4X InfiniBand Pass-thru Module for IBM BladeCenter

Installation and User's Guide

4X InfiniBand Pass-thru Module for IBM BladeCenter

Installation and User's Guide

Note: Before using this information and the product it supports, read Appendix B, "Warranty," on page 35 and the general information in Appendix C, "Notices," on page 53.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

v

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

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

For example, if a caution statement is labeled "Statement 1," translations for that caution statement are in the *Safety Information* document under "Statement 1."

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

Statement 1:

DANGER

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

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

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

Statement 2:

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

Do not:

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

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

Statement 3:

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

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

DANGER

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

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

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

Statement 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 21:

CAUTION:
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade server-cover before installing the blade server.
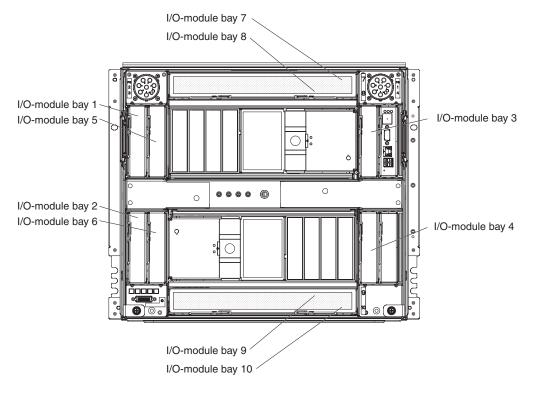
Chapter 1. Introduction

This *Installation and User's Guide* contains instructions for and information about:

- Installing or replacing the 4X InfiniBand Pass-thru Module for IBM® BladeCenter®
- Enabling the 4X InfiniBand Pass-thru Module and its external ports
- Using the status LEDs and external ports on the 4X InfiniBand Pass-thru Module
- Performing basic troubleshooting of the 4X InfiniBand Pass-thru Module

To support each high-speed I/O module that you install in the BladeCenter unit, you must also install a compatible high-speed expansion card in each blade server that you want to communicate with the high-speed I/O module. For installation details, see Chapter 2, "Installing, replacing, and enabling an I/O module," on page 7. For additional information about expansion cards and other BladeCenter components, see the BladeCenter documentation that comes with these devices.

The following illustration shows an example of a BladeCenter H unit with the I/O-module bays identified. In this example, these bays are in the rear of the BladeCenter chassis. In a different type of BladeCenter unit, the bays might be in a different location. For a list of the types of supported BladeCenter units, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. Throughout this document, the 4X InfiniBand Pass-thru Module for IBM BladeCenter is generically referred to as the pass-thru module or the I/O module.

   With respect to certain screen contents or titles, this product might be referred to as an I/O module, a switch module, or a switch, because the term *I/O module*, *switch module*, or *switch* appears on those screens.

3. The screens that are described or referenced in this document might differ slightly from the screens that are displayed by your system. Screen content varies according to the type of BladeCenter unit and the firmware versions and options that are installed.

4. Unless otherwise stated, references to the BladeCenter unit apply to all supported BladeCenter unit types, such as the BladeCenter H unit.

5. Unless otherwise stated, references to the management module apply to all supported types of BladeCenter management modules, such as the BladeCenter Advanced Management Module.

6. Using the CFFv expansion card in combination with a CFFh expansion card in a high-speed blade server provides simultaneous connections to both the I/O-module bays 3 and 4 in all BladeCenter unit types and the BladeCenter high-speed I/O-module bays (7 through 10).

7. The I/O modules in I/O-module bays 7/8 and 9/10 must support high-speed operation.

8. Use a compatible cable, such as one of the following types of cable, with the I/O module:

   • IBM InfiniBand 3m DDR 4X Copper Cable

   • IBM InfiniBand 8m DDR 4X Copper Cable

   For information about ordering the previously listed types of cable, see Chapter 4, "Parts listing," on page 21. For cabling information, see the *Configuration and Options Guide* at http://www.ibm.com/servers/eserver/ xseries/cog/. For additional information about compatible devices, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

9. Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

10. This document might contain references or links to other companies' Web sites, also known as *non-IBM Web sites*. As of the date of this document, the non-IBM Web sites are correct. However, these sites might be updated after this document has been published. Certain conditions apply to the usage of non-IBM Web sites. For additional information, see Appendix C, "Notices," on page 53.

Record information about the I/O module in the following table. You can find this information on the labels on the I/O module. You can register the I/O module with IBM at http://www.ibm.com/support/mysupport/. The product name and serial number are required for registration.

Product name	4X InfiniBand Pass-thru Module for IBM BladeCenter
Model number	_____
Serial number	_____
Other identifiers	_____
	_____

Your I/O module comes with a one-year limited warranty. For information about your warranty, see Appendix B, "Warranty," on page 35. You can obtain up-to-date information about your I/O module and other IBM server products at http://www.ibm.com/systems/x/.

This *Installation and User's Guide* and the most recent versions of other documents that provide detailed information about your BladeCenter unit, blade server, and available options are provided in Portable Document Format (PDF) at http://www.ibm.com/systems/support/.

For service or assistance, see Appendix A, "Getting help and technical assistance," on page 33.

High-speed technology overview

The 4X InfiniBand Pass-thru Module for IBM BladeCenter provides high bandwidth, low latency, non-blocking, 10 Gbps (Gigabits per second) and 20 Gbps single-data rate (SDR) and double-data rate (DDR) InfiniBand connectivity to the blade servers in the BladeCenter unit. You can increase the benefits of having BladeCenter architecture in your system configuration by using the pass-thru module in combination with the external InfiniBand, Ethernet, and Fibre Channel switching capabilities of various I/O modules.

The pass-thru module uses repeaters to improve signal integrity. The pass-thru module is managed by the IBM Advanced Management Module for IBM BladeCenter through a connection to the chassis midplane in the BladeCenter unit. Thus, the pass-thru module does not require and does not contain an InfiniBand Subnet Management (SM) function.

The pass-thru module is a double-height, high-speed device that occupies two I/O-module bays in the rear of the BladeCenter unit. You can install a maximum of two I/O modules in the BladeCenter unit. You can install one pass-thru module in I/O-module bays 7/8, and one pass-thru module in I/O-module bays 9/10. Installing two pass-thru modules provides dual-path connections to the expansion card in a blade server.

For an illustration that shows the pass-thru module installed in the IBM BladeCenter H unit, see Chapter 2, "Installing, replacing, and enabling an I/O module," on page 7.

The maximum number of blade servers that you can connect to the BladeCenter unit varies according to the type of BladeCenter unit that you are using. The BladeCenter H unit can contain a maximum of 14 blade servers. Each blade server can host an InfiniBand host channel adapter (HCA). Each HCA has two InfiniBand ports that connect to the pass-thru modules that are installed on the rear of the BladeCenter unit. Port 0 of each HCA connects to the pass-thru module that is installed in bays 7/8 at the top rear of the BladeCenter unit. Port 1 of each HCA connects to the pass-thru module that is installed in bays 9/10 at the bottom rear of the BladeCenter unit. The pass-thru modules connect the blade servers to external high-speed switch modules (HSSMs) and switches.

To enable communication between blade servers and the pass-thru module, you must install a compatible high-speed expansion card in each blade server that you want to communicate with the pass-thru module. The pass-thru module is compatible with the following types of expansion cards:
- 4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter

- Cisco 4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter
- Voltaire 4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter

Notes:

1. For additional information about these expansion cards, see the *4X InfiniBand DDR Expansion Cards (CFFh) for IBM BladeCenter Installation and User's Guide* on the *4X InfiniBand Pass-thru Module and Expansion Cards Documentation* CD.

2. For additional information about compatible devices, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Related documentation

This *Installation and User's Guide* contains instructions for installing and enabling the I/O module. This document is provided on the *4X InfiniBand Pass-thru Module and Expansion Cards Documentation* CD that comes with the I/O module. This CD is also known as the *Documentation* CD. Follow the instructions in this *Installation and User's Guide* after you read the *IBM Getting Started* guide that comes with the I/O module.

