



@server

xSeries 455

User's Guide





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User's Guide

SC88-P919-60

Note: Before using this information and the product it supports, read the general information in Appendix A, "IBM Statement of Limited Warranty Z125-4753-07 11/2002", on page 39 and Appendix B, "Notices", on page 55.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

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

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

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

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

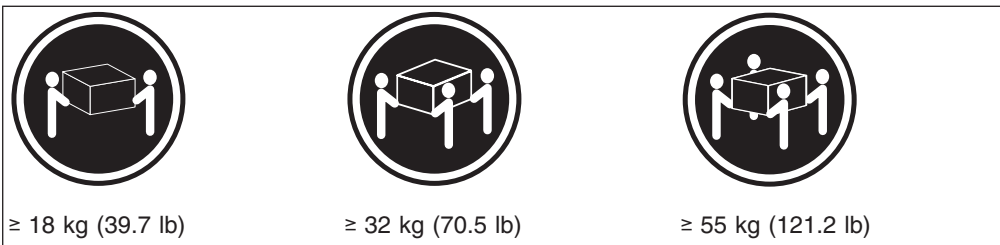


DANGER

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

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

Statement 4:

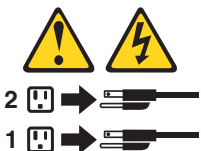


CAUTION:
Use safe practices when lifting.

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 10:



CAUTION:

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



>82 kg (180 lb)

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. Introducing the IBM xSeries 455 server

Your IBM® @server™ xSeries™ 455 Type 8855 is a four U-high¹ rack model server for high-availability 64-bit database processing.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of your server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

Your server contains IBM Enterprise X-Architecture™ technologies, which help increase performance and reliability. For more information, see “What your server offers” on page 3 and “Reliability, availability, and serviceability features” on page 4.

You can obtain up-to-date information about your server and other IBM server products at <http://www.ibm.com/eserver/xseries/>.

For service, assistance, or additional information on the World Wide Web, see Chapter 3, “Getting help and technical assistance”, on page 37.

Related publications

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

- *Installation Guide*

This printed publication contains instructions for setting up your server and basic instructions for installing some options.

- *Option Installation Guide*

This publication is in Portable Document Format (PDF) on the IBM *xSeries Documentation* CD. It contains detailed instructions for installing, removing, and connecting optional devices that your server supports.

- *Safety Information*

This publication is in PDF on the IBM *xSeries 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* book.

- *Rack Installation Instructions*

This printed publication contains instructions for installing your server in a rack.

- *Hardware Maintenance Manual and Troubleshooting Guide*

This publication is in PDF on the IBM *xSeries Documentation* CD. It contains information to help you solve problems yourself, and it contains information for service technicians.

Depending on your server model, additional publications might be included on the IBM *xSeries Documentation* CD.

Your server might have features that are not described in the documentation that you received with the server. The documentation might be updated occasionally to

1. Racks are marked in vertical increments of 1.75 inches each. Each increment is referred to as a unit, or “U.” A one-U-high device is 1.75 inches tall.

include information about those features, or technical updates might be available to provide additional information that is not included in your server documentation. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Learn** section, click **Online publications**.
3. On the "Online publications" page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **xSeries 455**.
5. Click **Display documents**.

Notices and statements used in this book

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

The following notices and statements are used in the documentation:

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

Features and specifications

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

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Intel® Itanium 2 1.3 MHz or higher, depending on server model • 3 MB (minimum) Level-3 cache • 200 MHz front-side bus (FSB), at two data transfers per cycle, yielding a 400 MHz system bus (minimum) • Support for up to four microprocessors • XcelL4™ Server Accelerator Cache: 64 MB <p>Note: Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors in your server.</p> <p>Active Memory™:</p> <ul style="list-style-type: none"> • Minimum: 1 GB • Maximum: 56 GB • Type: 2-way interleaved PC2100, ECC DDR SDRAM, registered DIMMs only • Supports 512 MB, 1 GB, and 2 GB dual inline memory modules (DIMMs) <p>Drives standard:</p> <p>DVD/CD-RW: IDE</p> <p>Expansion bays:</p> <ul style="list-style-type: none"> • Two removable media bays (one DVD/CD-RW preinstalled) • Supports up to two internal Ultra320 SCSI hard disk drives <p>Active™ PCI-X expansion slots:</p> <p>Six 64-bit Active PCI-X expansion slots:</p> <ul style="list-style-type: none"> • Two 66 MHz PCI-X slots • Two 100 MHz PCI-X slots • Two 133 MHz PCI-X slots <p>Cooling:</p> <p>Four hot-swap fans</p> <ul style="list-style-type: none"> • Two 150 mm x 51 mm fans • Two 150 mm x 38 mm fans <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Declared sound power, idle: 6.5 bels • Declared sound power, operating: 6.5 bels • Bystander sound pressure, idle: 49 dBA • Bystander sound pressure, operating: 49 dBA 	<p>Power supply:</p> <p>Two power supplies: 550 watts at 100-127 V ac or 1050 watts at 200-240 V ac (hot-swappable and redundant at 200-240 V ac only)</p> <p>Video:</p> <ul style="list-style-type: none"> • Integrated ATI RageXL video • PCI bus interface • Compatible with SVGA • 8 MB SDRAM video memory <p>Size (4 U):</p> <ul style="list-style-type: none"> • Height: 17.5 cm (6.9 inches, 4 U) • Depth: 71.3 cm (28.1 inches) • Width: 44 cm (17.3 inches) • Maximum weight: 54.3 kg (120 lb), depending on your configuration <p>Integrated functions:</p> <ul style="list-style-type: none"> • Broadcom 5704 10/100/1000 dual port Ethernet controller • Light path diagnostics • One external and one internal Ultra320 SCSI port (dual-channel integrated controller with RAID capabilities) • Remote Supervisor Adapter (service processor) <ul style="list-style-type: none"> – ASM interconnect (peer-to-peer) port – Ethernet port – Serial port • IDE controller • RXE Management Port • RXE Expansion Ports • USB ports • Serial port • SMP Expansion Ports • Wake on LAN® <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Server on: 10° to 35°C (50.0° to 95.0°F). Altitude: 0 to 914 m (2998.7 ft) – Server on: 10° to 32°C (50.0° to 89.6°F). Altitude: 0 to 2133 m (6998.0 ft) – Server off: -40° to 60°C (-104° to 140°F). Maximum altitude: 2133 m (6998.0 ft) • Humidity: <ul style="list-style-type: none"> – Server on: 8% to 80% – Server off: 5% to 100% 	<p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour</p> <ul style="list-style-type: none"> • Minimum configuration: 854 Btu (250 watts) • Maximum configuration: 2646 Btu (775 watts) <p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50-60 Hz) required • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 100 V ac – Maximum: 127 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 200 V ac – Maximum: 240 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.250 kVA – Maximum: 1.3 kVA <p>Notes:</p> <ol style="list-style-type: none"> 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.
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What your server offers

Your server includes the following features and technologies:

- **IBM Enterprise X-Architecture technology**

Enterprise X-Architecture technology combines proven, innovative IBM designs to make your Intel-processor-based server powerful, scalable, and reliable. For more information, go to <http://www.ibm.com/pc/us/eserver/xseries/xarchitecture/enterprise/index.html>

- **Active Memory**

The Active Memory feature improves the reliability of memory through hot-swap memory, memory mirroring, memory scrubbing, and the Memory ProteXion feature. For more information, see “Active Memory” on page 5.

– **Large system-memory capacity**

The memory bus supports up to 56 GB of system memory. The memory controller provides error code correcting (ECC) support for up to 28 industry-standard PC2100, 2.5 V, 184-pin, 133 megahertz (MHz), registered, double data rate (DDR), synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

– **Xcel4™ Server Accelerator Cache**

The Xcel4 Server Accelerator Cache provides 64 MB of external Level-4 cache, which increases effective memory bandwidth.

• **Integrated network support**

Your server comes with an integrated Broadcom Gigabit Ethernet controller, which supports connection to a 10-Mbps, 100-Mbps, or 1000-Mbps network. For more information, see “Configuring the Gigabit Ethernet controller” on page 33.

• **Light path diagnostics**

Light path diagnostics provides LEDs to help you isolate problems. For more information, see the section about light path diagnostics in the *Installation Guide*.

• **Scalable partitions**

Your server is scalable and can be connected to multiple servers so that you can share resources between servers.

• **Systems-management capabilities**

The server comes with a Remote Supervisor Adapter installed in a dedicated connector. This adapter, when used with the system-management software that comes with the server, enables you to manage the functions of the server locally and remotely. The Remote Supervisor Adapter also provides system monitoring, event recording, and dial-out alert capability.

Reliability, availability, and serviceability features

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

Your server has the following RAS features:

- Active Memory
- Active PCI-X (hot-plug) adapter slots
- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI) features
- Advanced memory ECC, including the Memory ProteXion feature and multiple Chipkill™ capability
- Automatic error retry or recovery
- Auto-ranging power supplies
- Automatic restart
- Built-in, menu-driven Configuration/Setup Utility program and diagnostic programs
- Built-in monitoring for fan, power, temperature, voltage, and power-supply redundancy
- Customer-upgradeable system firmware
- Diagnostic support of Ethernet controller provided on the *Resource CD*
- Error codes and messages
- Error correcting code (ECC) protection on the L3 and Xcel4 cache

- Failover Ethernet support
- Front-side bus (FSB) ECC protected
- Hot-swap hard disk drives
- Hot-swap memory
- Light path diagnostics
- Memory mirroring
- Parity checking on the SCSI buses
- Power-on self-test (POST)
- Processor serial number access
- Read-only memory (ROM) checksums
- Remote Supervisor Adapter to enable remote server management
- SDRAM with serial presence detect (SPD) and vital product data (VPD)
- Standard cable presence detection
- Standby voltage for system-management features and monitoring
- System-error logging
- Vital product data (VPD) (includes information stored in nonvolatile memory for easier remote viewing)
- Wake on LAN capability

Active Memory

Active Memory is an IBM feature that improves the reliability of memory through hot-swap memory, memory mirroring, memory scrubbing, and the Memory ProteXion feature.

Memory scrubbing and Memory ProteXion

Memory scrubbing tests the memory at regular intervals to detect and report recoverable memory ECC errors before they can cause server outages.

If the recoverable ECC error rate exceeds the system-defined threshold, the Memory ProteXion feature replaces the failing bit positions, maintaining reliable operation. If the recoverable ECC error rate exceeds the threshold, light path diagnostics LEDs are lit to indicate the failing DIMM.

