IBM System x3550 Type 7978 and 1913

Problem Determination and Service Guide

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Problem Determination and Service Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 161 and the Warranty and Support Information document on the IBM System x *Documentation* CD.

Fifth Edition November 2006)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Guidelines for trained service technicians

This section contains information for trained service technicians.

Inspecting for unsafe conditions

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

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

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

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

1. Make sure that the power is off and the power cord is disconnected.
2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.
3. Check the power cord:
   - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
   - Make sure that the power cord is the correct type, as specified in “Power cords” on page 93.
   - Make sure that the insulation is not frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Guidelines for servicing electrical equipment

Observe the following guidelines when servicing electrical equipment:

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

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

Safety statements

Important:

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

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *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.

Statement 1:

DANGER

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

To avoid a shock hazard:

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

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

Statement 2:

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

Do not:

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

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

Statement 3:

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

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

DANGER

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

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

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

Statement 4:

≥ 18 kg (39.7 lb)

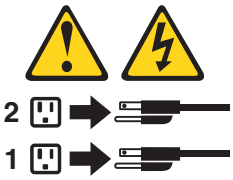
≥ 32 kg (70.5 lb)

≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

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



Statement 8:

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

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

Statement 26:

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

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

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.***

Chapter 1. Introduction

This *Problem Determination and Service Guide* contains information to help you solve problems that might occur in your IBM® System x3550 Type 7978 and 1913 server. It describes the diagnostic tools that come with the server, error codes and suggested actions, and instructions for replacing failing components.

Technical updates might be available to provide additional information that is not included in the server documentation. To check for updates, go to http://www.ibm.com/servers/eserver/support/xseries/index.html, select **System x3550** from the **Hardware** list, and click **Go**. For firmware updates, click the **Download** tab. For Documentation updates, click the **Install and use** tab, and click **Product documentation**.

Replaceable components are of three types:

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

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

Related documentation

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

- *Installation Guide*

  This printed document contains instructions for setting up the server and basic instructions for installing some options.
- *User's Guide*

  This document is in Portable Document Format (PDF) on the IBM *System x Documentation* CD. It provides general information about the server, including information about features, and how to configure the server. It also contains detailed instructions for installing, removing, and connecting optional devices that the server supports.
- *Rack Installation Instructions*

  This printed document contains instructions for installing the server in a rack.
- *Safety Information*

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

Depending on the server model, additional documentation might be included on the IBM *System x Documentation* CD.

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

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

1. Go to http://www.ibm.com/support/.
2. Under **Search technical support**, type **System x3550** 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 *System x Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

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

Features and specifications

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

Table 1. Features and specifications

Microprocessor:

- Intel® Xeon™ FC-LGA 771 dual-core with 4096 KB (minimum) Level-2 cache
- Support for up to two microprocessors
- Support for Intel Extended Memory 64 Technology (EM64T)

Note:

- Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.
- For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/

Memory:

- Minimum: 1 GB
- Maximum: 32 GB
- Type: PC2-5300, 667 MHz, ECC, DDR II fully buffered SDRAM DIMMs only
- Slots: Eight dual inline
- Supports 512 MB, 1 GB, 2 GB, and 4 GB (when available) DIMMs

Drives:

CD/DVD: IDE 24x CD-RW/ 8x DVD combination

Expansion bays (depending on model):

Either two 3.5-inch or four 2.5-inch hard disk drive bays

- Servers with a 2.5-inch hot-swap drive bay configuration support up to four 2.5-inch hot-swap SAS hard disk drives
- Servers with a 3.5-inch hot-swap drive bay configuration support up to two 3.5-inch SAS or SATA hot-swap hard disk drives
- Servers with a 3.5-inch simple-swap drive bay configuration support up to two 3.5-inch simple-swap SATA hard disk drives

PCI Expansion slots:

- One PCI Express x8 (half length)
- One PCI Express x8 (half length) or PCI-X (half length)

Power supply:

Maximum of two redundant 670-watt (110 or 220 V ac auto-sensing) hot-swap power supplies.

Hot-swap fans:

- Standard: five
- Maximum: six (with two microprocessors installed)

Size:

- Height: 43 mm (1.69 inches, 1 U)
- Depth: 711 mm (28 inches)
- Width: 440 mm (17.3 inches)
- Maximum weight: 15.4 kg (34 lb) when fully configured

Integrated functions:

- Two Broadcom NetXtreme II Gb Ethernet controllers with TOE and Wake on LAN® support
- Four Universal Serial Bus (USB) 2.0 ports (two front and two rear)
- One Advanced System Management RJ-45 (active only when a Remote Supervisor Adapter II SlimLine is installed)
- One serial port

Hard disk controllers:

- Serial ATA (SATA) controller with integrated RAID (simple-swap SATA models)
- Serial-attached SCSI (SAS) controller with integrated RAID (hot-swap SAS models)

Acoustical noise emissions:

- Sound power, idling: 6.8 bels maximum
- Sound power, operating: 6.8 bels maximum

Environment:

- Air temperature:
  - Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 914 m (2998.7 ft)
  - Server off: -40° to 60°C (-104° to 140°F); maximum altitude: 2133 m (6998.0 ft)
- Humidity:
  - Server on: 8% to 80%
  - Server off: 8% to 80%

Heat output:

Approximate heat output in British thermal units (Btu) per hour:

- Minimum configuration: 662 Btu per hour (194 watts)
- Maximum configuration: 2390 Btu per hour (700 watts)

Electrical input:

- Sine-wave input (47-63 Hz) required
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA), approximately:
  - Minimum: 0.194 kVA
  - Maximum: 0.700 kVA

Video controller (integrated):

- ATI Radeon RN50 (dual ports - front and rear)
- Support for SPI Serial flash memory video BIOS
- Flexible memory support
  - 8 MB to 256 MB
  - DDR1 and DDR2 SDRAM and SGRAM

Notes:

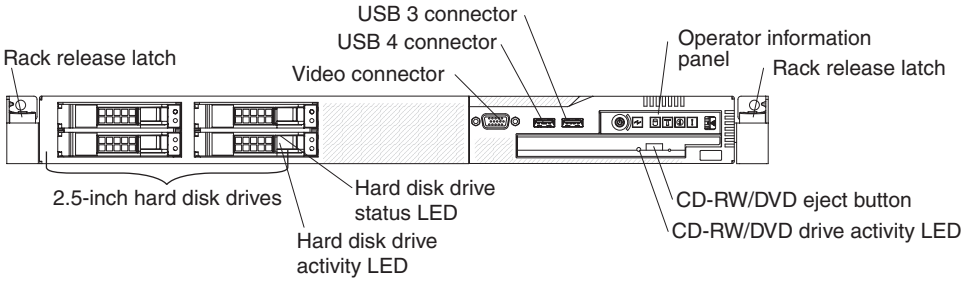
1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.
2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute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

Server controls, LEDs, and connectors

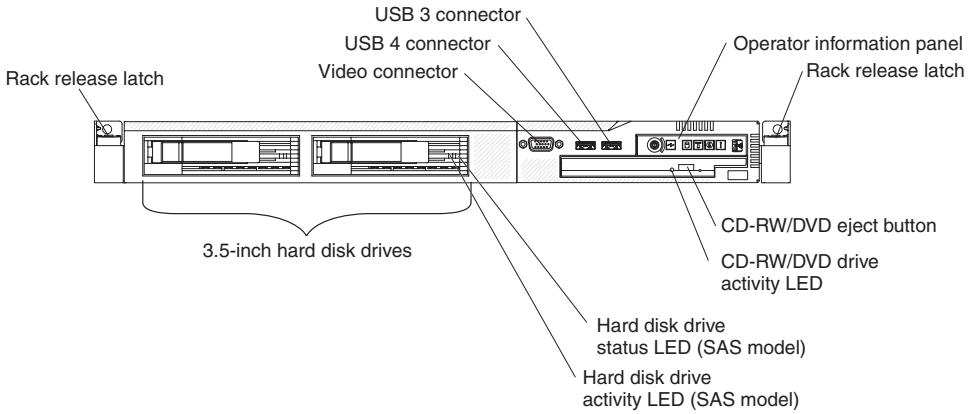
This section describes the controls, light-emitting diodes (LEDs), and connectors on the front and rear of the server.

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the server. This configuration supports up to four 2.5-inch hot-swappable hard disk drives.

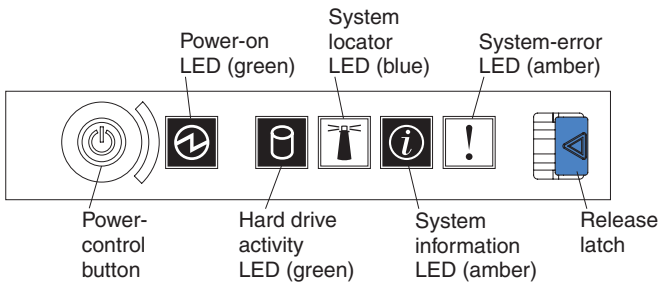


The following illustration shows the controls, LEDs, and connectors on the front of the server. This configuration supports up to two 3.5-inch hot-swappable hard disk drives or two 3.5-inch simple-swap SATA hard disk drives.



Note: The locations of the controls, LEDs, and connectors vary, depending on the hardware configuration that you have.

- **Operator information panel:** This panel contains controls and LEDs about the status of the server.



The following controls and LEDs are on the operator information panel:

– **Power-on LED:** When this green LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server

is turned off and is still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed. A power LED is also on the rear of the server.

Note: If this LED is off, it does not mean that there is no electrical power in the server. The LED might be burned out. To remove all electrical power from the server, you must disconnect the power cord from the electrical outlet.

- **System-locator LED:** Use this blue LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely. This LED is controlled by the BMC.
- **System-error LED:** When this amber LED is lit, it indicates that a system error has occurred. A system-error LED is also on the rear of the server. An LED on the light path diagnostics panel on the system board is also lit to help isolate the error. This LED is controlled by the BMC.
- **Release latch:** Press the release latch to the left to slide out the operator information panel and view the light path diagnostics LEDs and buttons. See the *Problem Determination and Service Guide* for more information about the light path diagnostics panel.
- **System-information LED:** When this amber LED is lit, it indicates that a noncritical event has occurred. Check the error log for additional information. See the information about light path diagnostics in the *Problem Determination and Service Guide* for more information about error logs.
- **Hard drive activity LED:** When this green LED is lit, it indicates that one of the hard disk drives is in use.

  Notes:

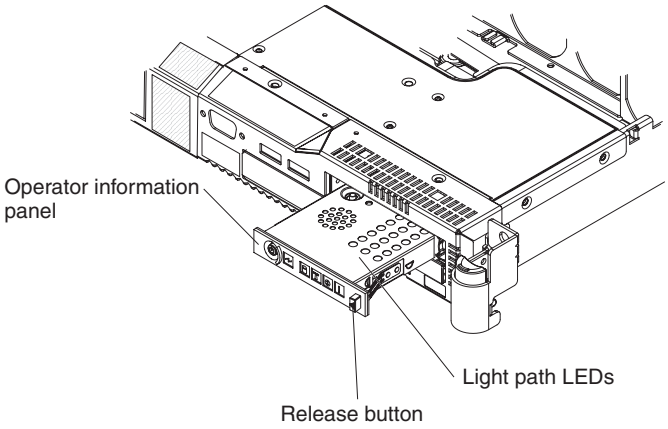
  1. For a SAS drive, a hard disk drive activity LED is shown in two places: on the hard disk drive and on the operator information panel.
  2. For a SATA drive, hard disk drive activity is indicated only by the hard disk drive activity LED on the operator information panel.
- **Power-control button:** Press this button to turn the server on and off manually.

- **Rack release latches:** Press the latches on each front side of the server to remove the server from the rack.
- **Video connector:** Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.
- **USB connectors:** Connect a USB device, such as a USB mouse, keyboard, or other device to any of these connectors.
- **CD-RW/DVD eject button:** Press this button to release a DVD or CD from the CD/DVD drive.
- **CD-RW/DVD drive activity LED:** When this LED is lit, it indicates that the CD-RW/DVD drive is in use.
- **Hard disk drive status LED:** This LED is used on SAS hard disk drives. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID™ controller is installed in the server, when this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.
- **Hard disk drive activity LED:** This LED is used on SAS hard disk drives. Each hot-swap hard disk drive has an activity LED, and when this LED is flashing, it indicates that the drive is in use.

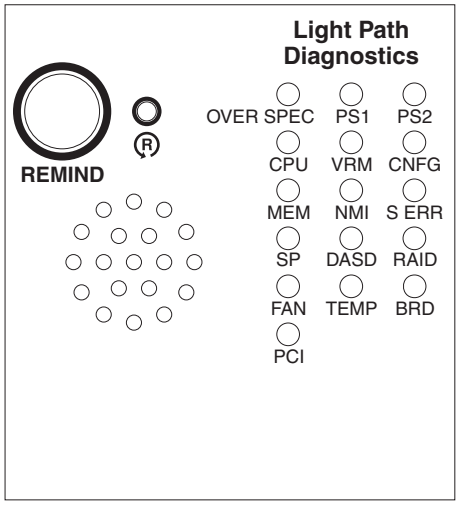
Light path diagnostics panel

The light path diagnostics panel is on the top of the operator information panel.

To access the light path diagnostics panel, push the release button on the operator panel to the left. Pull forward on the unit until the hinge of the operator panel is free of the server chassis; then, pull down on the unit, so that the operator information panel is at a right angle with the server.



The following illustration shows the LEDs and controls on the light path diagnostics panel.



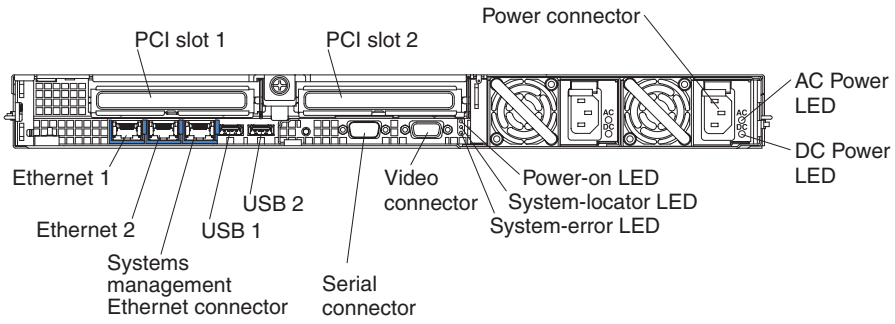
- **Remind button:** This button places the system-error LED on the front panel into Remind mode. In Remind mode, the system-error LED flashes rapidly until the problem is corrected, the system is restarted, or a new problem occurs.

  By placing the system-error LED indicator in Remind mode, you acknowledge that you are aware of the last failure but will not take immediate action to correct the problem. The remind function is handled by the BMC.
- **Reset button:** Press this button to reset the server and run the power-on self-test (POST). You might have to use a pen or the end of a straightened paper clip to press the button. The reset button is to the right of the remind button.

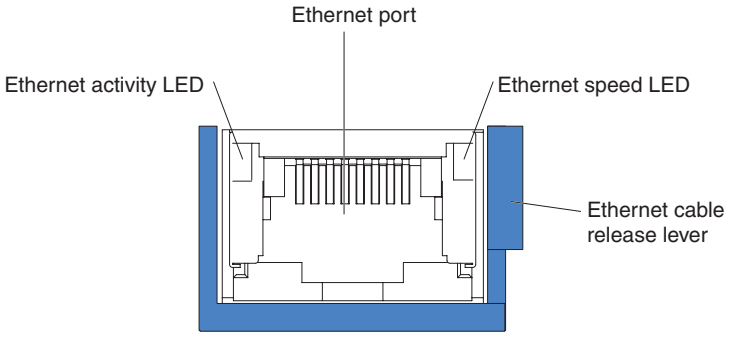
For information about light path diagnostics, see the *System x3550 Problem Determination and Service Guide* on the IBM *System x Documentation* CD.

Rear view

The following illustration shows the connectors and LEDs on the rear of the server.



- **PCI slot 1:** Insert a PCI Express type adapter into this slot.
- **PCI slot 2:** Insert a PCI Express type adapter into this slot. You can purchase an optional PCI-X riser card assembly to convert this slot to accept a PCI-X adapter.
- **Power connector:** Connect the power cord to this connector.
- **AC power LED:** Each hot-swap power supply has an ac power LED and a dc power LED. When the ac power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **DC power LED:** Each hot-swap power supply has a dc power LED and an ac power LED. When the dc power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **System-error LED:** When this LED is lit, it indicates that a system error has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.
- **Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed.
- **System-locator LED:** Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.
- **Video connector:** Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.
- **Serial connector:** Connect a 9-pin serial device to this connector. The serial port is shared with the baseboard management controller (BMC). The BMC can take control of the shared serial port to perform text console redirection and to redirect serial traffic, using Serial over LAN (SOL).
- **USB connectors:** Connect a USB device, such as a USB mouse, keyboard, or other device to any of these connectors.
- **Systems-management Ethernet connector:** Use this connector to connect the server to a network for systems-management information control. This connector is active only if you have installed a Remote Supervisor Adapter II SlimLine, and it is used only by the Remote Supervisor Adapter II SlimLine.



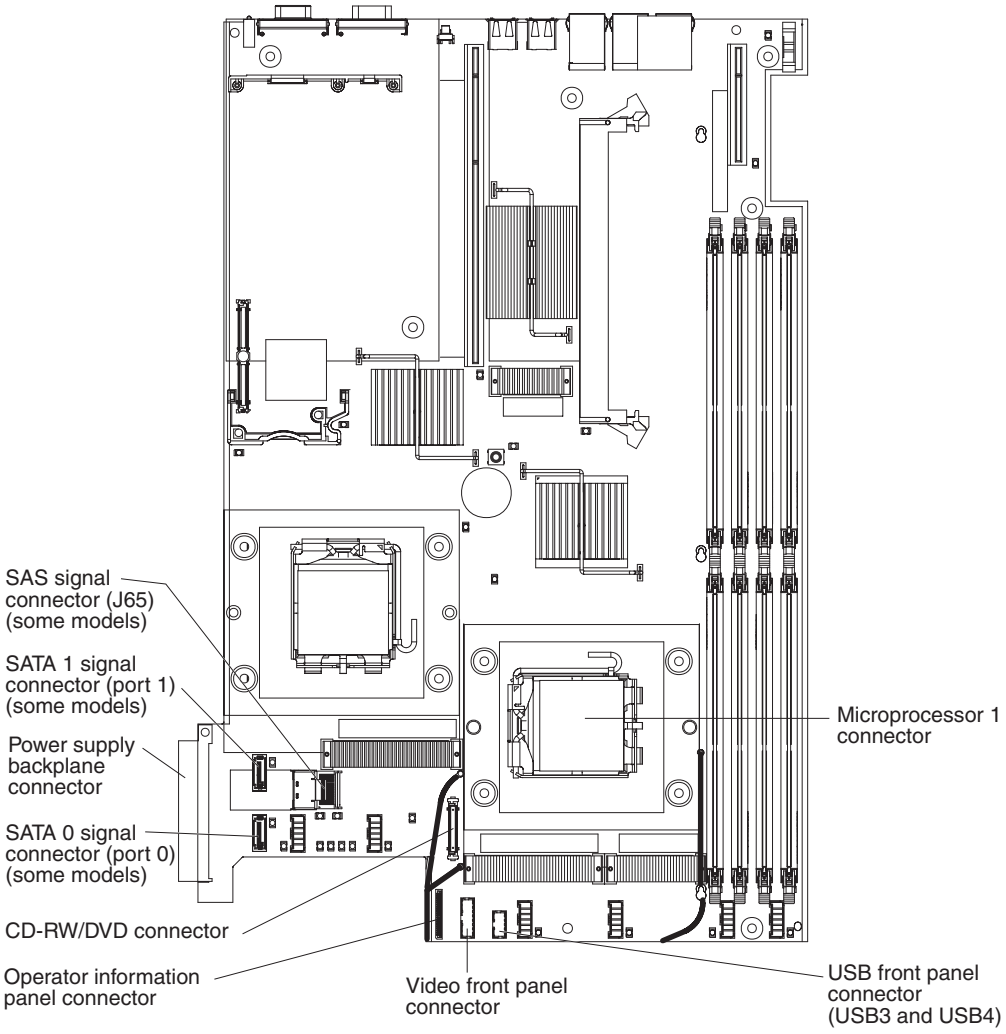
- **Ethernet activity LEDs:** When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.
- **Ethernet speed LED:** When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.
- **Ethernet connectors:** Use either of these connectors to connect the server to a network.

Internal LEDs, connectors, and jumpers

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

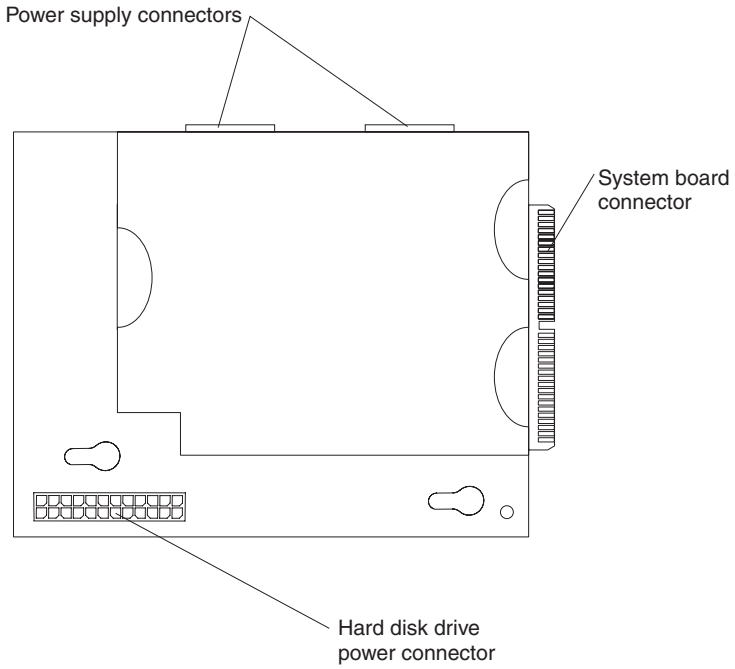
System-board internal connectors

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



Power backplane card internal connectors

The following illustration shows the internal connectors on the power backplane card.



System-board switches and jumpers

The following illustration shows the switches and jumpers on the system board.

Note: If a clear protective sticker is present on top of the SW2 switch block, you must remove and discard it in order to access the switches.

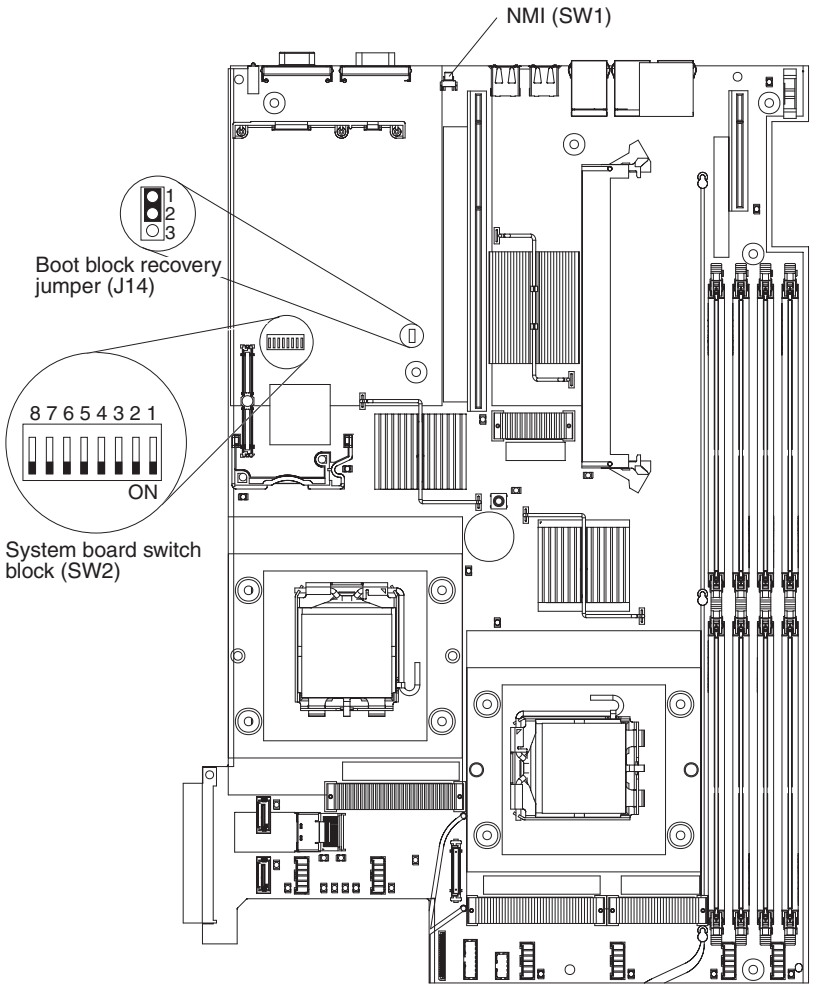

NMI (SW1)
1
2
3
Boot block recovery
jumper (J14)
8 7 6 5 4 3 2 1
ON
System board switch
block (SW2)

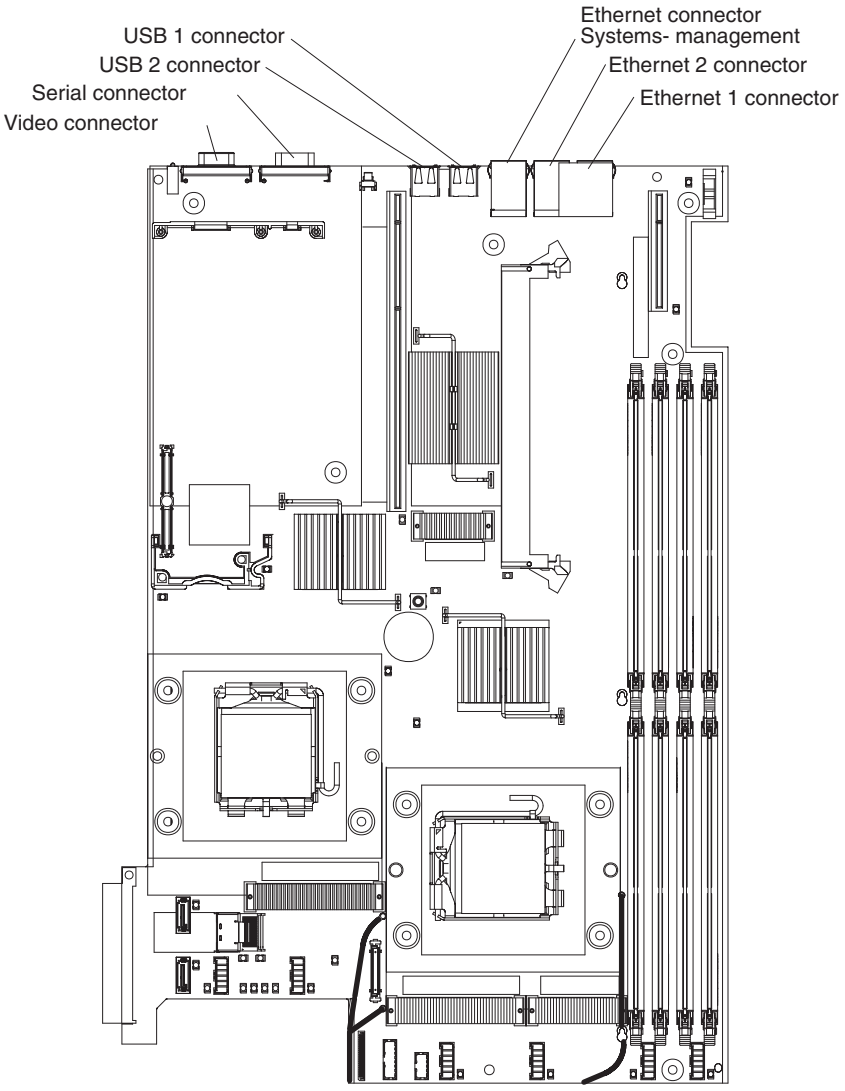
Table 2. Switch and jumper settings

Component	Default value	Settings
NMI (nonmaskable interrupt) switch (SW1)	Off	NMI button on rear of server pressed: NMI issued
Power-on password switch (SW2-1)	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not have to move the switch back to the default position after the password is overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set. See the *User's Guide* on the IBM *System x Documentation* CD for additional information about the power-on password.
BMC update switch (SW2-2)	Off	Force BMC update (trained service technician only). When toggled to On, this switch causes an update of BMC microcode from the on-board ROM.
BMC disable switch (SW2-3)	Off	Setting this to On might be necessary when a service processor adapter other than the optional Remote Supervisor Adapter II SlimLine is installed.
Force power-on switch (SW2-8)	Off	Power-on override. When toggled to On, this switch forces the server power on, overriding the power-on button.
Boot block recovery jumper (J14)		• Pins 1 and 2: Normal (default) • Pins 2 and 3: Recover boot block.

Note: The server is shipped with a clear plastic shield on the face of switch SW2. Remove and discard this shield if you need to change the switch settings.

System-board external connectors

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



System-board LEDs

The following illustration shows the light-emitting diodes (LEDs) on the system board.