Notes:

- The most recent versions of this *Installation and User's Guide* and all other BladeCenter documentation are at http://www.ibm.com/systems/support/.
- Other IBM BladeCenter CDs, such as the IBM *BladeCenter Documentation* CD, might come with other BladeCenter devices that you have purchased. Depending on your blade-server model and BladeCenter unit type, the IBM BladeCenter CDs might contain additional documents and other information. Use the subdirectories to help you find information quickly.
- For more information about documentation requirements, see "Using the documentation" on page 33.

IBM documentation

The following related IBM documentation comes with the I/O module, BladeCenter unit, blade server, or other BladeCenter devices that you have purchased. This documentation contains important, useful information to help you with the setup, installation, configuration, operation, and troubleshooting processes for these devices. This documentation is available at http://www.ibm.com/systems/support/:

- *IBM Getting Started* guide

  This document contains setup instructions for the I/O module, including information about getting started. Read this document before you install the I/O module in the BladeCenter unit.

- *4X InfiniBand DDR Expansion Cards (CFFh) for IBM BladeCenter Installation and User's Guide*

  This document contains information about the 4X InfiniBand DDR expansion cards (CFFh) that are compatible with the I/O module.

- IBM BladeCenter unit *Installation and User's Guide*

  Each type of BladeCenter unit has a customized *Installation and User's Guide*.

- IBM BladeCenter blade server *Installation and User's Guide*

  Each type of blade server has a customized *Installation and User's Guide*.

- *Safety Information*

  This multilingual document contains translated versions of the caution and danger statements that appear in the documentation for your server. Each

caution and danger statement has an assigned number, which you can use to locate the corresponding statement in your native language.

- *IBM Problem Determination and Service Guide*

  This document contains information to help you solve problems yourself or to provide helpful information to a service technician.

Cisco and Voltaire documentation

You can obtain relevant Cisco or Voltaire documentation for device drivers, various utilities, and other tools, by going to http://www.ibm.com/systems/support/, and entering the search term **Cisco** or **Voltaire** to list and access the applicable Web sites.

Features and specifications

The pass-thru module has the following features and specifications:

- 14 external SDR/DDR 4X InfiniBand ports.
- Based on repeaters. Signal integrity improvements through on-board repeater devices.
- Improves latency in larger clusters by eliminating one level of InfiniBand switching.
- The pass-thru module microcontroller has an interface for the Advanced Management Module.
- Two status LEDs on the front panel.

  Note: Pass-thru module LEDs do not show the industry standard InfiniBand link indications. For additional information about the LEDs, see Chapter 3, "Status LEDs and external ports," on page 17.

- Compliance with U.S. and international safety and emissions standards.
- Support for direct memory access (DMA).
- Support for a hot-pluggable media converter for fibre-optic cable.
- Hot-swappable

Inventory checklist

The option package includes the following items:

- *IBM Getting Started* guide (flyer)
- One 4X InfiniBand Pass-thru Module for IBM BladeCenter
- The *4X InfiniBand Pass-thru Module and Expansion Cards Documentation* CD, that contains the following items:
  - The *4X InfiniBand Pass-thru Module for IBM BladeCenter Installation and User's Guide*
  - The *4X InfiniBand DDR Expansion Cards (CFFh) for IBM BladeCenter Installation and User's Guide*
  - Other documents about the I/O module and expansion cards, if applicable
  - The *IBM Safety Notices* documents
- *Safety Information* document

If any of these items are missing or damaged, contact your authorized reseller for replacement.

Notices and statements used in this document

The caution and danger statements used in this document are also in the multilingual *Safety Information* document provided on the IBM *BladeCenter Documentation* CD and at http://www.ibm.com/systems/support/ on the World Wide Web. Each caution and danger statement is numbered for reference to the corresponding statement in the *Safety Information* document.

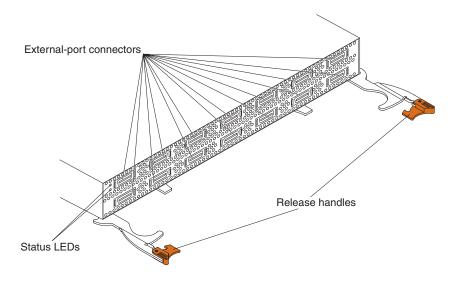The following types of notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible 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.

Major components of the I/O module

The following illustration shows the major components of the I/O module.

Note: The illustrations in this document might differ slightly from your hardware, and your I/O module might have labels that are not shown in the illustrations in this document. For example, the serial number or another type of identifier might be on the same label as the part number.

.

External-port connectors

Release handles

Status LEDs

Chapter 2. Installing, replacing, and enabling an I/O module

This chapter provides information about and instructions for installing, replacing, and enabling an I/O module in the BladeCenter unit.

To support each high-speed I/O module that you install in the BladeCenter unit, you must also install a compatible high-speed expansion card in each blade server that you want to communicate with the high-speed I/O module. In this configuration scenario, the expansion card is also known as a host channel adapter (HCA). You can install a maximum of two I/O modules in the BladeCenter unit.

Notes:

- For the locations of the BladeCenter unit I/O-module bays, see Chapter 1, "Introduction," on page 1.
- The blade servers or BladeCenter units that are described or shown in this document might be different from your blade server or BladeCenter unit. For additional information, see the documentation that comes with your blade server or BladeCenter unit.
- Configuration requirements for expansion cards, blade servers, and the BladeCenter unit might vary. You can obtain up-to-date information about these devices at http://www.ibm.com/systems/bladecenter/.
- Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.
- This document might contain references or links to other companies' Web sites, also known as *non-IBM Web sites*. As of the date of this document, the non-IBM Web sites are correct. However, these sites might be updated after this document has been published. Certain conditions apply to the usage of non-IBM Web sites. For additional information, see Appendix C, "Notices," on page 53.

Before you install an I/O module in the BladeCenter unit, consider the following BladeCenter I/O-module information:

Table 1. I/O-module bay/HCA port interconnections

BladeCenter unit I/O-module bays	Host channel adapter (HCA) port	High-speed expansion card support
7/8	0	One of the following types of expansion cards: • 4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter
9/10	1	• Cisco 4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter • Voltaire 4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter

Notes:

1. Installing two I/O modules provides dual-path connections to the expansion card in a blade server. A dual-path connection enables a redundant path and a separate connection from a blade server to the external InfiniBand network.

2. If I/O modules are installed in both I/O-module bays 7/8 and 9/10, both I/O modules must be of the same type. Installing a second I/O module in the BladeCenter unit provides a backup I/O module in case one I/O module fails. This configuration is also known as redundant, dual-switch topology.

3. Installing only one I/O module in the BladeCenter unit creates a single-path connection to the expansion card in a blade server. This non-redundant, single-switch topology does *not* provide a backup I/O module in case of failure.

See the following BladeCenter documentation for additional information:

• The *Installation and User's Guide* for your blade server provides server specific expansion card installation requirements.

• The *Installation Guide* for your BladeCenter unit shows the I/O-module bay locations. This document also contains installation and configuration instructions for other types of I/O modules that you might need to install in the BladeCenter unit; for example, a power module.

Installation guidelines

Before you install the I/O module or the blade server in the BladeCenter unit, read the following information:

• Read the safety information that begins on page v, "Handling static-sensitive devices" on page 10, and the safety statements in the BladeCenter unit documentation. This information will help you work safely.

• Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.

• Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the blade server or BladeCenter unit, open or close a latch, and so on.

• Orange on a component or an orange label on or near a component on the I/O module, blade server, or BladeCenter unit indicates that the component can be hot-swapped, which means that if the BladeCenter unit and operating system support hot-swap capability, you can remove or install the component while the BladeCenter unit is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.

• You do not have to turn off the BladeCenter unit to install or replace any of the hot-swap modules on the front or rear of the BladeCenter unit.

• When you install an I/O module in the BladeCenter unit, you must also install a compatible I/O expansion card in the blade server to support the I/O module.

• The pass-thru module is a double-height device that requires *two* high-speed I/O-module bays (7/8 or 9/10) in the BladeCenter unit. Therefore, the following conditions apply:

  – Before you install an I/O module in the BladeCenter unit, you must remove the filler modules from the *two* bays that you have selected for the I/O module.

  – If you remove an I/O module from the BladeCenter unit and you do not replace the I/O module with another I/O module, you must replace the I/O module with *two* filler modules. You must install the filler modules in I/O-module bays 7/8 or 9/10 in the BladeCenter unit.

