

QLogic Ethernet and 8 Gb Fibre Channel Expansion  
Card (CFFh) for IBM BladeCenter



# Installation and User's Guide



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**Note:** Before using this information and the product it supports, read Appendix B, "Warranty," on page 41 and the general information in Appendix C, "Notices," on page 61.

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

**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 the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

**To Connect:**

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

**To Disconnect:**

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

**Statement 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.**

This device is intended for use only with UL Listed IBM BladeCenter units.



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## Chapter 1. Introduction

The QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM® BladeCenter® provides both 1 Gb Ethernet and 8 Gb Fibre Channel technologies in a single device. The expansion card has four configurable adapter ports. Communication signals are routed from the blade server through the high-speed connector on the expansion card to Ethernet and Fibre Channel switch modules installed in a BladeCenter chassis, such as a BladeCenter H, that has been configured with at least one Multi-Switch Interconnect Module for IBM BladeCenter (MSIM). Up to two MSIM can be installed; one in I/O bays 7 and 8 and another in I/O bays 9 and 10. (For the latest compatibility information for BladeCenter and other IBM products, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.)

For more about the design, architecture, and features of the expansion card, see “Technology overview” on page 4 and “Features, specifications, and standards” on page 9.

### Notes:

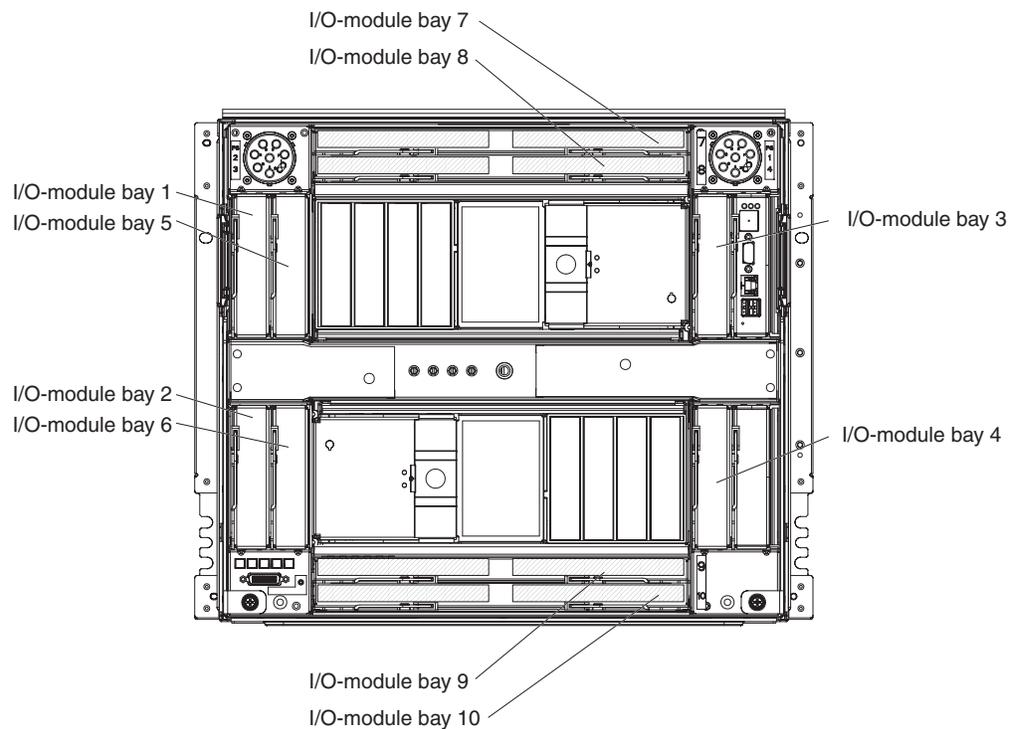
1. Unless otherwise stated, references to the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter is also referred to throughout this document as the expansion card or the combo expansion card.
2. Unless otherwise stated, references to the blade server apply to all blade servers that support the I/O modules and expansion card.
3. The illustrations in this document might differ slightly from your hardware.