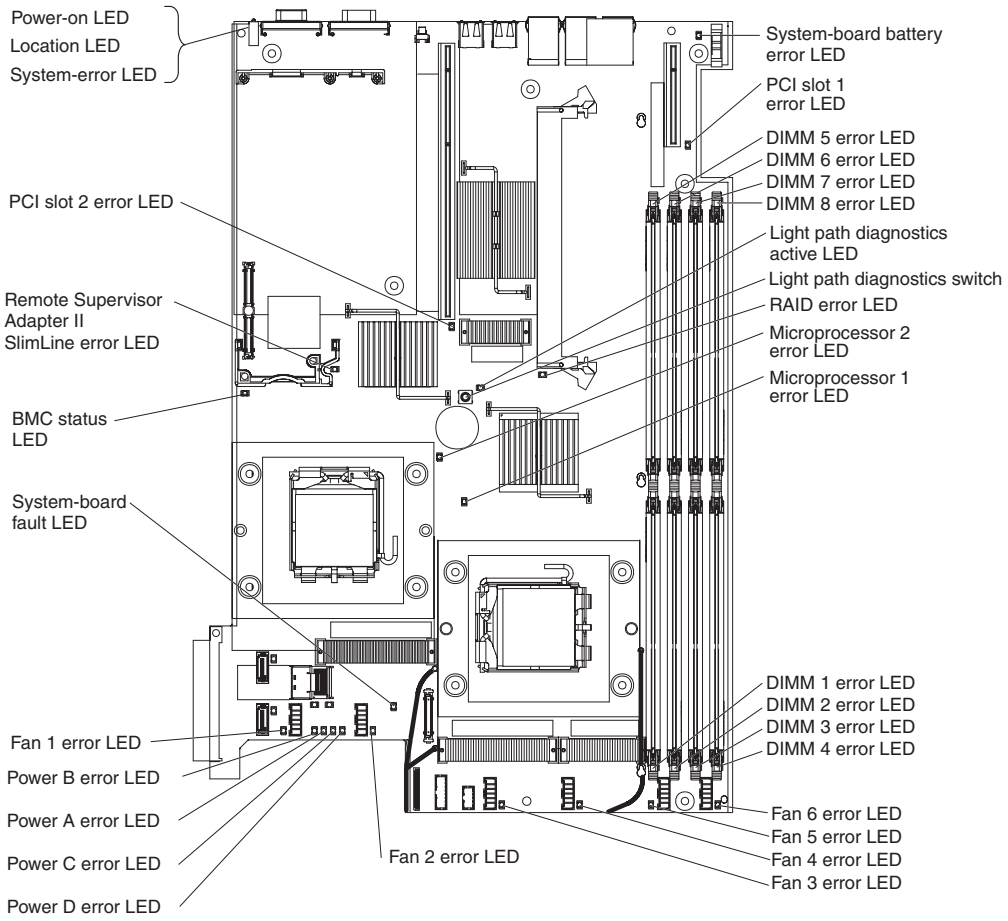
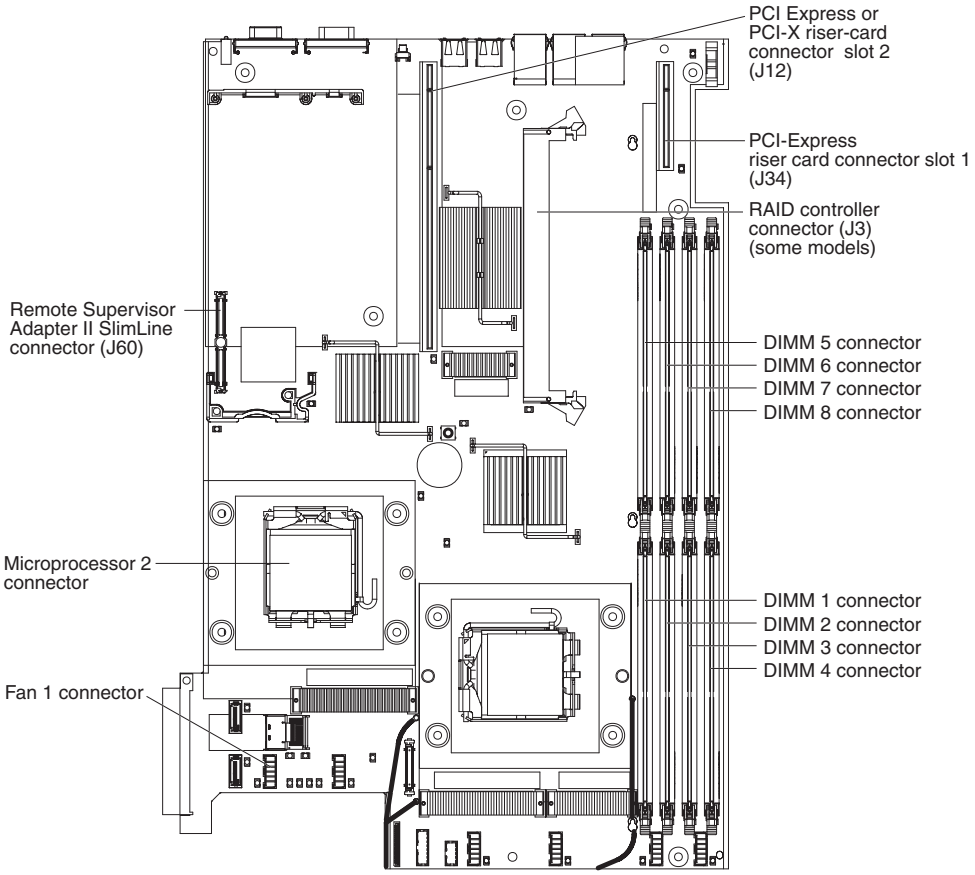


Table 3. System-board LEDs

LED	Description
Error LEDs	The associated component has failed.
BMC status LED	This LED flashes to indicate that the BMC (baseboard management controller) is functioning normally.
Standby power LED	When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed.
12-volt power (A, B, C, D) LEDs	If any of these LEDs is lit, there is a failure in the associated system board power bus (see “Power problems” on page 52).
Location LED	Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.
System-error LED	When this LED is lit, it indicates that a system error has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.

System-board option connectors

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



Chapter 2. Diagnostics

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

If you cannot locate and correct the problem using the information in this chapter, see Appendix A, “Getting help and technical assistance,” on page 159 for more information.

Diagnostic tools

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

- **POST beep codes, error messages, and error logs**

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

  These tables list problem symptoms and actions to correct the problems. See “Troubleshooting tables” on page 43.
- **Light path diagnostics**

  Use the light path diagnostics to diagnose system errors quickly. See “Light path diagnostics” on page 56 for more information.
- **Diagnostic programs, messages, and error messages**

  The diagnostic programs, which are stored in upgradeable read-only memory (ROM) on the system board, are the primary method of testing the major components of the server. See “Diagnostic programs, messages, and error codes” on page 61 for more information.

POST

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

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

If POST detects a problem, one or more beeps might sound, or an error message is displayed. See “POST beep codes” and “POST error codes” on page 28 for more information.

POST beep codes

A beep code is a combination of short or long beeps or a series of short beeps that are separated by pauses. For example, a “1-2-3” beep code is one short beep, a pause, two short beeps, and pause, and three short beeps. A beep code indicates that POST has detected a problem.

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

Exception: If there are multiple error codes or light path diagnostics LEDs that indicate a microprocessor error, the error might be in the microprocessor or in the microprocessor socket. See “Microprocessor problems” on page 48 for information about diagnosing microprocessor problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, “Parts listing, Type 7978 and 1913 server,” on page 89 to determine which components are CRUs and which components are FRUs.**
- **If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.**

Beep code	Description	Action
No beep	System board failure.	(Trained service technician only) Replace the system board.
1-1-2	Microprocessor register test failed.	1. (Trained service technician only) Reseat the microprocessors. 2. (Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: a. Microprocessor 2 (if present). b. Microprocessor 1.
1-1-3	CMOS write/read test failed.	1. Reseat the system board battery. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
1-1-4	BIOS EEPROM checksum failed.	1. Reload the server BIOS (see “Recovering the BIOS code” on page 76). 2. (Trained service technician only) Replace the system board.
1-2-1	Programmable interval timer failed.	(Trained service technician only) Replace the system board.
1-2-2	DMA initialization failed.	(Trained service technician only) Replace the system board.
1-2-3	DMA page register write/read failed.	(Trained service technician only) Replace the system board.
1-2-4	RAM refresh verification failed.	1. Reseat the DIMMs. 2. Replace the following components, one at a time, in the order shown: a. DIMMs b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are CRUs and which components are FRUs.**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
1-3-1	1st 64K RAM test failed.	1. Reseat the DIMMs. 2. Replace the following components, one at a time, in the order shown: a. DIMMs b. (Trained service technician only) System board
1-3-2	1st 64K RAM parity test failed.	1. Reseat the DIMMs. 2. Replace the following components, one at a time, in the order shown: a. DIMMs b. (Trained service technician only) System board
2-1-1	Secondary DMA register failed.	(Trained service technician only) Replace the system board.
2-1-2	Primary DMA register failed.	(Trained service technician only) Replace the system board.
2-1-3	Primary interrupt mask register failed.	(Trained service technician only) Replace the system board.
2-1-4	Secondary interrupt mask register failed.	(Trained service technician only) Replace the system board.
2-2-2	Keyboard controller failed.	Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Keyboard 2. (Trained service technician only) System board
2-2-3	CMOS power failure and checksum checks failed.	1. Reseat the system-board battery. 2. Replace the following components, one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
2-2-4	CMOS configuration information checks failed.	1. Reseat the system-board battery. 2. Replace the following components, one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
2-3-1	Screen initialization failed.	(Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are CRUs and which components are FRUs.**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
2-3-2	Screen memory failed.	(Trained service technician only) Replace the system board.
2-3-3	Screen retrace failed.	(Trained service technician only) Replace the system board.
2-3-4	Search for video ROM failed.	(Trained service technician only) Replace the system board.
2-4-1	Video failed.	(Trained service technician only) Replace the system board.
2-4-4	Memory configuration error.	1. Make sure that the DIMMS are installed in the correct configuration. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. Failing DIMM b. (Trained service technician only) System board
3-1-1	Timer tick interrupt failed.	(Trained service technician only) Replace the system board.
3-1-2	Interval timer channel 2 failed.	(Trained service technician only) Replace the system board.
3-1-3	RAM test failed above address 0FFFFh.	1. Reseat the DIMMs. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. (Trained service technician only) System board
3-1-4	Time-of-day clock failed.	1. Reseat the system-board battery. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
3-2-1	Serial port failed.	(Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are CRUs and which components are FRUs.**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
3-2-4	Failed comparing CMOS memory size against actual.	1. Reseat the following components: a. DIMMs b. System-board battery 2. Replace the following components, one at a time, in the order shown, restarting the server each time: a. DIMMs b. System-board battery c. (Trained service technician only) System board
3-3-1	Memory size mismatch occurred.	1. Reseat the following components: a. DIMMs b. System-board battery 2. Replace the following components, one at a time, in the order shown, restarting the server each time: a. DIMMs b. System-board battery c. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are CRUs and which components are FRUs.**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
3-3-2	Critical SMBUS (I^2C bus) error occurred.	1. Disconnect server power, wait 30 seconds and retry. 2. Reseat the following components: a. (Trained service technician only) Microprocessor b. PCI-X/PCI Express riser (if present) c. PCI-X/PCI Express adapter (if present) d. DIMMs e. Hard disk drives f. Hard disk drive backplane g. Hard disk drive power cable h. Hard disk drive signal cable (only for SAS drive) 3. Replace the following components, one at a time, in the order shown, restarting the server each time: a. (Trained service technician only) System board b. (Trained service technician only) Microprocessor c. PCI-X/PCI Express riser (if present) d. PCI-X/PCI Express adapter (if present) e. DIMMs f. Hard disk drives g. Hard disk drive backplane h. Hard disk drive power cable i. Hard disk drive signal cable (only for SAS drive)

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are CRUs and which components are FRUs.**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
3-3-3	No operational memory in system.	1. Make sure that the server contains the correct number of DIMMs, in the correct order; install or reseat DIMMS; then, restart the server. **Important:** In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the **Boot Fail Count** option in the **Start Options** of the Configuration/Setup Utility program is enabled, you must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled). 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. (Trained service technician only) System board

Error logs

The POST error log contains the three most recent error codes and messages that were generated during POST. The BMC log contains messages that were generated by the BMC. The system event/error log is a combined log that contains messages that were generated during POST and all system status messages from the service processor (BMC).

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

Important: After you complete a repair or correct an error, clear the BMC log to turn off the system-error LED on the front of the server.

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

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

You can view the contents of the POST error log, the system event log, and the system event/error log from the Configuration/Setup Utility program.

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

Viewing error logs from the Configuration/Setup Utility program

For complete information about using the Configuration/Setup Utility program, see the *User's Guide* on the IBM *System x Documentation* CD.

To view the error logs, complete the following steps:

1. Turn on the server.
2. When the prompt `Press F1 for Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to view the error logs.
3. Use one of the following procedures:
   - To view the POST error log, select **Event/Error Logs**, and then select **POST Error Log**.
   - To view the BMC system event log, select **Advanced Setup --> Baseboard Management Controller (BMC) Settings --> BMC System Event Log**
   - To view the combined system event/error log that is generated by the Remote Supervisor Adapter II SlimLine, select **Event/Error logs**, and then select **System Event/Error Log**.

Clearing the error logs

For complete information about using the Configuration/Setup Utility program, see the *User's Guide* on the IBM *System x Documentation* CD.

To clear the error logs, complete the following steps:

1. Turn on the server.
2. When the prompt `Press F1 for Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to view the error logs.
3. Use one of the following procedures:
   - To clear the BMC system event log, select **Advanced Setup --> Baseboard Management Controller (BMC) Settings-->BMC System Event Log**. Select **Clear BMC SEL**; then, press Enter twice.
   - To clear the combined system event/error log, select **Event/Error logs**, and then select **System Event/Error Log**. When any log entry is displayed, press Enter (**Clear event/error logs** is highlighted on each entry page).

Note: The POST error log is automatically cleared each time the server is restarted.

No-beep symptoms

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

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

No-beep symptom	Description	Action
No beeps occur, and the server operates correctly.	Possible problem with the operator information panel.	1. Check the operator information panel cable for damage. 2. Reseat the operator information panel cable. 3. Replace the following components, one at a time, in the order shown, restarting the server each time: a. (Trained service technician only) Operator information panel b. (Trained service technician only) System board
No beeps occur after successful completion of POST.	The power-on status is Disabled.	1. Run the Configuration/Setup Utility program and select **Start Options**; then, set **Power-On Status** to **Enable**. 2. Check the operator information panel cable for damage. 3. Reseat the operator information panel cable. 4. (Trained service technician only) Replace the system board
No beeps occur, and there is no video.	Unknown problem.	See "Solving undetermined problems" on page 86.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

No-beep symptom	Description	Action
No beep occurs, and the power-supply ac LED is off	Possible power problem.	1. Make sure that the ac power cord is connected to the power supply and to an ac outlet. 2. Reseat the power supplies. 3. If two power supplies are installed, swap them to determine whether one is defective. 4. Disconnect the cable from the hard disk drive backplane power connector (J13) on the power backplane. If the ac power LED comes on, see "Solving undetermined problems" on page 86.
No beep occurs, the server does not start, and the power-supply ac LED is lit.	Possible power problem.	See "Power-supply LEDs" on page 60.

POST error codes

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

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
062	Three consecutive boot failures using the default configuration.	1. Run the Configuration/Setup Utility program, save the configuration, and restart the server. 2. Update the system firmware to the latest level (see "Updating the firmware" on page 149). 3. Reseat the following components, one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) Microprocessor 1 4. Replace the components listed in step 3, one at a time, in the order shown, restarting the server each time.
101, 102, 106	System and microprocessor error.	1. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
111	Channel check error.	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. Adapter (if present) 2. DIMMs Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Adapter (if present) 2. DIMMs 3. (Trained service technician only) System board
114	Adapter read-only memory error.	1. Reseat the adapter. 2. Replace the adapter.
129	Internal cache (L2) error.	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Reseat microprocessor 2 (if present). 3. (Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: a. Microprocessor 1 b. Microprocessor 2 (if present) c. System board
151	Real-time clock error.	1. Reseat the battery. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
161	Real-time clock battery error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the battery. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
162	Device configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the following components, one at a time, in the order shown, restarting the server each time: a. System-board battery b. Failing device (if the device is a FRU, the device must be reseated by a trained service technician only) 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. Failing device (if the device is a FRU, the device must be replaced by a trained service technician only) c. (Trained service technician only) System board
163	Real-time clock error. (time of day not set)	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure that the date and time are correct, and save the settings. 2. Reseat the battery. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
164	Memory configuration changed.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the DIMMs. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. (Trained service technician only) System board
165	Service processor failure.	(Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
175	Bad EEPROM CRC #1.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Update the Remote Supervisor Adapter II SlimLine firmware (if present). 3. (Trained service technician only) Replace the system board.
178	System VPD not available.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reflash or update firmware for the BMC. 3. (Trained service technician only) Replace the system board.
184	Power-on password damaged.	1. Restart the server and enter the administrator password; then, run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the battery. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
185	Drive startup sequence information corrupted.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. (Trained service technician only) Replace the system board.
187	VPD serial number not set.	1. Run the Configuration/Setup Utility program, set the serial number, and save the configuration. 2. (Trained service technician only) Replace the system board.
188	Bad EEPROM CRC #2.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reflash or update firmware for the BMC. 3. Update the Remote Supervisor Adapter II SlimLine firmware (if present). 4. (Trained service technician only) Replace the system board.
189	An attempt was made to access the server with an incorrect password.	Restart the server and enter the administrator password; then, run the Configuration/Setup Utility program and change the power-on password.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
201	Memory test error.	1. Make sure that the DIMM is installed correctly (see "Installing a memory module" on page 110). 2. Reseat the DIMM. 3. Replace the DIMM. 4. (Trained service technician only) Replace the system board.
229	Internal cache (L2) error.	(Trained service technician only) Reseat the following components one at a time, in the order shown, restarting the server each time: 1. Microprocessor 1 2. Microprocessor 2 (if installed) (Trained service technician only) Replace the components listed above, one at a time, in the order shown, restarting the server each time.
262	DRAM parity configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the battery. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. (Trained service technician only) System board
289	A DIMM has been disabled by the user or by the system.	1. If the DIMM was disabled by the user, run the Configuration/Setup Utility program and enable the DIMM. 2. Make sure that the DIMM is installed correctly (see "Installing a memory module" on page 110). 3. Reseat the DIMM. 4. Replace the DIMM. 5. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
301	Keyboard or keyboard controller error.	1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. Reseat the keyboard cable in the connector. 3. If you are using an external USB hub, disconnect the keyboard from the hub and connect it directly to the server. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Keyboard b. (Trained service technician only) System board
303	Keyboard controller error.	1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. Reseat the keyboard cable in the connector. 3. If you are using an external USB hub, disconnect the keyboard from the hub and connect it directly to the server. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Keyboard b. (Trained service technician only) System board
762	Coprocessor configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the battery. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. System-board battery b. Microprocessor 1
11xx	Serial port configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
1600	BMC failed BIST.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reflash or update firmware for the BMC. 3. (Trained service technician only) Replace the system board.
1601	BMC is not functioning.	1. Reflash or update firmware for the BMC. 2. (Trained service technician only) Replace the system board.
1602	Remote Supervisory Adapter II SlimLine communication error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reflash or update firmware for the Remote Supervisory Adapter II SlimLine. 3. (Trained service technician only) Replace the system board.
1603	Remote Supervisory Adapter II SlimLine firmware needs to be updated.	Reflash or update firmware for the Remote Supervisory Adapter II SlimLine.
1762	Hard drive configuration error.	1. Run the hard disk drive diagnostics tests on drive x. 2. Reseat the following components: a. Hard disk drive b. Hard disk drive backplane cable or backplate cables 3. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Hard disk drive b. Hard disk drive backplate c. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
178x	Hard drive error. **Note:** x is the drive that has the error.	1. Run the hard disk drive diagnostics tests on drive x. 2. Reseat the following components: a. Hard disk drive b. Hard disk drive backplane cable or backplate cables 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Hard disk drive b. Hard disk drive backplate c. (Trained service technician only) System board
1800	Unavailable PCI hardware interrupt.	1. Run the Configuration/Setup Utility program and adjust the adapter settings. 2. Remove each adapter one at a time, restarting the server each time, until the problem is isolated.
1801	An adapter has requested memory resources that are not available	1. Run the Configuration/Setup Utility program and verify that sufficient memory is installed in the server. 2. Run the Configuration/Setup Utility program and disable some other resources to make more space available. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Each adapter b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
1962	A hard disk drive does not contain a valid boot sector.	1. Make sure that a startable operating system is installed. 2. Run the hard disk drive diagnostic tests. 3. Reseat the following components: a. Hard disk drive b. Hard disk drive backplane cable or backplate cables 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. (Hot-swap models) Hard disk drive cables b. Hard disk drive c. Hard disk drive backplane or backplate d. (Trained service technician only) System board
2400	Video controller test failure.	1. Optional video adapter (if installed) 2. (Trained service technician only) System board
2462	Video memory configuration error.	1. Optional video adapter (if installed) 2. (Trained service technician only) System board
5962	IDE CD-ROM configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat the following components: a. CD-RW/DVD drive b. CD-RW/DVD drive cable c. System-board battery 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. CD-RW/DVD drive b. CD-RW/DVD drive cable c. System-board battery d. (Trained service technician only) System board
8603	Pointing device error.	1. Reseat the pointing-device cable. 2. If you are using an external USB hub, disconnect the pointing device from the hub and connect it directly to the server. 3. Replace the pointing device. 4. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
00012000	Microprocessor machine check error.	1. (Trained service technician only) Reseat the following components: a. Microprocessor 1 b. Microprocessor 2 (if present) 2. (Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: a. Microprocessor 1 b. Microprocessor 2 (if present) c. System board
00019501	Microprocessor 1 not functioning.	(Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: 1. Microprocessor 1 2. System board
00019502	Microprocessor 2 not functioning.	(Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: 1. Microprocessor 2 (if present) 2. System board
00019701	Microprocessor 1 failed BIST.	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: a. Microprocessor 1 b. System board
00019702	Microprocessor 2 failed BIST.	1. (Trained service technician only) Reseat microprocessor 2 (if present). 2. (Trained service technician only) Replace the following components one at a time, in the order shown, restarting the server each time: a. Microprocessor 2 (if present) b. System board
00180100	No room for PCI option ROM.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Remove the PCI adapters and riser cards, one at a time, until the problem is isolated. 3. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
00180200	No more I/O space available for PCI adapter.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Remove the PCI adapters and riser cards, one at a time, until the problem is isolated. 3. (Trained service technician only) Replace the system board.
00180300	No more memory above 1 MB for PCI adapter.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Remove the PCI adapters and riser cards, one at a time, until the problem is isolated. 3. (Trained service technician only) Replace the system board.
00180400	No more memory below1 MB for PCI adapter.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Remove the PCI adapters and riser cards, one at a time, until the problem is isolated. 3. (Trained service technician only) Replace the system board.
00180500	PCI option ROM checksum error.	1. Reseat each of the installed PCI adapters and riser cards. 2. Replace each of the installed PCI adapters, restarting the server each time. 3. (Trained service technician only) Replace the system board.
00180600	PCI device BIST failure.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. 2. Reseat each installed PCI adapter and riser card. 3. Replace each installed PCI adapter, restarting the server each time. 4. (Trained service technician only) Replace the system board.
00180700	PCI device not responding.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure that installed PCI devices are enabled, and save the settings. 2. Reseat each installed PCI adapter and riser card. 3. (Trained service technician only) Replace the system board. 4. Replace each installed PCI adapter, restarting the server each time.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
00180800	Unsupported PCI device installed.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure that installed PCI devices are enabled, and save the settings. 2. Reseat each installed PCI adapter and riser card. 3. Replace each installed PCI adapter, restarting the server each time. 4. (Trained service technician only) Replace the system board.
01298001	No update data for microprocessor 1.	1. Update the BIOS code again (see "Recovering the BIOS code" on page 76). 2. (Trained service technician only) Replace microprocessor 1.
01298002	No update data for microprocessor 2.	1. Update the BIOS code again (see "Recovering the BIOS code" on page 76). 2. (Trained service technician only) Replace microprocessor 2 (if present).
01298101	Bad update data for microprocessor 1.	1. Update the BIOS code again (see "Recovering the BIOS code" on page 76). 2. (Trained service technician only) Replace microprocessor 1.
01298102	Bad update data for microprocessor 2.	1. Update the BIOS code again (see "Recovering the BIOS code" on page 76). 2. (Trained service technician only) Replace microprocessor 2 (if present).
I9990301	Hard disk drive boot sector error.	1. Reseat the following components: a. Hard disk drive b. Hard disk drive backplane cable or backplate cables 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. Hard disk drive backplane cable or backplate cables b. Hard disk drive c. Hard disk drive backplane or backplate d. (Trained service technician only) System board
I9990305	Operating system not found.	Run the Configuration/Setup Utility program to make sure that a bootable operating system is installed on one or more devices that are listed in the boot order.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
I9990650	AC power has been restored.	1. Check the power cables. 2. Check for interruption of the ac power supply.

Checkout procedure

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

About the checkout procedure

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

- Read the safety information that begins on page vii.
- The diagnostic programs provide the primary methods of testing the major components of the server, such as the system board, Ethernet controller, keyboard, mouse (pointing device), serial ports, and hard disk drives. You can also use them to test some external devices. If you are not sure whether a problem is caused by the hardware or by the software, you can use the diagnostic programs to confirm that the hardware is working correctly.
- When you run the diagnostic programs, a single problem might cause more than one error message. When this happens, correct the cause of the first error message. The other error messages usually will not occur the next time you run the diagnostic programs.

  Exception: If there are multiple error codes or light path diagnostics LEDs that indicate a microprocessor error, the error might be in the microprocessor or in the microprocessor socket. See “Microprocessor problems” on page 48 for information about diagnosing microprocessor problems.
- Before running the diagnostic programs, you must determine whether the failing server is part of a shared hard disk drive cluster (two or more servers sharing external storage devices). If it is part of a cluster, you can run all diagnostic programs except the ones that test the storage unit (that is, a hard disk drive in the storage unit) or the storage adapter that is attached to the storage unit. The failing server might be part of a cluster if any of the following conditions is true:
  - You have identified the failing server as part of a cluster (two or more servers sharing external storage devices).
  - One or more external storage units are attached to the failing server and at least one of the attached storage units is also attached to another server or unidentifiable device.
  - One or more servers are located near the failing server.

  Important: If the server is part of a shared hard disk drive cluster, run one test at a time. Do not run any suite of tests, such as “quick” or “normal” tests, because this might enable the hard disk drive diagnostic tests.
- If the server is halted and a POST error code is displayed, see “Error logs” on page 26. If the server is halted and no error message is displayed, see “Troubleshooting tables” on page 43 and “Solving undetermined problems” on page 86.
- For information about power-supply problems, see “Solving power problems” on page 84.
- For intermittent problems, check the error log; see “Error logs” on page 26 and “Diagnostic programs, messages, and error codes” on page 61.

Performing the checkout procedure

To perform the checkout procedure, complete the following steps:

1. Is the server part of a cluster?

- **No:** Go to step 2.
- **Yes:** Shut down all failing servers that are related to the cluster. Go to step 2.

2. Complete the following steps:
   a. Check the power supply LEDs, see “Power problems” on page 52.
   b. Turn off the server and all external devices.
   c. Check all internal and external devices for compatibility.
   d. Check all cables and power cords.
   e. Make sure the server is cabled correctly.
   f. Set all display controls to the middle positions.
   g. Turn on all external devices.
   h. Turn on the server. If the server does not start, see “Troubleshooting tables” on page 43.
   i. Check the system-error LED on the operator information panel. If it is flashing, check the light path diagnostics LEDs (see “Light path diagnostics” on page 56).
   j. Check for the following results:
      - Successful completion of POST (see “POST” on page 19 for more information)
      - Successful completion of startup
3. Did one or more beeps sound?
   - **No:** Find the failure symptom in “Troubleshooting tables” on page 43; if necessary, run the diagnostic programs (see “Running the diagnostic programs” on page 62).
     – If you receive an error, see “Diagnostic error codes” on page 64.
     – If the diagnostic programs were completed successfully and you still suspect a problem, see “Solving undetermined problems” on page 86.
   - **Yes:** Find the beep code in “POST beep codes” on page 19; if necessary, see “Solving undetermined problems” on page 86.

Troubleshooting tables

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

If you cannot find the problem in these tables, see “Running the diagnostic programs” on page 62 for information about testing the server.

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

1. Check the system-error LED on the operator information panel; if it is lit, check the light path diagnostics LEDs (see “Light path diagnostics” on page 56).
2. Remove the software or device that you just added.
3. Run the diagnostic tests to determine whether the server is running correctly.
4. Reinstall the new software or new device.

CD-RW/DVD drive problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, “Parts listing, Type 7978 and 1913 server,” on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.**

Symptom	Action
The CD-RW/DVD drive is not recognized.	1. Make sure that: • The IDE channel to which the CD-RW/DVD drive is attached (primary) is enabled in the Configuration/Setup Utility program. • All cables and jumpers are installed correctly. • The pins on the cables are not bent. • The correct device driver is installed for the CD-RW/DVD drive. 2. Run the CD-RW/DVD drive diagnostic programs. 3. Reseat the following components: a. CD-RW/DVD drive b. CD-RW/DVD drive cable 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. CD-RW/DVD drive b. CD-RW/DVD drive cable c. (Trained service technician only) System board
The CD-RW/DVD is not working correctly.	1. Clean the CD-RW/DVD drive. 2. Run the CD-RW/DVD drive diagnostic programs. 3. Check the signal cable for bent pins. 4. Reseat the following components: a. CD-RW/DVD drive b. CD-RW/DVD drive cable 5. Replace the CD-RW/DVD drive.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The CD-RW/DVD drive tray is not working.	1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD-RW/DVD drive cable. 4. Replace the CD-RW/DVD drive.

General problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
An LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

Hard disk drive problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic test.	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive that you removed with a new one.
The server stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the server stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.
A hard disk drive passes the diagnostic Fixed Disk Test, but the problem remains.	Run the diagnostic for SCSI Attached Disks (see "Running the diagnostic programs" on page 62). **Note:** This test is not available on server models that use any of the available optional RAID controllers. For these server models, check the system error log for RAID device errors (see "Error logs" on page 26) and use the RAID device utilities to confirm correct disk drive setup ("Using the Configuration/Setup Utility program" on page 151).

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
A hard disk drive that you are installing does not fit correctly in the cage.	Make sure that the type of drive is correct for this server (see Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89).

Intermittent problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
A problem occurs only occasionally and is difficult to diagnose.	1. Make sure that: • All cables and cords are connected securely to the rear of the server and attached devices. • There is adequate cooling airflow. Reduced airflow due to a failed fan or an internal or external obstruction can cause the server to overheat and shut down. 2. Check the system-error log or BMC log (see "Error logs" on page 26). 3. See "Solving undetermined problems" on page 86. If the problem remains, call for service.
The server resets (restarts) occasionally.	1. If the reset occurs during POST and the POST watchdog timer is enabled (click **Advanced Setup --> Baseboard Management Controller (BMC) Setting --> BMC Post Watchdog** in the Configuration/Setup Utility program to see the POST watchdog setting), make sure that sufficient time is allowed in the watchdog timeout value (**BMC POST Watchdog Timeout**). See the *User's Guide* for information about the settings in the Configuration/Setup Utility program. If the server continues to reset during POST, see "POST" on page 19 and "Diagnostic programs, messages, and error codes" on page 61. 2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities, such as the IBM Automatic Server Restart IPMI Application for Windows, or ASR devices that may be installed. **Note:** ASR utilities operate as operating-system utilities and are related to the IPMI device driver. If the reset continues to occur after the operating system starts, the operating system might have a problem; see "Software problems" on page 55. 3. If neither condition applies, check the system-error log or BMC log (see "Error logs" on page 26). If the problem remains, call for service.

USB keyboard, mouse, or pointing-device problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
All or some keys on the keyboard do not work.	1. Run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. Make sure that: • The keyboard is compatible with the server. • The keyboard cable is securely connected. • The server and the monitor are turned on. 3. Reseat the keyboard cable. 4. If you are using an external USB hub, disconnect the keyboard from the hub and connect it directly to the server. 5. Replace the following components one at a time, in the order shown, restarting the server each time: a. Keyboard b. (Trained service technician only) System board
The USB mouse or USB pointing device does not work.	1. Make sure that: • The mouse is compatible with the server. • The mouse or pointing-device USB cable is securely connected to the server, and the keyboard and the device drivers are installed correctly. • The server and the monitor are turned on. • Keyboardless operation has been enabled in the Configuration/Setup Utility program. 2. Reseat the mouse or pointing-device cable. 3. If you are using an external USB hub, disconnect the mouse or pointing device from the hub and connect it directly to the server. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Mouse or pointing device b. (Trained service technician only) System board

Memory problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The amount of system memory that is displayed is less than the amount of installed physical memory.	1. Make sure that: • No light path diagnostics LEDs are lit on the operator information panel. • Memory mirroring or sparing does not account for the discrepancy. • The DIMMs are seated correctly. • You have installed the correct type of memory. See "Installing a memory module" on page 110. • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program. • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. 2. Check the POST error log for error message 289: • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. 3. Run memory diagnostics (see "Running the diagnostic programs" on page 62). 4. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair are matching. Install the DIMMs in the sequence described in "Installing a memory module" on page 110. 5. Reseat the DIMMs. See "Installing a memory module" on page 110. 6. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. (Trained service technician only) System board
Multiple rows of DIMMs in a branch are identified as failing.	1. Reseat the DIMMs; then, restart the server. 2. If the DIMM was disabled the user or POST, run the Configuration/Setup Utility program and enable the DIMM. 3. Replace the lowest-numbered DIMM pair of those identified; then, restart the server. Repeat as necessary. 4. (Trained service technician only) Replace the system board.

Microprocessor problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).** • **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	
Symptom	**Action**
The server emits a continuous beep during POST, indicating that the startup (boot) microprocessor is not working correctly.	1. Correct any errors that are indicated by the light path diagnostics LEDs (see "Light path diagnostics" on page 56). 2. Make sure that the server supports the microprocessor. 3. (Trained service technician only) Make sure that the microprocessor is seated correctly. 4. (Trained service technician only) Replace the microprocessor.

