

IBM IntelliStation Z Pro
Type 9228



User's Guide

IBM IntelliStation Z Pro
Type 9228



User's Guide

Note:

Before using this information and the product it supports, read the information in “Notices,” on page 65.

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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 ασφαλείας (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.

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.

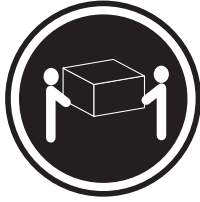


DANGER

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.

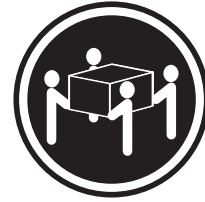
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

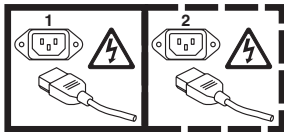
Use safe practices when lifting.

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.

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

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

Statement 26:



CAUTION:

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



Statement 27:



CAUTION:
Hazardous moving parts are nearby.



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:

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

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

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

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. Introducing the IntelliStation Z Pro computer

The IBM® IntelliStation® Z Pro Type 9228 computer incorporates many of the latest advances in computing technology and can be expanded and upgraded as your needs change.

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

The computer model and serial numbers for the Z Pro Type 9228 are on labels on the bottom of the computer and on the lower-right side of the bezel. You will need these numbers to register the computer with IBM.

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

Related documentation

This *User's Guide* provides general information about the computer, including information about features, how to configure the computer, how to install options, and how to solve problems and get help. In addition to this *User's Guide*, the following documentation comes with the computer:

- *Installation Guide*

This printed document contains setup and installation instructions.

- *Problem Determination and Service Guide*

This document is in Portable Document Format (PDF) on the *IntelliStation Documentation* CD and at <http://www.ibm.com/support/>. It contains information to help you solve problems yourself and it contains information for service technicians.

- *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* CD

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

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

The computer might have features that are not described in the documentation that you received with the computer. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information. These updates are available from the IBM Web site. 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 9228, and click **Search**.

Notices and statements in this document

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

The following notices and statements are used in this document:

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

Features and specifications

The following table provides a summary of the features and specifications of the computer. Depending on the model, some features might not be available, or some specifications might not apply. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Supports up to two Intel® Xeon dual-core microprocessors • One 4 MB Level-2 cache • 1333 MHz front-side bus (FSB) <p>Memory:</p> <ul style="list-style-type: none"> • Minimum: 1 GB • Maximum: 32 GB (mirroring mode 16 GB) • Type: PC2-5300, 667 MHz, dual-data-rate 2 (DDR2) fully-buffered error correcting code (ECC) • Connectors: eight 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 – CD-ROM: IDE – DVD ROM: IDE – Multi-burner Plus: IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> • Two half-high 5.25-inch bays (optical drive installed in one bay) • Four slim-high 3.5-inch internal drive bays (one hard disk drive installed) • One slim-high 3.5-inch drive bay (optional diskette drive) <p>PCI expansion slots:</p> <ul style="list-style-type: none"> • One PCI Express x16 (x16) slot • One PCI Express x16 (x4) slot • One PCI Express x8 (x4) slot • One PCI 32-bit/33 MHz slot • Two PCI-X 64-bit 133 MHz slots <p>Power supply:</p> <ul style="list-style-type: none"> • One 815-watt power supply <p>Cooling:</p> <ul style="list-style-type: none"> • Six to eight speed-controlled fans and one power-supply fan 	<p>Integrated functions:</p> <ul style="list-style-type: none"> • Broadcom BC5752KFB 10/100/1000 Ethernet controller with RJ-45 Ethernet connector • One serial connector • Four-port Serial ATA controller • Two IEEE 1394A (FireWire) ports (one on rear, one on front) • Seven Universal Serial Bus (USB) connectors (two on front, four on rear, and one internal) • Keyboard connector • Mouse connector • Audio connectors <ul style="list-style-type: none"> – Line out (rear) – Mic (front and rear) – Line in (rear) – Headphone (front) • 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 GDDR3 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 • NVIDIA Quadro FX 4500 (DVI-I), PCI Express x16, with 512 MB GDDR3 SDRAM and two dual DVI-I connectors 	<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: 100 V ac – Maximum: 124 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 200 V ac – Maximum: 240 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.03 kVA – Maximum: 1.24 kVA <p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 433 Btu per hour (127 watts) • Maximum configuration: 1948 Btu per hour (571 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 (with SATA hard disk drive) • Sound power, operating: 5.3 bel <p>Size:</p> <ul style="list-style-type: none"> • Height: 467.3 mm (18.4 in.) • Depth: 492.7 mm (19.4 in.) • Width: 215.9 mm (8.5 in.) • Weight: 18.1 kg (40 lb) to 21.8 kg (48 lb) depending upon configuration
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What the computer offers

The computer uses the following features and technologies:

- **PCI Express x16 graphics**

The computer comes with a graphics adapter installed in the PCI Express x16 slot (slot 1). This high-performance adapter supports high resolutions and includes many performance-enhancing features for the operating-system environment.

- **Large system-memory capacity**

The computer supports up to 32 GB of system memory. The memory controller provides error correcting code (ECC) support for up to eight industry-standard PC2-5300, 667 MHz, 1.8 V, 240-pin, double-data-rate 2 (DDR2), fully-buffered, synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

- **Systems-management capabilities**

The computer comes with features that a network administrator or file server can use to remotely manage and control the computer. These features include Wake on LAN[®], Remote Administration, IBM Director Agent, and System Migration Assistant. See “Software available on the World Wide Web” on page 6 and “Managing the computer” on page 17 for more information.

- **Integrated network support**

The computer comes with an integrated Ethernet controller, which supports connection to a 10-Mbps, 100-Mbps, or 1-Gbps network. For more information, see “Configuring the Broadcom NetXtreme Gigabit Ethernet controller” on page 25. The controller supports Wake on LAN and Trusted Platform Module (TPM) technologies.

- **Memory mirroring**

Some models support memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. To support memory mirroring, you must have at least two pairs of DIMMs installed, and they must be identical pairs of DIMMs. For more information, see “Installing memory modules” on page 48.

- **Online-spare memory**

Some models support online-spare memory. Online-spare memory disables a failed pair of DIMMs from the system configuration and activates an online-spare pair of DIMMs to replace the failed pair of DIMMs. For an online-spare pair of DIMMs to be activated, you must have installed an additional pair of DIMMs of the same speed, type, size (or larger), and technology as the failed pair of DIMMs. For more information, see “Installing memory modules” on page 48.

- **Symmetric multiprocessing**

The computer supports up to two Intel Xeon dual-core microprocessors for symmetric multiprocessing (SMP).

Software

The computer comes with preinstalled Microsoft[®] Windows[®] XP Professional or Red Hat Enterprise Linux[®] Workstation and a variety of software, including application programs, diagnostic tools, and device drivers.

Important: The software, other than the operating system, is licensed under the terms of the IBM International License Agreement for Non-Warranted Programs. Use of the computer signifies acceptance of this license

agreement. For detailed instructions for viewing the license agreement, see “Viewing the license agreement” on page 13.

Preinstalled software

In addition to the operating system, the preinstalled software includes some or all of the following programs. Some programs might require setup and configuration before use.

- **Adobe Acrobat Reader**

You can use this program to read files in PDF, including documentation. You can download the most current versions of Adobe Acrobat Reader for other languages and operating systems from the Adobe Web site at <http://www.adobe.com>.

- **Device drivers**

Device drivers for factory-installed features are preinstalled in the computer. The latest device drivers are also available at <http://www.ibm.com/support/>.

- **IBM Drive Letter Access**

You can use this program to copy files to CD-R or CD-RW media.

- **Sonic RecordNow Business Edition and DLA**

You can use this program to record data or audio to CD-R or CD-RW media or to create copies of existing CDs.

- **WinDVD or LinDVD**

This software comes on models with DVD read capability. You can use this program to play DVDs.

- **DVDCreator**

This software comes on models with DVD write capability. You can use this program to create DVDs.

- **Norton Internet Security**

You can use this program to detect and remove viruses from the computer.

- **Online Books**

You can use this program to access documentation for the computer.

- **Product Recovery Program**

You can use this program to recover the operating system and other software programs in the event of a system failure.

Important: The Product Recovery Program is on a hidden, hard disk drive partition. Do not delete or otherwise destroy this partition.

- **IBM Dynamic System Analysis**

IBM Dynamic System Analysis (DSA) is a system information collection and analysis tool that is used by IBM System x™ Service and Support personnel to aid in the diagnosis of system problems.

You must have Internet access to use some of these programs. For more information about connecting to the Internet, see the operating-system documentation that comes with the computer.

See “Using preinstalled software” on page 12 for additional information about the preinstalled software.

Important:

1. You can reinstall the device drivers and applications that come with the computer from the directories on the hard disk.

2. The device drivers and some programs are also available at <http://www.ibm.com/support/> and on the *Device Drivers* CD.

Software on CD

In addition to the IBM-preinstalled programs and device drivers, additional software is provided on the *Device Drivers* CD or other CDs. You decide which programs to install according to your needs.

Device drivers

Some of the preinstalled device drivers are on the *Device Drivers* CD that comes with the computer.

Software available on the World Wide Web

The following software is available from the IBM Web site:

- **IBM Director Agent**

You can use IBM Director Agent to view detailed information about the hardware and software, set up alerts, monitor a variety of system resources, and manage your asset security. IBM Director Agent streamlines and automates personal computer (PC) systems-management and support tasks, such as asset deployment and tracking.

- **Remote Deployment Manager**

Remote Deployment Manager (RDM) is a graphical, server-based system deployment program that enables mass unattended installations of operating systems, software images, device drivers, and basic input/output system (BIOS) code updates to remote systems. When RDM is used with the Wake on LAN feature, it can remotely turn on the computer so that the installation can be done while the computer is not being used.

See the product documentation for these tools to determine whether the operating system supports this software. To download any of the tools or to get information about them, complete the following steps:

1. Go to <http://www.ibm.com/support/> and select your country.
2. Click the **Products** tab at the top of the page.
3. Under **Servers**, click **Intel processor-based**.
4. From the topics on the left, click **Systems Management**.
5. Scroll down and click a product to get details about the product. To download a product, select **Systems Management Downloads** in the **Download** category.

Reliability, availability, and serviceability features

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in the computer, the availability of the computer when you need it, and the ease with which you can diagnose and repair problems.

The computer has the following RAS features:

- 24 hours a day, 7 days a week¹ customer support
- 3-year parts and 3-year labor limited warranty
- Advanced Configuration and Power Interface (ACPI)
- Automatic computer restart after a power failure
- Automatic error retry or recovery
- Boot-block recovery
- Built-in, menu-driven configuration and setup programs
- Built-in, menu-driven SAS configuration programs (some models)
- Cooling fan with speed-sensing capability
- Error codes and messages
- ECC DDR2 SDRAM with serial presence detect (SPD)
- Hard disk drive partition-based diagnostic programs
- Integrated Ethernet controller
- Integrated IEEE 1394A (FireWire) support
- Integrated SAS support using a mini-PCI Express adapter
- Monitoring support for temperatures, voltages, and fan speed
- Power supply error LED
- Power-on self-test (POST)
- Self-Monitoring Analysis and Reporting Technology (SMART) on hard disk drives for early prediction of failures
- Predictive Failure Analysis[®] (PFA) on hard disk drives
- Read-only memory (ROM) checksums
- Upgradeable basic input/output system (BIOS) and power-on self test (POST) code
- Wake on LAN capability

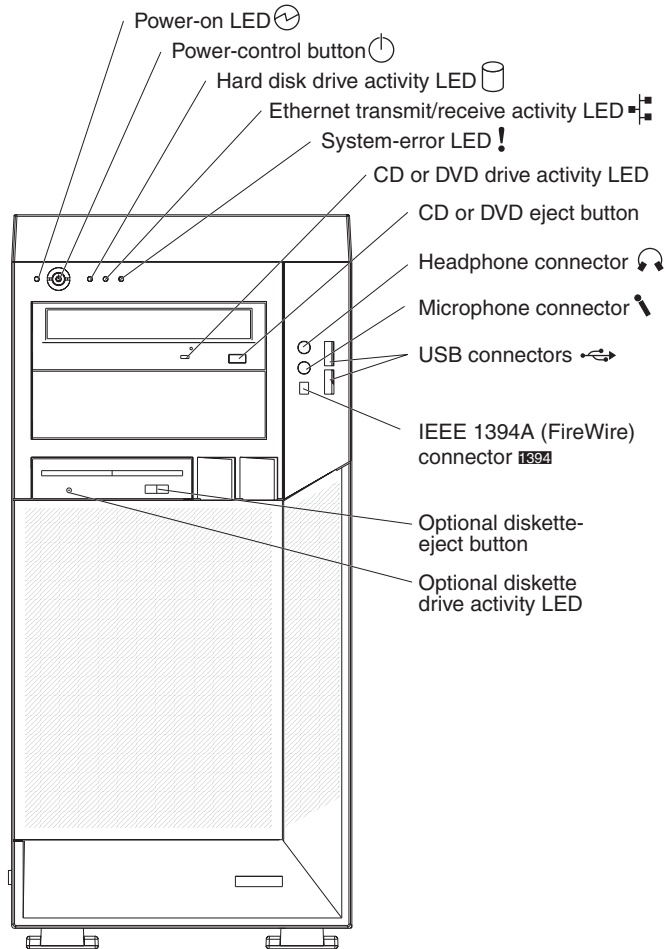
1. Service availability will vary by country. Response time varies; may exclude holidays.

