

IBM IntelliStation M Pro Type 9229



Problem Determination and Service Guide

IBM IntelliStation M Pro Type 9229



Problem Determination and Service Guide

Note:

Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 133.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Guidelines for trained service technicians

This section contains information for trained service technicians.

Inspecting for unsafe conditions

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

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

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

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

1. Make sure that the power is off and the power cord is disconnected.
2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.
3. Check the power cord:
 - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
 - Make sure that the power cord is the correct type, as specified in "Power cords" on page 21.
 - Make sure that the insulation is not frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the computer for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Guidelines for servicing electrical equipment

Observe the following guidelines when you service electrical equipment:

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

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

Safety statements

Important:

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

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

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

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

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

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

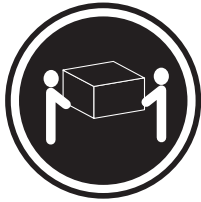


DANGER

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

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

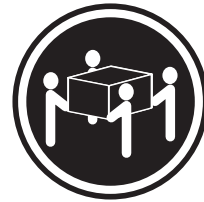
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

Use safe practices when lifting.

Statement 5:



CAUTION:

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



Statement 8:



CAUTION:

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



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

Statement 26:



CAUTION:

Do not place any object on top of rack-mounted devices.



Statement 28:



CAUTION:

The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call.

Important:

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

Chapter 1. Introduction

This *Problem Determination and Service Guide* contains information to help you solve problems that might occur in your IBM® IntelliStation® M Pro Type 9229 computer. It describes the diagnostic tools that come with the computer, error codes and suggested actions, and instructions for replacing failing components.

Replaceable components are of three types:

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

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

Related documentation

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

- *Installation Guide*

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

- *User's Guide*

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

- *Safety Information*

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

- *Warranty and Support Information*

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

- Readme files on the *Device Drivers and IBM Enhanced Diagnostics* 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. Diagnostic test programs are also stored on the *Device Drivers and IBM Enhanced Diagnostics* CD. These programs provide the primary methods of testing system components.

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

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

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

1. Go to <http://www.ibm.com/support/>.
2. Under **Search technical support**, type 9229, and click **Search**.

Notices and statements in this document

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

The following notices and statements are used in this document:

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

Features and specifications

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

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

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Supports one Intel® Core™ 2 Duo dual-core or quad-core microprocessor • 2 or 4 MB Level-2 cache • 1066 MHz front-side bus (FSB) <p>Memory:</p> <ul style="list-style-type: none"> • Minimum: 512 MB • Maximum: 8 GB • Type: PC2-5300, dual-data-rate 2 (DDR2) unbuffered error correcting code (ECC) • Connectors: four dual inline memory module (DIMM) connectors <p>Internal drives:</p> <ul style="list-style-type: none"> • Hard disk drive: SATA or SAS • One of the following drives: <ul style="list-style-type: none"> – DVD/CD-RW combo: IDE – CD-RW: IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> • One slim-high 3.5-inch external drive bay (optional diskette drive) • Two half-high 5.25-inch bays (optical drive installed in one bay) • Three slim-high 3.5-inch internal drive bays (one hard disk drive installed) <p>PCI expansion slots:</p> <ul style="list-style-type: none"> • One PCI Express x8 slot (x4 electrical) • Two PCI Express x16 slots (one x16 or two x8) • One PCI 32-bit/33 MHz slot <p>Note: When you install the NVIDIA Quadro FX 1500 or NVIDIA Quadro FX 3500 video adapters in the computer, do not set the analog resolution above 1600 x 1200 @ 60 Hz. This is the highest resolution supported for these adapters. In addition, when you use a cathode ray tube (CRT) type monitor, the monitor cable must come with a ferrite suppression on both ends of the monitor cable.</p>	<p>Integrated functions:</p> <ul style="list-style-type: none"> • Broadcom 5752 10/100/1000 Ethernet controller with RJ-45 Ethernet connector • Two serial connectors • One parallel connector • Four-port serial ATA controller • Two IEEE 1394 (FireWire) ports (four-pin on front, six-pin on rear) • Eight Universal Serial Bus (USB) connectors (two on front and six on rear) • Keyboard connector • Mouse connector • Audio connectors <ul style="list-style-type: none"> – Line out (front and rear) – Mic (front) – Line in (rear) • Single-channel IDE controller <p>Video adapter: (depending on the model)</p> <ul style="list-style-type: none"> • NVIDIA Quadro NVS 285 (DMS-59), PCI Express x16, with 128 MB DDR2 SDRAM and dual analog connectors, (or dual digital monitor capability with the purchase of an additional pigtail cable) • NVIDIA Quadro FX 550 (DVI-I), PCI Express x16, with 128 MB GDDR3s synchronous dynamic random access memory (SDRAM) and dual DVI-I connectors • NVIDIA Quadro FX 1500 (dual-link DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM and two dual DVI-I connectors • NVIDIA Quadro FX 3500 (DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM and two dual DVI-I connectors <p>Power supply: One 400-watts (115 - 230 V ac)</p> <p>Cooling:</p> <ul style="list-style-type: none"> • One speed-controlled microprocessor fan • One power-supply fan 	<p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50 or 60 Hz) required • Input voltage and frequency ranges automatically selected • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 90 V ac – Maximum: 137 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 180 V ac – Maximum: 265 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.10 kVA – Maximum: 0.37 kVA <p>Heat output: Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 341 Btu per hour (100 watts) • Maximum configuration: 1239 Btu per hour (363 watts) <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – 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% <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idle: 4.3 bel • Sound power, operating: 4.8 bel <p>Size:</p> <ul style="list-style-type: none"> • Height: 430 mm (16.9 in.) • Depth: 445 mm (17.5 in.) • Width: 178 mm (7.0 in.) • Weight: 12.5 kg (27.5 lb) to 15.5 kg (34.1 lb) depending upon configuration
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Controls, LEDs, and connectors

The following illustration shows the controls, LEDs, and connectors on the front of the computer. See the *User's Guide* for an illustration and description of the input/output connectors on the rear of the computer.

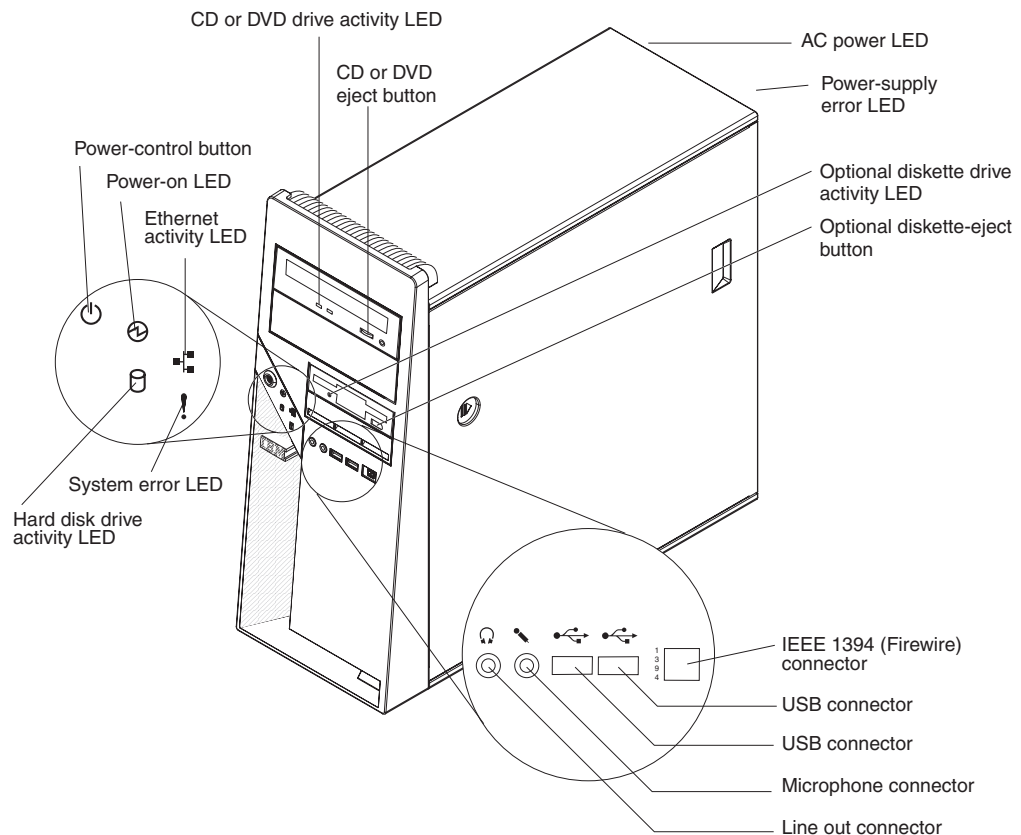


Figure 1. Controls, LEDs, and indicators

CD or DVD drive activity LED

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

CD or DVD drive eject button

Press this button to insert or remove a CD or DVD.

AC power LED

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

Power-supply error LED

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

Optional diskette drive activity LED

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

Optional diskette-eject button

Press this button to release a diskette from the diskette drive.

IEEE 1394 (FireWire) connectors

Use these connectors (four-pin on the front and six-pin on the rear) to connect FireWire devices, such as a digital video camera or an external hard disk drive.

USB connectors

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

Microphone connector (pink)

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

Line out connector (green)

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

Hard disk drive activity LED

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

System-error LED

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

Ethernet activity LED

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

Power-on LED

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

Power-control button

Press this button to turn the computer on or off.

Internal LEDs, connectors, and jumpers

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

System-board optional-device connectors

The following illustration shows the connectors on the system board for user-installable optional devices.

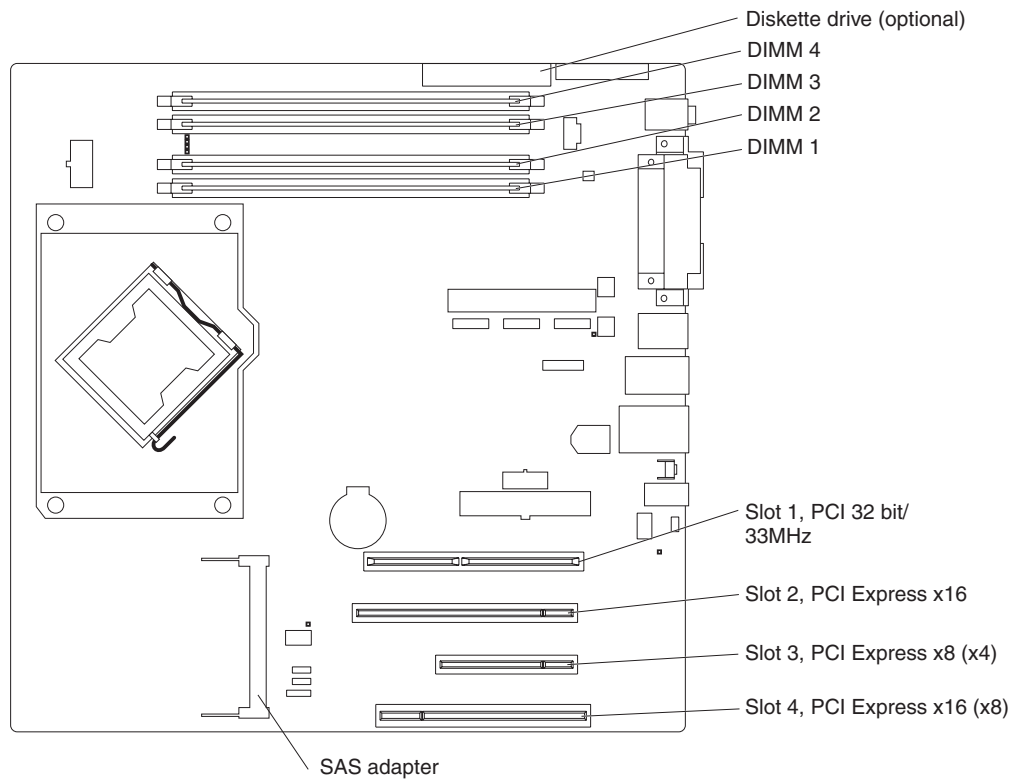


Figure 2. System-board option connectors

System-board internal connectors

The following illustration shows the internal connectors on the system board.

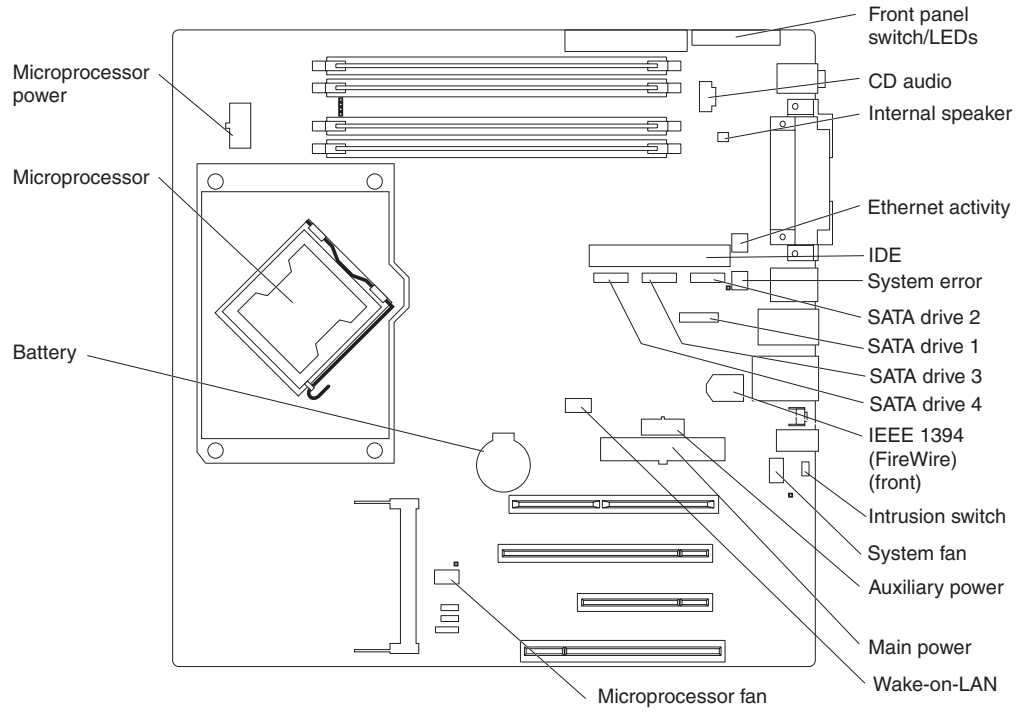


Figure 3. System-board internal connectors

System-board external connectors

The following illustration shows the external input/output port connectors on the system board.

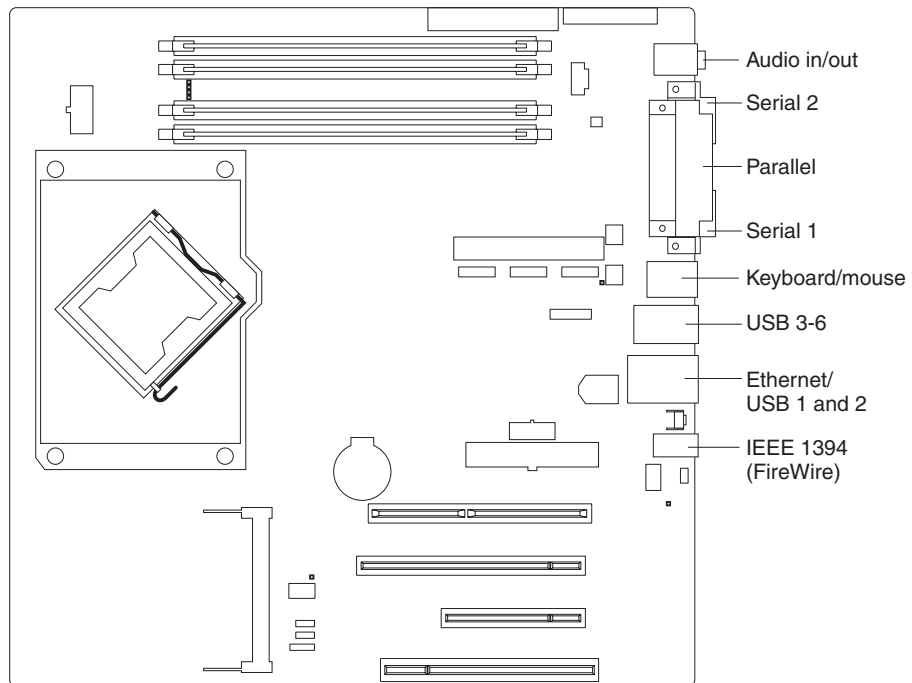


Figure 4. System-board external connectors

System-board error LEDs

The following illustration shows the system-board LEDs.

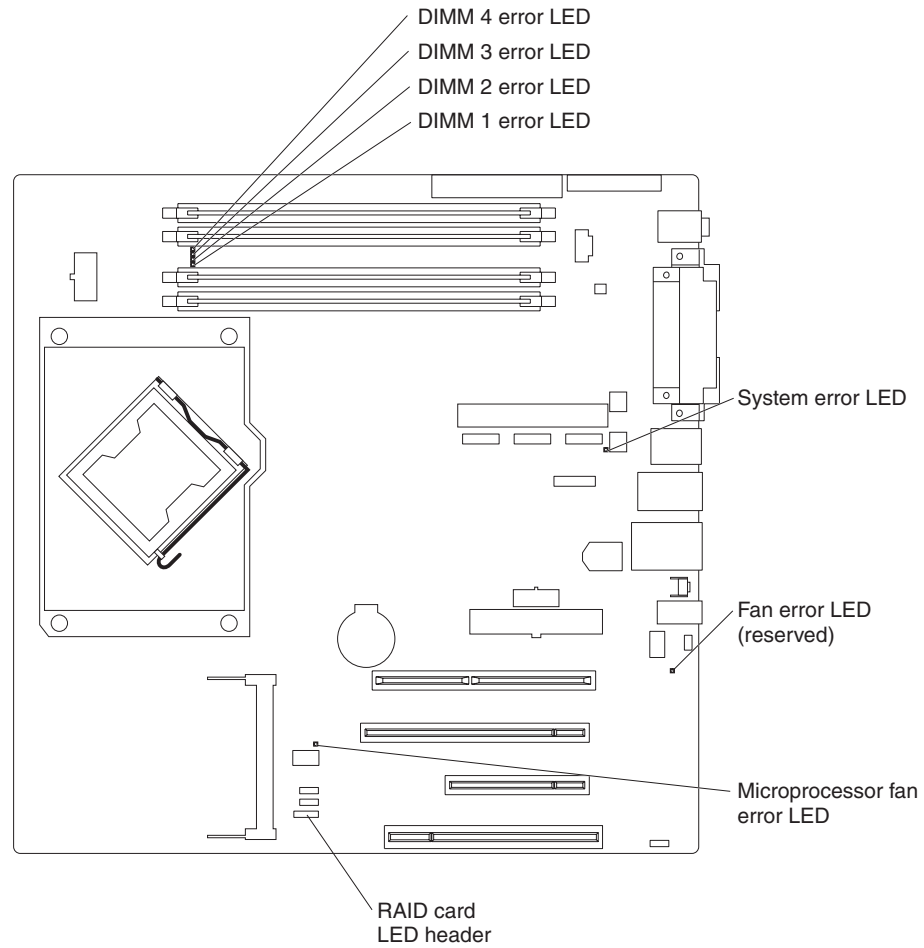


Figure 5. System-board LEDs

An error LED is lit to indicate a problem with a specific component. The error LEDs remain lit until the error log is cleared, so that intermittent errors do not remain undetected. For information about how to correct the problems that are indicated by the error LEDs, see “System-board error LEDs” on page 116.

System-board jumpers

The following illustration shows the jumper blocks on the system board.

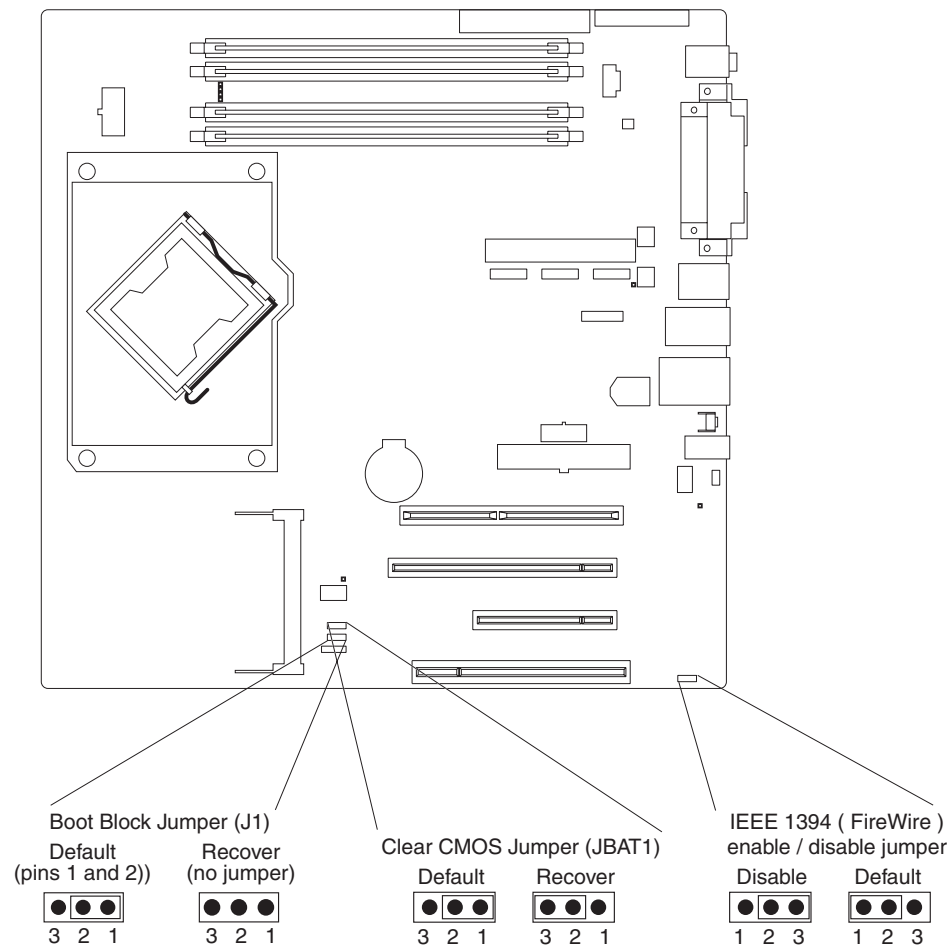


Figure 6. System-board jumpers

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

Jumper	Settings
Boot block (J1)	<ul style="list-style-type: none"> Normal (default): Jumper on pins 1 and 2 Boot block recovery: No jumper; see "Recovering from a BIOS update failure" on page 123 for more information.
Clear CMOS (JBAT1)	<ul style="list-style-type: none"> Keep CMOS data (default): Jumper on pins 1 and 2 Clear CMOS data: Jumper on pins 2 and 3 with power cords removed from the computer; see "Erasing a lost or forgotten password (clearing CMOS)" on page 125 for more information.
IEEE 1394, Firewire (J1394)	<ul style="list-style-type: none"> IEEE 1394 enabled (default): Jumper on pins 1 and 2 IEEE 1394 disabled: Jumper on pins 2 and 3

Chapter 2. Configuration information and instructions

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

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

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

Updating the firmware

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

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

- BIOS code is stored in ROM on the system board.
- Ethernet firmware is stored in ROM on the Ethernet controller on the system board.
- Major components contain VPD code. You can select to update the VPD code when you update the BIOS code.

Configuring the computer

The following configuration programs are available to configure the computer:

- **Configuration/Setup Utility program**

The Configuration/Setup Utility program is part of the basic input/output system (BIOS). You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, set passwords, and set the chassis-intrusion detector. For more information about using this utility program, see "Starting the Configuration/Setup Utility program" on page 12.

- **Boot Menu program**

The Boot Menu program is part of the BIOS. Use it to temporarily assign a device to be first in the startup sequence. Override the startup sequence that is set in the Configuration/Setup Utility program and for information about how to start the Boot Menu, see "Using the Boot Menu program" on page 12.

- **Broadcom NetXtreme Gigabit Ethernet Boot Agent**

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS. You can use it to configure the network as a startable device, and you can customize where the network startup option occurs in the startup sequence. Enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program. For information, see "Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent" on page 13.

- **Broadcom NetXtreme Gigabit Ethernet controller configuration**

To configure the integrated Gigabit Ethernet controller, see "Configuring the Broadcom NetXtreme Gigabit Ethernet controller" on page 13.