Monitor problems

Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the documentation that comes with the monitor for instructions for testing and adjusting the monitor. If you cannot diagnose the problem, call for service.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
Testing the monitor.	1. Make sure that the monitor cables are firmly connected. 2. Try using a different monitor on the server, or try testing the monitor on a different server. 3. Run the diagnostic programs. If the monitor passes the diagnostic programs, the problem might be a video device driver. 4. Reseat the Remote Supervisor Adapter II SlimLine (if one is present). 5. Replace the following components one at a time, in the order shown, restarting the server each time: a. Remote Supervisor Adapter II SlimLine (if one is present) b. (Trained service technician only) System board
The screen is blank.	1. If an external USB hub is in use, disconnect the monitor from the hub and connect it directly to the server. 2. Make sure that: • The server is turned on. If there is no power to the server, see "Power problems" on page 52. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. • No beep codes sound when the server is turned on. **Important:** In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the **Boot Fail Count** option in the **Start Options** of the Configuration/Setup Utility program is enabled, you must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled). 3. Make sure that the correct server is controlling the monitor, if applicable. 4. Make sure that damaged BIOS code is not affecting the video; see "Recovering the BIOS code" on page 76. 5. See "Solving undetermined problems" on page 86.
The monitor works when you turn on the server, but the screen goes blank when you start some application programs.	1. Make sure that: • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the application. 2. Run video diagnostics (see "Running the diagnostic programs" on page 62). • If the server passes the video diagnostics, the video is good; see "Solving undetermined problems" on page 86. • (Trained service technician only) If the server fails the video diagnostics, replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	1. If the monitor self-tests show the that monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. **Attention:** Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor. **Notes:** a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. 2. Reseat the following components: • Monitor cable • Remote Supervisor Adapter II SlimLine (if one is present) 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor cable b. Monitor c. Remote Supervisor Adapter II SlimLine (if one is present) d. (Trained service technician only) System board
Wrong characters appear on the screen.	1. If the wrong language is displayed, update the BIOS code (see "Updating the firmware" on page 149) with the correct language. 2. Reseat the monitor cable. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. (Trained service technician only) System board

Optional-device problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
An IBM optional device that was just installed does not work.	1. Make sure that: • The device is designed for the server (see http://www.ibm.com/servers/eserver/serverproven/compat/us/). • You followed the installation instructions that came with the device and the device is installed correctly. • You have not loosened any other installed devices or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration. 2. Reseat the device that you just installed. 3. Replace the device that you just installed.
An IBM optional device that worked previously does not work now.	1. Make sure that all of the hardware and cable connections for the device are secure. 2. If the device comes with test instructions, use those instructions to test the device. 3. Reseat the failing device. 4. Replace the failing device.

Power problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The power-control button does not work, and the reset button does work (the server does not start). **Note:** The power-control button will not function until 20 seconds after the server has been connected to ac power.	1. Make sure that the power-control button is working correctly: a. Disconnect the server power cords. b. Reconnect the power cords. c. Press the power-control button. d. If the server does not start, disconnect the server power cords and reseat the operator information panel cables; then, repeat steps 1a through 1c. If the problem remains, replace the operator information panel. 2. Make sure that: • The power cords are correctly connected to the server and to a working electrical outlet. • The server contains the correct type of DIMMs. • The DIMMs are correctly seated. • (Trained service technician only) The microprocessor is correctly installed. 3. If you just installed an optional device, remove it, and restart the server. If the server now turns on, you might have installed more devices than the power supply supports. 4. Reseat the following components: a. DIMMs b. (Trained service technician only) Power backplane 5. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. Power supply c. (Trained service technician only) Power backplane d. (Trained service technician only) System board 6. See "Solving undetermined problems" on page 86.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The server does not start.	Check the four 12-volt power LEDs (A, B, C, and D) on the system board. See "Internal LEDs, connectors, and jumpers" on page 9 for the LED locations. 1. If the Channel A power LED is lit, check components in the following order. a. Remove all PCI adapters and riser cards. Try restarting the server. If the server starts, reinstall the PCI adapters and riser cards, one at a time, to isolate the defective adapter. b. (Trained service technician only) System board c. (Trained service technician only) Power backplane. 2. If the Channel B power LED is lit, check components in the order listed below. a. Fans 1 and 2 b. (Trained service technician only) Remove microprocessor 2 (if present). Try restarting the server. c. (Trained service technician only) System board d. (Trained service technician only) Power backplane 3. If the Channel C power LED is lit, check components in the following order. a. Fans 3 and 4 b. (Trained service technician only) System board c. (Trained service technician only) Power backplane d. (Trained service technician only) Microprocessor 1 4. If the Channel D power LED is lit, check components in the following order. a. Remove all DIMMs. Try restarting the server, listening for any memory error beep codes. If the server restarts, reinstall the DIMMs, one pair at a time, to isolate the defective DIMM (see "Installing a memory module" on page 110). b. Fans 5 and 6 c. (Trained service technician only) System board d. (Trained service technician only) Power backplane
The server does not turn off.	1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps: a. Press Ctrl+Alt+Delete. b. Turn off the server by pressing the power-control button for 5 seconds. c. Restart the server. d. If the server fails POST and the power-control button does not work, disconnect the ac power cord for 20 seconds; then, reconnect the ac power cord and restart the server.
The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit.	See "Solving undetermined problems" on page 86.

Serial port problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	1. Make sure that: • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter (if one is present) is seated correctly. 2. Reseat the serial port adapter. 3. Replace the serial port adapter.
A serial device does not work.	1. Make sure that: • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. • The device is connected to the correct connector (see "Internal LEDs, connectors, and jumpers" on page 9). 2. Reseat the following components: a. Failing serial device b. Serial cable c. Remote Supervisor Adapter II SlimLine (if one is present) 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Failing serial device b. Serial cable c. Remote Supervisor Adapter II SlimLine (if one is present) d. (Trained service technician only) System board

ServerGuide problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The *ServerGuide™ Setup and Installation* CD will not start.	1. Make sure that the server supports the ServerGuide program and has a startable (bootable) CD-RW/DVD drive. 2. If the startup (boot) sequence settings have been changed, make sure that the CD-RW/DVD drive is first in the startup sequence. 3. If more than one CD-RW/DVD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive.
The ServeRAID program cannot view all installed drives, or the operating system cannot be installed.	1. Make sure that there are no duplicate IRQ assignments. 2. Make sure that the hard disk drive is connected correctly. 3. Make sure that the hard disk drive cables are securely connected.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the *ServerGuide Setup and Installation* CD label for a list of supported operating-system versions.
The operating system cannot be installed; the option is not available.	Make sure that the server supports the operating system. If it does, no logical drive is defined (RAID servers). Run the ServerGuide program and make sure that setup is complete.

Software problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
You suspect a software problem.	1. To determine whether the problem is caused by the software, make sure that: • The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict. • The software is designed to operate on the server. • Other software works on the server. • The software works on another server. 2. If you received any error messages when using the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 3. Contact your place of purchase of the software.

Universal Serial Bus (USB) port problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).** • **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	
Symptom	**Action**
A USB device does not work.	1. Make sure that: • The correct USB device driver is installed. • The operating system supports USB devices. 2. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program (see the *User's Guide* on the IBM *System x Documentation* CD for more information). 3. If you are using an external USB hub, disconnect the USB device from the hub and connect it directly to the server.

Video problems

See "Monitor problems" on page 49.

Light path diagnostics

Light path diagnostics is a system of LEDs on various external and internal components of the server. When an error occurs, LEDs are lit throughout the server. By viewing the LEDs in a particular order, you can often identify the source of the error.

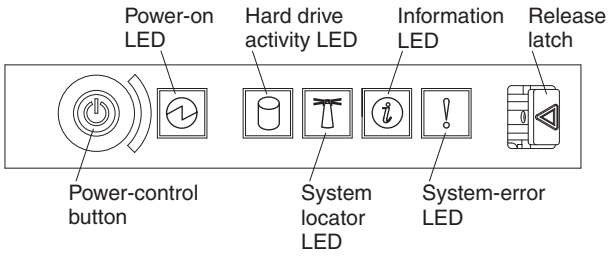
When LEDs are lit to indicate an error, they remain lit when the server is turned off, provided that the server is still connected to power and the power supply is operating correctly.

Before working inside the server to view light path diagnostics LEDs, read the safety information that begins on page "Safety" on page vii and "Handling static-sensitive devices" on page 96.

If an error occurs, view the light path diagnostics LEDs in the following order:

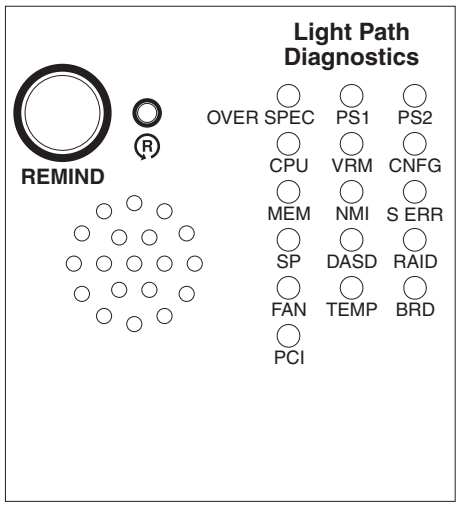
1. Look at the operator information panel on the front of the server.
   - If the information LED is lit, it indicates that information about a suboptimal condition in the server is available in the BMC log or in the system-error log.
   - If the system-error LED is lit, it indicates that an error has occurred; go to step 2 on page 57.

   The following illustration shows the operator information panel.



2. To view the light path diagnostics panel, slide the latch to the left on the front of the light path diagnostics drawer. This reveals the light path diagnostics panel. Lit LEDs on this panel indicate the type of error that has occurred.

   The following illustration shows the light path diagnostics panel.

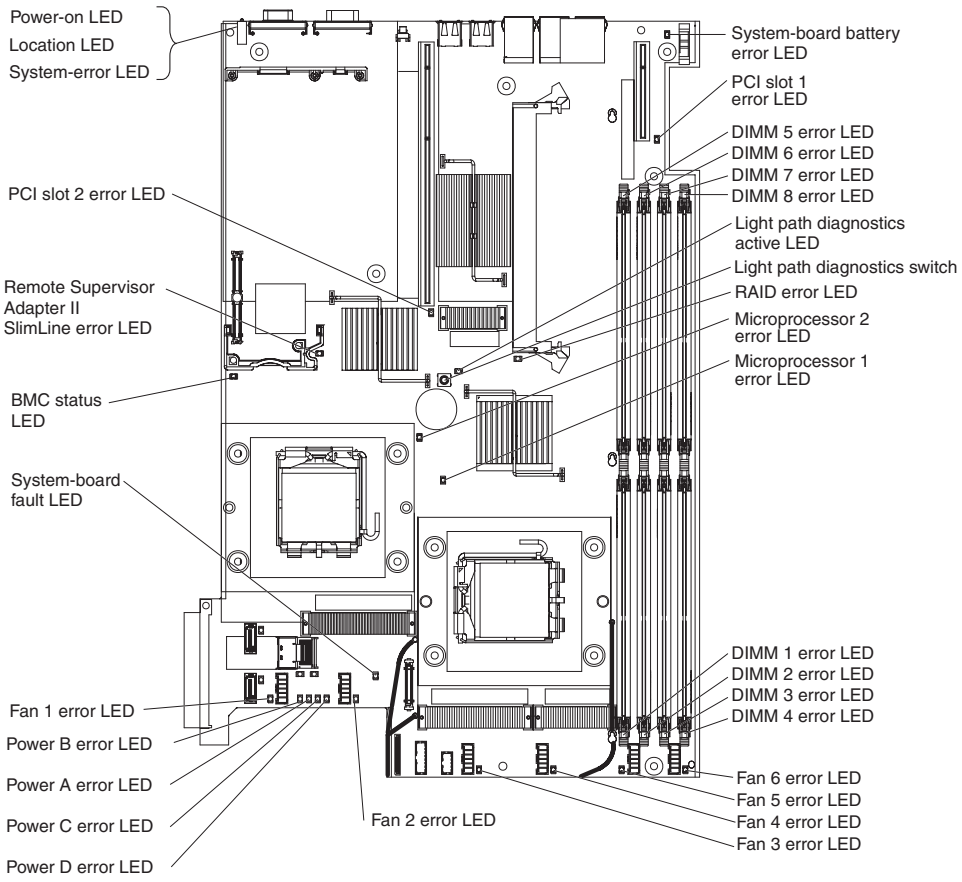


   Note any LEDs that are lit, and then close the drawer.

   Look at the system service label on the top of the server, which gives an overview of internal components that correspond to the LEDs on the light path diagnostics panel. This information and the information in “Light path diagnostics LEDs” on page 58 can often provide enough information to diagnose the error.

3. Remove the server cover and look inside the server for lit LEDs. A lit LED on or beside a component identifies the component that is causing the error.

   The following illustration shows the LEDs on the system board.



Remind button

You can use the remind button on the light path diagnostics panel to put the system-error LED on the operator information panel into Remind mode. When you press the remind button, you acknowledge the error but indicate that you will not take immediate action. The system-error LED flashes while it is in Remind mode and stays in Remind mode until one of the following conditions occurs:

- All known errors are corrected.
- The server is restarted.
- A new error occurs, causing the system-error LED to be lit again.

Light path diagnostics switch

The light path diagnostics switch allows you to review error indications after the server has been powered down. Press and hold the diagnostics switch, located on the system board to relight the LEDs that were lit before you removed power from the server. The LEDs will remain lit for as long as you press the switch, to a maximum of 25 seconds.

Light path diagnostics LEDs

The following table describes the LEDs on the light path diagnostics panel and suggested actions to correct the detected problems.

Note: Check the system-error log or BMC log for additional information before replacing a FRU.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
None	An error has occurred and cannot be diagnosed, or the Advanced System Management (ASM) processor on the Remote Supervisor Adapter II SlimLine has failed. The error is not represented by a light path diagnostics LED.	Check the system error log for information about the error.
OVER SPEC	The power supplies are using more power than their maximum rating.	Replace the failing power supply, or remove optional devices from the server.
PS1	The power supply in bay 1 has failed.	Replace the failed power supply.
PS2	The power supply in bay 2 has failed.	Replace the failed power supply.
CPU	A microprocessor has failed.	Make sure that the failing microprocessor, which is indicated by a lit LED on the system board, is installed correctly. See "Installing a microprocessor" on page 138 for information about installing a microprocessor.
VRM	Reserved.	Reserved.
CNFG	Microprocessor configuration error.	• Check the microprocessor options for compatibility. • Check the system error log for information indicating incompatible components.
MEM	A memory error has occurred.	Replace the failing DIMM, which is indicated by the lit LED on the system board.
NMI	A machine check error has occurred.	Check the system error log for information about the error.
S ERR	Reserved	
SP	The service processor has failed.	Remove ac power from the server; then, reconnect the server to ac power and restart the server. If a Remote Supervisor Adapter II SlimLine is installed, replace it.
DASD	A hard disk drive error has occurred.	Check the LEDs on the hard disk drives and replace the indicated drive.
BRD	An error has occurred on the system board.	• Check the LEDs on the system board to identify the component that is causing the error. • Check the system error log for information about the error.
FAN	A fan has failed, is operating too slowly, or has been removed. A failing fan can also cause the TEMP LED to be lit.	Replace the failing fan, which is indicated by a lit LED near the fan connector on the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

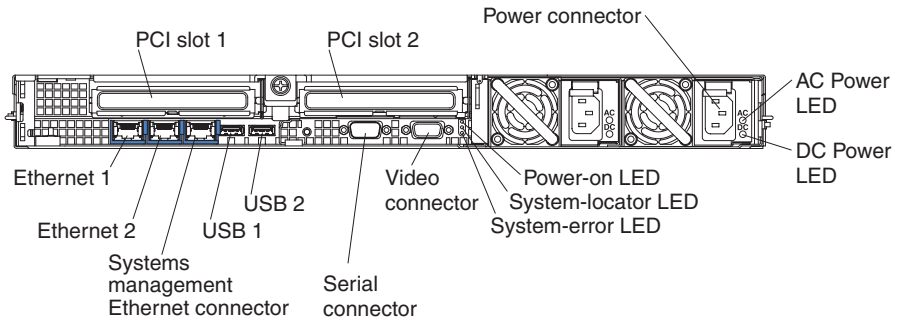
Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
TEMP	The system temperature has exceeded a threshold level.	• Determine whether a fan has failed. If it has, replace it. • Make sure that the room temperature is not too high. See "Features and specifications" on page 3 for temperature information. • Make sure that the air vents are not blocked.
RAID	A RAID controller error has occurred.	Check the system error log for information about the error. If an optional RAID controller is installed, see the documentation that comes with the RAID controller.
PCI	An error has occurred on a PCI bus or on the system board. An additional LED will be lit next to a failing PCI slot.	• Check the LEDs at the PCI slots to identify the component that is causing the error. • Check that the PCI riser assemblies are seated correctly. • Check the system error log for information about the error. • If you cannot isolate the failing adapter through the LEDs and the information in the system error log, remove one adapter at a time from the failing PCI bus, and restart the server after each adapter is removed.

Power-supply LEDs

The following minimum configuration is required for the DC LED on the power supply to be lit:
- Power supply
- Power backplane
- Power cord

The following minimum configuration is required for the server to start:
- One microprocessor in microprocessor socket 1
- Two 512 MB DIMMs on the system board
- One power supply
- Power backplane
- Power cord
- Five cooling fans

The following illustration shows the locations of the power-supply LEDs.



The following table describes the problems that are indicated by various combinations of the power-supply LEDs and the power-on LED on the operator information panel and suggested actions to correct the detected problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Power-supply LEDs		Operator information panel power-on LED	Description	Action
AC	DC			
Off	Off	Off	No power to the server, or a problem with the ac power source.	1. Check the ac power to the server. 2. Make sure that the power cord is connected to a functioning power source. 3. Remove one power supply at a time.
Lit	Off	Off	DC source power problem.	1. Remove one power supply at a time. 2. View the system-error log (see "Error logs" on page 26).
Lit	Lit	Off	Standby power problem.	1. View the event log (see "Error logs" on page 26). 2. Remove one power supply at a time. 3. (Trained service technician only) Replace the power backplane.
Lit	Lit	Flashing	The power is good.	The server is not powered on. No action is necessary.
Lit	Lit	Lit	The power is good.	The server is powered on. No action is necessary.

Diagnostic programs, messages, and error codes

The diagnostic programs are the primary method of testing the major components of the server. As you run the diagnostic programs, text messages and error codes are displayed on the screen and are saved in the test log. A diagnostic text message or error code indicates that a problem has been detected; to determine what action you should take as a result of a message or error code, see the table in "Diagnostic error codes" on page 64.

Running the diagnostic programs

To run the diagnostic programs, complete the following steps:

1. Turn off the server and any peripheral devices.
2. Turn on all attached devices; then, turn on the server.
3. When the prompt `F2 for Diagnostics` appears, press F2.

   Note: To run the diagnostic programs, you must start the server with the highest level password that is set. That is, if an administrator password is set, you must enter the administrator password, not the user password, to run the diagnostic programs.
4. Type the applicable password; then, press Enter.
5. Select either **Extended** or **Basic** from the top of the screen.
6. From the diagnostic programs screen, select the test that you want to run, and follow the instructions on the screen.

You can press F1 while running the diagnostic programs to obtain help information. You also can press F1 from within a help screen to obtain online documentation from which you can select different categories. To exit from the help information and return to where you left off, press Esc.

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

The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the server.

If you run the diagnostic programs with no mouse attached to the server, you will not be able to navigate between test categories using the **Next Cat** and **Prev Cat** buttons. All other functions provided by mouse-selectable buttons are also available using the function keys.

You can test the USB keyboard by using the regular keyboard test. The regular mouse test can test a USB mouse. Also, you can run the USB interface test only if there are no USB devices attached.

You can view server configuration information (such as system configuration, memory contents, interrupt request (IRQ) use, direct memory access (DMA) use, device drivers, and so on) by selecting **Hardware Info** from the top of the screen.

When you are diagnosing hard disk drives, select **SCSI Attached Disks** for the most thorough test. Select **Fixed Disks** for any of the following situations:

- You want to run a faster test.
- The server contains RAID arrays.
- The server contains simple-swap SATA hard disk drives.

To determine what action you should take as a result of a diagnostic text message or error code, see the table in “Diagnostic error codes” on page 64.

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

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

Exception: If there are multiple error codes or diagnostics LEDs that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See “Microprocessor problems” on page 48 for information about diagnosing microprocessor problems.

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

Diagnostic text messages

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

Passed: The test was completed without any errors.

Failed: The test detected an error.

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

Not Applicable: You attempted to test a device that is not present in the server.

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

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

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

Viewing the test log

To view the test log when the tests are completed, select **Utility** from the top of the screen and then select **View Test Log**. The summary test log is displayed. To view the detailed test log, press the Tab key while viewing the summary log.

The test-log data is maintained only while you are running the diagnostic programs. When you exit from the diagnostic programs, the test log is cleared.

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

Notes:

1. To create and use a diskette, you must add an optional external diskette drive to the server before you turn it on.
2. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette can contain other data.

Diagnostic error codes

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

If the diagnostic programs generate error codes that are not listed in the table, make sure that the latest levels of BIOS, Remote Supervisor Adapter II SlimLine, and ServeRAID code are installed.

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

000 The server passed the test. Do not replace a CRU or FRU.

195 The Esc key was pressed to end the test. Do not replace a CRU or FRU.

197 This is a warning error, but it does not indicate a hardware failure; do not replace a CRU or FRU. Take the action that is indicated in the Action column but *do not replace a CRU or a FRU*. See the description of **Warning** in "Diagnostic text messages" on page 63 for more information.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
001-250-000	Failed microprocessor board ECC.	1. Check the system-error log and the BMC log for messages that indicate the cause of the error (see "Error logs" on page 26). 2. From the diagnostic programs, run Quick Memory Test All Banks (see "Running the diagnostic programs" on page 62). 3. From the diagnostic programs, run the ECC test again (see "Running the diagnostic programs" on page 62). 4. (Trained service technician only) Replace the system board.
001-xxx-000	Failed core tests.	(Trained service technician only) Replace the system board.
001-xxx-001	Failed core tests.	(Trained service technician only) Replace the system board.
001-292-000	Failed microprocessor board ECC.	Load BIOS code defaults and run the test again.
005-xxx-000	Failed video test.	1. Reseat the optional video adapter, if one is installed. 2. (Trained service technician only) Replace the system board.
011-xxx-000	Failed COM1 serial port test.	1. Check the loopback plug that is connected to the serial port. 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
011-xxx-001	Failed COM2 serial port test.	1. Check the loopback plug that is connected to the serial port. 2. (Trained service technician only) Replace the system board.
030-xxx-000	Failed internal SAS interface test.	(Trained service technician only) Replace the system board.
035-285-001	Adapter communication error.	1. Update the RAID controller firmware. 2. Reseat the RAID controller. 3. Replace the RAID controller.
035-286-001	Adapter CPU test error.	1. Update the RAID controller firmware. 2. Reseat the RAID controller. 3. Replace the RAID controller.
035-287-001	Adapter local RAM test error.	1. Update the RAID controller firmware. 2. Reseat the RAID controller. 3. Replace the RAID controller.
035-288-001	Adapter NVSRAM test error.	1. Update the RAID controller firmware. 2. Reseat the RAID controller. 3. Replace the RAID controller.
035-289-001	Adapter cache test error.	1. Update the RAID controller firmware. 2. Reseat the RAID controller. 3. Replace the RAID controller.
035-292-001	Adapter parameter set error.	1. Update the RAID controller firmware. 2. Reseat the RAID controller. 3. Replace the RAID controller.
035-230-001	Battery low.	Replace the battery module of the RAID controller.
035-231-001	Abnormal battery temperature.	Replace the battery module of the RAID controller.
035-230-001	Battery status unknown.	Replace the battery module of the RAID controller.
035-xxx-snn	Failed hard disk drive with ID nn on RAID adapter in slot s.	1. Check the system-error log and replace any indicated failing devices. 2. Reseat the disk with ID nn on adapter in slot s. 3. Replace the disk with ID nn on adapter in slot s.
035-xxx-099	No adapters were found.	If an adapter is installed: 1. Reseat the adapter. 2. Check the adapter cables to be sure they are secure.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
035-xxx-s99	Failed RAID test: s = number of failing adapter slot.	1. Check the system-error log and replace any indicated failing devices. 2. Reseat the following components, one at a time, in the order shown, restarting the server each time: a. RAID adapter in slot s b. Cable for the RAID adapter in slot s c. Riser card 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. RAID adapter in slot s b. Cable for the RAID adapter in slot s c. Riser card d. (Trained service technician only) System board
035-253-s99	RAID adapter initialization failure.	1. Reseat the following components, one at a time, in the order shown, restarting the server each time: a. ServeRAID adapter b. Hot-swap hard disk drive backplane cable 2. Replace the components listed in step 1 one at a time, in the order shown, restarting the server each time.
089-xxx-00n	Failed microprocessor test.	1. Make sure that the BIOS code is at the latest level. 2. Trained service technician only: a. Reseat microprocessor 1 (if n = 0 or 1) or microprocessor 2 (if n = 2 or 3). b. Replace microprocessor 1 (if n = 0 or 1) or microprocessor 2 (if n = 2 or 3).
165-060-000	Service Processor: ASM may be busy.	1. Rerun the diagnostic test. 2. Fix other error conditions that may be keeping the ASM busy. Refer to the error log and diagnostic panel. 3. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 4. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
165-198-000	Service Processor: Aborted.	1. Rerun the diagnostic test. 2. Fix other error conditions that may be keeping ASM busy. Refer to the error log and diagnostic panel. 3. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 4. (Trained service technician only) Replace the system board.
165-201-000	Service Processor: Failed.	1. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 2. (Trained service technician only) Replace the system board.
165-330-000	Service Processor: Failed.	Update to the latest ROM diagnostic level and retry.
165-342-000	Service Processor: Failed.	1. Ensure that the latest firmware levels for ASM and BIOS are installed. 2. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 3. (Trained service technician only) Replace the system board.
165-051-000	System Management: Failed. (Unable to communicate with RSA. It may be busy. Run the test again.)	1. Update to the latest levels of firmware (BIOS, service processor, diagnostics). 2. Rerun the diagnostic test. 3. Correct other error conditions (including failed system management tests and items logged in Remote Supervisor Adapter II SlimLine system-error log and BMC log) and retry. 4. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 5. Reseat the remote Supervisor Adapter II SlimLine. 6. Replace the remote Supervisor Adapter II SlimLine.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-060-000	System Management: Failed. (Unable to communicate with RSA. It may be busy. Run the test again.)	1. Flash the latest levels of the firmware (BIOS, service processor, diagnostics). 2. Rerun the diagnostic test. 3. Correct other error conditions (including failed system management tests and items logged in Remote Supervisor Adapter II SlimLine system-error log and BMC log) and retry. 4. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 5. Reseat the remote Supervisor Adapter II SlimLine. 6. Replace the remote Supervisor Adapter II SlimLine.
166-070-000	System Management: Failed. (Unable to communicate with RSA. It may be busy. Run the test again.)	1. Flash the latest levels of the firmware (BIOS, service processor, diagnostics). 2. Rerun the diagnostic test. 3. Correct other error conditions (including failed system management tests and items logged in Remote Supervisor Adapter II SlimLine system-error log and BMC log) and retry. 4. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 5. Reseat the remote Supervisor Adapter II SlimLine. 6. Replace the remote Supervisor Adapter II SlimLine.
166-198-000	System Management: Aborted. (Unable to communicate with RSA. It may be busy. Run the test again.)	1. Run the diagnostic test again. 2. Correct other error conditions and retry. These include other failed system management tests and items logged in the system-error log of the optional Remote Supervisor Adapter II SlimLine. 3. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 4. Remote Supervisor Adapter II SlimLine, if installed. 5. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-201-001	System Management: Failed (I2C bus error(s). See SERVPROC and DIAGS entries in the event log.)	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. Remote Supervisor II SlimLine (if installed). 2. DIMMs. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Remote Supervisor II SlimLine (if installed). 2. DIMMs. 3. (Trained service technician only) System board.
166-201-002	System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. I2C cable between the operator information panel and the system board ("System-board internal connectors" on page 10). 2. Operator information panel. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. I2C cable between the operator information panel and the system board ("System-board internal connectors" on page 10). 2. Operator information panel. 3. (Trained service technician only) System board.
166-201-003	System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. Power backplane. 2. Power supply. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Power backplane. 2. Power supply. 3. (Trained service technician only) System board.
166-201-004	System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	Reseat the SAS backplane. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. SAS backplane. 2. (Trained service technician only) System board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-201-005	System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. DIMMs. 2. (Trained service technician only) Microprocessors. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. DIMMs. 2. Microprocessors. 3. (Trained service technician only) System board.
166-250-000	System Management: Failed (I2C cable is disconnected. Reconnect I2C cable between RSA and system board.)	1. Reseat the Remote Supervisor Adapter II SlimLine. 2. Replace the Remote Supervisor Adapter II SlimLine. 3. (Trained service technician only) Replace the system board.
166-260-000	System Management: Failed (Restart RSA Error. After restarting, RSA communication was lost. Unplug and cold boot to reset RSA.)	1. Disconnect all the option and power cords from the server, wait 30 seconds, reconnect, and retry. 2. Reseat the Remote Supervisor Adapter II SlimLine. 3. Replace the Remote Supervisor Adapter II SlimLine.
166-342-000	System Management: Failed (RSA adapter BIST indicate failed tests.)	1. Ensure the latest firmware levels for the Remote Supervisor Adapter II SlimLine and BIOS are installed. 2. Disconnect all the option and power cords from the server, wait 30 seconds, reconnect, and retry. 3. Reseat the Remote Supervisor Adapter II SlimLine. 4. Replace the Remote Supervisor Adapter II SlimLine.
166-400-000	System Management: Failed (BMC self test result failed tests: *x* where *x* = Flash, RAM, or ROM.)	1. Reflash or update the firmware for the BMC. 2. (Trained service technician only) Replace the system board.
166-404-001	System Management: Failed (BMC indicates failure in I2C bus test.)	1. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 2. Reflash or update the firmware for the BMC. 3. Reseat the power backplane 4. Replace the power backplane. 5. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-406-001	System Management: Failed (BMC indicates failure in I2C bus test.)	1. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 2. Reflash or update the firmware for the BMC. 3. Reseat the SAS backplane and the SAS backplane cable. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. SAS backplane 2. SAS backplane cable 3. (Trained service technician only) System board.
166-407-001	System Management: Failed (BMC indicates failure in I2C bus test.)	1. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 2. Reflash or update the firmware for the BMC. 3. Operator information panel cable. 4. Operator information panel. 5. (Trained service technician only) Replace the system board.
166-NNN-001	System Management: Failed (BMC indicates failure in self test where NNN=300 to 320.)	1. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 2. Reflash or update the firmware for the BMC. 3. (Trained service technician only) Replace the system board.
166-NNN-001	System Management: Failed (BMC indicates failure in I2C bus test where NNN=400 to 420 (excluding 412, 414, and 415).)	1. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 2. Reflash or update the firmware for the BMC. 3. (Trained service technician only) Replace the system board.
180-197-000	SAS ASPI driver not installed.	Ignore this message if the server is a SATA system. This test is not supported for SATA drives. 1. Update the SAS configuration parameters (see "Configuring hot-swap SAS or hot-swap SATA RAID" on page 152). 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
180-197-000	Hard disk drive backplane not found .	Ignore this message if the server is a SATA system. This test is not supported for SATA drives. Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. SAS backplane. 2. SAS backplane cable. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. SAS backplane. 2. SAS backplane cable. 3. (Trained service technician only) System board.
180-198-000	Test aborted.	Review the error log for the failure condition that caused the test to abort.
180-358-000	Ethernet failure.	1. Enable Ethernet with the Configuration/Setup Utility program (see "Using the Configuration/Setup Utility program" on page 151). 2. Update the Ethernet firmware (see "Updating the firmware" on page 149). 3. (Trained service technician only) Replace the system board.
180-361-003	Failed fan LED test.	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. Fan cable. 2. Fan. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Fan cable. 2. Fan. 3. (Trained service technician only) System board.
180-xxx-000	Diagnostics LED failure.	Run the diagnostics panel LED test for the failing LED.
180-xxx-001	Failed front LED panel test.	Reseat the operator information card cable connection on the system board. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Operator information card. 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
180-xxx-002	Failed diagnostics LED panel test.	Trained service technician only: 1. Disconnect the server power cords and reseat the operator information panel cable. Restart the server. 2. Replace the operator information panel.
180-xxx-003	Failed system board LED test.	(Trained service technician only) Replace the system board.
180-xxx-005	Failed SAS backplane LED test.	Reseat the following components, one at a time, in the order shown, restarting the server each time: 1. SAS backplane. 2. SAS backplane cable. Replace the following components, one at a time, in the order shown, restarting the server each time: 1. SAS backplane. 2. SAS backplane cable. 3. (Trained service technician only) System board.
201-xxx-0nn	Failed memory test. **Note:** n = slot number of failing DIMM.	Replace the following components one at a time, in the order shown, restarting the server each time: 1. DIMM identified by nn. 2. (Trained service technician only) System board.
201-xxx-n99	Multiple DIMM failure. **Note:** n = bank number of failing pair.	1. See the error text to identify the failing DIMMs. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs in bank n. b. (Trained service technician only) System board.
202-xxx-00n	Failed system cache test.	1. Trained service technician only: a. Reseat microprocessor 1 (if n = 0 or 1) or microprocessor 2 (if n = 2 or 3). b. Replace microprocessor 1 (if n = 0 or 1) or microprocessor 2 (if n = 2 or 3). c. Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
215-xxx-000	Failed CD or DVD test.	1. Run the test again with a different CD or DVD. 2. Reseat the following components: a. CD-RW/DVD drive b. CD-RW/DVD drive cable c. (Trained service technician only) operator information panel assembly 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. CD-RW/DVD drive cable b. CD-RW/DVD drive
217-198-xxx	Could not establish drive parameters.	1. Reseat the hard disk drive cables. 2. Reseat the hard disk drive. 3. Replace the following components in the order shown, restarting the server each time: a. Hard disk drive b. Hard disk drive cable c. (Hot-swap models) RAID controller d. Hard disk drive backplane or backplate
217-xxx-000	Failed fixed disk test.	1. Reseat the hard disk drive 1 cables. 2. Reseat hard disk drive 1. 3. Replace hard disk drive 1.
217-xxx-001	Failed fixed disk test.	1. Reseat the hard disk drive 2 cables. 2. Reseat hard disk drive 2. 3. Replace hard disk drive 2.
217-xxx-002	Failed fixed disk test.	1. Reseat the hard disk drive 3 cables. 2. Reseat hard disk drive 3. 3. Replace hard disk drive 3.
217-xxx-003	Failed fixed disk test.	1. Reseat the hard disk drive 4 cables. 2. Reseat hard disk drive 4. 3. Replace hard disk drive 4.
301-xxx-000	Failed keyboard test.	1. Reseat the keyboard cable. 2. Replace the following components one at a time, in the order shown, restarting the server each time: a. Keyboard b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
405-xxx-000	Failed Ethernet test on controller on the system board.	1. Verify that Ethernet is not disabled in BIOS. 2. (Trained service technician only) Replace the system board.
405-xxx-00n	Failed Ethernet test on adapter in PCI slot *n*.	Reseat the adapter in PCI slot *n*. Replace the following components one at a time, in the order shown, restarting the server each time: 1. Adapter in PCI slot *n* 2. (Trained service technician only) System board
405-xxx-a0n	Failed Ethernet test on adapter in PCI slot *a*.	1. For *a* = 0, (trained service technician only) replace the system board. 2. For *a* > 0, a. Reseat the adapter in PCI slot *a*. b. Replace the adapter in PCI slot *a*.