Chapter 2. Operating the computer

This chapter provides information about how to use the computer.

Controls, LEDs, and connectors

This section identifies the controls, LEDs, and front connectors on the IntelliStation Z Pro Type 9228 computer. See “Input/output connectors” on page 60 for an illustration of the connectors 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.

Hard disk drive activity LED

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

Ethernet transmit/receive activity LED

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

System-error LED

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

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 eject button

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

Headphone connector (green)

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

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.

USB connectors

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

IEEE 1394A (FireWire) connectors

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

Optional diskette-eject button

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

Optional diskette drive activity LED

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

Turning on the computer

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

Notes:

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

Approximately 20 seconds after the computer is connected to ac power, the power-control button becomes active, and you can turn on the computer and start the operating system by pressing the power-control button. The computer can also be turned on in any of the following ways:

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

What you see and hear when you start the computer depends on the features that are installed and the settings in the Configuration/Setup Utility program.

If power-on self-test (POST) detects a problem, there might be a series of beeps or no beep, and a numeric error message might appear on the screen. Write down any beep series and error code numbers with descriptions, and then see the *Problem Determination and Service Guide* for an explanation of the error codes.

On a computer running a Windows operating system, the following messages might be displayed briefly during startup:

- Press F1 for Configuration/Setup Utility, Press F12 for Boot Menu
- <<< Press <CTRL><C> to start LSI Logic Configuration Utility >>> (some models)
- To start the Product Recovery Program, Press F11

On a computer running a Red Hat Linux operating system, the following messages might be displayed briefly during startup:

- Press F1 for Configuration/Setup Utility, Press F12 for Boot Menu
- <<< Press <CTRL><C> to start LSI Logic Configuration Utility >>> (some models)

To start the Product Recovery Program in Red Hat Linux, watch the screen until the operating system selection menu is displayed and select **IBM Preload Recovery & Diagnostics**.

To use these features, press the applicable function key or keys quickly. The messages appear for only a short time. For more information about these messages, see “Using the Configuration/Setup Utility program” on page 21.

Use the Configuration/Setup Utility program to configure passwords, PCI adapters, and other options.

The operating system and application programs start from the hard disk. If the computer is attached to a network, the computer will begin attaching to any LANs and remote applications to which you have access. A network administrator can also start the computer remotely to download programs or gather information about computer performance. For more information, see “Wake on LAN” on page 18.

Using preinstalled software

This section contains information to assist you in setting up the preinstalled operating system and describes how to use the programs that come with the computer.

Running the operating-system setup program

The setup program runs automatically when you start the computer for the first time. The program will prompt you to make choices or type information. If you need more detailed information than is provided in this *User's Guide*, see the operating-system documentation.

Important:

1. After turning on the computer for the first time, you must complete the operating-system setup procedure before turning off the computer; otherwise, unexpected results might occur.
2. The setup program might be slightly different from the one that is described in the operating-system documentation. Some choices do not appear because they are preset.
3. During the setup procedure, you must indicate that you accept the license agreement.
4. For Windows operating systems, the registration information is already displayed in the registration field. If the product ID number is not already displayed, you must type it. The product ID is on a label that is attached to the computer.

You will need the following information to complete the setup program:

- The documentation that comes with the computer.
- Network information from the network administrator, if the computer is being connected to a network.
- The printer model and port, if a printer is attached directly to the computer.

After the setup procedure is completed and the computer restarts, the desktop opens, and the computer is ready for use.

Installing other operating systems

The computer comes with Microsoft Windows XP Professional or Red Hat Enterprise Linux Workstation preinstalled. To install another operating system, follow the instructions in the documentation that comes with the operating system.

If you are installing an operating system other than Microsoft Windows XP or Red Hat Linux Workstation, follow the instructions in the readme files on the *Device Drivers* CD to install the device drivers. You might also need additional software or device drivers.

Note: If you experience problems with the device drivers that are installed from the *Device Drivers* CD, you can obtain the latest device drivers from <http://www.ibm.com/support/>.

Before installing any operating system, be sure to obtain the latest updates. Contact the operating-system manufacturer or, if applicable, check the manufacturer's Web site to obtain the updates.

Additional information about operating systems is posted periodically at <http://www.ibm.com/support/>.

Viewing the license agreement

The IBM International License Agreement for Non-Warranted Programs is viewable from the Access IBM folder. Use of the computer signifies acceptance of this agreement.

To view the license agreement in Windows XP, complete the following steps:

1. From the Windows XP desktop, click **Start → All Programs → Access IBM**.
2. Click **IBM License Agreement**.

For Red Hat Linux, when you start the computer, the License Agreement window opens. To accept the terms of the agreement, click **I Agree**. You can also view the license agreement by clicking the **IBM License Agreement** icon on the desktop.

Creating an emergency recovery-repair diskette in Windows

Note: To create and use a diskette, you must add a diskette drive to the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Devices and I/O Ports → Internal Floppy Disk**).

At the earliest opportunity, create a recovery-repair diskette and an IBM Enhanced Diagnostics diskette, and store them in a safe place. In the unlikely event that the computer becomes unusable, you can use the recovery-repair diskette to access the Product Recovery program. For information about using the recovery-repair diskette see the *Installation Guide* on the IBM *IntelliStation Documentation CD*.

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

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

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

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

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

5. Use the arrow keys to select **Create a Recovery Repair diskette**, and then press Enter.
6. Follow the instructions on the screen.

See “Creating an IBM Enhanced Diagnostics diskette or CD in Windows” for information about how to create an IBM Enhanced Diagnostics diskette.

Creating an IBM Enhanced Diagnostics diskette or CD in Windows

Note: To create and use a diskette or CD, a diskette, CD-RW, or DVD/CD-RW combo drive must be installed in the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Devices and I/O Ports** → **Internal Floppy Disk**).

The IBM Enhanced Diagnostics diskette is a self-starting diagnostics diskette that is used to test hardware components in the computer. You can create only an IBM Enhanced Diagnostics diskette from the Product Recovery program. You can create an IBM Enhanced Diagnostics diskette from the Product Recovery program or a CD from the World Wide Web.

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

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

To download the latest 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. Click **Support & downloads**.
3. Click **Search technical support**.
4. In the **Enter keyword(s)** field, type `diagnostics 9228`, and click **Search**.
5. From the “Search results” page, click the Enhanced Diagnostics item for the computer.
6. On the next page, click the CD image file for the Enhanced Diagnostics code and download it, using a writeable optional device (CD-RW or DVD/CD-RW combo drive).

For more information about using the IBM Enhanced Diagnostics program, see the *Problem Determination and Service Guide* on the IBM *IntelliStation Documentation* CD.

Using video features

The computer has a PCI Express x16 graphics adapter that renders 2D or 3D image quality and uses a standard video protocol for displaying text and graphic images on a monitor screen. The adapter supports a variety of video modes (combinations of resolution, refresh rate, and color that are defined by a video standard for displaying text or graphics).

Video device drivers

To use the full capabilities of the graphics adapter in the computer, some operating systems and application programs require custom video device drivers. These device drivers provide greater speed, higher resolution, more available colors, and flicker-free images.

Device drivers for the graphics adapter and a readme file with instructions for installing the device drivers are provided on the *Device Drivers* CD that comes with the computer and in the c:\ibmtools\drivers directory on the hard disk. Use the device-driver installation instructions if you have to reinstall the device drivers or if you need information about obtaining and installing updated device drivers. For more information about installing device drivers, see the *Problem Determination and Service Guide*.

Changing monitor settings

To get the best possible image on the screen and to reduce flicker, you might have to reset the resolution and refresh rate of the monitor. You can view and change monitor settings through the operating system by following the instructions in the readme files on the *Device Drivers* CD or in the c:\ibmtools\drivers\ directory on the hard disk. See the operating-system documentation for more information about monitor settings.

Attention: Before changing monitor settings, review the documentation that comes with the monitor. Using a resolution or refresh rate that the monitor does not support might cause the screen to become unreadable and could damage the monitor. The information that comes with the monitor usually includes resolution and screen refresh rates that the monitor supports. If you need additional information, contact the manufacturer of the monitor.

If you are using a cathode ray tube (CRT) monitor, set the monitor for the highest noninterlaced refresh rate that the monitor supports. If the monitor complies with the Video Electronics Standards Association (VESA) display data channel (DDC) standard, it is probably already set to the highest refresh rate the monitor and video controller can support. If you are not sure whether the monitor is DDC-compliant, see the documentation that comes with the monitor.

If you are using a flat-panel monitor, the refresh rate does not have to be set to the highest noninterlaced refresh rate that the monitor supports. Flat-panel monitors produce flicker-free images even when they are operating at a minimum 60 Hz noninterlaced rate.

If you have a dual-monitor video adapter, see the video adapter device-driver readme file and documentation for more information about enabling dual monitors.

Using audio features

The computer has an integrated audio controller that supports Sound Blaster applications. The computer also has a single internal speaker and three types of audio connectors. Using the audio controller, you can record and play back sound and music to enhance multimedia applications. Optionally, you can connect external speakers to the line-out connector to provide improved sound with multimedia applications.

The audio connectors in the computer are 3.5 mm (0.125-in.) mini-jacks. For the location of the audio connectors, see "Input/output connectors" on page 60.

Line in

This connector accepts audio signals into the computer sound system from external devices, such as the line output from a stereo, television, or a musical instrument. One line-in connector is on the rear of the computer.

Line out

This connector sends audio signals from the computer to external devices, such as speakers with built-in amplifiers, headphones, multimedia keyboards, or the audio line-in jack on a stereo system. Line-out connectors are on both the front and the rear of the computer.

Microphone

Use this connector to connect a microphone to the computer when you want to record voice or other sounds on the hard disk. With a microphone attached to the computer, you can also use speech-recognition software. One microphone connector is on the front of the computer.

Using security features

To deter unauthorized use of the computer, you can use anti-intrusion features and other security features that are provided with the computer.

Anti-intrusion features

IBM anti-intrusion features help protect against the theft of computer components, such as the microprocessor, system memory modules, or hard disk drives.

You can set the chassis-intrusion detector switch inside the computer to alert the network administrator each time the computer cover is removed. For more information about setting the chassis-intrusion alert, see Chapter 3, "Configuring the computer," on page 21.

Component protection

Each component in the computer has a serial number that you can register with a security company. You can register the components individually, or you can register the entire computer. By registering computer components, you can improve the chances of identifying the components if they are ever stolen and recovered. For more information about component registration, see <http://www.ibm.com/support/>.

Data protection

You can lose data from the hard disk for a variety of reasons. Security violations, viruses, or hard disk drive failures can all contribute to data loss. To help protect against the loss of valuable information, IBM has incorporated the following data-saving features in the computer:

- **SMART hard disk drive**

The computer comes with a self-monitoring and reporting technology (SMART) hard disk drive that is enabled to report potential hard disk failures. If an error is detected, a Desktop Management Interface (DMI) compliant warning message is sent to the monitor screen and, if the computer is part of a network, to an administrator console. When an error is detected, the data on the hard disk can be backed up and the drive replaced.

- **Virus protection**

The computer has built-in virus protection that can be enabled through the IBM Configuration/Setup Utility program. Norton AntiVirus for IBM is available on the hard disk.

- **Trusted platform module**

This integrated security chip performs cryptographic functions and stores private and public secure keys. It provides the hardware support for the Trusted Computing Group (TCG) specification. The Trusted Platform Module (TPM) subsystem supports the following features:

- Prevention of the risk of data exposure after hard disk drive or system disposal
- Secure data backup
- Password validation
- Network file and document encoding

Updating system programs

System programs are the basic layer of software that is built into the computer. They include the POST, the BIOS, and the Configuration/Setup Utility program.

System programs are stored in electrically erasable programmable read-only memory (EEPROM) on the system board. This is sometimes referred to as flash memory.

IBM occasionally makes changes and enhancements to the system programs. When updates are released, they are available as downloadable files on the World Wide Web (see “Getting help and technical assistance” in the *Installation Guide*). You can update system programs by starting the computer from a flash update diskette, or if the computer is connected to a network, a network administrator can update the system program remotely. Instructions for using system program updates are included in a readme file that comes with the downloadable files.

Managing the computer

The computer comes with features that a network administrator or server can use to remotely manage and control the computer. This section describes some of these network-management tools. See the product documentation for these tools to determine whether the operating system supports this software. To get more detailed information about these tools or to download any of this software, complete the following steps:

1. Go to <http://www.ibm.com/support/>.
2. Under **Support Topics**, click **Downloads & Drivers**.
3. From the Downloads & Drivers page, click **Driver Matrices**.
4. From the Driver Matrices page, click **Systems Management**.
5. From the Troubleshooting - Systems Management page, click a product to get more details about the product or to download the product.

The computer supports the following systems-management tools:

- **IBM Director Agent**

IBM Director Agent streamlines and automates personal computer (PC) systems-management and support tasks, such as asset deployment and tracking. These utilities are available for IBM computers at no additional charge, helping to reduce total cost of ownership of networked computers. IBM Director Agent is available from http://www.ibm.com/servers/eserver/xseries/systems_management/ibm_director/agent/.