- When you are attaching a 4X InfiniBand cable to the I/O module:
  - Do not fold, bend, or twist the cable.
  - Do not over-bend the cable behind the connector.
  - Do not twist the cable connector.

  Note: For cabling information, see the *Configuration and Options Guide* at http://www.ibm.com/servers/eserver/xseries/cog/.
- When you are finished working on the blade server or BladeCenter unit, reinstall all safety shields, guards, labels, and ground wires.
- Make sure that you are using the latest versions of device drivers, firmware, and BIOS for your blade server, management module, and I/O modules that are used by the I/O expansion card. See http://www.ibm.com/systems/support/ for the latest information about upgrading the device drivers and firmware for BladeCenter components. See the latest instructions in the documentation that comes with the updates.
- For a list of supported optional devices for the BladeCenter unit and other IBM products, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

For additional information, see the following BladeCenter documentation and the Cisco and Voltaire documentation that is discussed in "Cisco and Voltaire documentation" on page 5:

- The *Installation and User's Guide* for your blade server provides server-specific I/O expansion card installation requirements.
- The *Installation Guide* for your BladeCenter unit shows I/O-module bay locations.
- The I/O module *Installation Guide* provides installation and configuration instructions for the I/O module.

System reliability guidelines

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

- Each of the module bays on the rear of the BladeCenter unit contains either a module or a filler module.
- A removed hot-swap module is replaced with an identical module or filler module within 1 minute of removal.
- A removed hot-swap blade server is replaced with another blade server or filler blade within 1 minute of removal.
- The ventilation areas on the sides of the blade server are not blocked.
- You have followed the reliability guidelines in the documentation that comes with the BladeCenter unit.

Cable requirements for the I/O module are described in the IBM *Configuration and Options Guide* at http://www.ibm.com/servers/eserver/xseries/cog/. See the documentation that comes with the blade server for cable-routing information. If you must install cables for other BladeCenter components, see the cable-routing information in the documentation that comes with the BladeCenter components and the cables.
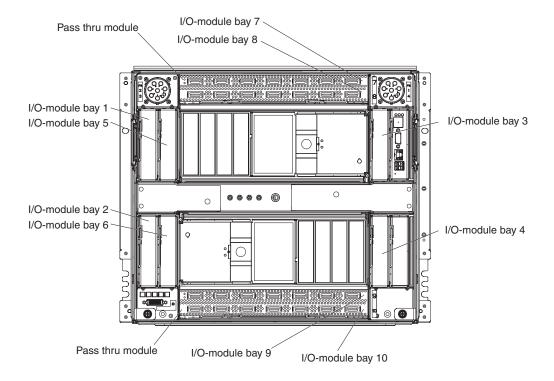
Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal surface of the BladeCenter unit chassis or an *unpainted* metal surface on any other grounded rack component in the rack that you are installing the device in for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the BladeCenter unit without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the BladeCenter unit or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Some types of BladeCenter units come with electrostatic discharge (ESD) connectors. If the BladeCenter unit is equipped with an ESD connector, see the documentation that comes with the BladeCenter unit for using the ESD connector.

Installing the I/O module

See the BladeCenter unit documentation for detailed instructions for installing the I/O module.

To install an I/O module, complete the following steps:

1. Make sure that you are using the latest versions of device drivers, firmware, and BIOS code for your blade server and management module. Go to the IBM Support Web site, http://www.ibm.com/systems/support/ for the latest information about upgrading the device drivers, firmware, and BIOS code for BladeCenter components. The latest instructions are in the documentation that comes with the updates.

2. Read the safety information that begins on page v and "Installation guidelines" on page 8.

3. Make sure that the BladeCenter unit is turned on, the green dc power LED on each power module is lit, and the green OK LED on the management module is lit.

4. Select only I/O-module bays 7/8 or 9/10 in which to install the I/O module.

   Note: For details about I/O-module bay requirements and bay locations, see the documentation for the BladeCenter unit, blade servers, and the applicable device.

5. Remove the filler modules from the two selected bays (7/8 or 9/10). Store the filler modules for future use.

6. If you have not already done so, touch the static-protective package that contains the I/O module to an *unpainted* metal surface of the BladeCenter chassis or an *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the I/O module for at least 2 seconds.

7. Remove the I/O module from its static-protective package.

8. Make sure that the release handles on the I/O module are in the open position (perpendicular to the I/O module).

   Depending on the type of BladeCenter unit that you are using, the installation procedure requires either a vertical or horizontal orientation for the I/O module. For information about installing an I/O module in your type of BladeCenter unit, see the documentation that comes with the BladeCenter unit.

9. Slide the I/O module into the applicable I/O-module bays until it stops.

10. Secure the I/O module to the chassis by pushing the I/O-module release handles inward to the closed position.

    Attention:

    When you are attaching a 4X InfiniBand cable to the I/O module:
    - Do not fold, bend, or twist the cable.
    - Do not over-bend the cable behind the connector.
    - Do not twist the cable connector.

11. Connect all of the necessary 4X InfiniBand cables to the I/O module.

    Note: For cabling information, see the *Configuration and Options Guide* at http://www.ibm.com/servers/eserver/xseries/cog/.

12. Push the release handles on the front of the I/O module to the closed position. After you insert and lock the I/O module, it is turned on, and a power-on self-test (POST) occurs to verify that the I/O module is operating correctly.

    Note: The I/O module takes approximately 5 seconds to complete the POST. When the I/O module is turned on, an LED test occurs. All LEDs are lit and remain lit for approximately 2 seconds; then, all the LEDs except the OK LED turn off. The OK LED flashes to indicate a normal POST

13. Make sure that the LEDs on the I/O module indicate that it is operating correctly. (For LED locations, see "Status LEDs" on page 18.)
    - When the POST starts, make sure that the green OK (power) LED on the I/O module is flashing. The POST tests the condition of firmware, memory, data paths, and switch logic and uses the fault LED (amber) on the I/O module to indicate pass or fail conditions.
    - Make sure that the green OK LED on the I/O module stops flashing to indicate that the switch logic has completed POST.

    Note: If the fault LED on the I/O module continues to be lit, the POST has failed. Make sure that the BladeCenter unit is powered on and the BladeCenter unit LEDs are lit. If POST has failed, see the following sections for diagnostic information:
    - "Status LEDs" on page 18
    - Chapter 5, "Solving problems," on page 23

    An amber LED on the BladeCenter unit is lit when a system error or event has occurred. To identify the error or event, check the other LEDs on the I/O module, and check the BladeCenter management-module event log or the switch system log.

14. If you have a second I/O module to install, repeat step 4 on page 11 through step 13; otherwise, go to step 15.

15. If you are using the external I/O-module ports, you can connect an optional device, such as a high-speed switch module, to these ports. For device installation instructions, see the documentation that comes with the device.

16. Enable the new I/O module and its external ports through the management module, as described in "Enabling the I/O module and its external ports" on page 14.

For additional information about the management module and enabling ports through the management module, see the following documents on the IBM Support Web site, http://www.ibm.com/systems/support/:

* BladeCenter unit *Installation and User's Guide*
* *BladeCenter Management Module Installation Guide*
* *IBM BladeCenter Management Module User's Guide*

Removing or replacing an I/O module

To remove or replace an I/O module, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 8.
2. Disconnect the cables from the external ports on the I/O module. Removing these cables disrupts the network connection from the external port to any connected external devices, such as high-speed switch modules. For removal instructions, see the documentation that comes with the cable options.
3. If you are replacing the I/O module with another I/O module and if you are using the existing external devices with the replacement I/O module, do not remove these external devices from the cables that you disconnected in step 2.

   If you are not using the existing external devices with the replacement I/O module or if you are not replacing the I/O module with another I/O module, remove any devices from the cables that you disconnected in step 2. For device removal instructions, see the documentation that comes with the devices. Store the devices for future use.
4. Pull the release handles toward the bottom of the I/O module. The I/O module moves out of bays 7/8 or 9/10 approximately 0.6 cm (0.25 inch).
5. Slide the I/O module out of bays 7/8 or 9/10 and set it aside.
6. Place either another I/O module or two filler modules in bays 7/8 or 9/10.