Recovering the BIOS code

If the BIOS code has become damaged, such as from a power failure during an update, you can recover the BIOS code using the boot block jumper and a BIOS recovery diskette.

Notes:

1. You can obtain a BIOS recovery diskette from one of the following sources:
   - Download the BIOS code update from the World Wide Web and use it to make a recovery diskette.
   - Contact your IBM service representative.
2. To create and use a diskette, you must add an optional external diskette drive to the server.

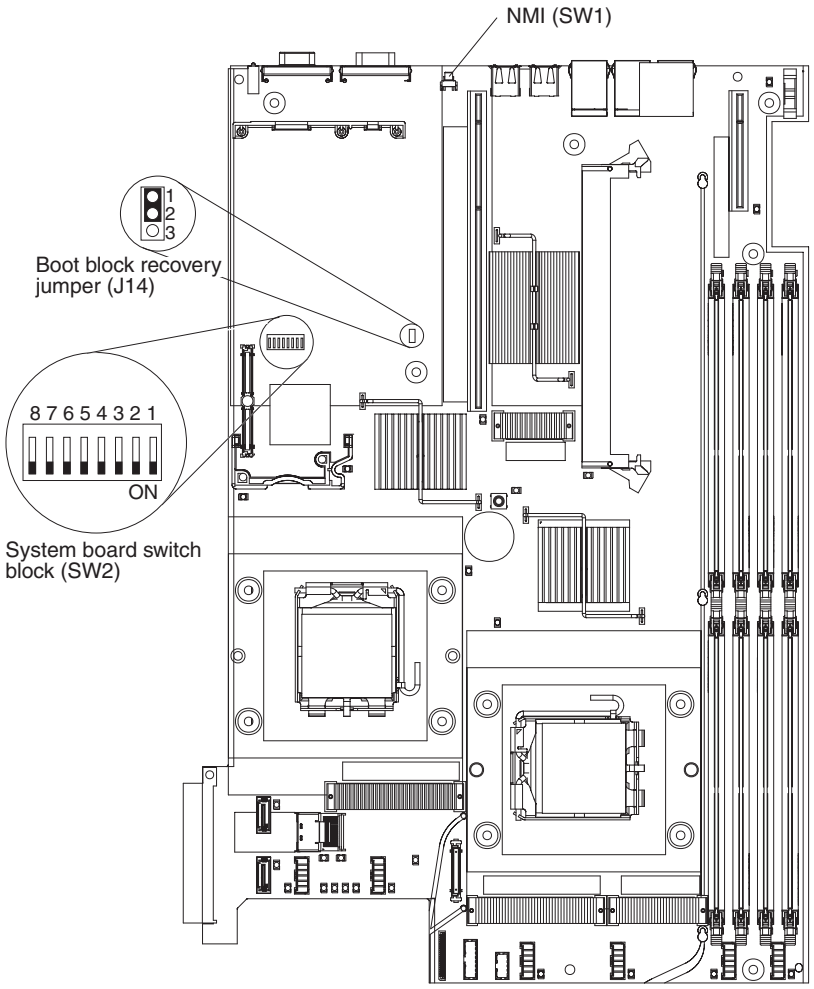
To download the BIOS code update from the World Wide Web, complete the following steps:

1. Go to http://www.ibm.com/support.
2. In the **Search technical support** box, enter **x3550 bios**
3. Download the latest BIOS code update.
4. Create the BIOS recovery diskette, following the instructions that come with the update file that you downloaded.

The flash memory of the server consists of a primary page and a backup page. The backup page is a protected area that cannot be overwritten. The recovery boot block is a section of code in this protected area that enables the server to start up and to read a recovery diskette. The recovery utility recovers the system BIOS code from the BIOS recovery files on the diskette.

To recover the BIOS code and restore the server operation to the primary page, complete the following steps:

1. Turn off the server, and disconnect all power cords and external cables.
2. Remove the server cover. See “Removing the cover” on page 98 for more information.
3. Locate the boot block recovery jumper block (J14) on the system board.



4. Move the jumper from pins 1 and 2 to pins 2 and 3 to enable the BIOS recovery mode.
5. Connect an external USB diskette drive to the server and insert the BIOS recovery diskette.
6. Reinstall the server cover; then, reconnect all power cords.
7. Restart the server. The system begins the power-on self test (POST).
8. Select **1 - Update POST/BIOS** from the menu that contains various flash update options.
9. When prompted as to whether you want to save the current code to a diskette, press **N**.
10. When prompted to choose a language, select a language (from 0 to 7), and press **Enter** to accept your choice.
11. Remove the BIOS recovery diskette from the diskette drive.
12. Turn off the server, and disconnect all power cords and external cables; then, remove the server cover.
13. Remove the jumper from the boot block recovery jumper block, or move it to pins 1 and 2, to return to normal startup mode.
14. Reconnect all external cables and power cords, and turn on the peripheral devices; then, reinstall the server cover.
15. Restart the server. The server starts up normally.

System-error log messages

A system-error log is generated only if a Remote Supervisor Adapter II SlimLine is installed. The system-error log can contain messages of three types:

Message Messages do not require action; they record significant system-level events, such as when the server is started.

Warning Warning messages do not require immediate action; they indicate possible problems, such as when the recommended maximum ambient temperature is exceeded.

Error Error messages might require action; they indicate system errors, such as when a fan is not detected.

Each message contains date and time information, and it indicates the source of the message (POST/BIOS or the BMC service processor).

Note: The BMC log, which you can view through the Configuration/Setup Utility program, also contains many information, warning, and error messages.

In the following example, the system-error log message indicates that the server was turned on at the recorded time.

```
- - - - - - - - - - - - - - - - - - - - - - - - -
   Date/Time: 2002/05/07 15:52:03
   DMI Type:
   Source: SERVPROC
   Error Code: System Complex Powered Up
   Error Code:
   Error Data:
   Error Data:
 - - - - - - - - - - - - - - - - - - - - - - - - -
```

The following table describes the possible system-error log messages and suggested actions to correct the detected problems.

Note: These actions have the following meaning:

Reseat the power supply

Complete the following steps:

1. Remove the power supply from the server.
2. Check the power supply for damage and for damaged connectors.
3. Install the power supply in the server (see “Installing a power supply” on page 121).

Reseat the microprocessor

Complete the following steps:

1. Remove the heatsink and the microprocessor from the server using a vacuum tool (see “Removing a microprocessor” on page 137).
2. Visually inspect the microprocessor and the microprocessor socket for damage.
3. Reinstall the microprocessor and the heatsink in the server, taking special care that the layer of thermal grease is intact (see “Installing a microprocessor” on page 138).

   Attention: If the layer of thermal grease is disturbed, the microprocessor could overheat and be damaged.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
+12v critical over voltage fault	1. If the OVER SPEC LED on the light path diagnostics panel is lit, or any of the four power channel error LEDs (A, B, C, or D) on the system board are lit, see the entries about power-channel error LEDs in "Power problems" on page 52. (See "System-board LEDs" on page 15 for the location of the power channel error LEDs.) 2. If the actions in "Power problems" on page 52 do not identify a defective component, complete the following steps: a. Remove the power supplies. Replace the power supplies one at a time, restarting the server each time, to isolate a failing power supply. b. If the server fails to start, (trained service technician only) replace the power backplane. Restart the server. c. If the server fails to start, (trained service technician only) replace the system board.
+12v critical under voltage fault	1. If the OVER SPEC LED on the light path diagnostics panel is lit, or any of the four power channel error LEDs (A, B, C, or D) on the system board are lit, see the entries about power-channel error LEDs in "Power problems" on page 52. (See "System-board LEDs" on page 15 for the location of the power channel error LEDs.) 2. If the actions in "Power problems" on page 52 do not identify a defective component, complete the following steps: a. Remove the power supplies. Replace the power supplies one at a time, restarting the server each time, to isolate a failing power supply. b. If the server fails to start, (trained service technician only) replace the power backplane. Restart the server. c. If the server fails to start, (trained service technician only) replace the system board.
12v planar fault	1. If the OVER SPEC LED on the light path diagnostics panel is lit, or any of the four power channel error LEDs (A, B, C, or D) on the system board are lit, see the entries about power-channel error LEDs in "Power problems" on page 52. (See "System-board LEDs" on page 15 for the location of the power channel error LEDs.) 2. If the actions in "Power problems" on page 52 do not identify a defective component, complete the following steps: a. Remove the power supplies. Replace the power supplies one at a time, restarting the server each time, to isolate a failing power supply. b. If the server fails to start, (trained service technician only) replace the power backplane. Restart the server. c. If the server fails to start, (trained service technician only) replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
+5v critical over voltage fault	1. Remove the following devices, which are powered by 5 volts: • All PCI adapters • USB devices • CD-RW/DVD drive • (Trained service technician only) Hard disk drive backplane 2. Reinstall each I/O device removed in step 1, one at a time, restarting the server each time, to isolate a defective device. Replace any defective device. 3. If the error continues, (trained service technician only) replace the power backplane. Restart the server. 4. If the error continues, (trained service technician only) replace the system board.
+5v critical under voltage fault	1. Remove the following devices, which are powered by 5 volts: • All PCI adapters • USB devices • CD-RW/DVD drive • (Trained service technician only) Hard disk drive backplane 2. Reinstall each I/O device removed in step 1, one at a time, restarting the server each time, to isolate a defective device. Replace any defective device. 3. If the error continues, (trained service technician only) replace the power backplane. Restart the server. 4. If the error continues, (trained service technician only) replace the system board.
5V fault	1. Remove the following devices, which are powered by 5 volts: • All PCI adapters • USB devices • CD-RW/DVD drive • (Trained service technician only) Hard disk drive backplane 2. Reinstall each I/O device removed in step 1, one at a time, restarting the server each time, to isolate a defective device. Replace any defective device. 3. If the error continues, replace the power backplane. Restart the server. 4. If the error continues, (trained service technician only) replace the system board.
+2.5v critical over voltage fault	Information only
+2.5v critical under voltage fault	Information only
+1.8v critical over voltage fault	Information only
+1.8v critical under voltage fault	Information only
The system real time clock battery is no longer reliable.	Replace the battery.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
+3.3v critical over voltage fault	1. Remove all PCI adapters. 2. Reinstall each PCI adapter, one at a time, restarting the server each time, to isolate a defective adapter. Replace any defective adapter. 3. If the error continues, (trained service technician only) replace the system board.
+3.3v critical under voltage fault	1. Remove all PCI adapters. 2. Reinstall each PCI adapter, one at a time, restarting the server each time, to isolate a defective adapter. Replace any defective adapter. 3. If the error continues, (trained service technician only) replace the system board.
3.3V Bus Fault	1. Remove all PCI adapters. 2. Reinstall each PCI adapter, one at a time, restarting the server each time, to isolate a defective adapter. Replace any defective adapter. 3. If the error continues, (trained service technician only) replace the system board.
Power Good Fault	1. Reseat the power supplies. 2. If the error continues, (trained service technician only) replace the power backplane.
VRM 1 Power Good Fault	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace microprocessor 1. 3. (Trained service technician only) Replace the system board.
VRM 2 Power Good Fault	1. (Trained service technician only) Reseat microprocessor 2. 2. (Trained service technician only) Replace microprocessor 2. 3. (Trained service technician only) Replace the system board.
Memory Area non-critical over temperature warning	1. Make sure that the fans are operating and are not obstructed. 2. Make sure that the air baffles are in place and correctly installed. 3. Make sure that the server cover is installed and fully closed.
Memory Area non-recoverable over temperature fault	1. Make sure that the fans are operating and are not obstructed. 2. Make sure that the air baffles are in place and correctly installed. 3. Make sure that the server cover is installed and fully closed. 4. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
Fan *n* Failure *n* = the fan number	1. Make sure that the connector on the fan is not damaged. 2. Make sure that the fan connector on the system board is not damaged. 3. Make sure that the fan is fully installed (press down on the fan). 4. Reseat fan *n*. 5. Replace fan *n*.
Fan *n* Fault *n* = the fan number	1. Make sure that the connector on the fan is not damaged. 2. Make sure that the fan connector on the system board is not damaged. 3. Make sure that the fan is fully installed (press down on the fan). 4. Reseat fan *n*. 5. Replace fan *n*.
Hard Drive *n* Fault *n* = the hard disk drive number	1. Reseat hard disk drive *n*. 2. Replace hard disk drive *n*.
Hard drive *n* removal detected. *n* = the hard disk drive number	Reseat hard disk drive *n*.
Power supply *n* removed *n* = the power supply number	1. Reseat power supply *n*. 2. Replace power supply *n*. 3. Replace the power backplane.
Power supply *n* fault *n* = the power supply number	1. If the server power-on LED is lit, perform the following steps: a. Reduce the server to the minimum configuration (see "Power-supply LEDs" on page 60). b. Reinstall the components you removed, one at a time, restarting the server each time. c. If the error reoccurs, the component you just reinstalled is defective; replace the defective component. 2. Reseat the following components: a. Power supply *n* b. (Trained service technician only) power backplane 3. Replace the components listed in step 2, one at a time, in the order shown, restarting the server each time.
Power supply *n* AC power removed *n* = the power supply number	1. Make sure that the power cords are correctly connected to the server and to a working electrical outlet. 2. (Trained service technician only) replace the power supply *n*. 3. (Trained service technician only) replace the power backplane.
Power supply *n* fan fault *n* = the power supply number	1. Make sure that there are no obstructions, such as bundled cables, to the airflow on the power-supply fan. 2. Replace power supply *n*.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
Power supply current exceeded max spec value	1. Make sure that two power supplies are installed, and that the ac power cords are correctly connected to the power supplies and to a working electrical outlet. 2. (Trained service technician only) replace the power backplane.
Front panel NMI	1. If the MEM LED on the light path diagnostics panel is lit, complete the following steps: a. Check the other system logs for related entries and actions. b. Reinstall the server device drivers. c. Reinstall the operating system. 2. If the error LED for PCI slot 1 or PCI slot 2 is lit, complete the following steps: a. Remove the adapter from the PCI slot that has the lit error LED. b. If the error continues, replace the riser-card assembly that has the error LED lit. c. (Trained service technician only) If the error continues, replace the system board. 3. Remove all PCI adapters from the server. (Trained service technician only) If the error continues, replace the system board.
Software NMI	Information only
CPU *n* IERR detected, the system has been restarted *n* = the microprocessor number	1. Make sure that you have installed the latest levels of firmware and device drivers for all adapters and standard devices, such as Ethernet, SCSI, or SAS. 2. Run the diagnostics programs for the hard disk drives and other I/O devices. 3. (Trained service technician only) Replace microprocessor *n*.
CPU *n* IERR, the CPU has been disabled *n* = the microprocessor number	1. (Trained service technician only) Reseat microprocessor *n*. 2. (Trained service technician only) Replace microprocessor *n*. 3. (Trained service technician only) Replace the system board.
CPU *n* over temperature *n* = the microprocessor number	1. Make sure that the fans are operating, that there are no obstructions to the airflow, that the air baffles are in place and correctly installed, and that the server cover is installed and completely closed. 2. (Trained service technician only) Make sure that the heat sink for microprocessor *n* is installed correctly. 3. (Trained service technician only) Replace microprocessor *n*.
CPU *n* removal detected *n* = the microprocessor number	(Trained service technician only) Reseat microprocessor *n* if it is installed.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, Type 7978 and 1913 server," on page 89 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
CPU *n* non-critical over temperature warning *n* = the microprocessor number	1. Make sure that the fans are operating, that there are no obstructions to the airflow, that the air baffles are in place and correctly installed, and that the server cover is installed and completely closed. 2. (Trained service technician only) Make sure that the heat sink for microprocessor *n* is installed correctly.
CPU *n* non-recoverable over temperature fault	1. Make sure that the fans are operating, that there are no obstructions to the airflow, that the air baffles are in place and correctly installed, and that the server cover is installed and completely closed. 2. (Trained service technician only) Make sure that the heat sink for microprocessor *n* is installed correctly. 3. (Trained service technician only) Replace microprocessor *n* 4. (Trained service technician only) Replace the system board.
VRD 1 critical over voltage fault	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the system board.
VRD 1 critical under voltage fault	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the system board.
VRD 2 critical over voltage fault	1. (Trained service technician only) Reseat microprocessor 2. 2. (Trained service technician only) Replace the system board.
VRD 2 critical under voltage fault	1. (Trained service technician only) Reseat microprocessor 2. 2. (Trained service technician only) Replace the system board.
Microprocessor VTT Power Fault.	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the system board.

Solving power problems

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

1. Turn off the server and disconnect all ac power cords.
2. Check the power-fault LEDs on the system board. See ("Power problems" on page 52).
3. Check for loose cables in the power subsystem. Also check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.
4. Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimum configuration that is required for the server to start (see "Solving undetermined problems" on page 86 for the minimum configuration).

5. Reconnect all ac power cords and turn on the server. If the server starts successfully, reseat the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimum configuration (see “Power-supply LEDs” on page 60), replace the components in the minimum configuration one at a time until the problem is isolated.

Solving Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Try the following procedures:

- Make sure that the correct device drivers, which come with the server are installed and that they are at the latest level.
- Make sure that the Ethernet cable is installed correctly.
  - The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
  - If you set the Ethernet controller to operate at 100 Mbps, you must use Category 5 cabling.
  - If you directly connect two servers (without a hub), or if you are not using a hub with X ports, use a crossover cable. To determine whether a hub has an X port, check the port label. If the label contains an X, the hub has an X port.
- Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the Ethernet controller LEDs on the rear panel of the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.
  - The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
  - The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity light is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Check the LAN activity LED on the rear of the server. The LAN activity LED is lit when data is active on the Ethernet network. If the LAN activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Check for operating-system-specific causes of the problem.
- Make sure that the device drivers on the client and server are using the same protocol.

If the Ethernet controller still cannot connect to the network but the hardware appears to be working, the network administrator must investigate other possible causes of the error.

Solving undetermined problems

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

If you suspect that a software problem is causing failures (continuous or intermittent), see “Software problems” on page 55.

Damaged data in CMOS memory or damaged BIOS code can cause undetermined problems. To reset the CMOS data, use the CMOS jumper to clear the CMOS memory and override the power-on password; see “System-board switches and jumpers” on page 11. If you suspect that the BIOS code is damaged, see “Recovering the BIOS code” on page 76.

Check the LEDs on all of the power supplies, see “Power-supply LEDs” on page 60. If the LEDs indicate that the power supplies are working correctly, complete the following steps:

1. Turn off the server.
2. Check all connections and cables.
3. Make sure that the server is cabled correctly.
4. Check all internal and external devices for compatibility.
5. Remove or disconnect the following devices, one at a time, until you find the failure. Turn on the server and reconfigure it each time.
   - Any external devices.
   - Surge-suppressor device (on the server).
   - Printer, mouse, and non-IBM devices.
   - Each adapter.
   - Hard disk drives.
   - Memory modules. The minimum configuration requirement is 1 GB (two 512 MB DIMMs in DIMM slots 1 and 3).
6. Turn on the server.

If the problem is solved when you remove an adapter from the server but the problem recurs when you reinstall the same adapter, suspect the adapter; if the problem recurs when you replace the adapter with a different one, suspect the riser card.

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

Problem determination tips

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

- Machine type and model
- Microprocessor or hard disk upgrades
- Failure symptom
  - Do diagnostics fail?
  - What, when, where, single, or multiple systems?
  - Is the failure repeatable?
  - Has this configuration ever worked?
  - If it has been working, what changes were made prior to it failing?

  - Is this the original reported failure?
- Diagnostics version
  - Type and version level
- Hardware configuration
  - Print (print screen) configuration currently in use
  - BIOS level
- Operating system software
  - Type and version level

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

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

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

Calling IBM for service

See Appendix A, “Getting help and technical assistance,” on page 159 for information about calling IBM for service.

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

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

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

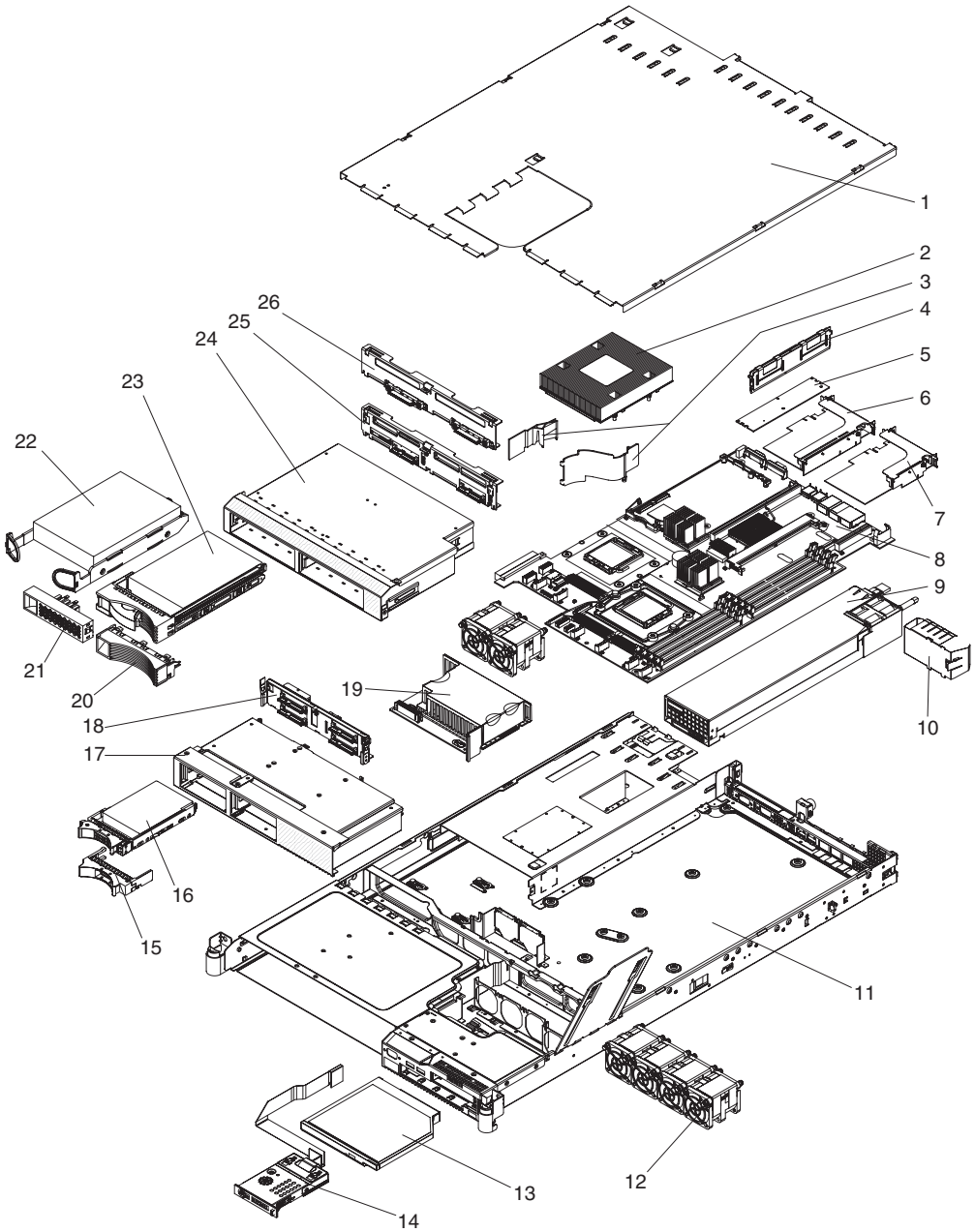
- Machine type and model

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

Chapter 3. Parts listing, Type 7978 and 1913 server

The following replaceable components are available for the System x3550 Type 7978 and 1913 servers. To check for an updated parts listing on the Web, complete the following steps:

1. Go to http://www.ibm.com/servers/eserver/support/xseries/index.html
2. Under Search technical support, type `x3550` and click **Search**.
3. Under **Document type**, select **Parts information** and click **Go**.



Replaceable server components

Replaceable components are of three types:

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

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

Table 4. Parts listing, Type 7978 and 1913

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
1	Top cover assembly	43W0609		
2	Heatsink assembly			39Y9423
3	Air baffles	39Y9420		
4	Memory, 512 MB PC2-5300 ECC (all except C1x)	39M5781		
4	Memory, 1 GB PC2-5300 ECC (model C1x)	39M5784		
4	Memory, 2 GB PC2-5300 ECC (optional)	39M5790		
4	Memory, 4 GB PC2-5300 ECC (optional)	39M5796		
5	ServeRAID 8k card with battery (all except 46x, G6x)	25R8079		
5	ServeRAID 8 k-l card (optional)	25R8076		
6	PCI-X riser card (optional)		39Y9545	
7	PCI Express riser card		32R2883	
8	Planar, SATA (models 22x, 32x, 42x, 46x, G6x)			42D3639
8	Planar, SATA (optional)			42D3805
8	Planar, SAS (models 21x, 31x, 3Ax, 41x, 45x, 4Ax, 4Sx, 51x, 5Ax, 61x, 6Ax, 71x, 7Ax, G5x)			42D3638
8	Planar, SAS (models A1x, C1x)			42D3804
9	Power supply, 670 W	39Y7189		
9	Power supply, -48 V (optional)	39Y7186		
10	Power supply filler panel	39Y9420		
11	Chassis assembly			39Y9522
12	Fan assembly unit (dual-fans)	26K8083		
13	CD-RW/DVD combo drive	39M3541		
14	Operator information panel assembly			43W0625
15	Hot-swap filler panel, 2.5-inch (model 4Sx)	26K8680		
16	Hard disk drive, 2.5-inch, HS	varies		
17	Hot-swap SAS hard disk drive cage, 2.5-inch (model 4Sx)		32R2822	

Table 4. Parts listing, Type 7978 and 1913 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
18	Hot-swap SAS hard disk drive backplane, 2.5-inch (model 4Sx)		39Y9541	
19	Power backplane		39Y6972	
20	Hot-swap filler panel, 3.5-inch (models 45x, A1x, C1x, G5x)	39M4375		
21	Simple-swap filler panel, 3.5-inch (models 46x, G6x	23K4990		
22	Hard disk drive, 3.5-inch SATA	varies		
23	Hard disk drive, 3.5-inch SAS, HS	varies		
24	Simple-swap SATA disk drive cage, 3.5-inch (models 46x, G6x)		32R2823	
24	Hot-swap SAS disk drive cage, 3.5-inch (models 45x, A1x, C1x, G5x)		32R2821	
25	Backplane SAS (models 45x, A1x, C1x, G5x)		39M4349	
26	Power cable, SATA, with backplate (models 46x, G6x)	26K8060		
	Microprocessor, 1.6 GHz with heatsink (models 21x, 22x)			42C4231
	Microprocessor, 1.6 GHz with heatsink (model A1x)			42D3803
	Microprocessor, 1.86 GHz with heatsink (models 31x, 32x, 3Ax)			42C4230
	Microprocessor, 1.86 GHz with heatsink (model C1x)			42D3799
	Microprocessor, 2.0 GHz with heatsink (models 41x, 42x, 4Ax)			42C4229
	Microprocessor, 3.7 GHz with heatsink (models 45x, 46x, 4Sx)			42C3998
	Microprocessor, 2.33 GHz with heatsink (models 51x, 5Ax)			42C4228
	Microprocessor, 2.33 GHz with heatsink (optional)			42D3771
	Microprocessor, 2.66 GHz with heatsink (models 61x, 6Ax)			42C4227
	Microprocessor, 3.0 GHz with heatsink (models 71x, 7Ax)			42C4226
	Microprocessor, 3.0 GHz with heatsink (models G5x, G6x)			42C4001
	Rack latch assembly, EIA		26K8080	
	Media bezel assembly		39Y9507	
	Cable, signal, SAS HDD (models 45x, 4Sx, A1x, C1x, G5x)		42C2376	
	Cable, power, SAS (models 45x, 4Sx, G5x)		26K8068	
	Cable, front panel USB		26K8058	
	Cable, 6 inch video (optional)	39Y9493		
	Cable, 6 inch serial (optional)	39Y9495		
	Cable, -48 V power supply (optional)	43W0619		
	Power cable, rack	39M5377		
	Power cord, AC	39M5081		
	Y power cord, AC (optional)		39M5450	
	CD-RW/DVD blank filler (optional)	26K8938		
	CD-RW/DVD drive interposer card		42C3983	

Table 4. Parts listing, Type 7978 and 1913 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
	Heat-sink assembly			39Y9423
	Cable management arm assembly, 1U	39Y9530		
	Slides and hardware		52P8517	
	Slide kit		39Y9510	
	Battery pack, ServeRAID 8 k, 3.0 volt (optional)	25R8088		
	Battery, system board, 3.0 V	33F8354		
	Service label, system (models 45x, 4Sx, A1x, C1x, G5x)	43W0610		
	Service label, 3.5-inch SATA (model 46x, G6x)	32R2820		
	Service label, right fan door	39Y9418		
	Handi-vac CPU removal tool	26K7189		

Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda

IBM power cord part number	Used in these countries and regions
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

Chapter 4. Removing and replacing server components

Replaceable components are of three types:

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

See Chapter 3, “Parts listing, Type 7978 and 1913 server,” on page 89 to determine whether a component is a Tier 1 CRU, Tier 2 CRU, or FRU.