You do not have to enable memory mirroring to use memory scrubbing and the Memory ProteXion feature.

Memory mirroring

Memory mirroring stores data in memory port 1 and memory port 2 simultaneously. To support memory mirroring, you must install identical dual inline memory modules (DIMMs) in memory port 1 and memory port 2. For more information, see the section about installing memory modules in the *Option Installation Guide* on the IBM *xSeries Documentation CD*.

To enable memory mirroring through the Configuration/Setup Utility program, select **Advanced Setup** from the main menu, and select **Memory Configuration**. For more information about using the Configuration/Setup Utility program, see Chapter 2, “Configuring the server”, on page 11.

Hot-swap memory

You can replace a failed DIMM while the server is turned on, provided that you have enabled memory mirroring and that you have installed all DIMMs in the sequence to support memory mirroring.

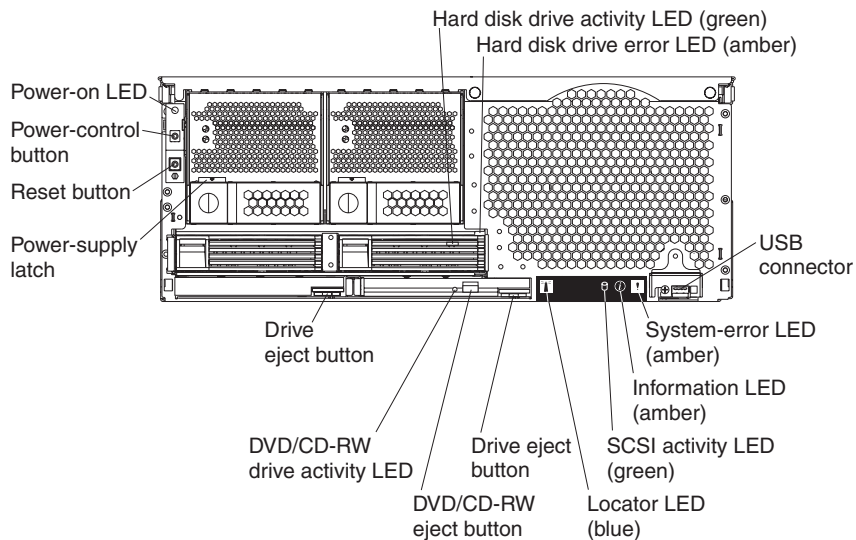
If a problem with a DIMM is detected, light path diagnostics LEDs are lit to indicate the failing DIMM. When this occurs, identify the defective DIMM, and then remove and replace the DIMM. For more information, see the information about installing memory modules in the *Option Installation Guide* on the IBM xSeries Documentation CD.

Server controls, LEDs, and power

This section describes the controls and light-emitting diodes (LEDs) on the front and rear of your server. It also describes how to turn the server on and off.

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the server.



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.

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 or the server might have malfunctioned. To remove all electrical power from the server, you must disconnect the power cords from the electrical outlets.

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

Hard disk drive error LED: On some server models, each hot-swap hard disk drive has an error LED. The interpretation of a flashing error LED depends on the SCSI controller connected to the hot-swap drive. When the drive is connected to the integrated SCSI controller with RAID capabilities, a flashing error LED indicates that the drive is a secondary drive in a mirrored pair and the drive is being synchronized.

USB connector: Connect a USB device to this connector.

System-error LED: When this LED is lit, it indicates a system error has occurred.

Information LED: When this LED is lit, it indicates that information about a system error has been entered in the System Error log.

SCSI activity LED: When this LED is lit, it indicates that there is activity on the SCSI bus.

Locator LED: Use this LED to visually locate the server if it is in a location with numerous other servers.

In multi-node configurations, when this LED flashes during startup, it indicates that the server is the primary node. When this LED is lit during startup, it indicates that the server is a secondary node.

Drive eject button: Press this button to release the drive from the server.

DVD/CD-RW eject button: Press this button to release a DVD or CD from the drive.

DVD/CD-RW drive activity LED: When this LED is lit, it indicates that the DVD/CD-RW drive is in use.

Drive eject button: Press this button to release a drive from the server.

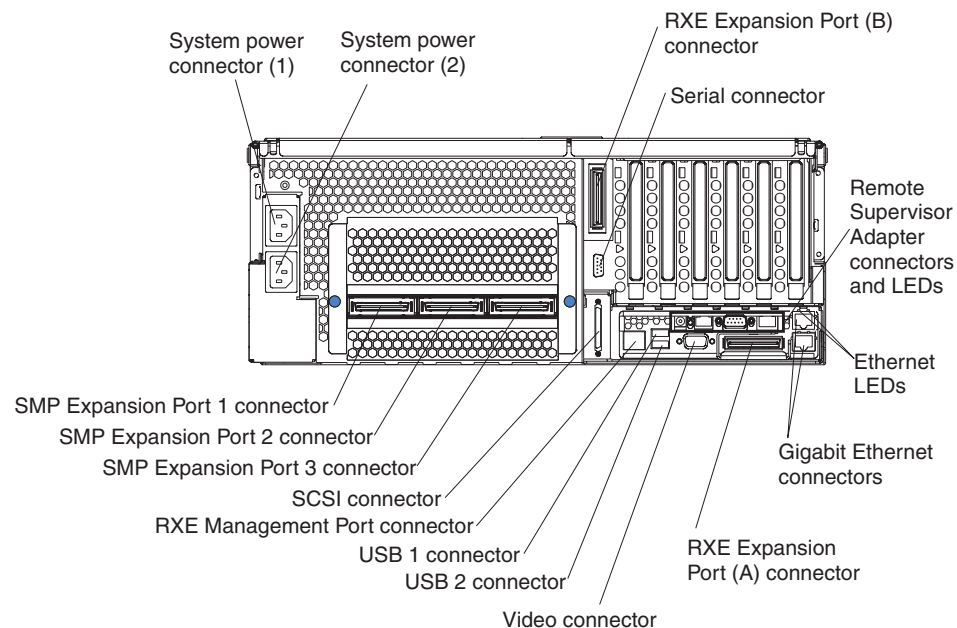
Power-supply latch: This latch secures the power supply in place.

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.

Power-control button: Press this button to turn the server on and off manually. A power-control-button shield comes with your server. You can install this disk-shaped shield to prevent the server from being turned off accidentally.

Rear view

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

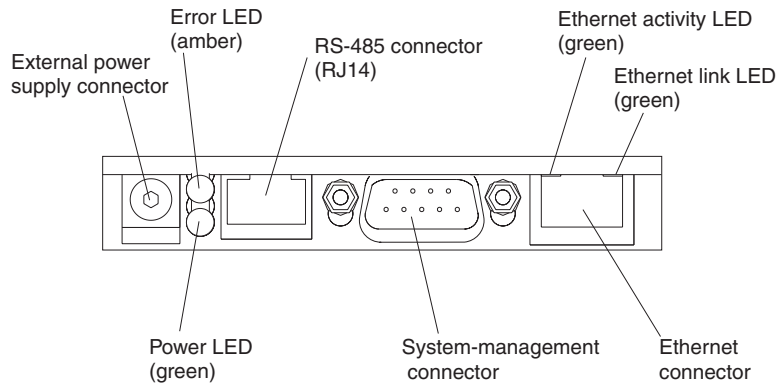


System power connectors (1 and 2): Connect the power cords to these two connectors to provide power to the server.

RXE Expansion Port (B) connector: Connect a remote I/O enclosure to this connector.

Serial connector: Connect the signal cable for a modem or other serial device to this connector.

Remote Supervisor Adapter connectors and LEDs: This group of connectors and LEDs on the back of the server are used for system management information and control.



- **External power supply connector:** This connector is not supported on this server.
- **Error LED:** When this amber LED is lit, it indicates an error on the Remote Supervisor Adapter.
- **ASM RS-485 connector (RJ-14):** Connect signal cables for managing expansion module resources to this connector.
- **Ethernet activity LED:** When this green LED flashes, it indicates that there is activity on the Ethernet LAN.
- **Ethernet link LED:** When this green LED is lit, it indicates that there is an active link connection.
- **Ethernet connection:** Connect Ethernet signal cables to this connector.
- **System-management connector:** Connect signal cables for modems or other serial devices to this connector.
- **Power LED:** This LED indicates the status of the power connection.

Ethernet LEDs: When these LEDs are amber, they indicate that there is activity on the Ethernet LAN. When these LEDs are green, they indicate that there is an active link connection on the Gigabit Ethernet controller.

Gigabit Ethernet connectors: Use these connectors to connect the server to a network.

RXE Expansion Port (A) connector: Connect a remote I/O enclosure to this connector.

Video connector: Connect a monitor to this connector.

USB 2 connector: Connect a USB device to this connector.

USB 1 connector: Connect a USB device to this connector.

RXE Management Port connector: Connect a remote I/O enclosure to this connector.

SCSI connector: Connect a SCSI device to this connector.

SMP Expansion Port 3 connector: Use this connector to connect the server to other servers and form multi-node configurations.

SMP Expansion Port 2 connector: Use this connector to connect the server to other servers and form multi-node configurations.

SMP Expansion Port 1 connector: Use this connector to connect the server to other servers and form multi-node configurations.

Server power features

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the service processor is shut down; however, the server can respond to requests from the service processor, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to ac power but is not turned on.

Turning on the server

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

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If ac power is present, the server can be turned on from the Remote Supervisor Adapter user interface.
- The Wake on LAN feature can turn on the server.

Notes:

1. The power supplies are hot-swappable and redundant only at 200-240 V ac.
2. Both power supplies must be connected to the power source for operation at 100-127 V ac.
3. During normal operation, both power supplies must be installed for proper operation.
4. While the server is powering up, the power-on LED on the front of the server is lit. When the server is connected to ac power but is not turned on, the power-on LED on the front of the server flashes.
5. When you press the power-control button on any server in a scalable partition, all servers in the scalable partition will be turned on. If the servers do not turn on when the power-control button is pressed, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

Turning off the server

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

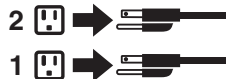
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:



CAUTION:

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



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

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- If the server is connected to an Advanced System Management interconnect network, the server can be turned off using the Remote Supervisor Adapter user interface.