   Important: Complete this step within 1 minute. (For more information, see step 4 on page 11 through step 13 on page 12; then, return here and continue with the next step.)
7. If you placed another I/O module into bays 7/8 or 9/10 and if you are using the external I/O-module ports with the existing devices that were attached to the removed I/O module, reconnect any cables that you disconnected in step 2.

   If you disconnected the external devices that were attached to the removed I/O module in step 3 and you are attaching a new external device to the replacement I/O module, connect one end of a compatible cable to the new device. Connect the other end of the cable to one of the external I/O-module ports. For device installation instructions, see the documentation that comes with the devices. Then, reconnect any cables that you disconnected in step 2. For more information, see the documentation that comes with the cable options.

8. Enable the new I/O module and its external ports through the management module, as described in "Enabling the I/O module and its external ports."

   For additional information about the management module and enabling ports through the management module, see the following documents on the IBM Support Web site, http://www.ibm.com/systems/support/:

   • BladeCenter unit *Installation and User's Guide*
   • *BladeCenter Management Module Installation Guide*
   • *IBM BladeCenter Management Module User's Guide*

Enabling the I/O module and its external ports

After you install an I/O module, you must enable the I/O module and its 14 external ports to complete the process that makes them fully operational. To do this, use the BladeCenter Advanced Management Module.

Notes:

• For additional information about the management module and its configuration requirements, including the requirements for enabling ports, see the following documents on the IBM Support Web site, http://www.ibm.com/systems/support/:

  – BladeCenter unit *Installation and User's Guide*
  – *BladeCenter Management Module Installation Guide*
  – *IBM BladeCenter Advanced Management Module User's Guide*
  – *IBM BladeCenter Management Module Command-Line Interface Reference Guide*

• The contents of all management-module Web-interface pages vary according to the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

• The 14 external I/O-module ports correspond to the connectors for the blade servers that you can attach to the BladeCenter unit. For the location of the external ports, see the illustration in "External-port connectors" on page 19.

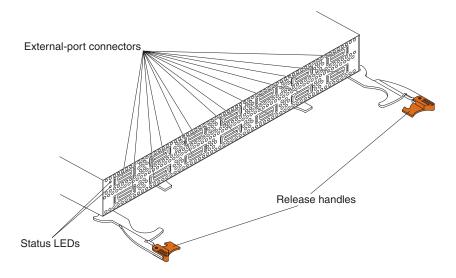To enable an I/O module and its external ports, complete the following steps:

1. Start a management-module session by using a Web browser to connect to the BladeCenter Advanced Management Module. To do this, use the Advanced Management Module Internet protocol (IP) address. The BladeCenter management-module Web-interface page opens.

2. In the Advanced Management Module window, under **I/O Module Tasks** (left pane), click **Admin/Power/Restart**. The I/O Module Power/Restart window opens.

3. In the main window, select the I/O module that you want to turn on by checking the box in the first column.

4. Click the **Power On Module(s)** link at the bottom of the table. The I/O module is powered on, and a power-on self-test (POST) is performed. This might take several moments to complete. At the end of the process, the following actions occur:

   a. In the table, the power (**PWR**) status column will change to ON.

   b. In the table, the **Power On Self Test (POST) Status** column displays: "POST results available: FF: Module completed POST successfully." For additional POST values, see Chapter 5, "Solving problems," on page 23.

c. The green LED (OK) located on the I/O module will be constantly lit. For additional information about LEDs, see Chapter 3, "Status LEDs and external ports," on page 17.

5. In the Advanced Management Module main window, scroll down to the **I/O Module Advanced Setup** choice.

6. From the drop-down menus, select the applicable I/O module.

   Important: Do not skip step 7. If you skip step 7, the ports will not operate.

7. Select the **Enable** choice for the external ports.

8. Click **Save**. The I/O module and its external ports are now fully operational.

Chapter 3. Status LEDs and external ports

This chapter describes the status LEDs on the pass-thru module and identifies the external ports on the pass-thru module.

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

The pass-thru module contains:

- LEDs that display the status of the I/O module and its network connections. (See "Status LEDs" on page 18.)
- 14 external high-speed ports to connect 4X InfiniBand high-speed host channel adapters (HCAs) in the blade servers. The corresponding port number is below each port on the I/O module. In the I/O-module configuration menus, these ports are identified as ports 1 through 14, and the internal connectors are numbered 1 through 14.

  For additional information about the external ports, see "External-port connectors" on page 19.

LED states and colors

After you install the I/O module in the BladeCenter unit, the I/O-module LEDs become active. There are four possible LED states: off, lit, flickering, and flashing. The lit (steady) LEDs and flashing LEDs can be green or amber. A flickering LED can only be green.
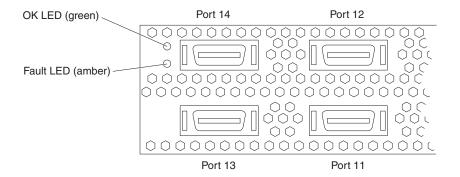
The LEDs might display any of these states and colors during startup, POST, or other diagnostic tests. This is typical and does not indicate a problem, unless the LEDs indicate a problem after all the startup (boot) processes and diagnostic tests have been completed.

Any errors that are detected during POST are written to the system log. This log is accessible through the management module. For information about the management module, see the documentation that comes with the management module. For information about POST error codes, see Chapter 5, "Solving problems," on page 23.

Note: You can also use the management module to make sure that the I/O module is operating correctly. For more information, see the documentation for the BladeCenter unit.

Status LEDs

There are two LEDs on the top left side of the I/O module: OK (green) and fault (amber). These LEDs represent the I/O-module status. The following illustration shows the locations of these LEDs on the I/O module.

Notes:

- An amber LED on the BladeCenter unit is lit when a system error or event has occurred. To identify the error or event, check the other LEDs on the I/O module, and check the BladeCenter management-module event log or the switch system log.
- An LED test occurs whenever the I/O module is turned on. All LEDs are lit and remain lit for approximately 2 to 3 seconds during POST, and then all the LEDs except the OK LED turn off. The OK LED flashes to indicate a normal POST condition; then, POST proceeds as described in Table 3 on page 26.
- For additional information about diagnostics, see the applicable documentation on the IBM Support Web site, http://www.ibm.com/systems/support/:
  - *BladeCenter Installation and User's Guide*
  - *Problem Determination and Service Guide*
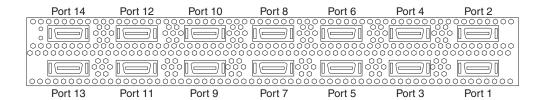 - *Hardware Maintenance Manual and Troubleshooting Guide*

Table 2 contains a description of each status LED on the information panel. For the descriptions of the status LED activities and corresponding I/O-module conditions and status, and the applicable user actions, see Table 3 on page 26.

Table 2. I/O-module LED descriptions

LED name	LED description
OK	This green LED is at the top left of the I/O module, to the left of port 14, on the front panel. When this LED is lit, it indicates that the I/O module has passed the POST and is operational.
Fault	This amber LED is below the OK LED on the front panel. This LED indicates that the I/O module has a fault. If the I/O module fails the POST, this LED is lit. **Note:** This LED is also known as the system-error LED or the I/O-module fault LED.

External-port connectors

There are 14 external connectors for high-speed ports on front of the I/O module, as shown in the following illustration. The order of the external ports is from right to left.

Port 14   Port 12   Port 10   Port 8   Port 6   Port 4   Port 2

Port 13   Port 11   Port 9   Port 7   Port 5   Port 3   Port 1

The following port-mapping information applies to the pass-thru module. Use this information to help you determine which ports to select for connecting the pass-thru module to the blade bays in the BladeCenter unit. Also, you will use this information when you enable the I/O module and its 14 external ports through the management module.

- The following ports are on the top row of the I/O module: 2, 4, 6, 8, 10, and 12. These ports match the even-numbered blade bays in the BladeCenter unit.
- The following ports are on the bottom row of the I/O module: 1, 3, 5, 7, 9, 11, and 13. These ports match the odd-numbered blade bays in the BladeCenter unit.
- In the I/O-module configuration menus, these I/O-module ports are identified as ports 1 through 14, and the internal connectors are numbered 1 through 14.

Note: For instructions for enabling the I/O-module external ports through the management module, see"Enabling the I/O module and its external ports" on page 14.