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

Installation guidelines

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

- Read the safety information that begins on page “Safety” on page vii and the guidelines in “Handling static-sensitive devices” on page 96. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace hot-plug Universal Serial Bus (USB) devices.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific

hot-swap component for any additional procedures that you might have to perform before you remove or install the component.

- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported options for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

To help ensure proper 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 server to allow the server cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.
- You have kept the preinstalled air deflector in place unless directed to remove it in this publication or by IBM Service. See “Removing the air baffle” on page 99 for the location of the air deflector in the server.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

You might have to have the server turned on while the cover is off, to look at light path diagnostics LEDs or replace hot swap components. Follow these guidelines when you work inside a server that is turned on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

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

To reduce the possibility of 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. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.
- 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 on the outside of the server 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 server 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 server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Returning a device or component

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

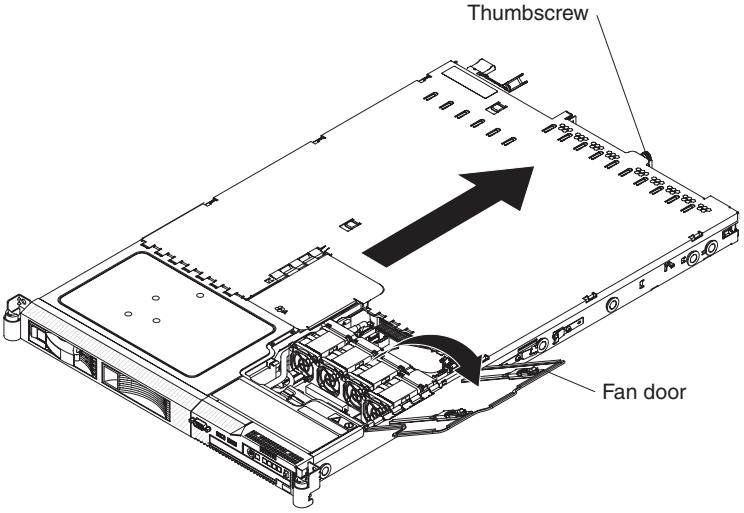
Removing and replacing Tier 1 CRUs

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

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

Removing the cover

To remove the server cover, complete the following steps.



Attention: Never remove the server cover with power applied.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Loosen the thumbscrew that secures the cover at the rear of the server.
3. Extend the server from the rack:
   a. Press the two release latches at the front right and front left of the server.
   b. Pull the server out until it stops.
4. Open the fan door. To open the fan door, slide the two latches to the right, and raise the door panel.
5. Remove the server cover:
   a. Slide the cover slightly toward the rear of the server until it comes free. Make sure that the cover tabs all slide away from the insets that are on the front, rear, and sides of the server.
   b. Lift the cover off the server and set the cover aside.

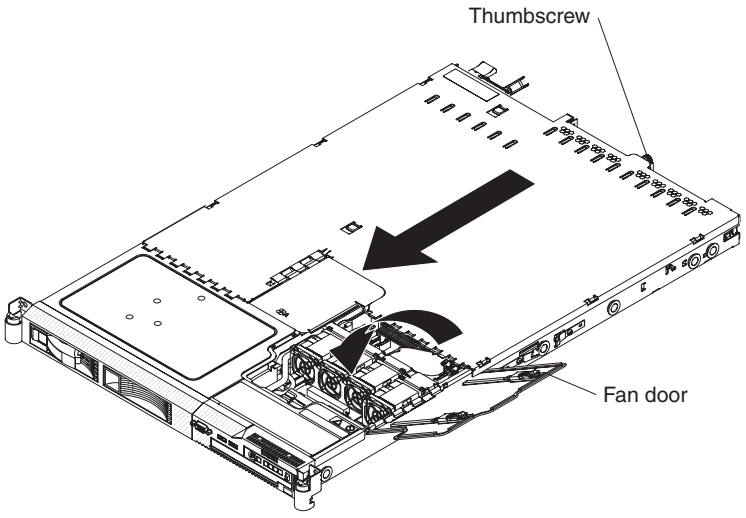
Installing the cover

To install the server cover, complete the following steps:

1. Position the internal cables so that they do not interfere with the cover installation.

   Important: Before sliding the cover forward, make sure that all the tabs on both the front, rear, and side of the cover engage the chassis correctly. If all the tabs do not engage the chassis correctly, it will be very difficult to remove the cover later.
2. Position the cover on top of the server and open the fan door.

3. Tighten the thumbscrew until the cover correctly engages all the inset tabs on the server.

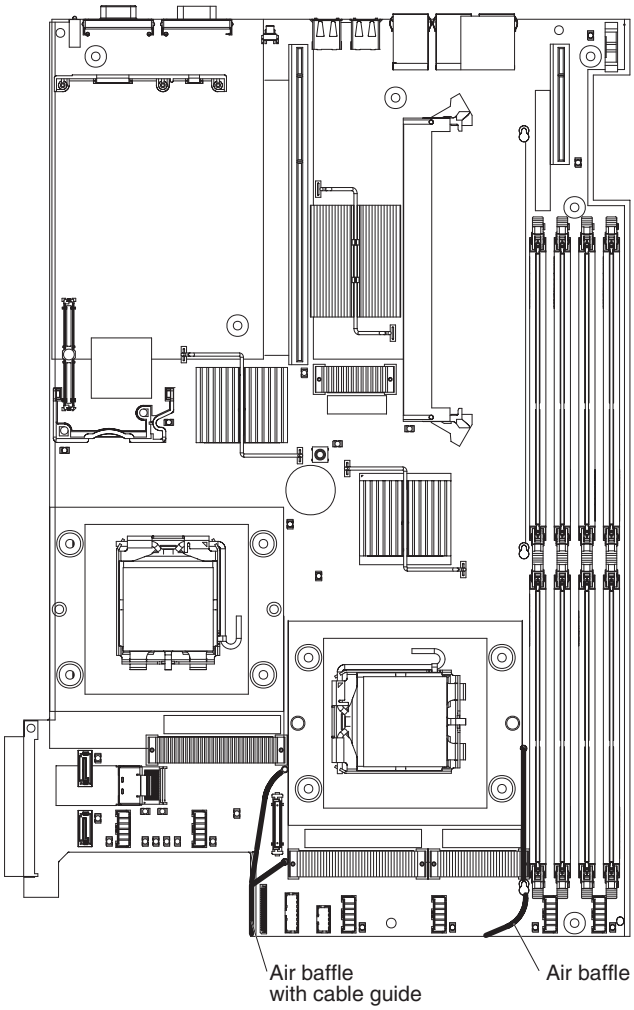


4. Close the fan door.
5. Slide the server all the way into the rack until it latches.

Removing the air baffle

When working with some options, such as DIMMs, you must first remove the air baffle to access certain components or connectors on the system board. The following illustration shows how to remove the air baffle.

To remove the air baffle, complete the following steps.

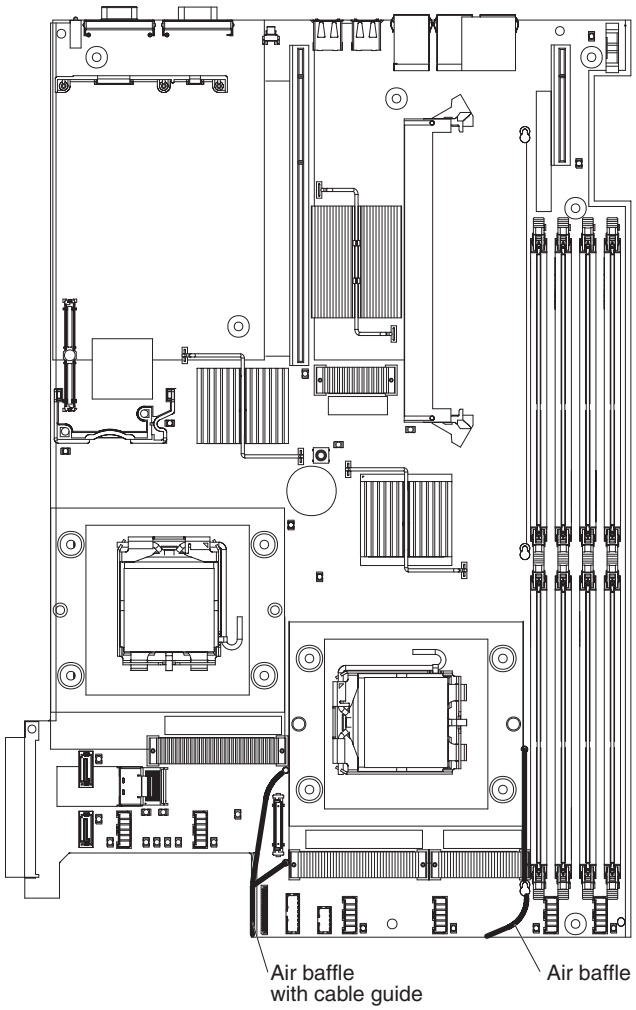


1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. From the front of the server, slide the baffle back to disengage the baffle hook at the front of the baffle from the bulkhead.
4. Lift the baffle up, making sure that the pins come out of the holes on the system board.

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

Installing the air baffle

To install the air baffle, complete the following steps.

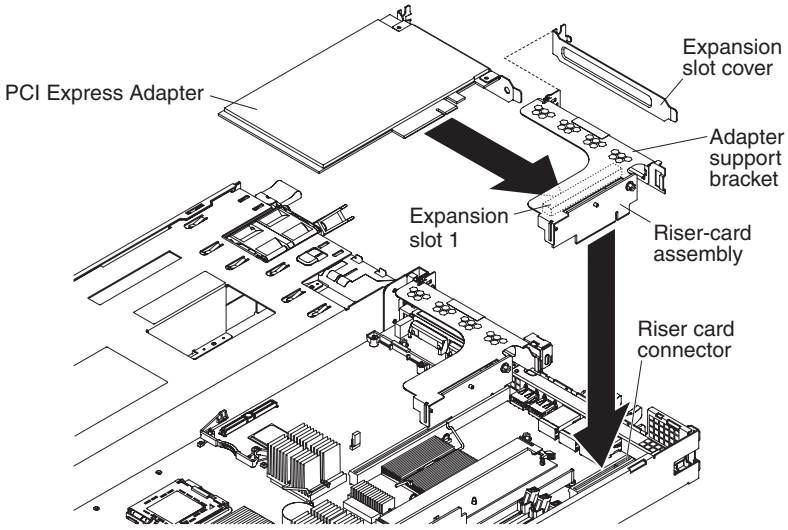


1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Put the baffle into place from the top of the server and slide it forward to engage the bulkhead.
3. Press down on the baffle until the pins seat in the system board.

   Attention: For proper cooling and airflow, replace the air baffle before turning on the server. Operating the server with the air baffle removed might damage server components.
4. Install the cover (see “Installing the cover” on page 98).
5. Slide the server into the rack.
6. Reconnect the power cords and any cables that were removed.
7. Turn on the peripheral devices and the server.

Removing an adapter

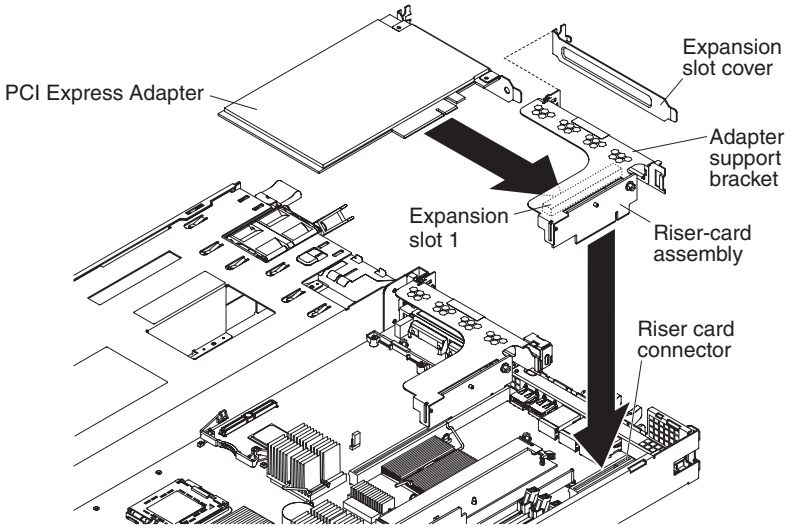
To remove a PCI-X or PCI Express adapter, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Disconnect any cables from the adapter.
4. Grasp the riser-card assembly at the rear edge and lift to remove the riser-card assembly.
5. Place the riser-card assembly on a flat, static-protective surface.
6. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the riser-card assembly.
7. If you are instructed to return the adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing an adapter

To install an adapter, complete the following steps.



1. Remove the adapter from the static-protective package and set any jumpers or switches on the adapter as directed by the adapter manufacturer.
2. Route the adapter cables, if any, before you install the adapter.
3. As you start inserting the adapter, align the edge connector, on the low-profile adapter, with the connector on the riser-card assembly. Press the edge connector firmly into the riser-card assembly connector. Make sure that the adapter snaps into the riser-card assembly securely.

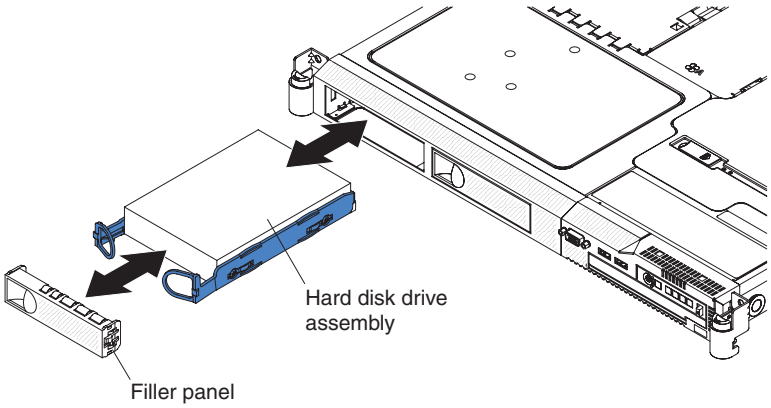
   Attention: When you install an adapter, make sure that the adapter is correctly seated in the connector before you turn on the server. An incorrectly seated adapter might cause damage to the system board, the riser-card assembly, or the adapter.
4. Perform any configuration tasks that are required for the adapter.
5. Install the cover (see “Installing the cover” on page 98).
6. Slide the server into the rack.
7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

Removing a hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this section.

Removing a simple-swap Serial ATA (SATA) hard disk drive

To remove a simple-swap SATA drive, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Make sure that the server cover is in place and fully closed.
3. Turn off the server and peripheral devices and disconnect all power cords.
4. Remove the filler panel from the bay.

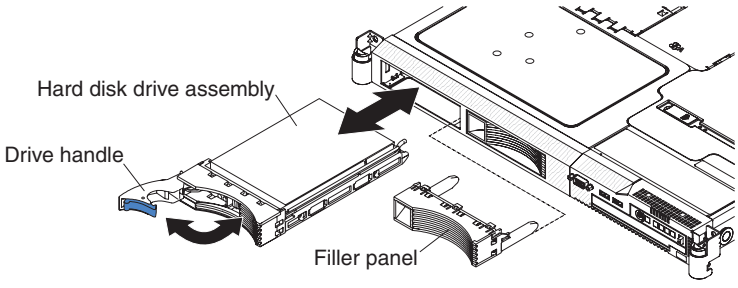
   Note: To make sure that there is adequate system cooling, do not operate the server for more than 2 minutes without either a hard disk drive or a filler panel installed in each bay.
5. Pull the loops of the drive tray toward each other and pull the tray out of the bay.

   Attention: To avoid damage to the hard disk drive connectors, make sure that the server cover is in place and fully closed whenever you install or remove a hard disk drive.

Removing a hot-swap hard disk drive

The server hot-swap models support two 3.5-inch or four 2.5-inch SAS hard disk drives. The removal and installation procedures are the same for either type of drive.

To remove a hot-swap hard disk drive, complete the following steps.



Attention: To avoid damage to the hard disk drive connectors, make sure that the server cover is in place and fully closed whenever you install or remove a hard disk drive.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Move the handle on the drive to the open position (perpendicular to the drive).
3. Pull the hot-swap drive assembly from the bay.

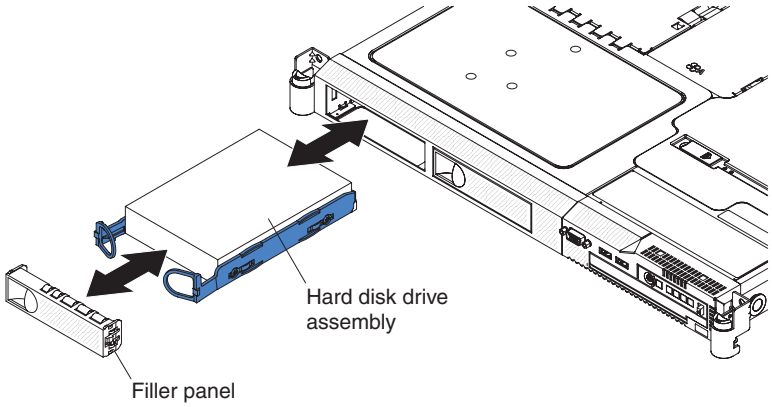
Note: To make sure that there is adequate system cooling, do not operate the server for more than 2 minutes without either a hard disk drive or a filler panel installed in each bay.

Installing a hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.

Installing a 3.5-inch simple-swap hard disk drive

To install a simple-swap Serial ATA hard disk drive, complete the following steps.



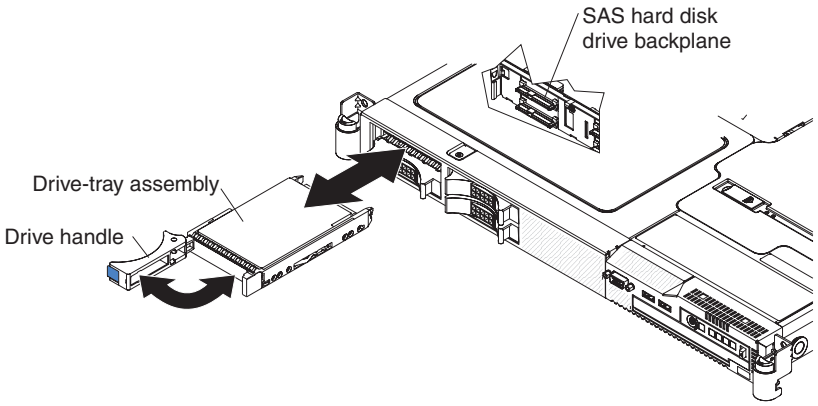
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Make sure that the server cover is in place and fully closed.

   Attention: To avoid damage to the hard disk drive connectors, make sure that the server cover is in place and fully closed whenever you install or remove a hard disk drive.
3. Pull the loops of the drive tray toward each other, and slide the drive into the server until the drive connects to the backplate.
4. Release the loops of the drive tray.
5. Insert the filler panel into the bay to cover the drive.

Note: If the server has a RAID controller or adapter installed, you might have to reconfigure the disk arrays after installing hard disk drives. See the RAID documentation on the IBM *System x Documentation* CD for information about RAID adapters.

Installing a 2.5-inch hot-swap hard disk drive

To install a 2.5-inch hot-swap SAS hard disk drive, complete the following steps.

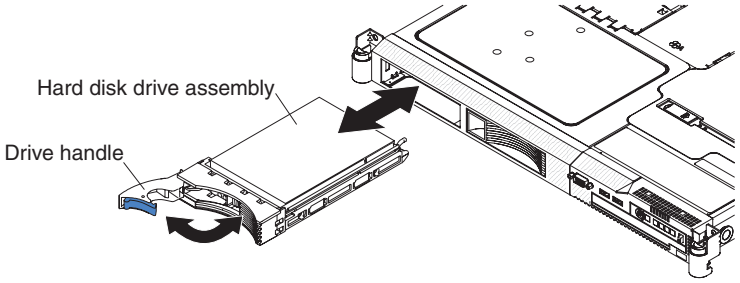


1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Place the drive handle in the open position and slide the drive into the bay.
3. Close the drive handle.
4. Check the hard disk drive status LED and activity LED to verify that the drive is operating correctly.

Note: If you have a RAID configuration you might have to reconfigure the disk arrays after installing hard disk drives. See the RAID documentation on the IBM *System x Documentation* CD for information about RAID adapters.

Installing a 3.5-inch hot-swap hard disk drive

To install a 3.5-inch hot-swap hard disk drive, complete the following steps.



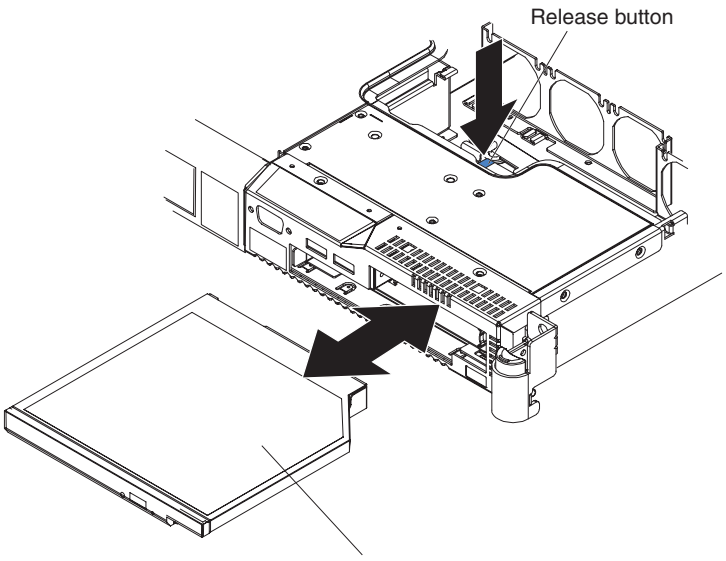
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Place the drive handle in the open position and slide the drive tray into the bay.
3. Close the drive handle.
4. Check the hard disk drive status LED and activity LED to verify that the drive is operating correctly.

Note: If you have a RAID configuration, you might have to reconfigure the disk arrays after installing hard disk drives. See the RAID documentation on the IBM *System x Documentation* CD for information about RAID adapters.

Removing and installing the internal CD-RW/DVD drive

Removing the CD-RW/DVD drive

To remove the CD-RW/DVD drive, complete the following steps.



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

   Note: If you are installing a drive that contains a laser, 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.**

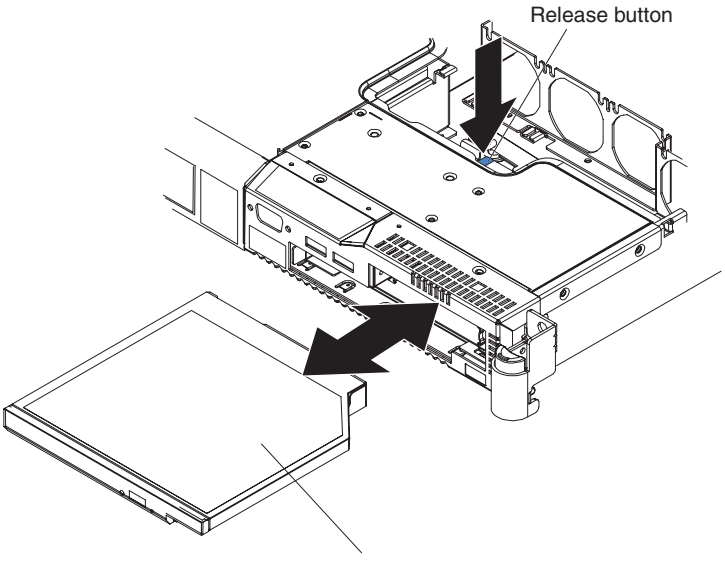
DANGER

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

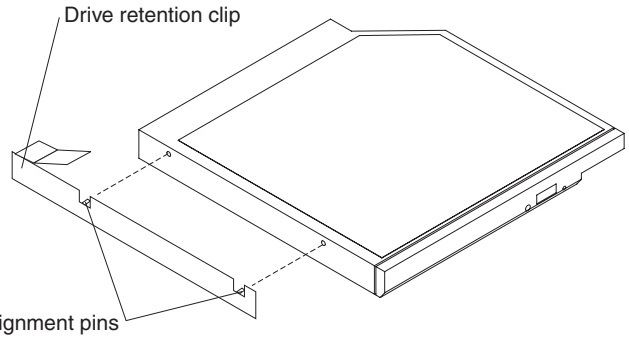
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

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

2. Read the safety information that begins on page vii and “Installation guidelines” on page 95
3. Turn off the server and peripheral devices and disconnect all power cords; then, open the fan door.



4. Press and hold the release button as you push the drive from the rear to slide it out of the bay.

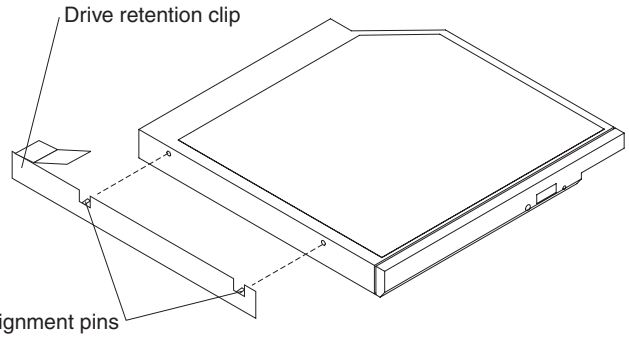


5. Slide the drive-retention clip to remove it from the drive.
6. If you are instructed to return the CD-RW/DVD drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the CD-RW/DVD drive

To install the replacement CD-RW/DVD drive, complete the following steps.

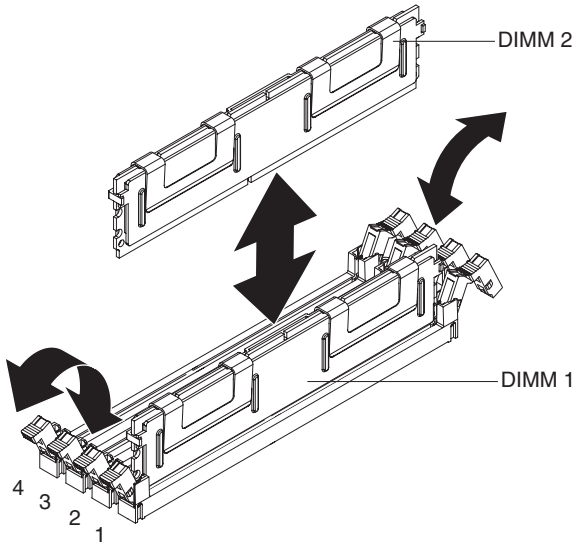
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Follow the instructions that come with the new drive to set any jumpers or switches.



3. Slide the drive-retention clip to attach it to the side of the drive.
4. Slide the drive into the CD/DVD drive bay until the drive clicks into place.
5. Close the fan door.
6. Slide the server into the rack.
7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

Removing a memory module (DIMM)

To remove a DIMM, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Open the retaining clip on each end of the DIMM connector.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
4. Lift the DIMM out of the connector.
5. If you are instructed to return the DIMM, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a memory module

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

- The server supports up to eight DIMMs for system memory. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of memory modules that you can use with the server.

  Note: Because some memory is reserved for system operation, the actual usable memory size that is reported by the operating system is less than the total installed size.
- The server comes with a minimum of two 512 MB DIMMs or two 1 GB DIMMs, installed in slots 1 and 3 or slots 5 and 7. When you install additional DIMMs, you must install two identical DIMMs at a time, in the order shown in the following table, to maintain performance.

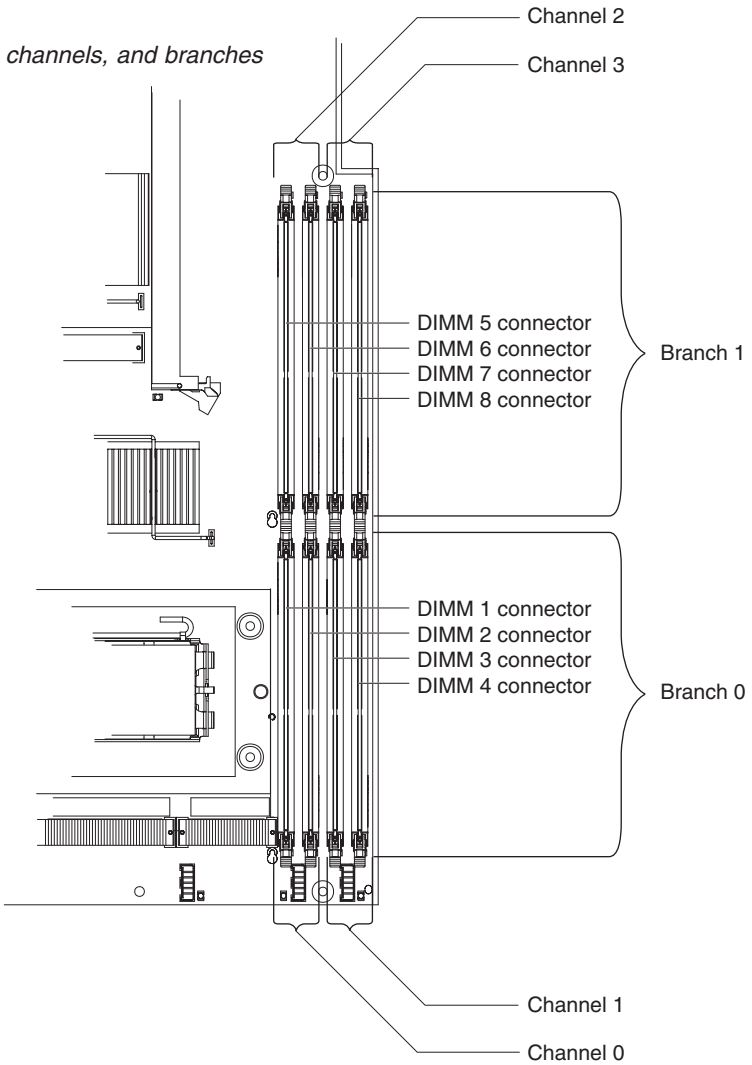
Table 5. DIMM installation sequence

Pair	DIMM connectors
1	1 and 3
2	5 and 7
3	2 and 4

Table 5. DIMM installation sequence (continued)

Pair	DIMM connectors
4	6 and 8

Figure 1. DIMM connectors, channels, and branches



- Each DIMM in a pair must be the same size, speed, type, and technology to ensure that the server will operate correctly.
- You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. Memory mirroring reduces the amount of available memory. Enable memory mirroring through the Configuration/Setup Utility program.