You can use IBM Director Agent to view detailed information about the computer hardware and software, set up alerts, monitor a variety of system resources, and manage your asset security.

- **Wake on LAN**

A network administrator can use the Wake on LAN feature to turn on the computer from a remote location. When the Wake on LAN feature is used with network-management software, many functions, such as data transfers, software updates, and POST or BIOS code updates can be performed on many computers simultaneously.

Note: The Wake on LAN feature works only if the computer was correctly shut down and turned off.

- **Remote Administration**

A network administrator can use the Remote Administration feature to remotely update the POST and BIOS code in the computer. Network-management software, such as Remote Deployment Manager, is required to take advantage of this feature.

- **Remote Deployment Manager**

Remote Deployment Manager (RDM) is a graphical, server-based program that performs mass unattended installations of operating systems, software, device drivers, and BIOS code updates to remote systems. When RDM is used with the Wake on LAN feature, it can remotely turn on the computer so that installations can be performed while the computer is not being used.

Shutting down the operating system

When you are ready to turn off the computer, use the shutdown procedure for the operating system to save data and prevent damage to the applications. See the operating-system documentation for more information.

If you are using the preinstalled Microsoft Windows XP operating system, to shut down the operating system and computer, complete the following steps:

1. Save and close all files with which you are working.
2. Close all open applications.
3. Click **Start**.
4. Click **Turn Off Computer**, and click **Turn Off** to confirm.

If you are using the preinstalled Red Hat Linux operating system, to shut down the operating system and computer, complete the following steps:

1. Save and close all files with which you are working.
2. Close all open applications.
3. Click **Red Hat Linux Main Menu Button** → **Logout** → **Shutdown**.
4. Click **OK** to confirm.

Turning off the computer

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

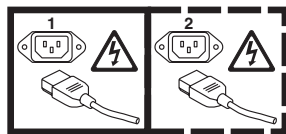
Some operating systems require an orderly shutdown before you turn off the computer. See the operating-system documentation for information about shutting down the operating system.

Statement 5:



CAUTION:

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



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

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

To turn off the computer from the Microsoft Windows XP operating system, click **Start → Turn Off Computer**, and click **Turn Off**.

To turn off the computer from the Red Hat Linux operating system, click **Red Hat Linux Main Menu Button → Logout → Shutdown**, and click **Yes**.

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

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

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

Chapter 3. Configuring the computer

The following configuration programs are available to configure the computer:

- **Configuration/Setup Utility program**

The Configuration/Setup Utility program is part of the basic input/output system (BIOS) code in the computer. You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the device startup sequence, set the date and time, set passwords, and set the chassis-intrusion detector. For information about using this utility program, see “Using the Configuration/Setup Utility program” on page 21.

- **Boot Menu program**

The Boot Menu program is part of the BIOS code in the computer. Use it to temporarily assign a device to be first in the startup sequence, overriding the startup sequence that is set in the Configuration/Setup Utility program. For information about using this utility program, see “Using the Boot Menu program” on page 24.

- **Broadcom NetXtreme Gigabit Ethernet Boot Agent**

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS code in the computer. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in the startup sequence. You enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program. For information, see “Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent” on page 25.

- **Broadcom NetXtreme Gigabit Ethernet controller configuration**

To configure the integrated Gigabit Ethernet controller, see “Configuring the Broadcom NetXtreme Gigabit Ethernet controller” on page 25.

- **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 “LSI Logic Configuration Utility program” on page 25.

Using the Configuration/Setup Utility program

This section provides instructions for starting the Configuration/Setup Utility program and descriptions of the menu choices that are available.

Starting the Configuration/Setup Utility program

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

1. Turn on the computer and watch the monitor screen. If the computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use LEDs are turned off, and restart the computer.
2. When the message Press F1 for Configuration/Setup, Press F12 for Boot Menu appears on the screen during startup, press F1. (This prompt appears on the screen for only a few seconds. You must press F1 quickly.) If you have set both a user password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu.
3. Follow the instructions on the screen.

Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of the BIOS code in the computer, some menu choices might differ slightly from these descriptions.

Note: When you use the computer for the first time, you might want to use the Configuration/Setup Utility menu choice **Load Default Settings** to reset the Configuration/Setup Utility menu choices to the factory default settings, in case they were changed before you received the computer. Otherwise, some choices might not appear in the list of menu choices.

- **System Summary**

Select this choice to view configuration information, including the amount of installed memory. When you make configuration changes through other options in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

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

- **Processor summary**

Select this choice to view the processor information, including the type, speed, and cache size of the microprocessor.

- **System MAC Address**

Select this choice to view the MAC addresses for network devices that are installed in the computer.

Note: This choice appears only if at least one Preboot eXecution Environment (PXE) option, read only memory (ROM) starts during POST.

- **System Information**

Select this choice to view information about the computer. When you make changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information.

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

- **Devices and I/O Ports**

Select this choice to view or change device assignments and input/output (I/O) ports. You can select this choice to enable or disable the mini-PCI Express SAS and Ethernet controllers, and standard connectors (such as serial and parallel).

Enable is the default setting for all controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the mini-PCI Express SAS controller and no SAS adapter is installed, the computer will have no SAS capability. If you disable the integrated Ethernet controller and no Ethernet adapter is installed, the computer will have no Ethernet capability.

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

- **Remote Console Redirection**

Select this choice to enable and configure serial remote video and keyboard redirection.

- **Video**

Select this choice to view the video information.

- **Date and Time**
 Select this choice to set the date and time in the computer, in 24-hour format (*hour:minute:second*).
 This choice is on the Configuration/Setup Utility menu only.
- **System Security**
 Select this choice to set password settings. See “Using passwords” on page 24 for more information about passwords. You can also enable the chassis-intrusion detector to alert you each time the computer cover is removed.
 - **Administrator Password**
 This choice is on the Configuration/Setup Utility menu.
 Select this choice to set or change an administrator password. An administrator password is intended to be used by a system administrator; it limits access to the full Configuration/Setup Utility menu. If an administrator password is set, the full Configuration/Setup Utility menu is available only if you type the administrator password at the password prompt.
 - **Power-on Password**
 Select this choice to set or change a power-on password.
 - **Trusted Platform Module Setting**
 Select this choice to view the Trusted Platform Module Setting information.
- **Startup Option**
 Select this choice to view or change the startup options. Changes in the startup options take effect when you start the computer.
 You can set keyboard operating characteristics, such as the keyboard speed, or specify whether the computer starts with the keyboard number lock on or off.
 You can enable a virus-detecting test that checks for changes in the boot record when the computer starts.
 - **Startup Sequence Options**
 Select this choice to view the **Startup Sequence** menu. The startup sequence specifies the order in which the computer checks devices to find a boot record. The computer starts from the first boot record that it finds.
- **Advanced Setup**
 Select this choice to change values for advanced hardware features, such as CPU options and PCI configuration.
Important: The computer might malfunction if these options are incorrectly configured. Follow the instructions on the screen carefully.
 This choice is on the full Configuration/Setup Utility menu only.
 - **Advanced Processor Options**
 Select this choice to view the Advanced Processor Options information.
 - **PCI Bus Control**
 Select this choice to view the system resources that are used by the installed PCI or PCI-Express devices.
 - **ASF Configuration**
 Select this choice to view the Alert Standard Format (ASF) feature in the computer.
- **Hardware Monitor**
 Select this choice to display the computer temperature, voltage status, and fan speeds.

- **Error Logs**
Select this choice to view or clear error logs.
 - **System Event/Error Log**
Select this choice to view the system event and error messages that the system generated during POST and runtime. Select **Clear event/error logs** to clear the event and error log.
- **Save Settings**
Select this choice to save the changes that you have made in the settings.
- **Restore Settings**
Select this choice to cancel the changes that you have made in the settings and restore the previous settings.
- **Load Default Settings**
Select this choice to cancel the changes that you have made in the settings and restore the factory settings.
- **Exit Setup**
Select this choice to exit from the Configuration/Setup Utility program. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Using passwords

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

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

Keep a record of the password in a secure place. If you forget the power-on or administrator password, 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. Start the Configuration/Setup Utility program and change the power-on password.
- Remove the battery and then install the battery.

Using the Boot Menu program

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

To use the Boot Menu program, complete the following steps:

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

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

Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent

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

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

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

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/>.

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 on a SAS hard disk drive
 - Set SAS protocol parameters

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:

- The integrated SAS controller with RAID capabilities supports:
 - 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 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 settings for attached devices.

Using the LSI Logic Configuration Utility program

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

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

The integrated SAS controller with RAID capabilities supports 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 settings for attached devices.

The following sections provide instructions for starting the LSI Logic Configuration Utility program and performing selected functions.

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 >>> appears, press Ctrl+C. If you have set an administrator password, you are prompted to type the password.
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 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 performing this procedure.

Note: Before you format a SAS hard disk, make sure that the disk is not part of a mirrored pair.

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. Press Alt+D.
5. To start the low-level formatting operation, select **Format** and press Enter.

Creating a RAID array of SAS hard disk drives

To create a RAID array of SAS 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.

Chapter 4. Installing options

This section provides instructions for installing and replacing hardware options in the computer. For a list of supported options for the computer, go to <http://www.ibm.com/intellistation/>; then, select your country and navigate to the list of options for the computer.

Installation guidelines

Before you install options, read the following information:

- Read the safety information that begins on page v and the guidelines in “Handling static-sensitive devices” on page 30. This information will help you work safely.
- When you install your new computer, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your computer is ready to function at maximum levels of performance. To download firmware updates for your computer, go to <http://www.ibm.com/support/> and click **Downloads and drivers**.
- Observe good housekeeping rules in the area where you are working. Place removed covers and other parts in a safe place.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you can 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 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 to install options, you might find it easier to lay the computer on its side.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the computer, open or close a latch, and so on.
- When you are finished working on the computer, reinstall all safety shields, guards, labels, and ground wires.

System reliability considerations

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

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- There is adequate space around the computer to allow the computer cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the computer. Do not place objects in front of the fans. For proper cooling and airflow, replace the computer cover before turning

on the computer. Operating the computer for extended periods of time (more than 30 minutes) with the computer cover removed might damage computer components.

- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.

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:

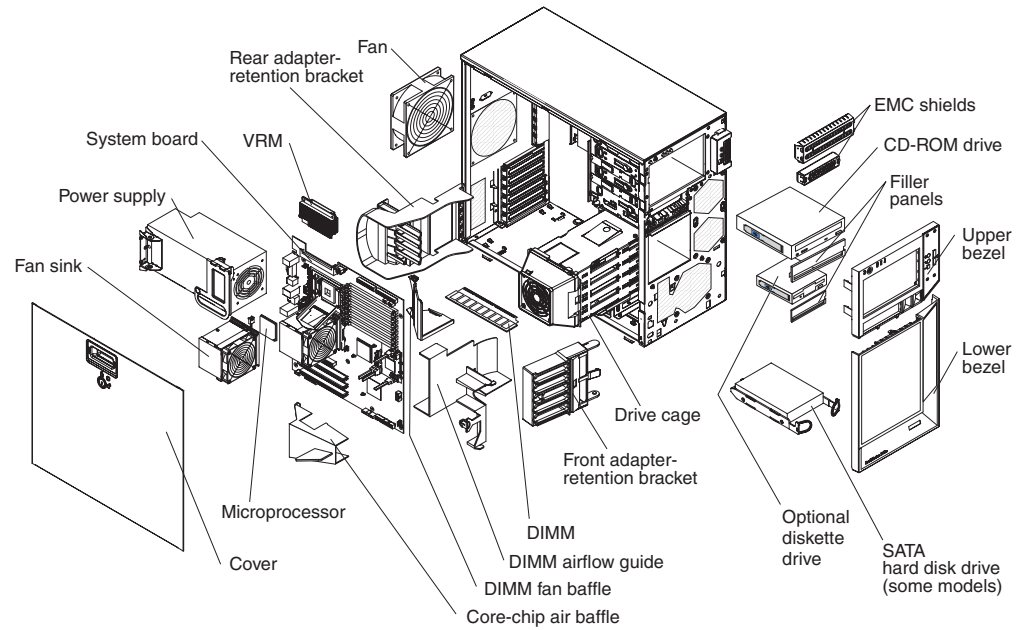
1. If you are instructed to return a device or component, follow all packaging instructions. Use any packaging materials for shipping that are supplied to you.
2. Use product-specific electrostatic-discharge procedures when they exceed the requirements that are specified in this document.
3. Make sure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

To reduce the possibility of damage from 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.

