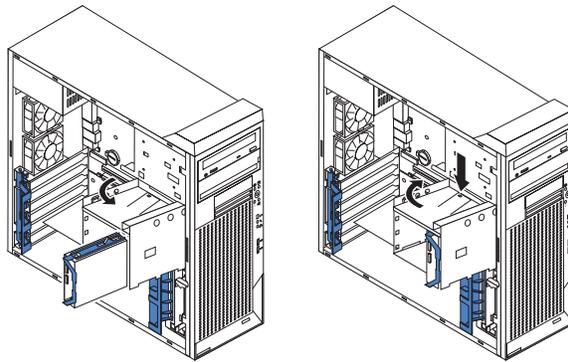

Figure 15. Rotating the drive cage

8. Grasp the drive cage and rotate the cage out of the computer until it locks into place with the drive-cage retention tab (see Figure 15).

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

   The open ends of the drive slots and installed drives will face you. Make sure that the drive cage locks into place over the drive-cage retention tab by rotating the drive cage all the way out of the computer.
9. If you are installing a new drive in an empty bay, slide the existing drive tray out of the drive bay.
10. If you are replacing a drive:
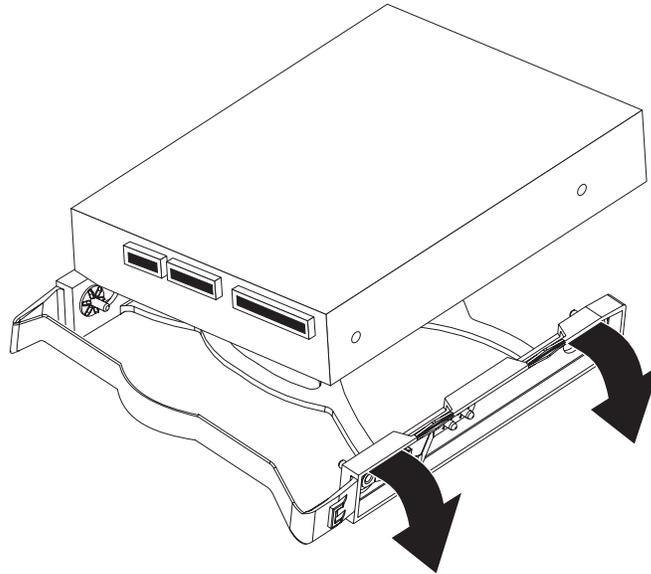   a. Slide the existing drive out of the drive bay.

Figure 16. Attaching the drive to the drive tray

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

11. Touch the static-protective package containing the new drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.

12. Set any jumpers or switches on the new drive according to the documentation that comes with the drive.

13. Attach the new drive to the drive tray. Place the drive on the drive tray and align the holes on the drive with the mounting pins on the drive tray (see Figure 16). Gently pull both sides of the drive tray outward and insert the mounting pins into the holes on the drive.

14. Slide the drive into the drive bay until the drive snaps into place.

15. Determine whether the drive is a Serial ATA or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable Serial ATA or SCSI connector on the system board. If there are open connectors on the cables connecting existing Serial ATA or SCSI drives, you can use these cables to connect the new drive. See "Power and signal cables for internal drives" on page 44 for additional information about cabling drives and "System-board internal connectors" on page 77 for the location of Serial ATA and SCSI connectors on the system board.

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

17. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

18. Push the drive cage outward, and press in on the drive-cage release tab. Rotate the cage part-way into the computer; then, reconnect any power cables you disconnected in step 8 and rotate the cage the rest of the way back into the computer. Make sure that the drives and cables do not strike the microprocessor fan sink.

19. If you have other options to install or remove, do so now.

20. Replace the support bracket (see "Replacing the support bracket" on page 29).
21. Replace the side cover (see "Replacing the side cover" on page 27).
22. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Power and signal cables for internal drives

The computer uses cables to connect IDE, Serial ATA, and SCSI devices to the power supply and to the system board. (See "System-board internal connectors" on page 77 for the location of system-board connectors.) Review the following information before connecting power and signal cables to internal drives:

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

The following cables are provided:

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

    Note: The optical drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is connected to the system board. The black connector is connected to the master IDE device. The gray middle connector is connected to the subordinate IDE device.
  - **Serial ATA:** The narrower, black signal cable has two connectors. One is connected to the SATA drive, and the other is connected to the connector on the system board. Each SATA drive comes with a cable. If you install an additional SATA drive, you will need an additional cable.
  - **SCSI:** The following cables can be used to attach SCSI devices to the integrated SCSI controller on the system board:

- An Ultra320 twisted ribbon cable connects the internal Ultra320 SCSI hard disk drive to the SCSI connector on the system board. This cable has four additional connectors for attaching more internal SCSI devices.
- A round SCSI cable connects external SCSI devices to the integrated SCSI controller (SCSI B) on the system board. For more information about connecting SCSI devices, see the SCSI documentation.

Replacing memory modules

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

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

  Exception: Although the computer supports a maximum of 16 GB of system memory, the Microsoft Windows XP operating systems recognize and support a maximum of 4 GB of system memory.
- The computer comes with two 512 MB or 1 GB memory DIMMs installed.
- Install only 2.5 V, 184-pin, double-data-rate (DDR), PC3200, registered, buffered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC3200 SDRAM buffered DIMM specification. For a list of supported options for the computer, go to http://www.ibm.com/pc/; then, select your country and navigate to the list of options for the computer.
- DIMMs must be installed in matched pairs. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match other pairs. You can mix compatible DIMMs from various manufacturers.
- The first pair of DIMMs on the system board are installed in DIMM connectors 1 and 2. If you install a second pair of DIMMs for microprocessor 1, install the pair in DIMM connectors 3 and 4. Table 2 shows the system board DIMM installation sequence.

Table 2. DIMM installation sequence on system board

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

- If you install a second microprocessor (microprocessor 2), install the first pair of DIMMs for the microprocessor in DIMM connectors 5 and 6 on the microprocessor board. If you install a second pair of DIMMs for the microprocessor, install the pair in DIMM connectors 7 and 8 on the microprocessor board. See "Installing a second microprocessor" on page 48 for more information about the microprocessor option. Table 3 shows the microprocessor board DIMM installation sequence.

Table 3. DIMM installation sequence on microprocessor board

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

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

Complete the following steps to install a pair of DIMMs:
1. Read the safety information in Appendix B, "Safety information," on page 117, and the guidelines in "Handling static-sensitive devices" on page 25.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 5); then, disconnect all external cables and power cords.
3. Remove the side cover (see "Replacing the side cover" on page 27).
4. Remove the support bracket (see "Replacing the support bracket" on page 29).
5. For easier access to the memory modules on the system board, rotate the drive cage out of the computer until it locks into place. You might need to disconnect the power cables from the drives before you rotate the cage all the way.

   Note: If you are installing memory modules on the microprocessor board for a second microprocessor on the computer, it is not necessary to move the drive cage.
6. If you are installing DIMMs for microprocessor 1, and you have installed a second microprocessor on the computer, remove the microprocessor 2 air baffle:
   a. Lift up on the large end of the baffle until it releases.
   b. Slide the baffle toward the front of the computer; then, lift the baffle out of the computer.
7. Locate the DIMM connectors. Determine the connectors into which you will install the DIMMs. See the notes at the beginning of this section for the installation sequence.
8. Gently open the retaining clips on each end of the DIMM connectors you have selected and, if necessary, remove any existing DIMMs.

9. Touch the static-protective package containing the new DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.

10. Turn the DIMM so that the contacts align correctly with the connector.

11. Insert the DIMM into the connector (see Figure 17). Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and then reinsert it.
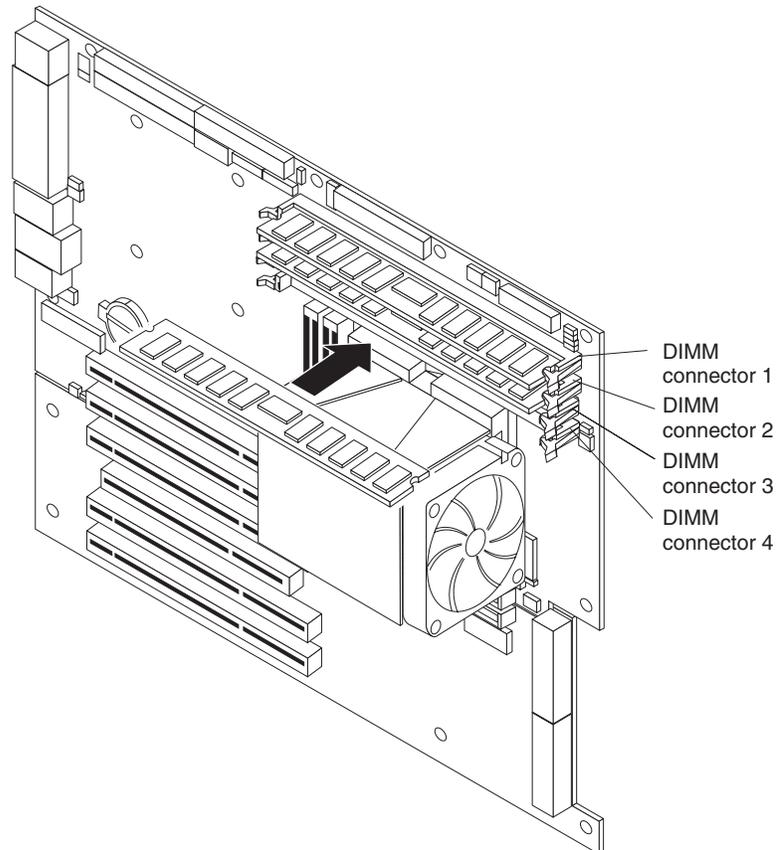

DIMM connector 1
DIMM connector 2
DIMM connector 3
DIMM connector 4

Figure 17. Installation of DIMMs 1-4

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

13. If you have other options to install or remove, do so now.

14. If you moved the drive cage out of the way in step 5, push the drive cage outward and press in on the drive-cage release tab. Rotate the cage part-way into the computer, reconnect any power cables you disconnected from the drives, and rotate the cage the rest of the way back into the computer.

15. If you removed the air baffle for the optional second microprocessor in step 6, replace the air baffle (see step 17 on page 51).

16. Replace the support bracket (see "Replacing the support bracket" on page 29).

17. Replace the side cover (see "Replacing the side cover" on page 27).

18. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

Installing a second microprocessor

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

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

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

- The speed of microprocessors 1 and 2 must match.
- The microprocessor option kit comes with a microprocessor board, a microprocessor socket, the microprocessor, a fan sink, and a microprocessor air baffle. The necessary screws and the microprocessor socket are preinstalled on the microprocessor board.
- Each microprocessor contains a memory controller for the memory modules that are associated with it.
- You must install at least one pair of matched DIMMs on the microprocessor board with the microprocessor. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match other pairs. See "Replacing memory modules" on page 45 for information about the installation order and the type of DIMMs that are supported.
- With more than one microprocessor, the computer can operate as a symmetric multiprocessing (SMP) computer. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors. This enhances performance for database and other applications.
- To use SMP, obtain an SMP-capable operating system. For a list of supported operating systems, go to http://www.ibm.com/pc/us/compat/.
- Read the documentation that comes with the microprocessor to determine whether you need to update the computer basic input/output system (BIOS) code. The most current level of BIOS code for the computer is available from http://www.ibm.com/pc/support/.
- For a list of supported microprocessor options for the computer, go to http://www.ibm.com/pc/; then, select your country and navigate to the list of options for the computer

Before you begin, obtain the following items:
- A Phillips-head screwdriver
- A flat-blade screwdriver or a nut driver

Complete the following steps to install a second microprocessor.

Note: For clarity, the illustrations in this procedure show only the system board. You will not remove the system board from the computer to perform this procedure.

1. Read the safety information in Appendix B, "Safety information," on page 117, and the guidelines in "Handling static-sensitive devices" on page 25.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 5).
3. Disconnect all external cables and power cords; then, remove the side cover (see "Replacing the side cover" on page 27)
4. Remove the support bracket (see "Replacing the support bracket" on page 29).

5. Touch the static-protective package containing the microprocessor board to any unpainted metal surface on the computer. Then, remove the microprocessor board from the package.
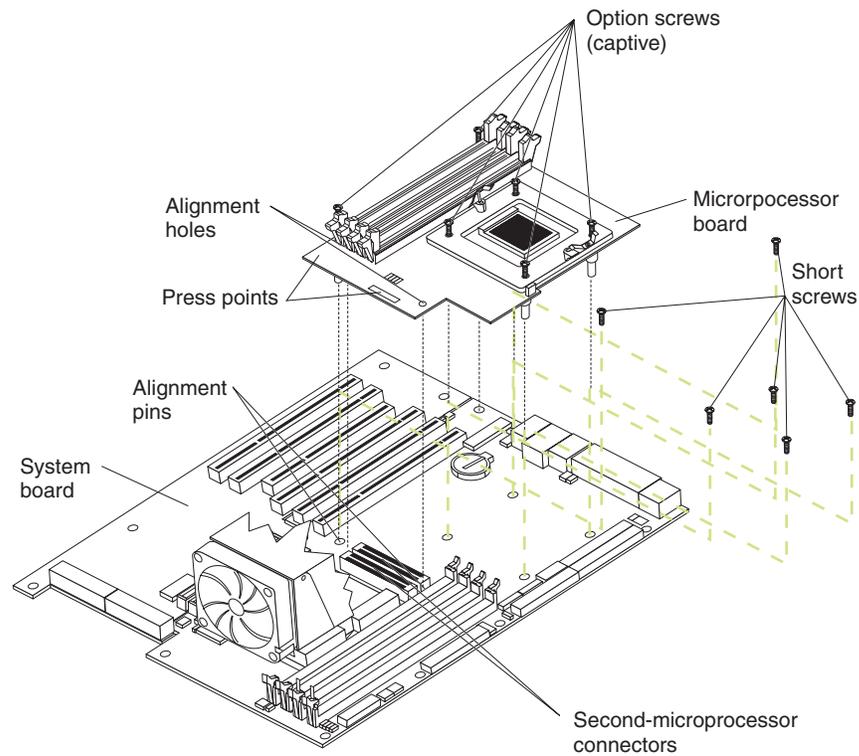

Figure 18. Installing the microprocessor board

6. Remove the six indicated screws from the system board.
7. Position the alignment holes in the microprocessor board over the guide pins on the system board; then, lower the microprocessor board onto the guide pins.
8. Make sure that the connectors on the underside of the microprocessor board line up with the second-microprocessor connectors on the system board.
9. Tighten the four screws on the fan-sink socket; then, tighten the two screws on the corners of the microprocessor board to secure the microprocessor board to the system board.
10. Press down on the barcode label and the indicated corner to make sure that the microprocessor board is firmly seated in the connectors on the system board.
11. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if any is present.

12. Lift the microprocessor-release lever (see Figure 19) to the fully open position (90°).
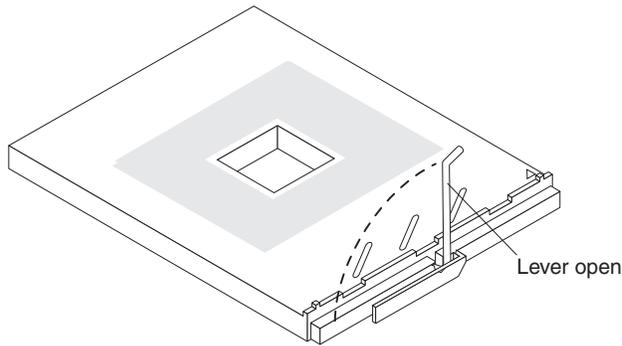

Figure 19. Opening the microprocessor locking lever

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

13. Install the new microprocessor:

a. Touch the static-protective package containing the new microprocessor to any unpainted metal surface on the computer; then, remove the microprocessor from the package.

b. Position the microprocessor over the microprocessor socket as shown in Figure 20. Carefully press the microprocessor into the socket.

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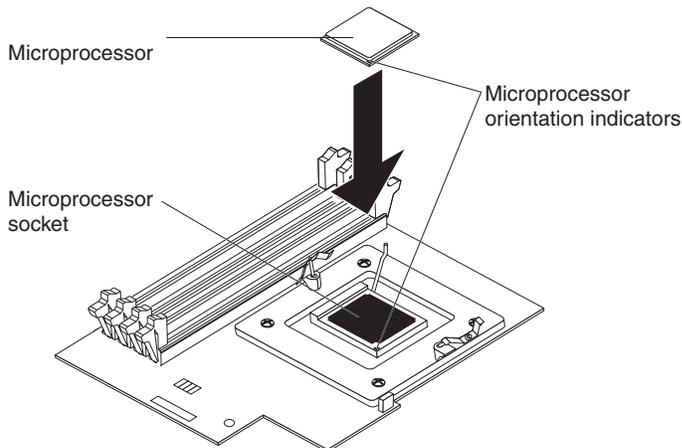

Figure 20. Installing a microprocessor

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

Attention:

• Do not disturb or contaminate the gray thermal material on the bottom of the new fan sink. Doing so damages its heat-conducting capability and exposes the new microprocessor to overheating.

• If you need to remove the fan sink after installing it, see "Microprocessor and fan sink" on page 72.
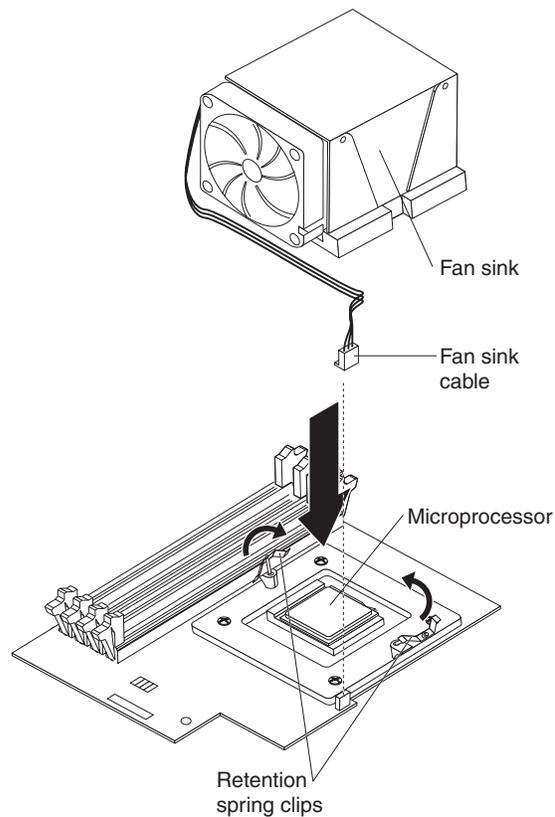
15. Install the fan sink.

Figure 21. Installing the fan sink

    a. Remove the fan sink from its package and remove the cover from the bottom of the fan sink. Make sure that the thermal material is still on the bottom of the fan sink.

    b. Connect the fan-sink cable to the microprocessor fan connector on the microprocessor board (see Figure 34 on page 73 for the location of the connector); then, press the fan sink into place.

    c. Remove the release liner and orient the fan sink above the microprocessor (see Figure 21).

    d. Raise the retention spring clips into position on each side of the fan sink. Start both screws into the fan-sink socket; then, tighten both screws. Do not overtighten the screws.

16. Install at least one pair of supported DIMMs on the microprocessor board. See "Replacing memory modules" on page 45 for information about the installation order and the type of supported DIMMs.
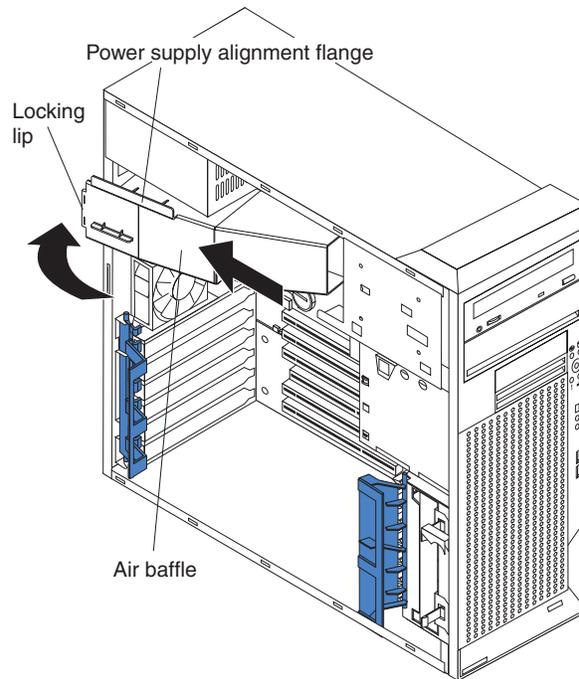
17. Install the microprocessor air baffle.