  When you use memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each group must be identical. See the following table for the installation sequence of DIMM connectors for memory mirroring.

Table 6. Memory mirroring DIMM installation sequence

Group	DIMM connectors
1	1, 3, 5, and 7
2	2, 4, 6, and 8

Table 7. Memory mirroring DIMM functions

Group	Active DIMMs	Mirroring DIMMs
1	1, 3	5, 7
2	2, 4	6, 8

- The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair. Online-spare memory reduces the amount of available memory. Before you can enable this feature, you must install up to two additional pairs of DIMMs. The online-spare DIMM pairs must be the same speed, type, and the same size as, or larger than, the largest active DIMM pairs.

  Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare DIMM pairs according to your DIMM configuration. Two online-spare configurations are supported. See Table 8 for the online-spare memory DIMM connector assignments.

Table 8. Online-spare DIMM connector assignments

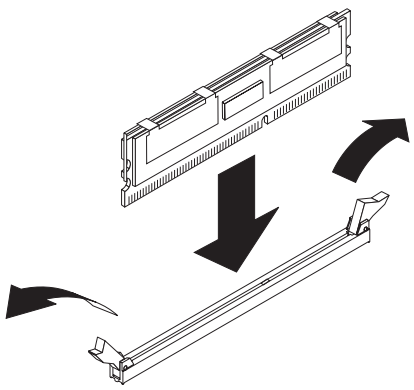
Group	DIMM connectors
1	1 and 3, 2 and 4
2	5 and 7, 6 and 8

- You can enable either online-spare memory or memory mirroring, but not both at the same time. Online-spare memory provides more memory capacity than mirroring; mirroring provides better memory protection but less memory capacity than online-spare memory.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page “Safety” on page vii and “Installation guidelines” on page 95.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.
3. Remove the server cover.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
4. Open the retaining clip on each end of the DIMM connector.

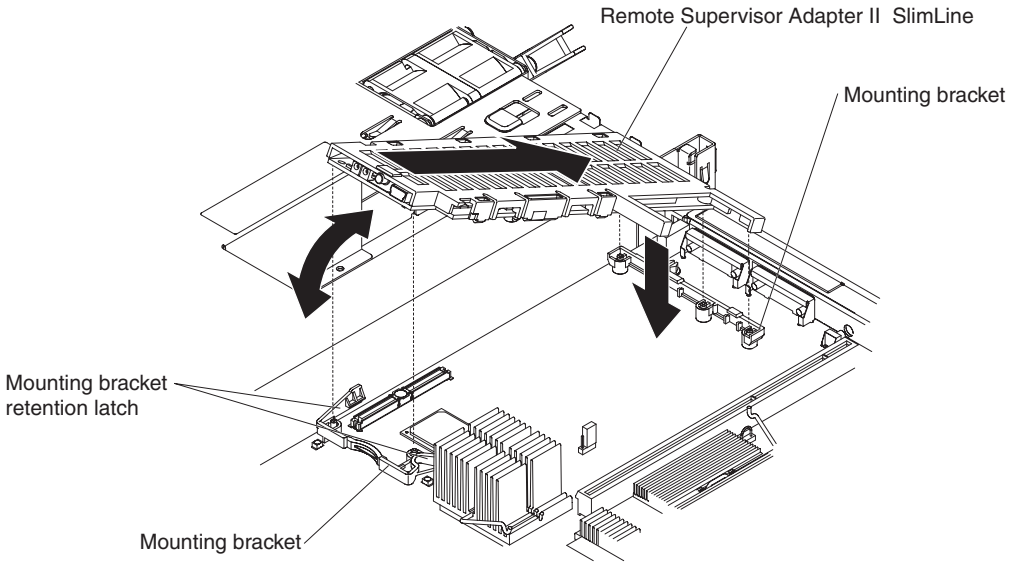


5. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.
6. Turn the DIMM so that the DIMM keys align correctly with the slot.
7. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector.
8. 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.

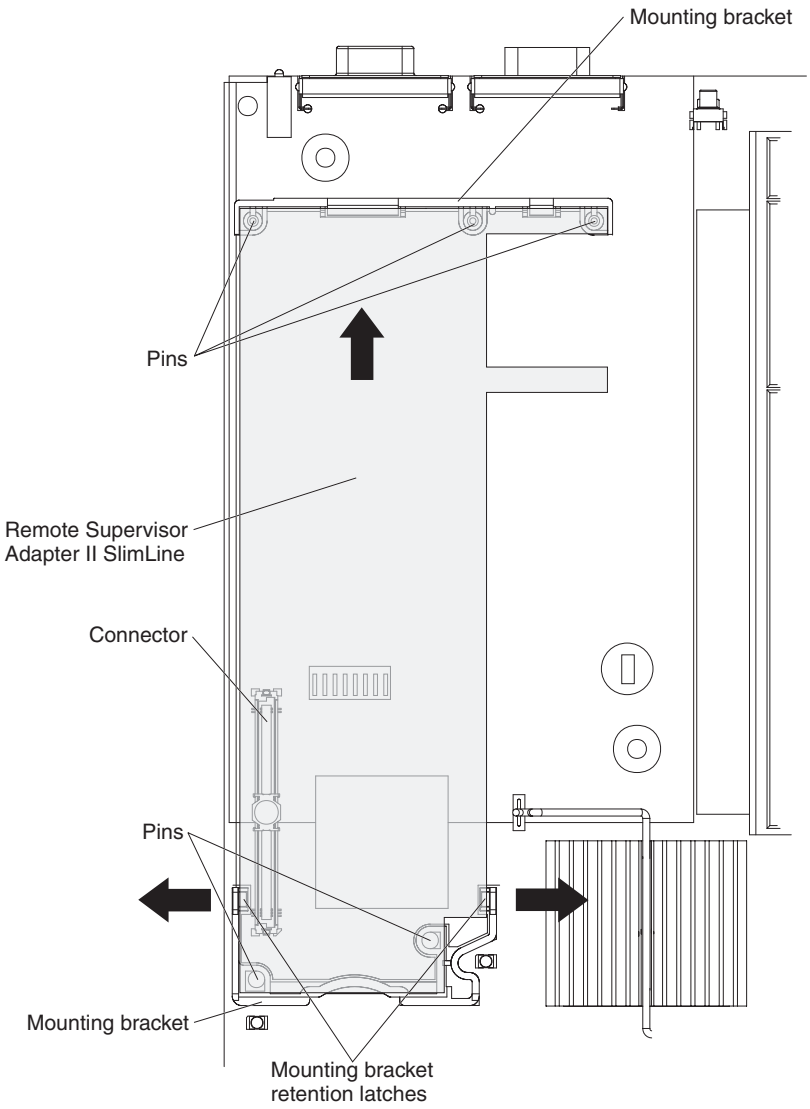
   Note: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

Removing the Remote Supervisor Adapter II SlimLine

To remove the Remote Supervisor Adapter II SlimLine assembly, complete the following steps:



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Remove the PCI riser card assembly and any installed adapter.



4. Spread the card retainers as you lift the Remote Supervisor Adapter II SlimLine card to disconnect it from the system board, then lift it out of the server.

Installing the Remote Supervisor Adapter II SlimLine

To install the Remote Supervisor Adapter II SlimLine assembly, complete the following steps. Refer to the graphics in “Removing the Remote Supervisor Adapter II SlimLine” on page 113:

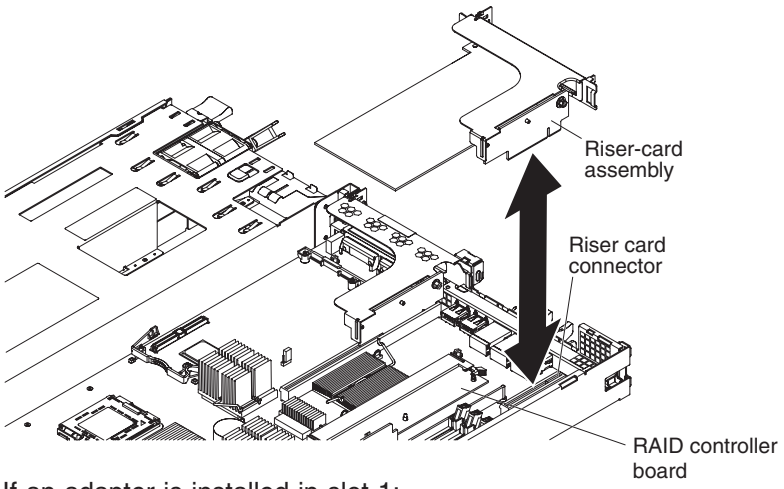
1. Position the Remote Supervisor Adapter II SlimLine card so that the keys on the connector align correctly with the connector on the system board.
2. Insert the card into the rear retainer bracket; then, press the card into the connector and make sure that all support posts and retainers secure the card in place.
3. Replace the PCI riser-card assembly and adapter (if present).
4. If you are instructed to return the Remote Supervisor Adapter II SlimLine, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
5. Install the cover (see “Installing the cover” on page 98).
6. Slide the server into the rack.

7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

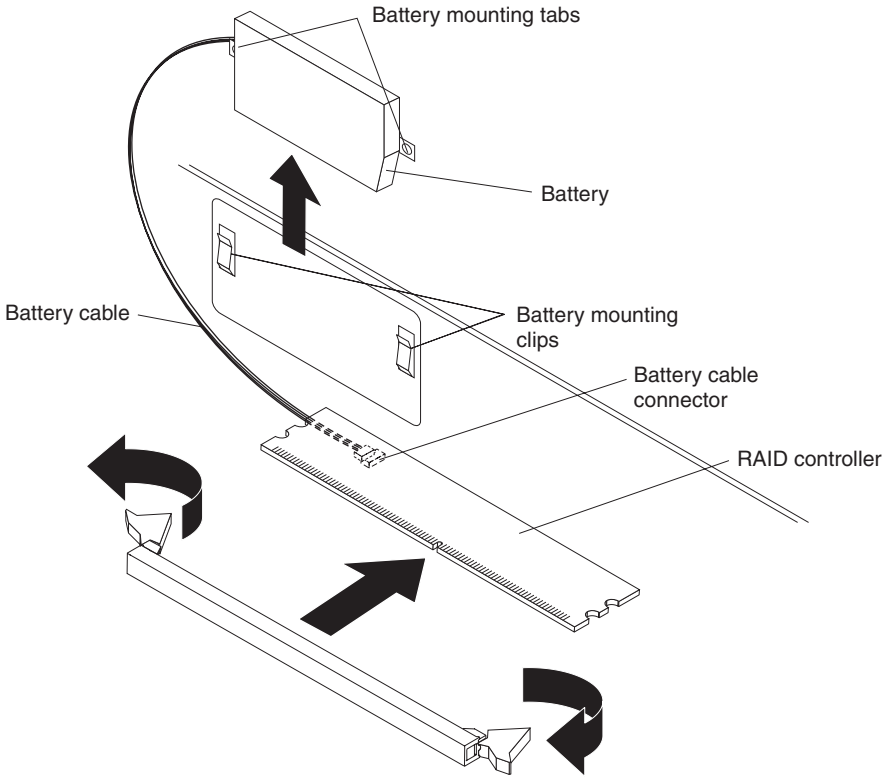
Removing the RAID controller

To remove the RAID controller (some models) from the system board, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).



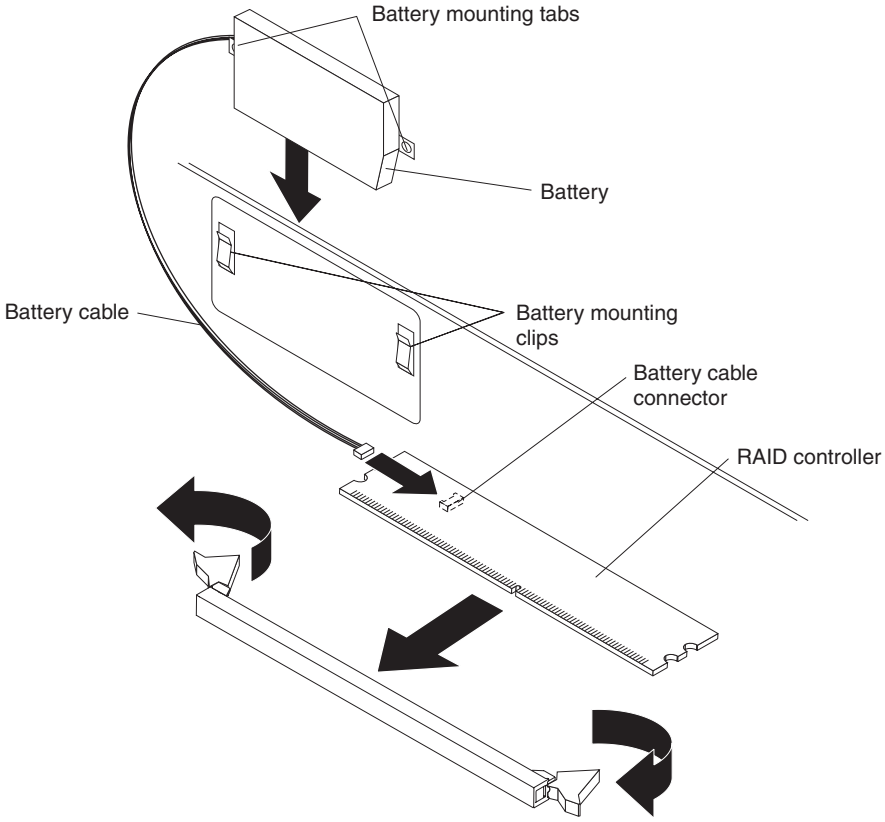
3. If an adapter is installed in slot 1:
   a. Disconnect any cables from the adapter.
   b. Grasp the riser-card assembly at the rear edge and lift to remove the riser-card assembly and adapter from the server.



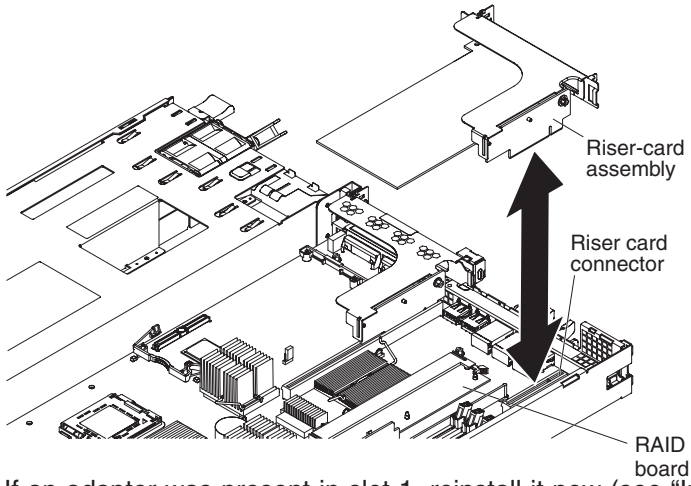
4. Do not disconnect the cable from the RAID controller battery (some models only) to the RAID controller board.
5. Open the retaining clip on each end of the RAID controller board connector.
6. Slide the RAID controller board out of the connector.

Installing the RAID controller

To install the RAID controller on the system board, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Grasp the edges of the RAID controller board.
3. Open the retaining clip on each end of the controller socket.
4. Slide the RAID controller board into the controller socket.
5. Close the retaining clip on each end of the controller socket.
6. Connect the cable from the RAID-controller battery to the RAID controller board (some models only).



7. If an adapter was present in slot 1, reinstall it now (see “Installing an adapter” on page 103).

8. Install the cover (see “Installing the cover” on page 98).
9. Slide the server into the rack.
10. Reconnect the power cords and any cables that were removed.
11. Turn on the peripheral devices and the server.

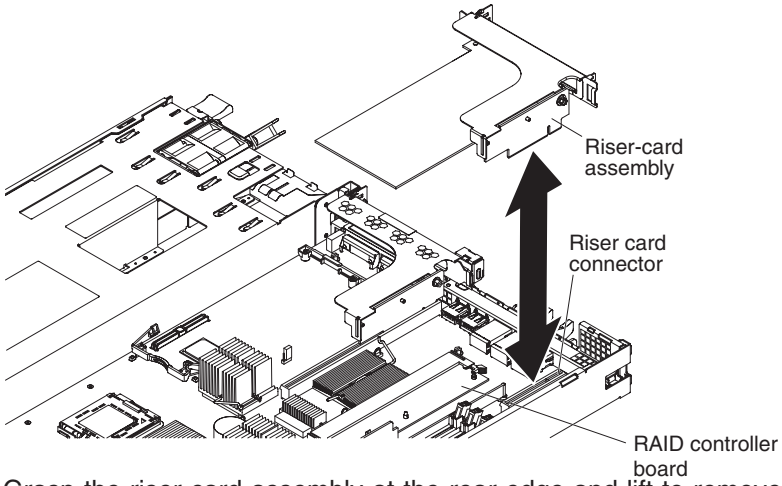
Removing the RAID-controller battery

To remove the RAID-controller battery from the server, complete the following steps.

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.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. If an adapter is installed in slot 1:
   a. Disconnect any cables from the adapter.



   b. Grasp the riser-card assembly at the rear edge and lift to remove the riser-card assembly and adapter from the server.
4. Disconnect the cable from the RAID controller battery to the RAID controller board.
5. Remove the battery.

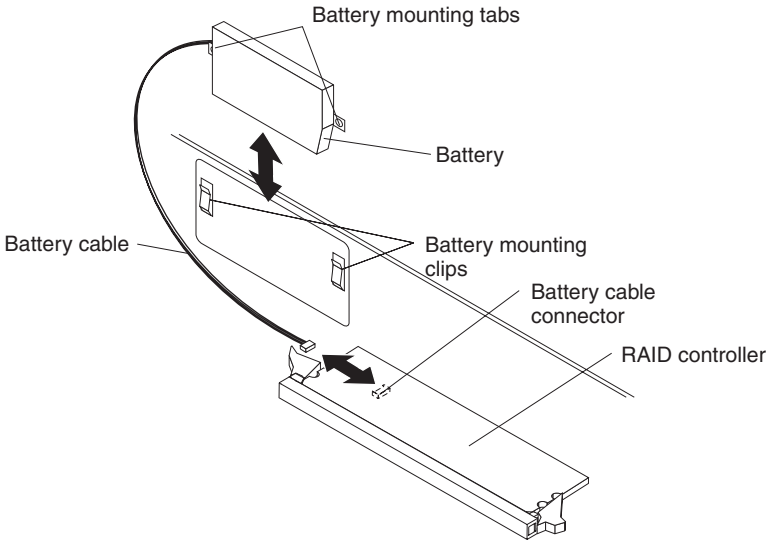
Installing the RAID-controller battery

To install the RAID-controller battery in the server, complete the following steps.

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.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95



2. Insert the RAID controller battery in the server chassis.
3. Connect the cable from the RAID controller battery to the RAID controller board.
4. If an adapter was present in slot 1, reinstall the adapter and riser card assembly now.
5. Install the cover (see “Installing the cover” on page 98).
6. Slide the server into the rack.
7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

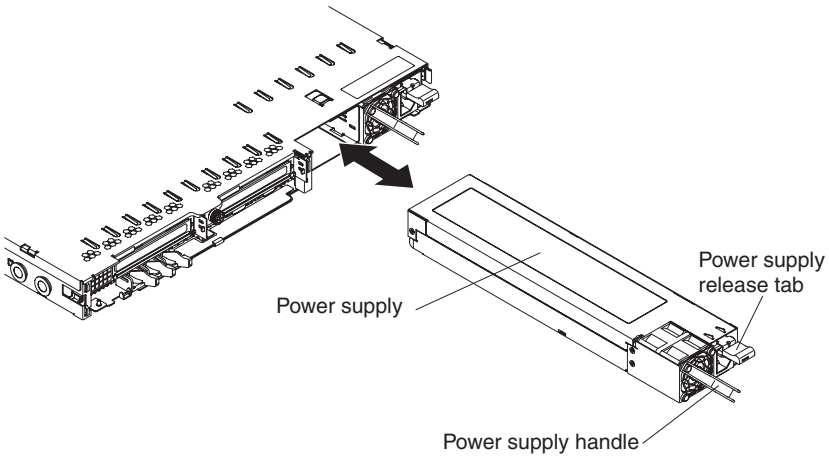
Removing a power supply

Statement 8:

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

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

To remove a hot-swap power supply, complete the following steps:



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. If only one power supply is installed, turn off the server and peripheral devices and disconnect all power cords.
3. If the server is in a rack, at the back of the server, pull back the cable management arm to gain access to the rear of the server and the power supply.
4. Press and hold the orange release tab down and pull the power supply out of the server.

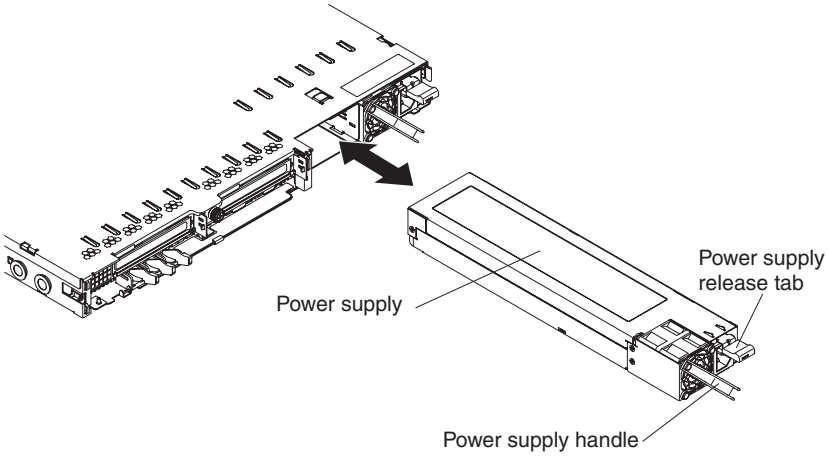
Installing a power supply

Statement 8:

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

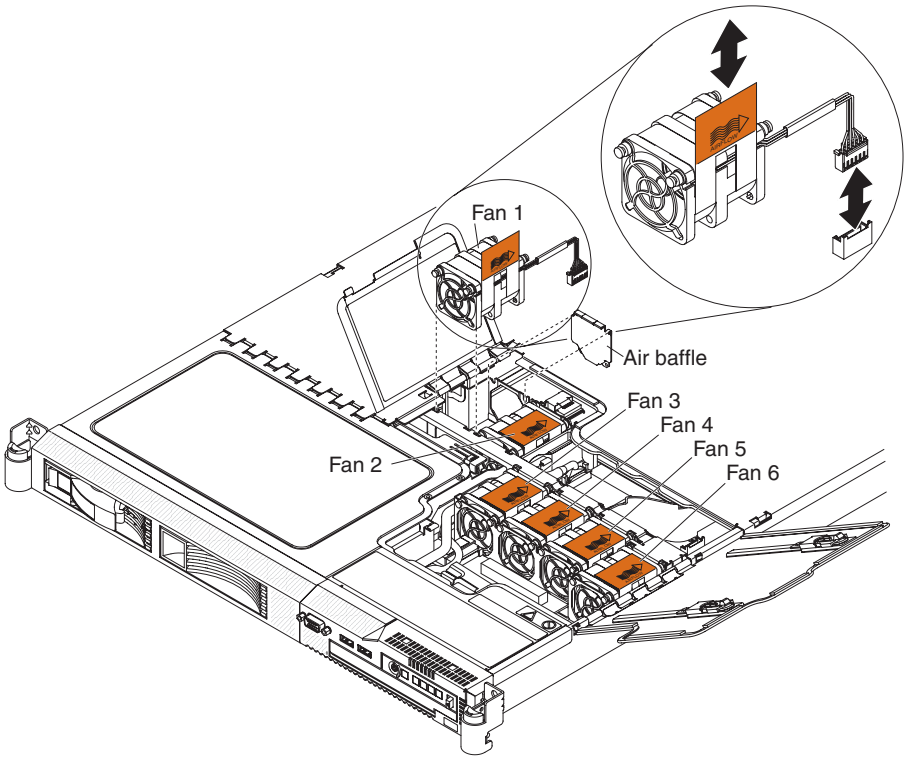
Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

To install a hot-swap power supply, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Grasp the handle on the rear of the power supply and slide the power supply forward fully into the server until it clicks in place.
3. Connect the power cord to the power-cord connector on the power supply, being sure to route the cord through the power supply handle in order to minimize mechanical strain on the cord.
4. Connect the other end of the power cord to a properly grounded electrical outlet.
5. Make sure that the ac power LED and the dc power LED on the power supply are lit, indicating that the power supply is operating correctly. The two green LEDs are to the left of the power-cord connector.

Removing a hot-swap fan assembly

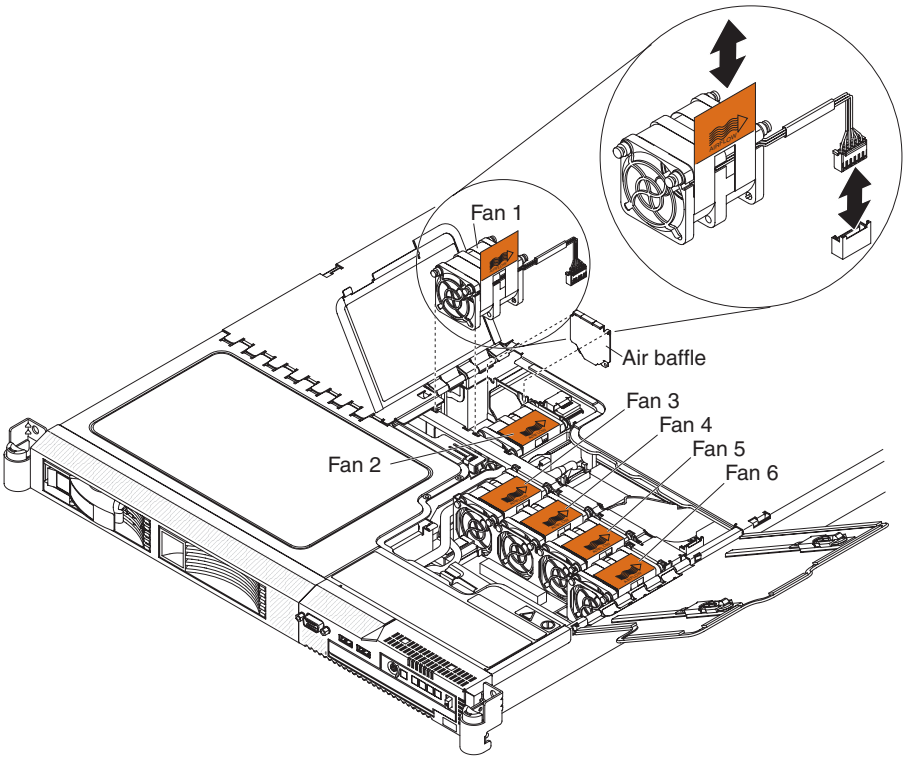


Attention: To ensure proper server operation, replace a failed fan within two minutes.

To remove a hot-swap-fan, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Slide the server forward to gain access to the fan doors.
3. Open the fan door for the failing fan. The LED near the connector of the failing fan assembly is lit.
4. Disconnect the cable of the failing fan from the connector.
5. Pull up on the orange tab to lift the fan out of the server.

Installing a hot-swap fan assembly



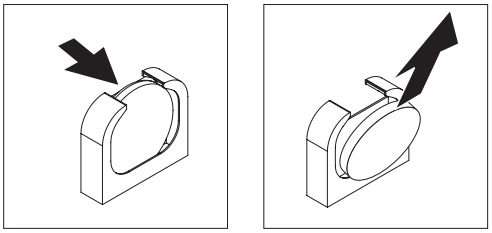
Attention: To ensure proper server operation, replace a failed fan within two minutes.

To replace a hot-swap-fan, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Orient the new fan in the same position as the fan that you removed. Make sure that the airflow indicator, on the top of the fan, is pointing to the rear of the server.
3. Push the fan assembly down into the server until the blue mounting grommets are correctly seated.
4. Connect the cable of the replacement fan into the connector.
5. Close the fan door.
6. Slide the server into the rack.

Removing the system-board battery

To remove the system-board battery, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. If necessary, lift the riser-card assembly out of the way (see “Removing an adapter” on page 102).
4. Remove the system-board battery:
   a. Use a fingernail to press the top of the battery clip away from the battery. The battery pops up when released.
   b. Use your thumb and index finger to lift the battery from the socket.
5. Dispose of the battery as required by local ordinances or regulations. See “Battery return program” on page 164 for more information.

Installing the system-board battery

The following notes describe information that you must consider when replacing the system-board battery in the server.

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

Statement 2:

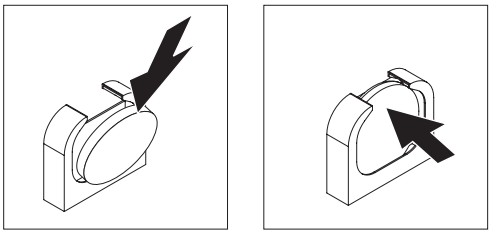
CAUTION:
When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium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

Do not:

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

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

To install the replacement system-board battery, complete the following steps.



1. Follow any special handling and installation instructions that come with the replacement battery.
2. Insert the new battery:
   a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.
   b. Press the battery down into the socket until it clicks into place. Make sure that the battery clip holds the battery securely.
3. Install the cover (see “Installing the cover” on page 98).
4. Slide the server into the rack.
5. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.
6. Start the Configuration/Setup Utility program and reset the configuration.
   - Set the system date and time.
   - Set the power-on password.
   - Reconfigure the server.

   See “Using the Configuration/Setup Utility program” on page 151 for details.