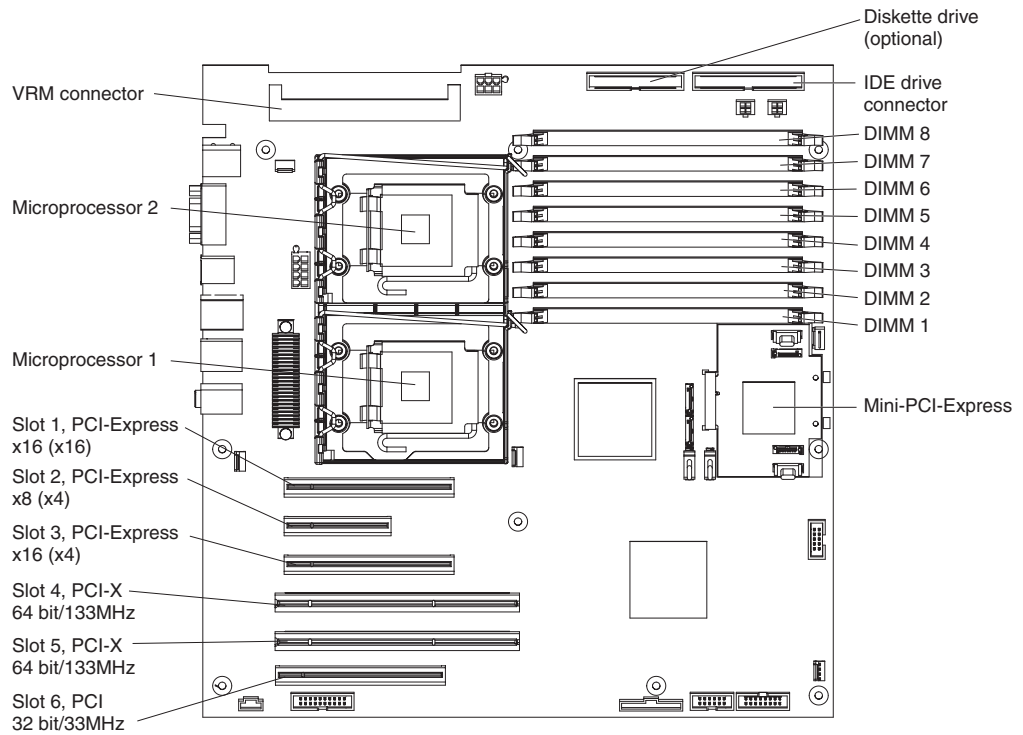
Major components of the computer

The following illustration shows the major components in the Z Pro Type 9228 computer.



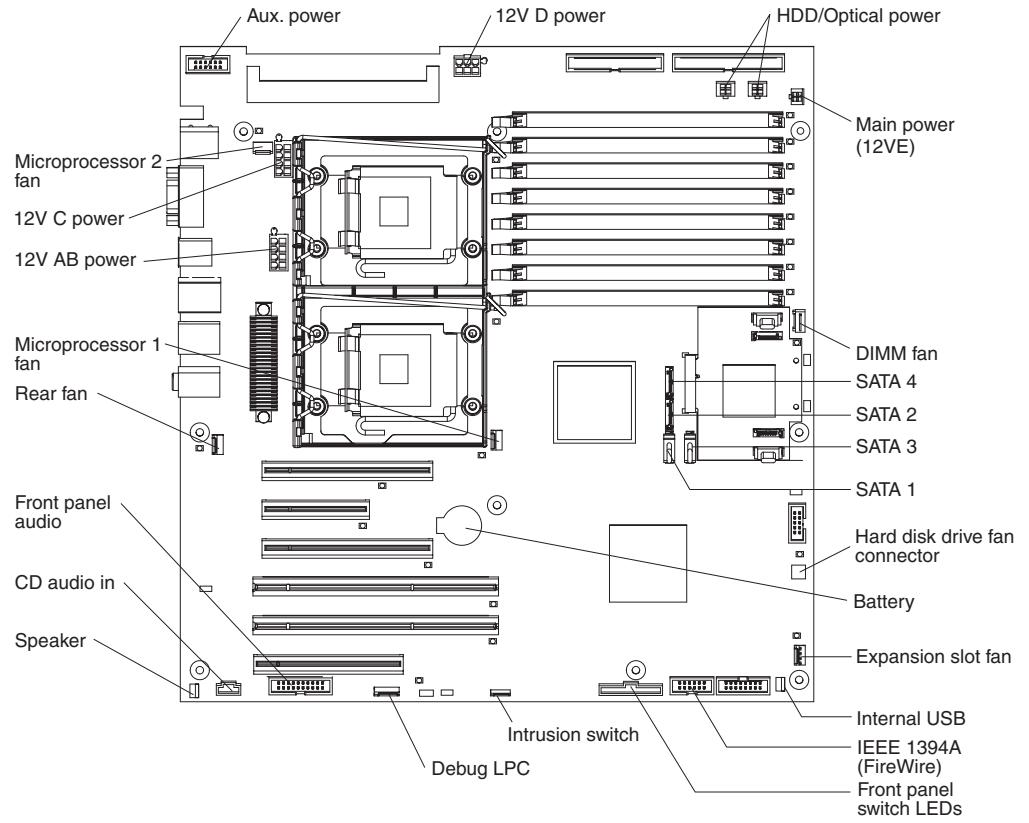
System board option connectors

The following illustration shows the system-board connectors for user-installable options.



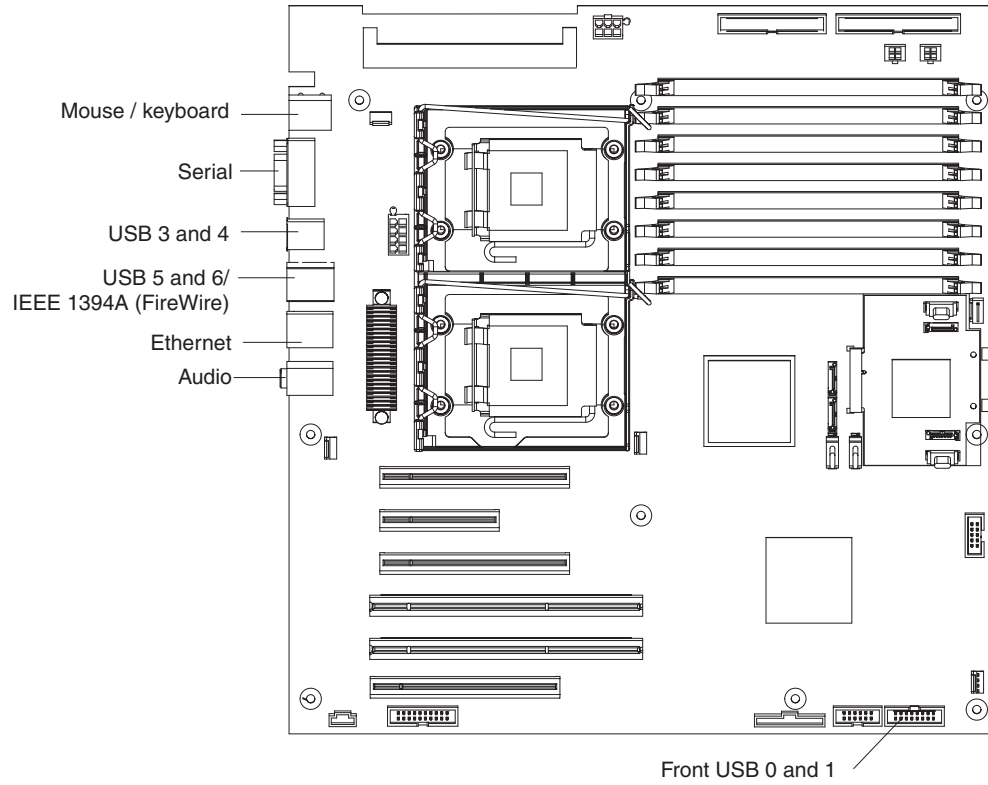
System board internal connectors

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



System board external connectors

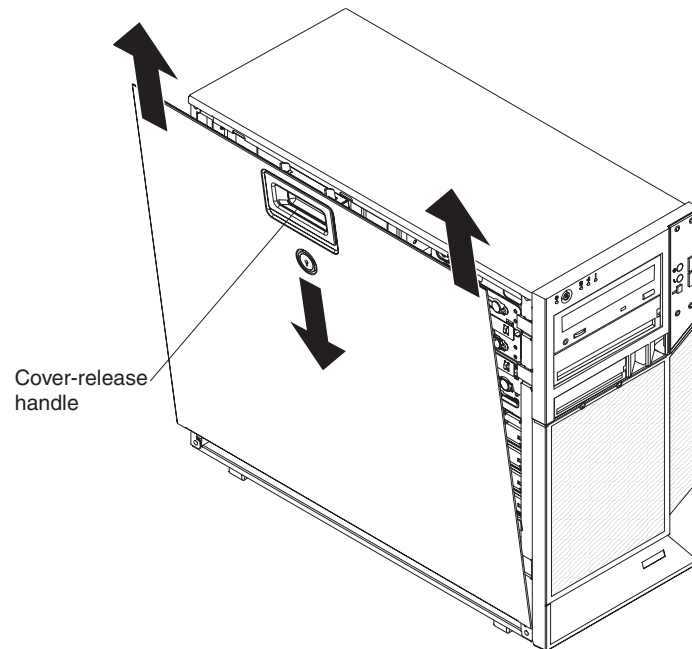
The following illustration shows the external input/output connectors on the system board.



Removing the side cover

To remove the side cover of the computer, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 18); then, disconnect all power cords and external cables.
3. Unlock the side cover.
4. Press down on the cover-release handle; then, pull the cover straight up. Lift the side cover off the computer and set it aside.



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

Removing the two-piece bezel

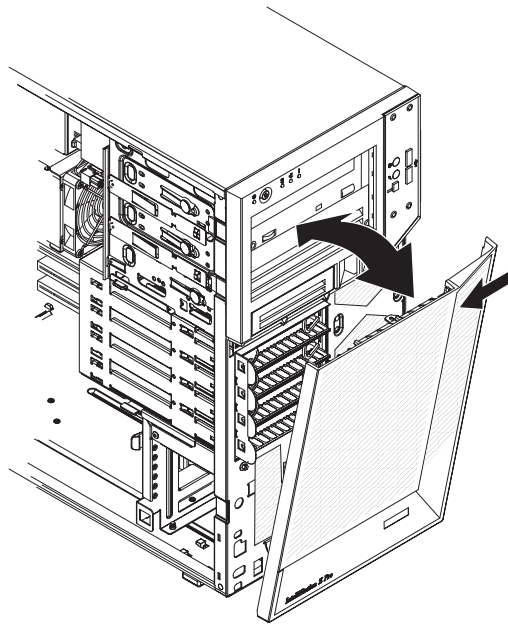
When working with some options, such as a bay 1 through bay 7, you must first remove the two-piece bezel to access the option.

Notes:

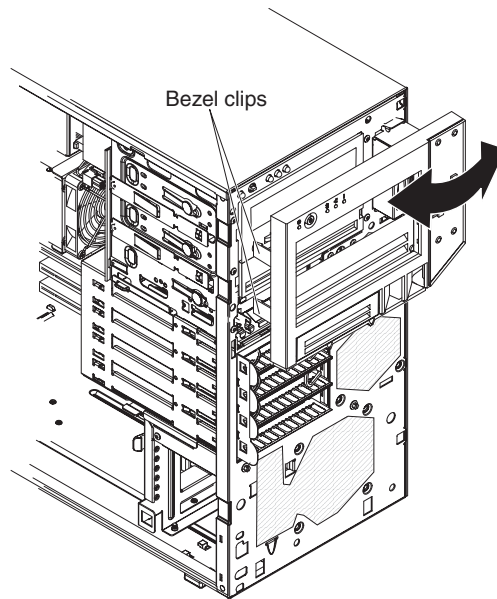
1. Before you remove the upper bezel, you must first remove the lower bezel.
2. If you are only removing the lower bezel, you do not have to remove the side cover. However, the side cover must be unlocked.

To remove the two-piece bezel, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 18); then, disconnect all power cords and external cables.
3. Unlock the side cover.
4. Remove the side cover (see “Removing the side cover” on page 35).
5. Remove the lower bezel.



- a. Press the round blue release button on the upper-right side of the lower bezel.
 - b. Tilt the lower bezel forward; then, lift it up to disengage the bottom tabs from the chassis. Store the bezel for future use.
6. Remove the upper bezel.



- a. Carefully pull the two bezel clips on the left side of the upper bezel away from the chassis.
- b. Rotate the upper bezel to the right side of the computer to disengage the two right-side tabs from the chassis. Store the bezel for future use.

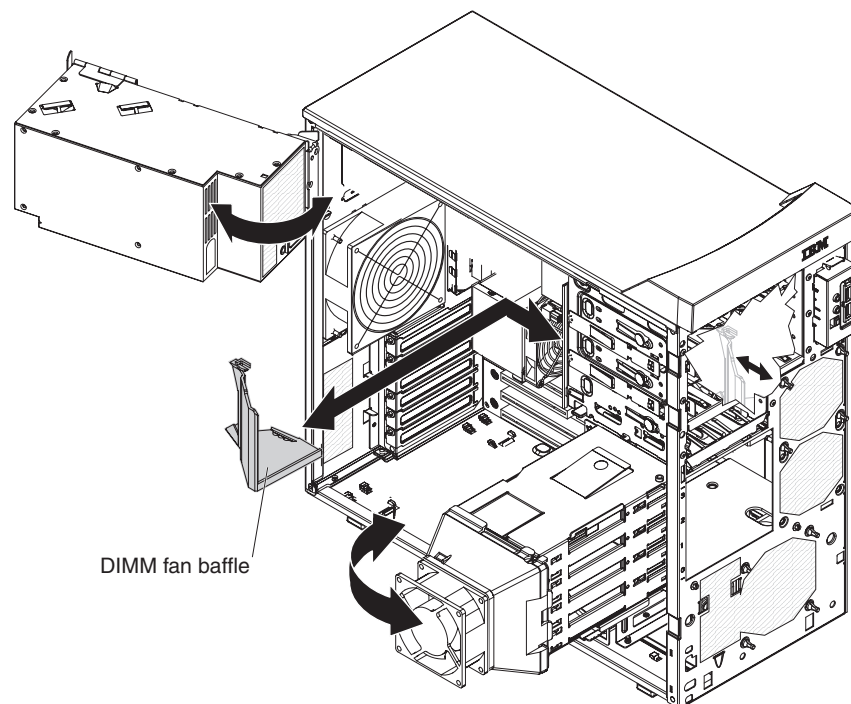
For instructions regarding replacing the two-piece bezel (see “Replacing the two-piece bezel” on page 57).