Figure 22. Installing the baffle

    a. Orient the air baffle as shown and align it with the side of the power supply.

    b. Insert the small end of the baffle into the computer toward the front of the computer.

    c. Lower the larger end of the baffle until the side flange rests on the power supply.

    d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the baffle until it clicks into place.

18. If you have other options to install or remove, do so now.

19. Replace the support bracket (see "Replacing the support bracket" on page 29).

20. Replace the side cover (see "Replacing the side cover" on page 27).

21. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

Installing an external SCSI cable

To install an external SCSI connector on the rear of the computer, install an external SCSI interface option. For a list of supported external SCSI interface options for the computer, go to http://www.ibm.com/pc/.

The external SCSI interface option contains a SCSI cable with a connector at one end and on the other end another connector or an expansion-slot cover with an embedded connector. Complete the following steps to install and route the SCSI cable in the computer:

1. Turn off the computer and all peripheral devices. Disconnect all power cords; then, disconnect all external signal cables from the computer.

2. Remove the computer cover (see "Replacing the side cover" on page 27).

3. Remove the support bracket (see "Replacing the support bracket" on page 29).

4. Open the front adapter-retention bracket and remove the rear adapter-retention bracket from the PCI-X slots (see "Installing and removing an adapter" on page 31 for instructions). You might also have to remove longer adapters for access to the SCSI connectors on the system board.

5. If you are removing an existing SCSI cable:

   a. Remove the standoff screws securing the cable to the chassis.

   b. Disconnect the cable from the system board connector.

   c. Remove the cable.

6. To attach the cable, connect the SCSI signal cable end labeled "PLANAR" to the connector for SCSI channel B on the system board. See "System-board internal connectors" on page 77 for the location of the SCSI channel B connector.

7. Route the SCSI cable between the chassis and PCI-X slot 5 to the back of the computer. Make sure the cable does not block the flow of air to the microprocessors or hard disk drives.

8. Attach the external connector to the rear of the computer.

   • If the external end of the SCSI cable has a standard SCSI connector, complete the following steps:

      a. Remove the SCSI-connector knockout from the rear of the computer.

      b. Insert the external SCSI connector on the SCSI cable into the knockout opening and secure it with the attached screws.

   • If the external end of the SCSI cable has an expansion-slot cover with an embedded connector, complete the following steps:

      a. Remove an expansion-slot cover from an available PCI-X slot.

      b. Insert the expansion-slot cover with embedded connector into the slot opening.

9. Replace any adapters you removed in step 4. Close the front adapter-retention bracket and replace the rear adapter-retention bracket.

10. Replace the support bracket (see "Replacing the support bracket" on page 29).

11. Replace the cover (see "Replacing the side cover" on page 27).

12. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

13. Use the SCSISelect program to configure SCSI channel B (see the *User's Guide* on the IBM *IntelliStation Documentation* CD).

Replacing the battery

Important: In servers containing the optional microprocessor board, the battery must be replaced by a trained servicer who is familiar with IBM products.

When replacing the battery, you must replace it with a lithium battery of the same type from the same manufacturer. To avoid possible danger, read and follow the safety information in Appendix B, "Safety information," on page 117.

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.

Note: After you replace the battery, you must reconfigure the computer and reset the system date and time.

Complete the following steps to replace the battery:

1. Read the safety information in Appendix B, "Safety information," on page 117, "Installation guidelines" on page 25, and "Handling static-sensitive devices" on page 25.

2. Follow any special handling and installation instructions that come with the replacement battery.

3. Turn off the computer and all attached devices. Disconnect all external cables and power cords; then, remove the computer cover and the support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).

4. Remove the battery:

   a. Use a fingernail to press the top of the battery clip away from the battery (see Figure 23). The battery pops up when released.

   b. Use your thumb and index finger to lift the battery from the socket.
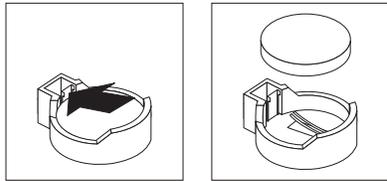
Figure 23. Removing the battery

5. Insert the new battery:

   a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.

   b. Press the battery down into the socket (Figure 24) until it clicks into place. Make sure that the battery clip holds the battery securely.
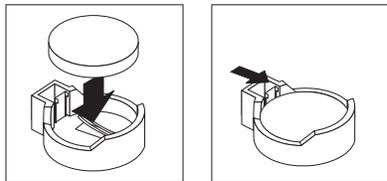

Figure 24. Installing the battery

6. Replace the support bracket (see "Replacing the support bracket" on page 29).

7. Replace the cover and connect the cables.

8. Turn on the computer.

9. Start the Configuration/Setup Utility program and set configuration parameters.

   • Set the system date and time.

   • Set passwords if necessary.

   • Save the configuration.

Cabling the computer

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

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

Figure 25 on page 56 shows the input/output (I/O) connectors on the rear of the A Pro Type 6224 computer.

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

Connecting external options

You can connect a number of optional external devices to the connectors on the rear and front of the computer.

Complete the following steps to connect an external device:

1. Read the safety information in Appendix B, "Safety information," on page 117,the guidelines in "Handling static-sensitive devices" on page 25, and the documentation that comes with the options.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 5).
3. Follow the instructions that come with the option to prepare it for installation and to connect it to the computer.

If you are attaching a SCSI device, see "Ultra320 SCSI connector" on page 59 for SCSI ID and cabling information.

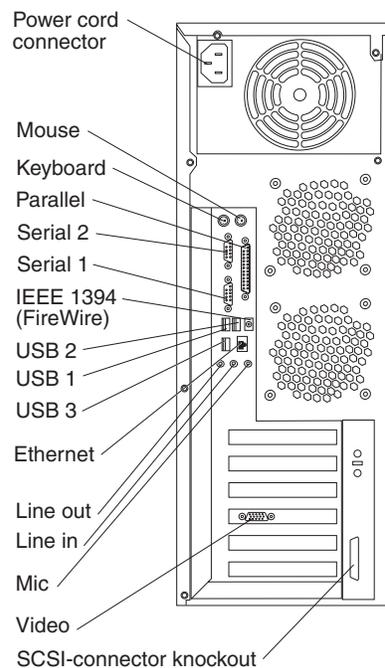# Input/output connectors

Connect optional external devices to the connectors on the front and rear of the computer.

The computer has the following input/output (I/O) connectors:
- One audio line in
- One auxiliary-device (pointing device)
- Two audio line out
- Two audio microphone
- One Ethernet
- Two IEEE 1394A (FireWire)
- One keyboard
- One parallel
- Two serial
- Five Universal Serial Bus (USB)
- One video

Figure 25 shows the locations of the connectors on the rear of the computer. See "Controls, LEDs, and connectors" on page 4 for the locations of the connectors on the front of the computer.

Power cord connector

Mouse

Keyboard

Parallel

Serial 2

Serial 1

IEEE 1394 (FireWire)

USB 2

USB 1

USB 3

Ethernet

Line out

Line in

Mic

Video

SCSI-connector knockout

Figure 25. Rear connectors

The following sections describe these connectors.

Audio connectors

Use the audio connectors to connect external audio equipment to the computer. The following illustration shows the audio connectors.

Line out   Line in   Mic
(green)   (blue)   (pink)
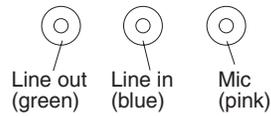
Line in

There is one line-in connector on the rear of the computer. The computer receives audio signals through this connector from an external audio device.

Line out

There are two line-out connectors, one on the front and one on the rear of the computer. The computer sends audio signals through this connector to powered speakers with built-in amplifiers, headphones, a multimedia keyboard, or the audio line-in connector on a stereo system. The internal speaker in the computer is disabled when a device is attached to this connector.

Mic

There are two microphone connectors, one on the front and one on the rear of the computer. Connect a microphone to this connector to record sounds onto the hard disk or to use speech-recognition software.

Auxiliary-device (pointing-device) connector

There is one auxiliary-device connector on the rear of the computer. Use this connector to connect a mouse or other pointing device. The following illustration shows an auxiliary-device connector.

6   5
4   3
2   1
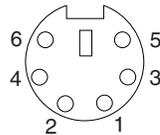
Ethernet (RJ-45) connector

There is one Ethernet connector on the rear of the computer. Use this connector to connect the computer to a 10-Mbps, 100-Mbps, or 1000-Mbps network. The following illustration shows an Ethernet connector.

Activity LED   Link LED
(green)   (green)

8   1
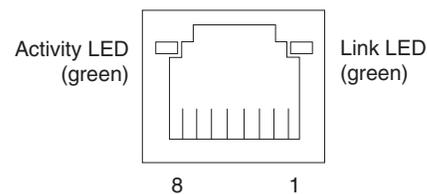
Connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to this connector. The 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

The Ethernet connector has one LED that indicates Ethernet-link status. When this LED is lit, it indicates that there is an active connection on the Ethernet port. Activity

between the computer and the network is indicated by the Ethernet transmit/receive activity LEDs on the front and rear of the computer (see "Controls, LEDs, and connectors" on page 4).

IEEE 1394A (FireWire) connector

There is one 4-pin IEEE 1394A (FireWire) connector on the front of the computer and one 6-pin IEEE 1394A (FireWire) connector on the rear of the computer. Use these connectors to connect IEEE 1394 (FireWire) devices. The following illustrations show the IEEE 1394A (FireWire) connectors.

4-pin IEEE 1394A (FireWire) connector (front)
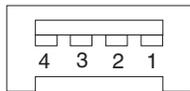
6-pin IEEE 1394A (FireWire) connector (rear)
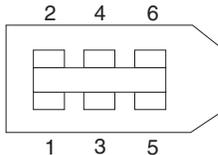
Keyboard connector

There is one keyboard connector on the rear of the computer. Use this connector to connect a PS/2® (non-USB) keyboard. The following illustration shows a keyboard connector.
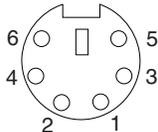
If you attach a keyboard to this connector, USB ports and devices are disabled during the power-on self-test (POST).

Parallel connector

There is one parallel connector on the rear of the computer. Use this connector to connect a parallel device. The following illustration shows a parallel connector.
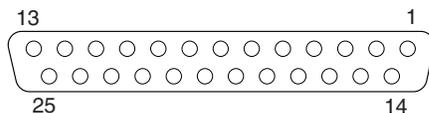
The parallel connector supports three standard Institute of Electrical and Electronics Engineers (IEEE) 1284 modes of operation: standard parallel port (SPP), enhanced parallel port (EPP), and extended capability port (ECP). If you configure the parallel port to operate in bidirectional mode, it supports the ECP and EPP modes. When the parallel connector is configured as bidirectional, use an IEEE 1284-compliant cable that does not exceed 3 meters (9.8 ft). Use the **Devices and I/O Ports** options in the IBM Configuration/Setup Utility program to configure the parallel connector as bidirectional.

Serial connectors

There are two serial connectors on the rear of the computer. Use these connectors to connect serial devices. The following illustration shows a serial connector.
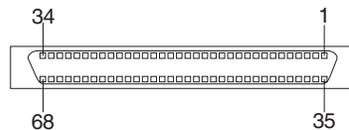
```
1          5
 O O O O O
  O O O O
6          9
```
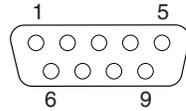
Ultra320 SCSI connector

The computer has an integrated SCSI controller. This dual-channel controller supports two independent, Ultra320 SCSI channels that support up to 15 SCSI devices each. The SCSI connectors for the channels are on the system board. The controller has the following features:

- Double-transition clocking to achieve up to 320 MBps (megabytes per second) data-transfer rates
- Domain name validation to negotiate compatible data-transfer speeds with each device
- Cyclic-redundancy checking (CRC) to improve data reliability
- An active terminator for SCSI bus termination

The following illustration shows a SCSI connector.

```
34                          1
┌──────────────────────────────┐
│ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ │
│ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ │
└──────────────────────────────┘
68                          35
```

SCSI cabling requirements

You can install four internal SCSI devices using the SCSI signal cable that comes with some computer models. If you plan to attach external SCSI devices, you can order an additional SCSI cable, remove the SCSI knockout from the rear of the computer, and connect the new cable from the SCSI channel B connector on the system board to this opening. To select and order the correct cables for use with external devices, contact your IBM reseller or IBM marketing representative. See "System-board internal connectors" on page 77 for the locations of the SCSI connectors.

If you want to attach external SCSI devices to the computer without using the internal SCSI channel B, you must install an optional SCSI adapter.

Setting SCSI IDs

Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. See the information that comes with the device for instructions for setting its SCSI ID.

Universal Serial Bus connectors

There are five Universal Serial Bus (USB) 2.0 connectors, two on the front and three on the rear of the computer. Use the USB connectors to connect optional telephony and multimedia devices. USB 2.0 technology transfers data at up to 480 Mb per second (Mbps) with a maximum of 127 external devices and a maximum signal distance of 5 meters (16 ft) per segment (if the device that is attached to the computer is a USB 2.0 device). If multiple USB devices are attached to the computer, the USB hub must be USB 2.0; otherwise, all USB 2.0 devices will transfer data at 12 Mbps. Using Plug and Play technology, USB devices are configured automatically. The following illustration shows a USB connector.
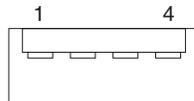
Use a 4-pin USB cable to connect an external devices to a USB connector.

If you connect a PS/2 (non-USB) keyboard to the keyboard connector, USB ports and devices are disabled during power-on self-test (POST).

If you connect a USB keyboard that has a mouse port, the keyboard emulates a mouse, and you cannot disable the mouse settings in the Configuration/Setup Utility program.
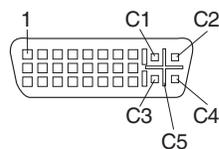
Video connector

The Accelerated Graphics Port (AGP) adapter, which is in the AGP slot on the system board, provides the video connector. This connector is on the rear of the computer. Use the video connector to connect a monitor or other display device. The following illustrations show examples of different video connectors.
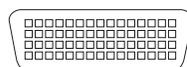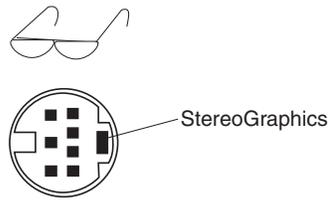
Analog video connector
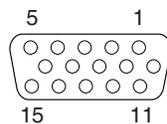
Digital (DVI-I) video connector

Low force helical-60 (LFH-60) video connector

**Stereo shutter glasses video connector**

StereoGraphics

Some models come with a digital video interface (DVI) connector for connecting a digital monitor. If you have problems viewing information with a second monitor, see the *User's Guide* on the IBM *IntelliStation Documentation* CD for information about changing monitor settings.

Models with the NVIDIA Quadro FX 1100 or NVIDIA Quadro FX 3000 video adapter come with a DVI-I to VGA style analog converter for each DVI-I connector.

If the software application supports it, the connector identified by an eyeglasses icon is used for stereo shutter glasses.

Attention: To get the best performance from the NVIDIA Quadro FX 1100 and NVIDIA Quadro FX 3000 video adapters, you must connect the video adapter to the computer power supply. Otherwise, the video adapter will be operating with very limited power, resulting in a decrease in performance for some applications. Use the dedicated PCI power drop to connect the video adapter to the computer power supply. The following illustration shows the location of the video adapter power connector:

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

Video adapter
power connector
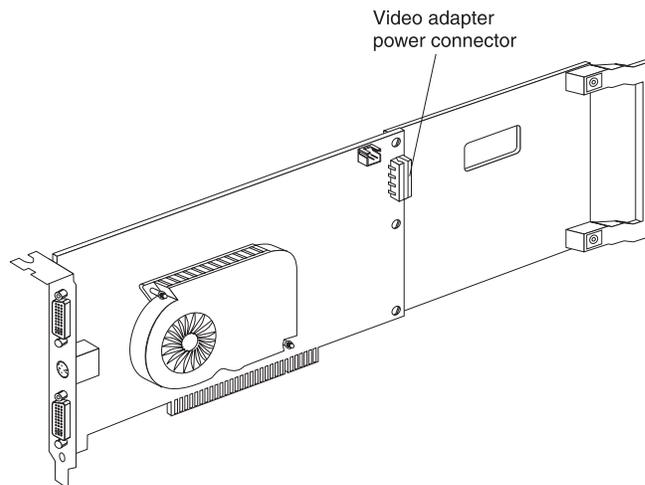
Models with the NVIDIA Quadro NVS 280 video adapter come with a low force helical-60 (LFH-60) to dual-analog monitor pigtail cable. If you want to set up two digital monitors, you will have to purchase a separate dual-digital monitor cable.

Chapter 5. Field replaceable units

This chapter describes the removal of computer components.

Important   The field replaceable unit (FRU) procedures are intended for trained servicers who are familiar with IBM products. Customer replacement units (CRUs) can be replaced by the customer. See the parts listing in Chapter 7, "Parts listing, Type 6224," on page 107 to determine whether the component being replaced is a CRU or a FRU.

Speaker

- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Important: Before you begin, make sure that you have a flat work surface available next to the computer on which you can set down the drive cage (see step 5).

Complete the following steps to remove the speaker:

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

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

2. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).

3. Remove the front bezel (see "Replacing the bezel" on page 30).

4. Remove all adapters and set them on a static-protective surface.

5. Disconnect from the hard disk drives any cables, such as the SCSI cable, that are too short to allow the drive cage to rest on a clean work surface at the side of the computer.

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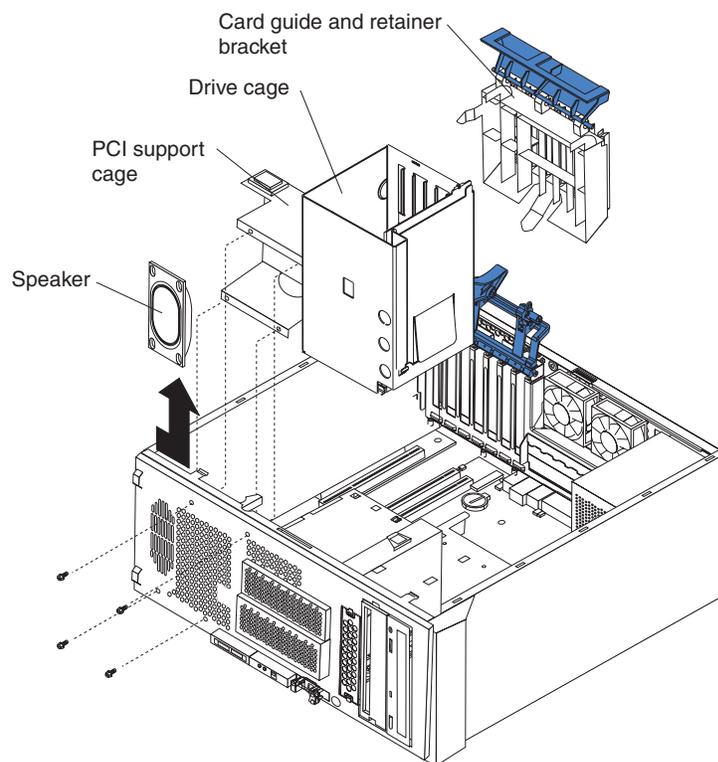

Figure 26. Speaker replacement

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

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

7. Disengage the two alignment pins on the drive cage from the chassis and the PCI support cage.

8. Pull the drive cage away from the chassis and carefully set it on a clean work surface.

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

9. Remove the PCI support cage from the chassis and set it aside.

10. Disconnect the speaker cable from the system board.

11. Slide the speaker out of the retaining hooks on the chassis and remove it from the computer, making sure that the cable follows freely.

To install the speaker, reverse the preceding steps.

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

Fan assembly

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove a rear fan:

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

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

2. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).

3. Disconnect the fan cable from the system board, making a note of where the cable was connected for later installation.