- **LSI Logic Configuration Utility program**

Use the LSI Logic Configuration Utility program to configure the integrated SAS controller with RAID capabilities and the devices that are attached to it. For information about using this program, see “Using the LSI Logic Configuration Utility program” on page 13.

- **PS/2 keyboard or mouse configuration**

To configure a PS/2 keyboard or mouse, see “Configuring a PS/2 keyboard or mouse” on page 15.

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

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

Starting the Configuration/Setup Utility program

Configuration/Setup is a menu-driven utility that is part of the BIOS code in the computer. You can use it to:

- Configure serial connector assignments
- Change the startup sequence
- Enable USB keyboard and mouse support
- Resolve configuration conflicts
- Set the date and time
- Set an administrator password

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

1. Turn on the computer and watch the monitor screen. If the computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use LEDs are turned off, and restart the computer.
2. When the message Press F1 for Configuration/Setup, Press F12 for Boot Menu is displayed press F1. (This prompt is displayed on the screen for only a few seconds. You must press F1 quickly.) If you have set both a power-on password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu. If you do not type the administrator password, a limited Configuration/Setup Utility menu is available.
3. Follow the instructions on the screen.

Using the Boot Menu program

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

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

1. Turn off the computer.
2. Restart the computer.
3. Press F12.
4. Select the startup device.

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

Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent

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

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

1. From the Configuration/Setup Utility main menu, select **Devices and I/O Ports** and press Enter.
2. Select **Planar Ethernet** and use the Right Arrow (→) key to set it to **Enabled**.
3. Set the network-planar device as the first startup device under the **Startup Option → Startup Sequence Options** menu choice in the Configuration/Setup Utility program.
4. Under the **Startup Option** menu choice, select **Planar Ethernet PXE/DHCP** and use the Right Arrow key (→) to set it to **Planar Ethernet**.
5. Select **Save Settings** and press Enter.

Configuring the Broadcom NetXtreme Gigabit Ethernet controller

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

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

Using the LSI Logic Configuration Utility program

Use the LSI Logic Configuration Utility program to configure and manage redundant array of independent disks (RAID) arrays. Be sure to use this program as described in this document.

Use the LSI Logic Configuration Utility program to perform the following tasks:

- Perform a low-level format of a SAS/SATA hard disk drive
- Create an array of SAS/SATA hard disk drives with or without a hot-spare drive
- Set SAS/SATA protocol parameters on SAS/SATA hard disk drives

The integrated SAS/SATA controller with RAID capabilities supports redundant array of independent disks (RAID) arrays. You can use the LSI Logic Configuration Utility program to configure RAID 1 (IM), RAID 1E (IME), and RAID 0 (IS) for a single pair of attached devices. If you install a different type of RAID adapter, follow the instructions in the documentation that comes with the adapter to view or change SAS/SATA settings for attached devices.

In addition, you can download an LSI command-line configuration program from <http://www.ibm.com/support/>.

When you are using the LSI Logic Configuration Utility program to configure and manage arrays, consider the following information:

Note: Once you activate the onboard RAID or add an additional storage boot controller (for example, a RAID adapter), you can no longer use the Product Recovery CD (for Windows XP) or the Product Recovery DVD (for Windows Vista) to recover your operating system and applications because it will no longer function correctly. You will have to manually install the operating system and applications.

- The integrated SAS/SATA controller with RAID capabilities supports the following features:
 - Integrated Mirroring (IM) with hot-spare support (also known as RAID 1)
Use this option to create an integrated array of two disks plus an optional hot spare. All data on the primary disk can be migrated.
 - Integrated Mirroring Enhanced (IME) with hot-spare support (also known as RAID 1E)
Use this option to create an integrated mirror enhanced array of three to eight disks, including an optional hot spare.
 - Integrated Striping (IS) (also known as RAID 0)
Use this option to create an integrated striping array of two to eight disks. All data on the array disk will be deleted.
- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- If you use an integrated SAS/SATA controller with RAID capabilities to configure a RAID 1 (mirrored) array after you have installed the operating system, you will lose access to any data or applications that were previously stored on the secondary drive of the mirrored pair.
- If you install a different type of RAID controller, see the documentation that comes with the controller for information about viewing and changing SAS/SATA settings for attached devices.

Starting the LSI Logic Configuration Utility program

To start the LSI Logic Configuration Utility program, complete the following steps:

1. Turn on the computer.
2. When the prompt <<< Press <CTRL><C> to start LSI Logic Configuration Utility >>> is displayed, press Ctrl+C.
3. To select a controller (channel) from the list of adapters, use the arrow keys and press Enter.
4. To change the settings of the selected items, follow the instructions on the screen. If you select **Raid Properties**, **SAS Topology**, or **Advanced Adapter Properties**, additional screens are displayed.

When you have finished changing settings, press Esc to exit from the program; select **Save** to save the settings that you have changed.

Formatting a SAS/SATA hard disk drive

Low-level formatting removes all data from the hard disk. If there is data on the disk that you want to save, back up the hard disk before you perform this procedure.

Note: Before you format a SAS/SATA hard disk, make sure that the disk is not part of a mirrored pair. From the list of adapters, select the controller (channel) for the drive that you want to format. Select **SAS Topology**; then, highlight **Drive**. Press Alt+D.

To format a drive, complete the following steps:

1. From the list of adapters, select the controller (channel) for the drive that you want to format and press Enter.
2. Select **SAS Topology** and press Enter.
3. Select **Direct Attach Devices** and press Enter.
4. To highlight the drive that you want to format, use the Up Arrow and Down Arrow keys. To scroll left and right, use the Left Arrow and Right Arrow keys or the End key.
5. To start the low-level formatting operation, select **Format** and press Enter.

Creating a RAID array of SAS/SATA hard disk drives

To create a RAID array of SAS/SATA hard disk drives, complete the following steps:

1. From the list of adapters, select the controller (channel) for the drives that you want to mirror.
2. Select **RAID Properties**.
3. Select the type of array you want to create from the list.
4. Use the arrow keys to highlight the first drive in the pair; then, press the Minus (-) or Plus (+) key to change the mirror value to **Primary**.
5. Continue to select the next drive using the Minus (-) or Plus (+) key until you have all the drives for your array.
6. Press C to create the disk array.
7. Select **Apply changes and exit menu** to create the array.

Configuring a PS/2 keyboard or mouse

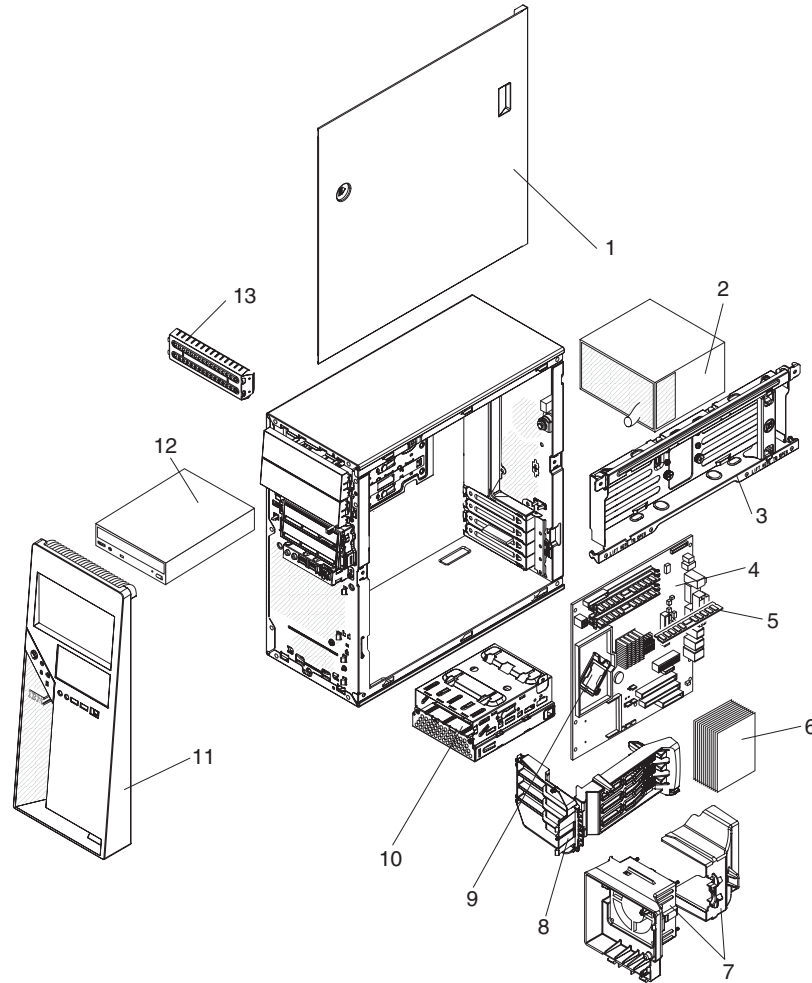
If you connect a PS/2 keyboard or mouse to the computer, you must configure the device in Windows so that the computer will come out of standby (power saving) when you press a key or move the mouse. To configure the keyboard or mouse, complete the following steps:

1. On the desktop, right-click the **My Computer** icon.
2. Click **Properties**.
3. Click the **Hardware** tab.
4. Click **Device Manager**.
5. From the list, double-click the keyboard or mouse.
6. In the device properties window, click the **Power Management** tab.
7. Select the **Allow this device to bring the computer out of standby** check box, and Click **OK**.

Chapter 3. Parts listing, Type 9229

The following replaceable components are available for the IntelliStation M Pro Type 9229 computer, except as specified otherwise in Table 2 on page 18. 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 9229 and click **Search**.
3. Under **Document type**, select **Parts information** and click **Go**.



Replaceable computer components

Replaceable components are of three types:

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

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

Table 2. Part listing, Type 9229

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
1	Chassis, side cover (all models)	42C7440		
2	Power supply, 400 watt (all models)			38Y7297
3	Hard disk drive side tray with screws (all models)		41Y3893	
4	System board (all models)			42C8192
5	Memory, 512 MB, 667 MHz, PC2-5300 ECC (DDR2) (models 42x, 52x, 6Gx)	41Y2725		
5	Memory, 1 GB, 667 MHz, PC2-5300 ECC (DDR2) (models 62x, 72x, 74x, 76x 78x 7Gx, 92x, 9Gx, 9Hx)	41Y2728		
5	Memory, 2 GB, 667 MHz, PC2-5300 ECC (DDR2) (option)	41Y2854		
6	Heat sink (all models)			39M6367
7	Fan assembly, system with air baffle (all models)	42C7479		
8	Adapter retention bracket (all models)	39Y8399		
9	Microprocessor, 1.86 GHz 2M L2 cache (model 42x)			41Y4250
9	Microprocessor, 2.13 GHz 2M L2 cache (model 52x)			41Y4251
9	Microprocessor, 2.4 GHz 4M L2 cache (model 62x)			41Y4252
9	Microprocessor, 2.4 GHz, 2x4M, L2 chache (models 92x, 9Gx, 9Hx)			43W5244
9	Microprocessor, 2.66 GHz 4M L2 cache (models 72x, 74x, 76x, 78x, 7Gx)			41Y4253
10	Cage assembly, hard disk drive (all models)		41Y3895	
11	Bezel assembly (all models)	39M0469		
12	DVD Combo drive, GCC-4482B (all models)	39M3539		
12	DVD Combo drive, TS-H292B (all models)	26K5429		
12	DVD Combo drive, TS-H492C (all models)	39M0135		
12	DVD-ROM drive, GDR-8163B (option)	39M3515		
12	DVD-ROM TS-H352A (option)	39M3517		
12	DVD multi-burner plus drive GSA-H10N (option)	42C0951		
12	Multi-burner plus drive GSA-4163B (option)	39M3519		

Table 2. Part listing, Type 9229 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
13	EMC shield, 5.25 inch (all models)	42C7434		
	Adapter, video, NVIDIA Quadro FX 550 (model 52x)	13M8461		
	Adapter, video, NVIDIA Quadro FX 1500 (models 62x, 78x)	13M8479		
	Adapter, video, NVIDIA Quadro FX 3500 (models 72x, 74x, 76x, 92x)	13M8457		
	Adapter, video, NVIDIA Quadro NVS 285 (with DDR2) (model 42x)	13M8493		
	Adapter, video, NVIDIA Quadro FX 4500 PCIExpress x16 (option)	13M8429		
	Audio, front panel input/output assembly (all models)		41Y4281	
	Battery, 3.0 volt (all models)	33F8354		
	Cable, 1394 (all models)		42C7418	
	Cable, audio (all models)		39Y8421	
	Cable, C2 security (all models)		42C7412	
	Cable, diskette drive (option)		39Y8384	
	Cable, dongle - DVI to VGA (models 52x, 62x, 6Gx, 72x, 74x, 76x, 78x, 7Gx, 92x, 9Gx, 9Hx)	25R9043		
	Cable, pigtail DMS59 to dual VGA (model 42x, 6Gx, 7Gx, 9Gx, 9Hx)	25R9045		
	Cable, pigtail DMS59 to dual VGI (option)	25R9048		
	Cable, IDE 2-drop (models 42x, 52x, 62x, 6Gx, 72x, 74x, 76x, 78x, 7Gx, 92x, 9Gx, 9Hx)	13N2466		
	Cable, SAS/SATA 4-drop (models 72x, 74x, 76x, 92x, 9Gx)		41Y4256	
	Cable, SATA (models 42x, 52x, 62x, 6Gx, 78x, 7Gx, 9Hx)		39Y9810	
	Carrier, tape drive (optional)	25R0037		
	Cartridge, tape drive (optional)	25R0038		
	Chassis, assembly (all models)			41Y3889
	Clips, optical drive retention (all models)	42C7438		
	Diskette drive, 1.44 MB (optional)	39M0101		
	EMC shield diskette drive (all models)		42C7436	
	Hard disk drive, SAS 36 GB 15K (option)		39R7358	
	Hard disk drive, SAS 73 GB 15K (models 72x, 74x, 76x, 92x, 9Gx)		39R7360	
	Hard disk drive, SAS 73 GB 10K (option)		39R7352	
	Hard disk drive, SATA 80 GB (option)		39M4503	
	Hard disk drive, SAS 146 GB 10K (option)		39R7354	
	Hard disk drive, SATA 160 GB (models 42x, 52x, 62x, 6Gx, 78x, 7Gx)		39M4507	
	Hard disk drive, SATA 250 GB (model 9Hx)		39M4511	
	Hard disk drive, SATA 500 GB (option)		39M4517	
	Hard disk drive, SATA 750 GB (option)		43W7575	
	Hard disk drive mounting bracket assembly with snubber (all models)	39M0462		

Table 2. Part listing, Type 9229 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
	Heat sink retention module kit		39M0483	
	Keyboard, USB (all models)	42C0060		
	Miscellaneous kit (all models)	42C7439		
	Mouse, three button, USB	40K9203		
	NetXtreme ECP G Ethernet adapter	39Y6100		
	NetXtreme 1000 Ethernet adapter	39Y6081		
	Planar shield (all models)		39M0475	
	Power cord, 1.8 M	39M5080		
	Tempest SAS adapter (models 72x, 74x, 76x, 92x, 9Gx)		42C1279	
	PRO/1000 GT server Ethernet adapter	39Y6107		
	Switch, power/LED cable assembly (all models)		39M0472	
	System service label (all models)	41Y3892		

Product recovery CDs

Operating system, language, and language code	CRU part number
Windows XP Professional 32-bit, U.S. English (EN)	42D2463
Windows XP Professional 32-bit, French (FR)	42D2464
Windows XP Professional 32-bit, German (GE)	42D2465
Windows XP Professional 32-bit, Italian (IT)	42D2466
Windows XP Professional 32-bit, Spanish (SP)	42D2467
Windows XP Professional 32-bit, Danish (DK)	42D2468
Windows XP Professional 32-bit, Dutch (NL)	42D2469
Windows XP Professional 32-bit, Norwegian (NO)	42D2470
Windows XP Professional 32-bit, Swedish (SV)	42D2471
Windows XP Professional 32-bit, Finnish (FI)	42D2472
Windows XP Professional 32-bit, Japanese (JP)	42D2473
Windows XP Professional 32-bit, Korean (KR)	42D2474
Windows XP Professional 32-bit, Chinese, Simplified (CS)	42D2475
Windows XP Professional 32-bit, Hong Kong (HK)	42D2476
Windows XP Professional 32-bit, Chinese, Traditional (CT)	42D2477
Windows XP Professional 64-bit, U.S. English (EN)	42D2523
Windows XP Professional 64-bit, Japanese (JP)	42D2524
Vista RDVD 32-bit, (Type 9229, models 76, 78, 7G), U.S. English (EN)	43W6920
Vista RDVD 32-bit, (Type 9229, models 76, 78, 7G), Japanese (JP)	43W6921
Vista RDVD 64-bit, (Type 9229, models 76, 78, 7G), US English (US)	43W6922
Vista RDVD 64-bit, (Type 9229, models 76, 78, 7G), Japanese (JP)	43W6923

Operating system, language, and language code	CRU part number
Vista RDVD 64-bit, (Type 9229, models 76, 78, 7G), French (FR)	43W6924
Vista RDVD 64-bit, (Type 9229, models 76, 78, 7G), German (GE)	43W6925
Vista RDVD 64 bit, (Type 9229, models 76, 78, 7G), Italian (IT)	43W6968
Vista RDVD 64 bit, (Type 9229, models 76, 78, 7G), Spanish (SP)	43W6969
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Chinese, Simplified (CS)	43W6970
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Chinese, Traditional (CT)	43W6971
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Chinese, Traditional (CT), Hong Kong (HK)	43W6972
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Korean (KR)	43W6973
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Danish (DK)	43W6974
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Dutch (NL)	43W6975
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Swedish (SV)	43W6976
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Finnish (FI)	43W6977
Vista RDVD 64 bit (Type 9229, models 76, 78, 7G), Norwegian (NO)	43W6978

Product recovery DVDs

Operating system, language, language code	CRU part number
Windows Vista Business 64-bit, U.S. English (EN)	43W9260
Windows Vista Business 64-bit, Japanese (JP)	43W9261
Windows Vista Business 64-bit, French/Italian/German/Spanish/Danish (FR, IT, GE, SP, DK)	43W9262
Windows Vista Business 64-bit, Dutch/Swedish/Norwegian/Finnish (NL, SV, NO, FI)	43W9263
Windows Vista Business 64-bit, Chinese - Simplified/Chinese - Traditional/Korean (CS, CT, KR)	43W9264
Windows Vista Business 64-bit, Russian/Polish/Arabic/Hungarian/Czech (RU, PL, AR, HU, CZ)	43W9265

Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
39M5206	China
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
39M5123	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
39M5130	Denmark
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
39M5151	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
39M5158	Liechtenstein, Switzerland
39M5165	Chile, Italy, Libyan Arab Jamahiriya
39M5172	Israel

IBM power cord part number	Used in these countries and regions
39M5095	220 - 240 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
39M5081	110 - 120 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela
39M5219	Korea (Democratic People's Republic of), Korea (Republic of)
39M5199	Japan
39M5068	Argentina, Paraguay, Uruguay
39M5226	India
39M5233	Brazil

Chapter 4. Removing and replacing computer components

Replaceable components are of three types:

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

See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine whether a component is a Tier 1 CRU, Tier 2 CRU, or FRU.

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

Installation guidelines

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

- Read the safety information that begins on page vii and “Handling static-sensitive devices” on page 26. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the computer while the cover is removed, make sure that no one is near the computer and that no tools or other objects have been left inside the computer.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the computer, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- When you have to access the inside of the computer, you might find it easier to lay the computer on its side.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the computer, open or close a latch, and so on.
- When you are finished working on the computer, reinstall all safety shields, guards, labels, and ground wires.

System reliability guidelines

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

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- There is adequate space around the computer to allow the computer cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the computer. Do not place objects in front of the fans. For proper cooling and airflow, replace the computer cover before you turn on the computer. Operating the computer for extended periods of time (more than 30 minutes) with the computer cover removed might damage computer components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.
- You do not operate the computer without the air baffle installed. Operating the computer without the air baffle might cause the microprocessor to overheat.

Handling static-sensitive devices

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

Notes:

1. If you are instructed to return a device or component, follow all packaging instructions. Use any packaging materials for shipping that are supplied to you.
2. Use product-specific electrostatic-discharge procedures when they exceed the requirements that are specified in this document.
3. Make sure that the electrostatic-discharge-protective devices that you use have been certified (ISO 9000) as fully effective.

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

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

Returning a device or component

If you are instructed to return a device or component, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Removing and replacing Tier 1 CRUs

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

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

Removing the side cover

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

To remove the side cover, complete the following steps.

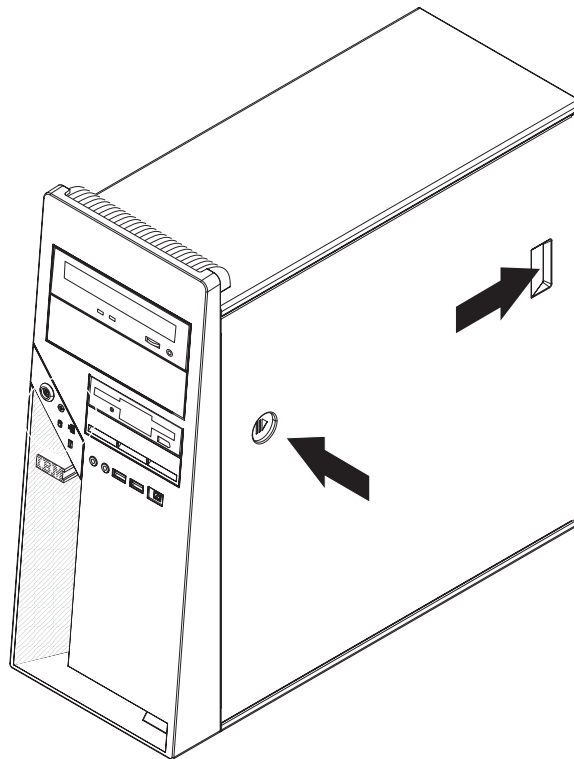


Figure 7. Removing the side cover

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices.
3. Disconnect all external cables and power cords.
4. Unlock the side cover, if it is locked.
5. Press the cover-release button on the side of the computer, and push the side cover toward the rear of the computer. Lift the side cover off the computer and set it aside.

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

Installing the side cover

To install the side cover, complete the following steps.

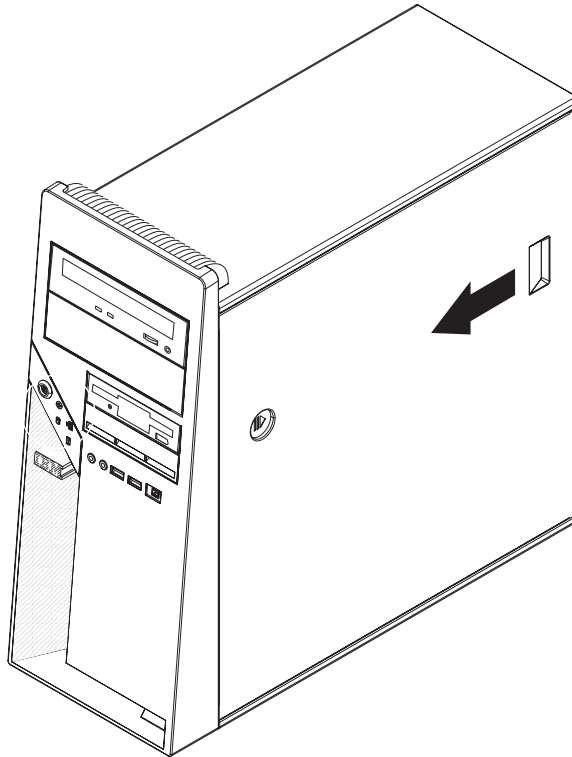


Figure 8. Installing the side cover

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

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have removed all work tools or parts from inside the computer.
2. If you removed the internal drive-bay bracket, reinstall it before you install the side cover (see “Installing the internal drive-bay bracket” on page 49).
3. If you removed the bezel, reinstall it before you install the side cover (see “Installing the bezel” on page 30).
4. Install the side cover by placing it into position on the computer. Make sure that the lip on the bottom of the cover rests on the ledge on the bottom of the chassis. Slide the side cover forward to secure the side cover in place.
5. Lock the side cover, if you unlocked it during removal.
6. Reconnect the external cables and power cords to the computer; then, connect the power cords to electrical outlets.
7. Turn on the attached devices; then, turn on the computer.

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

Removing the bezel

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

To remove the bezel, complete the following steps.