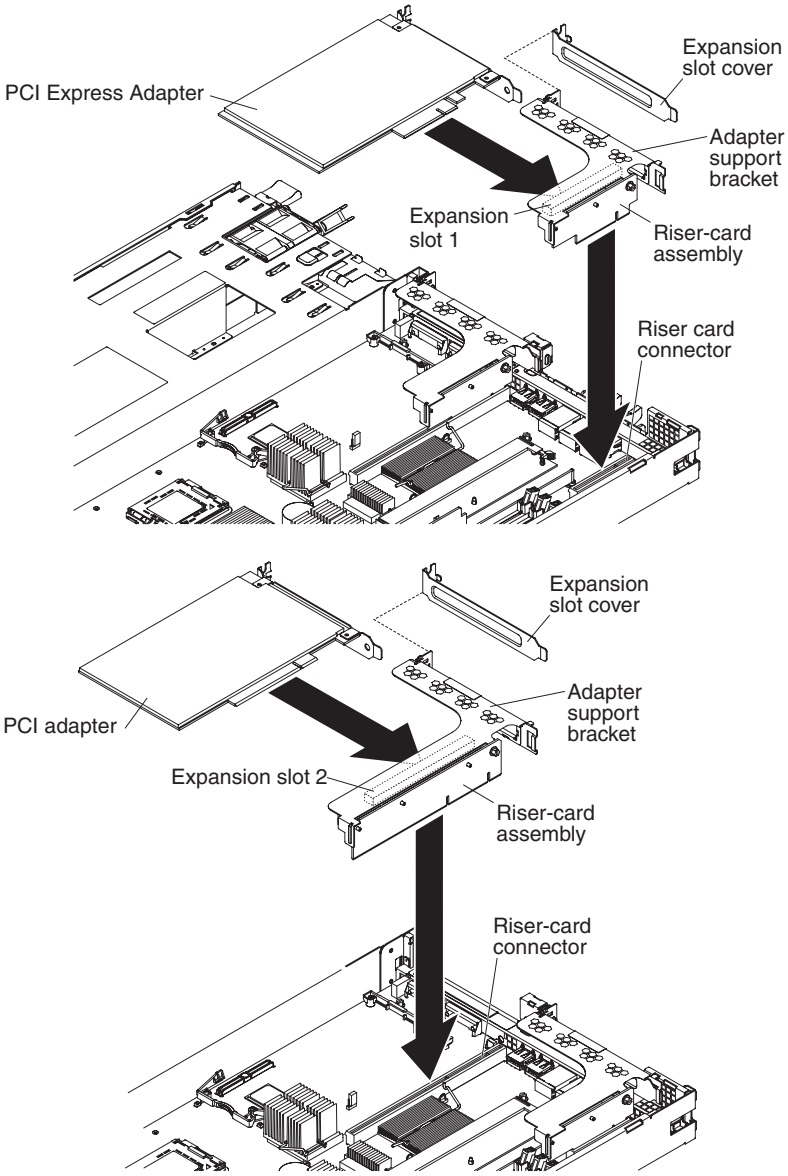
Removing and replacing Tier 2 CRUs

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

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

Removing a riser card assembly

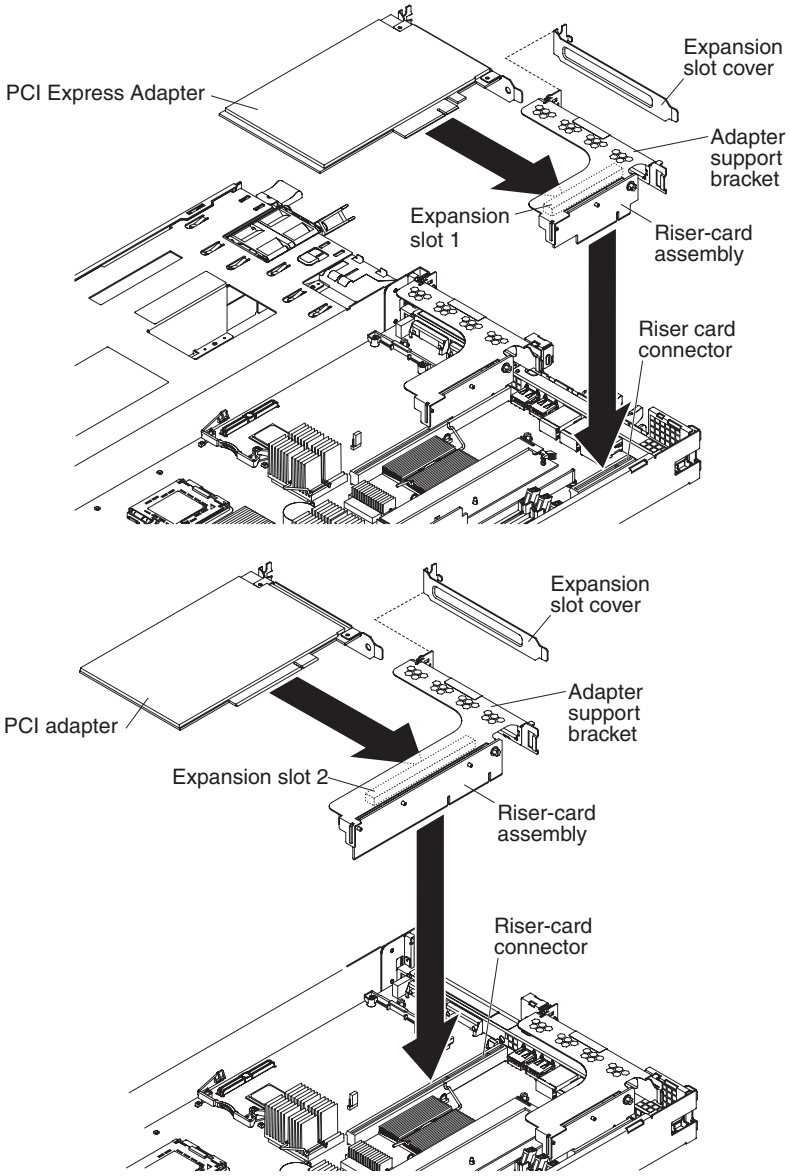
To remove a riser assembly, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95.
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. If an adapter is installed in the riser card assembly, disconnect any cables connected to the adapter.
4. Grasp the riser-card assembly at the rear edge and lift to remove the riser-card assembly.
5. Remove the adapter, if one is present, from the riser card assembly.
6. If you are instructed to return the riser card assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a riser card assembly

To replace a riser card assembly, complete the following steps.

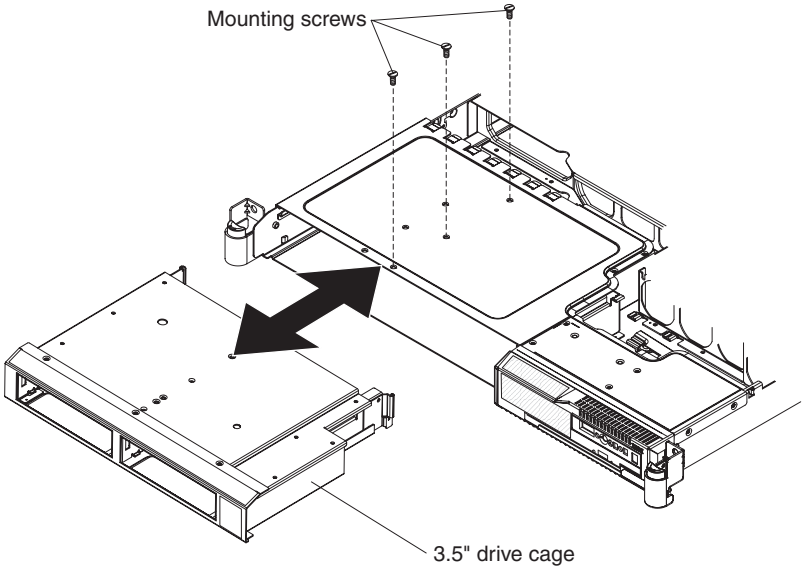


1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Reinstall the adapter, if one is present. See “Installing an adapter” on page 103.
3. Insert the riser card assembly into the connector on the system board. Be sure that it is fully seated.
4. Install the cover (see “Installing the cover” on page 98).
5. Slide the server into the rack.
6. Reconnect the power cords and any cables that were removed.
7. Turn on the peripheral devices and the server.

Removing a disk drive cage assembly

Removing a 3.5-inch disk drive cage assembly

To remove a 3.5-inch SAS disk drive cage assembly, complete the following steps.

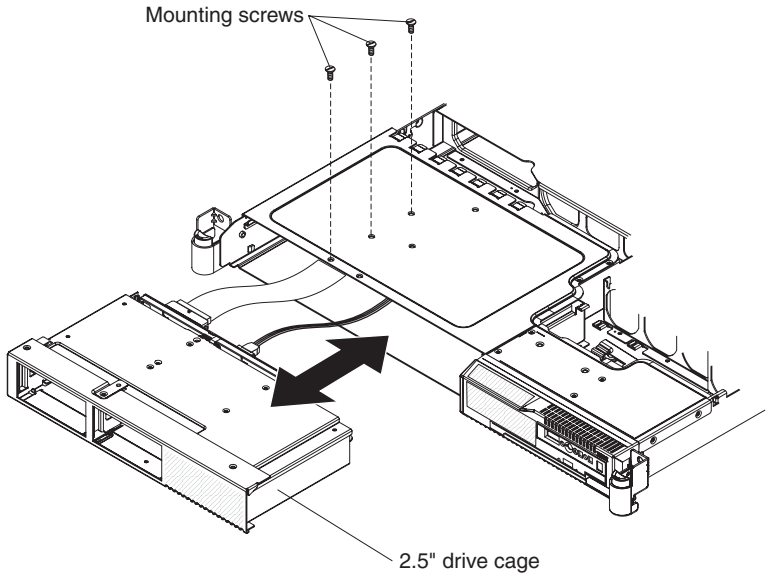


1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Remove the drives from the server (see “Removing a hard disk drive” on page 103).
4. Remove the backplane or backplate. (See “Removing the hot swap backplane or simple swap backplate” on page 131).
5. Remove the three mounting screws; then, slide the drive cage assembly forward out of the server.

Removing a 2.5-inch disk drive cage assembly

To remove a 2.5-inch SAS disk drive cage assembly, complete the following steps.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Remove the drives from the server (see “Removing a hard disk drive” on page 103).

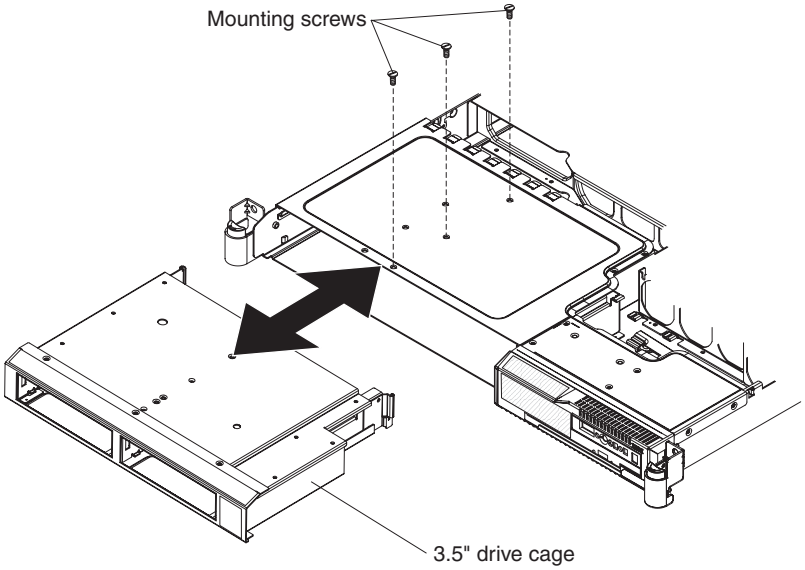


4. Remove the three drive cage mounting screws; then, slide the drive cage assembly forward out of the server.
5. Remove the SAS backplane. (See “Removing the hot swap backplane or simple swap backplate” on page 131).

Installing a disk drive cage assembly

Installing a 3.5-inch disk drive cage assembly

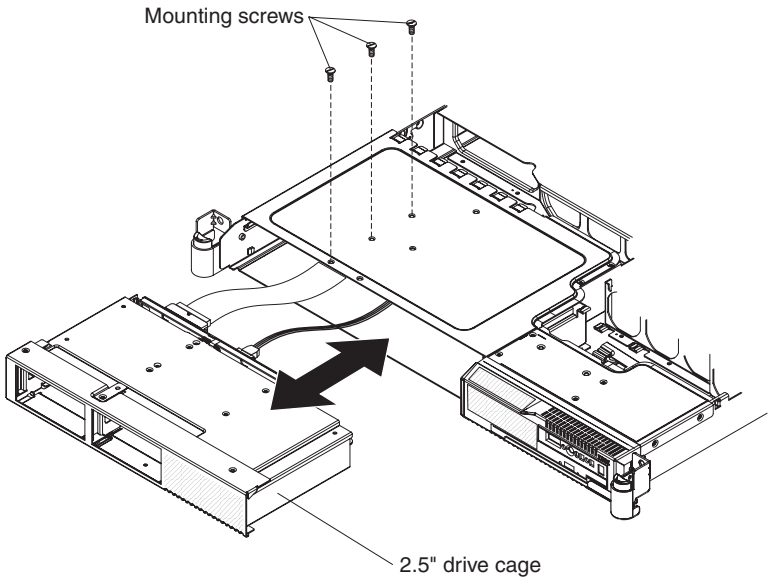
To install a 3.5-inch disk drive cage assembly, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Slide the drive cage assembly forward until it seats in the server.
3. Replace the 3.5-inch backplane or backplate. (See “Installing the hot swap backplane or simple swap backplate” on page 133).
4. Reinstall the removed drives, see “Installing a hard disk drive” on page 105.
5. Install the cover (see “Installing the cover” on page 98).
6. Slide the server into the rack.
7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

Installing a 2.5-inch SAS disk drive cage assembly

To install a 2.5-inch SAS disk drive cage assembly, complete the following steps.



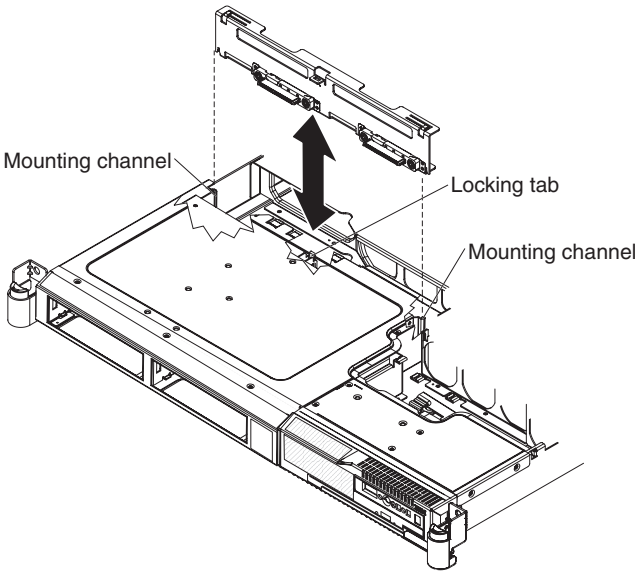
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Replace the 2.5-inch SAS backplane. (See “Installing the hot swap backplane or simple swap backplate” on page 133).
3. Slide the drive cage assembly forward until it seats in the server.
4. Reinstall the removed drives, see “Installing a hard disk drive” on page 105.
5. Install the cover (see “Installing the cover” on page 98).
6. Slide the server into the rack.
7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

Removing the hot swap backplane or simple swap backplate

Removing the 3.5-inch backplane or backplate

To remove the 3.5-inch SAS backplane or simple-swap SATA backplate, complete the following steps.

Note: The following illustration shows removing the 3.5-inch hot-swap SAS backplane.

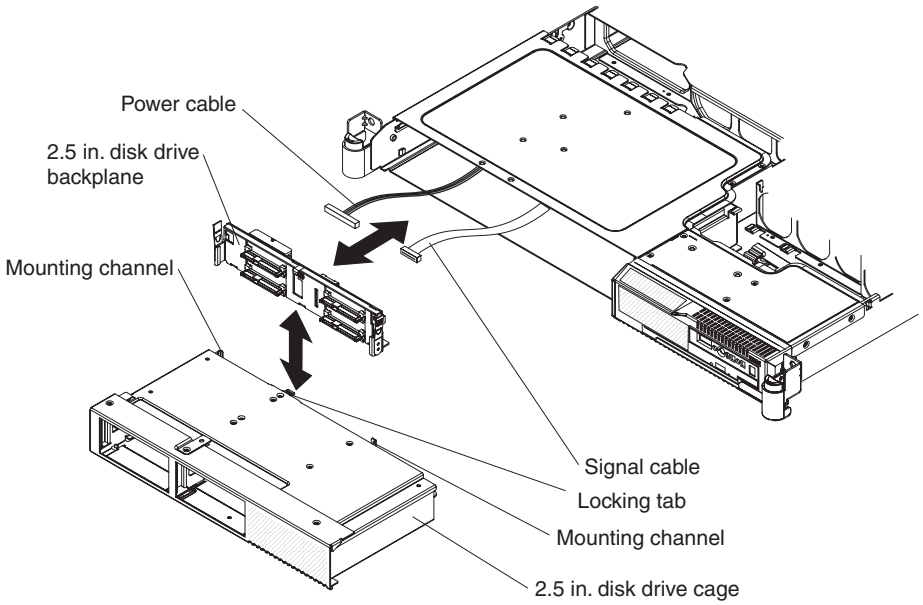


1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords.
3. Remove the cover (see “Removing the cover” on page 98).
4. Pull the hard disk drives out of the server slightly to disengage them from the backplane or backplate.
5. Disconnect the backplane or backplate cables.
   - If the server is a hot-swap model, disconnect the two cables from the backplane.
   - If the server is a simple-swap model, disconnect the two blue signal cables from the system board, and disconnect the power cable from the power supply backplane card.
6. Press the locking tab and lift the backplane or backplate out of the server slightly; then, disconnect the power cable and remove the backplane or backplate.

Removing the 2.5-inch SAS backplane

To remove the 2.5-inch SAS backplane, complete the following steps.

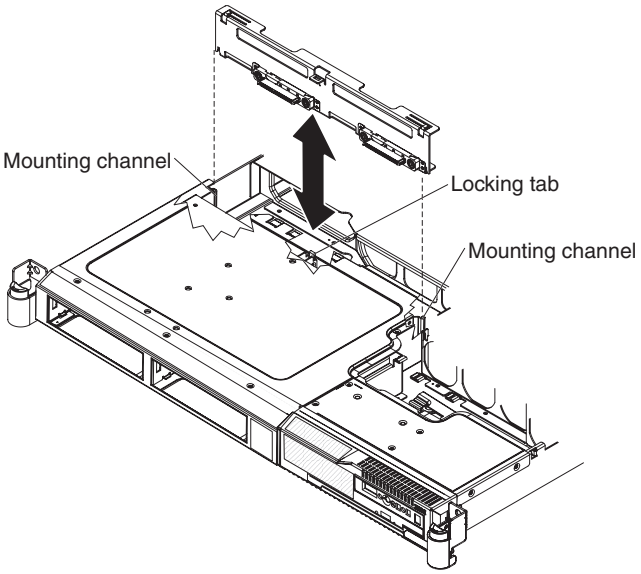
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords.
3. Remove the cover (see “Removing the cover” on page 98).
4. Pull the hard disk drives out of the server slightly to disengage them from the backplane.
5. Disconnect the power cable from the power backplane.
6. Disconnect the signal cable from the system board.
7. Remove the disk drive cage (see “Removing a 2.5-inch disk drive cage assembly” on page 128).



8. Press the locking tab and lift the backplane out of the server.
9. Disconnect the power cable and the signal cable from the disk drive backplane.
10. If you are instructed to return the backplane, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the hot swap backplane or simple swap backplate

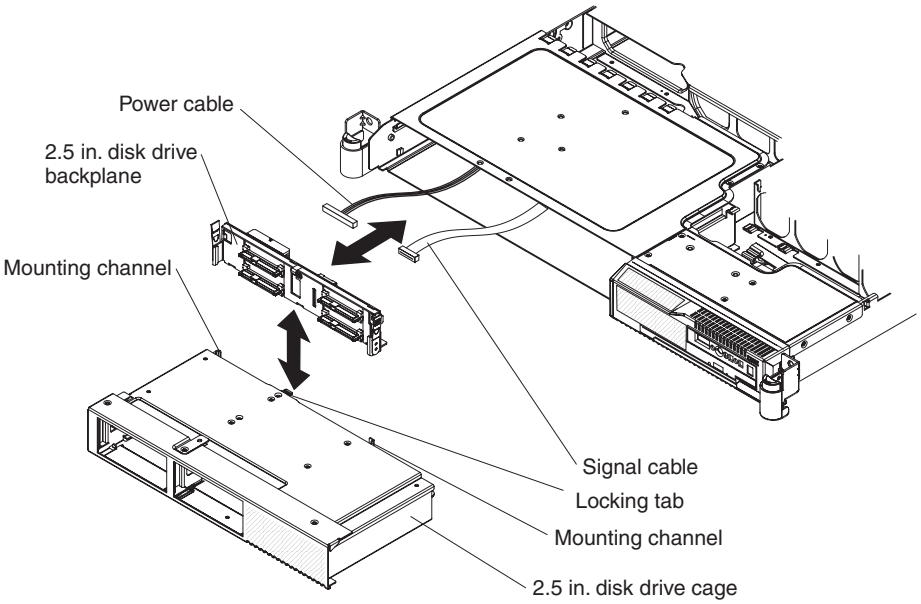
To install the 3.5-inch replacement backplane or backplate, complete the following steps:



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Connect the power cable to the replacement backplane or backplate.
3. Slide the backplane or backplate into the card guides, making sure not to trap or pinch any nearby wires or cables.

4. Press firmly until the backplane or backplate is fully seated and the locking tab snaps into place.
5. Reconnect the backplane or backplate cables.
   - If the server is a hot-swap model, reconnect the two cables to the backplane.
   - If the server is a simple-swap model, reconnect the two blue signal cables to the system board and reconnect the power cable to the power supply backplane card. See “System-board internal connectors” on page 10 for the location of the connectors on the system board.
6. Install the cover (see “Installing the cover” on page 98).
7. Replace the hard disk drives.
8. Slide the server into the rack.
9. Reconnect the power cords and any cables that were removed.
10. Turn on the peripheral devices and the server.

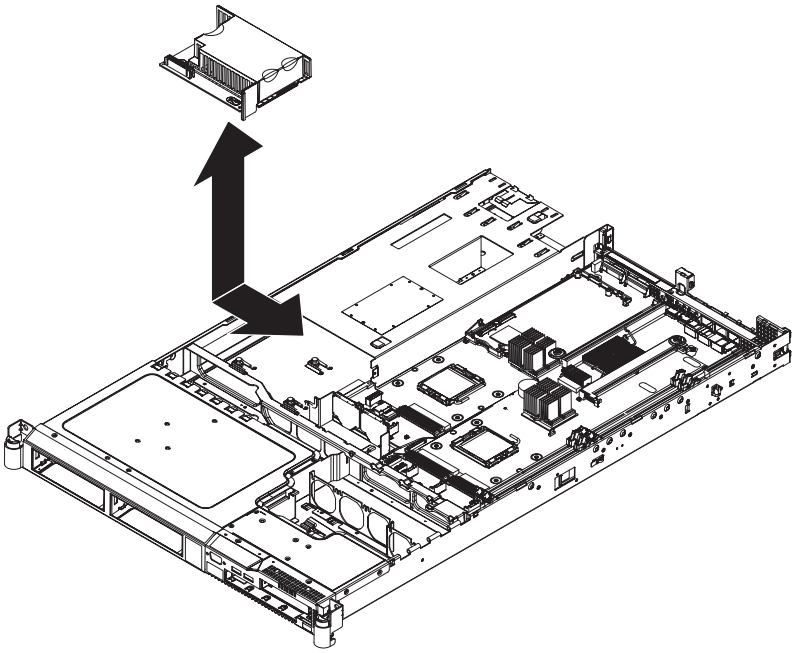
To install the 2.5-inch replacement backplane, complete the following steps:



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Connect the power cable and signal cable to the replacement backplane.
3. Insert the backplane into the drive cage. Press firmly until the backplane is fully seated and the locking tab snaps into place.
4. Reinstall the hard disk drive cage (see “Installing a 2.5-inch SAS disk drive cage assembly” on page 131).
5. Install the cover (see “Installing the cover” on page 98).
6. Replace the hard disk drives.
7. Slide the server into the rack.
8. Reconnect the power cords and any cables that were removed.
9. Turn on the peripheral devices and the server.

Removing the power-supply backplane

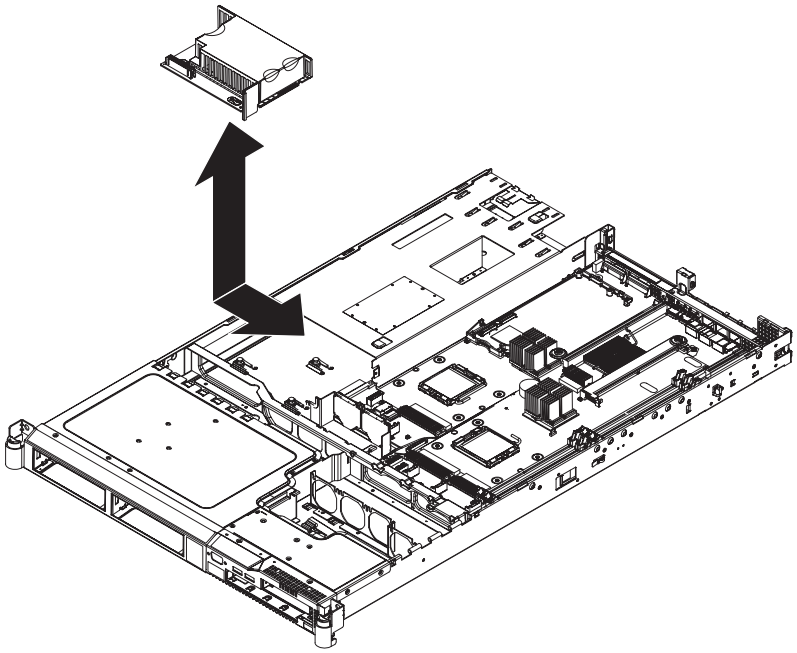
To remove the power-supply backplane, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Disconnect the power supplies from the power-supply backplane (see “Removing a power supply” on page 120).
4. Disconnect the cable connected to the power-supply backplane.
5. Slide the power-supply backplane to the left, disconnecting it from the system board.
6. Lift the power-supply backplane to remove it from the server.

Installing the power-supply backplane

To install the power-supply backplane, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Align the keyhole slots in the power-supply backplane with the mounting pins in the server.
3. Slide the power-supply backplane toward the right side of the server until the edge-connectors are fully connected.
4. Reconnect the cables to the power supply backplane.
5. Install the power supplies into the power-supply bays (see “Installing a power supply” on page 121).
6. Install the cover (see “Installing the cover” on page 98).
7. Slide the server into the rack.
8. Reconnect the power cords and any cables that were removed.
9. Turn on the peripheral devices and the server.

Removing and replacing FRUs

FRUs must be replaced or installed only by trained service technicians.

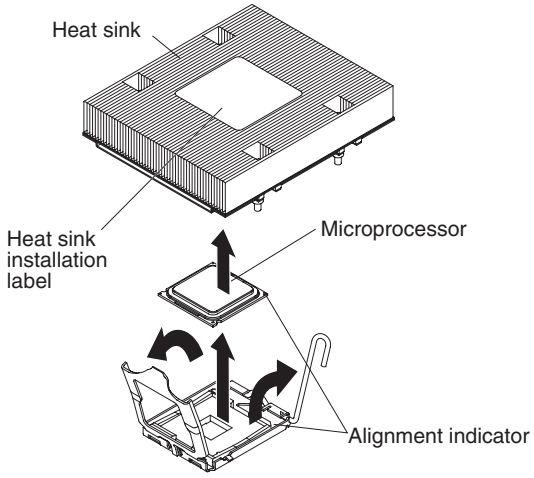
The illustrations in this document might differ slightly from the hardware.

Removing a microprocessor

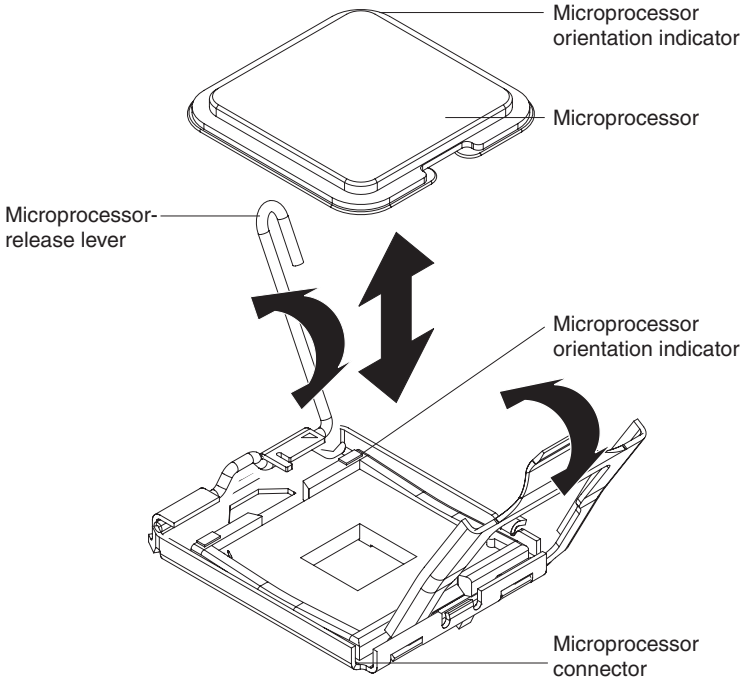
Attention:

- Do not allow the thermal grease on the microprocessor and heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease and the microprocessor socket.
- Use the vacuum tool that comes with the replacement microprocessor to remove the microprocessor. Dropping the microprocessor during installation or removal can damage the contacts.
- Do not touch the microprocessor contacts; handle the microprocessor by the edges only. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

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



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Remove the heatsink. Loosen two captive screws on alternate sides of the heatsink fully before loosening the other two captive screws (this helps to break the bond between the heat sink and the microprocessor). After the captive screws are loosened, remove the heat sink.

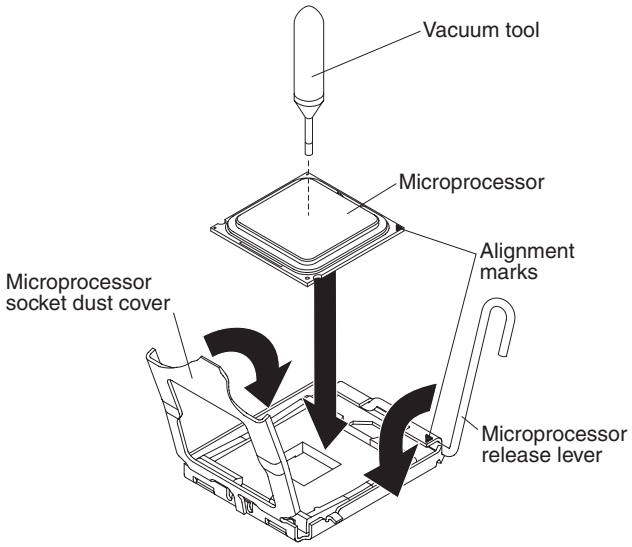


4. Open the microprocessor release lever to the fully-open position.
5. Open the microprocessor bracket frame.
6. Using the vacuum tool that comes with the replacement microprocessor, carefully remove the microprocessor.
7. If you are instructed to return the microprocessor, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a microprocessor

To install a microprocessor, complete the following steps:

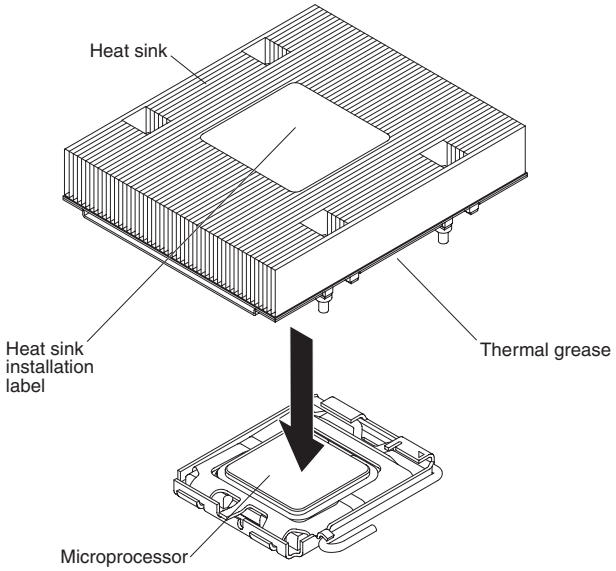
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95



2. Align the microprocessor with the socket (note the alignment mark and the position of the notches); then, carefully place the microprocessor on the socket and close the microprocessor bracket frame.

   Attention: Do not use excessive force when inserting the microprocessor into the socket.

   Note: The microprocessor fits only one way on the socket.
3. Carefully close the release lever to secure the microprocessor in the socket.