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

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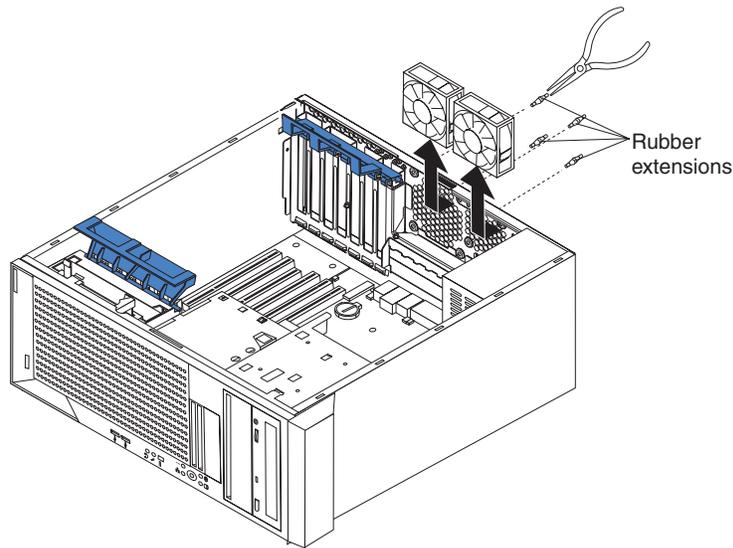

Figure 27. Fan assembly replacement

4. Pull the fan assembly slightly toward the interior of the chassis, stretching one of the rubber grommets.

5. From the outside of the chassis, grasp the grommet and stretch it; then, pull the grommet through either the hole in the chassis or the hole in the fan assembly.

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

6. Repeat steps 4 and 5 for the remaining three grommets.

7. Pull the fan up and out of the chassis.

To install the fan assembly, reverse the previous steps, attaching the rubber grommets to the fan and then using needle-nosed pliers to pull them through the holes in the chassis. If necessary, use an implement such as a flat-blade screwdriver to assist in connecting the fan cable to the system board.

Control panel assembly

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove the control panel assembly:

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

2. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).

3. Remove the bezel (see "Replacing the bezel" on page 30).

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

4. Slide the hard disk drives out of the drive cage and set them in a safe place, disconnecting any drive cables that impede this procedure. Note the placement of the cables for later reinstallation.

5. Pivot the drive cage until it locks in position.

6. Disconnect the three control panel assembly cables from the system board.

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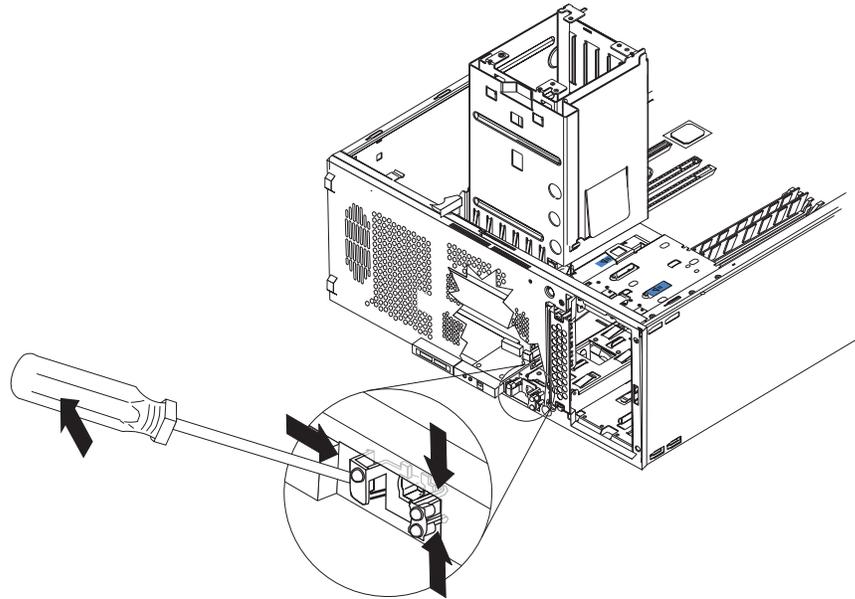

Figure 28. Control panel assembly replacement

7. From the outside of the chassis, use a flat-blade screwdriver to press up on the lower tab of the control panel assembly until the bottom of the assembly detaches from the chassis.

8. From inside the chassis, squeeze together the two latches at the top of the assembly until it detaches from the chassis; then, pull the control panel assembly out of the chassis through the front, making sure that the cables follow freely.

To install the control panel assembly, reverse the previous steps, making sure to route the cables carefully and snap the operator information panel firmly into place.

Audio card/FireWire assembly

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove the audio card/FireWire assembly:

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

2. Turn the computer so that the cover is facing up.

3. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).

4. Remove the bezel (see "Replacing the bezel" on page 30).

5. Rotate the drive cage up.

6. Slide the hard disk drives out of the drive cage and set them in a safe place, disconnecting any drive cables that impede this procedure. Note the placement of the cables for later reinstallation.

7. Disengage the cables of the audio card/FireWire assembly from the system board.

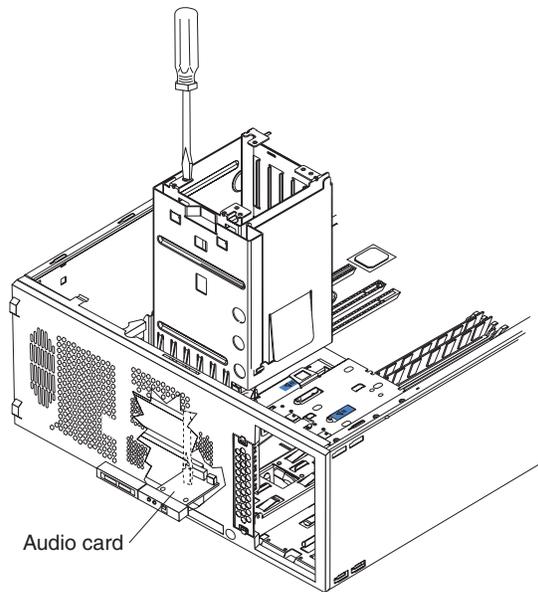   **Note:** The illustrations in this document might differ slightly from your hardware.

Audio card

Figure 29. Audio card/FireWire assembly replacement

8. Insert a long-bladed screwdriver through the empty drive cage and loosen the two screws that secure the audio card/FireWire assembly to the chassis.

9. Reach under the drive cage and remove the two screws; then, gently pull the audio card/FireWire assembly out of the computer, making sure that the cable follows freely.

To install the audio card/FireWire assembly, reverse the previous steps.

Front USB connector assembly

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove the front USB connector assembly:

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

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

2. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).

3. Remove the front bezel (see "Replacing the bezel" on page 30).

4. Pivot the drive cage until it locks in position.

5. Slide the hard disk drives out of the drive cage and set them in a safe place, disconnecting any drive cables that impede this procedure. Note the placement of the cables for later reinstallation.

6. Disconnect the cable for the front USB connector assembly from the system board.

   Note: The illustrations in this document might differ slightly from your hardware.
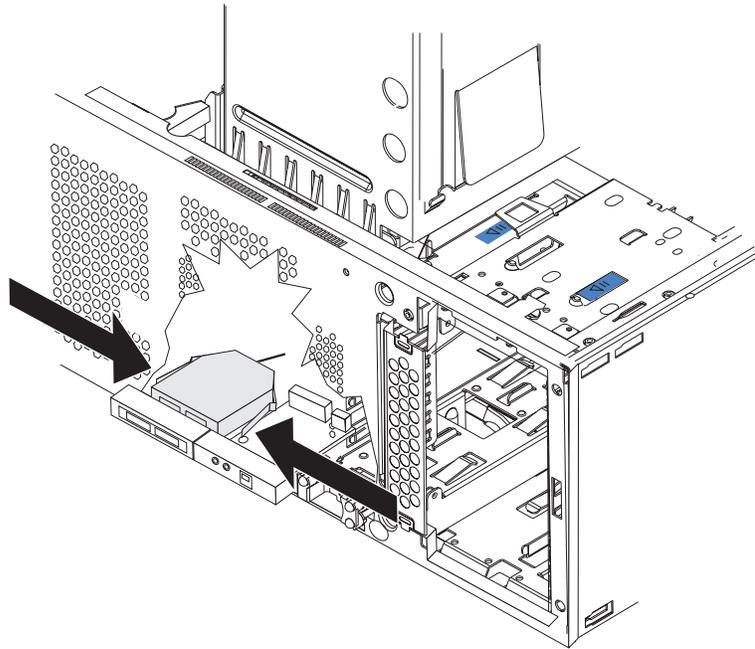
Figure 30. Front USB connector assembly replacement

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

To install the front USB connector assembly, reverse the previous steps, routing the cable correctly and snapping the front USB connector assembly into place.

Note: When replacing the USB front connector assembly:

1. Route the cable so that it does not impede movement of the drive cage.

2. It might be helpful to use a flat-blade screwdriver from the outside to help snap the connector into place.

Power supply

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove the power supply:

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

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

2. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).
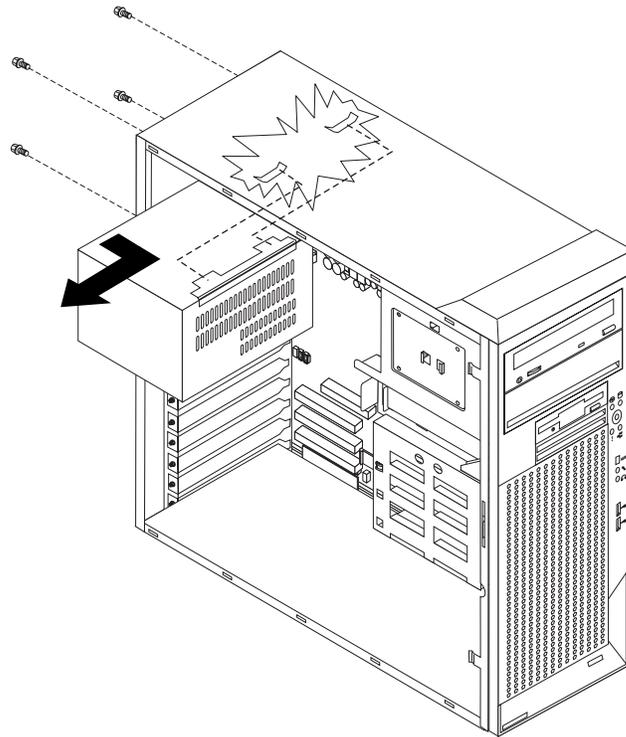
   Note: The illustrations in this document might differ slightly from your hardware.

Power supply alignment flange

Locking lip
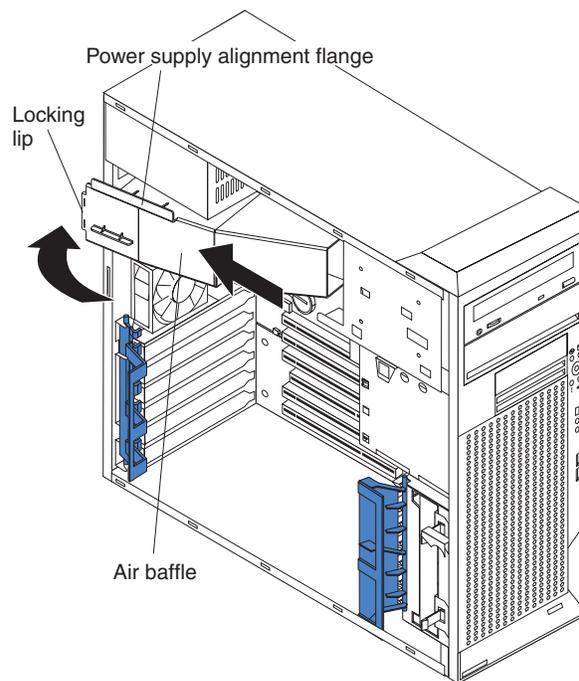
Air baffle

Figure 31. Removing the air baffle

3. Remove the air baffle, if present.
4. Disconnect the internal power supply cables to the drives and the system board.

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

Figure 32. Removing the power supply

5. Remove the four screws that secure the power supply to the chassis.
6. Lift the power supply out of the chassis, disengaging it from the two connectors.

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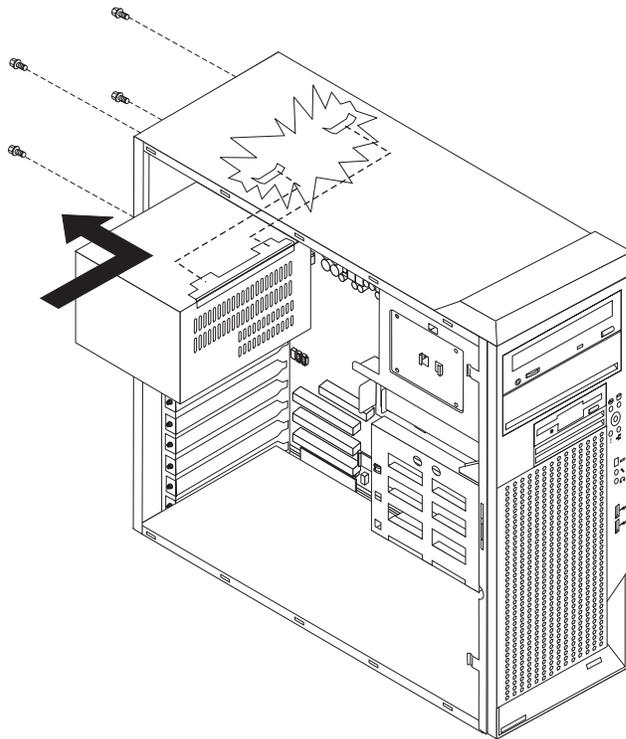

Figure 33. Replacing the power supply

To replace the power supply, reverse the previous steps, making sure to engage the hooks on the power supply to the slots on the chassis.

Microprocessor and fan sink

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove the fan-sink assembly and the microprocessor:

1. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
2. Turn the computer on its side so that it is lying flat, with the cover facing up.
3. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).
4. Remove the air baffle, if installed.
5. Disconnect the fan sink cable, noting its location.

   Figure 34 on page 73 shows the location of the fan sink connector on the microprocessor board.
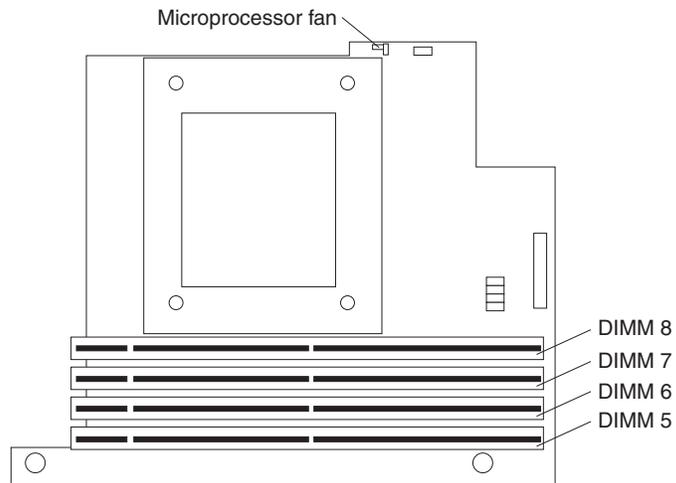
Figure 34. Connector locations on microprocessor board

6. Disconnect any cables that impede access to the microprocessor.

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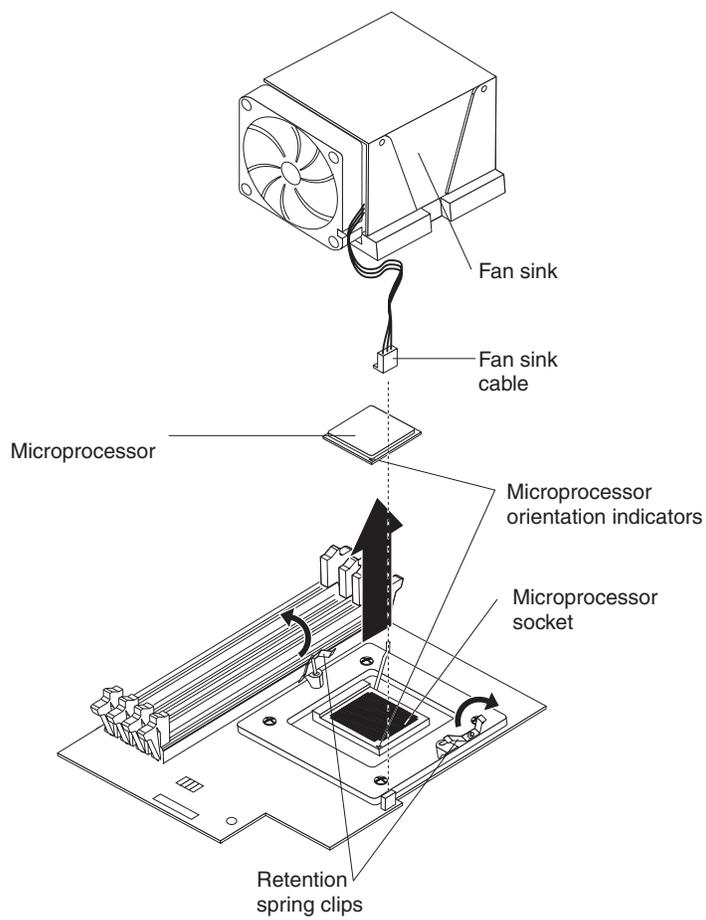

Figure 35. Removing microprocessor and fan sink

7. Loosen the two captive screws on either side (in leaf spring enclosures) of the fan sink.

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

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

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

   Important:

   a. Fan sink 1 and fan sink 2 are not interchangeable. Installing fan sink 2 on microprocessor 1 will impede movement of the drive cage.

   b. Be careful when handling the adhesive material on the microprocessor. If the adhesive material on the microprocessor will be reused, do not contaminate it. If replacement adhesive material is provided with the replacement part, be sure to remove all traces of existing adhesive material from the microprocessor before applying the new adhesive material.

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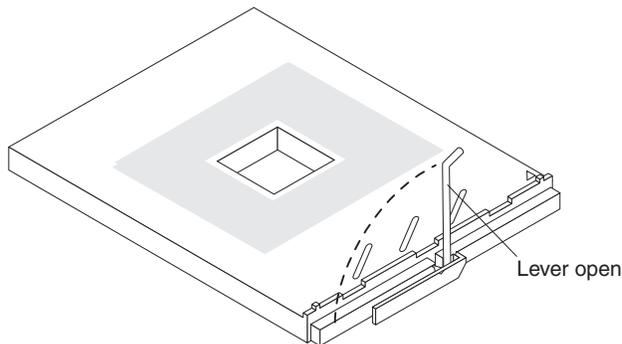

Lever open

Figure 36. Opening the microprocessor locking lever

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

11. Pull the microprocessor out of the socket.

To install a microprocessor and fan sink, reverse the preceding steps.

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

Microprocessor board

Note:
- Read "Installation guidelines" on page 25.
- Read Appendix B, "Safety information," on page 117.
- Read "Handling static-sensitive devices" on page 25.

Complete the following steps to remove the microprocessor board:

1. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
2. Turn the computer on its side so that it is lying flat, with the cover facing up.
3. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).
4. Remove the air baffle.
5. Disconnect all cables from the microprocessor board.
6. Remove all DIMMs from the microprocessor board and set them in a safe, static-protective place.
7. Remove the fan sink and microprocessor from the microprocessor board (see "Microprocessor and fan sink" on page 72) and set them in a safe, static-protective place.

   Attention: Before attempting to remove the fan sink from the microprocessor, be sure to read all the instructions at "Microprocessor and fan sink" on page 72.
8. Fully loosen the six captive screws connecting the microprocessor board to the system board. Four of these screws also secure the fan sink retention module.
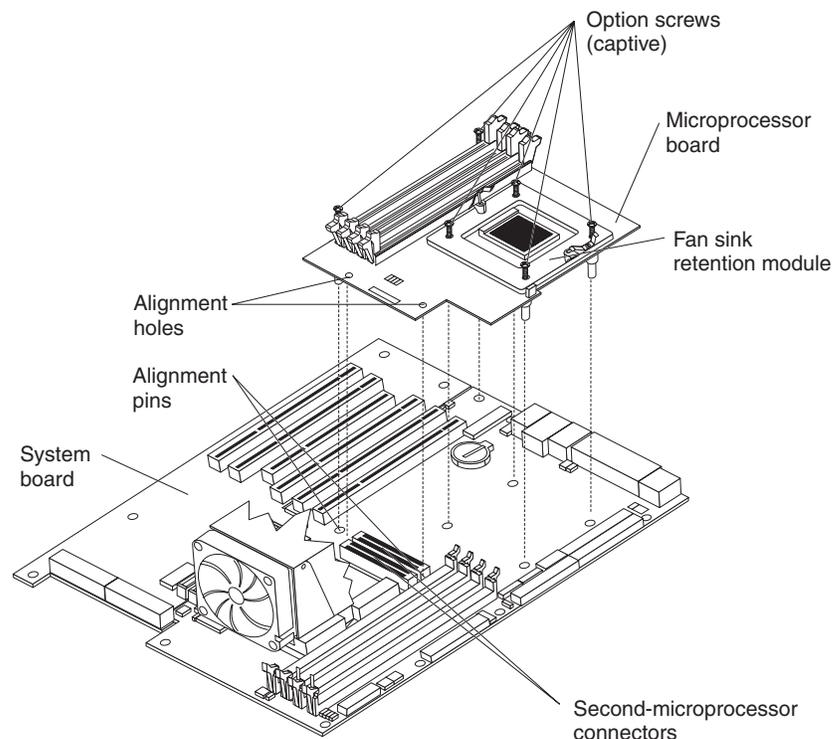

Figure 37. Removing the microprocessor board

9. Disconnect the microprocessor board from the system board by grasping the pull points on microprocessor board (at the two corners of the board nearest

microprocessor 1). This will free the board from the second-microprocessor connectors and the two plastic alignment pins. The alignment pins will stay with either the system board or the microprocessor board.