This *Installation and User's Guide* contains the following instructions and information:

- Installing the expansion card in an IBM BladeCenter blade server
- Removing the expansion card from a blade server
- Configuring the expansion card
- Updating the firmware and device drivers of the expansion card
- Using the IBM Fast!UTIL utility and the QLogic SANsurfer application to configure host bus adapters (HBAs) and the expansion card
- Using the IBM Fast!UTIL utility and the QLogic SANsurfer application for the following tasks:
  - Performing custom configuration of the expansion card, HBAs, and other Fibre Channel devices
  - Managing Fibre Channel networks and other Fibre Channel devices, including local and remote devices, in your system
- Performing basic troubleshooting tasks and solving problems with the expansion card
- Getting help, service, and technical assistance

To support each I/O module that you install in the BladeCenter unit, you must also install a compatible expansion card in each blade server that you want to communicate with the I/O module. For installation details, see Chapter 2, “Installing and removing an expansion card,” on page 13. 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. For a list of supported BladeCenter units, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.



If firmware and documentation updates are available, you can download them from the IBM Web site. To check for updates, complete the following steps.

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, click **BladeCenter**.
3. Under **Popular links**, click **Software and device drivers** for firmware updates, or click **Publications lookup** for documentation updates.

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.

#### Notes:

- Any I/O modules that are installed in bay 8 and bay 10 of a Multi-Switch Interconnect Module for IBM BladeCenter (MSIM) must support Fibre Channel operation.
- Any I/O modules that are installed in bay 7 and bay 9 of an MSIM must support Ethernet operation:
- If you install the expansion card into a IBM BladeCenter Storage Expansion Unit 3, the two 1GB Ethernet ports are *not* functional. Only the 8GB Fibre Channel ports are supported in this expansion unit.
- When you are using the expansion card with an optional optical pass-thru module (OPM), the data-rate speed of the expansion card must be set to 2 Gbps for Fibre Channel devices. To change the data-rate speed setting of the expansion card, see Chapter 4, "Using Fast!UTIL," on page 23 or Chapter 5, "Using the SANsurfer application," on page 29.

- If your blade server supports Concurrent keyboard/video/mouse (cKVM) or modular flash drive optional devices, you can install these optional devices in the same blade server as the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter. However, if the expansion card has already been installed in the blade server and you plan to install the IBM BladeCenter Concurrent KVM Feature Card or an optional modular flash drive in the blade server or remove these devices from the blade server, you must first remove the expansion card from the blade server, as described in “Removing the expansion card from a blade server” on page 19.

For additional information, see the following documentation:

- The *Installation and User's Guide* for your blade server
- The documentation that comes with the IBM BladeCenter Concurrent KVM Feature Card
- The documentation that comes with the modular flash drive optional devices
- The following types of blade servers *do not* support the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter:
  - HS20
  - JS20
  - LS20
- Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
- See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
- For details about installation, configuration, and use of compatible devices, see the documentation that comes with these devices.
- 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 addresses of non-IBM Web sites are correct. However, these addresses might be updated after this document has been published. Certain conditions apply to the use of non-IBM Web sites. For additional information, see Appendix C, “Notices,” on page 61.
- You can find detailed hardware and software information, including documentation, about IBM products at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>.
- You can find detailed hardware and software information, including documentation, about BladeCenter devices at <http://publib.boulder.ibm.com/infocenter/systems/scope/blades/index.jsp> or <http://publib.boulder.ibm.com/infocenter/systems/scope/bladecenter/index.jsp>.

Your expansion card comes with a one-year limited warranty. For information about your warranty, see Appendix B, “Warranty,” on page 41. You can obtain up-to-date information about your expansion card and other IBM server products at <http://www.ibm.com/systems/x/>. You can obtain up-to-date information about compatible I/O modules and other IBM products at <http://www.ibm.com/systems/support/>.

At <http://www.ibm.com/support/mysupport/>, you can create a personalized support page by identifying IBM products that are of interest to you. From this personalized

page, you can subscribe to weekly e-mail notifications about new technical documents, search for information and downloads, and access various administrative services.

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 optional devices 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 39.

Record information about the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) in Table 1. You can find this information on the labels on the expansion card. You can register the expansion card with IBM at <http://www.ibm.com/support/mysupport/>. The product name and serial number are required for registration.

Table 1. Product information

<b>Product name</b>	QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter
<b>Model number</b>	_____
<b>Serial number</b>	_____

If you participate in the IBM client reference program, you can share information about your use of technology, best practices, and innovative solutions; build a professional network; and gain visibility for your business. For more information about the IBM client reference program, see <http://www.ibm.com/ibm/clientreference/>.

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## Technology overview

The QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter is a standard, compact-form-factor expansion card whose architecture integrates both the Ethernet and Fibre Channel technologies in a single-card design, resulting in faster system processing and enhanced networking performance.