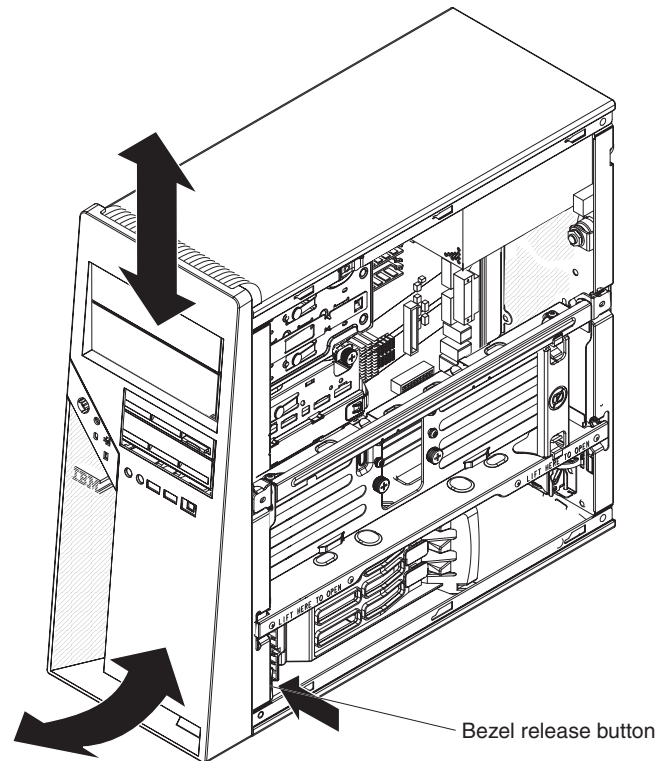


Figure 9. Removing the bezel

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Press the bezel release button and pull the bottom of the bezel away from the chassis; then, pull downward on the handle. The top tabs of the bezel are disengaged from the matched holes in the chassis.
5. Remove the bezel from the computer and store the bezel for future use.

Installing the bezel

To install the bezel, complete the following steps.

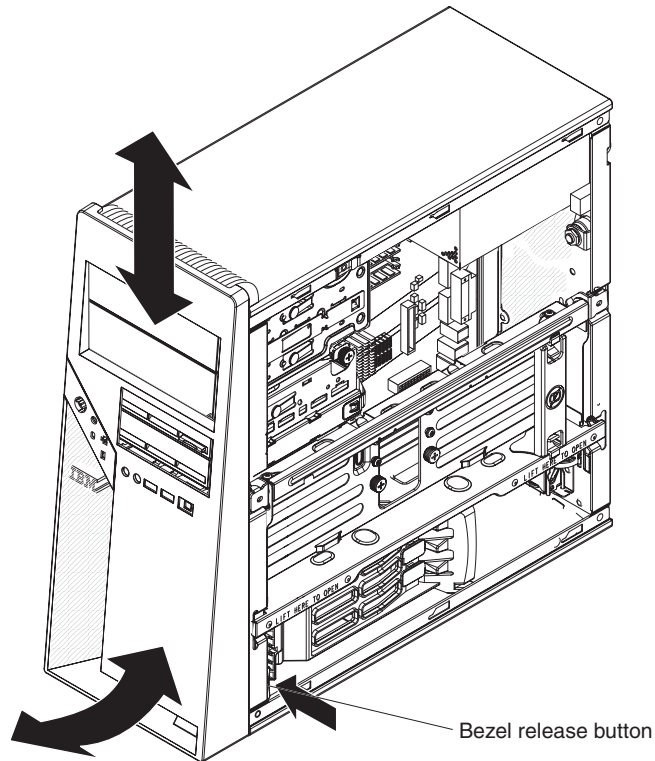


Figure 10. Installing the bezel

1. Insert the four tabs at the top of the bezel into the matching holes on the computer chassis above drive bay 1.
2. Push the bottom of the bezel toward the computer until the two tabs at the bottom of the bezel snap into place.
3. Install the side cover (see “Installing the side cover” on page 28).
4. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the front adapter-retention bracket

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

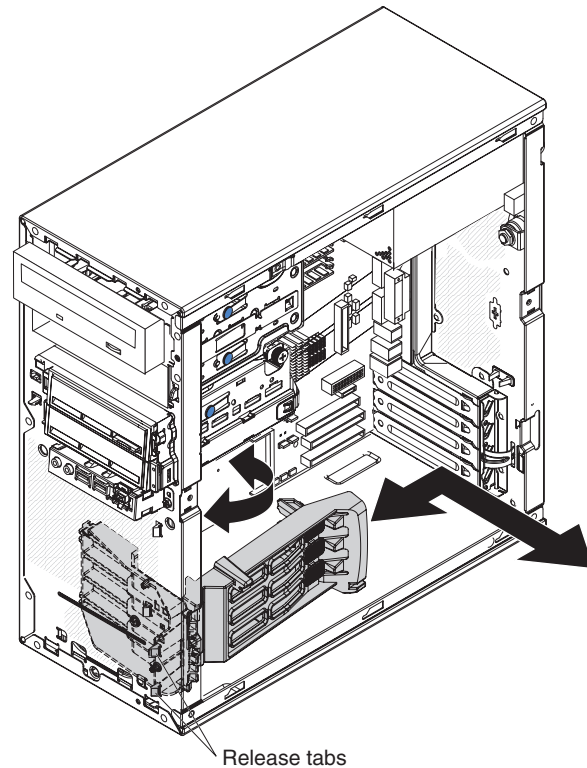


Figure 11. Removing the front adapter-retention bracket

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
5. Remove the front bezel (see “Removing the bezel” on page 29).

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

6. Remove any full-length adapters that are installed (see “Removing an adapter” on page 37).
7. Disconnect the speaker wire from the system-board connector.
8. From the front of the computer, press down and inward on the two retention tabs that secure the top of the adapter-retention bracket to the chassis.
9. Carefully tilt the adapter-retention bracket toward the rear of the computer and disengage the lower retention tabs from the chassis.
10. Pull the speaker wire out of the adapter-retention bracket and remove the retention bracket from the computer.
11. If you are instructed to return the adapter-retention bracket, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the front adapter-retention bracket

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

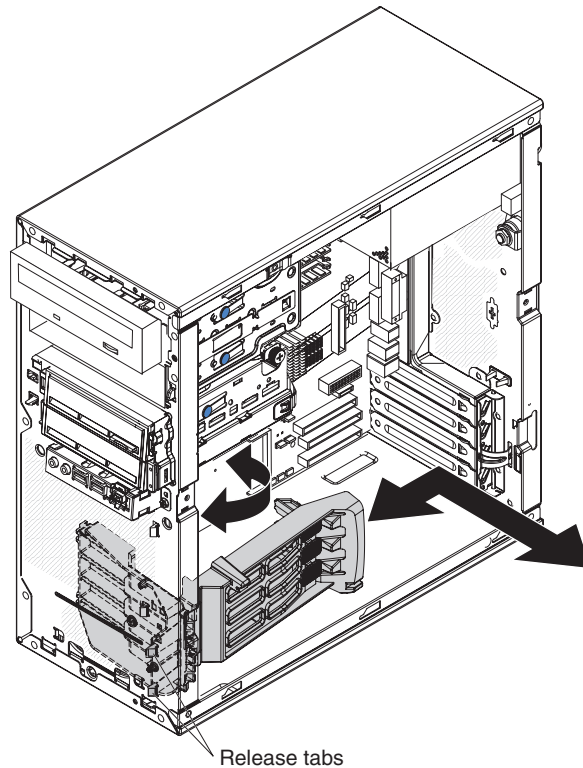


Figure 12. Installing the front adapter-retention bracket

1. Insert the speaker wire through an opening in the bottom of the adapter-retention bracket.
2. Engage the lower retention tabs of the adapter-retention bracket with openings in the chassis and tilt the bracket toward the front of the computer.
3. Press the two retention tabs at the top of the adapter-retention bracket through the openings in the front of the computer until they lock securely.
4. Reconnect the speaker wire to the system-board connector.
5. Install any full-length adapters that were removed.
6. Install the front bezel (see “Installing the bezel” on page 30).
7. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
8. Install the side cover (see “Installing the side cover” on page 28).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the microprocessor fan assembly

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

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
5. Remove the front bezel (see “Removing the bezel” on page 29).
6. Press the air-baffle release tab toward the handle and pull on the handle to remove the air baffle from the computer.

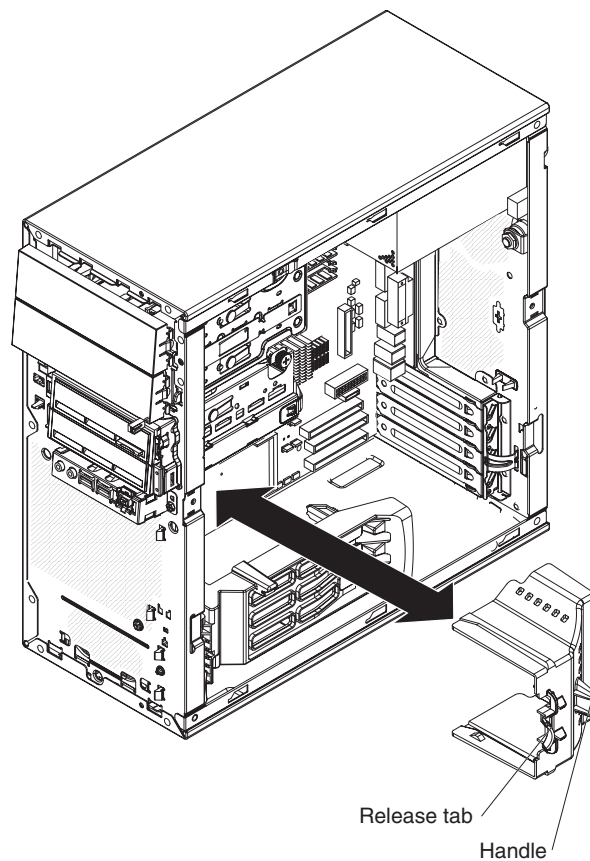


Figure 13. Removing the air baffle

7. Remove the front adapter-retention bracket (see “Removing the front adapter-retention bracket” on page 31).

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

8. Disconnect the fan power cable from the system board (see “System-board internal connectors” on page 7 for the location of the microprocessor fan connector).
9. From the front of the computer, press down and inward on the two retention tabs that secure the top of the fan housing to the chassis.

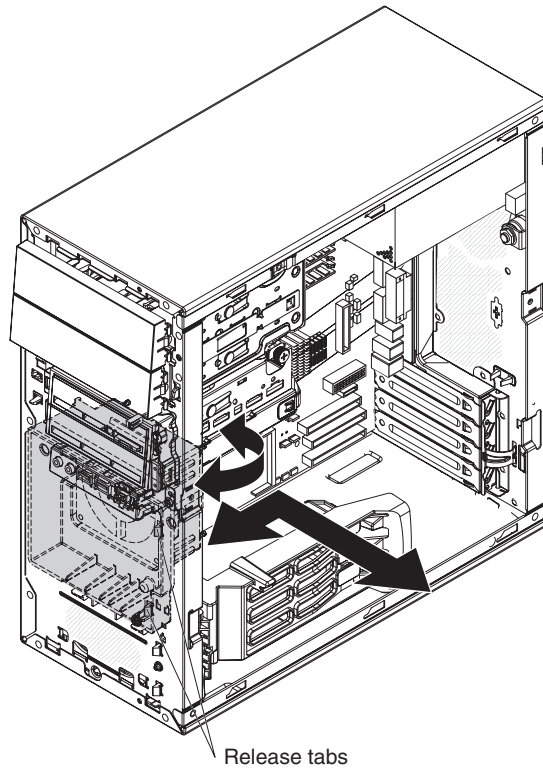


Figure 14. Removing the fan housing

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

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

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

Installing the microprocessor fan assembly

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

1. Reinstall the internal speaker if you removed it.
2. Engage the lower retention tabs of the fan housing with openings in the chassis and tilt the housing toward the front of the computer.
3. Press the two retention tabs at the top of the fan housing through the openings in the front of the computer until they lock securely.

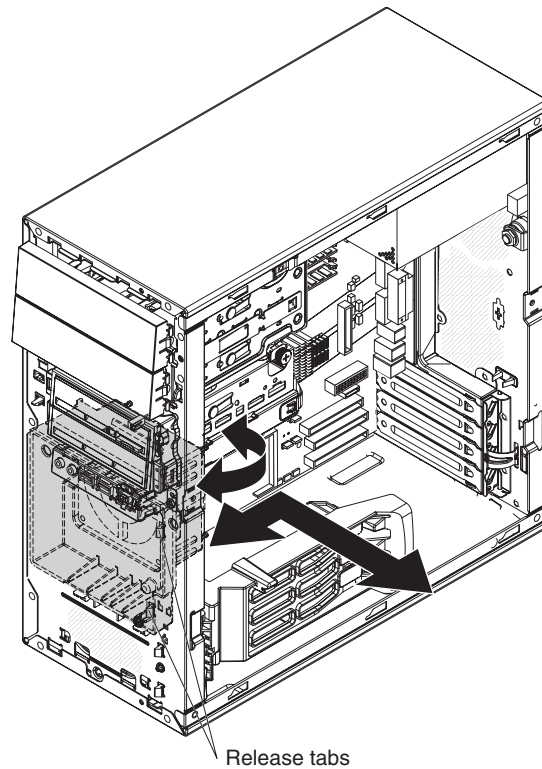


Figure 15. Installing the fan housing

4. Reconnect the fan power cable to the system board (see “System-board internal connectors” on page 7 for the location of the microprocessor fan connector).
5. Install the front adapter-retention bracket (see “Installing the front adapter-retention bracket” on page 32).
6. Position the air-baffle over the end of the fan housing and the edge of the heat sink; then, press it in place until it locks securely.

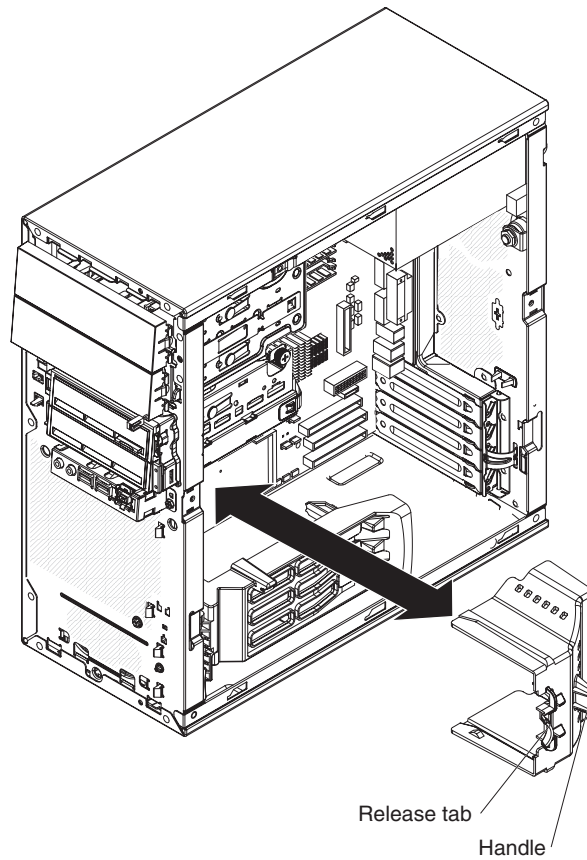


Figure 16. Installing the air baffle

7. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
8. Install the bezel if you removed it (see “Removing the bezel” on page 29).
9. Install the side cover (see “Installing the side cover” on page 28).
10. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing an adapter

This section describes the removal of adapters in PCI slots 1 through 4 on the system board.

To remove an adapter, complete the following steps.

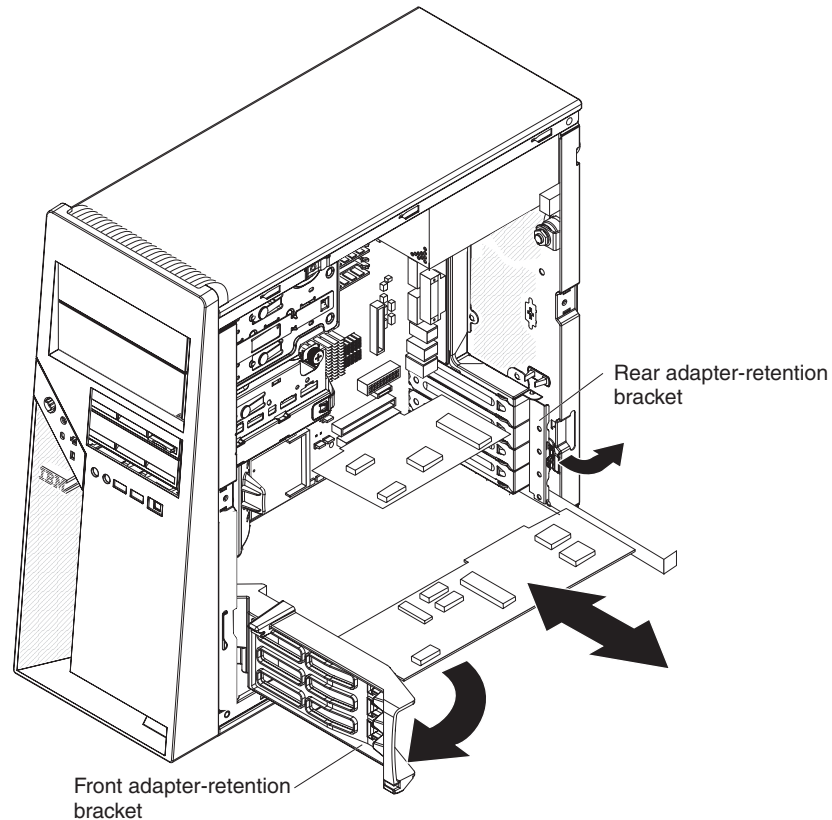


Figure 17. Removing an adapter

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Lift up on the bottom edge of the internal drive-bay bracket and rotate the bracket out of the computer.
5. Disconnect any cables to the adapter or any cables that impede access to the adapter.
6. For full-length adapters, rotate the front adapter-retention bracket to the fully open (unlocked) position.

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

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

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

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

9. If you are instructed to return the adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
10. If you are not replacing the adapter, install an expansion-slot cover in the expansion-slot opening.

Installing an adapter

For information about the types of adapters that the computer supports and other information that you might consider when you install an adapter, see the *User's Guide* on the IBM *IntelliStation Documentation CD*.

To install an adapter, complete the following steps.

Note: When you install the NVIDIA Quadro FX 1500 or NVIDIA Quadro FX 3500 video adapters in the computer, do not set the analog resolution above 1600 x 1200 @ 60 Hz. This is the highest resolution supported for these adapters. In addition, when you use a cathode ray tube (CRT) type monitor, the monitor cable must come with a ferrite suppression on both ends of the monitor cable.

1. Check the instructions that come with the adapter for any requirements, restrictions, or cabling instructions. It might be easier to route cables before you install the adapter.
2. Follow the instructions that come with the adapter to set jumpers or switches, if any.

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

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

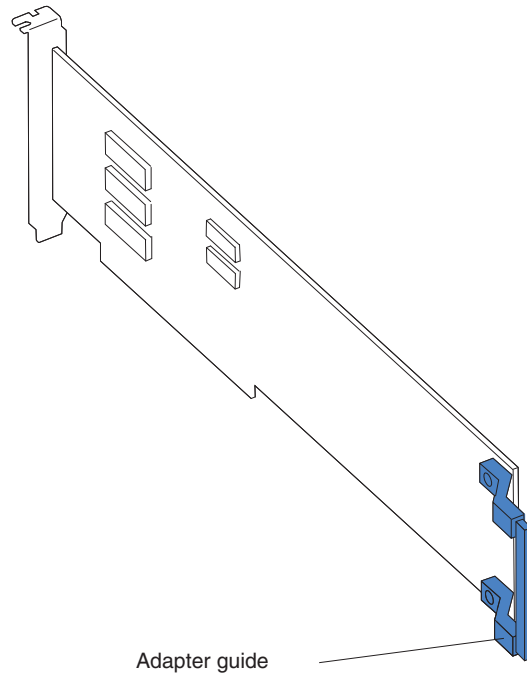


Figure 18. Adapter guide location

4. Make sure that the rear adapter-retention bracket is rotated to the fully open (unlocked) position and, for full-length adapters, the front adapter-retention bracket is rotated to the fully open (unlocked) position.

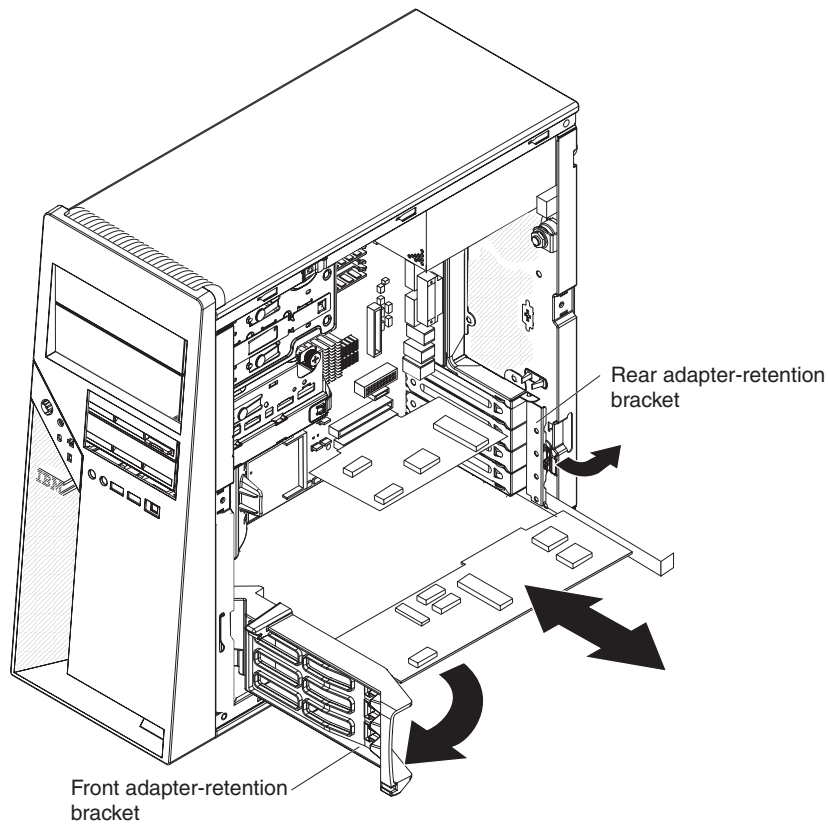


Figure 19. Installing an adapter

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

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

6. Rotate the rear adapter-retention bracket to the closed (locked) position.
7. Connect any required cables to the adapter. Make sure that they do not block the flow of air from the fan.
8. If you have installed a full-length adapter, press down on the top tab of the front adapter-retention bracket to lock it in place.
9. Rotate the internal drive-bay bracket back into the computer and press down on the bracket to lock it into place.
10. Install the side cover (see “Installing the side cover” on page 28).
11. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing a DIMM

To remove a dual inline memory module (DIMM), complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).

Note: For easier access to the memory modules on the system board, it might be easier to remove the drive cage from the computer.

5. Loosen the thumbscrew at the rear of the drive cage.
6. Slide the drive cage to the rear to disengage it from the upper clips, and lift the cage out of the computer.