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

To reinstall the microprocessor board, reverse the preceding steps.

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

System board

This section shows the locations of items on the system board and describes how to remove the system board.

System-board option connectors
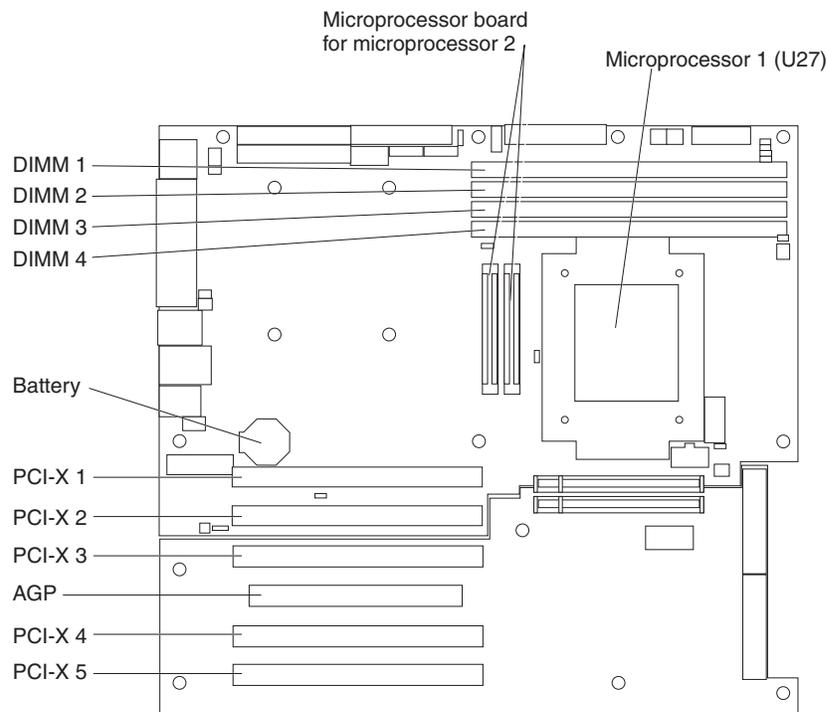
Figure 38 shows the system-board connectors.

Figure 38. System-board option connectors

System-board internal connectors

Figure 39 shows the internal connectors and LEDs on the system board.

Front 1394 (FireWire) Diskette SATA 0 LAN activity (front)
                                  SATA 1 Front USB connector
Primary IDE   Power
Secondary IDE   Front panel
Rear system
fan 1
Rear system   Microprocessor 1 fan
fan 2
                                                    Extender board
                                                    power (CN22)
CD-ROM   Microprocessor power
audio in
Front panel   Reserved
audio   System error LED
Speaker   connector (GFAULT)
                                                    SCSI channel B
                                                    Extender board
                                                    power
                                                    SCSI channel A
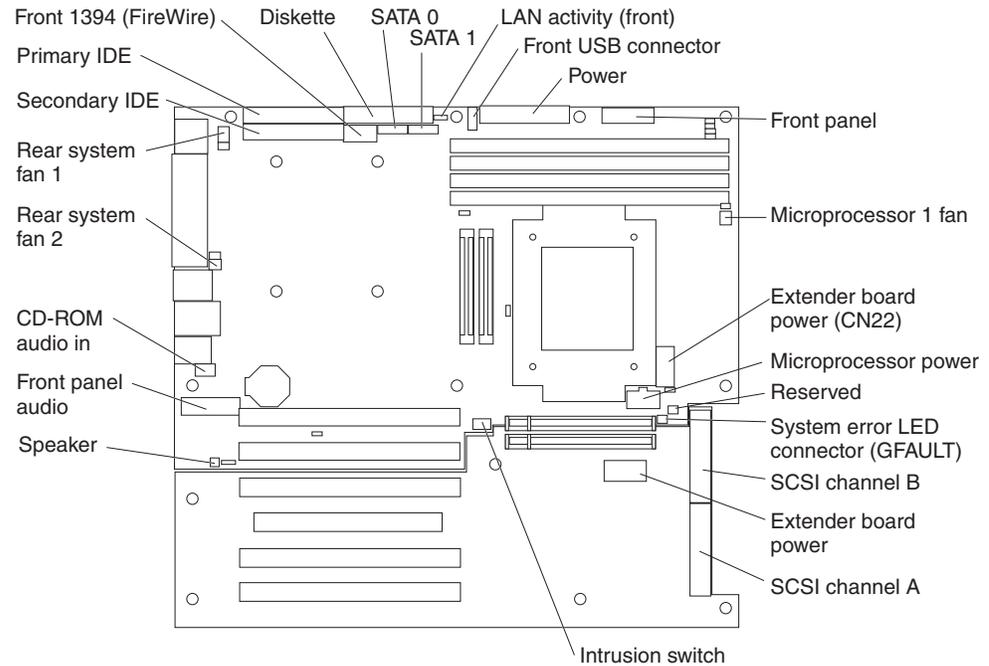   Intrusion switch

Figure 39. System-board internal connectors

System-board external connectors

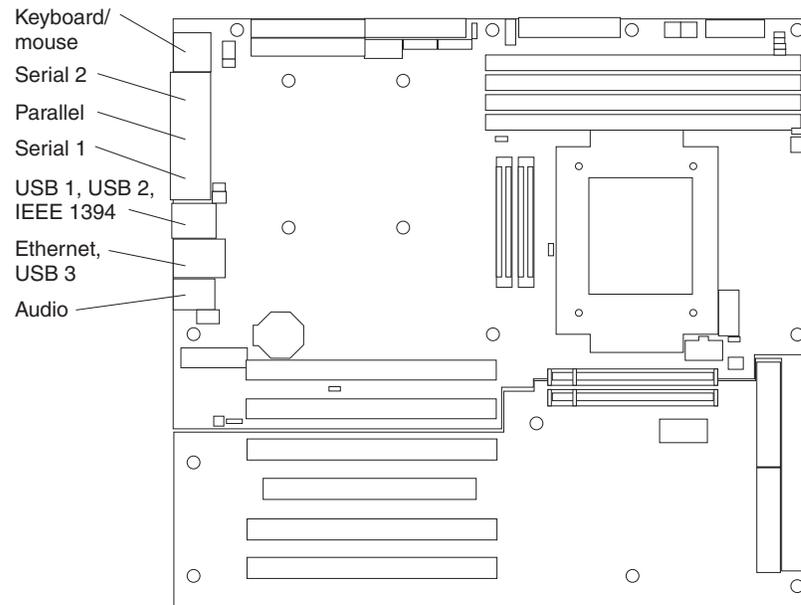Figure 40 shows the external input/output port connectors on the system board.

Keyboard/
mouse
Serial 2
Parallel
Serial 1
USB 1, USB 2,
IEEE 1394
Ethernet,
USB 3
Audio

Figure 40. System-board external connectors

System-board LEDs

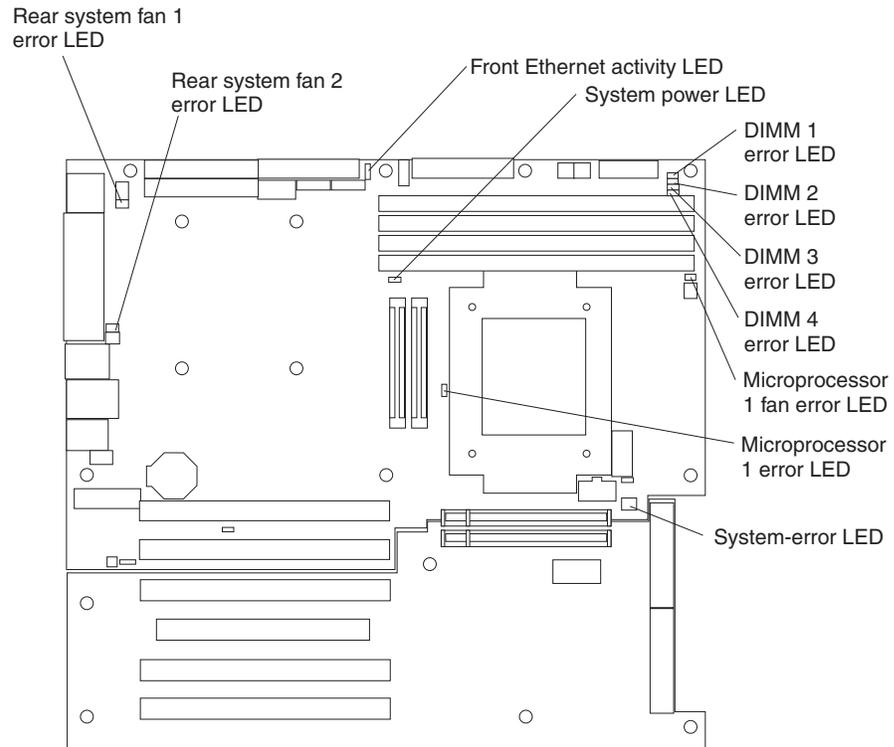Figure 41 shows the system-board LEDs.

Figure 41. System-board LEDs

System-board jumpers

Figure 42 shows the jumper blocks on the system board.
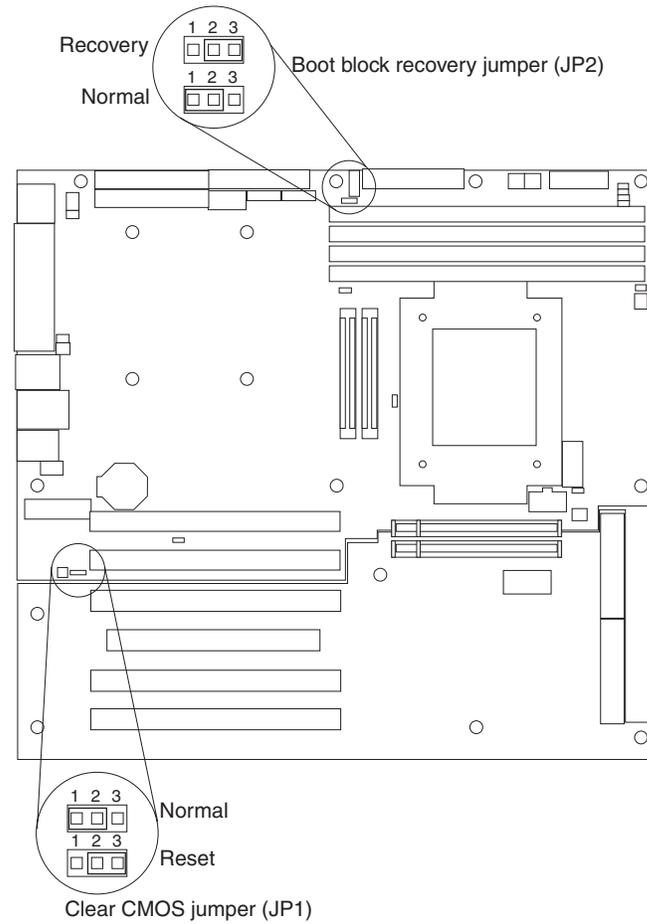

Figure 42. System-board jumpers

Any jumper blocks on the system board that are not shown in the illustration are reserved. For information about BIOS code recovery or the boot block recovery jumper, see "Recovering from a POST/BIOS update failure" on page 21.

System board removal

1. Read "Installation guidelines" on page 25, "Handling static-sensitive devices" on page 25, and Appendix B, "Safety information," on page 117.
2. When replacing the system board, you must either update the system with the latest firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image.

Complete the following steps to remove the system board:

1. Turn off the computer and attached devices; then, disconnect all power cords and external cables.
2. Turn the computer on its side so that it is lying flat, with the cover facing up.
3. Remove the cover and support bracket (see "Replacing the side cover" on page 27 and "Replacing the support bracket" on page 29).
4. Disconnect all cables on the system board.
5. If there is a drive installed in bay 3, slide it out through the front far enough so that it will not impede the removal of the system board.
6. Pivot the drive cage up.

   Note: The drive cage will lock in the pivoted position. To lower the drive cage, press in on the blue flap on the side of the drive cage.
7. Remove any of the following components and put them in a safe, static-protective place:

   - Adapters
   - Air baffle, if present
   - Microprocessor board, if present

     Note: Before removing the microprocessor board, remove microprocessor 2 and fan sink 2 (see "Microprocessor and fan sink" on page 72), as well as DIMMs 4 through 8.
   - Microprocessor and fan-sink assembly

     Important:
     a. Fan sink 1 and fan sink 2 are not interchangeable. Installing fan sink 2 on microprocessor 1 will impede movement of the drive cage.
     b. Be careful when handling the adhesive material on the microprocessor. If the adhesive material on the microprocessor will be reused, do not contaminate it. If replacement adhesive material is provided with the replacement part, be sure to remove all traces of existing adhesive material from the microprocessor before applying the new adhesive material.
   - DIMMs (see "Replacing memory modules" on page 45).

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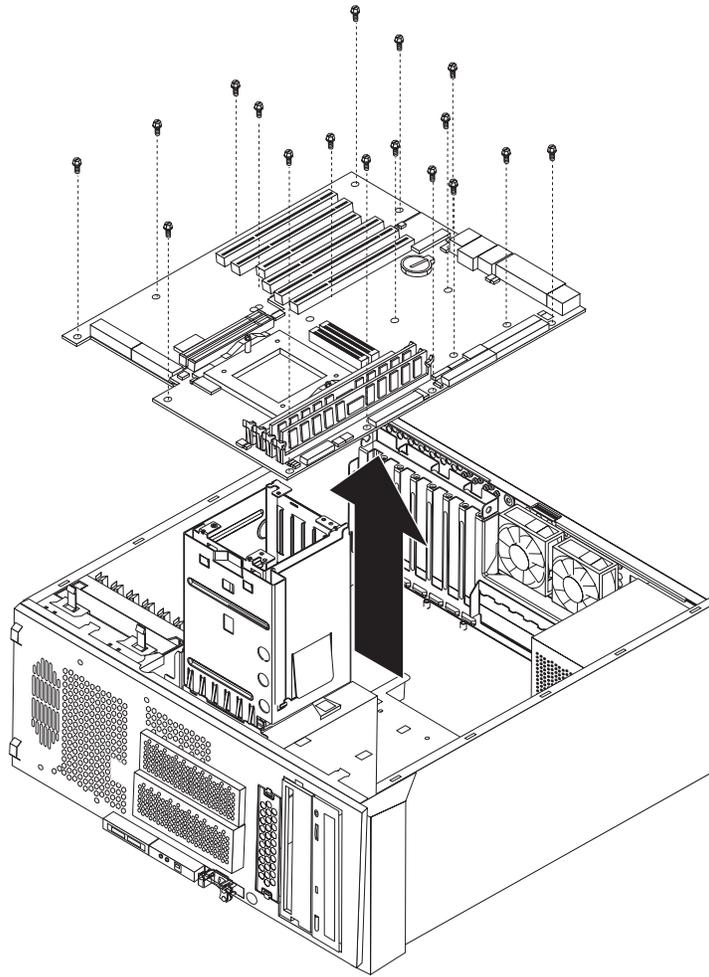   b. The illustrations in this document might differ slightly from your hardware.

Figure 43. System board removal

8. Remove the two screws at the each fan sink and set them in a safe place.

9. Remove the four screws at the fan sink retention module for microprocessor one and set them in a safe place.

10. If the optional microprocessor board had not been installed, remove the six screws at the location where it would be installed and set them in a safe place.

11. Remove the remaining 13 screws on the system board and set them in a safe place.

To reinstall the board, place it into position in the computer, align the holes on the system board with the holes in the chassis, and install the screws that were removed in step 9; then, replace the components that were removed in step 7 on page 80.

Note: Make sure that the fan sink retention module is in place before replacing the four screws at that location.

Important: When installing the system board, make sure that the clips at the I/O section of the system board slide into position on the chassis.

When reassembling the components in the computer, be sure to route all cables carefully so that they are not exposed to excessive pressure.

Important: If you are reinstalling the microprocessor board, be sure to do so after all of the necessary system board cables have been connected. Once the microprocessor board has been installed, it will be difficult to connect some of these cables.

Chapter 6. Symptom-to-FRU index

The symptom-to-FRU index lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this symptom-to-FRU index to help you decide which FRUs to have available when servicing the computer.

Notes:

1. The field replaceable unit (FRU) procedures in this manual are intended for trained servicers who are familiar with IBM products. Customer replacement units (CRUs) can be replaced by the customer. See Chapter 7, "Parts listing, Type 6224," on page 107 to determine if the component being replaced is a CRU or a FRU.

2. Check the configuration before you replace a FRU. Configuration problems can cause false errors and symptoms.

3. For IBM devices not supported by this index, refer to the manuals for those devices.

4. Always start with "General checkout" on page 9.

5. Some tables have more than two columns; in those instances, more than one column on the left is required to describe the error symptom. Take the action (or replace the FRU) suggested first in the list in the column on the right-hand side, then try the computer again to see whether the problem has been corrected before taking further action.

6. Always try reseating a suspected component or reconnecting a cable before replacing the component.

The left column of each table in this index lists error codes or messages, and the right column lists one or more suggested actions or FRUs to replace.

The POST BIOS code displays POST error codes and messages on the screen.

Beep symptoms

Beep symptoms are short tones or a series of short tones separated by pauses (intervals without sound). See the examples in the following table.

Beeps	Description
1-2-3	• One beep • A pause (or break) • Two beeps • A pause (or break) • Three beeps
4	Four continuous beeps

One beep after successfully completing POST indicates that the computer is functioning correctly.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Beep/symptom	FRU/action
1-1-3 (CMOS write/read test failed)	1. **Battery** 2. System board
1-1-4 (BIOS EEPROM checksum failed)	1. **Recover BIOS code.** 2. System board.
1-2-1 (Programmable Interval Timer failed)	• **System board**
1-2-2 (DMA initialization failed)	• **System board**
1-2-3 (DMA page register write/read failed)	• **System board**
1-3-1 (first 64K RAM test failed)	1. **DIMM** 2. System board
2-1-1 (Secondary DMA register failed)	• **System board**
2-1-2 (Primary DMA register failed)	• **System board**
2-1-3 (Primary interrupt mask register failed)	• **System board**
2-1-4 (Secondary interrupt mask register failed)	• **System board**
2-2-2 (Keyboard controller failed)	1. **Keyboard** 2. System board
2-2-3 (CMOS power failure and checksum checks failed)	1. **Battery** 2. System board
2-4-1 (Video failed; system believed operable)	1. **Video adapter** 2. System board

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Beep/symptom	**FRU/action**
3-1-1 (Timer tick interrupt failed)	• **System board**
3-1-2 (Interval timer channel 2 failed)	• **System board**
3-1-3 (RAM test failed above address OFFFFH))	1. **DIMM** 2. System board
3-1-4 (Time-of-Day clock failed)	1. **Battery** 2. System board
3-2-1 (Serial port failed)	• **System board**
3-2-2 (Parallel port failed)	• **System board**
3-2-3 (Math coprocessor test failed)	1. **Microprocessor** 2. System board
3-2-4 (Failure comparing CMOS memory size against actual)	1. **DIMM** 2. Battery 3. System board
3-3-1 (Memory size mismatch occurred.)	1. **DIMM** 2. Battery 3. System board
3-3-2 (Critical SMBUS error occurred; I2C bus error occurred)	1. **Disconnect computer power, wait 30 seconds, and retry.** 2. System board 3. Microprocessor 4. DIMMs
3-3-3 (No memory installed)	1. **Install or reseat the memory modules; then, do a three-boot reset.** 2. DIMMs. 3. System board.