Chapter 4. Parts listing

Replaceable components are of three types:

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

For information about the terms of the warranty, see Appendix B, "Warranty," on page 35.

The replaceable components in the following table are Tier 1 CRUs only.

Name of component	CRU/FRU identifier
4X InfiniBand Pass-thru Module for IBM BladeCenter	43W4424 (Tier 1 CRU)
I/O module filler, single high	31R3303 (Tier 1 CRU)
IBM InfiniBand 3m DDR 4X Copper Cable	43W6744 (Tier 1 CRU)
IBM InfiniBand 8m DDR 4X Copper Cable	43W6745 (Tier 1 CRU)

If other BladeCenter components require replacement, see the following documentation that comes with these devices:

- BladeCenter *Problem Determination and Service Guide* or *Hardware Maintenance Manual and Troubleshooting Guide*
- *Installation and User's Guide* or *Installation Guide*

Notes:

1. The latest versions of these documents are on the IBM Support Web site, http://www.ibm.com/systems/support/.
2. For cabling information, see the *Configuration and Options Guide* at http://www.ibm.com/servers/eserver/xseries/cog/.
3. Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.
4. The pass-thru module is a double-height device that requires *two* high-speed I/O-module bays (7/8 or 9/10) in the BladeCenter unit. Therefore, the following conditions apply:
   - Before you install an I/O module in the BladeCenter unit, you must remove the filler modules from the *two* bays that you have selected for the I/O module.
   - If you remove an I/O module from the BladeCenter unit and you do not replace the I/O module with another I/O module, you must replace the I/O module with *two* filler modules. You must install the filler modules in I/O-module bays 7/8 or 9/10 in the BladeCenter unit.

Chapter 5. Solving problems

This section provides basic troubleshooting information to help you solve some problems that might occur while you are setting up the I/O module.

If you are having a problem with the I/O module, use the following information to help you determine the cause of the problem and the action to take. Additional troubleshooting and debugging procedures are available in the *Problem Determination Service Guide* or *Hardware Maintenance Manual and Troubleshooting Guide* for the:
- BladeCenter unit
- Blade server

Make sure that you are using the latest versions of device drivers, firmware code, and BIOS code for your blade server, the management module, and the I/O modules that are used by the expansion cards in the blade server. If these items are obsolete, the BladeCenter unit might not recognize the high-speed I/O module (that is, the pass-thru module) and might not turn it on. To download the most recent device drivers and firmware and BIOS boot code updates, go to http://www.ibm.com/systems/support/ for the latest information about upgrading the device drivers, firmware, and BIOS code for BladeCenter components. The instructions are in the documentation that comes with the updates.

Notes:
1. Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.
2. This document might contain references or links to other companies' Web sites, also known as *non-IBM Web sites*. As of the date of this document, the non-IBM Web sites are correct. However, these sites might be updated after this document has been published. Certain conditions apply to the usage of non-IBM Web sites. For additional information, see Appendix C, "Notices," on page 53.

If you cannot locate and correct a problem by using the information in this chapter, see Appendix A, "Getting help and technical assistance," on page 33.

Running POST

To ensure that it is fully operational, the I/O module processes a series of tests during power-up or a restart (power-on self-test, or POST). These tests take approximately 5 seconds to complete. The management module reads the test results and displays them for you. During normal operation, these tests are completed without error, and the green OK LED is lit. However, if the I/O module fails POST, the amber I/O-module fault LED and the system-error LED on the BladeCenter unit are lit. An event is stored in the event log in the system status panel of the management module. The specific failure is displayed on the system status I/O module panel of the management module.

Note: For the locations and descriptions of the I/O module LEDs, see Chapter 3, "Status LEDs and external ports," on page 17.

POST error codes and status descriptions

The following table contains the possible error status codes and status conditions that might occur if there is an I/O module fault during the I/O module POST:

POST error code	Status description
0x10	VPD read failure
0x20	Power Domain #2 Over Current
0x25	Mezzanine presence error
0x30	Over Temperature
0x41	Error in general purpose input/output (GPIO) device #1
0x42	Error in GPIO device #2
0x43	Error in GPIO device #3
0x44	Error in GPIO device #4
0x50	2.5 Voltage Error
0x51	3.3 Voltage Error
0x60	InfiniBand Repeater 1 errors
0x61	InfiniBand Repeater 2 errors
0x62	InfiniBand Repeater 3 errors
0x63	InfiniBand Repeater 4 errors
0x64	InfiniBand Repeater 5 errors
0x65	InfiniBand Repeater 6 errors
0x66	InfiniBand Repeater 7 errors
0x67	InfiniBand Repeater 8 errors
0x68	InfiniBand Repeater 9 errors
0x69	InfiniBand Repeater 10 errors
0x6A	InfiniBand Repeater 11 errors
0x6B	InfiniBand Repeater 12 errors
0x6C	InfiniBand Repeater 13 errors
0x6D	InfiniBand Repeater 14 errors
0x6E	InfiniBand Repeater 15 errors
0x6F	InfiniBand Repeater 16 errors
0x70	Wrong bay identifier
0x80	Temperature sensor failure

POST noncritical and critical errors

There are two types of errors: noncritical and critical. A noncritical error applies to one port, and the I/O module is operational. You can continue to operate the I/O module; however, you must replace it or the faulty device that is connected to it as soon as possible. When critical errors occur, the I/O module does not operate. To view POST results, complete the following steps:

1. Log on to the management module as described in the *IBM BladeCenter Management Module Command-Line Interface Reference Guide*. If necessary, obtain the IP address of the management module from your system administrator. The login window opens.

   Note: If you need to see the latest version of the *IBM BladeCenter Management Module Command-Line Interface Reference Guide*, go to the IBM Support Web site, http://www.ibm.com/systems/support/.

2. Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.

   After you install an I/O module, you must enable the I/O module and its external ports to complete the process that makes them fully operational. To do this, use the BladeCenter Advanced Management Module. For additional information about the management module, see the documentation that comes with the management module.

3. After POST is completed, the management module displays the results. Refresh the window to view the POST results. If a critical error occurs, replace the I/O module. If a noncritical error occurs, see the I/O-module error log for additional details.

The following table describes the basic critical and noncritical failures. This abbreviated list is representative; it is not an exhaustive list. An error code is associated with each failure. Error codes are displayed on the Management Module Switch Information window. Be sure to note the applicable error code and corresponding failure. You might have to provide this information when you call for service. For details, see Appendix A, "Getting help and technical assistance," on page 33.

Diagnostic indicator (in hex)	Failing functional area	Failure criticality
00 - 7F	Base internal functions	Critical
80 - 9F	Internal interface failures	Noncritical
A0 - AF	External interface errors	Noncritical
B0 - FE	Reserved	Noncritical
FF	I/O module "good" indicator	Operation

Status LED activities and corresponding I/O-module conditions and status

Table 3 contains descriptions of the activities of the I/O-module LEDs and corresponding I/O-module conditions and status. Where applicable, this table also specifies the required actions that you must take to correct the problem.

Note: For LED locations, see "Status LEDs" on page 18.

Table 3. I/O-module LED activities and corresponding I/O-module conditions and status

OK LED activity (green)	Fault LED activity (amber)	I/O-module condition	I/O-module status and user action
OFF	OFF	Pre-POST.	**Status:** • The I/O module has auxiliary power only. • The I/O module is not fully powered. Therefore, it is not operational. **Action:** 1. Make sure that the I/O module is correctly installed, attached to a compatible cable on the BladeCenter unit, and connected to a compatible expansion card in a blade server in the BladeCenter unit. If necessary, reinstall the I/O module. Also, enable the I/O module and its external ports. For instructions, see Chapter 2, "Installing, replacing, and enabling an I/O module," on page 7. For additional information, see the documentation that come with the cable, expansion card, blade server, and the BladeCenter unit. 2. If the BladeCenter unit is off, turn it on. If the BladeCenter unit is on, turn it off and then on again. 3. Wait for POST to start and complete its processes.
ON (first 1 to 3 seconds only)	ON (first 1 to 3 seconds only)	POST startup.	**Status:** LED test (also known as the lamp test). **Action:** None.