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

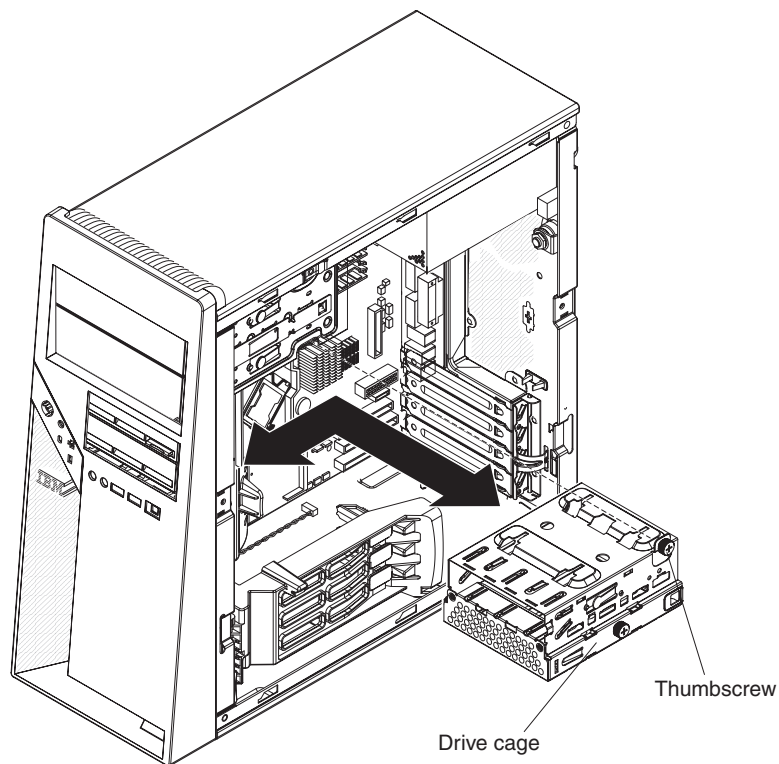


Figure 20. Removing the drive cage

7. Disconnect any cables that impede access to the DIMMs.

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

8. Carefully open the retaining clips on each end of the DIMM connector and remove the DIMM (see Figure 21 on page 42).

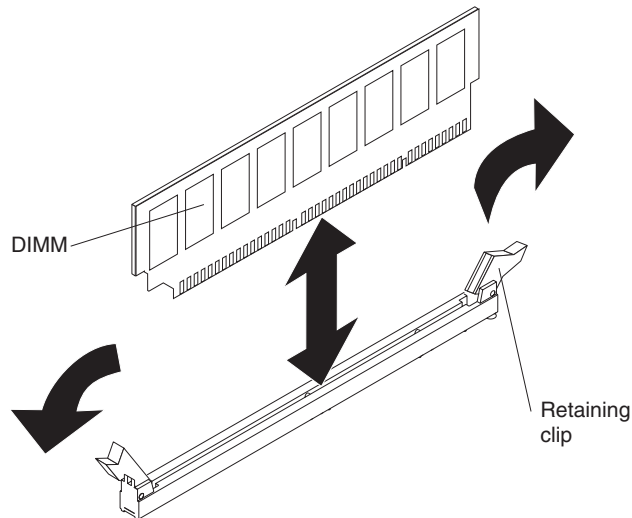


Figure 21. Removing a DIMM

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

Installing a DIMM

To install a DIMM, complete the following steps:

1. Make sure that the retaining clips on each end of the DIMM connector are fully open.
2. Touch the static-protective package that contains the new DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.
3. Turn the DIMM so that the contacts align correctly with the connector.
4. Insert the DIMM into the connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and reinsert it.

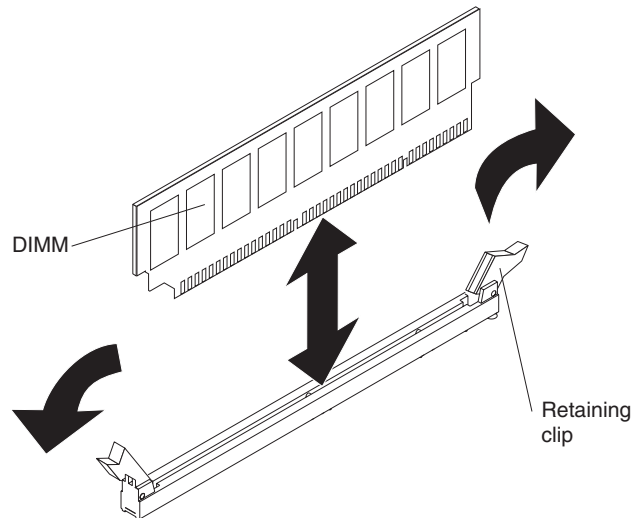


Figure 22. Installing a DIMM

5. Reinstall the drive cage if you removed it:
 - a. Place the drive cage into position and slide it forward to engage the upper clips.
 - b. Tighten the thumbscrew at the rear of the drive cage.
 - c. Reconnect the power cables to the drives in the cage if any were disconnected.

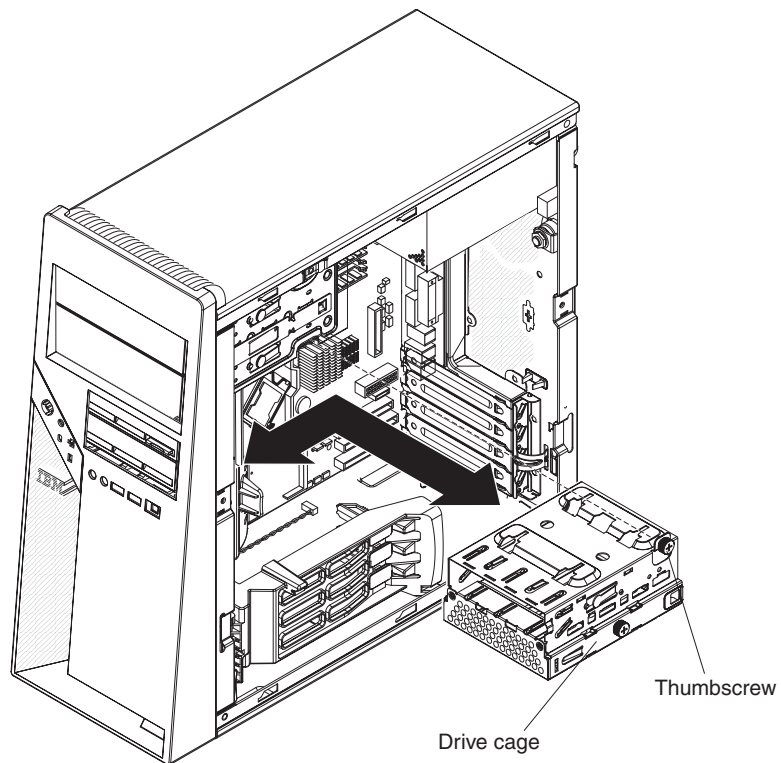


Figure 23. Installing the drive cage

6. Reconnect any cables that you disconnected during removal.

7. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
8. Install the side cover (see “Installing the side cover” on page 28).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the battery

The following notes describe information that you must consider when removing and replacing the battery:

- IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following instructions.

Note: In the U. S., call 1-800-IBM-4333 for information about battery disposal.

- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.
- To order replacement batteries, call 1-800-IBM-SERV within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your support center or business partner.

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

Statement 2:



CAUTION:

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

Do not:

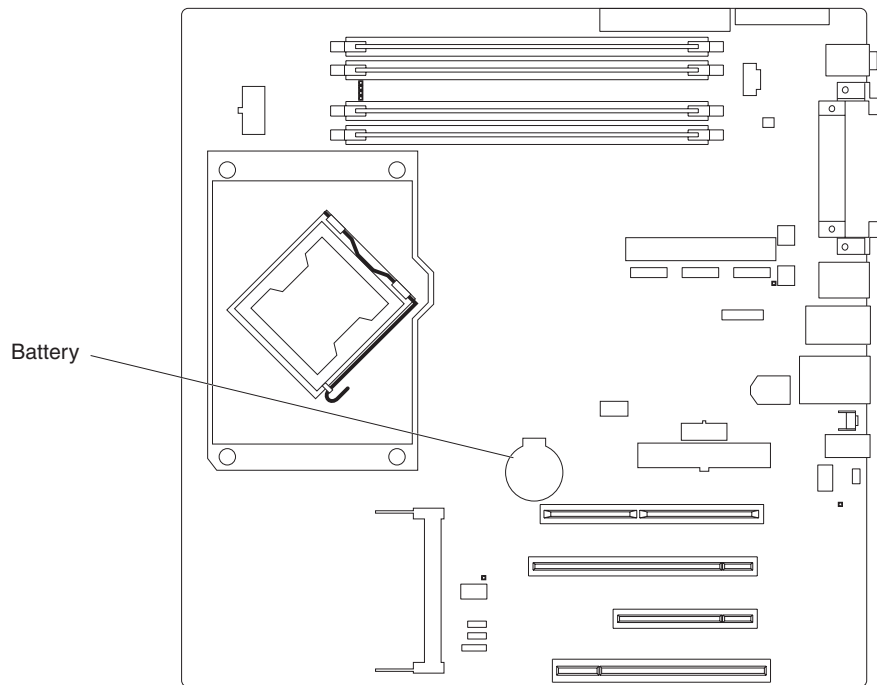
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

To remove the battery, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).

4. Remove the internal drive-bay bracket, if one is installed (see “Removing the internal drive-bay bracket” on page 48).
5. Remove any adapters that impede access to the battery.
6. Locate the battery on the system board.



7. Remove the battery:
 - a. Use a finger to lift the battery up out of its housing.
 - b. Lift the battery from the socket.

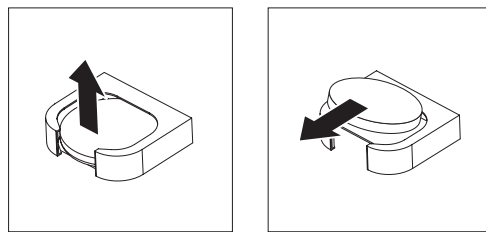


Figure 24. Removing the battery

8. Dispose of the battery as required by local ordinances or regulations. See “Battery return program” on page 136 for more information.

Installing the battery

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

- You must replace the battery with a lithium battery of the same type from the same manufacturer.
- After you replace the battery, you must reconfigure the system and reset the system date and time.
- 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.

- To avoid possible danger, read and follow the following safety statement.

Statement 2:



CAUTION:

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

Do not:

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

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

To install the battery, complete the following steps:

1. Follow any special handling and installation instructions that come with the replacement battery.
2. Insert the new battery:
 - a. Tilt the battery and insert it into the socket with the smaller side facing the housing.
 - b. Press the battery down into the socket (see Figure 25) until it snaps into place.

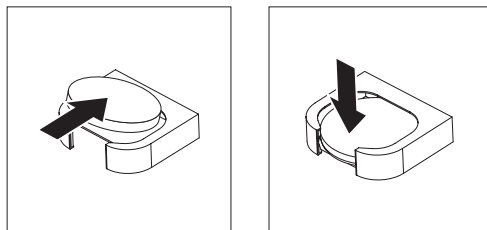


Figure 25. Installing the battery

3. Reinstall any adapters that were removed.
4. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
5. Install the side cover (see “Installing the side cover” on page 28).
6. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.
7. Start the Configuration/Setup Utility program and reset the configuration:
 - Set the system date and time.
 - Set passwords if necessary.
 - Reconfigure the computer.
 - Save the configuration.

Removing the internal speaker

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

To remove the speaker, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
5. Remove the front bezel (see “Removing the bezel” on page 29).

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

6. Remove any full-length adapters that are installed.
7. Disconnect the speaker wire from the system board connector.
8. Remove the front adapter-retention bracket (see “Removing the front adapter-retention bracket” on page 31).
9. Remove the microprocessor fan assembly (see “Removing the microprocessor fan assembly” on page 33).
10. Slide the speaker out of its retaining tabs toward the top of the computer and lift it out of the computer.
11. If you are instructed to return the speaker, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the internal speaker

To install the speaker, complete the following steps:

1. Slide the speaker into the retaining tabs in the front of the computer.
2. Install the microprocessor fan assembly (see “Installing the microprocessor fan assembly” on page 35).
3. Install the front adapter-retention bracket (see “Installing the front adapter-retention bracket” on page 32).
4. Reconnect the speaker wire to the system board connector.
5. Install any full-length adapters that were removed.
6. Install the front bezel (see “Installing the bezel” on page 30).
7. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
8. Install the side cover (see “Installing the side cover” on page 28).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing and replacing Tier 2 CRUs

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

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

Removing the internal drive-bay bracket

The internal drive-bay bracket provides two additional hard disk drives (bay 5 and bay 6). When you work with some devices, such as hard disk drives, adapters, and memory modules, you must first remove the internal drive-bay bracket to access the device.

To remove the internal drive-bay bracket, complete the following steps.

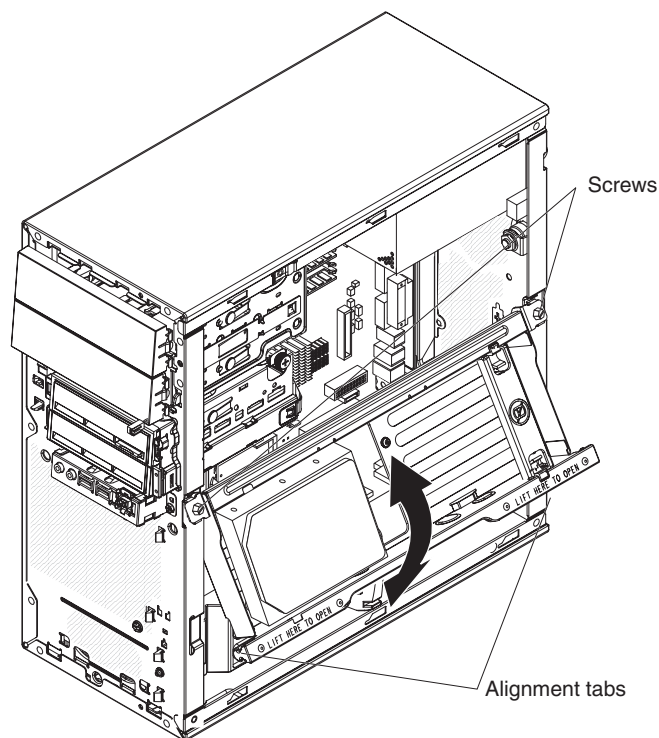


Figure 26. Removing the internal drive-bay bracket

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Disconnect the signal and power cables from the hard disk drive that is installed in the bracket.

Note: To remove the hard disk drive from the bracket, (see “Removing a drive from bay 5 or bay 6” on page 56).

5. Remove the two screws that fasten the top edge of the internal drive-bay bracket to the chassis.

6. Grasp the lower edge of the internal drive-bay bracket and disengage it from the chassis; then, lift the top edge of the bracket from the chassis and remove the bracket from the computer.
7. If you are instructed to return the internal drive-bay bracket, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the internal drive-bay bracket

To install the internal drive-bay bracket, complete the following steps.

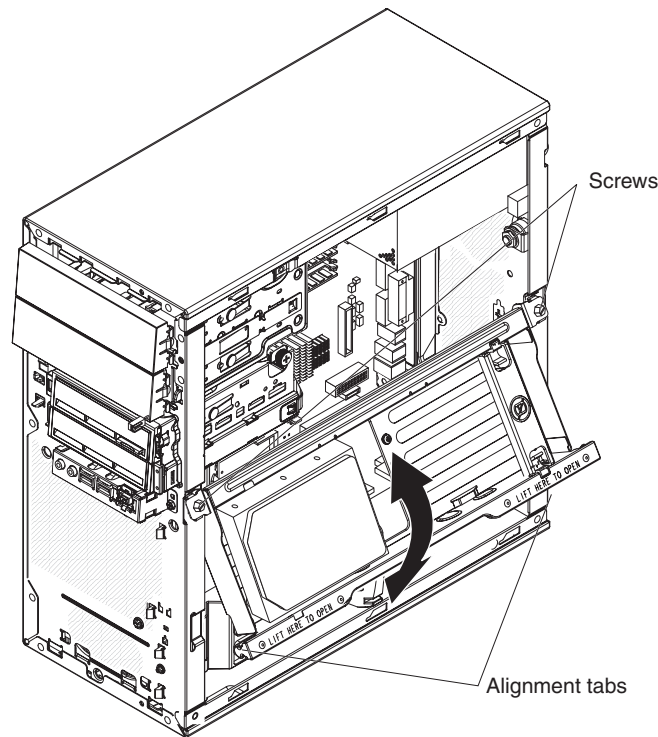


Figure 27. Installing the internal drive-bay bracket

1. Place the top edge of the internal drive-bay bracket into place on the chassis; then, rotate the bracket downward until it engages in the chassis.
2. Install the two screws that fasten the top edge of the internal drive-bay bracket to the chassis.
3. Reconnect the signal and power cables to the hard disk drive that is installed in the bracket.

Note: If you removed the hard disk drive while you removed the bracket, install it now (see “Installing a drive in bay 5 or bay 6” on page 57).

4. Install the side cover (see “Installing the side cover” on page 28).
5. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the computer.

Removing and installing internal drives

This section describes the removal and installation of internal drives. See the *User's Guide* for more information about the types of drives that the computer supports.

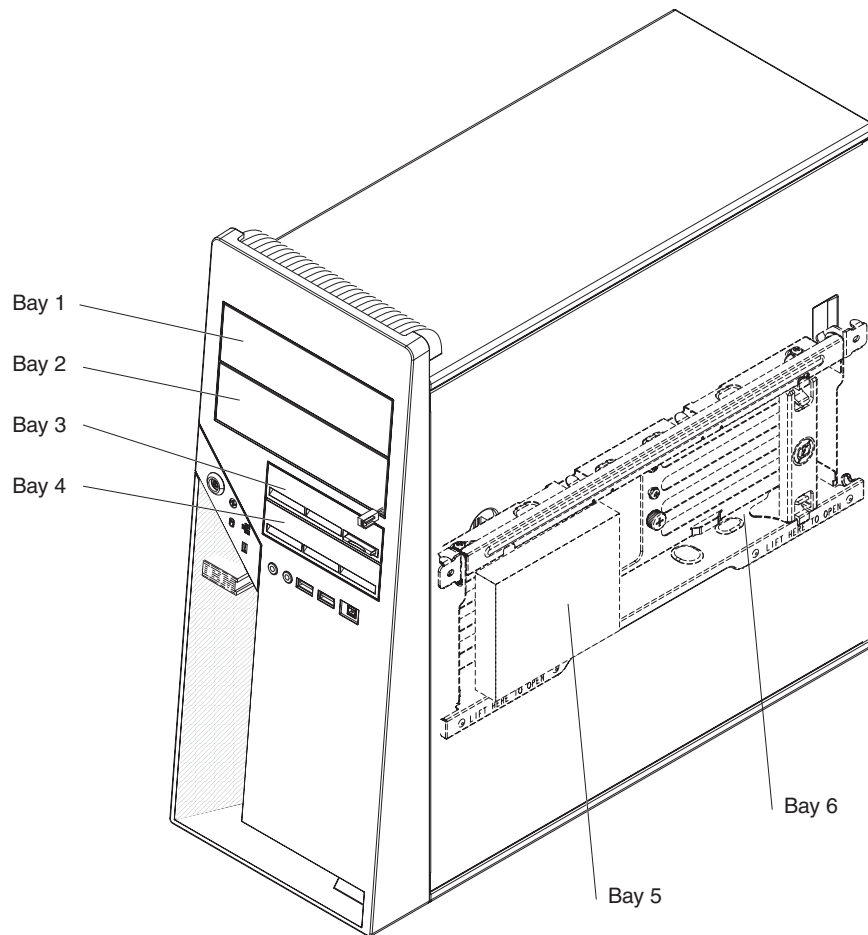


Figure 28. Internal drive bay locations

Removing a drive from bay 1 or 2

To remove a drive from bay 1 or 2, complete the following steps.

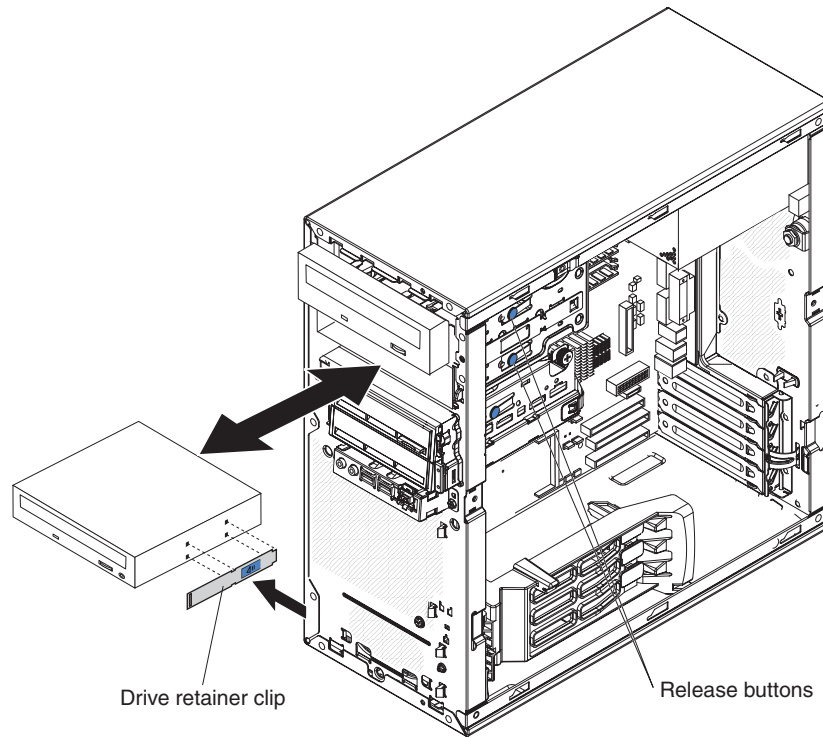


Figure 29. Removing a drive from bay 1 or 2

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the bezel (see “Removing the bezel” on page 29).
5. Disconnect the cables from the drive that you are removing.
6. Release the drive from the bay by pressing the blue release button on the side of the drive; then, pull the drive out of the computer.
7. Remove the blue drive retainer clip from the side of the drive and install it on the replacement drive.
8. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a drive in bay 1 or 2

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

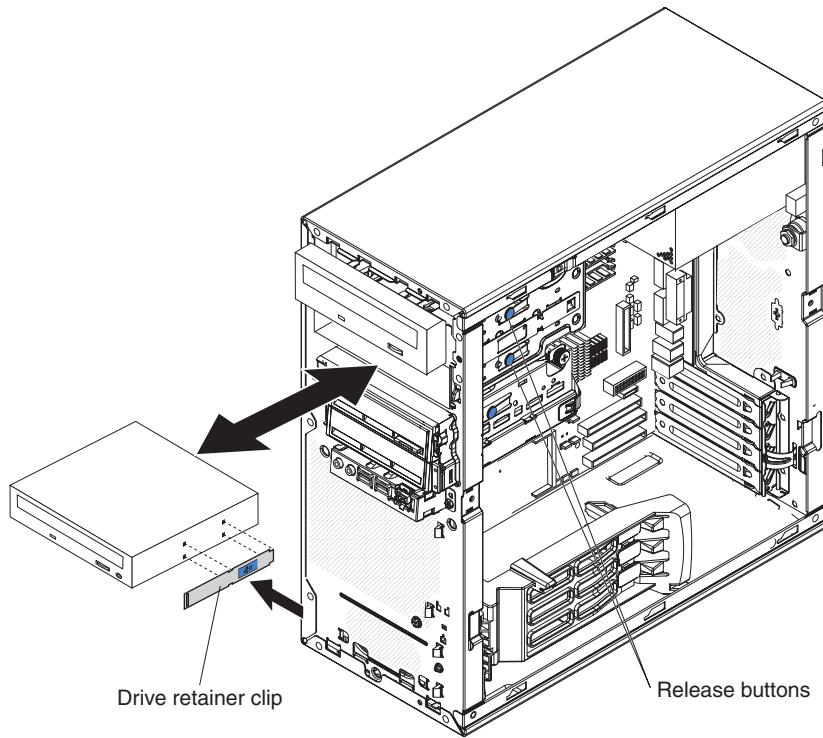


Figure 30. Installing a drive in bay 1 or 2

1. If you are replacing a removed drive with a new drive, make sure that:
 - You have all the cables and other equipment that are specified in the documentation that comes with the new drive.
 - You check the instructions that come with the new drive to determine whether you must set any switches or jumpers on the drive.
 - You have removed the blue drive retainer clip on the side of the original drive and have it available for installation on the new drive.

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

Statement 3



CAUTION:

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

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



DANGER

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

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

Class 1 Laser Product

Laser Klasse 1

Laser Klass 1

Luokan 1 Laserlaite

Appareil À Laser de Classe 1

2. Touch the static-protective package that contains the new drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
3. Follow the instructions that come with the drive to set jumpers and switches.

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 3.5 in. drive in bay 2, attach a 5.25 in. conversion kit to the 3.5 in. drive.
4. Install the blue drive retainer clip into the screw holes on the side of the drive or conversion kit (with the blue side of the clip facing outward).
 5. Push the drive into the front of the bay until it clicks into place.
 6. Reconnect the cables to the drive.

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

7. Install the bezel (see “Removing the bezel” on page 29).
8. Install the side cover (see “Installing the side cover” on page 28).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing a drive from bay 3 or 4

To remove a drive from bay 3 or 4, complete the following steps.