Notes:

1. You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server. You can use this feature if the operating system stops functioning.
2. If you disconnect the server from the power source, wait approximately 15 seconds for the server to stop running before you open the cover. Watch for the power-on LED on the front of the server to stop flashing.
3. When you press the power-control button on any server in a scalable partition, all servers in the scalable partition will be turned off. If the servers do not turn off when the power-control button is pressed, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

Chapter 2. Configuring the server

The following configuration programs and capabilities come with your server:

- **Extensible Firmware Interface (EFI) Firmware Boot Manager**

Use the EFI Firmware Boot Manager to select a startup operating system, configure a variety of startup options, and access utility programs. See “Using the EFI Firmware Boot Manager”.

- **Configuration/Setup Utility program**

The Configuration/Setup Utility program is an EFI utility that comes with your server. Use it to enable memory mirroring, configure scalable partitions, set the date and time, and set passwords. For more information about using this utility program, see “Using the Configuration/Setup Utility program” on page 12.

Note: In a multi-node configuration, some options or settings are defined through the primary server, and others must be defined on the individual (secondary) servers. Make sure that options and settings on the secondary servers are correct before creating a scalable partition.

- **RAID configuration programs**

- **ServeRAID™ Manager**

The ServeRAID programs come with your server. If you are using the integrated SCSI controller with RAID capabilities as a RAID controller, you must use the ServeRAID Manager program to define and configure your disk-array subsystem *before* you install your operating system. See “Using the RAID configuration programs” on page 15 for more information.

Note: If your server model comes with an operating system installed, see the software documentation that comes with your server for configuration information.

- **LSI Logic Configuration Utility program**

Use the LSI Logic Configuration Utility program to configure the integrated SCSI controller with RAID capabilities and the devices that are attached to it. For information about using this utility program, see “Using the LSI Logic Configuration Utility program” on page 16.

- **Remote Supervisor Adapter configuration**

For information about setting up and cabling the Remote Supervisor Adapter for use in an Advanced System Management (ASM) network, see “Setting up the Remote Supervisor Adapter” on page 19.

- **Ethernet controller configuration**

For information about configuring the integrated Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 33.

- **Scalable-partition configuration**

For information about creating and removing scalable partitions, see “Configuring scalable partitions” on page 34.

Using the EFI Firmware Boot Manager

Use the EFI Firmware Boot Manager to select an operating system to start to, configure a variety of startup options, and access utility programs. The following choices are available from the EFI Firmware Boot Manager:

- **Boot Option Maintenance**

Select this choice and specify a variety of startup options. For example, define a startup option to be used for the next startup operation only.

- **Diagnostics**
Select this choice to access the system diagnostic programs.
- **EFI Shell**
Select this choice to access the EFI Shell.
- **Configuration/Setup**
Select this choice to access the Configuration/Setup Utility program.
- **Driver Setup**
Select this choice to configure device drivers. For example, access the LSI Logic Configuration Utility program.
- **Flash**
Select this choice to perform a flash update of the SAL/EFI firmware or the diagnostic programs.

Complete the following steps to access the EFI Firmware Boot Manager:

1. Turn on the server.
2. Follow the instructions on the screen.

Using the Configuration/Setup Utility program

Use the Configuration/Setup Utility program to:

- Enable memory mirroring
- Set the date and time
- Configure scalable partitions
- View configuration information
- Set and change passwords and Remote Control Security settings
- Set and change settings for advanced hardware features
- View and clear error logs

The following sections provide instructions for starting the Configuration/Setup Utility program and descriptions of the menu choices that are available.

Starting the Configuration/Setup Utility program

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

1. Turn on the server.

Note: In a multi-node configuration, some options or settings are defined through the primary server, and others must be defined on the individual (secondary) servers. Make sure that options and settings on the secondary servers are correct before creating a scalable partition.

2. From the EFI Firmware Boot Manager, select the Configuration/Setup Utility program.
3. Follow the instructions on the screen.

Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of the system abstraction layer/extensible firmware interface (SAL/EFI) code in your server, some menu choices might differ slightly from these descriptions.

- **System Summary**

Select this choice to display configuration information. This includes the type and speed of the microprocessor and the amount of memory that is installed.

- **System Information**

- **System Product Data**

Select this choice to view system information, such as the machine type and model, the server serial number, and the revision level, date, and build level of the SAL/EFI code, diagnostic code, and ASM adapter code.

- **System Card Data**

Select this choice to view identifying information about the PCI-X board, processor board, memory board, power supplies, DASD backplane, and power backplane.

- **Date and Time**

Select this choice to set the system date and time and to change the system time that is sent to the Remote Supervisor Adapter when the server is started.

The system time is in a 24-hour format (*hour.minute:second*). All fields are required.

- **System Security**

Select this choice to set or change the power-on or administrator password. See “Passwords” on page 15 for more information.

Note: In a multi-node configuration, security settings are defined through the primary server. If you bypass the multi-node configuration during startup or start the servers in a stand-alone configuration, you must define the security setting on each individual server.

The **Remote Control Security Settings menu** is in **System Security**. Use this menu to set the failed login threshold and the automatic lockout delay. You can also use this menu to save, change, or delete a remote-control password.

- **Advanced Setup**

Select this choice to change values for advanced hardware features, such as memory configuration, cache control, PCI configuration, system management settings, scalability port configuration, and service processor settings.

- **Memory Configuration**

Select this choice to manually enable a bank of four DIMMs used for memory mirroring and to enable memory mirroring.

If a memory error is detected during POST or memory configuration, the server can automatically disable the failing DIMM bank and continue operating with reduced memory capacity. After the problem is corrected, you must manually enable the DIMM bank. Use the arrow keys to highlight the bank that you want to enable. Press Enter to view detailed information about your selection; then, use the arrow keys to select **Enable**.

- **System Cache Control**

Select this choice to enable or disable the Xcel4 cache.

- **PCI Slot Information**

Select this choice to configure and view information about the PCI-X slots and devices in your server and those located in the remote expansion enclosure, if one is attached.

– **System Management Settings**

Select this choice to set the server to restart automatically after a nonmaskable interrupt (NMI) occurs. You can also enable the system to assign the memory mapped I/O (MMIO) above 4 GB.

– **Scalable Partition Settings**

Select this choice to view a summary of current scalable partition settings and to configure or delete partition settings.

Notes:

1. Partition settings are called partition descriptors in some IBM documentation.
2. See “Configuring scalable partitions” on page 34 for more information about creating, deleting, and configuring scalable partitions.

– **Service Processor Information**

Select this choice to view or change the service processor settings. For example, you can view or change the IP address or gateway address.

• **System Event and Error Log**

Select this choice to view or clear the System Error Log and enable or disable debug options. Use the debug options to define the severity level of messages viewable during POST.

– **View System Error Log**

Select this choice to view the System Error Log. The System Error Log contains all the system error and warning messages that the system has generated. You can use the arrow keys to move between pages in the System Error Log.

– **Clear System Error Log**

Select this choice to clear the System Error Log.

• **Save Settings**

Select this choice to save the changes you have made in the settings (except PCI-X Slot Information changes, Scalable Partition Settings changes, the date and time, and password settings).

• **Save Settings and Reboot**

Select this choice to save the changes you have made in the settings (except PCI-X Slot Information changes, Scalable Partition Settings changes, the date and time, and password settings) and restart the server.

• **Restore Settings**

Select this choice to cancel the changes you have made in the settings (except PCI-X Slot Information changes, the date and time, and password settings) and restore the previous settings.

• **Load Default Settings**

Select this choice to cancel the changes you have made in the settings and restore the factory settings (except PCI-X Slot Information changes, the date and time, and password settings).

• **Exit Setup**

Select this choice to exit from the Configuration/Setup Utility program, if you have not saved the changes you have made in the settings (except PCI-X Slot

Information changes, the date and time, and password settings). You are asked whether you want to save the changes or exit without saving them.

Passwords

After you select this choice, you can set a power-on password and an administrator password.

Note: In a multi-node configuration, security settings are defined through the primary server. If you bypass the multi-node configuration during startup or start the servers in a stand-alone configuration, you must define the security setting on each individual server.

Power-on password

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your power-on password. Keep a record of your password in a secure place. When a power-on password is set, POST cannot be completed until you type the password. If you forget the power-on password, you can regain access to the server in either of the following ways:

- Remove the battery and then reinstall it (see "Replacing the battery" in the *Option Installation Guide* on the IBM xSeries Documentation CD for more information).

Attention: Before changing any switch settings or moving any jumpers, turn off the server and peripheral devices, and disconnect all power cords and external cables.

- Move the jumper on J20 to positions 2 and 3; then, restart the server. This removes the power-on password. Move the jumper on J20 back to positions 1 and 2, restart the server, and start the Configuration/Setup Utility program to set the power-on password. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD for the location of the jumper.

Administrator password

Select this choice to set an administrator password. The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user. You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your power-on password. Keep a record of your password in a secure place.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace a system board.

Using the RAID configuration programs

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

- Use the LSI Logic Configuration Utility program to:
 - Perform a low-level format on a SCSI hard disk drive
 - View or change SCSI IDs for attached devices
 - Set SCSI protocol parameters on SCSI hard disk drives
- Use ServeRAID Manager to:
 - Configure arrays

- View your RAID configuration and associated devices
- Monitor operation of your RAID controllers

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

- The integrated SCSI controller with RAID capabilities in your server supports only RAID level 1.
- You must configure your SCSI controller with RAID capabilities before you install your operating system to use RAID level 1.
- If you install a different type of RAID adapter in your server, follow the configuration instructions in the documentation that comes with the adapter to view or change SCSI settings for attached devices.
- The *IBM ServeRAID-6M Controller RAMDrive Support* CD includes code you must install if you have installed a ServeRAID-6M controller and you plan to install Microsoft® Windows® Server 2003, Enterprise Edition (64-bit) on hard disk drives controlled by the ServeRAID-6M controller. Install the code *after* you have configured your RAID arrays. See the README file on the *IBM ServeRAID-6M Controller RAMDrive Support* CD for instructions.

Using the LSI Logic Configuration Utility program

Use the LSI Logic Configuration Utility program to:

- Perform a low-level format of a SCSI hard disk drive
- Set a SCSI device scan order
- View or change SCSI IDs for attached devices
- Create a mirrored pair of SCSI hard disk drives with or without a hot-spare drive
- Set SCSI protocol parameters on SCSI hard disk drives

The integrated SCSI controller with RAID capabilities supports redundant array of independent disks (RAID). You can use the LSI Logic Configuration Utility program to configure RAID level 1 for a single pair of attached devices. If you install a different type of RAID adapter, follow the configuration instructions in the documentation that comes with the adapter to view or change SCSI settings for attached devices.