No-beep symptoms

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
No-beep symptom	**FRU/action**
No beep during POST.	• **System board**
No beep, no video, and system attention LED (if present) is off.	• **System board**
No beep, no video, and system attention LED (if present) is on.	• **See "Undetermined problems" on page 104.**

POST error codes

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

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Error code/symptom	**FRU/action**
062 (Three consecutive startup failures using the default configuration.)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board. 4. Microprocessor.
101, 102 (System and processor error)	• **System board**
106 (System and processor error)	• **System board**
151 (Real time clock error)	1. **Run diagnostics.** 2. Battery. 3. System board.
161 (Real time clock battery error)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board.
162 (Device configuration error) **Note:** Be sure to load the default settings and any additional desired settings; then, save the configuration.	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. Failing device. 4. System board.
163 (Real-time clock error)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board.
164 (Memory configuration changed)	1. **Run the Configuration/Setup Utility program.** 2. DIMM. 3. System board.
175 (Hardware error)	• **System board**
184 (Power-on password damaged)	1. **Run the Configuration/Setup Utility program.** 2. System board.
187 (VPD serial number not set.)	1. **Set serial number in the Configuration/Setup Utility program.** 2. System board.
188 (Bad EEPROM CRC #2)	1. **Run the Configuration/Setup Utility program.** 2. System board.
189 (An attempt was made to access the computer with invalid passwords)	• **Run the Configuration/Setup Utility program, and enter the administrator password.**
201 (Memory test error.) If the computer does not have the latest level of BIOS installed, update the BIOS to the latest level.	1. **DIMM** 2. System board

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Error code/symptom	FRU/action
289 (DIMM disabled by POST or user)	1. **Run the Configuration/Setup Utility program, if the DIMM was disabled by the user.** 2. Disabled DIMM, if not disabled by user. 3. System board
301 (Keyboard or keyboard controller error)	1. **Keyboard** 2. System board
303 (Keyboard controller error)	• **System board**
602 (Invalid diskette boot record)	1. **Diskette** 2. Diskette drive 3. Cable 4. System board
604 (Diskette drive error)	1. **Run the Configuration/Setup Utility program.** 2. Diskette drive. 3. Cable. 4. System board.
662 (Diskette drive configuration error)	1. **Run the Configuration/Setup Utility program and diagnostics.** 2. Diskette drive. 3. Drive cable. 4. System board.
962 (Parallel port error)	1. **Run the Configuration/Setup Utility program.** 2. System board.
1162 (Serial serial port 1 or 2 error)	1. **Run the Configuration/Setup Utility program.** 2. System board.
1762 (Hard disk configuration error, IDE only)	1. **Hard disk drive.** 2. Hard disk drive cables. 3. Run the Configuration/Setup Utility program. 4. System board.
1962 (Drive does not contain a valid boot sector)	1. **Verify that a startable operating system is installed.** 2. Run diagnostics. 3. Hard disk drive. 4. Cable. 5. System board.
5962 (IDE CD-ROM drive configuration error)	1. **Run the Configuration/Setup Utility program.** 2. CD-ROM drive. 3. CD-ROM power cable. 4. IDE cable. 5. System board. 6. Battery.
8603 (Pointing-device error)	1. **Pointing device** 2. System board

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Error code/symptom	**FRU/action**
00012000 (Machine check architecture error)	1. **Microprocessor** 2. System board
00180300 (No more memory above 1MB for PCI adapter)	1. **Run the Configuration/Setup Utility program.** 2. Adapter. 3. System board.
00180700 (PCI device not responding)	1. **System board** 2. Adapter
01298001 (No update data available for microprocessor)	1. **Update BIOS code.** 2. System board.
01298200 (Microprocessor speed mismatch)	• **Verify that both microprocessors are of the same speed.**
I9990650 (AC power has been restored)	1. **Check cable.** 2. Check for interruption of power. 3. Power cable.

Diagnostic error codes

Note: In the following error codes, if XXX is 000, 195, or 197, *do not* replace a FRU. The description for these error codes are:

000   The test passed.

195   The Esc key was pressed to stop the test.

197   Warning; a hardware failure did not occur. The test could not be run due to some other problem.

For all error codes, replace the FRU or take the action indicated.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Error code/symptom	FRU/action
001-250-000 (Failed system board ECC)	• **System board**
001-250-001 (Failed system board ECC)	• **System board**
001-XXX-000 (Failed core tests)	• **System board**
001-XXX-001 (Failed core tests)	• **System board**
005-XXX-000 (Failed video test)	1. **Video adapter (if installed)** 2. System board
011-XXX-000 (Failed COM1 serial port test)	1. **Check loopback plug connected to externalized serial port.** 2. Check cable from externalized port to system board. 3. System board.
011-XXX-001 (Failed COM2 serial port test)	1. **Check loopback plug connected to externalized serial port.** 2. Check cable from externalized port to system board. 3. System board.
014-XXX-000 (Failed parallel port test)	• **System board**
015-XXX-001 (USB interface not found, board damaged)	1. **System board**
015-XXX-015 (Failed USB external loopback test)	1. **Make sure the parallel port is not disabled.** 2. Run the USB external loopback test again. 3. System board.
015-XXX-198 (Remote Supervisor Adapter II installed *or* USB device connected during USB test)	1. **If Remote Supervisor Adapter II is installed as an option, remove it and rerun test.** **Note:** If Remote Supervisor Adapter II is present as a standard installation, do not remove it; the test cannot be run. 2. Remove USB devices and rerun test. 3. System board.
020-XXX-000 (Failed PCI interface test)	• **System board**
030-XXX-00N (Failed SCSI interface test)	• **If N=0, system board; if N>0, SCSI adapter in slot N.**

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Error code/symptom	**FRU/action**
035-253-s99 (RAID adapter initialization failure)	1. **ServeRAID adapter in slot s is not configured properly.** Obtain the basic and extended configuration status and see the *ServeRAID Hardware Maintenance Manual* for more information. 2. Cable. 3. Adapter.
035-XXX-099 (No adapters were found.)	• **If adapter is installed, re-check connection.**
035-XXX-s99 (Failed RAID test on PCI slot s. s = number of failing PCI slot.)	1. **RAID adapter** 2. Cable 3. System board
035-XXX-snn (s = number of failing PCI slot, nn = SCSI ID of failing fixed disk.)	• **Hard disk drive with SCSI ID nn on RAID adapter in PCI slot s.**
089-XXX-001 (Failed microprocessor test)	1. **Verify microprocessor 1 is installed and seated correctly.** 2. Verify BIOS code is at latest level. 3. Microprocessor 1. 4. System board.
089-XXX-002 (Failed optional microprocessor test)	1. **Verify microprocessor 2 is installed and seated correctly.** 2. Verify BIOS code is at latest level. 3. Microprocessor 2. 4. Microprocessor board.

201-XXX-0nn
(Failed memory test.)
 	
Note:
• nn 1=DIMM 1; 2=DIMM 2; 3=DIMM 3; 4=DIMM 4 on system board.
• nn 5=DIMM5; 6=DIMM6; 7=DIMM7; 8=DIMM8 on microprocessor board.
	1. **If nn = 1-4:**
	  a. DIMM nn
	  b. System board
	2. If nn = 5-8:
	  a. DIMM nn
	  b. Microprocessor board

201-XXX-999
(Multiple DIMM failure, see error text)
	• **See error text for failing DIMMs.**
	  1. If nn ≤ 4, system board.
	  2. If nn ≥ 5, microprocessor board.

202-XXX-001 (Failed system cache test)	1. **Verify microprocessor 1 is installed and seated correctly.** 2. Verify BIOS code is at latest level. 3. Microprocessor 1. 4. System board.
202-XXX-002 (Failed system cache test)	1. **Verify microprocessor 2 is installed and seated correctly.** 2. Verify BIOS code is at latest level. 3. Microprocessor 2. 4. Microprocessor board. 5. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Error code/symptom	FRU/action
206-XXX-000 (Failed diskette drive test)	1. **Rerun the test using another diskette.** 2. Cable. 3. Diskette drive. 4. System board.
215-XXX-000 (Failed IDE CD-ROM drive test)	1. **Rerun the test using another CD-ROM.** 2. CD-ROM drive cables. 3. CD-ROM drive. 4. System board.
217-198-XXX (Could not establish drive parameters)	1. **Check cable and termination.** 2. Hard disk drive.
217-XXX-001 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array.	1. **Hard disk drive 2** 2. System board.
301-XXX-000 (Failed keyboard test)	1. **Keyboard** 2. System board
302-XXX-000 (Failed mouse test)	1. **Mouse** 2. System board
405-XXX-000 (Failed Ethernet test on controller on the system board)	1. **Verify that Ethernet is not disabled in BIOS.** 2. System board.
405-XXX-00n (Failed Ethernet test on adapter in PCI slot n)	1. **For n=0, system board** 2. For n>0, adapter in PCI slot n 3. System board
415-XXX-000 (Failed Modem test) **Note:** Error message may indicate modem is not supported.	1. **Cable** **Note:** Ensure modem is present and attached to computer. 2. Modem 3. System board

System board error LEDs

Table 4. Error LEDs

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

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
LED	**FRU/action**
System fan 2	1. **Fan 2** 2. System board
System fan 1	1. **Fan 1** 2. System board
System power	1. **Power supply** 2. System board
DIMM x	1. **DIMM x** 2. System board
Microprocessor 1	1. **Microprocessor 1** 2. System board
Microprocessor 1 fan	1. **Fan sink** 2. System board

Microprocessor board LEDs

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
LED	**FRU/action**
Microprocessor 2 fan	1. **Fan sink** 2. System board
Microprocessor 2	1. **Microprocessor 1** 2. System board
DIMM x	1. **DIMM x** 2. System board

Error symptoms

You can use the error symptom table to find solutions to problems that have definite symptoms.

If you cannot find the problem in the error symptom charts, go to "Starting the diagnostic programs and viewing the test log" on page 13 to test the computer.

If you have just added new software or a new option and the computer is not working, use the following procedures before using the error symptom charts:

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

In the following table, if the entry in the FRU/action column is a suggested action, perform that action; if it is the name of a component, reseat the component and replace it if necessary. The most likely cause of the symptom is listed first.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

CD-ROM drive problems	
Symptom	**FRU/action**

CD-ROM drive is not recognized.	1. **Verify that:**
	   • The IDE channel to which the CD-ROM 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-ROM drive.
	2. Run CD-ROM drive diagnostics.
	3. CD-ROM drive.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Diskette drive problems	
Symptom	**FRU/action**

The diskette drive activity LED stays lit, or the computer bypasses the diskette drive.	1. **If there is a diskette in the drive, verify 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 program is working properly.
	   • The cable is installed 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 diskette drive diagnostics.
	4. Cable.
	5. Diskette drive.
	6. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

General problems	
Symptom	**FRU/action**
Problems such as broken cover locks or indicator LEDs not working	• **Broken CRU/FRU**

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Hard disk drive problems	
Symptom	**FRU/action**
Not all drives are recognized by the hard disk drive diagnostic test (Fixed Disk test).	1. **Remove the first drive not recognized and try the hard disk drive diagnostic test again.** 2. If the remaining drives are recognized, replace the drive you removed with a new one.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Hard disk drive problems	
Symptom	**FRU/action**
System stops responding during hard disk drive diagnostic test.	1. **Remove the hard disk drive being tested when the computer stopped responding and try the diagnostic test again.** 2. If the hard disk drive diagnostic test runs successfully, replace the drive you removed with a new one.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Intermittent problems	
Symptom	**FRU/action**
A problem occurs only occasionally and is difficult to detect.	1. **Verify 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 rear of the computer at the fan grill. If there is no airflow, the fan is not working. This causes the computer to overheat and shut down. • Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. 2. Check the system error log.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Keyboard, mouse, or pointing-device problems	
Symptom	**FRU/action**
All or some keys on the keyboard do not work.	1. **Verify that:** • The keyboard cable is securely connected to the system, and the keyboard and mouse cables are not reversed. • The computer and the monitor are turned on. 2. Keyboard. 3. System board.
The mouse or pointing device does not work.	1. **Verify that:** • The mouse or pointing-device cable is securely connected, and that the keyboard and mouse cables are not reversed. • The mouse device drivers are installed correctly. 2. Mouse or pointing device. 3. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Memory problems	
Symptom	**FRU/action**

The amount of system memory displayed is less than the amount of physical memory installed.	1. **Verify that:**
	  • The memory modules are seated properly.
	  • You have installed the correct type of memory.
	  • If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program.
	  • All banks of memory on the DIMMs are enabled. The computer might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled.
	2. Check 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:
	    a. Start the Configuration/Setup Utility program.
	    b. Enable the DIMM.
	    c. Save the configuration and restart the computer.
	3. DIMM.
	4. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Microprocessor problems	
Symptom	**FRU/action**
The computer emits a continuous tone during POST. (The startup (boot) microprocessor is not working properly.)	1. **Verify that the startup microprocessor is seated properly.** 2. Startup microprocessor.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Monitor problems	
Symptom	**FRU/action**
Testing the monitor.	• **See the information that comes with the monitor** for adjusting and testing instructions. (Some IBM monitors have their own self-tests.)

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Monitor problems	
Symptom	**FRU/action**

The screen is blank.	1. **Verify that:**
	• The computer power cord is plugged into the computer and a working electrical outlet.
	• The monitor cables are connected properly.
	• The monitor is turned on and the Brightness and Contrast controls are adjusted correctly.
	• If the computers are C2T chained together, verify that:
	  – The C2T chain cables are securely connected to the computers.
	  – The C2T breakout cable is connected properly.
	  – A computer that is turned on is selected.
	
	Important: 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 Start Options of the Configuration/Setup Utility program is set to **Enabled** (its default setting), you must restart the computer three times to force the system BIOS to reset the CMOS values to the default configuration (memory connector or bank of connectors enabled).
	
	2. If you have verified these items and the screen remains blank, replace:
	a. Monitor
	b. Video adapter, if installed
	c. System board

Only the cursor appears.	• **See "Undetermined problems" on page 104.**
The monitor works when you turn on the computer but goes blank when you start some application programs.	1. **Verify that:** • The application program is not setting a display mode higher than the capability of the monitor. • The primary monitor cable is connected to the C2T device breakout cable. • You installed the necessary device drivers for the applications. 2. If you have verified these items and the screen remains blank, replace the monitor.
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	1. **If the monitor self-tests show 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. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor. **Notes:** a. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. c. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, contact your IBM reseller or IBM marketing representative. 2. Video adapter, if installed. 3. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Monitor problems	
Symptom	**FRU/action**
Wrong characters appear on the screen.	1. **If the wrong language is displayed, update the BIOS code with the correct language.** 2. Video adapter, if installed. 3. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Option problems	
Symptom	**FRU/action**

An IBM option that was just installed does not work.	1. **Verify that:**
	  • The option 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 option.
	  • The option is installed correctly.
	  • You have not loosened any other installed options or cables.
	  • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration.
	2. Option you just installed.

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

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).

Power problems	
Symptom	**FRU/action**
The power switch does not work and the reset button, if supported, does work.	1. Reseat the connector. 2. Power switch card. 3. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Power problems	
Symptom	**FRU/action**

The computer does not turn on.	1. **Verify that:**
	  • The power cables are properly connected to the computer.
	  • The electrical outlet functions properly.
	  • The type of memory installed is correct.
	  • If you just installed an option, remove it, and restart the computer. If the computer now turns on, you might have installed more options than the power supply supports.
	2. If LEDs for microprocessors or VRMs are on, verify that:
	  a. A VRM is installed if a second microprocessor is present.
	  b. All microprocessors have the same speed.
	3. Override front panel power button:
	  a. Disconnect computer power cords.
	  b. Install a jumper on the force power-on jumper (J27).
	  c. Reconnect power cords.
	  If computer turns on:
	  a. Service processor (baseboard management controller) error.
	  b. Operator information card.
	  If computer does not turn on:
	  • System board
	4. See "Undetermined problems" on page 104.

The computer does not turn off.	1. **Verify whether you are using an ACPI or non-ACPI operating system.** If you are using a non-ACPI operating system:
	  a. Press Ctrl+Alt+Delete.
	  b. Turn off the system by holding the power-control button for 4 seconds.
	  c. If computer fails during BIOS POST and power-control button does not work, remove the AC power cord.
	2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Serial port problems	
Symptom	**FRU/action**

The number of serial ports identified by the operating system is less than the number of serial ports installed.	1. **Verify that:**
	  • Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports is disabled.
	  • The serial-port adapter, if you installed one, is seated properly.
	2. Failing serial port adapter.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Serial port problems	
Symptom	**FRU/action**

A serial device does not work.	1. **Verify 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 port (see "Input/output connectors" on page 56).
	2. Failing serial device.
	3. Serial adapter, if installed.
	4. System board.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer (CRU), and which components must be replaced by a field service technician (FRU).	
Software problem	
Symptom	**FRU/action**

Suspected software problem.	1. **To determine if problems are caused by the software, verify that:**
	   • The computer has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software.
	   Note: 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 that you are using works on another system.
	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.
	2. If you have verified these items and the problem remains, contact the place of purchase.

ServeRAID error codes

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

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer, and which components must be replaced by a field service technician.	
Error code/symptom	**FRU/action**
1xxx (Microcode checksum error)	1. ServeRAID controller
2xxx (Code DRAM error)	1. Install download jumpers, flash latest level BIOS and firmware for controller. Remove jumpers. 2. ServeRAID controller.
3000-31xx(Code DRAM error)	1. Install download jumpers, flash latest level BIOS and firmware for controller. Remove jumpers. 2. ServeRAID controller.
3200 (Code DRAM error)	1. Install download jumpers, flash latest level BIOS code and firmware for controller. Remove jumpers. 2. ServeRAID controller.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer, and which components must be replaced by a field service technician.	
Error code/symptom	**FRU/action**
3300 (ServeRAID-5i only)	1. Install ServeRAID-5i controller in an extended PCI expansion slot. See the documentation that came with the server for more information.
3E20 (ServeRAID-5i only)	1. Remove the ServeRAID-5i controller from its slot and install it in the proper PCI option slot. 2. Verify that the ServeRAID-5i controller is supported in this server. 3. ServeRAID-5i controller. 4. System board.
3E2x	1. Reseat the ServeRAID controller. 2. Flash latest level of BIOS code and firmware for controller. 3. ServeRAID-5i controller. 4. Integrated RAID controller on serve).
4xxx thru 5xxx (Code DRAM error)	1. Install download jumpers, flash latest level BIOS code and firmware for controller; then, remove jumpers. 2. ServeRAID controller.
6xxx (Cache DRAM error) (ServeRAID-4H only)	1. Reseat daughter card. 2. Install download jumpers, flash latest level BIOS code and firmware for controller; then, remove jumpers. 3. ServeRAID controller.
7xxx thru 8xxx (Host/local PCI bus interface error)	1. Flash latest level of BIOS code and firmware for controller. 2. If ServeRAID-4x controller, replace controller. 3. If ServeRAID-5i controller, integrated RAID controller on the computer.
9003	1. Flash latest level of BIOS code and firmware for controller. 2. Confirm that this controller is a supported option for this system. 3. ServeRAID controller. 4. Integrated RAID controller on the computer).
9xxx thru BZxx (SCSI bus error caused by cables, termination, defective drives, etc.). Z refers to the specific channel or channels that cause the error.	1. Follow indications at "POST (ISPR) error procedures" on page 101. Follow those instructions before continuing with the next steps listed in this index. 2. SCSI cable. 3. SCSI backplane. 4. Hard disk drive. 5. ServeRAID controller.
EFFE (Firmware code corrupt or download jumpers are in place)	1. Flash latest level BIOS and firmware for controller; then, remove jumpers. 2. ServeRAID controller.

Note: See Chapter 7, "Parts listing, Type 6224," on page 107 to determine which components are replaceable by the customer, and which components must be replaced by a field service technician.	
Error code/symptom	**FRU/action**
FFFF or other code not listed	1. Follow indications at "POST (ISPR) error procedures." 2. SCSI cable. 3. SCSI backplane. 4. Hard disk drive. 5. ServeRAID controller.

POST (ISPR) error procedures

Use the ISPR error procedures to help you solve ServeRAID problems. A complete list of error codes is listed at "ServeRAID error codes" on page 99.