Table 3. I/O-module LED activities and corresponding I/O-module conditions and status (continued)

OK LED activity (green)	Fault LED activity (amber)	I/O-module condition	I/O-module status and user action
This LED flashes during initialization. It is on for 0.5 seconds and then off for 0.5 seconds.	OFF	Continuation of POST initialization.	**Status:** Progress indication of POST initialization. **Action:** None.
OFF	ON	POST critical failure. **Note:** For additional information about noncritical and critical errors, see "POST noncritical and critical errors" on page 25.	**Status:** The I/O module is not operational. **Action:** 1. Replace the I/O module. Also, enable the I/O module and its external ports. For instructions, see Chapter 2, "Installing, replacing, and enabling an I/O module," on page 7. 2. Make sure that the I/O module is correctly installed, attached to a compatible cable on the BladeCenter unit, and connected to a compatible expansion card in a blade server in the BladeCenter unit. For additional information, see the documentation that come with the cable, expansion card, blade server, and the BladeCenter unit.

OK LED activity (green)	Fault LED activity (amber)	I/O-module condition	I/O-module status and user action

ON	ON	POST noncritical failure.
		
		Note: For additional information about noncritical and critical errors, see "POST noncritical and critical errors" on page 25.
			Status: The I/O module is operational in a degraded mode. There is a port fault.
			
			Action:
			1. Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.
			After you install an I/O module, you must enable the I/O module and its external ports to make them fully operational.
			2. Locate the port that has the faulty cable connection, or is attached to the faulty device or component.
			3. Check the cable connections for the devices that are attached to the port.
			If a cable is not correctly attached to the I/O module or another device, disconnect the cable and correctly reattach it to the I/O module or applicable device.
			4. Check the expansion card in the blade server that is attached to the port.
			  a. If the expansion card is not compatible with the I/O module, replace it with a compatible, high-speed expansion card.
			  b. If the expansion card is faulty, replace it.
			5. Check the blade server that is attached to the port.
			If the blade server is faulty, replace it.
			
			Note: For additional information, see the documentation that comes with the management module, cable, expansion card, blade server, and the BladeCenter unit.

ON	OFF	POST completed without any errors.	**Status:** The I/O module is fully operational. **Action:** None.

Table 3. I/O-module LED activities and corresponding I/O-module conditions and status (continued)

OK LED activity (green)	Fault LED activity (amber)	I/O-module condition	I/O-module status and user action

ON	ON	The I/O module has a noncritical fault and is operational.
		
		Note: For additional information about noncritical and critical errors, see "POST noncritical and critical errors" on page 25.
			Status: The I/O module is operational in a degraded mode. There is a port fault.
			
			Action:
			1. Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.
			
			   After you install an I/O module, you must enable the I/O module and its external ports to make them fully operational.
			2. Locate the port that has the faulty cable connection, or is attached to the faulty device or component.
			3. Check the cable connections for the devices that are attached to the port.
			
			   If a cable is not correctly attached to the I/O module or another device, disconnect the cable and correctly reattach it to the I/O module or applicable device.
			4. Check the expansion card in the blade server that is attached to the port.
			   a. If the expansion card is not compatible with the I/O module, replace it with a compatible, high-speed expansion card.
			   b. If the expansion card is faulty, replace it.
			5. Check the blade server that is attached to the port.
			
			   If the blade server is faulty, replace it.
			
			Note: For additional information, see the documentation that comes with the management module, expansion card, blade server, and the BladeCenter unit.

OK LED activity (green)	Fault LED activity (amber)	I/O-module condition	I/O-module status and user action
OFF	ON	A critical fault prevents the I/O module from operating. **Note:** For additional information about noncritical and critical errors, see "POST noncritical and critical errors" on page 25.	**Status:** The I/O module is not operational. **Action:** 1. Replace the I/O module. Also, enable the I/O module and its external ports. For instructions, see Chapter 2, "Installing, replacing, and enabling an I/O module," on page 7. 2. Make sure that the I/O module is correctly installed, attached to a compatible cable on the BladeCenter unit, and connected to a compatible expansion card in a blade server in the BladeCenter unit. For additional information, see the documentation that come with the cable, expansion card, blade server, and the BladeCenter unit.

Hardware problems

To determine whether the installation problem is caused by the hardware, perform the following tasks:

- Make sure that the I/O module is correctly installed in the BladeCenter unit. For additional information, see the *Installation and User's Guide* that comes with the BladeCenter unit.
- Make sure that the blade server is correctly installed in the BladeCenter unit.
- Make sure that the device-driver parameters are correct.
- Make sure that an I/O module that supports high-speed operation is correctly installed in I/O-module bays 7/8, I/O-module bays 9/10, or both I/O-module bays 7/8 and 9/10 of the BladeCenter unit.
- Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.

  After you install an I/O module, you must enable the I/O module and its external ports to complete the process that makes them fully operational. To do this, use the BladeCenter Advanced Management Module. For additional information about the management module, see the documentation that comes with the management module.

- Make sure that all parameters, internal devices, and external devices have been enabled, where required. For additional information about the management module, see the documentation that comes with the applicable utility programs and devices.

- Make sure that all peripheral devices are:
  - Correctly connected to the I/O modules
  - Turned on
  - Operating correctly

  Notes:
  1. For additional information, see the documentation that comes with the peripheral devices.
  2. If you have installed an expansion card is installed in a BladeCenter HS21, LS21, or LS41 blade server, see the documentation that comes with the blade server for information about displaying attached high-speed, InfiniBand, Ethernet, and Fibre Channel devices.

Software problems

To determine whether the installation problem is caused by the software, perform the following tasks:

- Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.

  After you install an I/O module, you must enable the I/O module and its external ports to complete the process that makes them fully operational. To do this, use the BladeCenter Advanced Management Module. For additional information about the management module, see the documentation that comes with the management module.

- Make sure that all parameters, internal devices, and external devices have been enabled, where required. For additional information about the management module, see the documentation that comes with the applicable utility programs and devices.

- Make sure that the correct device drivers are installed. To download or get information about the latest supported device drivers, utilities, and documentation, see http://www.ibm.com/systems/support/. Also see the *Installation and User's Guide* for the blade server for additional information.

- Make sure that the BIOS functional firmware and boot code in the I/O module and expansion card are at the latest levels.

System-configuration problems

To determine whether the installation problem is caused by the system configuration, perform the following tasks:

- Make sure that the I/O modules that support high-speed operation are correctly configured.
- Make sure that the blade server is correctly configured.
- Make sure that the BladeCenter unit and all other BladeCenter components are correctly configured.
- Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.

  After you install an I/O module, you must enable the I/O module and its external ports to complete the process that makes them fully operational. To do this, use the BladeCenter Advanced Management Module. For additional information about the management module, see the documentation that comes with the management module.

- Make sure that all parameters, internal devices, and external devices have been enabled, where required. For additional information about the management module, see the documentation that comes with the applicable utility programs and devices.

Note: For additional information, see the documentation that comes with the blade server and the BladeCenter unit.

If you still have a system-configuration problem, you need to determine whether the system board in the blade server requires a special configuration. To determine whether the system board requires a special configuration, see the documentation that comes with your BladeCenter unit and blade server, or contact your IBM technical-support representative. For additional information about other configuration requirements, see the documentation that comes with your BladeCenter unit, blade server, and other BladeCenter components.

High-speed device problems

To determine whether your problem is caused by an attached high-speed device, perform the following tasks:
- Make sure that an I/O module that supports high-speed operation is correctly installed in I/O-module bays 7/8 , I/O-module bays 9/10, or both I/O-module bays 7/8 and 9/10 of the BladeCenter unit.
- Make sure that the I/O module and its external ports have been enabled, as described in "Enabling the I/O module and its external ports" on page 14.

  After you install an I/O module, you must enable the I/O module and its external ports to complete the process that makes them fully operational. To do this, use the BladeCenter Advanced Management Module. For additional information about the management module, see the documentation that comes with the management module.
- Make sure that all parameters, internal devices, and external devices have been enabled, where required. For additional information about the management module, see the documentation that comes with the applicable utility programs and devices.
- Make sure that the blade server is turned on.
- Make sure that the BladeCenter I/O module settings are the correct values:
  - See the troubleshooting section of the documentation that comes with the applicable device driver.
  - If you determine that the system is correctly configured, see the diagnostics section of the applicable device driver *Installation Guide* or *User's Guide*.