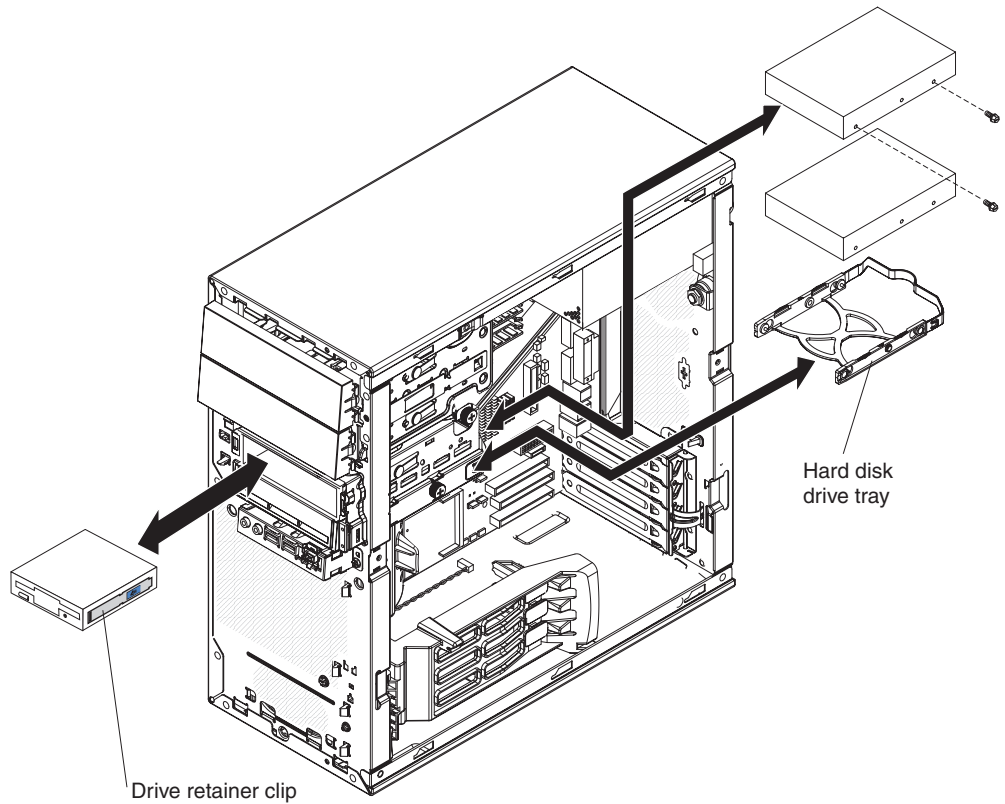


Figure 31. Removing a drive from bay 3 or 4

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. If you are removing a diskette drive, remove the bezel (see “Removing the bezel” on page 29).
5. If removing a drive from bay 4, lift up on the bottom edge of the internal drive-bay bracket and rotate the bracket out of the computer.
6. Disconnect the cables from the drive that you are removing.

7. To remove the drive, use one of the following procedures:
 - For a diskette drive in bay 3, press the blue latch on the side of the drive cage and pull the drive out of the front of the computer.
 - For a hard disk drive in bay 4, loosen the thumbscrew on the side of the drive cage; then, grasp the handle of the drive tray at the rear of the drive and carefully pull the drive out of the rear of the drive cage.
8. If you are replacing the removed drive with a new drive, remove the drive tray or retainer clip from the original drive and store it in a safe place.
9. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a drive in bay 3 or 4

To install a drive in bay 3 or 4, complete the following steps.

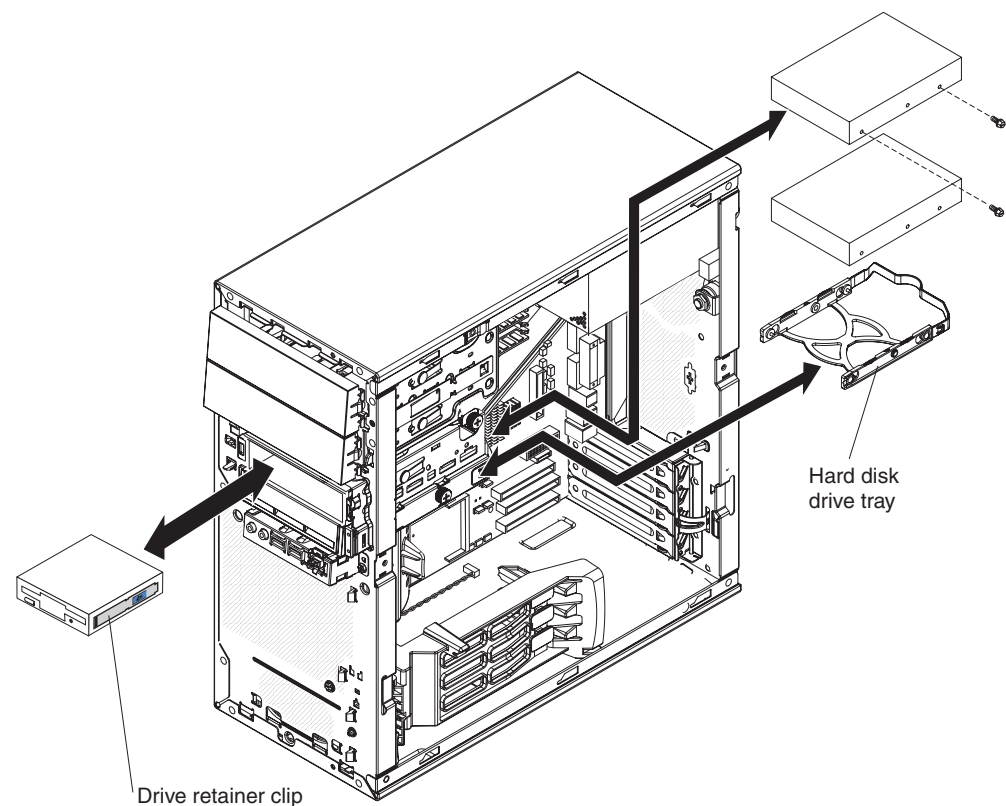


Figure 32. Installing a drive in bay 3 or 4

1. If you are replacing a removed drive with a new drive, make sure that:
 - You have all the cables and other equipment that are specified in the documentation that comes with the new drive.
 - You check the instructions that come with the new drive to determine whether you must set any switches or jumpers on the drive.
 - You have removed the drive tray or blue drive retainer clip from the original drive, and have it available for installation on the new drive.
2. Touch the static-protective package that contains the new drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
3. Follow the instructions that come with the drive to set jumpers and switches.

4. To insert the drive, use one of the following procedures:
 - For a diskette drive in bay 3, install the blue drive retainer clip into the screw holes on the side of the drive; then, push the drive into the front of the bay until it clicks into place.
 - For a hard disk drive in bay 4, install the hard disk drive tray onto the drive; then, push the drive into the rear of the bay until it clicks into place, and tighten the thumbscrew on the side of the drive cage.
5. Reconnect the cables to the drive.

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

6. Rotate the internal drive-bay bracket back into the computer and press down on the bracket to lock it into place, if it was rotated out of the computer.
7. Install the bezel, if you removed it (see “Installing the bezel” on page 30).
8. Install the side cover (see “Installing the side cover” on page 28).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing a drive from bay 5 or bay 6

To remove a drive from bay 5 or bay 6, complete the following steps.

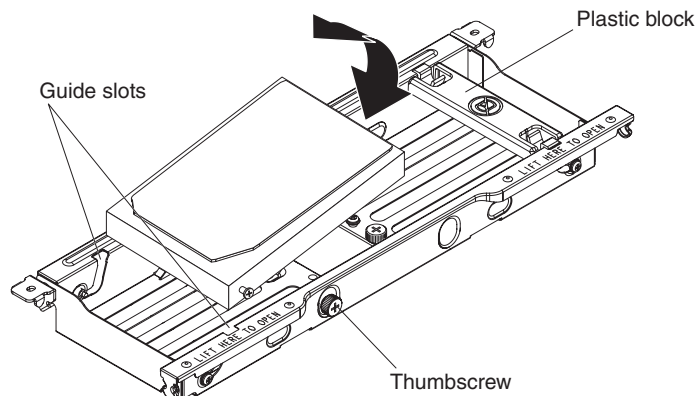


Figure 33. Removing a drive from bay 5

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Disconnect the signal and power cables from the hard disk drive.
5. Remove the thumbscrew at the rear of the drive.
6. Lift the rear of the drive out of the internal drive-bay bracket; then, slide the shoulder screws at the front of the drive out of the guide slots in the internal drive-bay bracket.
7. If you are replacing the hard disk drive with a new drive, remove the two shoulder screws, one on each side, at the front of the drive and store them for reuse.

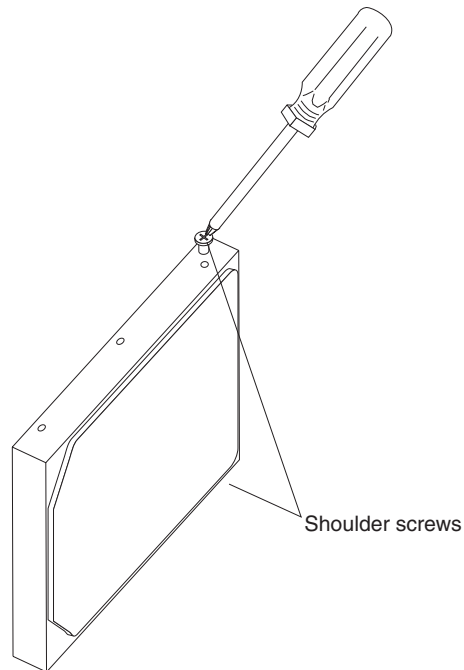


Figure 34. Hard disk drive shoulder screws

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

Installing a drive in bay 5 or bay 6

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

Note: Before you can install a hard disk drive in bay 6, you must remove the plastic block from bay 6.

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

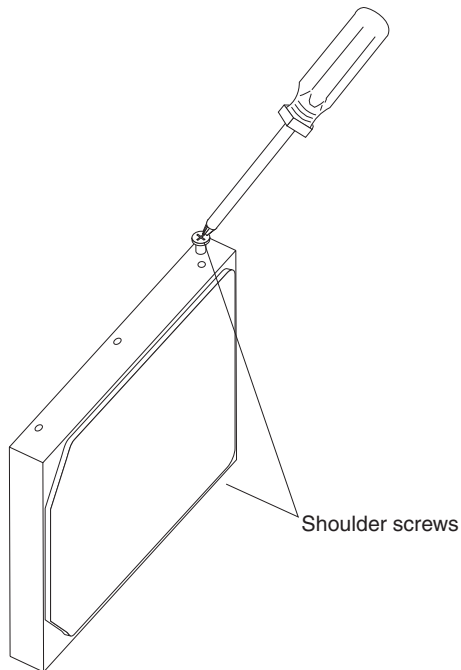


Figure 35. Hard disk drive shoulder screws

2. Position the hard disk drive so that the shoulder screws are aligned with the guide slots in internal drive-bay bracket and slide the front of the drive into the slots.

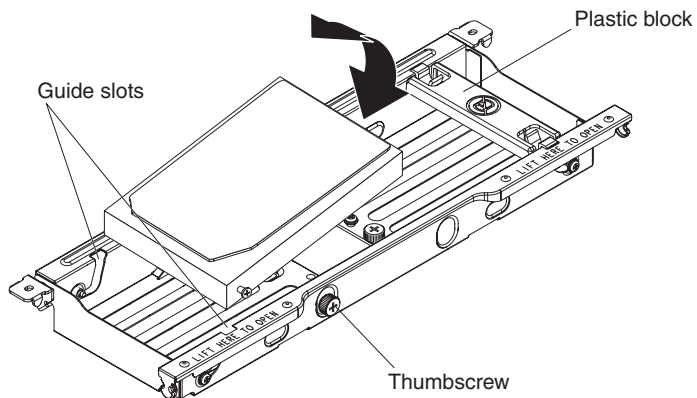


Figure 36. Installing a drive in bay 5

3. Lower the rear of the drive into position in the tray and install the thumbscrew at the rear of the drive.
4. Reconnect the signal and power cables to the hard disk drive in the bracket.
5. Install the side cover (see "Installing the side cover" on page 28).
6. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the computer.

Removing the mini-SAS adapter

To remove the mini-SAS adapter, complete the following steps.

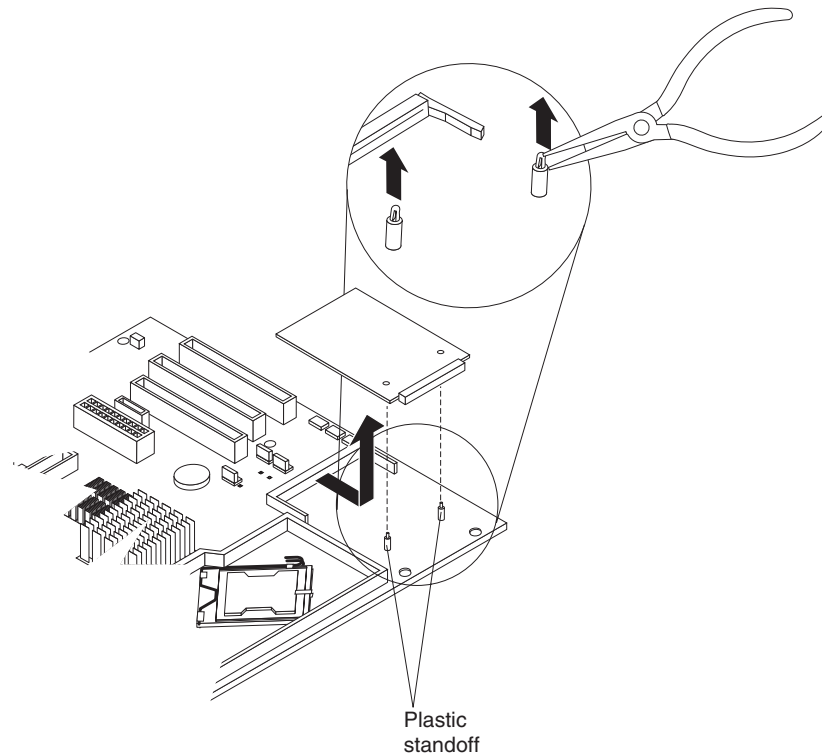


Figure 37. Removing the mini-SAS adapter

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
 2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
 3. Remove the side cover (see “Removing the side cover” on page 27).
 4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
 5. Remove any long adapters that might impede access to the SAS adapter.
 6. Disconnect the signal cable from the SAS adapter.
 7. Press the white retaining clip for the SAS adapter; then, gently pull up on the connector end of the SAS adapter until it disengages from the plastic standoffs. If the standoffs come away from the system board with the adapter, gently pull them out of the adapter and push them back into their apertures on the system board.
- Note:** You can also gently pinch the top of each standoff, using needle-nose pliers, and then pull the SAS adapter away.
8. Carefully pull the SAS adapter toward the front of the computer to remove it from the SAS connector on the system board.
 9. Lift the SAS adapter out of the computer.
 10. If you are instructed to return the SAS adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the mini-SAS adapter

To install the mini-SAS adapter, complete the following steps.

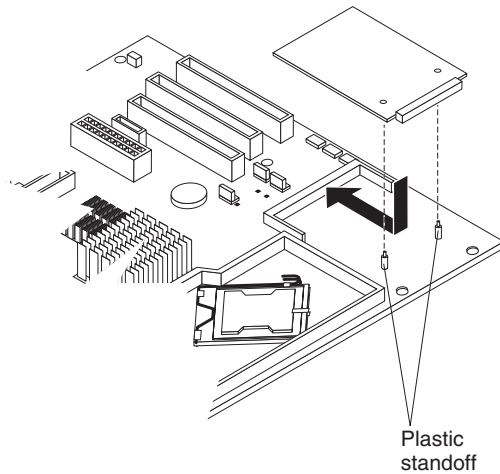


Figure 38. Installing the mini-SAS adapter

1. Insert the front edge of the SAS adapter into the SAS connector on the system board.
2. Lower the rear (connector) edge onto the plastic standoffs and gently press down on the connector until the standoffs securely snap into the SAS adapter.
3. Reconnect the signal cable to the SAS adapter.
4. Install any long adapters that you removed.
5. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
6. Install the side cover (see “Installing the side cover” on page 28).
7. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the power switch/LED assembly

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
5. Remove the bezel (see “Removing the bezel” on page 29).

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

6. Remove the drive cage from the computer (see Figure 20 on page 41):
 - a. Loosen the thumbscrew at the rear of the drive cage.
 - b. Slide the drive cage to the rear to disengage it from the upper clips, and lift the cage out of the computer.

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

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

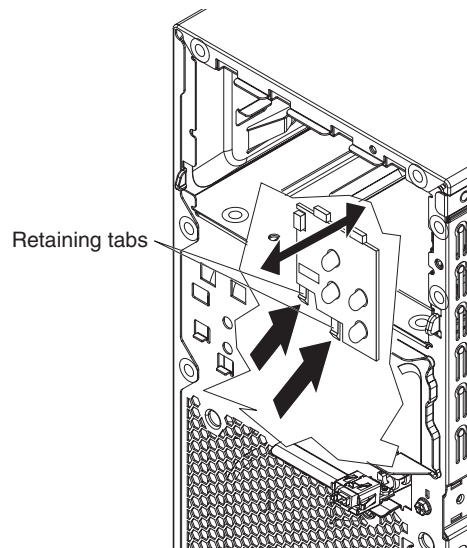


Figure 39. Removing the power switch/LED assembly

10. Disengage the upper retaining tabs from the chassis; then, carefully lift the power switch/LED assembly and cables out of the computer.
11. If you are instructed to return the power switch/LED assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the power switch/LED assembly

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

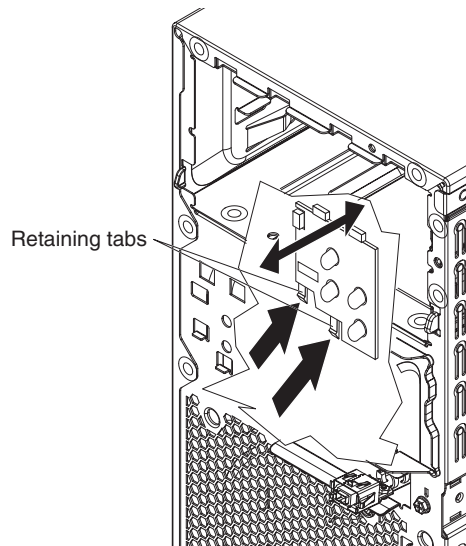


Figure 40. Installing the power switch/LED assembly

1. Insert the upper retaining tabs of the power switch/LED assembly into the openings in the chassis; then, press on the bottom edge of the assembly until the lower retention tabs click into place.
2. Reconnect the front Ethernet activity LED cable to the system board (see “System-board internal connectors” on page 7 for connector location).
3. Reconnect the power switch/LED assembly cable to the front I/O panel card.
4. Reinstall the drive cage if you removed it (see Figure 23 on page 43):
 - a. Place the drive cage into position and slide it forward to engage the upper clips.
 - b. Tighten the thumbscrew at the rear of the drive cage.
 - c. Reconnect the power cables to the drives in the cage if you disconnected any of them.
5. Install the bezel (see “Installing the bezel” on page 30).
6. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
7. Install the side cover (see “Installing the side cover” on page 28).
8. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing and replacing FRUs

FRUs must be installed only by trained service technicians.

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

Removing the front I/O panel

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
5. Remove the bezel (see “Removing the bezel” on page 29).

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

6. Remove the drive cage from the computer (see Figure 20 on page 41):
 - a. Loosen the thumbscrew at the rear of the drive cage.
 - b. Slide the drive cage to the rear to disengage it from the upper clips, and lift the cage out of the computer.

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

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

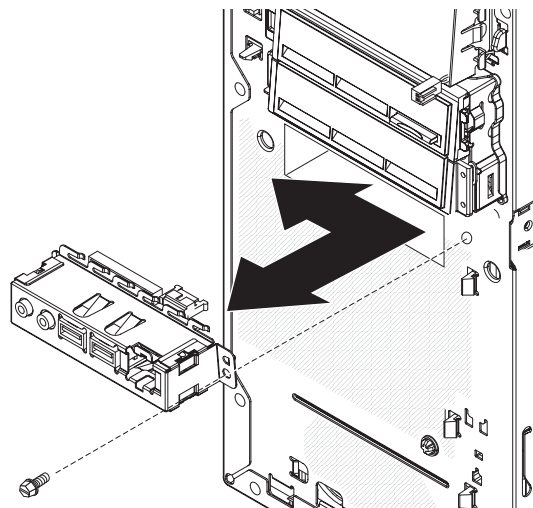


Figure 41. Removing the front I/O panel

10. Slide the I/O panel toward the right side of the computer (up, if the computer is on its side) to disengage it from the computer front panel; then, carefully pull the I/O panel, card, and cables out of the opening in the front panel.
11. If you are instructed to return the front I/O panel, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the front I/O panel

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

1. Carefully insert the IEEE 1394 (FireWire) cable and front-panel cable into the opening in the front of the computer.
2. Insert the I/O panel into the opening in the front of the computer and slide the panel to the left so that the clips on the left edge engage the opening.

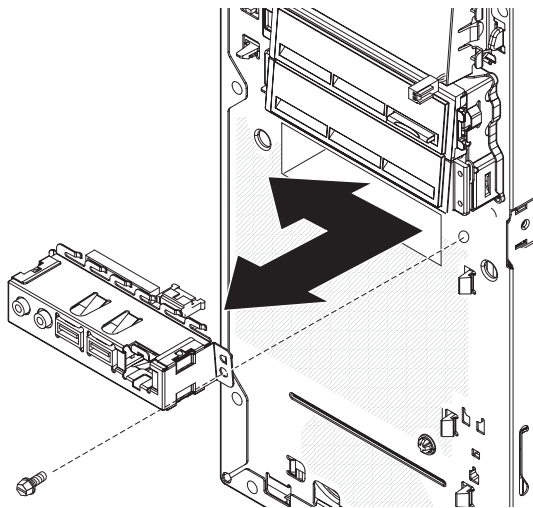


Figure 42. Installing the front I/O panel

3. Install the I/O panel screw on the front of the computer.
4. Reconnect the power switch/LED assembly cable to the back of the I/O card.
5. Reconnect the internal IEEE 1394 (FireWire) cable and front-panel cable to the system board (see “System-board internal connectors” on page 7 for connector locations).
6. Reinstall the drive cage (see Figure 23 on page 43):
 - a. Place the drive cage into position and slide it forward to engage the upper clips.
 - b. Tighten the thumbscrew at the rear of the drive cage.
 - c. Reconnect the power cables to the drives in the cage if you disconnected any of them.
7. Install the bezel (see “Installing the bezel” on page 30).
8. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
9. Install the side cover (see “Installing the side cover” on page 28).
10. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the microprocessor and heat sink

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Turn the computer on its side so that it is lying flat, with the cover facing up.
4. Remove the side cover (see “Removing the side cover” on page 27).
5. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).
6. Remove the air baffle from the microprocessor fan assembly (see “Removing the microprocessor fan assembly” on page 33).
7. Disconnect any cables that impede access to the heat sink and microprocessor.

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

8. Remove the heat sink from the microprocessor.

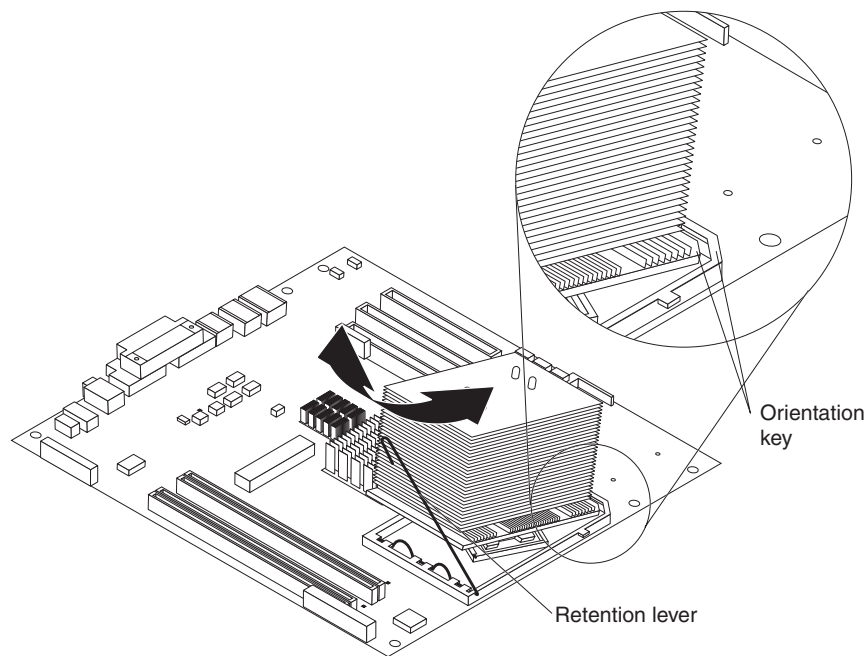


Figure 43. Removing the heat sink

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

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

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

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

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

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

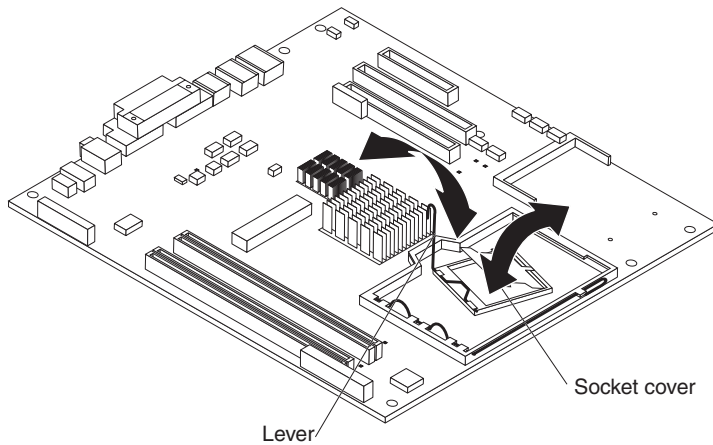


Figure 44. Opening the microprocessor socket

10. Open the microprocessor socket cover by lifting up the tab on the top edge.
Attention: Use the vacuum tool that comes with the replacement microprocessor to remove the microprocessor. Dropping the microprocessor during removal can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
11. Remove the microprocessor, using the vacuum tool and the following procedure.