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

Starting the LSI Logic Configuration Utility program

Complete the following steps to start the LSI Logic Configuration Utility program:

1. Turn on the server.
2. From the EFI Firmware Boot Manager, select **Driver setup**.
3. From the device driver menu, select the LSI Logic Ultra320 SCSI device driver.

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

Formatting a SCSI hard disk drive

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

Note: Before you format a SCSI hard disk, make sure that the disk is not part of a mirrored pair. From the list of adapters, select the controller (channel) for the

drive that you want to format. Select **Mirroring Properties** and make sure that the mirroring value for the drive is **None**.

Complete the following steps to format a drive:

1. From the list of adapters, select the controller (channel) for the drive that you want to format.
2. Select **Device Properties**.
3. Use the arrow keys (↑ and ↓) to highlight the drive that you want to format.
4. Use the arrow keys (← and →) or the End key to scroll to the right.
5. Select **Format**; then, press Enter to start the low-level formatting operation.

Creating a mirrored pair of SCSI hard disk drives

Complete the following steps to create a mirrored pair of SCSI hard disk drives:

1. From the list of adapters, select the controller (channel) for the drives that you want to mirror.
2. Select **Mirroring Properties**.
3. Use the arrow keys to highlight the first drive in the pair; then, press the Minus key to change the mirroring value to **Primary**.
4. Use the arrow keys to highlight the second drive in the pair; then, press the Minus key to change the mirroring value to **Secondary**.

Using ServeRAID Manager

Use ServeRAID Manager, which is on the *IBM ServeRAID Support CD*, to:

- Configure a redundant array of independent disks (RAID)
- View your RAID configuration and associated devices
- Monitor the operation of your RAID controllers

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the integrated SCSI controller with RAID capabilities and perform an initial RAID configuration on your server, you must run ServeRAID Manager in Startable CD mode, as described in the instructions in this section. If you install a different type of RAID adapter in your server, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

See the ServeRAID documentation on the *IBM ServeRAID Support CD* for additional information about RAID technology and instructions for using ServeRAID Manager to configure your integrated SCSI controller with RAID capabilities. 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**.

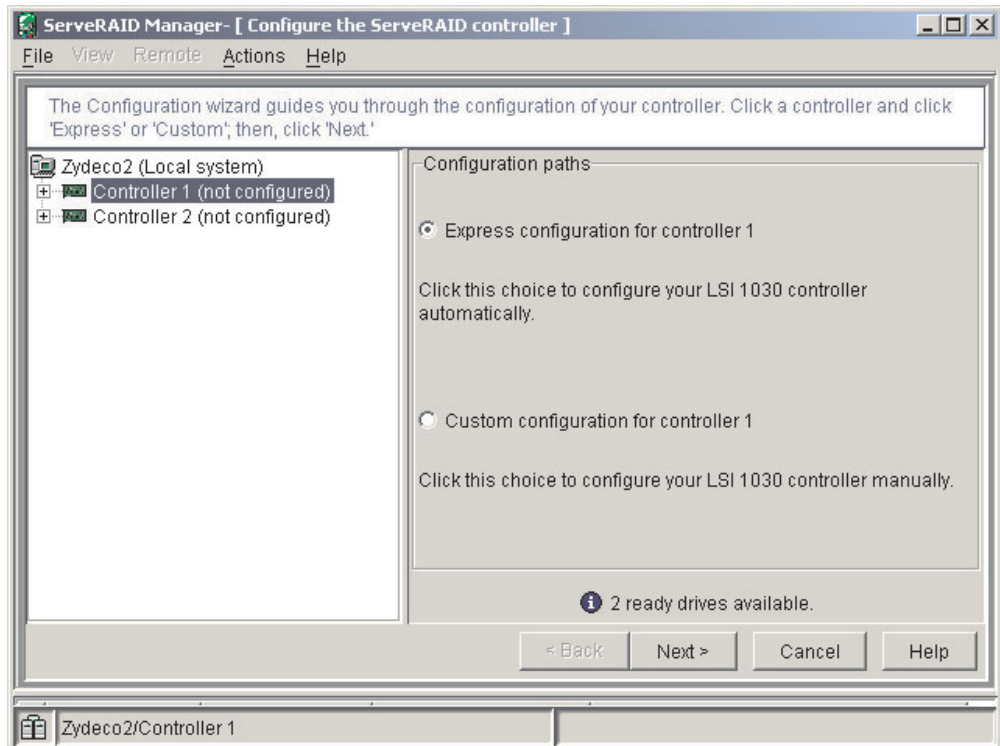
Configuring the controller

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

Complete the following steps to run ServeRAID Manager in Startable CD mode:

1. Make sure that the *IBM ServeRAID Support CD* is inserted in the drive.
2. Turn on the server.
3. Select **EFI Shell** from the EFI Firmware Boot Manager.

If ServeRAID Manager detects an unconfigured controller and ready drives, the Configuration wizard starts, and a window similar to that shown in the following illustration opens.




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

Using express configuration: Complete the following steps to use express configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click **Next**. The “Configuration summary” window opens.
4. Review the information in the “Configuration summary” window. To change the configuration, click **Modify arrays**.
5. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the CD-ROM drive.
7. If you have installed a ServeRAID-6M controller and you plan to install Microsoft Windows Server 2003, Enterprise Edition (64-bit) on hard disk drives controlled by the ServeRAID-6M controller, insert the *IBM ServeRAID-6M Controller RAMDrive Support* CD and restart the server. See the README file on the *IBM ServeRAID-6M Controller RAMDrive Support* CD for instructions. Otherwise, restart the server.

Using custom configuration: Complete the following steps to use custom configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**. The “Create arrays” window opens.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Click  >> (Add selected drives) to add the drives to the array.
6. Click **Next**. The “Configuration summary” window opens.
7. Review the information in the “Configuration summary” window. To change the configuration, click **Back**.
8. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
9. Exit from ServeRAID Manager and remove the CD from the CD-ROM drive.
10. If you have installed a ServeRAID-6M controller and you plan to install Microsoft Windows Server 2003, Enterprise Edition (64-bit) on hard disk drives controlled by the ServeRAID-6M controller, insert the *IBM ServeRAID-6M Controller RAMDrive Support CD* and restart the server. See the README file on the *IBM ServeRAID-6M Controller RAMDrive Support CD* for instructions. Otherwise, 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**.

Setting up the Remote Supervisor Adapter

This section describes the Remote Supervisor Adapter features and its prerequisites. It also explains how to cable and configure the adapter for use on an Advanced System Management (ASM) network so that you can manage the server from a remote location. For more detailed information, see the *Remote Supervisor Adapter User's Guide* on the *IBM xSeries Documentation CD*.

Attention: After you install your operating systems and fully configure your server, be sure to make a backup copy of the nonvolatile EFI variables stored in NVRAM on the Remote Supervisor Adapter. In the unlikely event that you need to remove or replace the Remote Supervisor Adapter or clear NVRAM, you can use the backup copy to restore the variables. See “Backing up and restoring the nonvolatile variables” in the *Option Installation Guide* on the *IBM xSeries Documentation CD* for more information.

Remote Supervisor Adapter features

The Remote Supervisor Adapter has the following features:

- Continuous health monitoring and control
- Advanced Predictive Failure Analysis[®] (PFA)
- Configurable notification and alerts
- Event logs that are time stamped, saved in nonvolatile memory, and can be attached to e-mail alerts
- Remote graphics console redirection

- LAN, serial, and Advanced System Management (ASM) interconnect remote access
- Point-to-point protocol (PPP) support
- Simple Network Management Protocol (SNMP)
- Domain Name System (DNS) and Dynamic Host Configuration Protocol (DHCP) support
- Remote power control
- Microsoft Windows® Server 2003, Enterprise Edition (64-bit) blue-screen capture
- Remote firmware update and access to critical server settings
- Optional, independent power, which enables around-the-clock access to the server, even if the server is turned off

Setup requirements

Before you set up the Remote Supervisor Adapter, you must download the EFI Remote Supervisor Utility program from <http://www.ibm.com/pc/support/> and create a CD.

Complete the following tasks before you set up the Remote Supervisor Adapter:

- Install the operating system on the server, using the documentation that comes with the operating system.
- Make sure that the remote alert recipients are IBM Director-enabled servers with UM Server Extensions, if you are configuring remote alert recipients for Director over LAN or Director over modem.
- The Remote Supervisor Adapter supports the following Web browsers for remote access. The Web browser that you use must be Java™-enabled and must support JavaScript™.
 - Microsoft Internet Explorer version 4.0 (with Service Pack 1), or later
 - Netscape Navigator version 4.72, or later (version 6.x is not supported)

Notes:

1. Java plug-in version 1.4 or later is required.
2. The Remote Supervisor Adapter Web Interface does not support the double-byte character set (DBCS) languages.

Cabling and configuring the Remote Supervisor Adapter

Complete the following tasks to cable and configure the Remote Supervisor Adapter.

Note: After you initially configure the adapter, use the Web-based interface to create a backup copy of the configuration. If you need to replace the adapter in the future, you can use the backup copy to restore the configuration and resume normal operation more quickly. See the *Remote Supervisor Adapter User's Guide* on the IBM xSeries Documentation CD for details.

Task 1.

Connect the Ethernet and serial port cables. See “Cabling the Ethernet LAN port and serial port” on page 21.

Task 2.

Perform the initial configuration to enable remote access to the Remote Supervisor Adapter. See “Enabling remote access to the adapter” on page 22. After you complete this task, you can configure the Ethernet and serial (COM) ports and set up the point-to-point protocol.

Task 3.

Configure the remote-control password to enable the ASM Web interface remote-control features. See “Configuring the remote-control password” on page 28.

Task 4.

Install the ASM device drivers. See “Installing Advanced System Management device drivers” on page 28.

For service, assistance, or additional information, see Chapter 3, “Getting help and technical assistance”, on page 37.

Cabling the Ethernet LAN port and serial port

You can manage the server remotely through the Remote Supervisor Adapter using one of the user interfaces and one of the connection methods that are described in Table 1. Perform the cabling procedure for the interface method you want to use.

If you plan to set up an ASM interconnect network, before you begin cabling the server, see “Using the ASM interconnect network” on page 29 for instructions for cabling the ASM interconnect port and setting up the network. You might want to review the information in “ASM interconnect network configuration examples” on page 31 before you connect the cables. Then, return to these instructions to start the cabling procedures.