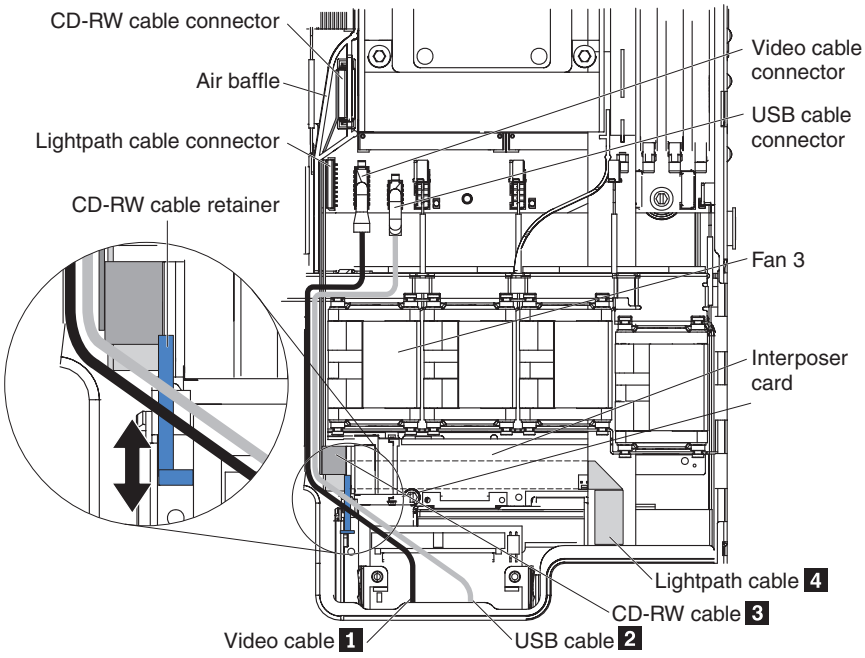
4. Install the heat sink on top of the microprocessor, and tighten the captive screws. Alternate among the screws on either side of the heat sink until they are snug, and then alternate again until they are tight, making sure that you do not overtighten any of them.

   Attention: Do not touch the thermal grease on the bottom of the heat sink or set down the heat sink after the plastic cover is removed. Touching the thermal grease will contaminate it.
5. Install the cover (see “Installing the cover” on page 98).
6. Slide the server into the rack.
7. Reconnect the power cords and any cables that were removed.
8. Turn on the peripheral devices and the server.

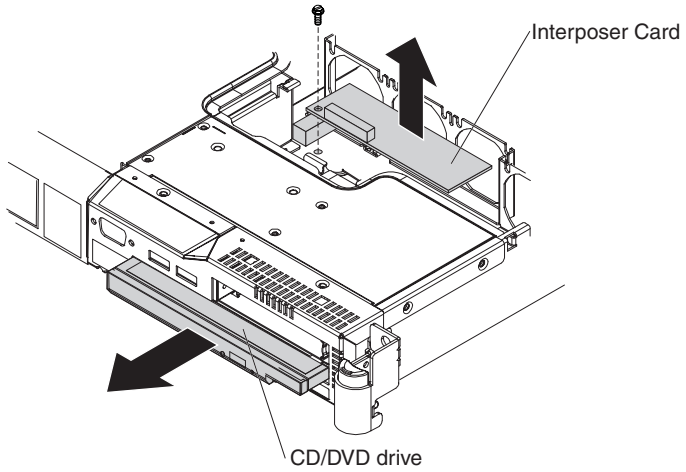
Removing the operator information panel assembly

To remove the operator information panel, complete the following steps.

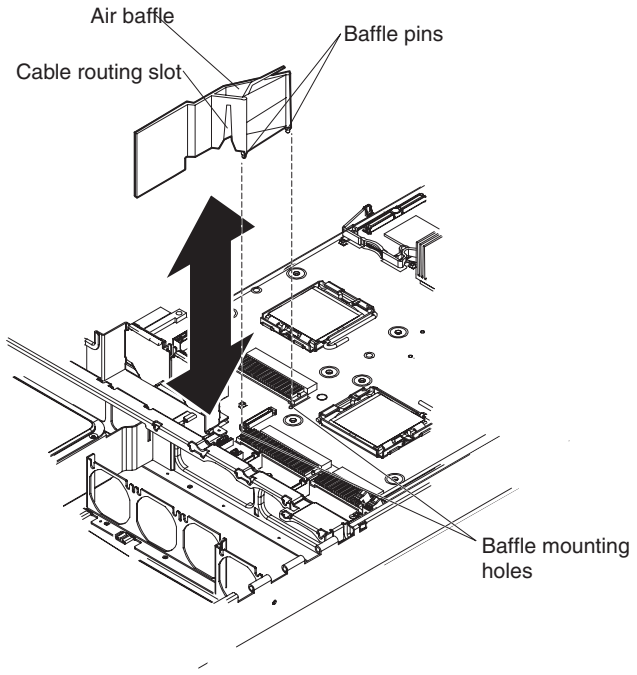
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
3. Open the fan door.
4. Remove the CD-RW/DVD drive (see “Removing the CD-RW/DVD drive” on page 107).



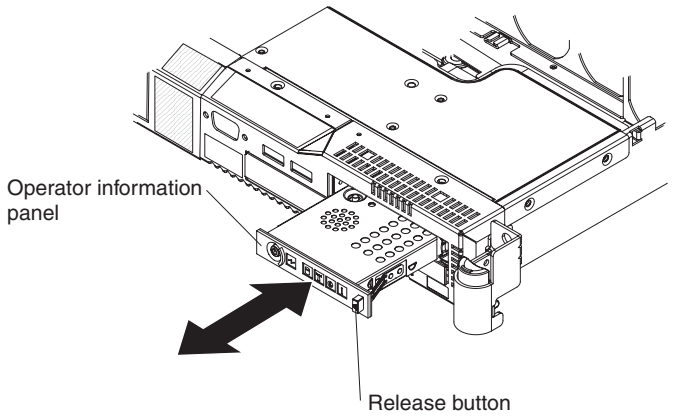
5. Slide the CD-RW cable retainer away from the interposer card.



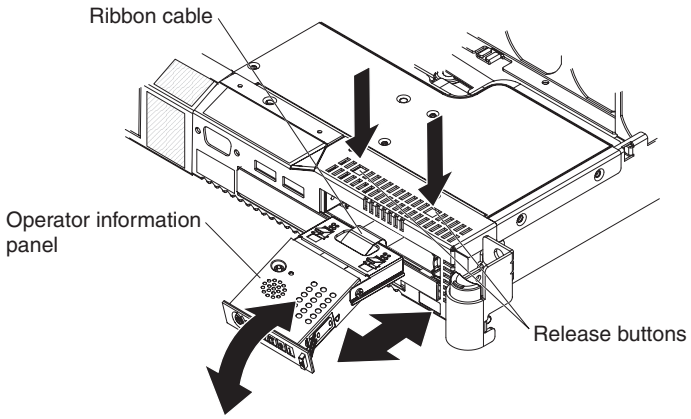
6. Remove the mounting screw from the interposer card and disconnect the CD-RW cable; then, remove the interposer card.
7. Remove fan 3.



8. Remove the air baffle.
9. Disconnect the video cable **1**, USB cable **2**, CD-RW cable **3**, and the lightpath cable **4** from the system board.



10. Press the release button on the front of the operator information panel and slide the assembly out of the server.

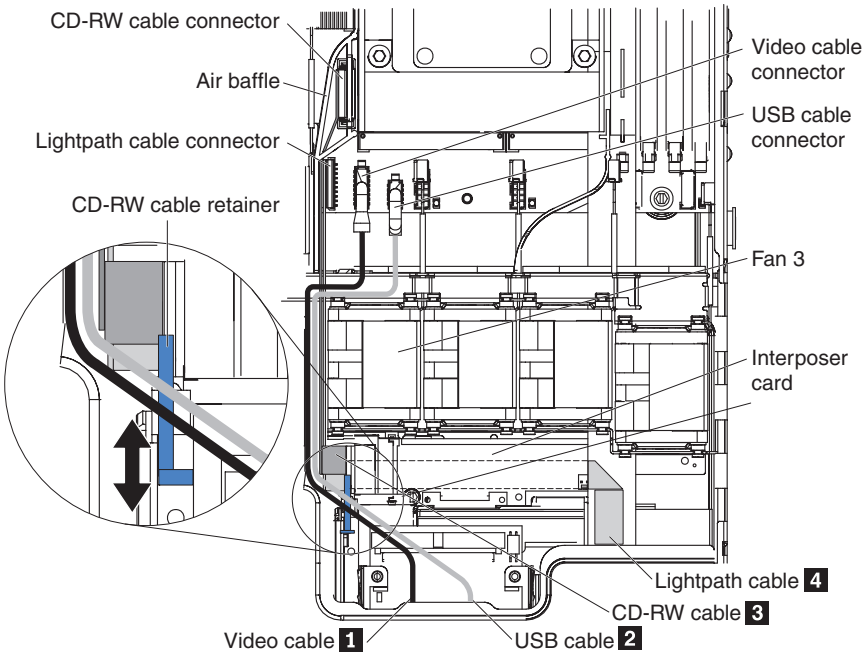


11. Press the release buttons on the top of the server and slide the operator information panel assembly rails out of the server as far as it will go.
12. Pull the panel away from the rails and carefully pull the attached lightpath ribbon cable out of the server.
13. If you are instructed to return the operator information panel assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

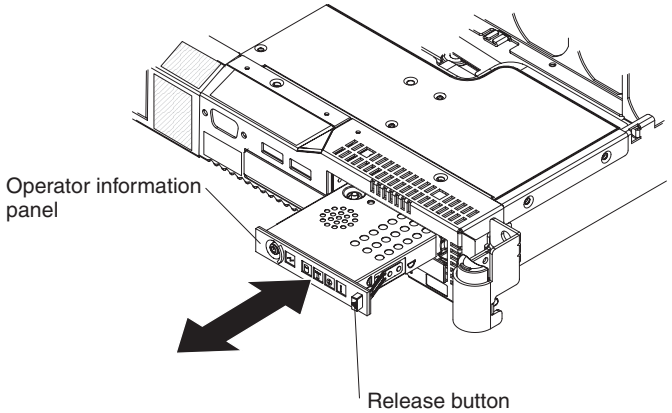
Installing the operator information panel assembly

To install the operator information panel, complete the following steps.

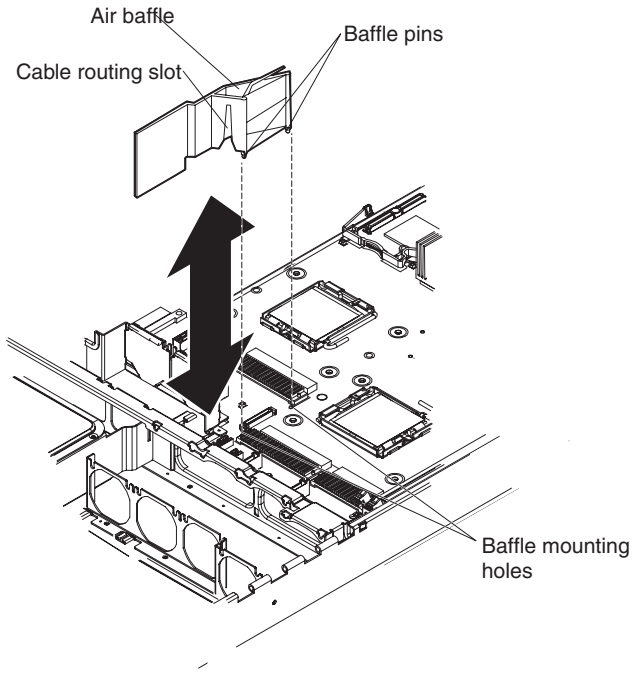
1. Read the safety information that begins on page vii and “Installation guidelines” on page 95



2. From the front of the server, thread the lightpath ribbon cable through the panel housing in the server; then, carefully route and connect the ribbon cable to the lightpath cable connector on the system board.



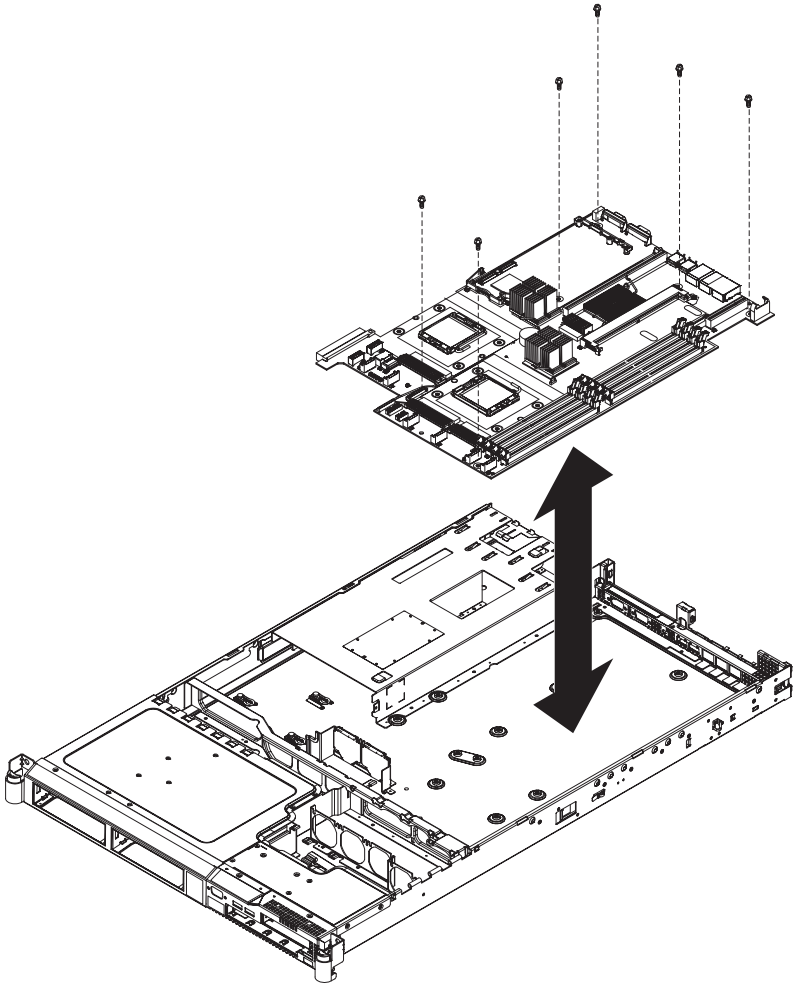
3. Slide the operator information panel into the server until it latches in place with a click.
4. Reconnect the CD-RW cable **3**, the USB cable **2**, and the video cable **1** to the system board.



5. Reinstall the air baffle into the system board.
6. Reinstall fan 3.
7. Connect the CD-RW cable to the interposer card; then, mount the card to the server with the screw that you removed.
8. Slide the CD-RW cable retainer toward the interposer card, so that it locks the CD-RW connector in place against the card.
9. Install the CD-RW/DVD drive (see “Removing the CD-RW/DVD drive” on page 107).
10. Close the fan door.
11. Install the cover (see “Installing the cover” on page 98).
12. Slide the server into the rack.
13. Reconnect the power cords and any cables that were removed.
14. Turn on the peripheral devices and the server.

Removing the system board

To remove the system board, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Turn off the server and any attached devices.

   Note: When replacing the system board, you must either update the server with the latest firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image.
3. Turn off the peripheral devices and disconnect all power cords; then, remove the cover (see “Removing the cover” on page 98).
4. Remove all riser card assemblies and adapters, including the Remote Supervisor Adapter II SlimLine, if one is installed (see “Removing an adapter” on page 102).
5. Remove the ServeRAID controller, if one is installed. If a RAID controller battery is installed, unmount it from the server, but do not disconnect it from the controller.

   Attention: Do not disconnect the RAID controller battery. Doing so could result in the loss of data that may be cached in the RAID controller.
6. Disconnect all cables from the system board. Make a list of each cable as you disconnect it; you can then use this as a checklist during system board installation.

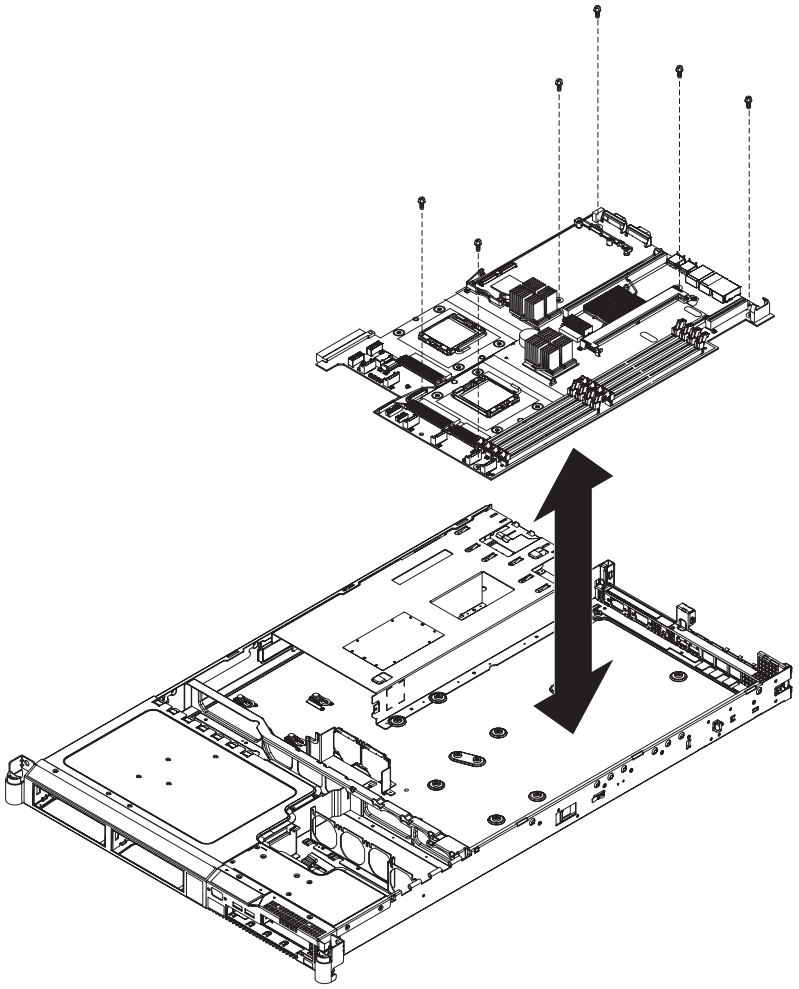
7. Remove all heat sinks and microprocessors, and set them aside on a static-protective surface for reinstallation (see “Installing a microprocessor” on page 138).
8. Remove the memory modules and set them aside on a static-protective surface for reinstallation (see “Installing a memory module” on page 110).

   Note: Make a note of the location of each DIMM as you remove it, so that you can later reinstall it in the same socket.
9. Remove the two air baffles from the system board. See “Removing the air baffle” on page 99.
10. Disconnect the power-supply backplane; then, slide it to the side and set it out of the way (see “Removing the power-supply backplane” on page 135).
11. Remove the six screws on the system board that secure the system board to the chassis.
12. Remove the four hex standoff screws from the serial connector and the video connector at the rear of the server.
13. Lift the system board slightly so that it disengages from the locator pin.
14. Slide the system board slightly toward the front of the server.
15. Lift up the left side of the system board.
16. Lift the rest of the system board and carefully remove it from the server, being careful not to disturb any surrounding components.

Installing the system board

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

To reinstall the system board, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 95
2. Align the system board with the chassis and replace the six screws that you removed.
3. Replace the microprocessor and microprocessor heat sink (see “Installing a microprocessor” on page 138).
4. Reconnect to the system board the cables that you disconnected in step 6 of “Removing the system board” on page 144.
5. Replace the RAID controller, if present (see “Installing the RAID controller” on page 117).
6. Replace the DIMMs (see “Installing a memory module” on page 110).
7. Replace the riser-card assemblies and adapters, if any were installed.
8. Replace the four jack screws connected to the video connector and the serial connector at the rear of the server.
9. Install the cover (see “Installing the cover” on page 98).
10. Slide the server into the rack.
11. Reconnect the power cords and any cables that were removed.
12. Turn on the peripheral devices and the server.

Important: Perform the following updates:

- Either update the server with the latest RAID firmware or restore the pre-existing firmware from a diskette or CD image.
- Update the UUID (see “Updating the UUID” on page 156).
- Update the DMI/SMBIOS (see “Updating the DMI/SMBIOS data” on page 156).

Chapter 5. Configuration information and instructions

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

Updating the firmware

The firmware in the server is periodically updated and is available for download on the Web. Go to http://www.ibm.com/servers/eserver/support/xseries/index.html to check for the latest level of firmware, such as BIOS code, vital product data (VPD) code, device drivers, and service processor firmware.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or restore the pre-existing firmware from a diskette or CD image.

- BIOS code is stored in ROM on the system board.
- The diagnostic programs are stored in ROM on the system board.
- BMC firmware is stored in ROM on the Baseboard Management Controller on the system board.
- Ethernet firmware is stored in ROM on the Ethernet controller.
- ServeRAID firmware is stored in ROM on the ServeRAID adapter.
- SATA firmware (simple-swap models) is stored in ROM on the integrated SATA controller.
- SAS/SATA firmware (hot-swap models) is stored in ROM on the SAS/SATA controller on the system board.
- Major components contain vital product data (VPD) code. You can select to update the VPD code during the BIOS code update procedure.

Configuring the server

The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are specifically designed for your IBM server. Use this CD during the initial installation of the server to configure basic hardware features and to simplify the operating-system installation.

In addition to the *ServerGuide Setup and Installation* CD, you can use the following configuration programs to customize the server hardware:

- Configuration/Setup Utility program
- SAS/SATA Configuration Utility program
- Adaptec HostRAID configuration programs

For more information about these programs, see “Configuring the server” in the *User’s Guide* on the IBM *System x Documentation* CD.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD contains a setup and installation program that is designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

If a later version of the ServerGuide program is available, you can download a free image of the *ServerGuide Setup and Installation* CD. To download the image, go to the IBM ServerGuide Web page at http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html.

The ServerGuide program has the following features:

- An easy-to-use interface
- Diskette-free setup, and configuration programs that are based on detected hardware
- ServeRAID Manager program, which configures your ServeRAID adapter
- Device drivers that are provided for your server model and detected hardware
- Operating-system partition size and file-system type that are selectable during setup

ServerGuide features

Features and functions can vary slightly with different versions of the ServerGuide program. To learn more about the version that you have, start the *ServerGuide Setup and Installation* CD and view the online overview. Not all features are supported on all server models.

The ServerGuide program requires a supported IBM server with an enabled startable (bootable) CD drive. In addition to the *ServerGuide Setup and Installation* CD, you must have your operating-system CD to install the operating system.

The ServerGuide program performs the following tasks:

- Sets system date and time
- Detects the RAID adapter or controller and runs the SAS RAID configuration program
- Checks the microcode (firmware) levels of a ServeRAID adapter and determines whether a later level is available from the CD
- Detects installed hardware options and provides updated device drivers for most adapters and devices
- Provides diskette-free installation for supported Windows® operating systems
- Includes an online readme file with links to tips for your hardware and operating-system installation

Setup and configuration overview

When you use the *ServerGuide Setup and Installation* CD, you do not need setup diskettes. You can use the CD to configure any supported IBM server model. The setup program provides a list of tasks that are required to set up your server model. On a server with a ServeRAID adapter or SAS/SATA controller with RAID capabilities, you can run the SAS RAID configuration program to create logical drives.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

When you start the *ServerGuide Setup and Installation* CD, the program prompts you to complete the following tasks:

- Select your language.
- Select your keyboard layout and country.
- View the overview to learn about ServerGuide features.
- View the readme file to review installation tips for your operating system and adapter.

- Start the operating-system installation. You will need your operating-system CD.

Typical operating-system installation

The ServerGuide program can reduce the time it takes to install an operating system. It provides the device drivers that are required for your hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)
2. The ServerGuide program stores information about the server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.
3. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.
4. The ServerGuide program prompts you to insert your operating-system CD and restart the server. At this point, the installation program for the operating system takes control to complete the installation.

Installing your operating system without ServerGuide

If you have already configured the server hardware and you decide not to use the ServerGuide program to install your operating system, complete the following steps to download the latest operating-system installation instructions from the IBM Web site.

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 `System x3550`, and click **Search**.
3. Select the installation instructions for your operating system.

Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is part of the BIOS. You can use it to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords
- Set and change the startup characteristics of the server and the order of startup devices (startup-drive sequence)
- Set and change settings for advanced hardware features
- View and clear the error log
- Change interrupt request (IRQ) settings
- Enable USB keyboard and mouse support
- Configure BMC features such as IP settings and userids
- Configure Remote Supervisor Adapter II SlimLine features, such as IP address and DHCP settings

- Resolve configuration conflicts

Go to http://www.ibm.com/servers/eserver/support/xseries/index.html to check for the latest version of the BIOS code.

Starting the Configuration/Setup Utility program

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

1. Turn on the server.
2. When the message `Press F1 for Setup` appears, press F1. If an administrator password has been set, you must type the administrator password to access the full Configuration/Setup Utility menu.
3. Follow the instructions on the screen.

See the *User's Guide* on the IBM *System x Documentation* CD for more detailed information about the Configuration/Setup Utility program.

Configuring the 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 ports in the server support 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 Ethernet controller, see the *Broadcom NetXtreme Gigabit Ethernet Software CD* that comes with the server. For updated information about configuring the controller, see http://www.ibm.com/servers/eserver/support/xseries/index.html.

Configuring hot-swap SAS or hot-swap SATA RAID

Use the IBM ServeRAID Configuration Utility program or ServeRAID Manager to configure and manage hot-swap SAS or hot-swap SATA redundant array of independent disks (RAID). Be sure to use these programs as described in this document.

- Use the IBM ServeRAID Configuration Utility program to:
  - Perform a low-level format on a hard disk drive
  - View or change IDs for some attached devices
  - Set protocol parameters on hard disk drives
- Use ServeRAID Manager to:
  - Configure arrays
  - View the RAID configuration and associated devices
  - Monitor operation of the RAID controller

Consider the following information when using the IBM ServeRAID Configuration Utility program or ServeRAID Manager to configure and manage arrays:

- The ServeRAID-8k-l SAS controller that comes with the server supports only RAID level-0 and RAID level-1. Servers that come with four 2.5-inch hot-swap

SAS drives also support RAID level-10. You can replace the ServeRAID-8k-l SAS controller with a ServeRAID-8k SAS controller that supports additional RAID levels.

- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the ServeRAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- Do not include SAS and SATA drives in the same array.
- To update the firmware and BIOS code for an optional ServeRAID controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.

Using the IBM ServeRAID Configuration Utility program

Use the IBM ServeRAID Configuration Utility program to perform the following tasks:

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

Starting the IBM ServeRAID Configuration Utility program: To start the IBM ServeRAID Configuration Utility program, complete the following steps:

1. Turn on the server.
2. When the prompt `<<< Press <CTRL><A> for IBM ServeRAID Configuration Utility! >>>` appears, press Ctrl+A.
3. To select a choice from the menu, use the arrow keys.
4. Use the arrow keys to select the channel for which you want to change settings.
5. To change the settings of the selected items, follow the instructions on the screen. Be sure to press Enter to save your changes.

IBM ServeRAID Configuration Utility menu choices: The following choices are on the IBM ServeRAID Configuration Utility menu:

- **Array Configuration Utility**

  Select this choice to create, manage, or delete arrays, or to initialize drives.
- **SerialSelect Utility**

  Select this choice to configure the controller interface definitions or to configure the physical transfer and SAS address of the selected drive.
- **Disk Utilities**

  Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

Using ServeRAID Manager

Use ServeRAID Manager, which is on the *IBM ServeRAID Manager Application* CD, to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- Erase all data from a hard disk drive and return the disk to the factory-default settings
- View the RAID configuration and associated devices
- Monitor the operation of the RAID controller

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the RAID controller and perform an initial RAID configuration on the server, you must run ServeRAID Manager in Startable CD mode, as described in the instructions in this section.

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

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

To run ServeRAID Manager in Startable CD mode, turn on the server; then, insert the CD into the CD-RW/DVD drive. If ServeRAID Manager detects an unconfigured controller and ready drives, the Configuration wizard starts.

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

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

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click Next.
4. In the “Configuration summary” window, review the information. To change the configuration, click **Modify arrays**.
5. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
7. Restart the server.

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

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**.
4. In the “Create arrays” window, from the list of ready drives, select the drives that you want to group into the array.
5. Click the (Add selected drives) icon to add the drives to the array.
6. If you want to configure a hot-spare drive, complete the following steps:
   a. Click the **Spares** tab.

b. Select the physical drive that you want to designate as the hot-spare drive, and click the (Add selected drives) icon.

7. Click **Next**.
8. Review the information in the “Configuration summary” window. To change the configuration, click **Back**.
9. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
10. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
11. Restart the server.

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

Configuring simple-swap SATA RAID

Important: HostRAID is not supported on the SCO 6.0 and UnixWare 7.14 operating systems.

Use the Adaptec HostRAID Configuration Utility program to add RAID level-0 and level-1 functionality to the integrated Serial ATA controller (simple-swap SATA models). Be sure to use this program as described in this document. Use this program to perform the following tasks:

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

When you are using the Adaptec RAID Configuration Utility program to configure and manage simple-swap SATA arrays, consider the following information:

- The integrated Serial ATA controller with integrated SATA RAID (simple-swap SATA models) supports RAID level-0 and level-1 with the option of having a hot-spare drive.
- You cannot use the *ServerGuide Setup and Installation* CD to configure the integrated Serial ATA controller with integrated RAID.
- Hard disk drive capacities affect how you create arrays. Drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.

Using the Adaptec RAID Configuration Utility program

Use the Array Configuration Utility to add RAID level-0 and level-1 functionality to the integrated Serial ATA (SATA) controller. This utility is a part of the BIOS code. For additional information about using the Adaptec RAID Configuration Utility program, see the documentation on the *Adaptec HostRAID Support* CD. If this CD did not come with the server, you can download it from http://www.ibm.com/support/.

Using the SATA HostRAID feature: The instructions in this section are for using the Array Configuration Utility program to access and perform an initial RAID level-1 configuration.

For additional information about using the Array Configuration Utility program to create, configure, and manage arrays, see the documentation on the *Adaptec HostRAID Support* CD.

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

1. Turn on the server.
2. When the prompt `Press <CTRL><<A> for Adaptec RAID Configuration Utility` appears, press Ctrl+A.
3. Select **Array Configuration Utility**.
4. Select **Create Array**.
5. From the list of ready drives, select the two drives that you want to group into the array.
6. When you are prompted to select the RAID level, select **RAID-1**.
7. (Optional) Type an identifier for the array.
8. When you are prompted for the array build method, select **Quick Int**.
9. Follow the instructions on the screen to complete the configuration, and select **Done** to exit.
10. Restart the server.

Viewing the configuration: To view information about the SATA controller, complete the following steps:

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

Updating the UUID

The Universal Unique Identifier (UUID) must be updated when the system board is replaced. To update the UUID, complete the following steps:

1. Copy the UUID utility (uuid.exe) from the BIOS flash diskette to a DOS bootable diskette.
2. Insert the diskette into a diskette drive that is connected to the server.
3. Restart the server from the diskette.
4. At the a:\ prompt, type `UUID /wr`, and press Enter. The utility generates a random identifier.
5. Restart the server.

Updating the DMI/SMBIOS data

The Desktop Management Interface (DMI) must be updated when the system board is replaced. To update the DMI, complete the following steps:

1. Copy the DMI/SMBIOS utility (extrmdmi`.exe`) from the BIOS flash diskette to a DOS bootable diskette.
2. Insert the diskette into a diskette drive that is connected to the server.

3. Restart the server from the diskette.
4. At the a:\ prompt, type *extrmdmi.exe*, and press Enter.
5. To change the machine type and model number, type `mtm` *xxxxyyy* where `xxxx` is the model type and *yyy* is the model number; then, press Enter.
6. To change the serial number, type `sn` *zzzzzzz* where *zzzzzzz* is the serial number; then, press Enter.
7. To change the asset tag, type `asset` *aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa* where *aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa* is the asset tag number; then, press Enter.
8. Restart the server.

Appendix A. Getting help and technical assistance

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

Before you call

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

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

  Note: For some IntelliStation models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.
- Go to the IBM support Web site at http://www.ibm.com/servers/eserver/support/xseries/index.html to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

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

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

Appendix B. Notices

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

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

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

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

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

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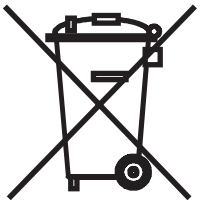

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In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these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

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Notice to Customers

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