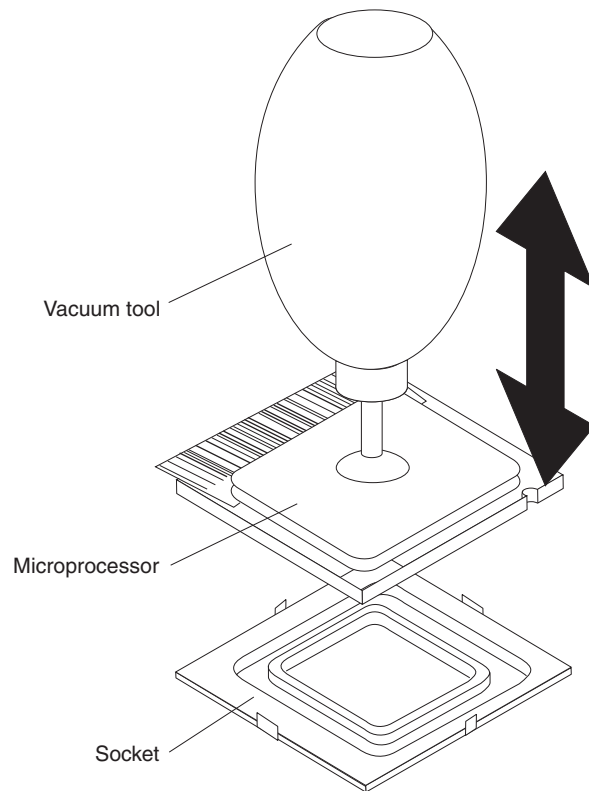


Figure 45. Removing the microprocessor

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

Installing the microprocessor and heat sink

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

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

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

2. Install the microprocessor, using the vacuum tool and the following procedure.

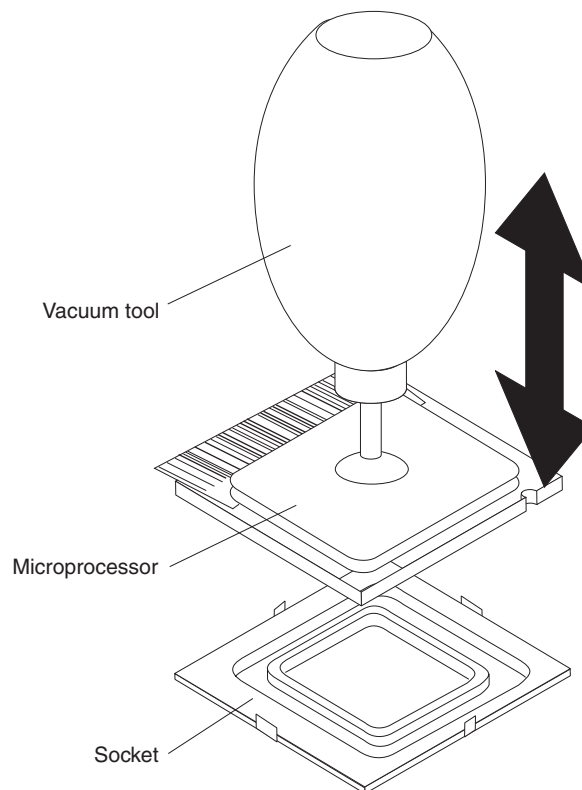


Figure 46. Installing the microprocessor

- a. Squeeze and hold the bladder of the tool; then, place the suction cup on the microprocessor and release the bladder.
- b. Using the tool, carefully place the microprocessor into the socket.
- c. Squeeze the bladder of the tool to release the microprocessor from the suction cup.

Note: To maintain correct orientation between the microprocessor and the microprocessor socket during installation, observe the following information:

- The microprocessor has two notches that are keyed to two tabs on the sides of the socket.
 - A triangle-shaped indicator on one corner of the microprocessor points to a 45-degree angle on one corner of the socket.
3. Close the microprocessor socket cover; then, close the microprocessor socket lever and lock it securely in place.

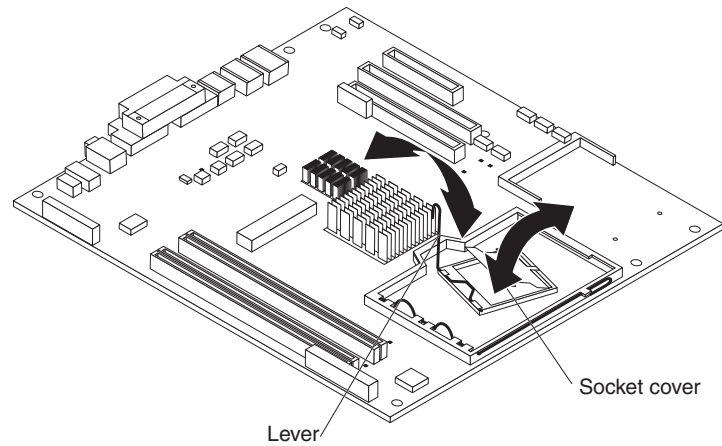


Figure 47. Closing the microprocessor socket

4. Install the heat sink.

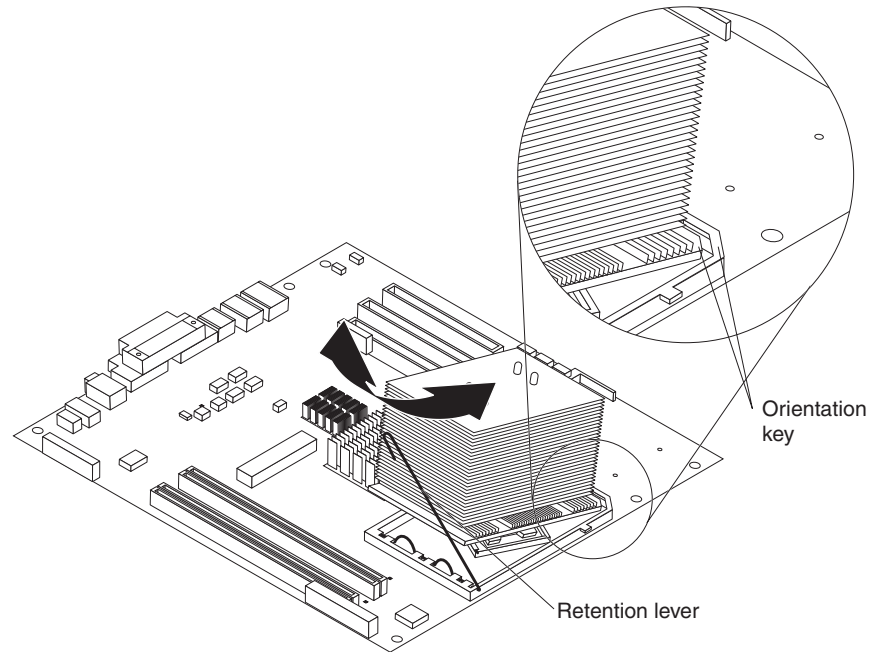


Figure 48. Installing the heat sink

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

Important: Be careful when you handle the microprocessor and heat sink. Do not contaminate the thermal grease between them.

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

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

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

5. Reconnect any cables that you disconnected during removal.

6. Install the air baffle onto the microprocessor fan assembly (see “Installing the microprocessor fan assembly” on page 35 step 6).
7. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
8. Install the side cover (see “Installing the side cover” on page 28).
9. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the power supply

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

Statement 8:



CAUTION:

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



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

To remove the power supply, complete the following steps.

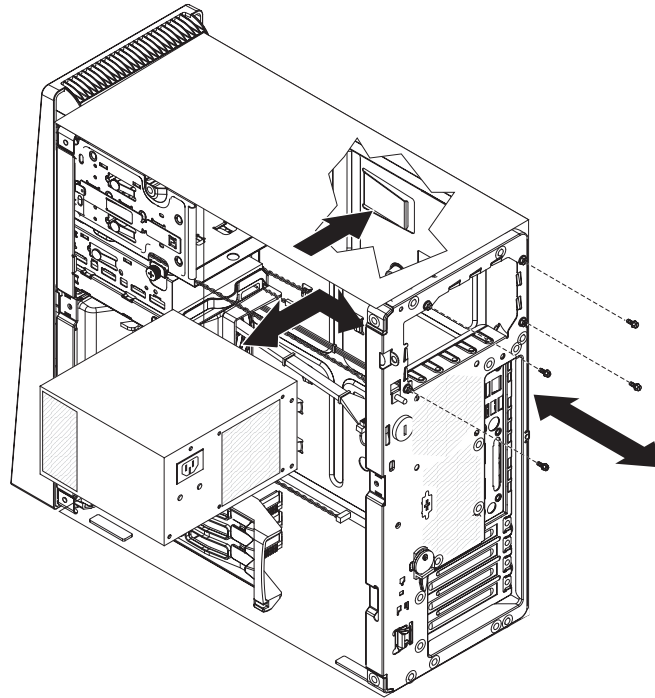


Figure 49. Removing the power supply

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).

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

5. Disconnect the cables from the power supply to the system board and all internal components.
6. Remove the power-supply retaining screws from the rear of the computer.
7. Press in on the power-supply retaining tab and slide the power supply toward the front of the computer until it clears the mounting bracket.
8. Carefully lift the power supply out of the computer.
9. If you are instructed to return the power supply, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the power supply

Important:

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

To install the power supply, complete the following steps.

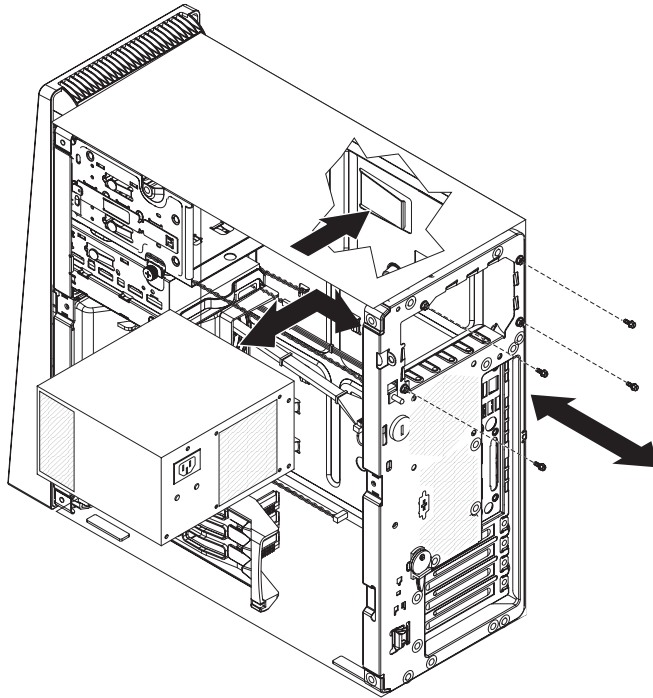


Figure 50. Installing the power supply

1. Place the power supply into the chassis and slide it toward the rear of the computer until the power-supply retaining tab clicks into place.
2. Install the power-supply retaining screws from the rear of the computer.
3. Reconnect the cables from the power supply to the system board and all internal components.
4. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
5. Install the side cover (see “Installing the side cover” on page 28).
6. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Removing the system board

To remove the system board, complete the following steps.

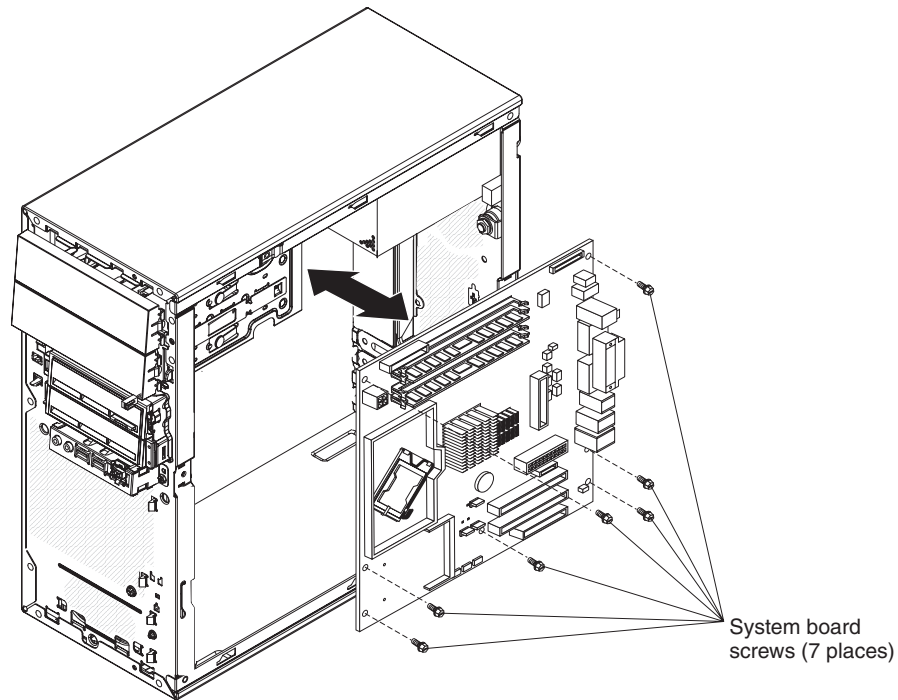


Figure 51. Removing the system board

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 27).
4. Remove the internal drive-bay bracket (see “Removing the internal drive-bay bracket” on page 48).

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

5. Remove the air baffle from the microprocessor fan assembly (see “Removing the microprocessor fan assembly” on page 33).

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

6. Remove the drive cage from the computer (see Figure 20 on page 41):
 - a. Loosen the thumbscrew at the rear of the drive cage.
 - b. Slide the drive cage to the rear to disengage it from the upper clips, and lift the cage out of the computer.

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

7. Disconnect the cables.

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

8. Remove any installed adapters (see “Removing an adapter” on page 37).

9. Remove the mini-PCI adapter, if one is installed (see “Removing the mini-SAS adapter” on page 59).
10. Remove the microprocessor and heat sink (see “Removing the microprocessor and heat sink” on page 65).
11. Remove the memory modules (see “Removing a DIMM” on page 41).
12. Remove the seven screws that secure the system board.
13. Slide the system board toward the front of the computer to disengage it from the slots in the computer chassis; then, lift the system board out of the computer.
14. If you are instructed to return the system board, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the system board

To install the system board, complete the following steps.

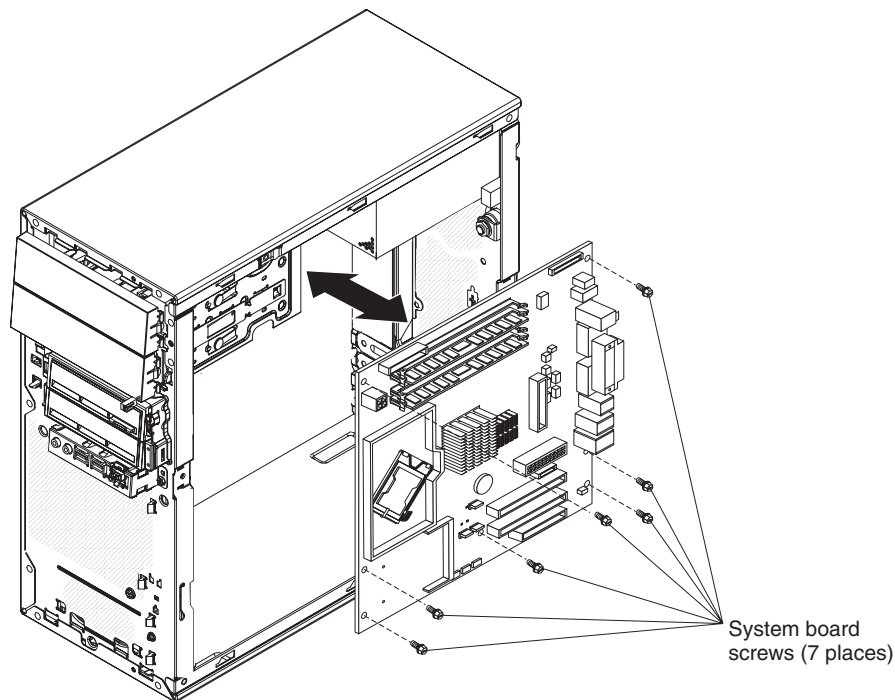


Figure 52. Installing the system board

1. Position the system board so that it is aligned with the slots in the computer chassis; then, slide the system board toward the rear of the computer until it locks securely into place.
2. Install the seven screws that secure the system board (see Figure 52).
3. Install the memory modules (see “Installing a DIMM” on page 42).
4. Install the microprocessor and heat sink (see “Installing the microprocessor and heat sink” on page 68).
5. Install the SAS adapter, if one was removed (see “Installing the mini-SAS adapter” on page 60).
6. Install any adapters (see “Installing an adapter” on page 38) and reconnect any cables that you removed or disconnected.
7. Reinstall the drive cage (see Figure 23 on page 43):

- a. Place the drive cage into position and slide it forward to engage the upper clips.
 - b. Tighten the thumbscrew at the rear of the drive cage.
 - c. Reconnect the power cables to the drives in the cage if any were disconnected.
8. Install the air baffle onto the microprocessor fan assembly (see “Installing the microprocessor fan assembly” on page 35).
 9. Install the internal drive-bay bracket (see “Installing the internal drive-bay bracket” on page 49).
 10. Install the side cover (see “Installing the side cover” on page 28).
 11. Reconnect the external cables and power cords; then, turn on the attached devices and the computer. Refer to “Updating the firmware” on page 11 for additional information pertaining to updating the firmware in the computer.

Chapter 5. Diagnostics

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

If you cannot locate and correct a problem by using the information in this chapter, see Appendix A, “Getting help and technical assistance,” on page 131 for more information.

Diagnostic tools

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

- **POST beep codes and error messages**

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

- **Troubleshooting tables**

These tables list problem symptoms and actions to correct the problems. See “Troubleshooting tables” on page 93 for more information.

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

The diagnostic programs are the primary method of testing the major components of the computer. The diagnostic programs are stored on a hidden partition on the hard disk. See “Diagnostic programs, messages, and error codes” on page 104 for more information.

POST

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

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

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

If POST detects a problem, more than one beep might sound, or an error message is displayed. See “Beep code descriptions” and “POST error codes” on page 83 for more information.

POST beep codes

A beep code is a combination of short and long beeps or a series of short beeps separated by pauses. For example, a “1-2-3” beep code is one short beep, a pause, two short beeps, a pause, and three short beeps. A beep code other than one beep indicates that POST has detected a problem. To determine the meaning of a beep code, see “Beep code descriptions.” If no beep code sounds, see “No-beep symptoms” on page 81.

Beep code descriptions

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

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

Exception: If there are multiple error codes that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See “Microprocessor problems” on page 97 for information about diagnosing microprocessor problems.

Table 3. POST beep codes

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Beep code	Description	Action
1-1-3	CMOS write/read test has failed.	<ol style="list-style-type: none"> Reseat the battery. Clear CMOS. See Erasing a lost or forgotten password (clearing CMOS) Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> Battery (Trained service technician only) System board
1-1-4	BIOS ROM checksum has failed.	<ol style="list-style-type: none"> Recover the BIOS code. (Trained service technician only) Replace the system board.
1-2-1	Programmable interval timer test has failed.	(Trained service technician only) Replace the system board.
1-2-2	DMA initialization has failed.	(Trained service technician only) Replace the system board.
1-2-3	DMA page register write/read test has failed.	(Trained service technician only) Replace the system board.
1-2-4	RAM refresh verification has failed.	(Trained service technician only) Replace the system board.

Table 3. POST beep codes (continued)

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Beep code	Description	Action
1-3-1	First 64 Kb RAM test has failed.	<ol style="list-style-type: none"> 1. Reseat the dual inline memory module (DIMM). 2. Replace the lowest-numbered pair of DIMMs with an identical known good pair of DIMMs; then, restart the server. If the beep code error remains, go to 3b. Return one DIMM at a time from the failed pair to its connector, restarting the server after each DIMM, to identify the failed DIMM. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. DIMM b. (Trained service technician only) System board
2-1-1	Secondary DMA register test has failed.	(Trained service technician only) Replace the system board.
2-1-2	Primary DMA register test has failed.	(Trained service technician only) Replace the system board.
2-1-3	Primary interrupt mask register test has failed.	(Trained service technician only) Replace the system board.
2-1-4	Secondary interrupt mask register test has failed.	(Trained service technician only) Replace the system board.
2-4-1	Video failed, system believed to be operable.	<ol style="list-style-type: none"> 1. Reseat the video adapter. 2. Replace the following components one at a time, in the order shown, restarting the computer each time. <ol style="list-style-type: none"> a. Video adapter. b. (Trained service technician only) System board.

Table 3. POST beep codes (continued)

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Beep code	Description	Action
3-3-2	A critical SMBUS error occurred (I2C bus has failed).	<ol style="list-style-type: none"> 1. Disconnect the power cord, wait 30 seconds, and retry. 2. Reseat the following components: <ol style="list-style-type: none"> a. DIMM b. (Trained service technician only) Microprocessor 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. DIMM b. (Trained service technician only) Microprocessor c. (Trained service technician only) System board
3-3-3	<p>No operational memory in the system.</p> <p>Attention: In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank display screen. If this occurs and the Boot Fail Count feature in the Startup Option menu of the Configuration/Setup Utility program is set to Enabled (its default setting), you must restart the computer three times to force the system BIOS to reset the memory connector from Disabled to Enabled.</p>	<ol style="list-style-type: none"> 1. If you just installed memory, make sure that the new memory is correct for your computer. 2. Make sure that the DIMMs are installed in pairs; then, restart the computer. 3. Reseat the DIMMs. 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. DIMMs b. (Trained service technician only) System board

No-beep symptoms

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

<ul style="list-style-type: none">• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.• See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).• If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.		
No-beep symptom	Description	Action
No beep during POST.	A system board failure occurred.	(Trained service technician only) Replace the system board.
No beep, no video, and the system-error LED is off.	A system board failure occurred.	(Trained service technician only) Replace the system board.
No beep, no video, and the system-error LED is lit.	An undetermined failure has occurred.	See “Solving undetermined problems” on page 127 for more information.