Table 1. Cabling tasks to enable remote access to the Remote Supervisor Adapter

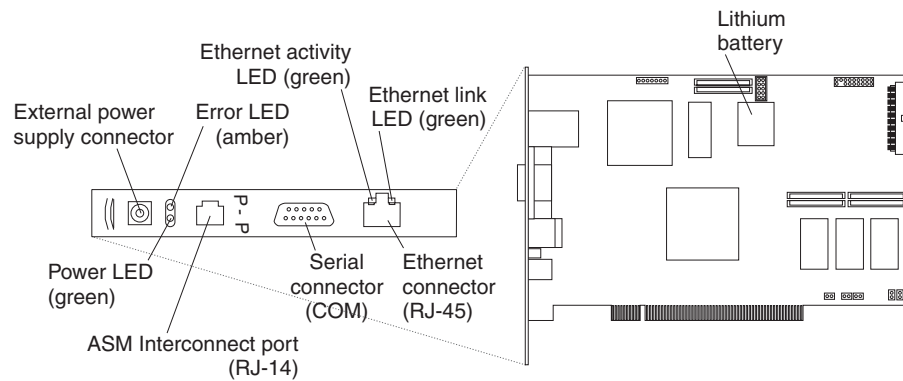
User interface to Remote Supervisor Adapter	Connection to Remote Supervisor Adapter	For the cabling procedure, see
ASM Web interface using HTTP	LAN using the Ethernet port	“Cabling the Ethernet LAN port” on page 21
Text-based user interface using Telnet		
Text-based user interface using a modem or a null modem	Serial (COM) port	“Cabling the serial (COM) port” on page 22
ASM Web interface using point-to-point protocol (PPP)		
Text-based user interface using the Telnet protocol over PPP		

Cabling the Ethernet LAN port: Complete the following steps to attach the Ethernet cables.

Attention: To avoid damage to the Ethernet connector on the Remote Supervisor Adapter, *do not* connect the ASM Interconnect module to the Ethernet connector.

1. Connect one end of a Category 3 or Category 5 Ethernet cable to the Ethernet connector on the Remote Supervisor Adapter. Connect the other end of the Ethernet cable to the network.

2. Check the Ethernet LEDs to ensure that the network connection is working. The following illustration shows the locations of the LEDs.



Ethernet activity LED

When the green Ethernet activity LED flashes, it indicates that there is Ethernet activity.

Ethernet link LED

When the green Ethernet link LED is lit, it indicates that the Ethernet cable is connected properly.

If you want to use the serial port connection, continue with “Cabling the serial (COM) port” on page 22; otherwise, go to “Configuring the adapter”.

Cabling the serial (COM) port: To cable the serial (COM) port, connect a modem or null modem cable to the serial connector on the Remote Supervisor Adapter.

Continue with “Configuring the adapter”.

Configuring the adapter

This section describes how to enable remote access to the Remote Supervisor Adapter and install ASM device drivers. These procedures assume that you have a keyboard and pointing device attached to the server.

Enabling remote access to the adapter: The Remote Supervisor Adapter must be configured to enable remote access through the Ethernet connector or the serial connector. Perform the configuration procedure for the interface method you want to use.

Note: For detailed information about using the ASM Web interface and the text-based interface, see the *Remote Supervisor Adapter User's Guide* on the IBM xSeries Documentation CD.

Table 2. Configuration tasks to enable remote access to the Remote Supervisor Adapter

User interface to Remote Supervisor Adapter	Connection to Remote Supervisor Adapter	For the configuration procedure, see
ASM Web interface using HTTP	LAN using the Ethernet port	“Configuring the Ethernet settings for Web-based remote access” on page 23
Text-based user interface using Telnet		

Table 2. Configuration tasks to enable remote access to the Remote Supervisor Adapter (continued)

User interface to Remote Supervisor Adapter	Connection to Remote Supervisor Adapter	For the configuration procedure, see
Text-based user interface using a modem or a null modem	Serial (COM) port	“Configuring the serial port for text-based remote access” on page 25 and “Setting up point-to-point protocol” on page 26
ASM Web interface using point-to-point protocol (PPP)		
Text-based user interface using the Telnet protocol over PPP		

Configuring the Ethernet settings for Web-based remote access: If you have an accessible, active, and configured Dynamic Host Configuration Protocol (DHCP) server on the network, the host name, IP address, gateway address, subnet mask, and DNS server IP address are set automatically. The default value has no effect on whether you have to do any other configuration. If you need to configure the serial port, go to “Configuring the serial port for text-based remote access” on page 25; otherwise, go to “Configuring the remote-control password” on page 28.

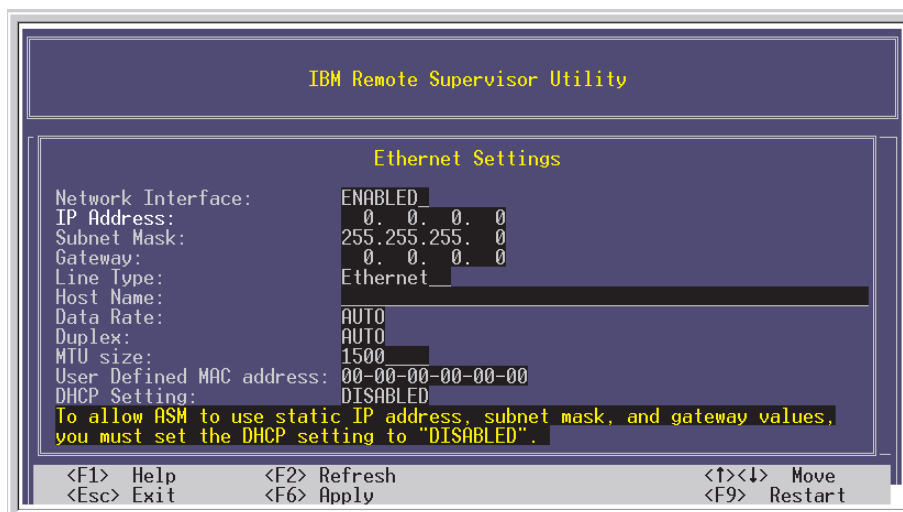
If you do not have a DHCP server on the network, complete the following steps to configure the Ethernet settings:

1. Insert the CD containing the EFI Remote Supervisor Utility program into the drive; then, turn on the server.
2. Select **EFI Shell** from the EFI Firmware Boot Manager.

Note: If EFI shell is not a choice in the list, the server has a customized startup configuration. Contact your system administrator for instructions.

3. Change to the file system for the formatted media and the directory where the program is located.
4. Type the following EFI command:
flash2
5. Use the Up Arrow and Down Arrow keys (↑ and ↓) to select **Configuration Settings**; then, press Enter. The Configuration Settings window opens.
6. Use the arrow keys to select **Ethernet Settings**; then, press Enter. The Ethernet Settings window opens, as shown in the following illustration.

Note: The settings in the window are only examples; your settings might be different.



7. Use the arrow keys to navigate to each field. Your system administrator can provide the information for the following fields:

Network Interface

The default setting is **Enabled**; verify that it is still set to **Enabled**.

IP Address

Type the IP address of the Remote Supervisor Adapter.

Subnet Mask

Type the subnet mask used by the Remote Supervisor Adapter. The default value is 255.255.255.0.

Gateway

Type the IP address of the gateway.

Host Name

Type the host name of the Remote Supervisor Adapter. The default host name is ASMA *burned-in MAC address*.

For detailed information about the Ethernet settings, see the *Remote Supervisor Adapter User's Guide* on the IBM xSeries Documentation CD.

8. Change the DHCP Setting field to **Disabled**. The default setting is **Enabled**.
9. Press F6 to apply the change.
10. Press Esc. After the Warning window opens, press Enter to restart the Remote Supervisor Adapter.
11. Press Esc to return to the Configuration Settings window. If you need to configure the serial port, go to "Configuring the serial port for text-based remote access" on page 25.
12. Press Esc to return to the main window.
13. Use the arrow keys to select **Exit Utility** from the menu or press Esc to exit from the program.
14. Remove the CD from the server.

If you also want to configure the serial port, continue with "Configuring the serial port for text-based remote access" on page 25. Otherwise, go to "Installing Advanced System Management device drivers" on page 28.

Configuring the serial port for text-based remote access: Complete the following steps to configure the Remote Supervisor Adapter serial port for access using a modem or null modem. If you completed the procedure for configuring the Ethernet port and the Configuration Settings window is open, go to step 6.

1. Insert the CD containing the EFI Remote Supervisor Utility program into the drive; then, turn on the server.
2. Select **EFI Shell** from the EFI Firmware Boot Manager.

Note: If EFI shell is not a choice in the list, the server has a customized startup configuration. Contact your system administrator for instructions.

3. Change to the file system for the formatted media and the directory where the program is located.

4. Type the following EFI command:

```
flash2
```

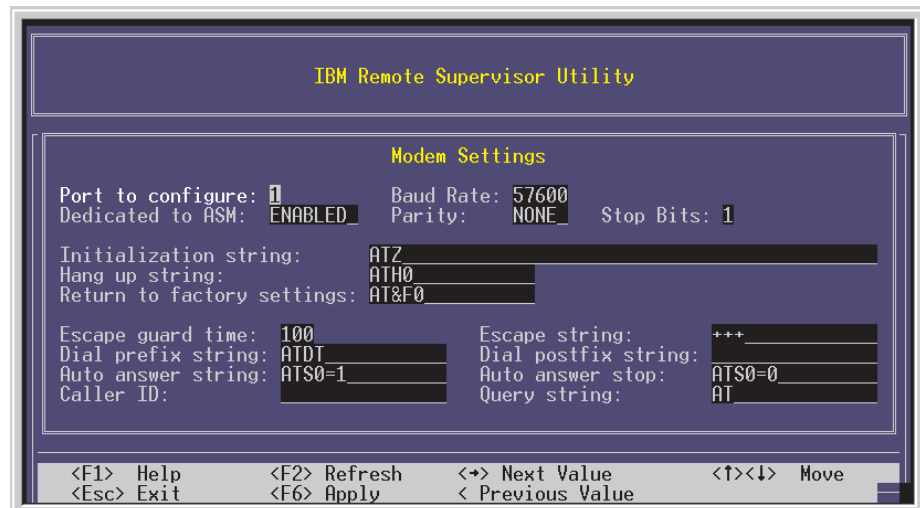
5. Use the Up Arrow and Down Arrow keys (↑ and ↓) to select **Configuration Settings**; then, press Enter.

The Configuration Settings window opens.

6. Use the arrow keys to select **Modem Settings**; then, press Enter.

The Modem Settings window opens, as shown in the following illustration.

Note: The settings in the window are only examples; your settings might be different.