Note: Where the ISPR error procedures refer to a SCSI backplane, see the chapter of this publication that concerns service replaceable units.

EF10 (Default ISPR)

1. No ISPR error present.

9Zxx through BZxx (SCSI bus error caused by cables, termination, defective drives, or similar problem)

1. Isolate between SCSI subsystem and controller by disconnecting all SCSI cables from suspect card, and restart.

   Attention: Do not press F5. Doing so changes the computer configuration.

   If an ISPR error is still present, perform the following actions until the error is no longer present:

   a. Reseat the controller

   b. Replace the controller

   Notes:

   a. SCSI channel cable details, if any, appear elsewhere in this publication.

   b. The adapter/controller detects a configuration change. *Do not* select **Save Changes**. Instead, press F10 to bypass any options to this effect.

2. If ISPR error is **EF10** after disconnecting cables:

   a. Identify which channel is causing the error by the second digit (Z) of the original ISPR code as indicated in the following table.

   Note: ServeRAID-4H controllers have 4 channels; ServeRAID-4L and -4Lx controllers have only one channel; and ServeRAID-4M and -4Mx controllers have 2 channels. ServeRAID-5i and ServeRAID-6i controllers have no channels. The ServeRAID-5i and ServeRAID-6i use the channel connectors of the onboard 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

Table 5. SCSI identifier (continued)

SCSI Channel Code (z)	Descriptions
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 identified from the error in step 2a on page 101 are the cause of the error by verifying that the error presents itself *only* when the offending channel is reconnected.

  c. Check termination of identified channel.

     Note: SCSI channel termination details, if any, appear elsewhere in this publication.

  d. Check for proper backplane jumper configuration.

     Note: SCSI channel jumper details, if any, appear elsewhere in this publication.

  e. Check for proper cabling configuration in systems that use hard disk drive status cables. Reconnect all cables removed in step 1 on page 101.

  f. Disconnect one drive at a time attached to the channel identified in step 2a on page 101; then, restart to determine which drive is causing the error.

  g. Replace SCSI cable.

  h. Replace SCSI backplane.

FFFF or other code not listed

1. Place download jumpers on the controller and try to flash the firmware code to the card.

2. Isolate between SCSI subsystem and controller by disconnecting all SCSI cables attached to the suspect card, and restart.

   Attention: Do not press F5. Doing so changes the computer configuration.

   If ISPR code is **EF10** after disconnecting cables, follow these steps until the error is eliminated:

   a. Identify which channel is causing the error by reconnecting cables one at a time and restarting until the error returns.

   b. Check termination of identified channel in step 2a.

      Note: SCSI channel termination details, if any, appear elsewhere in this publication.

   c. Disconnect one drive at a time attached to channel identified in step 2a and restart each time to determine which drive is causing the problem.

d. Replace SCSI cable attached to channel identified in step 2a on page 102.

e. Replace backplane attached to channel identified in step 2a on page 102.

3. If original ISPR code is still present after disconnecting all SCSI cables and restarting, perform the following actions until the error is no longer present:

- Reseat the controller
- Replace the controller

SCSI error codes

Error code	FRU/action
All SCSI Errors One or more of the following might be causing the problem: • A failing SCSI device (adapter, drive, controller) • An improper SCSI configuration or SCSI termination jumper setting • Duplicate SCSI IDs in the same SCSI chain • A missing or improperly installed SCSI terminator • A defective SCSI terminator • An improperly installed cable • A defective cable	1. **External SCSI devices must be turned on before you turn on the computer.** 2. Make sure that the cables for all external SCSI devices are connected correctly. 3. If you have attached an external SCSI device to the computer, make sure the external SCSI termination is set to automatic. 4. Make sure that the last device in each SCSI chain is terminated correctly. 5. Make sure that the SCSI devices are configured correctly.

Undetermined problems

Use the information in this section if the diagnostic tests did not diagnose the failure, the devices list is incorrect, or the computer is inoperative.

Notes:

1. Damaged data in CMOS memory can cause undetermined problems.
2. Damaged data in BIOS code can cause undetermined problems.

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

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

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

Notes:

1. If the problem goes away when you remove an adapter from the system and replacing that adapter does not correct the problem, suspect the system board.
2. If you suspect a networking problem and all the system tests pass, suspect a network cabling problem external to the system.

Problem determination tips

Because of the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type and model
- Microprocessor or hard disk upgrades
- Failure symptom
  - Do diagnostics fail?
  - What message appears in the diagnostics log?
  - What, when, where, single, or multiple computers?
  - Is the failure repeatable?
  - Has this configuration ever worked?
  - If it has been working, what changes were made before it failed?
  - Is this the original reported failure?
- Diagnostics version
  - Type and version level
- Hardware configuration
  - Print (print screen) configuration currently in use
  - BIOS level
- Operating system software
  - Type and version level

Note: To eliminate confusion, identical systems are considered identical only if they:

- Are the exact machine type and models
- Have the same BIOS level
- Have the same adapters/attachments in the same locations
- Have the same address jumpers/terminators/cabling
- Have the same software versions and levels
- Have the same diagnostics code (version)
- Have the same configuration options set in the system
- Have the same setup for the operation system control files

Comparing the configuration and software setup between working and non-working computers will often lead to problem resolution.

Chapter 7. Parts listing, Type 6224

The following parts information is for the IntelliStation A Pro Type 6224. 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 8872 or 8874 and click **Search**.
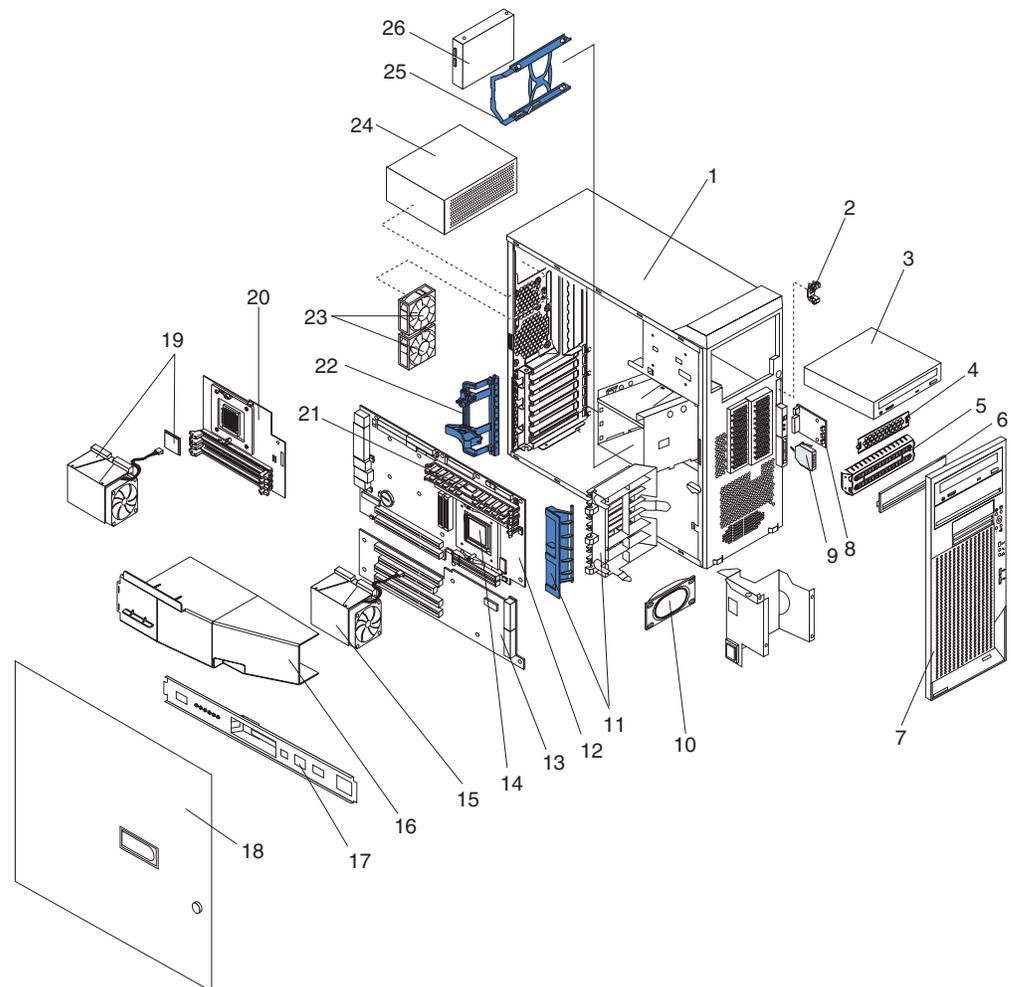3. Under Document type, select **Parts information** and click **Go**.

Figure 44. Parts, Type 6224

System

Index	System (Type 6224)	FRU No.	CRU/FRU
1	Cover, side/top (all models)	49P1965	FRU
2	Holder assembly, LEDs (all models)	59P8500	FRU
3	CD-ROM drive, 48X (models 10X, 20X, A0X, B0X)	71P7375	CRU
3	CD-RW drive, 48X (models 30X, 33X, 37X, 40X, 42X, 45X, 48X, C0X, C3X, D0X, D2X)	71P7347	CRU
3	CD-RW/DVD-RW drive (models 36X, C6X)	26K5383	CRU
3	DVD combo drive, 48X (models 35X, 38X, 39X, 43X, 46X, 49X, C5X, D3X)	26K5379	CRU
4	EMC shield, 3.5 (all models)	32P8501	CRU
5	EMC shield, 5.25 (all models)	32P8503	CRU
6	Blank bezel kit (all models)	00N7082	CRU
7	Bezel, front (all models)	13N2954	CRU
8	Card, audio and FireWire (all models)	49P1752	FRU
9	Dual USB cable assembly (all models)	49P4365	FRU
10	Speaker (all models)	19K4929	FRU
11	Card guide assembly (all models)	49P1971	CRU
12	System board (all models)	90P3290	FRU
13	System board extender (all models)	90P3292	FRU
14	Microprocessor, 1.8 GHz-1 GHz (models 10X, 1PU, A0X)	25K8808	FRU
14	Microprocessor, 2.0 GHz-1 GHz (models 20X, 2PU, B0X)	25K8809	FRU
14	Microprocessor, 2.2 GHz-1 GHz (models 30X, 33X, 35X, 36X, 37X, 38X, 39X, 3PU, C0X, C3X, C5X, C6X)	25K8810	FRU
14	Microprocessor, 2.4 GHz-1 GHz (models 40X, 42X, 43X, 45X, 46X, 48X, 49X, D0X, D2X, D3X)	25K8865	FRU
15	Fan sink for microprocessor 1 (all models)	13N2951	FRU
16	Baffle (models 43X, 48X, 49X, D3X)	13N2961	CRU
17	Support cam bracket (all models)	19K4963	CRU
18	Door assembly, sliding (all models)	49P1964	CRU
/19	Microprocessor, 2.4 GHz-1 GHz with fan sink (optional)	25K8866	FRU
20	Microprocessor board (models 43X, 48X, 49X, D3X)	90P3291	FRU
21	Memory, 1 GB (models 36x, 37X, 39X, 40X, 42X, 43X, 45X, 46X, 48X, 49X, C6X, D0X, D2X, D3X)	73P3237	CRU
21	Memory, 512 MB (all models except 37X, 39X, 40X, 42X, 43X, 45X, 46X, 48X, 49X, D0X, D2X, D3X, 36X, C6X)	73P3236	CRU
22	Retention latch, I/O cards (all models)	13N2955	CRU
23	Fan assembly, 80 x 38 mm fixed speed (all models)	59P2572	FRU
24	Power supply, 530 watt (all models)	74P4437	FRU
25	Tray assembly (all models)	13N2953	CRU
26	Hard disk drive, 36.4 SCSI (models 33X, 35X, 37X, 38X, 39X, 45X, 46X, 49X, C3X, C5X)	24P3704	CRU
26	Hard disk drive, 80 GB SATA, 7200 RPM (models 10X, 20X, 30X, 36X, 40X, 42X, 43X, 48X, A0X, B0X, C0X, C6X, D0X, D2X, D3X)	71P7293	CRU
	Bezel release latch (all models)	59P4791	FRU
	Cable, 2-drop (all models)	37L5098	CRU
	Cable, C2 SW/Cable (all models)	09K9827	CRU
	Cable, CD audio (all models)	75H9219	CRU
	Cable, dual VGA (models 10X, 20X, 30X, 37X, 40X, 45X, A0X, B0X, C0X, D0X, 4PU)	73P9598	FRU
/	Cable, DVI pigtail (optional)	73P9600	FRU
	Cable, front audio (all models)	49P1933	FRU
	Cable, power extender (all models)	23K4954	CRU
	Cable, SATA (models 10X, 20X, 30X, 36X, 37X, 40X, 42X, 43X, 48X, A0X, B0X, C0X, C6X, DOX, D2X, D3X)	88P5927	CRU

Index	System (Type 6224)	FRU No.	CRU/FRU
	Cable, SCSI, U320, 4-drop (models 33X, 35X, 37X, 38X, 39X, 45X, 46X, 49X, C3X, C5X)	59P2614	CRU
	Cable, VGA pigtail (models 10X, 20X, 30X, 37X, 40X, 45X, A0X, B0X, C0X, D0X, 1PU, 2PU, 3PU, 4PU)	48P7586	CRU
	Card, NVIDIA Q FX1100 (models 33X, 36X, 38X, 42X, 46X, 48X, C3X, C6X, D2X)	73P9613	CRU
	Card, NVIDIA Q FX3000 (models 35X, 39X, C5X)	71P8522	CRU
	Card, NVIDIA Q FX4000 (models 43X, 49X, D3X)	73P9631	CRU
	Card, NVIDIA Q4 280 NVS (models 10X, 20X, 30X, 37X, 40X, 45X, 1PU, 2PU, 3PU, 4PU, A0X, B0X, C0X, D0X)	59P4994	CRU
	Chassis (all models)	13N2952	FRU
	Fan sink, dual heatpipe (models 36X, 43X, 48X, 49X, C6X, D3X)	13N2951	FRU
	Feet (all models)	59P8537	CRU
	Handle cap (all models)	49P1968	CRU
	Handle support (all models)	49P1969	CRU
	Miscellaneous hardware (all models)	09N5764	CRU

- Bracket, I/O blank (1)
- Bracket, power support (1)
- Clamp, SCSI cable (1)
- Clip, RFID (1)
- Gasket, EMC two-position (1)
- Holder, key bracket (1)
- Screws, M3.5 third form (7)
- Screws, slotted M3x5 (4)
- Screws, slotted M3.5 (6)
- Spacer, system board (4)
- Support, isolator (4)

Index	System (Type 6224)	FRU No.	CRU/FRU
	Miscellaneous hardware kit (all models)	00N3517	CRU

- Bracket, I/O (6)
- Clip, RFID (1)
- Rubber mount grommets (20)
- Screws, self-tap M5 (4)
- Screws, shoulder (20)
- Screws, slotted M3.5) (13)
- Standoffs, shaft (2)
- Supports, fem-nut (2)

Index	System (Type 6224)	FRU No.	CRU/FRU
	Miscellaneous parts kit (all models)	00F2113	CRU

- Bag, red poly (1)
- Bracket, slot (1)
- Clips, front foot (2)
- Pads, front foot (2)
- Retainer, card (1)
- Screws, M3.0x8, CD support (2)
- Screws, M3.0x8 system board mt. (8)
- Screws, M3.5x5, with washers (2)
- Screws, M3.5x8, pnl-mon (2)
- Screws, M3.5x12, with washers (2)
- Screws, M4.0x6, drv mtg (2)
- Screws, M5.0x10, tilt (2)
- Screws, top cover (2)
- Springs, tilt leg (2)
- Standoffs with washers (2)

Index	System (Type 6224)	FRU No.	CRU/FRU
	Miscellaneous parts kit (all models)	59P4204	CRU
	• Bezel, IBM logo (1)		
	• Brackets, I/O blank tabs (5)		
	• Brackets, ser. num. mount (2)		
	• Clamp assembly (1)		
	• Clamp assembly (1)		
	• Clamps, diskette cable (5)		
	• Clamps, LED cable (5)		
	• Clips, 0.005 EMC (5)		
	• Covers, power switch (2)		
	• Foot, bumper (6)		
	• Kit, tape mounting (2)		
	• Latches, card retainer (5)		
	• Light pipe, shadowbox I/O (4)		
	• Links, wire retainer (2)		
	• Pawls, I cover latch (2)		
	• Screws, M3 x 3.6mm (10)		
	• Screws, M3.5x10 Phillip (10)		
	• Screws, Plastite 8-16 (10)		
	• Screws, Plastite M3x8mm (10)		
	• Screws, S/T D/S M3x10 (5)		
	• Screws, self-tap M5 (5)		
	• Screws, slotted M3.5 (10)		
	• Shield, shadowbox (1)		
	• Springs, EMC spring (20)		
	• Springs, I cover latch (2)		
	• Standoffs, shaft (10)		
	Mouse (all models)	76H6620	CRU
	Retainer kit, 3.5, 5.25 (all models)	73P9582	CRU
	Service label (all models)	25K8836	CRU
	Switch cover (all models)	09N8012	CRU
	Video conversion adapter, DVI-I to standard VGA (models 33X, 35X, 36X, 38X, 39X, 42X, 43X, 46X, 48X, 49X, C3X, C5X, C6X, D2X, D3X)	09N3435	CRU

Keyboard CRUs

Keyboard	CRU No.
Arabic (253)	39M6990
Arabic/French (462)	39M6991
Belgian/French (120)	39M6992
Belgian/UK (120)	39M6993
Brazilian/Portuguese (275)	39M6994
Bulgarian (442)	39M6995
Chinese/US (467)	39M6996
Czech ABB	39M6997
Danish (159)	39M6998
Dutch (143)	39M6999
English, UK (166)	39M7027
English, US (103P)	39M6989
English, US,-EMEA (103P)	39M7028
French (189)	39M7000
French Canadian (058)	39M7002
French Canadian (445)	39M7001
German (129)	39M7003
Greek (319)	39M7004

Keyboard	CRU No.
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/Cyrillic (441)	39M7018
Russian (443)	39M7017
Serbian/Cyrillic (118)	39M7019
Slavic (245)	39M7020
Spanish (172)	39M7021
Spanish, Latin American (171)	39M7012
Swedish/Finnish (153)	39M7022
Swiss, F/G (150)	39M7023
Thailand (191)	39M7024
Turkish (179)	39M7026
Turkish (440)	39M7025
Yugoslavian/Latin (234)	39M7029

Product recovery CDs

Operating system / Language / Language code	CRU No.
Windows XP Chinese / CS ("C" models)	24R8465
Windows XP Chinese / CT ("V" models)	24R8467
Windows XP Danish / DK ("G" models)	24R8458
Windows XP Dutch / NL ("G" models)	24R8459
Windows XP English / EN ("A", "E", "G", & "U" models)	24R8453
Windows XP Finnish / FI ("G" models)	24R8461
Windows XP French / FR ("F" and "G" models)	24R8454
Windows XP German / GE ("G" models)	24R8455
Windows XP Hong Kong / HK ("B" models)	24R8466
Windows XP Italian / IT ("G" models)	24R8456
Windows XP Japanese / JA ("J" models)	24R8463
Windows XP Korean / DK ("K" models)	24R8464
Windows XP Norwegian / NO ("G" models)	24R8460
Windows XP Spanish / SP ("G" models)	24R8457
Windows XP Swedish / SV ("G" models)	24R8462

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
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

IBM power cord part number	Used in these countries and regions
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

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 xSeries or IntelliStation system, 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 is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD or in the IntelliStation *Hardware Maintenance Manual* at 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 publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, 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, you can order publications 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 xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is http://www.ibm.com/eserver/xseries/. The address for IBM IntelliStation information is http://www.ibm.com/pc/intellistation/.

You can find service information for your IBM products, including supported options, 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, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to http://www.ibm.com/services/sl/products/.

For more information about Support Line and other IBM services, go to http://www.ibm.com/services/, or go to 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 Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to 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. Safety information

Note: The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that are familiar with the computers, functions, terminology, and service information provided in this manual.

The following section contains the safety information that you need to be familiar with before servicing an IBM computer.

General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
  1. Ensure you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 16 kg (35 lb) or objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.
  Remember: Metal objects are good electrical conductors.
- Wear safety glasses when you are: hammering, drilling soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.