Error logs

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

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

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

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

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

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

To view the error logs, complete the following steps:

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

POST error codes

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

Table 4. POST error messages

Error code	Description	Action
<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
062	The computer failed to start on three consecutive attempts.	<ol style="list-style-type: none"> 1. Reseat the following components: <ol style="list-style-type: none"> a. Battery b. (Trained service technician only) Microprocessor 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Battery b. (Trained service technician only) Microprocessor c. (Trained service technician only) System board
101	Timer tick interrupt failure.	(Trained service technician only) Replace the system board.
102	Timer 2 test failure	(Trained service technician only) Replace the system board.
151	A real-time clock (RTC) error occurred.	<ol style="list-style-type: none"> 1. Run the diagnostics program. 2. Reseat the battery. 3. Clear CMOS. See Erasing a lost or forgotten password (clearing CMOS) 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Battery b. (Trained service technician only) System board
161	The real-time clock battery has failed.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, select Load Default Settings, make sure that the date and time are correct, and save the settings. 2. Reseat the battery. 3. Clear CMOS. See Erasing a lost or forgotten password (clearing CMOS) 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Battery b. (Trained service technician only) System board

Table 4. POST error messages (continued)

Error code	Description	Action
162	<p>A change in the device configuration occurred. This error occurs under one or more of the following conditions:</p> <ul style="list-style-type: none"> • A new device has been installed. • A device has been moved to a different location or cable connection. • A device has been removed or disconnected from a cable. • A device is failing and is no longer recognized by the computer as being installed. • An external device is not turned on. • An invalid checksum is detected in the battery-backed memory. 	<ol style="list-style-type: none"> 1. Make sure that all external devices are turned on. You must turn on external devices before you turn on the computer. 2. If you did not add, remove, or change the location of a device, a device is probably failing. Running the diagnostic program might isolate the failing device. See "Running the diagnostic programs" on page 104 or "Using the IBM Enhanced Diagnostics diskette or CD in Windows XP" on page 116. 3. Run the Configuration/Setup Utility program, select Load Default Settings, and save the settings. 4. Reseat the following components: <ol style="list-style-type: none"> a. Battery b. Failing device 5. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Battery b. Failing device (if the device is a FRU, the device must be replaced by a trained service technician only) c. (Trained service technician only) System board
163	<p>The time of day has not been set.</p>	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, select Load Default Settings, make sure that the date and time are correct, and save the settings. 2. Reseat the battery. 3. Clear CMOS. See Erasing a lost or forgotten password (clearing CMOS) 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Battery b. (Trained service technician only) System board

Table 4. POST error messages (continued)

Error code	Description	Action
<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
164	A change in the memory configuration occurred. This message might appear after you add or remove memory.	<ol style="list-style-type: none"> 1. If POST error message 289 also occurred, follow the actions for the 289 POST error code first. 2. If you just installed or removed memory, run the Configuration/Setup Utility program, and save the new configuration settings. 3. Reseat the DIMMs. 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. DIMMs b. (Trained service technician only) System board
178x	An error occurred during the hard disk drive x test (x = 0 to 3).	<ol style="list-style-type: none"> 1. Reseat the hard disk drive x cable. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Hard disk drive x b. Hard disk drive cable x c. (Trained service technician only) System board
184	The power-on password information stored in the computer has been removed.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, select Load Default Settings, and save the settings. 2. Reseat the battery. 3. Clear CMOS. See Erasing a lost or forgotten password (clearing CMOS) 4. Replace the battery. 5. (Trained service technician only) Replace the system board.
187	The VPD serial number is not set. Note: The system serial number is set in the VPD EEPROM at the time of manufacturing. If the system board has been replaced, the system serial number will be invalid and must be reset.	<ol style="list-style-type: none"> 1. Restart the computer. 2. Update the BIOS code to set the serial number. For more information about updating the BIOS code, see “Updating the BIOS code on the computer” on page 122. 3. (Trained service technician only) Replace the system board.
189	An attempt has been made to access the computer with an incorrect password three times.	Restart the computer and enter the administrator password; then, run the Configuration/Setup Utility program and change the power-on password.

Table 4. POST error messages (continued)

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

Table 4. POST error messages (continued)

Error code	Description	Action
<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
604	An error occurred during a diskette drive test.	<ol style="list-style-type: none"> 1. Make sure that the Configuration/Setup Utility program correctly reflects the type of diskette drive that is installed. 2. Reseat the diskette drive cable. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Diskette drive cable b. Diskette drive c. (Trained service technician only) System board
962	A parallel port configuration error occurred.	<ol style="list-style-type: none"> 1. If you changed a hardware device, make sure that the parallel port setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it and save the settings. 2. (Trained service technician only) Replace the system board.
1162	The serial port configuration conflicts with another device in the system.	<ol style="list-style-type: none"> 1. Make sure that the interrupt request (IRQ) and I/O port assignments that are needed by the serial port are available. 2. If all interrupts are being used by adapters, remove an adapter to make an interrupt available to the serial port, or force other adapters to share an interrupt. 3. Make sure that the serial port setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it and save the settings. 4. (Trained service technician only) Replace the system board.
1801	A PCI adapter has requested memory resources that are not available.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Reseat each adapter. <p>Note: If an error LED is lit on an adapter, reseat that adapter first. If no LEDs are lit, reseat each adapter one at a time, restarting the computer each time to isolate the failing adapter.</p> 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board

Table 4. POST error messages (continued)

Error code	Description	Action
1802	No more I/O space is available for a PCI adapter.	<ol style="list-style-type: none"> 1. If the error code indicates a particular PCI or PCI Express slot or device, remove that device. 2. Reseat each adapter. Note: If an error LED is lit on an adapter, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board
1803	A PCI adapter has requested memory above 1 MB.	<ol style="list-style-type: none"> 1. If the error code indicates a particular PCI or PCI Express slot or device, remove the device. 2. Reseat each adapter. Note: If an error LED is lit on an adapter, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board
1804	A PCI adapter has requested memory below 1 MB.	<ol style="list-style-type: none"> 1. If the error code indicates a particular PCI or PCI Express slot or device, remove the device. 2. Reseat each adapter. Note: If an error LED is lit on an adapter, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board

Table 4. POST error messages (continued)

Error code	Description	Action
1805	A PCI option ROM checksum error occurred.	<ol style="list-style-type: none"> 1. Remove the failing adapter. 2. Reseat each adapter. Note: If an error LED is lit on an adapter, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board
1806	A PCI built-in self-test failure occurred.	<ol style="list-style-type: none"> 1. If the error code indicates a particular PCI or PCI Express slot or device, remove that device. 2. Reseat each adapter. Note: If an error LED is lit on an adapter, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board
1807 and 1808	General PCI error	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, select Devices and I/O Ports, and make sure that the device is enabled. 2. Reseat each adapter. Note: If an error LED is lit on an adapter, reseat that adapter first; if no LEDs are lit, reseat each adapter one at a time, restarting the computer each time, to isolate the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board

Table 4. POST error messages (continued)

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

Table 4. POST error messages (continued)

Error code	Description	Action
5962	An IDE CD or DVD drive configuration error occurred.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program and load the default settings. 2. Reseat the following components: <ol style="list-style-type: none"> a. CD or DVD drive cable b. Battery 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. CD or DVD drive b. CD or DVD drive cable c. Battery d. (Trained service technician only) System board
8603	<p>An error occurred during the mouse (pointing device) controller test. The addition or removal of a mouse, or a failing system board can cause this error.</p> <p>Note: This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the computer for at least 5 seconds; then, turn it back on.</p>	<ol style="list-style-type: none"> 1. Reseat the mouse (pointing device) cable and make sure that it is connected to the correct connector on the computer. 2. Complete the following steps: <ol style="list-style-type: none"> a. Turn off the computer. b. Disconnect the mouse (pointing device) from the computer. c. Turn on the computer. <p>If the error message is not displayed, the mouse (pointing device) is probably failing. See the documentation that comes with the device for additional testing information.</p> 3. Run the diagnostic tests to isolate the problem. 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Mouse (pointing device) b. (Trained service technician only) System board
00012000	A processor machine check error occurred.	<ol style="list-style-type: none"> 1. Update the BIOS code. For more information about updating the BIOS code, (see "Updating the BIOS code on the computer" on page 122). 2. (Trained service technician only) Reseat the microprocessor. 3. (Trained service technician only) Replace the microprocessor.

Table 4. POST error messages (continued)

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Error code	Description	Action
000197xx	The microprocessor has failed the built-in self-test (BIST). Note: xx is a number from 00 to 07.	<ol style="list-style-type: none"> 1. (Trained service technician only) Reseat the microprocessor. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor b. (Trained service technician only) System board
012980xx	No update data for microprocessor. Note: xx is 00 to 07.	<ol style="list-style-type: none"> 1. Make sure that the microprocessor has the correct cache size. 2. Update the BIOS code. For information about updating the BIOS code, see “Updating the BIOS code on the computer” on page 122. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor b. (Trained service technician only) System board
012981xx	Bad update data for microprocessor. Note: xx is 00 to 07.	<ol style="list-style-type: none"> 1. Make sure that the microprocessor has the correct cache size. 2. Update the BIOS code. For information about updating the BIOS code, see “Updating the BIOS code on the computer” on page 122. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor b. (Trained service technician only) System board
19990301	Invalid boot record on hard disk drive.	<ol style="list-style-type: none"> 1. Partition and format the hard disk drive. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Hard disk drive b. Hard disk drive cable c. (Trained service technician only) System board
19990650	AC power has been restored.	<ol style="list-style-type: none"> 1. Reseat the power cord. 2. (Trained service technician only) Check for interruption of the external power. 3. Replace the power cord.
Other codes	POST found an error.	Follow the instructions on the screen.

Troubleshooting tables

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

If you cannot find a problem in these tables, see “Running the diagnostic programs” on page 104 for information about testing the computer.

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

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

CD or DVD drive problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
The CD or DVD drive is not recognized.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The IDE channel to which the CD or DVD drive is attached (primary) is enabled in the Configuration/Setup Utility program. • All cables and jumpers are installed correctly. • The signal cable and connector are not damaged and the connector pins are not bent. • The correct device driver is installed for the CD or DVD drive. 2. Run the CD-ROM, CD-RW or DVD drive diagnostic programs. 3. Reseat the CD or DVD drive cable. 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. CD or DVD drive b. CD or DVD drive cable c. (Trained service technician only) System board
A CD or DVD is not working correctly.	<ol style="list-style-type: none"> 1. Clean the CD or DVD. 2. Run the CD-ROM, CD-RW or DVD drive diagnostic programs. 3. Reseat the CD or DVD drive cable. 4. Check the signal cable and connector for bent or damaged pins. 5. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. CD or DVD drive b. CD or DVD drive cable

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
The CD or DVD drive tray is not working.	<ol style="list-style-type: none"> 1. Make sure that the computer is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD or DVD drive cable. 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. CD or DVD drive b. CD or DVD drive cable

Diskette drive problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
The diskette drive activity LED stays lit, or the computer bypasses the diskette drive.	<ol style="list-style-type: none"> 1. If there is a diskette in the drive, make sure that: <ul style="list-style-type: none"> • The diskette drive is enabled in the Configuration/Setup Utility program. • The diskette is good and not damaged. (Try another diskette if you have one.) • The diskette is inserted correctly in the drive. • The diskette contains the necessary files to start the computer. • The software is working correctly. • The cable is connected correctly (in the correct orientation). 2. To prevent diskette drive read/write errors, make sure that the distance between monitors and diskette drives is at least 76 mm (3 in.). 3. Run the diskette drive diagnostic test. 4. Reseat the diskette drive cable. 5. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Diskette drive cable b. Diskette drive c. (Trained service technician only) System board

General problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
A cover lock is broken, an indicator LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

Hard disk drive problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive that you removed with a new one.
The computer stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the computer stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	See the <i>User’s Guide</i> for detailed information and installation instructions. Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.
A hard disk drive passes the diagnostic Fixed Disk Test, but the problem remains.	Run the diagnostic SCSI Fixed Disk Test. Note: This test is not available on computers that have RAID arrays, computers that have IDE or SATA hard disk drives, or computers that do not use the integrated SAS adapter.

Intermittent problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
A problem occurs only occasionally and is difficult to detect.	<p>Make sure that:</p> <ul style="list-style-type: none"> • All cables and cords are connected securely to the rear of the computer and attached options. • When the computer is turned on, air is flowing from the front of the computer at the fan grille. If there is no airflow, the fan is not working. This can cause the computer to overheat and shut down. • See “Solving undetermined problems” on page 127.

Keyboard, mouse, or pointing-device problems

For problems with a USB mouse or pointing device, see “USB device problems” on page 103.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
All or some keys on the keyboard do not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The keyboard is compatible with the server. See http://www.ibm.com/servers/eserver/serverproven/compat/us/. • The keyboard cable is securely connected to the computer and the keyboard and mouse cables are not reversed. • The computer and the monitor are turned on. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Keyboard b. (Trained service technician only) System board
The mouse or pointing device does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The mouse or pointing device is compatible with the server. See http://www.ibm.com/servers/eserver/serverproven/compat/us/. • The mouse or pointing-device cable is securely connected and the keyboard and mouse cables are not reversed. • The mouse or pointing device drivers are installed correctly. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Mouse or pointing device b. (Trained service technician only) System board

Memory problems

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The amount of system memory displayed is less than the amount of installed physical memory.	<ol style="list-style-type: none"> Make sure that: <ul style="list-style-type: none"> The memory modules are seated correctly. You have installed the correct type of memory. If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program. All banks of memory are enabled. The computer might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. Check the POST error log for error message 289: <ul style="list-style-type: none"> If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> DIMM (Trained service technician only) System board
Multiple rows of DIMMs in a branch are identified as failing.	<ol style="list-style-type: none"> Reseat the DIMMs; then, restart the server. Remove the lowest-numbered DIMM pair of those that are identified and replace it with an identical pair of known good DIMMs; then, restart the server. Repeat as necessary. If the failures continue after all identified pairs are replaced, go to step 4. Return the removed DIMMs, one pair at a time, to their original connectors, restarting the server after each pair, until a pair fails. Replace each DIMM in the failed pair with an identical known good DIMM, restarting the server after each DIMM. Replace the failed DIMM. Repeat step 3 until you have tested all removed DIMMs. Replace the lowest-numbered DIMM pair of those identified; then, restart the server. Repeat as necessary. (Trained service technician only) Replace the system board.

Microprocessor problems

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The computer emits a continuous beep during POST, indicating that the startup (boot) microprocessor is not working correctly.	<ol style="list-style-type: none"> (Trained service technician only) Reseat the microprocessor. (Trained service technician only) Replace the microprocessor.

Monitor or video problems

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

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The screen is blank.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The computer power cord is connected to the computer and a working electrical outlet. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. • If you are using the dual-graphic configuration, the video adapters are the same model, each video adapter is 65 watts or less, and the video auxiliary power cable is connected to the system board. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the Boot Fail Count option in the Startup Option of the Configuration/Setup Utility program is enabled (its default setting), you must restart the computer three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).</p> 2. Make sure that damaged BIOS code is not affecting the video; see “Recovering from a BIOS update failure” on page 123. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Monitor b. Video adapter (if one is installed) c. (Trained service technician only) System board
Only the cursor appears.	See “Solving undetermined problems” on page 127.
The monitor works when you turn on the computer, but the screen goes blank when you start some application programs.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the applications. 2. Replace the monitor.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, distorted.	<ol style="list-style-type: none"> 1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. Attention: Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor. Notes: <ol style="list-style-type: none"> a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Monitor b. Video adapter (if one is installed) c. (Trained service technician only) System board
Wrong characters appear on the screen.	<ol style="list-style-type: none"> 1. If the wrong language is displayed, update the BIOS code with the correct language. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Video adapter (if one is installed) b. (Trained service technician only) System board

Optional-device problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
An IBM optional-device that was just installed does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The device is designed for the computer (see http://www.ibm.com/servers/eserver/serverproven/compat/us/). • You followed the installation instructions that came with the device and the device is installed correctly. • You have not loosened any other installed device or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration. 2. Reseat the device that you just installed. 3. Replace the device that you just installed.
An IBM optional device that used to work does not work now.	<ol style="list-style-type: none"> 1. Make sure that all of the cable connections for the device are secure. 2. If the device comes with test instructions, use those instructions to test the device. 3. If the failing device is a SAS device, make sure that: <ul style="list-style-type: none"> • The cables for all external SAS options are connected correctly. • The last device in each SAS chain, or the end of the SAS cable, is terminated correctly. • Any external SAS device is turned on. You must turn on an external SAS device before turning on the computer. 4. Reseat the failing device. 5. Replace the failing device.

Power problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The power-control button does not work, and the reset button, if supported, does work.	<ol style="list-style-type: none"> 1. Reseat the power switch/LED assembly cable. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Power switch/LED assembly b. (Trained service technician only) System board

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The computer does not start.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The power cords are correctly connected to the computer and to a working electrical outlet. • The type of memory that is installed is correct. 2. If you just installed an optional device, remove it, and restart the computer. If the computer now starts, you might have installed more devices than the power supply supports. 3. Override the front panel power control button: <ol style="list-style-type: none"> a. Disconnect the computer power cords. b. Reconnect the power cords. 4. (Trained service technician only) If the computer does not start, replace the system board. 5. See “Solving undetermined problems” on page 127.
The computer does not turn off.	<ol style="list-style-type: none"> 1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps: <ol style="list-style-type: none"> a. Press Ctrl+Alt+Delete. b. Turn off the computer by pressing the power-control button for 4 seconds. c. If the computer fails POST and the power-control button does not work, disconnect the ac power cord. 2. If the problem remains or if you are using an ACPI-aware operating system, the problem might be with the system board.

Printer problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The printer does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The printer is turned on and is online. • The printer signal cable is connected to the correct serial or parallel connector on the computer (see “System-board external connectors” on page 8). Note: Non-IBM printer cables might cause unpredictable results. • You have assigned the printer port correctly in your operating system or application program. • You have assigned the printer port correctly in the Configuration/Setup Utility program. • You have run the tests that are described in the documentation that comes with the printer.

Serial port problems

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	<ol style="list-style-type: none"> Make sure that: <ul style="list-style-type: none"> Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports are disabled. The serial port adapter (if one is present) is seated correctly. Replace the failing serial port adapter.
A serial device does not work.	<ol style="list-style-type: none"> Make sure that: <ul style="list-style-type: none"> The device is compatible with the computer. The serial port is enabled and is assigned a unique address. The device is connected to the correct connector (see “System-board external connectors” on page 8). Reseat the failing serial device. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> Failing serial device (Trained service technician only) System board

Software problems

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
A suspected software problem occurred.	<ol style="list-style-type: none"> To determine whether the problem is caused by the software, make sure that: <ul style="list-style-type: none"> The computer has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, you might have a memory-address conflict. The software is designed to operate on the computer. Other software works on the computer. The software works on another computer. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. Contact the place where you purchased the software.

USB device problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
All or some keys on the USB keyboard do not work.	<ol style="list-style-type: none"> 1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. Make sure that the computer and the monitor are turned on. 3. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the computer. 4. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Keyboard b. (Trained service technician only) System board
The USB mouse or USB pointing device does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The mouse or pointing-device USB cable is securely connected to the computer. • The mouse or pointing device drivers are installed correctly. • Keyboardless operation has been enabled in the Configuration/Setup Utility program. 2. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the computer. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Mouse or pointing device b. (Trained service technician only) System board
A USB device does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The correct USB device driver is installed. • The operating system supports USB devices. • A standard PS/2 keyboard or mouse is not connected to the computer. If it is, a USB keyboard or mouse will not work during POST. 2. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the <i>User's Guide</i> for more information). 3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the computer.
A message such as Power surge on Port USB or A USB device has exceeded the limits of its hub port is displayed on Windows® operating systems.	This message indicates that a safety feature has been enabled on the computer to protect it from damage when a USB device draws too much power. If this message appears, contact the manufacturer of the USB device to see if a hardware upgrade or fix is available for the USB device.

Diagnostic programs, messages, and error codes

The diagnostic programs are the primary method of testing the major components of the computer. As you run the diagnostic programs, text messages and error codes are displayed on the screen and are saved in the test log. A diagnostic error code indicates that a problem has been detected; to determine what action you should take as a result of an error code, see “Diagnostic error codes” on page 107.

You can download the latest version of the diagnostics programs from <http://www.ibm.com/support/> and use the downloaded file to create an IBM Enhanced Diagnostics diskette or CD. See “Creating an IBM Enhanced Diagnostics diskette or CD in Windows XP” on page 115 for instructions.

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

1. Restart the computer and press F1 to start the Configuration/Setup Utility program.
2. Select **Startup Option**.
3. Make sure that the **Legacy USB Support** option is set to enable.

Running the diagnostic programs

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

You can run the diagnostic programs through the operating system or by using a diagnostics diskette or CD that you have created (see “Using the IBM Enhanced Diagnostics diskette or CD in Windows XP” on page 116 and “Creating an IBM Enhanced Diagnostics diskette or CD in Windows XP” on page 115).

To run the diagnostic programs, complete the following steps.

Note: You can start the IBM Enhanced Diagnostics programs by booting from the *Device Drivers and IBM Enhanced Diagnostics* CD that comes with the computer, in addition to the methods listed below. You can use the *Device Drivers and IBM Enhanced Diagnostics* CD to start the diagnostics programs in Windows XP, Windows Vista, and Red Hat Linux.

1. Start the IBM Enhanced Diagnostics programs.
 - To start the IBM Enhanced Diagnostics programs in a Windows XP 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 IBM Enhanced Diagnostics programs in Windows XP using a diskette or CD, insert the IBM Enhanced Diagnostics diskette or CD and restart the computer (see “Using the IBM Enhanced Diagnostics diskette or CD in Windows XP” on page 116).
 - To start the IBM Enhanced Diagnostics programs in Windows Vista™ operating system, complete the following steps:
 - a. Turn off the computer

- b. Insert the *Device Drivers and IBM Enhanced Diagnostics* CD into the CD or DVD drive.
- c. Restart the computer.
- d. Follow the instructions on the screen.
- To start the IBM Enhanced Diagnostics programs in a Red Hat® Linux™ operating system, complete the following steps:
 - a. Restart the computer.
 - b. When the operating-system selection menu is displayed, select **IBM Preload Recovery & Diagnostics**.
 - c. Select **Run diagnostics** to start the diagnostics programs.

2. Follow the instructions on the screen.
3. When the applicable diagnostics programs are complete, you can view the results in the test log (see “Viewing the test log” on page 107).
The test log records data about system failures and other pertinent information. The test log will not contain any information until after the diagnostic program has run.

To determine what action you should take as a result of a diagnostic text message or error code, see the table in “Diagnostic error codes” on page 107.

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

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

Exception: If there are multiple error codes that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See “Microprocessor problems” on page 97 for information about diagnosing microprocessor problems.

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

Diagnostic text messages

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

Passed: The test was completed without any errors.

Failed: The test detected an error.

User Aborted: You stopped the test before it was completed.

Not Applicable: You attempted to test a device that is not installed in the computer.

Aborted: The test could not proceed because of the computer configuration.

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

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

Viewing the test log

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

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

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

Diagnostic error codes

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

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

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

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

- 000** The computer passed the test. Do not replace a CRU or FRU.
- 195** The Esc key was pressed to end the test. Do not replace a CRU or FRU.
- 197** This is a warning error, but it does not indicate a hardware failure; do not replace a CRU or FRU. Take the action that is indicated in the Action column, but do not replace a CRU or FRU. See the description of **Warning** in “Diagnostic text messages” on page 106 for more information.