Removing the DIMM fan baffle

The computer comes with a DIMM fan baffle that directs airflow to the dual inline memory modules (DIMM). When installing options, you might have to remove the DIMM fan baffle to access some components.

To remove the DIMM fan baffle, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Lift the power-supply handle and rotate the power supply out of the chassis.
3. Press and hold the drive-cage release lever; then, rotate the drive cage completely out of the chassis until the retaining tab on top of the cage locks into place.
4. If any cables are routed through the DIMM fan baffle, remove them before removing the DIMM fan baffle.
5. From inside the chassis, grasp the fan baffle; then, slide it toward the rear of the chassis and remove it.



Installing an adapter

The following notes describe the types of adapters that the computer supports and other information that you might consider when installing an adapter. See “System board option connectors” on page 32 for an illustration of the adapter slot locations.

- Read the documentation that comes with the operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you have to change the switch or jumper settings on the adapter, follow the instructions that come with the adapter.
- The computer comes with the following adapter connectors, or *slots*:

Important:

The slot designation information describes the adapter that is supported in that slot and the bandwidth for that slot. For example, the *x8 (x4)* designation for slot 2 identifies an x8 slot that is designed to support x4 adapters and x8 adapters that can downshift to operate at the x4 bandwidth. If you install an x8 adapter in slot 2 that can downshift to the x4 bandwidth, it will run at the x4 bandwidth. The x8 connector is used for x4 and x8 adapters.

- Slot 1, PCI Express x16 (x16)
- Slot 2, PCI Express x8 (x4)

Note: If you install a double-wide adapter in slot 1, it will overlap slot 2. Therefore, you will have one less PCI slot available in which you can install an adapter. To work around this, you can set jumper 10 on the system board to positions 2 and 3, and jumper 11 on the system board to positions 1 and 2 to reroute the signals of slot 2 down to slot 3. This converts slot 3 to a PCI Express x8 slot. For the locations of jumpers 10 and 11 on the system board, see the *Problem Determination and Service Guide*.

Slot 2	Slot 3	Jumper (J10) position	Jumper (J11) position
PCI Express x4 electrical	PCI Express x4 electrical	1 and 2 (default)	2 and 3 (default)
Not available	PCI Express x8 electrical	2 and 3	1 and 2

- Slot 3, PCI Express x16 (x4)
- Slot 4, PCI-X, 64-bit, 133 MHz
- Slot 5, PCI-X, 64-bit, 133 MHz
- Slot 6, PCI, 32-bit, 33 MHz
- The computer comes with the video (graphics) adapter installed in PCI Express slot 1. You can install up to five additional optional adapters in the computer.
- You can install full-length adapters in PCI Express slots 1, 2, and 3.
- You can install full-length 64-bit or 32-bit PCI-X adapters, or 32-bit 3.3 V PCI adapters in slots 4 and 5.
- You can install a full-length 32-bit, 5 V PCI adapter in slot 6.
- To assign system resources, the computer scans the adapters in the following sequence:
 - Slot 1, PCI Express x16 (x16)
 - Slot 2, PCI Express x8 (x4)
 - Slot 3, PCI Express x16 (x4)

- Slot 4, PCI-X, 64-bit, 133 MHz
- Slot 5, PCI-X, 64-bit, 133 MHz
- Slot 6, PCI, 32-bit, 33 MHz

The computer starts the PCI devices in the following order, if you have not changed the default startup sequence: PCI Express x16 (slot 1), PCI Express x8 (slot 2), PCI Express x16 (slot 3), system-board IDE or Serial ATA (SATA) devices, PCI-X slots 4 and 5, and then PCI slot 6.

- The computer comes with integrated IEEE 1394A (FireWire) support.
- For a list of supported options for the computer, see <http://www.ibm.com/intellistation/>; then, select your country and navigate to the list of options for the computer.

To install an adapter, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 18); then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 35).
4. Determine which PCI slot you will use for the adapter. 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.
5. If an adapter is already installed in the slot, remove it, using the following procedure, and place it on a static-protective surface:

Note: For full-length adapters, rotate the rear adapter-retention bracket to the open (unlocked) position. Press the two blue release buttons located on the side of the front adapter-retention bracket that faces the adapters. If you are installing a smaller adapter, rotate only the rear adapter-retention bracket. Grasp the adapter and pull it out of the slot.

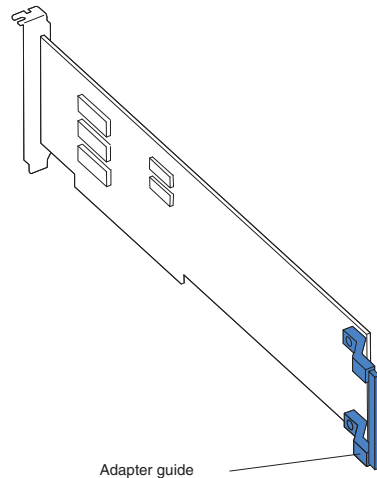
If the slot is empty, remove the expansion-slot cover. From the rear of the computer, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.

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

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

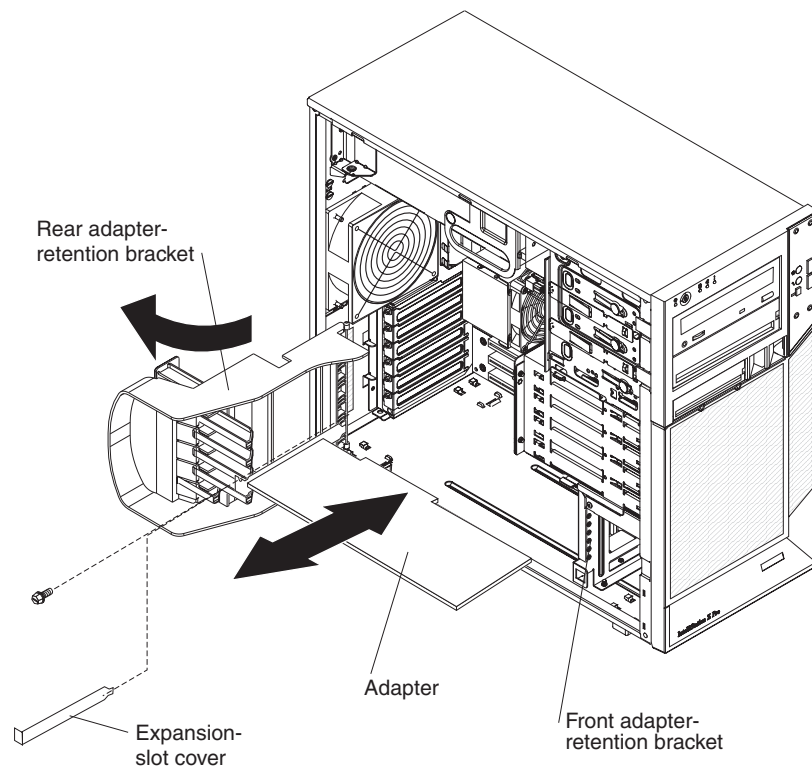
Attention: Avoid touching the components and gold-edge connectors on the adapter.

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



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

8. 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.



9. Rotate the rear adapter-retention bracket to the closed (locked) position.
10. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans.
11. If you have another adapter to install, repeat steps 4 through 10.

12. If you have installed a full-length adapter, press the blue dot on the top retention tab, which is located on the side of the front adapter-retention bracket that faces the fan compartment. When you press the top retention tab, the adapter locks in place.

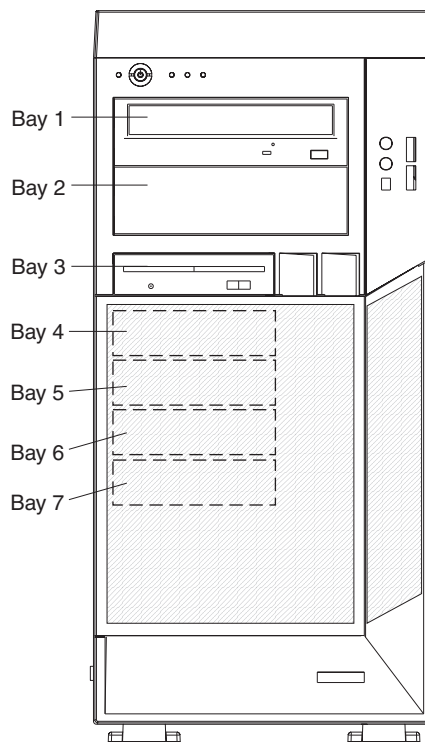
Note: If any adapter in the computer is large or has heavy cables attached to it, you can secure the adapter with a screw. Insert one backup expansion-slot screw through the top of each adapter bracket into the screw hole and secure the adapter before proceeding to the next step.

If you have other options to install, do so now; otherwise, replace the side cover (see "Replacing the side cover" on page 59).

Installing internal drives

Depending on the computer model, one or more of the following drives might be installed in the computer:

- Hard disk drive
- CD-RW or DVD/CD-RW combo
- CD-ROM
- DVD-ROM
- Multi-burner Plus
- Diskette drive (optional)



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

- The computer comes with an IDE optical drive in bay 1 and four simple-swap hard disk drive bays. A hard disk drive is installed in bay 4.
- Diskette drives, tape drives, CD-RW, DVD/CD-RW, and DVD-ROM drives are examples of removable-media drives. You can install removable-media drives in bays 1, 2, and 3 only.

- You can install a 3.5-in. slim-high (requires a conversion kit) or 5.25-in. half-high removable-media drive, such as a tape backup drive, in bay 2.
- The computer supports one diskette drive: an optional diskette drive in bay 3 or a Universal Serial Bus (USB) drive that is connected to the USB connector on the front of the computer.
- You can install only four SATA or SAS drives in the computer. You cannot mix SATA and SAS drives. The drives must be all SATA or all SAS drives.
- You can install a diskette drive or a 3.5-in. slim-high hard disk drive in bay 3.
- The sequence for installing the drives is drive bay 4, 5, 6, and 7.
- The electromagnetic interference (EMI) integrity and cooling of the computer are protected by having all bays and PCI slots covered or occupied. When you install a drive or PCI adapter, save the EMC shield and filler panel from the bay or the PCI adapter slot cover, in the event that you later remove the drive or adapter.
- For a complete list of supported options for the computer, see <http://www.ibm.com/intellistation/>; then, select your country and navigate to the list of options for the computer.

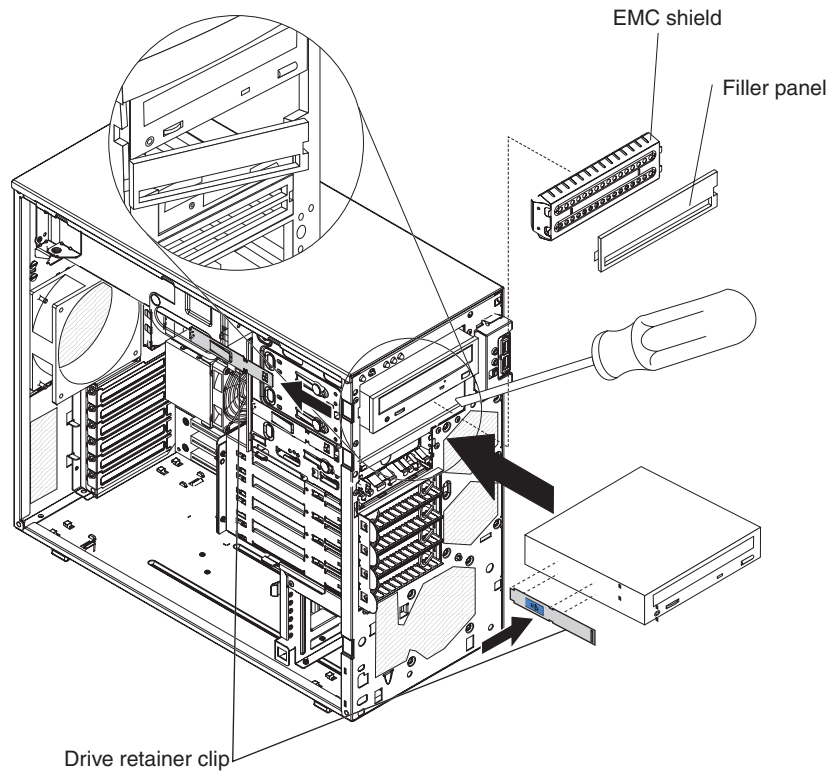
Installing a drive in bay 2 or 3

To install a drive in bay 2 or 3, complete the following steps.