Appendix A. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

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

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

IBM Taiwan product service

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

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

Appendix B. Warranty

IBM provides hardware warranty service for this product equivalent to that described in the IBM Statement of Limited Warranty ("SOLW"), a copy of which is included, notwithstanding the section entitled, "What this Warranty Does not Cover" of the SOLW. All references to "Machine" in the SOLW apply to this product (except for its firmware or accompanying software) for purposes of the warranty. References to "IBM's Official Published Specifications" mean the specifications for the product designated by IBM. Any firmware or software included in or which accompanies this product is subject to the terms and conditions of the manufacturer's end user license agreement.

IBM Statement of Limited Warranty Z125-4753-09 08/2006

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.**

This Statement of Limited Warranty is available, in multiple languages, at the following IBM Internet website: http://www.ibm.com/servers/support/ machine_warranties/.

What this Warranty Covers

IBM warrants that each Machine is free from defects in materials and workmanship and conforms to its Specifications. "Specifications" is information specific to a Machine in a document entitled "Official Published Specifications" which is available upon request.

During the warranty period, IBM provides repair and exchange service for the Machine under the type of warranty service IBM designates for the Machine. The warranty period for the Machine is a fixed period starting on its original Date of Installation. The date on your purchase invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. The warranty period, type of warranty, and service level that apply to your Machine are designated in Part 3.

Many features, conversions, or upgrades involve the removal of parts and their return to IBM. An IBM part that replaces a removed part will assume the warranty service status of the removed part. An IBM part that is added to a Machine without replacing a previously-installed part is subject to warranty effective on its Date of

Installation. Unless IBM specifies otherwise, the warranty period, type of warranty, and service level of such part is the same as the Machine on which it is installed.

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:
1. failure or damage 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;
2. failure caused by a product for which IBM is not responsible;
3. any non-IBM products, including those provided with, or installed on, an IBM Machine at your request;
4. accessories, supply items and consumables (e.g. batteries and printer cartridges), and structural parts (e.g. frames and covers);
5. service of Machine alterations; and
6. service of a Machine on which you are using capacity or capability, other than that authorized by IBM in writing.

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 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. Contact information for IBM is provided in Part 3. 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

IBM will attempt to diagnose and resolve your problem over the telephone or electronically by access to an IBM Internet website. Certain Machines contain remote support capabilities for direct problem reporting, remote problem determination and resolution with IBM. When you contact IBM for service, you must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, a service technician will be scheduled for service at your location.

You are responsible for downloading or obtaining from IBM, 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 in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes, however, you may be charged for that service.

Some parts of IBM Machines are designated as Customer Replaceable Units ("CRUs"). If your problem can be resolved with a CRU (e.g., keyboard, memory, hard disk drive), IBM will ship the CRU to you for you to install.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone or electronically, through your application of Machine Code or software updates, or with a CRU, IBM or its subcontractor or a reseller that has been 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 or its subcontractor or the reseller is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or its subcontractor or the 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 its subcontractor or the reseller replaces becomes IBM's 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

You agree:
1. before IBM or its subcontractor or the reseller exchanges a Machine or part, to remove all features, parts, options, alterations, and attachments not under warranty service and ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. to obtain authorization from the owner to have IBM or its subcontractor or the reseller service a Machine that you do not own;
3. where applicable, before service is provided:
   a. follow the service request procedures that IBM or its subcontractor or its reseller provides;

      b. backup and secure all programs, data, and funds contained in the Machine; and

      c. inform IBM or its subcontractor or the reseller of changes in the Machine's location;

4. to provide IBM or its subcontractor or the reseller with sufficient and safe access to your facilities to permit IBM to fulfill its obligations;

5. to allow IBM or its subcontractor or the reseller to install mandatory engineering changes, such as those required for safety;

6. when the type of warranty service requires that you deliver a failing Machine to IBM, you agree to ship it suitably packaged, as IBM specifies, to a location IBM designates. After the Machine has been repaired or exchanged, IBM will return the repaired Machine or provide a replacement Machine to you at its expense, unless IBM specifies otherwise. 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; and

7. to securely erase from any Machine you return to IBM for any reason all programs not provided by IBM with the Machine, and data, including without limitation the following: 1) information about identified or identifiable individuals or legal entities ("Personal Data") and 2) your confidential or proprietary information and other data. If removing or deleting Personal Data is not possible, you agree to transform such information (e.g., by making it anonymous or encrypting it) so that it no longer qualifies as Personal Data under applicable law. You also agree to remove all funds from Machines returned to IBM. IBM is not responsible for any funds, programs not provided by IBM with the Machine, or data contained in a Machine that you return to IBM. You acknowledge that, to perform its responsibilities under this Statement of Limited Warranty, IBM may ship all or part of the Machine or its software to other IBM or third party locations around the world, and you authorize IBM to do so.

Limitation of Liability

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, subcontractors, and resellers. It is the maximum for which IBM and its suppliers, subcontractors and resellers are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM OR ITS SUPPLIERS, SUBCONTRACTORS, 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.

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

Jurisdiction: *The following sentence is added to this section as it applies to
countries in bold print below:*

Any litigation arising from this Statement of Limited Warranty will be settled
exclusively by 1) in **Argentina**; the Ordinary Commercial Court of the city of Buenos
Aires; 2) in **Bolivia**; the courts of the city of La Paz; 3) in **Brazil**; court of Rio de
Janeiro, RJ; 4) in **Chile**; the Civil Courts of Justice of Santiago; 5) in **Colombia**; the
Judges of the Republic of Colombia; 6) in **Equador**; the civil judges of Quito for
executory or summary proceedings (as applicable); 7) in **Mexico**; the courts located
in Mexico City, Federal District; 8) in **Paraguay**; the courts of the city of Asuncion;
9) in **Peru**; the judges and tribunals of the judicial district of Lima, Cercado; 10) in
Uruguay; the courts of the city of Montevideo; 11) in **Venezuela**; the courts of the
metropolitan area of the city of Caracas.

BRAZIL

Exchange of a Machine or Part: *Delete the last sentence:*

The replacement assumes the warranty service status of the replaced item.

CANADA

What this Warranty Covers: *The following replaces the 2nd paragraph to this
section:*

During the warranty period, IBM provides repair and exchange service for the
Machine under the type of warranty service IBM designates for the Machine. The
warranty period for the Machine is a fixed period starting on its original Date of
Installation. The date on your purchase invoice or sales receipt is the Date of
Installation unless IBM informs you otherwise. The warranty period, type of
warranty, and service level that apply to your Machine are designated in Part 3.

Limitation of Liability: *The following replaces item 1 and item 2 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
2. the amount of any other actual direct damages, up to the greater of $100,000.00 or 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").

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.

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").

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 AND LAOS

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, AND LAOS

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.

As applies to transactions initiated and performed in Hong Kong S.A.R., phrases throughout this Agreement containing the word "country" (for example, "country of purchase" and "country of Installation") are replaced with "Hong Kong S.A.R."

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.

MACAU S.A.R.

As applies to transactions initiated and performed in Macau S.A.R., phrases throughout this Agreement containing the word "country" (for example, "country of purchase" and "country of Installation") are replaced with "Macau S.A.R."

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:

*Add the following paragraph in **Western Europe** (Andorra, Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Vatican State, and any country subsequently added to the European Union, as from the date of accession):*

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.

If you purchase a Machine in one of the Western European countries, as defined above, 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 purchase a Machine in a Middle East 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.

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, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan;** 2) "the laws of France" **in Algeria, Benin, Burkina Faso, Cameroon, 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, Libya, 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, United Kingdom, 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, 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, Libya, 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 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; 6) **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 8) **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, Libya, FYR Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan 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:

The warranty for Machines acquired in EU countries is valid and applicable in all EU countries provided the Machines have been announced and made available in such countries.

DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, NORWAY, 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, OR ITS SUPPLIERS, SUBCONTRACTORS, 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, OR ITS SUPPLIERS, SUBCONTRACTORS, 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 AND 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 price reduction 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.

IRELAND

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

Except as expressly provided in these terms and conditions or Section 12 of the Sale of Goods Act 1893 as amended by the Sale of Goods and Supply of Services Act, 1980 ("the 1980 Act"), all conditions or warranties (express or implied, statutory or otherwise) are hereby excluded including, without limitation, any warranties implied by the Sale of Goods Act 1893 as amended by the 1980 Act (including, for the avoidance of doubt, section 39 of the 1980 Act).