Electrical safety

CAUTION:
Electrical current from power, telephone, and communication cables can be hazardous. To avoid personal injury or equipment damage, disconnect the attached power cords, telecommunication systems, networks, and modems before you open the server covers, unless instructed otherwise in the installation and configuration procedures.

Observe the following rules when working on electrical equipment.

Important: Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.

Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing main units
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the off position.
- If you need to work on a machine that has exposed electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.
    Remember: Another person must be there to switch off the power, if necessary.
  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.
    Remember: There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.
  - When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.
  Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.
- Regularly inspect and maintain your electrical hand tools for safe operational condition.

- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered-off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts with the power on when they are removed from their normal operating places in a machine:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generators

  and similar units. (This practice ensures correct grounding of the units.)
- If an electrical accident occurs:
  - Use caution; do not become a victim yourself.
  - Switch off power.
  - Send another person to get medical aid.

Safety inspection guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of non-IBM features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards 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 bulging capacitor
- Mechanical hazards, such as loose or missing hardware

The guide consists of a series of steps presented in a checklist. Begin the checks with the power off, and the power cord disconnected.

Checklist:
1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Turn off the computer. Disconnect the power cord.
3. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
   b. The power cord should be the appropriate type as specified in the parts listings.
   c. Insulation must not be 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 unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.

7. Check for worn, frayed, or pinched cables.

8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling electrostatic discharge-sensitive devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the server, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.

2. Make sure that the ESD-protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those in the following list, to provide protection that meets the specific service requirement.

  Note: The use of a grounding system is desirable but not required to protect against ESD damage.
  – Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
  – Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
  – Use the round ground-prong of the ac plug on ac-operated computers.

Grounding requirements

Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Safety notices (multilingual translations)

The caution and danger safety notices in this section are provided in the following languages:

- English
- Brazilian/Portuguese
- Chinese
- French
- German
- Italian
- Japanese
- Korean
- Spanish

Important: All caution and danger statements in this IBM documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in this section.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in this section under statement 1.

Be sure to read all caution and danger statements before performing any of the instructions.

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 procedure**s.
- **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-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.**

Statement 4
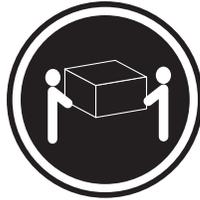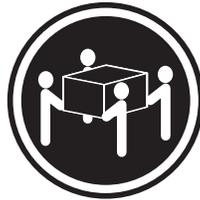
≥18 kg (39.7 lb)   ≥32 kg (70.5 lb)   ≥55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5

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

Statement 10

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

Importante:

Todas as instruções de cuidado e perigo da IBM documentation começam com um número. Este número é utilizado para fazer referência cruzada de uma instrução de cuidado ou perigo no idioma inglês com as versões traduzidas das instruções de cuidado ou perigo encontradas nesta seção.

Por exemplo, se uma instrução de cuidado é iniciada com o número 1, as traduções para aquela instrução de cuidado aparecem nesta seção sob a instrução 1.

Certifique-se de ler todas as instruções de cuidado e perigo antes de executar qualquer operação.

Instrução 1

PERIGO

A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicações é perigosa.

Para evitar risco de choque:
- Não conecte ou desconecte cabos e não realize instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.
- Conecte todos os cabos de alimentação a tomadas elétricas corretamente instaladas e aterradas.
- Conecte todos os equipamentos ao qual esse produto será conectado a tomadas corretamente instaladas.
- Sempre que possível, utilize apenas uma das mãos para conectar ou desconectar cabos de sinal.
- Nunca ligue qualquer equipamento quando existir evidência de danos por fogo, água ou na estrutura.
- Desconecte cabos de alimentação, sistemas de telecomunicação, redes e modems antes de abrir as tampas dos dispositivos, a menos que especificado de maneira diferente nos procedimentos de instalação e configuração.
- Conecte e desconecte cabos conforme descrito na seguinte tabela, ao instalar ou movimentar este produto ou os dispositivos conectados, ou ao abrir suas tampas.

Para Conectar:	Para Desconectar:
1. DESLIGUE Tudo.	1. DESLIGUE Tudo.
2. Primeiramente, conecte todos os cabos aos dispositivos.	2. Primeiramente, remova os cabos de alimentação das tomadas.
3. Conecte os cabos de sinal aos conectores.	3. Remova os cabos de sinal dos conectores.
4. Conecte os cabos de alimentação às tomadas.	4. Remova todos os cabos dos dispositivos.
5. LIGUE os dispositivos.	

Instrução 2

CUIDADO:

Ao substituir a bateria de lítio, utilize apenas uma bateria IBM, Número de Peça 33F8354 ou uma bateria de tipo equivalente, recomendada pelo fabricante. Se o seu sistema possui um móídulo com uma bateria de lítio, substitua-o apenas pelo mesmo tipo de mídulo, do mesmo fabricante. A bateria contém lítio e pode explodir se não for utilizada, manuseada e descartada de maneira correta.

Não:
* Jogue ou coloque na água
* Aqueça a mais de 100°C (212°F)
* Conserte nem desmonte

Para descartar a bateria, entre em contato com a área de atendimento a clientes IBM, pelo telefone (011) 889-8986, para obter informações sobre como enviar a bateria pelo correio para a IBM.

Instrução 3

PRECAUCIÓN:

Quando produtos a laser (unidades de CD-ROM, unidades de DVD, dispositivos de fibra ítica, transmissores, etc.) estiverem instalados, observe o seguinte:
* Não remova as tampas. A remoção das tampas de um produto a laser pode resultar em exposição prejudicial à radiação de laser. Nenhuma peça localizada no interior do dispositivo pode ser consertada.
* A utilização de controles ou ajustes ou a execução de procedimentos diferentes dos especificados aqui pode resultar em exposição prejudicial à radiação.

PERIGO

Alguns produtos a laser contêm um diodo laser da Classe 3A ou Classe 3B embutido. Observe o seguinte:

Radiação de laser quando aberto. Não olhe diretamente para o raio a olho nu ou com instrumentos íticos, e evite exposição direta ao raio.

Instrução 4
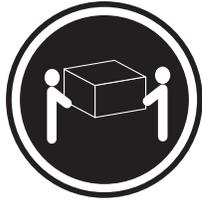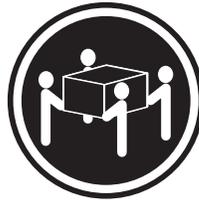
≥18 kg (39.7 lb)   ≥32 kg (70.5 lb)   ≥55 kg (121.2 lb)

CUIDADO:

Ao levantar a máquina, faça-o com segurança.

Instrução 5

CUIDADO:

Os botões Liga/Desliga localizados no dispositivo e na fonte de alimentação não desligam a corrente elétrica fornecida ao dispositivo. O dispositivo também pode ter mais de um cabo de alimentação. Para remover toda a corrente elétrica do dispositivo, assegure que todos os cabos de alimentação estejam desconectados da fonte de energia elétrica.

Instrução 10

CUIDADO:

Não coloque nenhum objeto com peso superior a 82 kg (180 lbs.) sobre dispositivos montados em rack.

重要:

            `Server Library` 中的所有提醒和危险条款前都有一个数字标识。该数字是用来交叉引用一个英文的提醒和危险条款及本部分中的与之对应的已翻译成其它文字的提醒和危险条款。

例如,如果一个提醒条款前的数字为 1,则本部分中相应的译文也带有标号 1。

在执行任何指示的操作之前,请确保您已经阅读了全部提醒和危险条款。

声明 1

危险

> 电源、电话和通信电缆中带有危险电流。
>
> 为避免电击:
>
> 雷电期间不要拆接电缆或安装、维修及重新配置本产品。
>
> 将所有电源线连接至正确布线并已安全接地的电源插座上。
>
> 将应与本产品连接的所有设备连接至正确布线的插座上。
>
> 尽量只使用单手拆接信号电缆。
>
> 有水、火及结构损坏迹象时,请勿打开任何设备。
>
> 除非在安装配置过程中有明确指示,否则,打开设备机盖前应先断开与电源线、远程通信系统、网络和调制解调器的所有连接。
>
> 安装、移动或打开本产品及其附带设备的机盖时,应按下表所述连接和断开电缆。

连接时:	断开连接时:
1. 关闭所有设备。	1. 关闭所有设备。
2. 首先将所有电缆连接至设备。	2. 首先从插座中拔出电源线。
3. 将信号电缆连接至接口。	3. 从接口上拔下信号电缆。
4. 将电源线连接至插座。	

声明 2

警告:

更换锂电池时，只能使用 IBM 产品号 33F8354 或者是厂商推荐的等同类型的电池。

如果系统模块中含有锂电池，则只能使用同一厂商制造的同一类型的模块进行更换。电池中含有锂，如果使用、拿放或处理不当，可能会发生爆炸。

请勿对电池进行下列操作：
扔入或浸入水电　　。
加热超过 100 （212 F）
进行修理或分解
请按本地法规要求处理电池。

声明 3

警告:

安装激光产品（如 CD-ROM、DVD 驱动器、光纤设备或送话器）时，应注意以下事项：

不要拆除外盖。拆除激光产品的外盖可能会导致激光辐射的危险，本设备中没有用户可维修的部件。

非此处指定的其它控制、调整或与性能有关的操作都有可能导致激光辐射的危险。

危险

某些激光产品中包含内嵌的 3A 级或 3B 级激光二极管。请注意以下事项。
打开时会产生激光辐射。不要直视光束，不要使用光学仪器直接观看光束，避免直接暴露于光束之下。

声明 4

≥18 kg (37 磅)　　≥32 kg (70.5 磅)　　≥ 55 kg (121.2 磅)

警告：
抬起时请采用安全操作方法。

声明 5

警告：

使用设备上的电源控制按钮和电源上的开关都不能断开本设备上的电流。
另外，本设备可能带有多条电源线。如要断开设备上的所有电流，请确
保所有电源线均已与电源断开连接。

声明 6

警告：

如果在电源线连接设备的一端安装了固定松紧夹，则必须将电源线的另一端连接至
使用方便的电源。

声明 7

⚠️

警告：

如果设备带有外门，则在移动或抬起设备前应将其拆除或固定
以避免造成人员伤害。外门支撑不了设备的重量。

声明 8

⚠️

警告：
不要拆除电源外盖或贴有下列标签的任何部件。

⊗ ⚡

贴有此标签的组件内部存在高电压、高电流的危险。这些组件中
没有用户可维修的部件。如果怀疑其中的部件存在问题，应与服
务技术人员联系。

声明 9

⚠️

警告：

为避免人员伤害，拆除设备上的风扇前应拨下热插拔风扇电缆。

声明 10

⚠️

警告：

机柜安装的设备上面不能放置重于 82kg（180 磅）的物品。

🚫

> 82 kg (180 磅)

声明 11

警告：

下面的标签表明附近有锋利的边、角或接头。

声明 12

警告：

下面的标签表明附近有高热表面。

重要資訊：

Server Library 中所有「注意」及「危險」的聲明均以數字開
始。此一數字是用來作為交互參考之用，英文「注意」或「危險」聲
明可在本節中找到相同內容的「注意」或「危險」聲明的譯文。

例如，有一「危險」聲明以數字 1 開始，則該「危險」聲明的譯文將
出現在本節的「聲明」1 中。

執行任何指示之前，請詳讀所有「注意」及「危險」的聲明。

聲明 1

危險

電源、電話及通信電纜上所產生的電流均有危險性。

欲避免電擊危險：

－在雷雨期間，請勿連接或切斷本產品上的任何電纜線，或安裝、維修及重新架
　構本產品。
－請將電源線接至接線及接地正確的電源插座。
－請將本產品隨附的設備連接至接線正確的插座。
－儘可能使用單手來連接或切斷信號電纜線。
－當設備有火燒或泡水的痕跡，或有結構性損害時，請勿開啟該設備的電源。
－在安裝及架構之時，若非非常熟悉，在開啟裝置蓋子之前，請切斷電源線、電
　信系統、網路及數據機。
－在安裝、移動本產品或附加裝置，或開啟其蓋子時，請依照下表中「連接」及
　「切斷」電纜線的步驟執行。

連接：	切斷：
1. 關閉所有開關。	1. 關閉所有開關。
2. 先將所有電纜線接上裝置。	2. 先自電源插座拔掉電源線。
3. 將信號電纜接上接頭。	3. 拔掉接頭上的所有信號電纜。
4. 再將電源線接上電源插座。	4. 再拔掉裝置上的所有電纜線。
5. 開啟裝置的電源。	

聲明 2

注意：
更換鋰電池時，只可使用 IBM 零件編號 33F8354 的電池，或製造商建議之相
當類型的電池。若系統中具有包含鋰電池的模組，在更換此模組時，請使用相同
廠商製造的相同模組類型。如未正確使用、處理或丟棄含有鋰的電池時，可能會
引發爆炸。

請勿將電池：
－ 丟入或浸入水中
－ 加熱超過 100 ℃ (212 ℉)
－ 修理或拆開

請遵照當地法令規章處理廢棄電池。

聲明 3

注意：
安裝雷射產品 (如 CD-ROM、DVD 光碟機、光纖裝置或發射器) 時，請注意下列
事項：
— 請勿移開蓋子。移開雷射產品的蓋子，您可能會暴露於危險的雷射輻射之下。
　 裝置中沒有需要維修的組件。
— 不依此處所指示的控制、調整或處理步驟，您可能會暴露於危險的輻射之下。

危險

有些雷射產品含有內嵌式 Class 3A 或 Class 3B 雷射二極體。請注意
下列事項：

開啟時會產生雷射輻射。請勿凝視光束，不要使用光學儀器直接觀
察，且應避免直接暴露在光束下。

聲明 4

≥ 18 公斤 (37 磅)　≥ 32 公斤 (70.5 磅)　≥ 55 公斤 (121.2 磅)

注意：

抬起裝置時，請注意安全措施。

聲明 5

注意：
裝置上的電源控制按鈕及電源供應器上的電源開關均無法關閉裝置上的電
流。
本裝置可能有一條以上的電源線。如要移除裝置上的所有電流，請確認所
有電源線已與電源分離。

聲明 10

注意：
請勿將任何重量超過 82 公斤 (180 磅) 的物品置於已安裝機架的裝置上方。

>82 公斤 (180 磅)

Important:

Toutes les consignes Attention et Danger indiquées dans la bibliothèque IBM documentation sont précédées d'un numéro. Ce dernier permet de mettre en correspondance la consigne en anglais avec ses versions traduites dans la présente section.

Par exemple, si une consigne de type Attention est précédée du chiffre 1, ses traductions sont également précédées du chiffre 1 dans la présente section.

Prenez connaissance de toutes les consignes de type Attention et Danger avant de procéder aux opérations décrites par les instructions.

Notice n° 1

DANGER

Le courant électrique passant dans les câbles de communication, ou les cordons téléphoniques et d'alimentation peut être dangereux.

Pour éviter tout risque de choc électrique:
- Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.
- Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.
- Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.
- Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.
- Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.
- Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux réseaux, aux systèmes de télécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).
- Lorsque vous installez ou que vous déplacez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion	Déconnexion
1. Mettez les unités hors tension. 2. Commencez par brancher tous les cordons sur les unités. 3. Branchez les câbles d'interface sur des connecteurs. 4. Branchez les cordons d'alimentation sur des prises. 5. Mettez les unités sous tension.	1. Mettez les unités hors tension. 2. Débranchez les cordons d'alimentation des prises. 3. Débranchez les câbles d'interface des connecteurs. 4. Débranchez tous les câbles des unités.

Notice n° 2

ATTENTION:

Remplacez la pile au lithium usagée par une pile de référence identique exclusivement - voir la référence IBM - ou par une pile équivalente recommandée par le fabricant. Si votre système est doté d'un module contenant une pile au lithium, vous devez le remplacer uniquement par un module identique, produit par le même fabricant. La pile contient du lithium et présente donc un risque d'explosion en cas de mauvaise manipulation ou utilisation.
- **Ne la jetez pas à l'eau.**
- **Ne l'exposez pas à une température supérieure à 100 °C.**
- **Ne cherchez pas à la réparer ou à la démonter.**

Pour la mise au rebut, reportez-vous à la réglementation en vigueur.

Notice n° 3

ATTENTION:

Si des produits laser sont installés (tels que des unités de CD-ROM ou de DVD, des périphériques contenant des fibres optiques ou des émetteurs-récepteurs), prenez connaissance des informations suivantes:
- **N'ouvrez pas ces produits pour éviter une exposition directe au rayon laser. Vous ne pouvez effectuer aucune opération de maintenance à l'intérieur.**
- **Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites dans le présent document.**

DANGER

Certains produits laser contiennent une diode laser de classe 3A ou 3B. Prenez connaissance des informations suivantes:

Rayonnement laser lorsque le carter est ouvert. évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques. évitez une exposition directe au rayon.

Notice n° 4
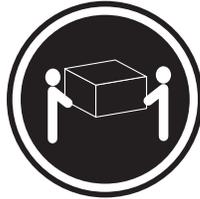
≥18 kg (39.7 lb)   ≥32 kg (70.5 lb)   ≥55 kg (121.2 lb)

ATTENTION:

Faites-vous aider pour soulever ce produit.

Notice n° 5

ATTENTION:

Le bouton de mise sous tension/hors tension de l'unité et l'interrupteur d'alimentation du bloc d'alimentation ne coupent pas l'arrivée de courant électrique à l'intérieur de la machine. Il se peut que votre unité dispose de plusieurs cordons d'alimentation. Pour isoler totalement l'unité du réseau électrique, débranchez tous les cordons d'alimentation des socles de prise de courant.

Notice n° 10

ATTENTION:

Ne posez pas d'objet dont le poids dépasse 82 kg sur les unités montées en armoire.

Wichtig:

Alle Sicherheitshinweise in dieser IBM documentation beginnen mit einer Nummer. Diese Nummer verweist auf einen englischen Sicherheitshinweis mit den übersetzten Versionen dieses Hinweises in diesem Abschnitt.

Wenn z. B. ein Sicherheitshinweis mit der Nummer 1 beginnt, so erscheint die übersetzung für diesen Sicherheitshinweis in diesem Abschnitt unter dem Hinweis 1.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Hinweis 1

VORSICHT

Elektrische Spannungen von Netz-, Telefon- und Datenübertragungsleitungen sind gefährlich.

Aus Sicherheitsgründen:
- Bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.
- Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Signalkabel möglichst einhändig anschließen oder lösen.
- Keine Geräte einschalten, wenn die Gefahr einer Beschädigung durch Feuer, Wasser oder andere Einflüsse besteht.
- Die Verbindung zu den angeschlossenen Netzkabeln, Telekommunikationssystemen, Netzwerken und Modems ist vor dem öffnen des Gehäuses zu unterbrechen. Es sei denn, dies ist in den zugehörigen Installations- und Konfigurationsprozeduren anders angegeben.
- Nur nach den nachfolgend aufgeführten Anweisungen arbeiten, die für Installation, Transport oder öffnen von Gehäusen von Personal Computern oder angeschlossenen Einheiten gelten.

Kabel anschlie*β*en:	Kabel lösen:
1. Alle Geräte ausschalten und Netzstecker ziehen. 2. Zuerst alle Kabel an Einheiten anschließen. 3. Signalkabel an Anschlußbuchsen anschließen. 4. Netzstecker an Steckdose anschließen. 5. Gerät einschalten.	1. Alle Geräte ausschalten. 2. Zuerst Netzstecker von Steckdose lösen. 3. Signalkabel von Anschlußbuchsen lösen. 4. Alle Kabel von Einheiten lösen.

Hinweis 2

ACHTUNG:

Eine verbrauchte Batterie nur durch eine Batterie mit der IBM Teilenummer 33F8354 oder durch eine vom Hersteller empfohlene Batterie ersetzen. Wenn Ihr System ein Modul mit einer Lithium-Batterie enthält, ersetzen Sie es immer mit dem selben Modultyp vom selben Hersteller. Die Batterie enthält Lithium und kann bei unsachgemäßer Verwendung, Handhabung oder Entsorgung explodieren.

Die Batterie nicht:
• mit Wasser in Berührung bringen.
• über 100 C erhitzen.
• reparieren oder zerlegen.

Die örtlichen Bestimmungen für die Entsorgung von Sondermüll beachten.