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

1. Read the safety information that begins on page v, “Installation guidelines” on page 29, and the documentation that comes with the drive.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Unlock the side cover.
4. Remove the side cover (see “Removing the side cover” on page 35).
5. Remove the two-piece bezel (see “Removing the two-piece bezel” on page 36).

6. Use a screwdriver to pry the filler panel and EMC shield away from the computer.



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

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.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

7. Touch the static-protective package that contains the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
8. Set any jumpers or switches on the drive according to the documentation that comes with the drive.

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

9. Install the drive in bay 2 or bay 3.

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

- a. Remove the drive retainer clip from the side of the drive cage of bays 1, 2, and 3 (see the illustration at the beginning of this section). Slide the drive retainer clip to the left to disengage it from the drive cage; then, snap the drive retainer clip into the screw holes on the side of the drive (the blue side of the drive retainer clip should be facing outward).
- b. If you are installing a 5.25-in. drive in bay 2, push the drive into the drive bay until it snaps in place. If you are installing a 3.5-in. drive in bay 2, attach the 5.25-in. conversion kit and push the drive into the drive bay until it snaps in place.

c. Continue with step 10.

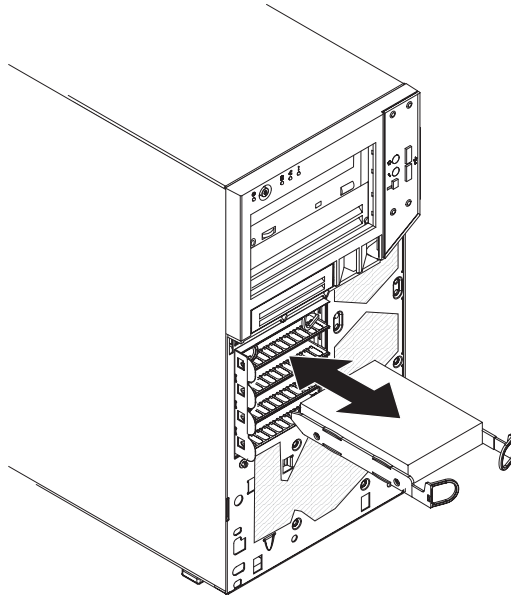
To install an optional diskette drive in bay 3, complete the following steps:

- a. Remove the small drive clip that is attached to the side of bay 3 of the drive cage for bays 1, 2, and 3. Slide the drive clip to the left to disengage it from the drive cage; then, snap the drive clip into the screw holes on the side of the replacement drive.
 - b. Slide the drive into the drive bay until it snaps in place.
10. Determine whether the drive is an IDE, SATA, or SAS device; then, connect one end of the applicable signal cable into the back of the drive and make sure that the other end of this cable is connected into the applicable IDE, SATA, or SAS connector.
 11. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor and DIMMs.
 12. If you have other options to install or remove, do so now.
 13. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
 14. Replace the two-piece bezel (see “Replacing the two-piece bezel” on page 57).
 15. Replace the side cover (see “Replacing the side cover” on page 59).

Installing a simple-swap hard disk drive in bay 4, 5, 6, or 7

This procedure applies to computer models that have simple-swap hard disk drives. Simple-swap hard disk drives are easily accessible from the front of the computer. Four SAS or SATA hard disk drives can be installed in bays 4 through 7. Drives are installed starting in bay 4. Additional drives are installed in bays 5, 6, and 7. Before you install a simple-swap hard disk drive, read the following information:

- Read the documentation that comes with the hard disk drive for cabling instructions.
 - You can install four simple-swap SATA or SAS hard disk drives in the computer.
 - You must turn off the computer before removing and replacing simple-swap drives.
 - Install simple-swap hard disk drives in this sequence: bay 4, bay 5, bay 6, and bay 7.
 - Bays 4, 5, 6, and 7 are simple-swap bays and do not require cabling.
- To install a simple-swap hard disk drive, complete the following steps.



1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and peripheral devices; then, disconnect all external cables and power cords.
3. Unlock the side cover. The bezel will not disengage from the computer if the cover is locked. You do not have to remove the side cover.
4. Remove the lower bezel (see “Removing the two-piece bezel” on page 36).
5. Touch the static-protective package that contains the hard disk drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
6. Align the drive assembly with the guide rails in the bay (the connector end of the drive goes in first).
7. Pull the loops of the drive assembly toward each other; then, carefully slide the drive assembly into the drive bay until the drive assembly connects to the back panel connector at the rear of the drive bay (you should hear a click).

Note: Do not release the loops on the drive assembly until the drive assembly is completely seated.

If you have other options to install or remove, do so now. Otherwise, replace the two-piece bezel (see “Replacing the two-piece bezel” on page 57) and the side cover if removed (see “Replacing the side cover” on page 59).

Power and signal cables for internal drives

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.

The computer uses cables to connect IDE, SATA, and SAS devices to the power supply and to the system board. See “System board internal connectors” on page 33 for the location of system-board connectors. Review the following information before connecting power and signal cables to internal drives:

- The drives that are preinstalled in the computer come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive.
- When you install a drive, make sure that one of the drive connectors of the signal cable is connected to the drive and that the connector at the other end of the signal cable is connected to the system board.
- If you have only one IDE device on a cable, it must be set as a primary device.
- If two IDE devices are used on a single cable, one must be designated as the primary device and the other as the secondary device; otherwise, the computer might not recognize some of the IDE devices. The primary and secondary designation is determined by switch or jumper settings on each IDE device.

The following cables are provided:

- **Power cables:** Power cables connect the drives to the system board. A serial ATA power cable is provided with the computer.
- **Signal cables:** Signal cables are typically flat cables, also called ribbon cables, that connect parallel IDE, SATA, SAS, and diskette drives to the system board. Two or three types of signal cables come with the computer:
 - **IDE:** The wider IDE signal cable has three connectors. One of these connectors is attached to the drive, one is a spare, and the third is attached to the primary IDE connector on the system board.
The optical drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is attached to the system board. The black connector is attached to the primary IDE device. The gray (middle) connector is attached to the secondary IDE device.
 - **Diskette drive (optional):** The narrower signal cable has two connectors. One is attached to the diskette drive, and the other is attached to the diskette drive connector on the system board.
 - **Serial ATA:** The narrower, black signal cable has two connectors. One connector is attached to the SATA drive, and the other is attached to the connector on the system board. SATA signal cables are connected to the system board connectors (SATA 1 through SATA 4) in numerical order, starting with SATA 1.
 - **SAS:** SAS signal cables are connected to the mini-PCI Express adapter. The signal cable has two connectors. One connector is attached to the SAS drive, and the other is attached to the connector on the mini-PCI Express adapter.

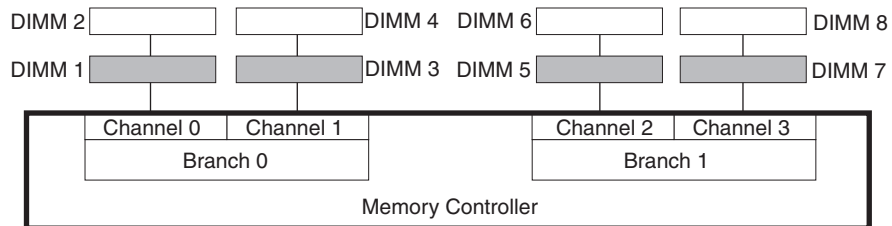
Installing memory modules

The following notes describe the types of DIMMs that the computer supports and other information that you must consider when installing DIMMs:

- When you restart the computer after adding or removing a DIMM, the computer displays a message that the memory configuration has changed.
- The system board contains eight DIMM connectors and supports two-way memory interleaving.
- Install only 1.8 V, 240-pin, 667 MHz, PC2-5300, DDR2 synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) fully buffered DIMMs. These DIMMs must be compatible with the latest PC2-5300 SDRAM, fully buffered DIMM specification. For a list of supported options for the computer, go to <http://www.ibm.com/intellistation/>; then, select your country and navigate to the list of options for the computer.
- The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system

resources. The basic input/output system (BIOS) displays the total amount of installed memory and the amount of configured memory.

- The DIMM options that are available for the computer are 512 MB, 1 GB, 2 GB, and 4 GB, which come in matched pairs. The computer supports a minimum of 1GB and a maximum of 32 GB of system memory.
- The memory controller has four fully buffered DIMM channels that are organized into two branches. Each branch has two channels, and each channel controls two DIMMs. DIMMs within the channels of a branch must be identical in size, type, speed, and technology. The following illustration shows how the memory controller is organized into branches and channels with two pairs of DIMMs installed.



Note: The DIMMs in the computer should be populated from the largest DIMM to the smallest DIMM (for example 2 GB, 1 GB, 512 MB). Populating DIMMs from the largest capacity to the smallest capacity will yield better performance, enabling the operating system to access more of the system memory before passing through the advanced memory buffer (AMB) to access the second DIMM on the channel.

- The computer can operate in two major modes, mirroring and non-mirroring (normal). The computer can also operate in a single-channel mode when one DIMM is installed.
 - The computer supports memory mirroring (mirroring mode) and online-spare memory.
 - Memory mirroring replicates data in two pairs of DIMMs simultaneously, this allows the computer to continue working if one set of DIMMs fail.
- When you use memory mirroring, consider the following information:
- The memory is reduced to half the amount of memory available. For example, the maximum available memory is reduced from 32 GB to 16 GB in the mirroring mode.
 - The minimum memory configuration is four identical DIMMs. You must install identical pairs of DIMMs in all four DIMM connections (same size, type, speed, and technology). These DIMMs must span both branches and all four channels. For example, when you assign the first four DIMMs, you must install two DIMMs in branch 0 (one in channel 0 and one in channel 1) and two DIMMs in branch 1 (one in channel 2 and one in channel 3). See the following table for the installation sequence for operating in the mirroring mode.
 - When you upgrade the computer to eight DIMMs, the DIMMs in both branches must be identical (same size, type, speed, and technology).
 - Both branches operate in dual-channel mode.

The following table shows the DIMM configuration upgrade sequence (mirroring mode).

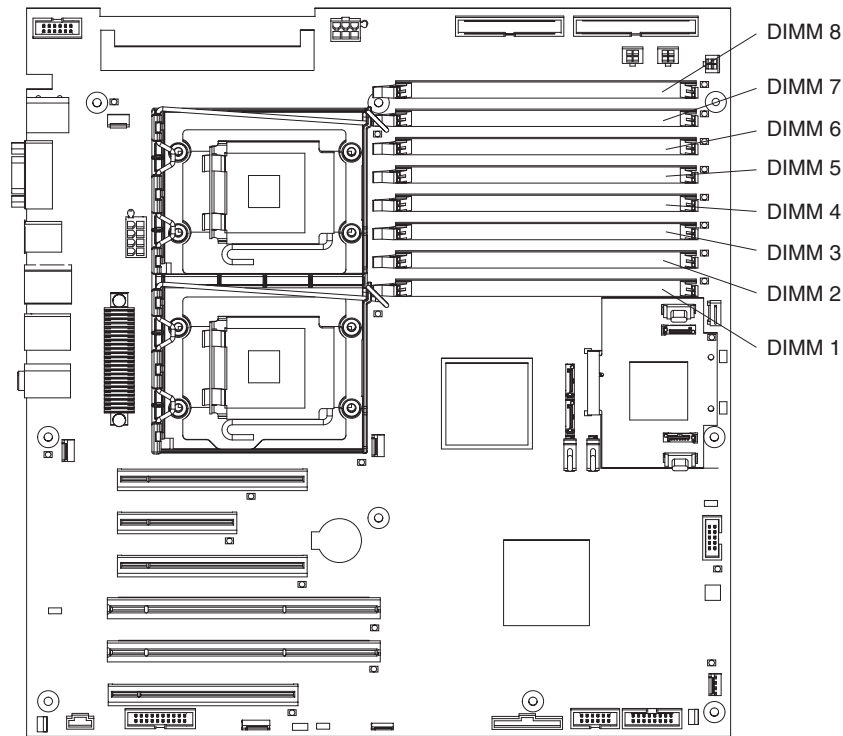
Number of DIMMs	DIMM connections
4	1, 3, 5, 7
8	1, 3, 5, 7, 2, 4, 6, 8

- Online-spare memory disables a failed pair of DIMMs from the system configuration and activates an online-spare pair of DIMMs to replace the failed pair of DIMMs. For an online-spare pair of DIMMs to be activated, you must have installed an additional pair of DIMMs of the same speed, type, size (or larger), and technology as the failed pair of DIMMs. When you use online-spare memory, consider the following information:
 - You cannot enable online-spare memory while the computer is operating in mirroring mode.
 - The minimum memory configuration is two double-rank DIMMs installed in branch 0, DIMM connection 1 (in channel 0) and DIMM connection 3 (in channel 1).
 - The spare pair of DIMMs must be the same speed, type, size (or larger), and technology as the failed pair of DIMMs.
 - Branch 0 and branch 1 operate independently.
- The following notes apply when the computer operates in the non-mirroring mode (normal mode).
 - The computer comes with two 512 MB DIMMs installed in DIMM connectors 1 and 3. The second pair of DIMMs must be installed in DIMM connectors 5 and 7. The third pair of DIMMs must be installed in DIMM connectors 2 and 4. The fourth pair of DIMMs must be installed in DIMM connectors 6 and 8.
 - DIMMs must be installed in matched pairs. For example, the DIMMs in DIMM connector 1 and 3 must be identical to each other, but do not have to be identical to the DIMMs in DIMM connector 5 and 7. But the DIMMs in DIMM connector 5 and 7 must be identical to each other. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match the other pairs. You can mix compatible DIMMs from various manufacturers. See the following table for the DIMM configuration upgrade sequence non-mirroring mode (normal mode).