<ul style="list-style-type: none">• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.• See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).• If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.		
Error code	Description	Action
005-XXX-000	Failed video test.	<ol style="list-style-type: none">1. Reseat the video adapter.2. Replace the video adapter.
011-XXX-000	Failed COM1 serial port test.	<ol style="list-style-type: none">1. (Trained service technician only) Make sure that the loopback plug is connected correctly to the COM1 serial port.2. (Trained service technician only) Replace the system board.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
011-XXX-001	Failed COM2 serial post test.	<ol style="list-style-type: none"> 1. (Trained service technician only) Make sure that the loopback plug is connected correctly to the COM2 serial port. 2. (Trained service technician only) Replace the system board.
014-XXX-000	Failed parallel port test.	<ol style="list-style-type: none"> 1. Make sure that the parallel port is not disabled in the Configuration/Setup Utility program. 2. Make sure that the BIOS code is at the latest level. 3. (Trained service technician only) Make sure that the loopback plug is connected correctly to the parallel port. 4. (Trained service technician only) Replace the system board.
020-XXX-000	Failed PCI interface test.	<ol style="list-style-type: none"> 1. Reseat the adapter. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Adapter b. (Trained service technician only) System board
035-002-0nn	ServeRAID™ interface timeout.	<ol style="list-style-type: none"> 1. The ServeRAID adapter might not be configured correctly. Obtain the basic and extended configuration status bytes and see the ServeRAID documentation for more information. 2. Reseat the following components: <ol style="list-style-type: none"> a. Adapter cable b. ServeRAID adapter 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
035-253-0nn	ServeRAID controller 0nn initialization failure; 0nn = the controller number.	<ol style="list-style-type: none"> 1. Make sure that the ServeRAID adapter is configured correctly. See the ServeRAID documentation for more information. 2. Reseat the following components: <ol style="list-style-type: none"> a. Adapter cable b. ServeRAID adapter 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
035-253-s99	RAID adapter initialization failure.	<ol style="list-style-type: none"> 1. Make sure that the ServeRAID adapter is configured correctly. See the ServeRAID documentation for more information. 2. Reseat the following components: <ol style="list-style-type: none"> a. ServeRAID adapter b. Adapter cable 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. ServeRAID adapter b. Adapter cable c. (Trained service technician only) System board
035-254-0nn	Setup error; unable to allocate memory to run test.	Check the system resources and make more memory available (see “Starting the Configuration/Setup Utility program” on page 12); then, run the test again.
035-255-0nn	Internal error.	<ol style="list-style-type: none"> 1. Reseat the following components: <ol style="list-style-type: none"> a. SAS hard disk drive cable b. SAS adapter 2. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. SAS hard disk drive cable b. SAS adapter
035-260-0nn	System to controller interface failure.	<ol style="list-style-type: none"> 1. Reseat the ServeRAID adapter. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. ServeRAID adapter b. (Trained service technician only) System board
035-265-0nn	Adapter Communication error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-266-0nn	Adapter CPU test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
035-267-0nn	Adapter Local RAM test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-268-0nn	Adapter NVSRAM test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-269-0nn	Adapter Cache test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-271-0nn	Adapter XOR engine test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-272-0nn	Adapter Drive test error.	Replace the attached drive.
035-273-0nn	Adapter Drive error.	Replace the attached drive.
035-274-0nn	Adapter Parameters set error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-275-001	Adapter Communication error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-276-001	Adapter CPU test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-277-001	Adapter Local RAM test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-278-001	Adapter NVSRAM test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
035-279-001	Adapter Cache test error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-280-001	Adapter Drive test error.	Replace the attached drive.
035-281-001	Adapter Drive error.	Replace the attached drive.
035-282-001	Adapter Parameters set error.	<ol style="list-style-type: none"> 1. Update the ServeRAID adapter firmware (see “Updating the firmware” on page 11). 2. Reseat the ServeRAID adapter. 3. Replace the ServeRAID adapter.
035-283-001	Adapter Battery error.	Replace the battery module on the ServeRAID adapter.
035-xxx-099	No adapters were found.	Reseat the following components: <ol style="list-style-type: none"> 1. ServeRAID adapter 2. Adapter cable
035-xxx-s99	Failed RAID test on PCI slot S. S = number of failing PCI slot.	<ol style="list-style-type: none"> 1. Reseat the following components: <ol style="list-style-type: none"> a. ServeRAID adapter b. Adapter cable 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. ServeRAID adapter b. Adapter cable c. (Trained service technician only) System board
035-xxx-cnn	c = ServeRAID channel number, nn = SCSI ID of failing fixed disk drive.	<ol style="list-style-type: none"> 1. Check the system-event/error log before replacing a FRU. 2. Reseat the hard disk drive on channel C, SAS ID nn. 3. Replace the hard disk drive on channel C, SAS ID nn.
035-xxx-snn	S = number of failing PCI slot, nn = SCSI ID of failing fixed disk.	<ol style="list-style-type: none"> 1. Check the system-event/error log before replacing a FRU. 2. Reseat the SAS disk with ID nn. 3. Replace the SAS disk with ID nn.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
089-XXX-001	Failed microprocessor test.	<ol style="list-style-type: none"> 1. (Trained service technician only) Make sure that the microprocessor is installed and seated correctly. 2. If the computer does not have the latest level of BIOS code installed, update the BIOS code to the latest level. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor b. (Trained service technician only) System board
201-XXX-0nn	Failed memory test. Note: Where <i>nn</i> : 1=DIMM 1; 2=DIMM 2; 3=DIMM 3; 4=DIMM 4.	<ol style="list-style-type: none"> 1. Reseat DIMM <i>nn</i>. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. DIMM <i>nn</i> b. (Trained service technician only) System board
201-XXX-999	Multiple DIMM failure, see the error text.	<ol style="list-style-type: none"> 1. See the error text for the failing DIMMs. 2. Reseat the failing DIMMs. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Failing DIMMs b. (Trained service technician only) System board
206-XXX-000	Failed diskette drive test.	<ol style="list-style-type: none"> 1. Run the test with another diskette. 2. Reseat the diskette drive cables and run the test again. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Diskette drive cable b. Diskette drive c. (Trained service technician only) System board

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
215-XXX-000	Failed IDE CD-ROM, CD-RW or DVD drive test.	<ol style="list-style-type: none"> 1. Run the test with another CD or DVD in the drive. 2. Reseat the CD or DVD drive cables and run the test again. 3. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. CD or DVD drive cable b. CD or DVD drive c. (Trained service technician only) System board
217-198-XXX	Could not establish drive parameters.	<ol style="list-style-type: none"> 1. Reseat the following components and run the test again: <ol style="list-style-type: none"> a. SAS cable b. SAS adapter 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. SAS cable b. SAS adapter c. Hard disk drive
217-XXX-001	Failed BIOS hard disk test.	<ol style="list-style-type: none"> 1. Reseat the hard disk drive cables and run the test again. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Hard disk drive cable b. Hard disk drive c. (Trained service technician only) System board
301-XXX-000	Failed keyboard test.	<ol style="list-style-type: none"> 1. Make sure that the keyboard cable is securely connected to the computer, and the keyboard and mouse cables are not reversed. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Keyboard b. (Trained service technician only) System board

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
302-XXX-000	Failed mouse test.	<ol style="list-style-type: none"> 1. Make sure that the pointing device (mouse) cable is correctly connected to the computer, and the keyboard and mouse cables are not reversed. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Pointing device (mouse) b. (Trained service technician only) System board
405-XXX-000	Failed Ethernet test on the controller on the system board.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program and make sure that the Ethernet adapter is not disabled and that the BIOS code is at the latest level. 2. (Trained service technician only) Replace the system board.
405-XXX-00n	Failed Ethernet test on the adapter in PCI slot <i>n</i> .	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program and select System MAC Addresses under the Devices and I/O Ports menu option. Compare the MAC address of the Ethernet adapter in the PCI slot under the System MAC Addresses information, to the MAC address of the failing device on the diagnostics screen. If the MAC addresses match, this is the failing adapter. 2. Reseat the Ethernet adapter in slot <i>n</i>. 3. Replace the Ethernet adapter in slot <i>n</i>.

Creating an IBM Enhanced Diagnostics diskette or CD in Windows XP

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

Notes:

1. To create and use a diskette or CD, a diskette drive, or a CD or DVD/CD combo drive must be installed in the computer.
2. When using diagnostics with a USB keyboard and mouse attached, you must first enable USB emulation. Restart the computer and press F1 to start the Configuration/Setup Utility, (click **Startup Sequence Options** → **Legacy USB Support**).

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

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

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

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

Using the IBM Enhanced Diagnostics diskette or CD in Windows XP

Note: To start the IBM Enhanced Diagnostics programs in Windows Vista, see “Running the diagnostic programs” on page 104.

To start the IBM Enhanced Diagnostics from a diskette or CD in Windows XP; complete the following steps.

Note: Before you restart the computer, make sure that the drive that contains the diagnostics diskette or CD is first in the startup sequence in the Configuration/Setup Utility program.

1. Turn off the computer and any peripheral devices.
2. Insert the IBM Enhanced Diagnostics diskette or CD into the drive.
3. Turn on all attached devices; then, turn on the computer.
4. Follow the instructions on the screen.
5. When the tests are completed, you can use one or more of the following procedures:
 - View the summary test log by pressing F3, or by selecting **Utility** from the top of the screen and selecting **View Test Log**. Press Page Up and Page Down to view the entire log.
 - View the detailed test log by pressing Tab while in the summary test log. Press Page Up and Page Down to view the entire log.
 - Save the test log to a file on a diskette or to the hard disk by selecting **Utility** from the top of the screen and selecting **Save Test Log**.

Notes:

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

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

System-board error LEDs

The following illustration shows the location of the error LEDs on the system board. An error LED on the system board is lit to indicate a problem with a specific component. The error LEDs remain lit until the error is cleared, so that intermittent errors do not remain. After a problem is cleared, the LED will not be lit the next time the computer is restarted.

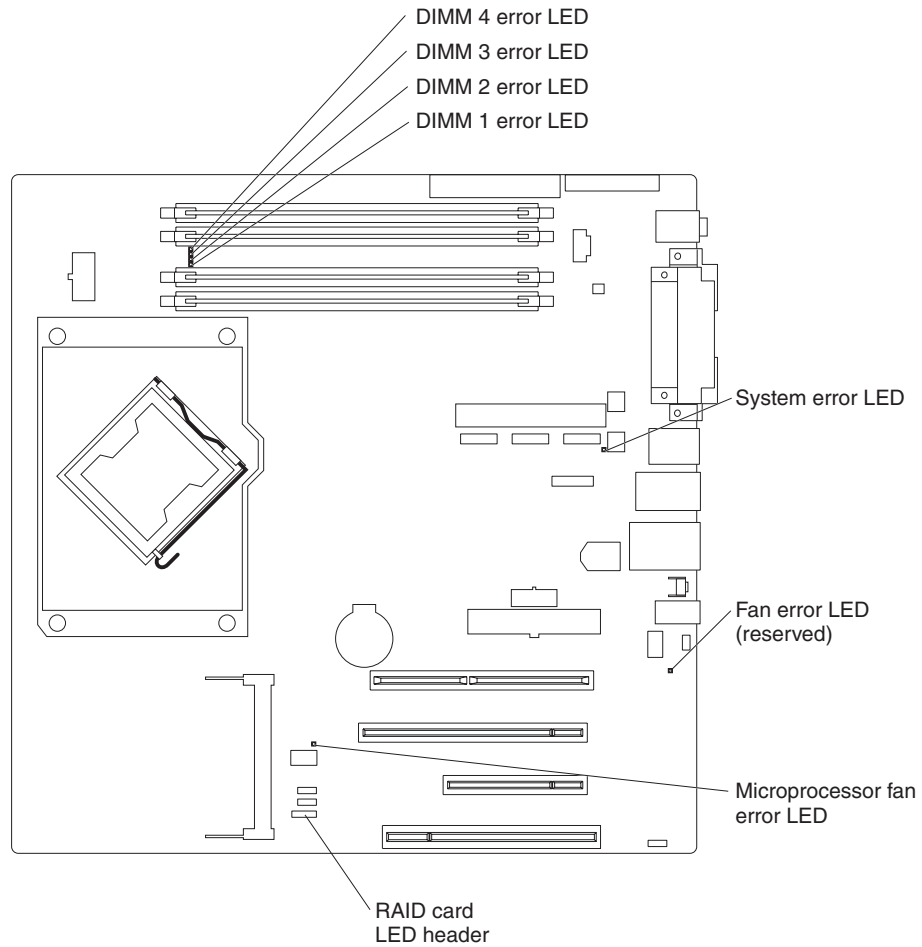


Figure 53. System-board error LED locations

Table 5. System board error LED descriptions

LED	Description	Action
DIMM x	A memory failure occurred on DIMM x.	<ol style="list-style-type: none"> 1. Reseat DIMM x. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. DIMM x b. (Trained service technician only) System board

Table 5. System board error LED descriptions (continued)

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See Chapter 3, “Parts listing, Type 9229,” on page 17 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
LED	Description	Action
Microprocessor fan	Microprocessor fan has failed.	<ol style="list-style-type: none"> 1. Reseat the microprocessor fan cable. 2. Replace the following components one at a time, in the order shown, restarting the computer each time: <ol style="list-style-type: none"> a. Microprocessor fan assembly b. (Trained service technician only) System board
System-error LED	A system error has occurred.	<ol style="list-style-type: none"> 1. If another error LED is also lit, follow the actions for that LED. 2. (Trained service technician only) If no other LED is lit, replace the system board.

Emergency recovery-repair diskettes (Windows XP)

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

Notes:

1. To create and use an emergency recovery-repair diskette, you must add a diskette drive to the computer.
2. When you use 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, click **Startup Sequence Options** → **Legacy USB Support**.

Creating an emergency recovery-repair diskette in Windows XP

If you are using a Windows XP operating system, you can create a recovery-repair diskette from the c:\ibmtools directory or from the Product Recovery program partition.

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

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

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

1. Shut down the operating system and turn off the computer.

2. Wait for at least 5 seconds; then, press and hold the F11 key while you restart the computer. When a menu is displayed, 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 XP

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 XP” on page 118. To run the recovery-repair diskette, complete the following steps:

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

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

If an error message is displayed during the repair operation and the repair operation cannot be completed, you might have a problem with the Product Recovery program or the partition that contains the Product Recovery program. Use a *Product Recovery* CD to access the Product Recovery program.

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, contact IBM to order the *IBM Product Recovery* CD for Windows XP or *IBM Product Recovery* DVD for Windows Vista to recover the preinstalled operating system, application programs, and device drivers.

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

Note: The recovery process replaces all information on drive C. If possible, back up your data files before you start 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 press the power-control button for at least 4 seconds, disconnect the power cord and wait a few seconds before you reconnect 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 XP” on page 119.

4. Quickly press F11, and wait for the program menu.
5. Select **Full recovery** and follow the instructions on the screen.
6. When recovery is complete, exit from the program.
7. Restart the computer.

To recover the Windows Vista operating system, complete the following steps:

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 press the power-control button for at least 4 seconds, disconnect the power cord and wait a few seconds before you reconnect it.

3. Turn on the computer and watch the screen.
4. When the operating system menu is displayed, quickly select **IBM Recovery Program**.
5. Select **Recovery** from the program menu; then, follow the instructions on the screen.
6. When the recovery is complete, exit from the program.
7. Restart the computer.

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

Note: The recovery process replaces all information on drive C. If possible, back up your data files before you start 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 press the power-control button for at least 4 seconds, disconnect the power cord and wait a few seconds before you reconnect 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 and IBM Enhanced Diagnostics 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 and IBM Enhanced Diagnostics CD* and in the `c:\ibmtools\drivers\` directory.

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

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/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 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 the computer does not have an integrated diskette drive); then, update the BIOS code on the computer.
- Download the BIOS code update file to a CD, using a CD-RW or DVD/CD-RW combo drive; then, start the computer with the CD in the optical drive to update the BIOS code on the computer.

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

To download the BIOS update files, complete the following steps:

1. Go to <http://www.ibm.com/support/>.
2. In the **Support by product** category, click **Personal computing**.
3. In the **Download** category, click **Downloads and drivers**.
4. In the **Brand** field, select **IntelliStation**.
5. In the **Family** field, select **IntelliStation M Pro**.
6. In the **Type** field, select **9229** and click **Continue**.
7. Scroll down and click the package for the correct operating system to view the available files.
8. Select the file to be downloaded.
9. Follow the instructions on the screen to complete the download and install the downloaded files.
10. 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 you update the BIOS code.

Recovering from a BIOS update failure

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the side cover and internal drive-bay bracket.
5. Locate the boot block recovery jumper (J1) on the system board (see Figure 54), removing any adapters that impede access to the jumper.

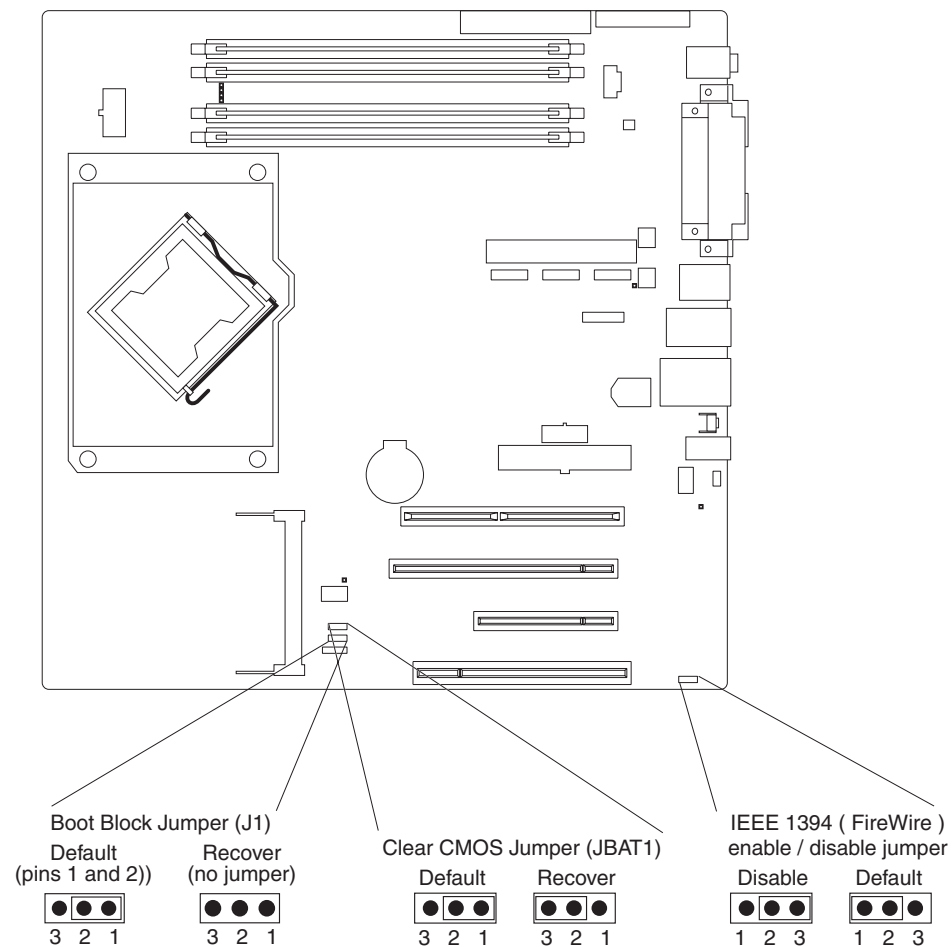


Figure 54. Recovery jumper locations

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

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

11. Disconnect all power cords; then, remove the computer cover and internal drive-bay bracket.
12. Remove any adapters that impede access to the jumper; then, return the boot block recovery jumper to pins 1 and 2.
13. Replace any adapters that were removed; then, replace the internal drive-bay bracket and the side cover.
14. Reconnect all external cables and power cords.
15. Turn on the attached devices and turn on the computer to restart the operating system.

Interrupt status port register (ISPR) error procedures

Use interrupt status port register (ISPR) error procedures to help you solve ServeRAID problems.

EF10 (Default ISPR)

1. There is no ISPR error.

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

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

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

If an ISPR error remains, complete the following steps until the error is corrected:

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

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

2. If the ISPR error is EF10 after the cables are disconnected, complete the following steps:
 - a. Identify which channel is causing the error according to the second digit (z) of the original ISPR code, as indicated in the following table.

Table 6. SAS identifier

SAS channel code (z)	Descriptions
1	Channel 1
2	Channel 2
3	Channels 1 and 2
4	Channel 3
5	Channels 1 and 3
6	Channels 2 and 3
7	Channels 1, 2, and 3
8	Channel 4
9	Channels 1 and 4
A	Channels 2 and 4

Table 6. SAS identifier (continued)

SAS channel code (z)	Descriptions
B	Channels 1, 2, and 4
C	Channels 3 and 4
D	Channels 1, 3, and 4
E	Channels 2, 3, and 4
F	Channels 1, 2, 3, and 4

- b. Confirm that the channels that are identified from the error in step 2a on page 124 are the cause of the error by making sure that the error occurs *only* when the suspected channel is reconnected.
- c. Check the termination of the identified channel.
- d. If the computer has hard disk drive status cables, make sure that the cables are connected correctly. Reconnect all cables that you removed in step 1.
- e. Disconnect one drive at a time from the channel that was identified in step 2a; then, restart the computer to determine which drive is causing the error.
- f. Reconnect the SAS cable.
- g. Reconnect the SAS backplane.

FFFF or other code not listed

1. Place download jumpers on the controller and try to update the firmware code on the adapter.
2. Isolate between the SAS subsystem and the controller by disconnecting all SAS cables from the suspected adapter, and restart the computer.

Attention: Do not press F5. Doing so changes the computer configuration. If the ISPR code is EF10 after the cables are disconnected, complete the following steps until the error is corrected:

- a. Identify which channel is causing the error by reconnecting cables one at a time and restarting the computer until the error occurs again.
- b. Check the termination of the identified channel in step 2a.
- c. Disconnect one drive at a time from the channel that was identified in step 2a, and restart the computer each time to determine which drive is causing the problem.
- d. Reconnect the SAS cable to the channel that was identified in step 2a.
- e. Reconnect the backplane to the channel that was identified in step 2a.
3. If original ISPR code remains after all SAS cables are disconnected and the computer is restarted, complete the following steps until the error is corrected:
 - a. Reseat the controller.
 - b. Replace the controller.

Erasing a lost or forgotten password (clearing CMOS)

If the power-on or administrator password is lost or forgotten, you can regain access to the computer through one of the following methods:

- If you have forgotten the power-on password and an administrator password is set, type the administrator password at the power-on prompt; then, start the Configuration/Setup Utility program and change the power-on password (see the *User's Guide* on the IBM *IntelliStation Documentation* CD for more information).

- Remove the battery and then reinstall the battery (see “Removing the battery” on page 44 and “Installing the battery” on page 45).
- Clear CMOS settings by changing the position of the CMOS recovery jumper (JBAT1).

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 25.
2. Turn off the computer and all attached devices.
3. Disconnect the power cord.
4. Remove the side cover and internal drive-bay bracket.
5. Locate the CMOS recovery jumper (JBAT1) on the system board (see Figure 54 on page 123), and remove 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 internal drive-bay bracket and the side cover.
9. Connect the computer to a power source, keyboard, monitor, and mouse.

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

10. Turn on the computer and start the Configuration/Setup Utility program.
11. Follow the instructions to erase the existing password or to create a new password.
12. Click **Save Settings** and exit the Configuration/Setup Utility program.

Solving power problems

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

1. Turn off the computer, and disconnect all ac power cords.
2. Check for loose cables in the power subsystem. Also check for short circuits, for example, if a loose screw is 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 that is required to start the computer (see “Solving undetermined problems” on page 127 for the minimum configuration).
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 minimum configuration, replace the components in the configuration one at a time until the problem is isolated.

Solving Ethernet controller problems

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

Solving undetermined problems

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

If you suspect that a software problem is causing failures (continuous or intermittent), see “Software problems” on page 102.

Damaged data in CMOS memory or damaged BIOS code can cause undetermined problems. To reset the CMOS data, use the clear CMOS jumper to override the power-on password and clear the CMOS memory; see “Erasing a lost or forgotten password (clearing CMOS)” on page 125. If you suspect that the BIOS code is damaged, see “Recovering from a BIOS update failure” on page 123.

Check the LEDs on the power supply. If the LEDs indicate that the power supply is working correctly, complete the following steps:

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

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

- Power supply
 - System board
 - Microprocessor
 - Memory (with a minimum of two 512 MB DIMMs)
4. Turn on the computer. If the problem remains, suspect the following components in the following order:
 - Power supply
 - System board

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

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

Problem determination tips

Due to 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, when, where, single, or multiple systems?
 - Is the failure repeatable?
 - Has this configuration ever worked?
 - If it has been working, what changes were made prior to it failing?
 - 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:

1. Are the exact machine type and models
2. Have the same BIOS level
3. Have the same adapters/attachments in the same locations
4. Have the same address jumpers/terminators/cabling
5. Have the same software versions and levels
6. Have the same diagnostics code (version)
7. Have the same configuration options set in the system
8. Have the same setup for the operation system control files

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

Calling IBM for service

See Appendix A, “Getting help and technical assistance,” on page 131 for information about calling IBM for service.

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

- Machine type and model
- Microprocessor or hard disk upgrades
- Failure symptoms
 - Does the computer fail the diagnostic programs? If so, what are the error codes?

- What occurred? When? Where? Did it occur on a single or multiple computers?
- Is the failure repeatable?
- Has the current computer configuration ever worked?
- What changes, if any, were made before it failed?
- Is this the original reported failure, or has this failure been reported before?
- Diagnostic program type and version level
- Hardware configuration (print the screen with the system summary information)
- BIOS code level
- Operating-system type and version level

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

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

Appendix A. Getting help and technical assistance

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

Before you call

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

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM Documentation CD that comes with your system.
- Go to the IBM support Web site at <http://www.ibm.com/support/> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

Important: When you call for service, you will be asked to provide the four-digit machine type of your system, which is 9229.

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

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

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

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Alert on LAN	Netfinity	Wake on LAN
BladeCenter	Predictive Failure Analysis	XA-32
Chipkill	ServeRAID	XA-64
e-business logo	ServerGuide	X-Architecture
@server	ServerProven	XpandOnDemand
FlashCopy	System x	xSeries
i5/OS		

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Important notes

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

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

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

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

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

Maximum memory may require replacement of the standard memory with an optional memory module.

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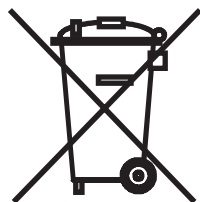
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Battery return program

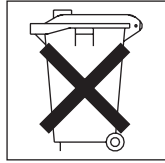
This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area.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

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

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For the European Union:



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IBM IntelliStation M Pro Type 9229

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:

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- 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.

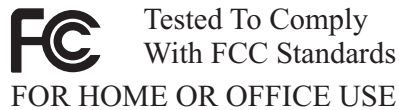
Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors 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



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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