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.

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.

SWITZERLAND

Your Additional Responsibilities: *The following sentence is added to this section:*

Personal Data also includes information about you as a legal entity.

TURKEY

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

The minimum warranty period for Machines is 2 years.

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;
3. loss of profits, business, revenue, goodwill, or anticipated savings; or
4. third party claims against you for damages.

Part 3 - Warranty Information

Machine - 4X InfiniBand Pass-thru Module for IBM BladeCenter

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	1 year	1
* See "Types of Warranty Service" for the legend and explanations of warranty-service types.		

Scheduling of a warranty service will depend upon the following: 1) the time your request for service is received, 2) Machine technology, and 3) availability of parts. Contact your local IBM representative or the subcontractor or reseller performing services on behalf of IBM for country and location specific information.

Types of Warranty Service

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

   IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your Machine and are available from IBM at any time on your request. CRUs are designated as being either Tier 1 or a Tier 2 CRU. Installation of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service designated for your Machine. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of 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 of the Machine and verification of its operation.

5. **CRU and On-site Service***

   This type of Warranty Service is a combination of Type 1 and Type 2 (see above).

6. **CRU and Courier or Depot Service***

   This type of Warranty Service is a combination of Type 1 and Type 3 (see above).

7. **CRU and Customer Carry-In or Mail-In Service***

   This type of Warranty Service is a combination of Type 1 and Type 4 (see above).

8. **Machine Exchange Service**

   IBM will initiate shipment of a replacement Machine to your location. You are responsible for its installation and verification of its operation. You must pack the failing Machine into the shipping container that contained the replacement Machine and return the failing Machine to IBM. Transportation charges, both ways, are paid by IBM. You may be charged for the replacement Machine if IBM does not receive the failing Machine within 15 days of your receipt of the replacement Machine.

(*) When a 5, 6, or 7 type of warranty service is listed, IBM will determine which type of warranty service is appropriate for the repair.

Service Levels

Service levels specified below are response-time objectives only and are not guarantees. The specified service level may not be available in all worldwide locations. Charges may apply outside IBM's normal service area. Certain Machines with a Same Day On-site response-time objective may require the installation and use of remote connectivity tools and equipment for direct problem reporting, remote problem determination and resolution.

1. **Next Business Day (NBD), 9X5**

   After we receive your call, following problem determination, if IBM determines on-site service is required, a service technician will be scheduled to arrive at your location on the next business day. Service will be provided from 8:00 a.m. to 5:00 p.m. in your local time zone, Monday through Friday, excluding holidays.

2. **Same Business Day (SBD), 9X5**

   After we receive your call, following problem determination, if IBM determines on-site service is required, a service technician will be scheduled to arrive at your location within four hours. Service will be provided from 8:00 a.m. to 5:00 p.m. in your local time zone, Monday through Friday, excluding local IBM holidays. If after 1:00 p.m. it is determined that on-site service is required, a service technician will be scheduled to arrive the morning of the following business day.

3. **Same Day (SD), 24X7**

   After we receive your call, following problem determination, if IBM determines on-site service is required, a service technician will be scheduled to arrive at your location within four hours. This type of service will be provided 24 hours a day, every day, including holidays.

IBM Contact Information

For IBM in Canada or the United States, call 1-800-IBM-SERV (or 1-800-426-7378). For IBM in the European Union (EU), Asia Pacific, and Latin America countries, contact IBM in that country or visit the following IBM Internet website: http://www.ibm.com/servers/support/machine_warranties/.

Appendix C. Notices

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

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

> IBM Director of Licensing
> IBM Corporation
> North Castle Drive
> Armonk, NY 10504-1785
> U.S.A.

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product, and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

IBM	FlashCopy	TechConnect
IBM (logo)	i5/OS	Tivoli
Active Memory	IntelliStation	Tivoli Enterprise
Active PCI	NetBAY	Update Connector
Active PCI-X	Netfinity	Wake on LAN

53

AIX	PowerExecutive	XA-32
Alert on LAN	Predictive Failure Analysis	XA-64
BladeCenter	ServeRAID	X-Architecture
Chipkill	ServerGuide	XpandOnDemand
e-business logo	ServerProven	xSeries
@server	System x	

Intel, Intel Xeon, Itanium, and Pentium are trademarks of Intel Corporation in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

Adobe and PostScript are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Adaptec and HostRAID are trademarks of Adaptec, Inc., in the United States, other countries, or both.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Red Hat, the Red Hat "Shadow Man" logo, and all Red Hat-based trademarks and logos are trademarks or registered trademarks of Red Hat, Inc., in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

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

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

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

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

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

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

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven®, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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 must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/index.shtml.

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM http://www.ibm.com/ibm/environment/products/index.shtml.

Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

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/index.shtml or contact your local waste disposal facility.

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

For Taiwan: Please recycle batteries.

For the European Union:

Notice: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

バッテリーあるいはバッテリー用のパッケージには、EU 諸国に対する廃電気電子機器指令 2006/66/EC のラベルが貼られています。この指令は、バッテリーと蓄電池、および廃棄バッテリーと蓄電池に関するものです。この指令は、使用済みバッテリーと蓄電池の回収とリサイクルの骨子を定めているもので、EU 諸国にわたって適用されます。このラベルは、使用済みになったときに指令に従って適正な処理をする必要があることを知らせるために種々のバッテリーに貼られています。

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

For California:

Perchlorate material – special handling may apply. See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

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. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

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 2004/108/EC 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.

European Community contact:
　　IBM Technical Regulations
　　Pascalstr. 100, Stuttgart, Germany 70569
　　Telephone: 0049 (0)711 785 1176
　　Fax: 0049 (0)711 785 1283
　　E-mail: tjahn@de.ibm.com

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

声　　明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

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。

Index

A

accessing the management module   14
activities, LED   26
assistance, getting   33

B

backup I/O module   8
battery return program   56
bay locations, BladeCenter unit   1
BIOS code updates   23, 30, 31
blade server
    matching blade bays to I/O-module external
      ports   14, 17
    network requirements   1
    turning on   32
BladeCenter components, upgrading device drivers,
  firmware, and BIOS code for   23, 30
BladeCenter documentation   4, 8
BladeCenter unit   1, 31

C

cables
    handling   9, 12
    installing   12, 13
    removing   13
    requirements for I/O modules   9
    specifications   2, 21
CD, documentation   4
Cisco documentation   5
Class A electronic emission notice   58
communication requirements   1, 13
compact-form-factor (CFFh) expansion card   2, 3
compatible BladeCenter options Web site   9
components
    major   6
    meanings of colors   8
    ports   17, 19
    status LEDs   17, 18
conditions, I/O module   26
configuration
    cable requirements   9
    dual-switch topology   8
    problems   31
    single-switch topology   8
configuration menus
    management module, accessing   14
    port mapping   14, 17, 19
connecting to the management module   14
connectors, internal, mapping to external ports   14, 17,
  19
country unique terms   39
courier or depot service   50
critical errors   25
critical failures   25
customer carry-in service   50

customer replaceable unit (CRU) service   49

D

depot or courier service   50
device drivers
    installing   31
    updating   23, 30
device problems, high-speed   32
diagnostic indicators   25
documentation
    BladeCenter   4
    cable requirements   9
    Cisco   5
    IBM   4
    related   4, 5
    Voltaire   5
dual-switch topology, redundant   8

E

electronic emission Class A notice   58
enabling
    devices   30, 31, 32
    external ports on I/O module   14
    I/O module   14
error
    codes, power-on self-test (POST)   24
    critical   25
    noncritical   25
error log, management module   12, 18, 23
event log, management module   12, 18, 23
exchange of a machine or part   37
expansion card
    I/O-module requirements   2, 3, 8
    installation guidelines   8, 9
    installing   1, 7
    support   1, 3, 7
external ports
    enabling   14
    illustration   19
    location   6
    mapping   14, 17, 19

F

failures, critical and noncritical   25
fault LED
    I/O module   18, 23, 26
    on BladeCenter unit   18, 23
FCC Class A notice   58
features   5
filler modules
    installing   8, 13
    removing   8, 11
    specifications   21
firmware updates   23, 30

IBM®

Part Number: 44R5039

Printed in USA