The following table shows the DIMM configuration upgrade sequence (non-mirroring mode).

Number of DIMMs	DIMM connections
First pair	1, 3
Second pair	5, 7
Third pair	2, 4
Fourth pair	6, 8

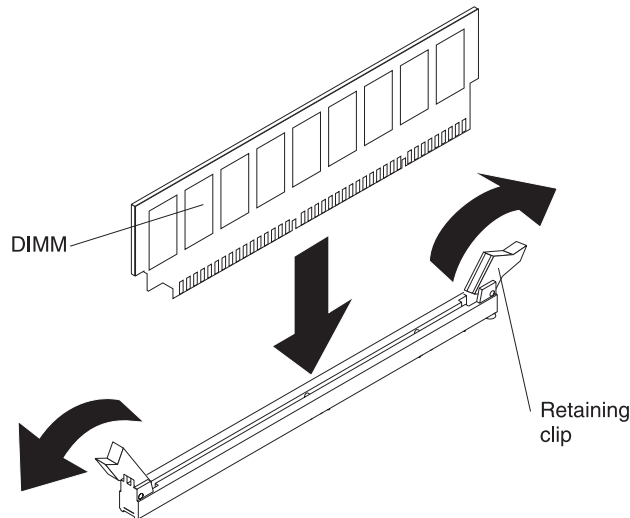
The following illustration shows the DIMM connectors on the system board.



To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 18); then, disconnect all power cords and external cables.
3. Remove the side cover (see “Removing the side cover” on page 35).
4. For easier access, lay the computer on its side.
5. Lift the power supply handle and rotate the power supply handle out of the chassis.
6. Press and hold the drive-cage release lever; then, rotate the drive cage completely out of the chassis until the retaining tab on top of the cage locks into place.
7. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. DIMM 1 and DIMM 3 must be the first installed pair, followed by DIMM 5 and DIMM 7, DIMM 2 and DIMM 4, and DIMM 6 and DIMM 8.
8. Gently open the retaining clips and, if necessary, remove any existing DIMM.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
9. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.
10. Gently open the retaining clip on each end of the DIMM slot. Turn the DIMM so that the pins align correctly with the connector.



11. 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 and remove the DIMM; then, reinsert it.
12. Push the drive cage outward, and press in on the drive-cage release lever; then, rotate the drive cage completely into the chassis.
13. Press down on the power-supply release latch and rotate the power supply into the chassis. Return the power-supply handle to the closed position.

If you have other options to install or remove, do so now. Otherwise, return the computer to the upright position. Replace the side cover (see “Replacing the side cover” on page 59).

Installing a second microprocessor

The computer comes with one microprocessor installed on the system board. The computer supports up to two microprocessors.

Note: When installing a microprocessor option, lay the computer on its side.

The following notes describe information that you must consider when installing an additional microprocessor in the computer:

- Read the documentation that comes with the microprocessor to determine whether you must update the computer BIOS code. The most current level of BIOS code for the computer is available from <http://www.ibm.com/support/>.
- To ensure proper computer operation, use microprocessors that have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical. You can use the Configuration/Setup Utility program to determine the specific type of microprocessor on the system board.

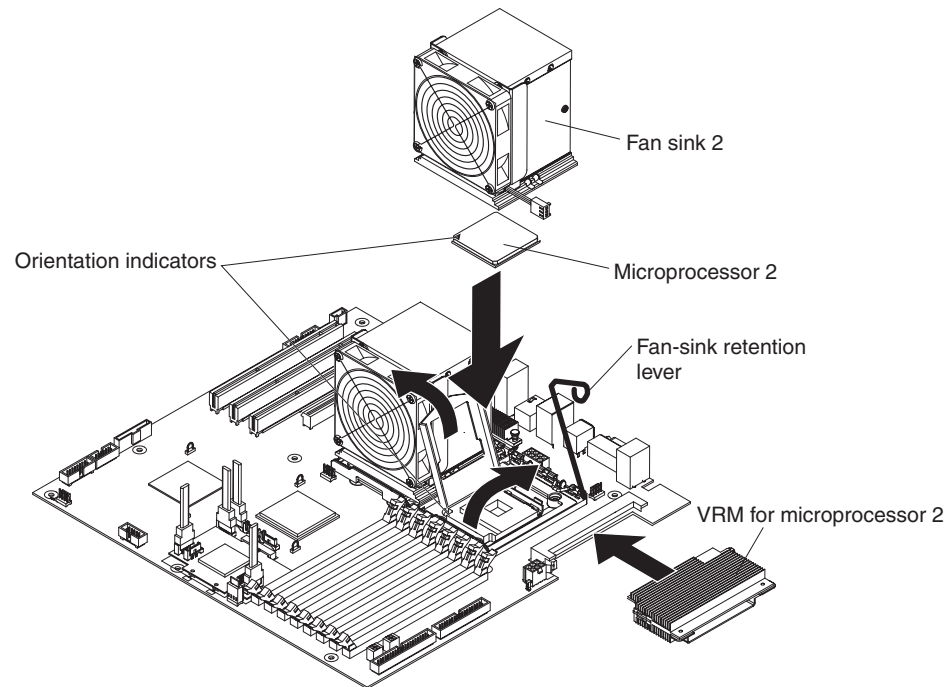
Important: The first microprocessor must always be installed in the microprocessor 1 socket.

- The microprocessor speeds are automatically set for this computer; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.

- Terminator cards are not required for empty microprocessor sockets.
- If you must replace a microprocessor, see the *Problem Determination and Service Guide*.
- For additional illustrations of the system-board components, see “System board option connectors” on page 32.
- To order additional microprocessor options, contact your IBM marketing representative or authorized reseller.
- For a list of supported microprocessor options for your computer, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/iserver.html/>.

The Microsoft Windows XP operating system that comes preinstalled on the computer automatically configures itself when an additional microprocessor is installed. Other operating systems might have to be manually configured to support an additional microprocessor.

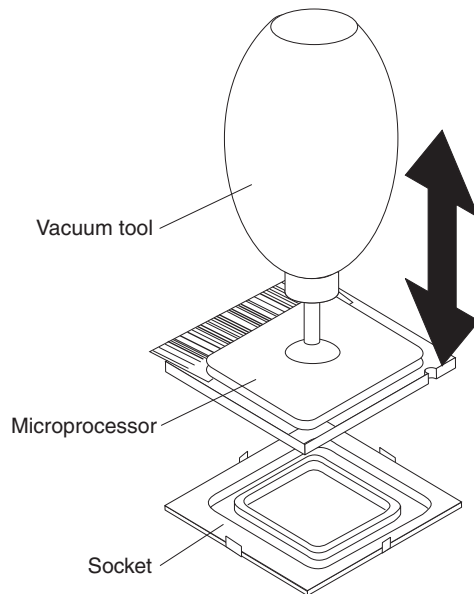
To install the microprocessor and fan sink, complete the following steps.



1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 18); then, disconnect all power cords and external cables.
3. For easier access, lay the computer on its side.
4. Remove the side cover (see “Removing the side cover” on page 35).
5. Lift the power supply handle and rotate the power supply out of the chassis.
6. Press and hold the drive-cage release lever; then, rotate the drive cage completely out of the chassis until the retaining tab on top of the cage locks into place.
7. Disconnect any cables that impede access to the second fan sink and microprocessor.
8. Locate the second microprocessor socket on the system board.

9. If the second microprocessor socket is covered with protective film or a label, peel and remove the film or label.
10. Touch the static-protective package containing the new microprocessor to any unpainted metal surface on the computer; then, remove the microprocessor from the package.
11. Make sure that the microprocessor socket lever and cover are in the fully open position.

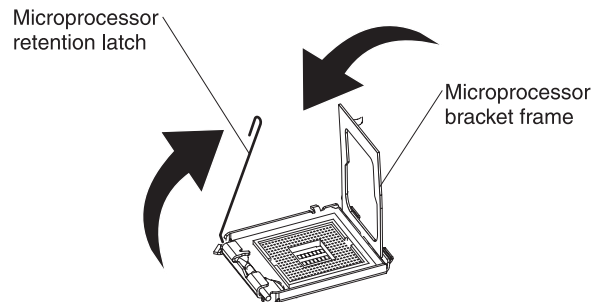
Attention: To install the second microprocessor, use the vacuum tool that comes with the new microprocessor. Dropping the microprocessor during installation can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the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



12. Install the microprocessor:
 - a. Squeeze and hold the bladder of the vacuum tool; then, place the suction cup on the microprocessor and release the bladder.

Note: To maintain the 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.
- b. Using the vacuum tool, carefully place the microprocessor into the socket.
 - c. Squeeze the bladder of the vacuum tool to release the microprocessor from the suction cup.
13. Close the microprocessor bracket frame; then, close the microprocessor retention latch and lock it securely in place.



14. Install the fan sink, see the figure on page 53:
 - a. Make sure that the fan-sink retention lever is in the fully open position.

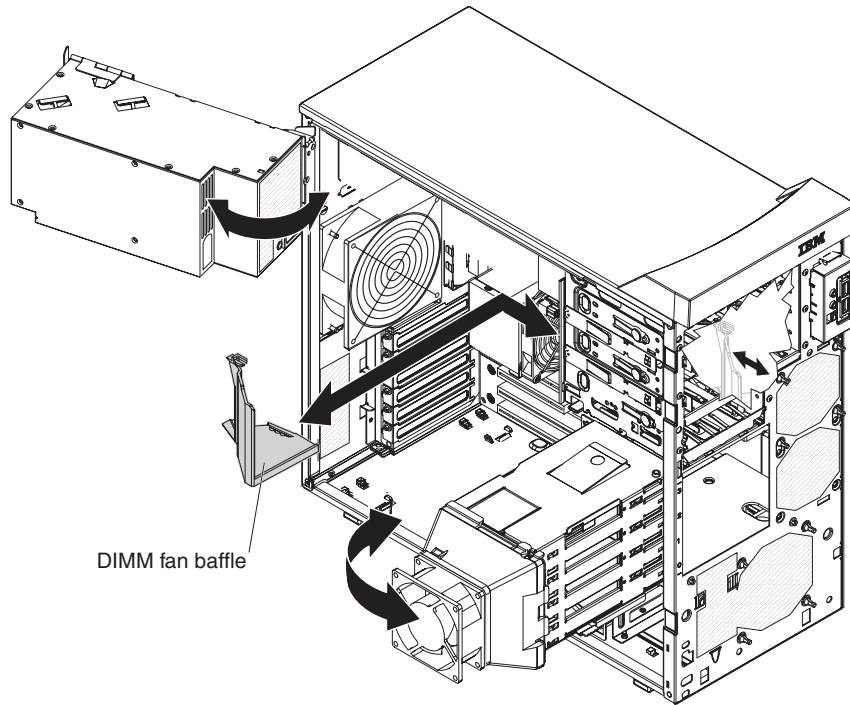
Important: Be careful when handling the microprocessor and fan sink. Do not contaminate the thermal material between them.
 - b. Slide the bottom edge of the fan sink under the lower flange of the retention module; then, place the top of the fan sink onto the top of the retention module.
 - c. Close the fan-sink retention lever and lock it securely in place.
15. Connect the fan-sink cable to the system board.
16. Insert the voltage regulator module (VRM) into the VRM connector:
 - a. Open the retaining clips on the VRM connector.
 - b. Touch the static-protective package that contains the VRM to any unpainted metal surface on the computer; then, remove the new VRM from the package.

Note: The VRM support bracket is attached to the VRM.
 - c. Align the VRM with the VRM connector. See page 53 for the location of the VRM connector.
 - d. Slide the VRM into the connector. The support bracket hooks into the chassis, and the retaining clips snap into the locked position when the VRM is firmly seated in the connector.
17. Reconnect any cables that you disconnected.
18. Push the drive cage outward, and press in on the drive-cage release lever; then, rotate the drive cage completely into the chassis.
19. Press down on the power-supply release latch and rotate the power supply into the chassis. Return the power-supply handle to the closed position.
20. If you have options to install, do so now. Otherwise, replace the side cover (see “Replacing the side cover” on page 59).

Replacing the DIMM fan baffle

To replace the DIMM fan baffle, complete the following steps:

1. Slide the fan baffle into the fan baffle tab in the front of the chassis until it locks in place.
2. Secure any cables that you removed from the fan baffle.
3. Push the drive cage outward, and press in on the drive-cage release lever; then, rotate the drive cage completely into the chassis.
4. Press down on the power-supply release latch and rotate the power supply into the chassis. Return the power-supply handle to the closed position.