7. Verify the following serial port values:

Baud Rate

The default is **57600**. Make sure that the baud rate matches the baud rate of the device you are connecting to the serial port on the Remote Supervisor Adapter.

Dedicated to ASM

The default is **Disabled**. If you are using point-to-point protocol (PPP), set this field to **Enabled**. If the value in this field is **Enabled** when the server is restarted, the serial port remains dedicated to system management and is not returned to the operating system.

Note: To use this serial port, you must first install the ASM device drivers as described in “Installing Advanced System Management device drivers” on page 28.

If the serial port is shared with the operating system, it is dedicated to the Remote Supervisor Adapter only while the server is turned off or during POST. The port is returned to the operating system after POST is completed. You can view information about the port using the operating system or any application. The Remote Supervisor Adapter takes over the port from the operating system only when information about a critical event is received. The Remote Supervisor Adapter dials out and transmits an alert and keeps the port dedicated until the server is restarted. The port is no longer available to the operating system or applications.

Parity The default is **None**.

Stop Bits

The default is **1**.

Note: The data bits value is preset to 8 and cannot be changed.

For detailed information about the serial port and modem settings, see the *Remote Supervisor Adapter User's Guide* on the IBM xSeries Documentation CD.

8. If you made changes to the serial port settings, press F6 to apply the changes.
9. Press Esc to return to the Configuration Settings window. If you need to set up point-to-point protocol, go to “Setting up point-to-point protocol”.
10. Press Esc to return to the main window.
11. Use the arrow keys to select **Exit Utility** from the menu, or press Esc to exit from the program.
12. Remove the CD from the drive.

Continue with “Setting up point-to-point protocol”.

Setting up point-to-point protocol: The Remote Supervisor Adapter serial port supports point-to-point protocol (PPP). PPP enables TCP/IP communication over the serial port, which enables Web-based management and Telnet sessions over a modem. To set up PPP, complete the following steps. If you completed the procedure for configuring the serial port and the Configuration Settings window is open, go to step 6.

1. Insert the CD containing the EFI Remote Supervisor Utility program into the drive; then, turn on the server.
2. Select **EFI Shell** from the EFI Firmware Boot Manager.

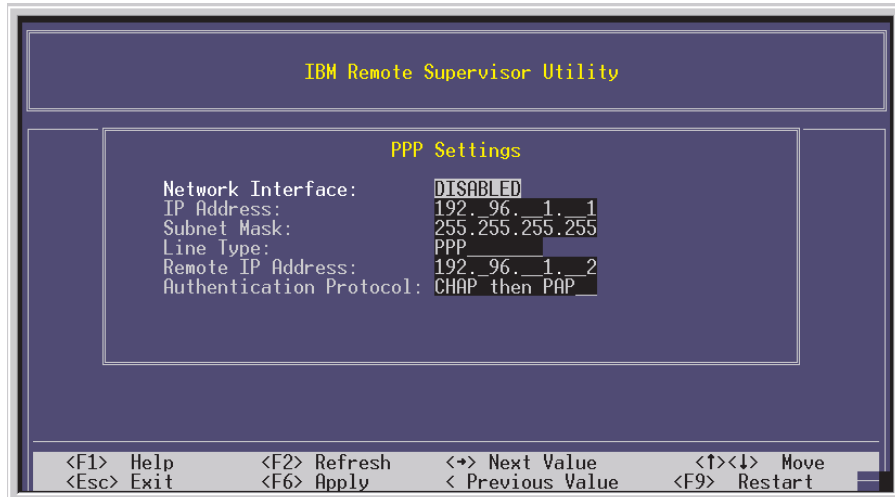
Note: If EFI shell is not a choice in the list, the server has a customized startup configuration. Contact your system administrator for instructions.

3. Change to the file system for the formatted media and the directory where the program is located.
4. Type the following EFI command:
flash2
5. Use the Up Arrow and Down Arrow keys (↑ and ↓) to select **Configuration Settings**; then, press Enter.

The Configuration Settings window opens.

- Use the arrow keys to select **PPP Settings**; then, press Enter.
The PPP Settings window opens, as shown in the following illustration.

Note: The settings in the window are only examples; your settings might be different.



- Use the arrow keys to navigate to each field. Verify the values in the following fields:

Network Interface

The default is **Disabled**. Change this field to **Enabled**.

IP Address

The default value is **192.96.1.1**. You can use the default value or another value, but the server must be able to establish a connection to that address. The default IP address (local and remote) is easily reconfigurable.

Subnet Mask

The default value is **255.255.255.255**.

Line Type

The default value is **PPP**.

Remote IP Address

The default value is **192.96.1.2**.

Authentication Protocol

The default is **CHAP then PAP**. Make sure that the value in this field matches your client settings.

For detailed information about the PPP settings, see the information about configuring PPP access over a serial port in the *Remote Supervisor Adapter User's Guide* on the IBM xSeries Documentation CD.

- Press F6 to apply the changes.
- Press Esc. After the Warning window opens, press Enter to restart the Remote Supervisor Adapter.
- Press Esc to return to the Configuration Settings window. If you need to configure the serial port, go to "Configuring the serial port for text-based remote access" on page 25.
- Press Esc to return to the main window.

12. Use the arrow keys to select **Exit Utility** from the menu or press Esc to exit from the program.
13. Remove the CD from the drive.

Continue with “Installing Advanced System Management device drivers”.

Installing Advanced System Management device drivers: You must install the ASM device drivers for the server. The device drivers enable communication between the Remote Supervisor Adapter and the server in which it is installed. You can obtain the most current device drivers from the World Wide Web at <http://www.ibm.com/pc/support/>.

Note: If you are installing device drivers manually, note the following requirements:

- You must install the operating system on the server before you install the ASM device drivers. For information about installing the operating system, see the documentation that comes with the operating system.
- Before installing the ASM device drivers for the Remote Supervisor Adapter, stop any system-management application.

After you install the ASM device drivers, go to “Configuring the remote-control password” to set the remote-control password.

Configuring the remote-control password: If you want to use the remote-control features of the Remote Supervisor Adapter ASM Web interface, you must configure the remote-control password using the Configuration/Setup Utility program.

To set up a remote-control password, complete the following steps:

1. Start the server.
2. From the EFI Firmware Boot Manager, select the Configuration/Setup Utility program.
3. Use the Up Arrow and Down Arrow keys (↑ and ↓) to select **System Security**; then, press Enter. The System Security window opens.
4. Select **Remote Control Security Settings**; then, press Enter. The Remote Control Security Settings window opens.
5. Enter the remote-control password that you will use each time you log in to the remote-control features of the Remote Supervisor Adapter ASM Web Interface.
6. Select **Save New Remote Control Password**; then, press Enter.
7. In the System Security window, press Esc.
8. Select **Save Settings**; then, press Enter.
9. Confirm your selection; then, exit the Configuration/Setup Utility.

Continue with “Completing the configuration”.

Completing the configuration: To complete the configuration of the Remote Supervisor Adapter, see the *Remote Supervisor Adapter User's Guide* on the IBM *xSeries Documentation* CD. Completing the configuration consists of the following tasks:

- Defining the login IDs and passwords
- Selecting the events that will receive alert notification
- Monitoring remote server status using the ASM Web interface or a text-based user interface
- Controlling the server remotely

If you want to set up an ASM interconnect network and have not already done so, continue with “Using the ASM interconnect network”. If you do not want to set up an ASM interconnect network, Remote Supervisor Adapter configuration is now complete. To start managing the server remotely, see the *Remote Supervisor Adapter User’s Guide* on the IBM xSeries Documentation CD.

Using the ASM interconnect network

This section explains how to configure and connect the server to function within an ASM interconnect network.

The ASM interconnect network can include as many as 12 individual ASM connections in a single bus. These connections can include Remote Supervisor Adapters, ASM processors, and ASM PCI Adapters. When the clients and servers are connected, they use the ASM interconnect network to share ASM resources, information, and alerts among multiple servers, without requiring additional communications hardware or network interface adapters.

An ASM interconnect network provides two levels of functionality. First, the ASM interconnect network enables you to configure settings and to control the servers where other Remote Supervisor Adapters, ASM processors, and ASM PCI Adapters on the network are. Second, the ASM interconnect network enables other interconnect network devices to use the resources (Ethernet or modem) of other Remote Supervisor Adapters, ASM processors, and ASM PCI Adapters in the ASM interconnect network for sending alerts. This interconnect network is used when Remote Supervisor Adapters, ASM processors, or ASM PCI Adapters cannot send an alert and must forward the information to another one of these devices to send the alert.

Planning and cabling the interconnect network

To support the most recent ASM features, a Remote Supervisor Adapter must be the main gateway interconnect to the ASM interconnect bus if the bus also includes servers with ASM PCI adapters or ASM processors. The Remote Supervisor Adapter forwards the ASM information generated by the servers attached to the ASM interconnect bus to other servers on the Ethernet network. The connected ASM processors and ASM PCI Adapters are managed through the new user interface and Web browser access of the Remote Supervisor Adapter.

Note: To ensure the stability of the system, the most current level of firmware must be installed on the Remote Supervisor Adapter that is the main interconnect gateway for the ASM interconnect network. The most current level of firmware is available from <http://www.ibm.com/pc/support>. For more information about updating firmware, see the *Remote Supervisor Adapter User’s Guide* on the IBM xSeries Documentation CD.

You must connect an ASM Interconnect module to the Remote Supervisor Adapter and to each xSeries 455 server that you connect to the ASM interconnect network bus.

Attention: To avoid damage to the Ethernet connector on the Remote Supervisor Adapter, do not connect the ASM Interconnect module to the Remote Supervisor Adapter Ethernet connector.

To connect the servers, note the following setup and configuration information:

- Make sure that the ASM interconnect network is set up as a bus topology. You must connect the servers to the ASM interconnect network in a series, with terminated beginning and end points.
- Make sure that the total combined length of all Ethernet cables connecting the server in the ASM interconnect network does not exceed 91 m (300 ft).
- Each Remote Supervisor Adapter, ASM PCI adapter, or ASM processor that is connected to the ASM interconnect network bus counts as one connection. For example, if an ASM PCI adapter is installed in a server that has an ASM processor, the processor and the adapter connect to each other using one ASM interconnect connection, but the processor and the adapter count as two connections on the ASM interconnect network bus.

Forwarding alerts

Remote Supervisor Adapters, ASM PCI adapters, and ASM processors that are connected to an ASM interconnect network share resources and systems-management information. This section provides information about how alerts are forwarded in the ASM interconnect network.