Hinweis 3

ACHTUNG:

Wenn ein Laserprodukt (z. B. CD-ROM-Laufwerke, DVD-Laufwerke, Einheiten mit Glasfaserkabeln oder Transmitter) installiert ist, beachten Sie folgendes.
• Das Entfernen der Abdeckungen des CD-ROM-Laufwerks kann zu gefährlicher Laserstrahlung führen. Es befinden sich keine Teile innerhalb des CD-ROM-Laufwerks, die vom Benutzer gewartet werden müssen. Die Verkleidung des CD-ROM-Laufwerks nicht öffnen.
• Steuer- und Einstellelemente sowie Verfahren nur entsprechend den Anweisungen im vorliegenden Handbuch einsetzen. Andernfalls kann gefährliche Laserstrahlung auftreten.

VORSICHT

Manche CD-ROM-Laufwerke enthalten eine eingebaute Laserdiode der Klasse 3A oder 3B. Die nachfolgend aufgeführten Punkte beachten.

Laserstrahlung bei geöffneter Tür. Niemals direkt in den Laserstrahl sehen, nicht direkt mit optischen Instrumenten betrachten und den Strahlungsbereich meiden.
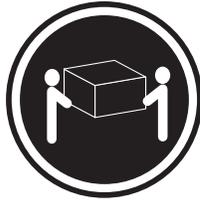
≥18 kg   ≥32 kg   ≥55 kg

ACHTUNG:

Beim Anheben der Maschine die vorgeschriebenen Sicherheitsbestimmungen beachten.

Hinweis 5

ACHTUNG:

Mit dem Betriebsspannungsschalter an der Vorderseite des Servers und dem Betriebsspannungsschalter am Netzteil wird die Stromversorgung für den Server nicht unterbrochen. Der Server könnte auch mehr als ein Netzkabel aufweisen. Um die gesamte Stromversorgung des Servers auszuschalten, muß sichergestellt werden, daß alle Netzkabel aus den Netzsteckdosen herausgezogen wurden.

2

1

Hinweis 10

ACHTUNG:

Keine Gegenstände, die mehr als 82 kg wiegen, auf Rack-Einheiten ablegen.

Importante:

Tutti gli avvisi di attenzione e di pericolo riportati nella pubblicazione IBM documentation iniziano con un numero. Questo numero viene utilizzato per confrontare avvisi di attenzione o di pericolo in inglese con le versioni tradotte riportate in questa sezione.

Ad esempio, se un avviso di attenzione inizia con il numero 1, la relativa versione tradotta è presente in questa sezione con la stessa numerazione.

Prima di eseguire una qualsiasi istruzione, accertarsi di leggere tutti gli avvisi di attenzione e di pericolo.

Avviso 1

PERICOLO

La corrente elettrica circolante nei cavi di alimentazione, del telefono e di segnale è pericolosa.

Per evitare il pericolo di scosse elettriche:
- Non collegare o scollegare i cavi, non effettuare l'installazione, la manutenzione o la riconfigurazione di questo prodotto durante i temporali.
- Collegare tutti i cavi di alimentazione ad una presa elettrica correttamente cablata e munita di terra di sicurezza.
- Collegare qualsiasi apparecchiatura collegata a questo prodotto ad una presa elettrica correttamente cablata e munita di terra di sicurezza.
- Quando possibile, collegare o scollegare i cavi di segnale con una sola mano.
- Non accendere qualsiasi apparecchiatura in presenza di fuoco, acqua o se sono presenti danni all'apparecchiatura stessa.
- Scollegare i cavi di alimentazione, i sistemi di telecomunicazioni, le reti e i modem prima di aprire i coperchi delle unità, se non diversamente indicato nelle procedure di installazione e configurazione.
- Collegare e scollegare i cavi come descritto nella seguente tabella quando si effettuano l'installazione, la rimozione o l'apertura dei coperchi di questo prodotto o delle unità collegate.

Per collegare:	Per scollegare:
1. SPEGNERE tutti i dispositivi.	1. SPEGNERE tutti i dispositivi.
2. Collegare prima tutti i cavi alle unità.	2. Rimuovere prima i cavi di alimentazione dalle prese elettriche.
3. Collegare i cavi di segnale ai connettori.	3. Rimuovere i cavi di segnale dai connettori.
4. Collegare i cavi di alimentazione alle prese elettriche.	4. Rimuovere tutti i cavi dalle unità.
5. ACCENDERE le unità.	

Avviso 2

ATTENZIONE:

Quando si sostituisce la batteria al litio, utilizzare solo una batteria IBM con numero parte 33F8354 o batterie dello stesso tipo o di tipo equivalente consigliate dal produttore. Se il sistema di cui si dispone è provvisto di un modulo contenente una batteria al litio, sostituire tale batteria solo con un tipo di modulo uguale a quello fornito dal produttore. La batteria contiene litio e può esplodere se utilizzata, maneggiata o smaltita impropriamente.

Evitare di:
• Gettarla o immergerla in acqua
• Riscaldarla ad una temperatura superiore ai 100°C
• Cercare di ripararla o smontarla

Smaltire secondo la normativa in vigore (D.Lgs 22 del 5/2/9) e successive disposizioni nazionali e locali.

Avviso 3

ATTENZIONE:

Quando si installano prodotti laser come, ad esempio, le unità DVD, CD-ROM, a fibre ottiche o trasmettitori, prestare attenzione a quanto segue:
• Non rimuovere i coperchi. L'apertura dei coperchi di prodotti laser può determinare l'esposizione a radiazioni laser pericolose. All'interno delle unità non vi sono parti su cui effettuare l'assistenza tecnica.
• L'utilizzo di controlli, regolazioni o l'esecuzione di procedure non descritti nel presente manuale possono provocare l'esposizione a radiazioni pericolose.

PERICOLO

Alcuni prodotti laser contengono all'interno un diodo laser di Classe 3A o Classe 3B. Prestare attenzione a quanto segue:

Aprendo l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici ed evitare l'esposizione diretta al fascio.

Avviso 4
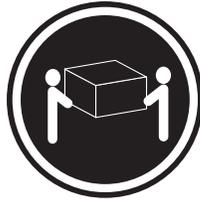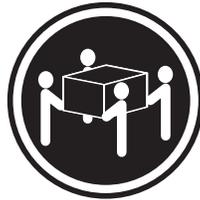
≥18 kg ≥32 kg ≥55 kg

ATTENZIONE:

Durante il sollevamento della macchina seguire delle norme di sicurezza.

Avviso 5

ATTENZIONE:

Il pulsante del controllo dell'alimentazione situato sull'unità e l'interruttore di alimentazione posto sull'alimentatore non disattiva la corrente elettrica fornita all'unità. L'unità potrebbe disporre di più di un cavo di alimentazione. Per disattivare la corrente elettrica dall'unità, accertarsi che tutti i cavi di alimentazione siano scollegati dalla sorgente di alimentazione.

Avviso 10

ATTENZIONE:

Non poggiare oggetti che pesano più di 82 kg sulla parte superiore delle unità montate in rack.

重要：

Netfinity Server ライブラリーにあるすべての注意および危険の記述は
数字で始まります。この数字は、英語版の注意および危険の記述と翻訳さ
れた注意および危険の記述を相互参照するために使用します。

例えば、もし注意の記述が数字の1で始まってる場合は、その注意の翻訳は、
記述 1 の下にあります。

手順を実施する前に、すべての注意.

・記述 1

⚠ 危険

感電を防止するため、雷の発生時には、いかなるケーブルの
取り付けまたは取り外しも行わないでください。また導入、
保守、再構成などの作業も行わないでください。

感電を防止するため ：

　－ 電源コードは正しく接地および配線が行われている
　　電源に接続してください。

　－ 本製品が接続されるすべての装置もまた正しく配線
　　された電源に接続されている必要があります。

できれば、信号ケーブルに取り付けまたは取り外しのとき
は片方の手のみで行うようにしてください。これにより、
電位差がある二つの表面に触ることによる感電を防ぐことが
できます。

電源コード、電話ケーブル、通信ケーブルからの電流は身体に
危険を及ぼします。設置、移動、または製品のカバーを開けたり
装置を接続したりするときには、以下のようにケーブルの接続 、
取り外しを行ってください。

接続するには	取り外すには
1. すべての電源を切る	1. すべての電源を切る
2. まず、装置にすべての　ケーブルを接続する。	2. まず、電源コンセントから　電源コードを取り外す
3. 次に、通信ケーブルを　コネクターに接続する	3. 次に、通信ケーブルを　コネクターから取り外す。
4. その後、電源コンセントに　電源コードを接続する	4. その後、装置からすべての　ケーブルを取り外す
5. 装置の電源を入れる。	

・記述 2

⚠ 注意

本製品には、システム・ボード上にリチウム電池が使用さ
れています。電池の交換方法や取り扱いを誤ると、発熱、
発火、破裂のおそれがあります。
電池の交換には、IBM部品番号33F8354の電池またはメーカー
推奨の同等の電池を使用してください。
交換用電池の購入については、お買い求めの販売店または
弊社の営業担当までお問い合わせください。
電池は幼児の手の届かない所に置いてください。
万一、幼児が電池を飲み込んだときは、直ちに医師に相談
してください。
以下の行為は絶対にしないでください。
－水にぬらすこと
－100度C 以上の過熱や焼却
－分解や充電
－ショート
電池を廃棄する場合、および保存する場合にはテープなど
で絶縁してください。他の金属や電池と混ざると発火、
破裂の原因となります。電池は地方自治体の条例、または
規則に従って廃棄してください。ごみ廃棄場で処分される
ごみの中に捨てないでください。

・記述 3

⚠ 注意

レーザー製品（ CD-ROM、DVD、または光ファイバー装置または
送信器など）が組み込まれている場合は、下記に御注意ください。

 − ここに記載されている制御方法、調整方法、または性能を超えて使用
  すると、危険な放射線を浴びる可能性があります。

 − ドライブのカバーを開けると、危険な放射線を浴びる可能性があります。
  ドライブの内部に修理のために交換可能な部品はありません。カバーを
  開けないでください。

⚠ 危険

一部 CD-ROM ドライブは、Class 3A または Class 3B レーザー・
ダイオードを使用しています。次の点に注意してください。

CD-ROMドライブのカバーを開けるとレーザーが放射されます。
光線をみつめたり、光学器械を使って直接見たりしないで
ください。また直接光線を浴びないようにしてください。

・記述 4

⚠ 注意

18Kg 以上　　　　32Kg 以上　　　　55Kg 以上

装置を持ち上げる場合は、安全に持ち上げる方法に従ってください。

・記述 5

⚠ 注意 ⚡

サーバーの前面にある電源制御ボタンは、サーバーに供給された
電流を遮断しません。
サーバーには、複数の電源コードが接続されているかもしれません。
サーバーから電流を完全に遮断するために、すべての電源コードが
電源から取り外されていることを確認してください。

2
1
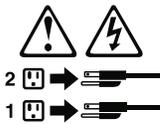
・記述 10

⚠ 注意

ラック・モデルのサーバーの上に 82 Kg 以上の物を置かないで
ください。

중요:

본 *Server Library*에 있는 모든 주의 및 위험 경고문은 번호로
시작합니다. 이 번호는 영문 주의 혹은 위험 경고문과 이 절에 나오는
번역된 버전의 주의 혹은 위험 경고문을 상호 참조하는 데 사용됩니다.

예를 들어, 주의 경고문이 번호 1로 시작하면, 번역된 해당 주의
경고문을 본 절의 경고문 1에서 찾아볼 수 있습니다.

모든 지시사항을 수행하기 전에 반드시 모든 주의 및 위험 경고문을
읽으십시오.

경고문 1

⚠️ ⚡
위험

전원, 전화 및 통신 케이블로부터 흘러 나오는 전류는
위험합니다.

전기 충격을 피하려면:

- 뇌우를 동반할 때는 케이블의 연결이나 철수, 이 제품의
  설치, 유지보수 또는 재구성을 하지 마십시오.

- 모든 전원 코드를 적절히 배선 및 접지해야 합니다.

- 이 제품에 연결될 모든 장비를 적절하게 배선된 콘센트에
  연결하십시오.

- 가능한한 신호 케이블을 한 손으로 연결하거나
  끊으십시오.

- 화재, 수해 또는 구조상의 손상이 있을 경우 장비를 켜지
  마십시오.

- 설치 및 구성 프로시저에 다른 설명이 없는 한, 장치 덮개를
  열기 전에 연결된 전원 코드, 원거리 통신 시스템, 네트워크
  및 모뎀을 끊어 주십시오.

- 제품 또는 접속된 장치를 설치, 이동 및 덮개를 열 때
  다음 설명에 따라 케이블을 연결하거나 끊도록 하십시오.

연결하려면:	연결을 끊으려면:
1. 모든 스위치를 끕니다.	1. 모든 스위치를 끕니다.
2. 먼저 모든 케이블을 장치에 연결합니다.	2. 먼저 콘센트에서 전원 코드를 뽑습니다.
3. 신호 케이블을 커넥터에 연결합니다.	3. 신호 케이블을 커넥터에서 제거합니다.
4. 콘센트에 전원 코드를 연결합니다.	4. 장치에서 모든 케이블을 제거합니다.
5. 장치 스위치를 켭니다.	

경고문 2

⚠️
주의:

리튬 배터리를 교체할 때는 IBM 부품 번호 33F8354 또는 제조업체에서
권장하는 동등한 유형의 배터리를 사용하십시오. 시스템에 리튬 배터리를
갖고 있는 모듈이 있으면 동일한 제조업체에서 생산된 동일한 모듈
유형으로 교체하십시오. 배터리에 리튬이 있을 경우 제대로 사용, 처리
또는 처분하지 않으면 폭발할 수 있습니다.

다음을 주의하십시오.

- 던지거나 물에 담그지 않도록 하십시오.
- 100℃(212℉) 이상으로 가열하지 마십시오.
- 수리하거나 분해하지 마십시오.

지역 법령이나 규정의 요구에 따라 배터리를 처분하십시오.

경고문 3

주의:
레이저 제품(CD-ROMs, DVD 드라이브, 광 장치 또는 트랜스미터 등과
같은)이 설치되어 있을 경우 다음을 유의하십시오.

- 덮개를 제거하지 마십시오. 레이저 제품의 덮개를 제거했을 경우
위험한 레이저 광선에 노출될 수 있습니다. 이 장치 안에는 서비스를
받을 수 있는 부품이 없습니다.

- 여기에서 지정하지 않은 방식의 제어, 조절 또는 실행으로 인해 위험한
레이저 광선에 노출될 수 있습니다.

위험

일부 레이저 제품에는 클래서 3A 또는 클래스 3B 레이저
다이오드가 들어 있습니다. 다음을 주의하십시오.

열면 레이저 광선에 노출됩니다. 광선을 주시하거나 광학 기계를
직접 쳐다보지 않도록 하고 광선에 노출되지 않도록 하십시오.

경고문 4

≥18 kg (37 lbs)   ≥ 32 kg (70.5 lbs)   ≥ 55 kg (121.2 lbs)

주의:
기계를 들 때는 안전하게 들어 올리십시오.

경고문 5

주의:
장치의 전원 제어 버튼 및 전원 공급기의 전원 스위치는 장치에
공급되는 전류를 차단하지 않습니다. 장치에 둘 이상의 전원 코드가
연결되어 있을 수도 있습니다. 장치에서 모든 전류를 차단하려면
모든 전원 코드가 전원으로부터 차단되어 있는 지 확인하십시오.

경고문 10

주의:
서랍형 모델의 장치 상단에 82 kg(180 lbs.)이 넘는 물체를 올려
놓지 마십시오.

> 82 kg (180 lbs)

Importante:

Todas las declaraciones de precauciín de esta IBM documentation empiezan con un número. Dicho número se emplea para establecer una referencia cruzada de una declaraciín de precauciín o peligro en inglés con las versiones traducidas que de dichas declaraciones pueden encontrarse en esta secciín.

Por ejemplo, si una declaraciín de peligro empieza con el número 1, las traducciones de esta declaraciín de precauciín aparecen en esta secciín bajo Declaraciín 1.

Lea atentamente todas las declaraciones de precauciín y peligro antes de llevar a cabo cualquier operaciín.

Declaración 1

PELIGRO

La corriente eléctrica de los cables telefínicos, de alimentaciín y de comunicaciones es perjudicial.

Para evitar una descarga eléctrica:
- No conecte ni desconecte ningún cable ni realice las operaciones de instalaciín, mantenimiento o reconfiguraciín de este producto durante una tormenta.
- Conecte cada cable de alimentaciín a una toma de alimentaciín eléctrica con conexiín a tierra y cableado correctos.
- Conecte a tomas de alimentaciín con un cableado correcto cualquier equipo que vaya a estar conectado a este producto.
- Si es posible, utilice una sola mano cuando conecte o desconecte los cables de sent.al.
- No encienda nunca un equipo cuando haya riesgos de incendio, de inundaciín o de daños estructurales.
- Desconecte los cables de alimentaciín, sistemas de telecomunicaciones, redes y mídems conectados antes de abrir las cubiertas del dispositivo a menos que se indique lo contrario en los procedimientos de instalaciín y configuraciín.
- Conecte y desconecte los cables tal como se describe en la tabla siguiente cuando desee realizar una operaciín de instalaciín, de traslado o de apertura de las cubiertas para este producto o para los dispositivos conectados.

Para la conexin	Para la desconexiín
1. APÁGUELO todo.	1. APÁGUELO todo.
2. En primer lugar, conecte los cables a los dispositivos.	2. En primer lugar, retire cada cable de alimentaciín de la toma de alimentaciín.
3. Conecte los cables de señal a los conectores.	3. Retire los cables de señal de los conectores.
4. Conecte cada cable de alimentaciín a la toma de alimentaciín.	4. Retire los cables de los dispositivos.
5. ENCIENDA el dispositivo.	

Declaración 2

PRECAUCIÓN:

Cuando desee sustituir la batería de litio, utilice únicamente el número de pieza 33F8354 de IBM o cualquier tipo de batería equivalente que recomiende el fabricante. Si el sistema tiene un mídulo que contiene una batería de litio, sustitúyalo únicamente por el mismo tipo de mídulo, que ha de estar creado por el mismo fabricante. La batería contiene litio y puede explotar si el usuario no la utiliza ni la maneja de forma adecuada o si no se desprende de la misma como corresponde.

No realice las acciones siguientes:
• Arrojarla al agua o sumergirla
• Calentarla a una temperatura que supere los 100°C (212°F)
• Repararla o desmontarla

Despréndase de la batería siguiendo los requisitos que exija el reglamento o la legislaciín local.

Declaración 3

PRECAUCIÓN:

Cuando instale productos láser (como, por ejemplo, CD-ROM, unidades DVD, dispositivos de fibra íptica o transmisores), tenga en cuenta las advertencias siguientes:
• No retire las cubiertas. Si retira las cubiertas del producto láser, puede quedar expuesto a radiaciín láser perjudicial. Dentro del dispositivo no existe ninguna pieza que requiera mantenimiento.
• El uso de controles o ajustes o la realizaciín de procedimientos que no sean los que se han especificado aquí pueden dar como resultado una exposiciín perjudicial a las radiaciones.

PELIGRO

Algunos productos láser contienen un diodo de láser incorporado de Clase 3A o de Clase 3B. Tenga en cuenta la advertencia siguiente.

Cuando se abre, hay radiaciín láser. No mire fijamente el rayo ni lleve a cabo ningún examen directamente con instrumentos ípticos; evite la exposiciín directa al rayo.

Declaración 4
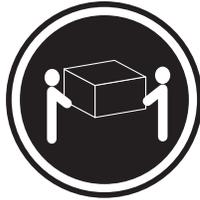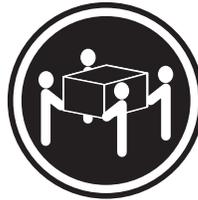
≥18 kg   ≥32 kg   ≥55 kg

PRECAUCIÓN:

Tome medidas de seguridad al levantar el producto.

Declaración 5

PRECAUCIÓN:

El botín de control de alimentaciín del dispositivo y el interruptor de alimentaciín de la fuente de alimentaciín no apagan la corriente eléctrica suministrada al dispositivo. Es posible también que el dispositivo tenga más de un cable de alimentaciín. Para eliminar la corriente eléctrica del dispositivo, asegúrese de desconectar todos los cables de alimentaciín de la fuente de alimentaciín.

2

1

Declaración 10

PRECAUCIÓN:

No coloque ningún objeto que pese más de 82 kg (180 libras) encima de los dispositivos montados en bastidor.

Appendix C. Notices

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

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

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IBM IntelliStation A Pro Type 6224

Federal Communications Commission (FCC) statement

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

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

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

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.

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

FC Tested To Comply
With FCC Standards
FOR HOME OR OFFICE USE

Industry Canada Class B emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

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