Installing a security rope clip

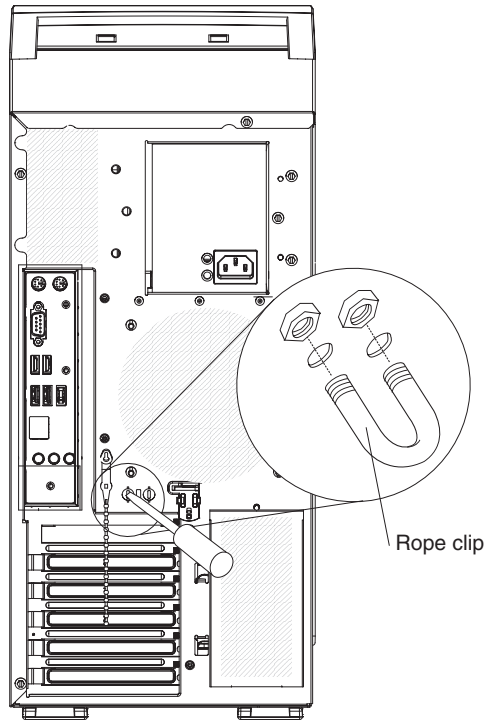
To help prevent hardware theft, you can thread a security rope clip and cable to the computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

Before you begin, obtain the following items:

- A flat-blade screwdriver
- An adjustable wrench
- A 19-mm (0.75-in.) rope clip or wire rope (similar to National Manufacturing number 3230, stock number 176-735)
- Threaded nuts that fit the rope clip
- A security cable
- A lock, such as a combination lock or padlock

To install a security cable, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the computer and all attached devices.
3. Disconnect all external cables and power cords; then, remove the side cover. See “Removing the side cover” on page 35.
4. Use a screwdriver to remove the two metal knockouts.
5. Insert the rope clip through the rear panel; then, attach and tighten the nuts.
6. Thread the cable through the rope loop and around an object that is not part of the computer, and is not permanently secured to the building structure or foundation. Make sure that the cable cannot be removed from the object.
7. Fasten the cable ends together with a lock. After you add the security cable, make sure that the cable does not interfere with other cables that are connected to the computer.

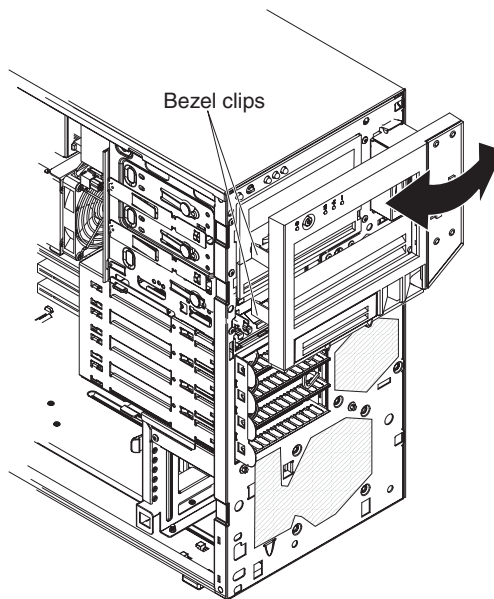


If you have other options to install or remove, do so now; otherwise, replace the side cover (see “Replacing the side cover” on page 59).

Replacing the two-piece bezel

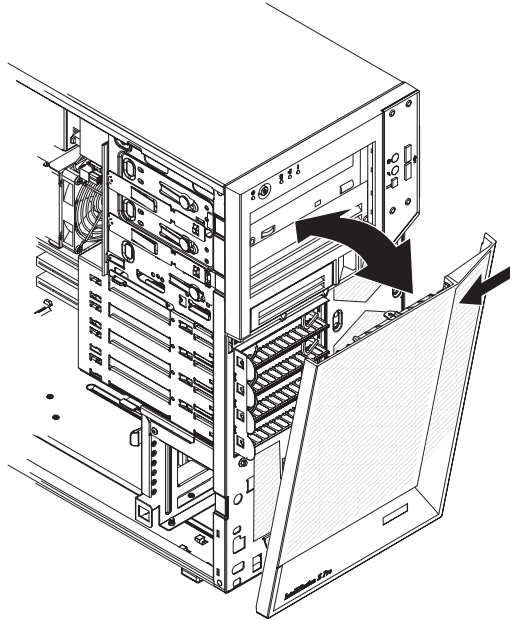
To replace the two-piece bezel, complete the following steps:

1. Install the upper bezel on the front of the computer chassis.



- a. Insert the two right-side tabs on the upper bezel into the matching holes on the right side of the chassis.

- b. Rotate the upper bezel to the left side of the chassis and press the bezel clips into the matching indentations on the left side of the chassis until the bezel clips snap into place.
2. Install the lower bezel on the front of the computer chassis.



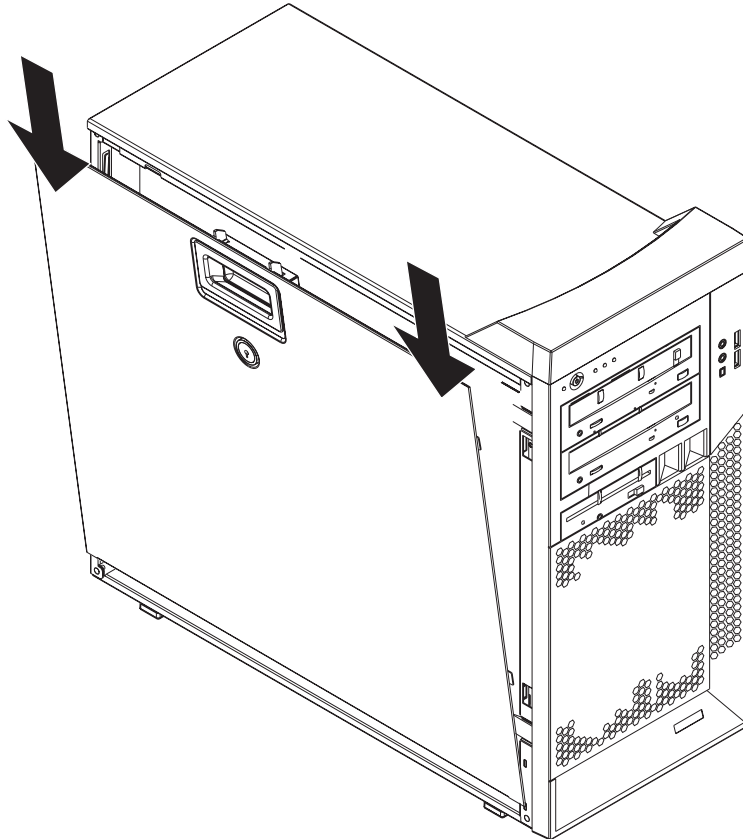
- a. Insert the two bottom tabs on the lower bezel into the matching holes in the front of the chassis.
 - b. Tilt the top of the lower bezel into position on the chassis until the lower bezel locks securely into place.

Replacing the side cover

To replace the side cover, complete the following steps:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have removed all work tools or spare parts from inside the computer.
2. Install the side cover by placing it into position on the computer. Insert the tabs inside the cover into the slots on the chassis.

Note: Make sure that each tab on the side cover is in its corresponding slot before closing the cover-release latch.



3. Close the cover-release latch to secure the side cover in place.
4. Lock the side cover, if you unlocked it during removal.
5. Reconnect the external cables and power cords to the computer; then, connect the power cords to electrical outlets.
6. Turn on the attached devices; then, turn on the computer.

Connecting external options

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

To connect an external device, complete the following steps:

1. Read the safety information that begins on page v, the “Installation guidelines” on page 29, and the documentation that comes with the device.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 18).

3. Follow the instructions that come with the device to prepare it for installation and to connect it to the computer.

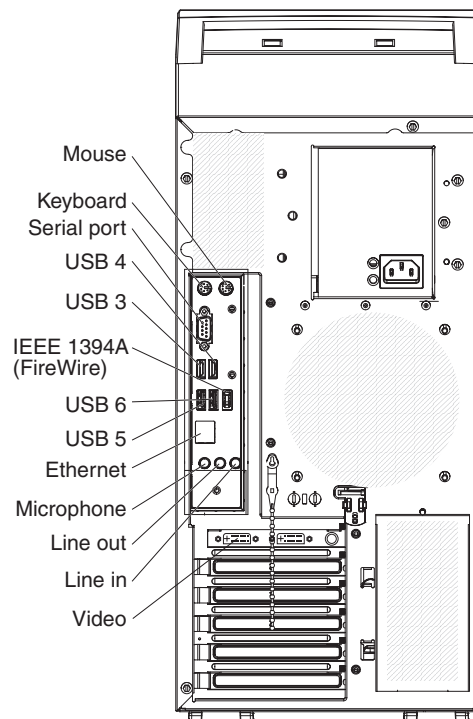
Input/output connectors

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

The computer has the following input/output (I/O) connectors:

- One mouse
- One keyboard
- One serial
- Seven USB 2.0
 - Two on the front
 - Four on the rear
 - One internal
- Two IEEE 1394A (FireWire)
 - One on the front
 - One on the rear
- One Ethernet
- Two audio microphones
 - One on the front
 - One on the rear
- Two audio line out
 - One on the front (headphone)
 - One on the rear
- One audio line in
- One video

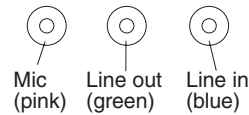
The following illustration shows the locations of the connectors on the rear of the computer.



The following sections describe these connectors.

Audio connectors

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



Mic

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

Line out

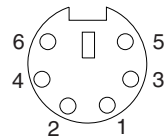
There are two line-out connectors, one on the front and one on the rear of the computer. The computer sends audio signals through this connector to powered speakers with built-in amplifiers, headphones, a multimedia keyboard, or the audio line-in connector on a stereo system. The internal speaker in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

Line in

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

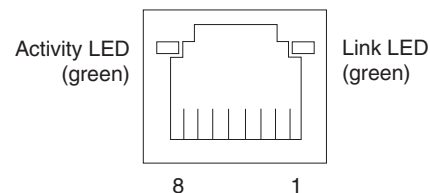
Auxiliary-device (pointing-device) connector

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



Ethernet (RJ-45) connector

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



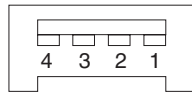
Connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to this connector. The 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

The Ethernet connector has one LED that indicates Ethernet-link status. When this LED is lit, it indicates that there is an active connection on the Ethernet port. Activity between the computer and the network is indicated by the Ethernet transmit/receive activity LEDs on the front and rear of the computer (see “Controls, LEDs, and connectors” on page 9).

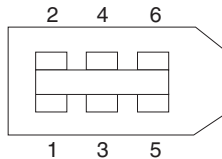
IEEE 1394A (FireWire) connector

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

4-pin IEEE 1394A (FireWire) connector (front)

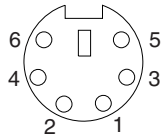


6-pin IEEE 1394A (FireWire) connector (rear)



Keyboard connector

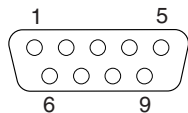
There is one keyboard connector on the rear of the computer. Use this connector to connect a PS/2 (non-USB) keyboard. The following illustration shows a keyboard connector.



If you attach a keyboard to this connector, USB ports and devices are disabled during the power-on self-test (POST).

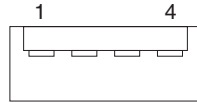
Serial connectors

There is one serial connector on the rear of the computer. Use this connector to connect serial devices. The following illustration shows a serial connector.



Universal Serial Bus connectors

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

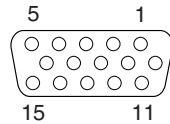


Use a 4-pin USB cable to connect an external device to a USB connector.

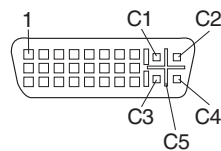
Video connector

The PCI Express x16 adapter (slot 1) provides the video connector. This connector is on the rear of the computer. Use the video connector to connect a monitor or other display device. The following illustrations show examples of different video connectors.

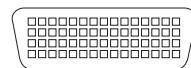
Analog video connector



Digital (DVI-I) video connector



Dual monitor system-59 (DMS-59) video connector



Some models come with a digital video interface (DVI) connector for connecting a digital monitor. If you have problems viewing information with a second monitor, see “Changing monitor settings” on page 15.

Models with the NVIDIA Quadro FX 550, NVIDIA FX 1500, NVIDIA Quadro FX 3500, or NVIDIA Quadro FX 4500 video adapter come with a DVI-I-to-VGA style analog converter for each DVI-I connector.

Important: To get the best performance from the NVIDIA Quadro FX 3500 or NVIDIA Quadro FX 4500 video adapters, you must connect the video adapter to the computer power supply. Otherwise, the video adapter will be operating with very limited power, resulting in a decrease in performance for some applications. Use the PCI Express x16 external power drop to connect the video adapter to the computer power supply.

If you install a double-wide video adapter in slot 1, it will overlap slot 2. Therefore, one less PCI slot is available in which you can install an adapter.

Models with the NVIDIA Quadro NVS 285 video adapter come with a dual-monitor system-59 (DMS-59) to dual-analog monitor pigtail cable. If you want to set up two digital monitors, you must purchase a separate dual-digital monitor cable.

Appendix. Notices

This publication was developed for products and services offered in the U.S.A.

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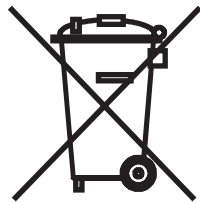
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