During normal operation, each Remote Supervisor Adapter, ASM processor, or ASM PCI adapter on the ASM interconnect network communicates with the other processors and adapters on the network. Processors or adapters that have modems or Ethernet connections notify the other processors and adapters that these communications resources are available for use by other servers on the ASM interconnect network. These resources are then used as ASM interconnect network resources, enabling Remote Supervisor Adapters, ASM processors, or ASM PCI adapters on the ASM interconnect network to send alerts using a modem or the network, even if they do not have a modem or network connection physically attached.

When alerts are generated, they are forwarded to the Remote Supervisor Adapter, ASM processor, or ASM PCI adapter on the ASM interconnect network that has the communication resources to forward the alert. If no system on the ASM interconnect network meets the requirements, the alert is set for transmission if the connection type is configured or becomes available later.

If there are multiple modems or network connections in the ASM interconnect network, you cannot specify which system will receive an alert or which will use its modem or network connection to forward the alert. If an alert is forwarded to a Remote Supervisor Adapter, ASM processor, or ASM PCI adapter that is unable to deliver the alert (for example, the modem it is configured to use has failed or the network cannot resolve the destination IP address), the processor or adapter attempts to forward the alert to another system on the ASM interconnect network that has the communication resources to forward the alert.

Alerts are typically sent only once (per connection type), but an alert is forwarded to another interconnect device if the resources are on other interconnect devices in the network. For example, on a three-ASM-processor network where ASM processor 1 generates a modem alert but does not have a modem and the other ASM processors have modems, the following scenario might occur:

If ASM processor 1 generates an alert and the modem is disconnected from ASM processor 2 within 45 seconds before ASM processor 1 generates the alert, ASM processor 1 forwards the alert to ASM processor 2, having previously determined that ASM processor 2 has an available modem. When ASM processor 2 receives the forwarded alert, it determines that a modem is attached to ASM processor 3 and forwards the alert. Therefore, depending upon the time frame (45 seconds)

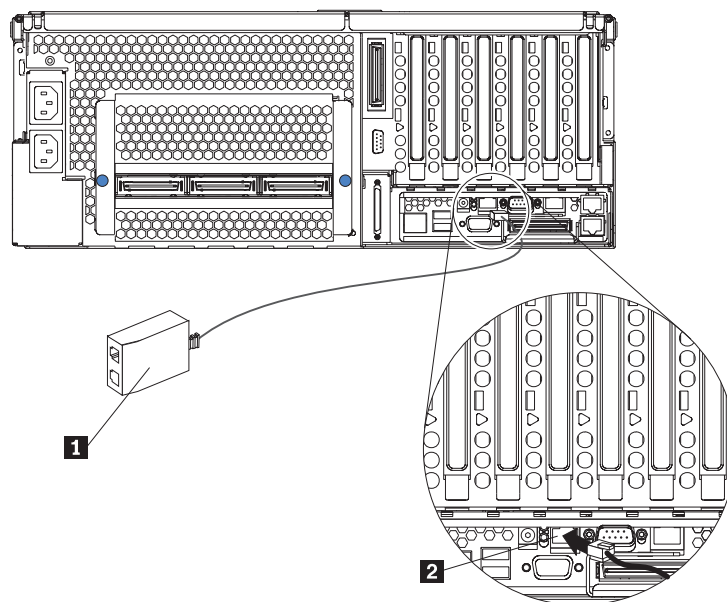
within which a resource (modem) fails, the alert might be forwarded multiple times until an interconnect device can send the alert.

Connecting the ASM Interconnect module to the xSeries 455 server

The ASM Interconnect module connects the Remote Supervisor Adapter to the ASM interconnect network. You must purchase this module separately. To connect the ASM interconnect module to the Remote Supervisor Adapter, complete the following steps.

Attention: To avoid damage to the Ethernet connector, do not connect the ASM interconnect module into the Remote Supervisor Adapter Ethernet connector.

1. Connect the ASM Interconnect module **1** to the Remote Supervisor Adapter ASM interconnect (peer-to-peer) connector **2** as shown in the following illustration. This connector is on the edge of the Remote Supervisor Adapter that is accessible from the rear of the server and is labeled “RS485”.



2. Connect one or two Category 3 or Category 5 Ethernet cables to the other end of the ASM Interconnect module.

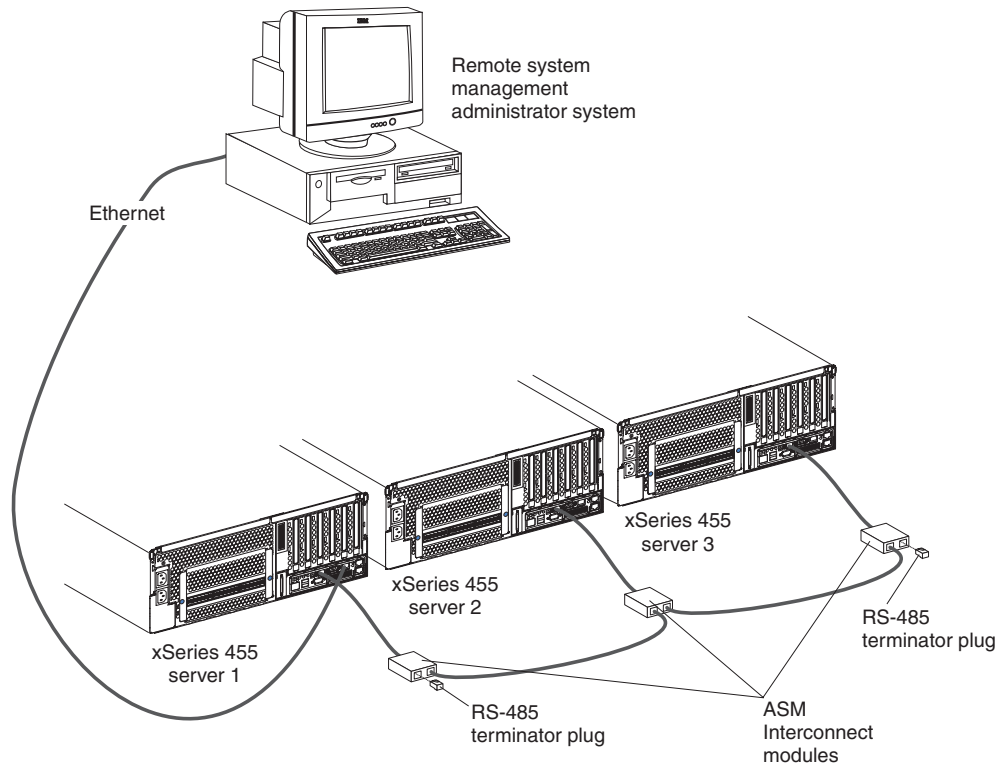
Continue with “ASM interconnect network configuration examples”.

ASM interconnect network configuration examples

The illustrations in this section show sample ASM interconnect network configurations.

The following illustration shows an Ethernet cable connecting the remote administrator system to the Remote Supervisor Adapter that is installed in an xSeries 455 server. Server 1 uses the LAN connection to forward system-management data generated by the other xSeries 455 servers in the ASM

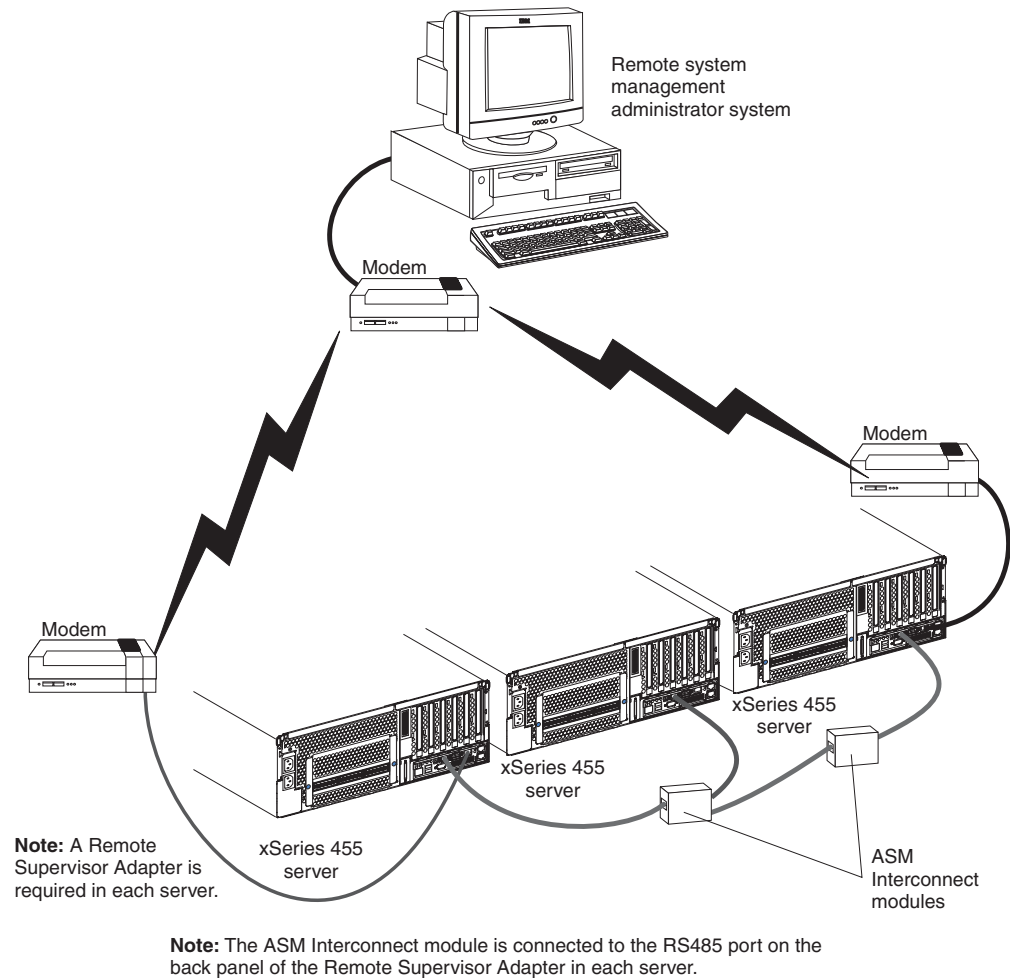
interconnect network bus to the remote system-management administrator.



Note: The ASM Interconnect module is connected to the RS485 connector on the back panel of the Remote Supervisor Adapter in each server.

The following illustration shows a modem connected to the serial port of the Remote Supervisor Adapter in the xSeries 455 server on the left, a modem connected to the serial port of the Remote Supervisor Adapter in the xSeries 455 server on the right, and a modem connected to the remote administrator system. Placing modems at opposite ends of the ASM interconnect network bus ensures that if an ASM interconnect connection in the bus fails, all of the servers on the ASM interconnect network have access to a modem to forward

system-management data to the remote system-management administrator.

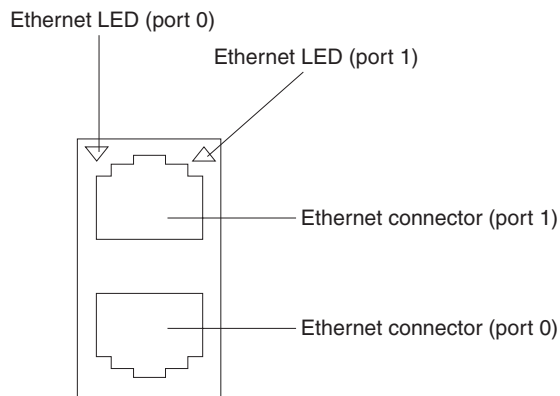


Configuring the Gigabit Ethernet controller

The Ethernet controller is integrated on the system board. It provides an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in your 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 need 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 *Resource CD* that comes with your server. For updated information about configuring the controller, go to <http://www.ibm.com/pc/support/>.

The following illustration shows the Ethernet controller port assignments, connectors, and LEDs.



Configuring scalable partitions

This section provides information and instructions for creating and deleting scalable partitions through the Configuration/Setup Utility program.

Note: The Scalable Systems Manager program, when available, is an extension to IBM Director that provides a graphical user interface for creating and managing scalable partitions. See the *Scalable Systems Manager Installation and Users Guide* for information about how to use that program to configure scalable partitions.

Before you create or delete scalable partitions, read the following information:

- The Remote Supervisor Adapters must be connected to a network through a management console device. This connection is needed so that the Remote Supervisor Adapters can communicate and manage scalable partitions.
- PCI slot numbering starts with the primary node, including attached remote I/O enclosures, and continues with the secondary nodes, in numeric order of the logical node IDs.
- To change the primary node, delete the scalable partition from the current primary node; then, create a new scalable partition from the new primary node.

Creating a scalable partition

Complete the following steps to create a scalable partition:

1. If you have not already done so, connect the SMP Expansion, RXE Expansion, and RXE Management cables. See the *Option Installation Guide* on the IBM *xSeries Documentation* CD for information about RXE cabling.
2. Start the Configuration/Setup Utility program.
3. From the main menu, select **Advanced Setup**.
4. Select **Scalable Partition Settings**.
5. Select **Create Scalable Partition Settings**.
6. Use one of the following procedures, depending on the configuration.
 - Single-chassis configuration:
 - a. Select **1 x455 chassis** as the scalable partition configuration.
 - b. Type a scalable partition ID.
 - c. If a remote I/O enclosure is attached, complete the following steps:

- 1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
 - 2) Select the destination of Expansion Port A on the remote I/O enclosure.
 - 3) Select the destination of Expansion Port B on the remote I/O enclosure.
- Two-chassis configuration:
 - a. Select **2 x455 chassis** as the scalable partition configuration.
 - b. Type a scalable partition ID.
 - c. Type the ASM host name or IP address for the secondary node.
 - d. If a remote I/O enclosure is attached, complete the following steps:
 - 1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
 - 2) Select the destination of Expansion Port A on the remote I/O enclosure.
 - 3) Select the destination of Expansion Port B on the remote I/O enclosure.
 - Four-chassis configuration:
 - a. Select **4 x455 chassis** as the scalable partition configuration.
 - b. Type a scalable partition ID.
 - c. Type the ASM host names or IP addresses for the secondary nodes.
 - d. If a remote I/O enclosure is attached in the first RXE configuration, complete the following steps:
 - 1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
 - 2) Select the destination of Expansion Port A on the remote I/O enclosure.
 - 3) Select the destination of Expansion Port B on the remote I/O enclosure.
 - e. If a remote I/O enclosure is attached in the second RXE configuration, complete the following steps:
 - 1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
 - 2) Select the destination of Expansion Port A on the remote I/O enclosure.
 - 3) Select the destination of Expansion Port B on the remote I/O enclosure.
7. Select **Write Scalable Partition Settings** and follow the prompts to exit the menu item.
 8. Save the changes and exit the Configuration/Setup Utility program.

Note: See the software documentation that comes with your operating system to install your operating system.

Deleting a scalable partition

Complete the following steps to delete the scalable partition:

1. Start the Configuration/Setup Utility on the primary server.
2. From the main menu, select **Advanced Setup**.
3. Select **Scalable Partition Settings**.

4. Select either **Delete ALL Scalable Partition Settings** or **Delete Local Scalable Partition Settings**.

Note: Do not select **Write Scalable Partition Settings** when you delete the scalable partition.

5. Exit the Configuration/Setup Utility program.
6. Turn off the servers.
7. If necessary, remove the SMP Expansion cables and reconnect them according to your new configuration. See the *Option Installation Guide* on the IBM *xSeries Documentation* CD for information.
8. Restart the servers.

Chapter 3. Getting help and technical assistance

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

Before you call

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

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

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

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

Software service and support

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

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

Hardware service and support

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

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

Appendix A. IBM Statement of Limited Warranty Z125-4753-07 11/2002

Part 1 - General Terms

Part 1 - General Terms

*This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.***

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

What this Warranty Does not Cover

This warranty does not cover the following:

- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and
- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

IBM does not warrant uninterrupted or error-free operation of a Machine.

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with “how-to” questions and those regarding Machine set-up and installation, is provided **WITHOUT WARRANTIES OF ANY KIND**.

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you call for service, you must follow the problem determination and resolution procedures that IBM specifies. A technician will attempt to make an initial diagnosis of your problem and help you resolve it over the telephone.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called “BIOS”), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit (“CRU”) (e.g., keyboard, mouse, speaker, memory, hard disk drive and other easily replaceable parts), IBM will ship these parts to you for replacement by you.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

When the warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

Your Additional Responsibilities

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to:

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
 - a. follow the service request procedures that IBM or your reseller provides;
 - b. backup or secure all programs, data, and funds contained in the Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
 - d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

IBM is responsible for loss of, or damage to, your Machine only while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller are responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM for any reason. You should remove all such information from the Machine prior to its return.

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST

PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Governing Law

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BRAZIL

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

NORTH AMERICA

How to Obtain Warranty Service: *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Limitation of Liability: *The following replaces item 1 of this section:*

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

What this Warranty Covers: *The following paragraph is added to this section:*

The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this section:*

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America.

CAMBODIA, INDONESIA, LAOS, AND VIETNAM

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the SIAC. Other vacancies shall

be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*

laws of Hong Kong Special Administrative Region of China.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence; and
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term “Machine” includes Machine Code and Licensed Internal Code (“LIC”).

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

Governing Law: *The following sentence is added to this section:*

Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

Limitation of Liability: *The word “SPECIAL” in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

What this Warranty Covers: *The following paragraph is added to this section:*

The warranties specified in this section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this section are subject to the limitations in that Act.

PEOPLE’S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words “SPECIAL” and “ECONOMIC” in item 3 in the fifth paragraph are deleted.*

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

How to Obtain Warranty Service: If you purchase a Machine in Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom or Vatican State, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service. If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase a Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

*Add the following paragraph in **Western Europe** (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom, Vatican State):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

Governing Law:

The phrase “the laws of the country in which you acquired the Machine” is replaced by:

1) “the laws of Austria” in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia;** 2)

“the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna**; 3) “the laws of Finland” in **Estonia, Latvia, and Lithuania**; 4) “the laws of England” in **Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe**; and 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland**.

Jurisdiction: *The following exceptions are added to this section:*

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) in **Belgium and Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: *The following is added under this heading:*

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova,

Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

How to Obtain Warranty Service: *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:

IBM Warranty & Service Quality Dept.
PO Box 30
Spango Valley
Greenock
Scotland PA16 0AH

AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

FRANCE AND BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this section:

The warranty period for Machines is 12 months from the date of delivery. The limitation period for consumers in action for breach of warranty is the statutory period as a minimum. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

GERMANY

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this section:

The minimum warranty period for Machines is twelve months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *The following is added to this section:*

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.

3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for:
 - a. death or personal injury caused by the negligence of IBM; and
 - b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds

Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the table below.

Note: "Region" means either Hong Kong or Macau Special Administrative Region of China.

Machine - IBM @server xSeries 455

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
All	Parts - 3 years, labor - 3 years	1 and 2
* See "Types of Warranty Service" for the legend and explanations of warranty-service types.		

A warranty period of 3 years on parts and 1 year on labor means that IBM provides warranty service without charge for:

1. parts and labor during the first year of the warranty period; and
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor provided in performance of the repair or replacement(s) in the second and third year of the warranty period.

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM's normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. **Customer Replaceable Unit ("CRU") Service**

IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of your receipt of the replacement CRU, IBM may charge you for the replacement.

2. On-site Service

IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. **For some Machines, certain repairs may require sending the Machine to an IBM service center.**

3. Courier or Depot Service*

You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

4. Customer Carry-In or Mail-In Service

You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM's expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

* This type of service is called ThinkPad® EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List

Phone numbers are subject to change without notice.

Austria -- 43-1-24592-5901	Italy -- 39-02-482-9202
Belgium -- 02-718-4339	Luxembourg -- 352-360385-1
Denmark -- 4520-8200	Netherlands -- 020-514-5770
Finland -- 358-9-4591	Portugal -- 351-21-7915-147
France -- 0238-557-450	Spain -- 34-91-662-4916
Germany -- 07032-15-4920	Sweden -- 46-8-477-4420
Greece -- 30-210-688-1220	United Kingdom -- 01475-555-055
Ireland -- 353-1-815-4000	

Appendix B. Notices

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

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@server	Update Connector
FlashCopy	Wake on LAN
IBM	XA-32
IntelliStation	XA-64
NetBAY	X-Architecture
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NetView	XpandOnDemand
OS/2 WARP	xSeries
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Important notes

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

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

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

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

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

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

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

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.

Battery return program

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

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

In the Netherlands, the following applies.



Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwanese Class A warning statement

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

Chinese Class A warning statement

聲 明
此為 A 級產品。在生活環境中，
該產品可能會造成無線電干擾。
在這種情況下，可能需要用戶對其
干擾採取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Maceo, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya

IBM power cord part number	Used in these countries and regions
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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