The expansion card supports Ethernet and Fibre Channel networks and devices. Thus, this expansion card is also known as a combo expansion card. This expansion card has one integrated Ethernet controller and one integrated Fibre Channel controller. These controllers are dual-channel devices. The Ethernet controller connects to Ethernet networks through an Ethernet I/O module or other supported I/O modules in the BladeCenter unit. The Fibre Channel controller connects to Fibre Channel networks through a Fibre Channel I/O module or other supported I/O modules in the BladeCenter unit.

The QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) provides a connection to high-speed I/O-module bays 7 and 8 or 9 and 10 when used with a supported BladeCenter unit, such as a BladeCenter H. The BladeCenter unit must be configured with at least one Multi-Switch Interconnect Module for IBM BladeCenter (MSIM) to support the available switch modules.

A CFFh-expansion card can be used in combination with a CFFv-expansion card in a blade server, providing simultaneous connections to I/O-module bays 3 and 4, and the high-speed I/O-module bays in a BladeCenter chassis such as the BladeCenter H unit.

Fibre Channel technology is outlined in the SCSI-3 Fibre Channel Protocol (SCSI-FCP) standard. Fibre Channel is a high-speed data transport technology that is used for mass storage and networking.

By adding Fibre Channel expansion cards to the blade servers and Fibre Channel-compatible I/O modules to the BladeCenter unit, you can attach the blade server to an external storage area network (SAN) through the external 4 Gbps (Gigabits per second) or 8 Gbps optical ports on the I/O modules. Depending on the system configuration, the expansion card provides up to 8 Gbps or 16 Gbps of full-duplex bandwidth per port.

---

## Inventory checklist

Make sure that the shipping carton contains the following items:

- One QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter
- IBM *Important Notices* document
- The *Documentation* CD, which contains the following documents:
  - This *Installation and User's Guide* (this document)
  - *IBM Safety Information* document (multilingual)

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

---

## Related documentation

This *Installation and User's Guide* contains instructions for installing, removing, configuring, and troubleshooting the expansion card. This document also contains information about updating the firmware and device drivers for the expansion card. This document is included on the *Documentation* CD that comes with the expansion card.

In addition to this *Installation and User's Guide*, the following IBM documents are available to help with the installation, configuration, and use of the other BladeCenter devices associated with the installation of the expansion card.

- IBM *Important Notices*

Read this document before you install the expansion card in the blade server. This document contains the warranty information, safety information, and environmental notices that apply. (This document is provided in printed form with this product.)
- IBM BladeCenter H *Installation and User's Guide*

This document includes the I/O-module bay locations in the BladeCenter H.

- IBM BladeCenter blade server *Installation and User's Guide*  
Each type of blade server has a customized *Installation and User's Guide*. This document includes server-specific expansion card installation requirements.
- IBM BladeCenter *Interoperability Guide*  
This document provides instructions to install the blade server in the interconnect module. For the latest version of this document, go to <http://www.ibm.com/systems/support/> and search for "BladeCenter Interoperability Guide".
- The *Installation Guide* or *Installation and User's Guide* for the I/O module installed in your BladeCenter  
This document contains installation and configuration instructions for the I/O module.
- IBM *BladeCenter SAN Solutions Guide*  
This document provides user-oriented information about how the BladeCenter Fibre Channel optional devices are used to provide different SAN storage solutions for different application requirements.
- IBM *BladeCenter Fibre Channel I/O Interoperability Guide*  
This document provides detailed Fibre Channel I/O-module configuration data and step-by-step configuration procedures for integrating the BladeCenter unit into other vendor switch fabrics. Each vendor configuration includes an initial integration checklist, configuration limitations, supported I/O module and firmware versions, specific management-application operations, and a successful-integration checklist.

The most recent versions of this and other BladeCenter documentation are at <http://www.ibm.com/systems/support/>.

Additionally, most BladeCenter documentation is now available from the IBM Systems Information Center. To access this information, complete the following steps.

1. Go to <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>.
2. In the Contents pane, select **Combined IBM Systems Information**.
3. Select **Systems hardware**.
4. Select **BladeCenter information**.

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## The IBM Documentation CD

The IBM *Documentation* CD contains documentation for your BladeCenter product in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

## Hardware and software requirements

You can run the IBM *Documentation* CD on any system that meets the hardware and software requirements.

The IBM *Documentation* CD requires the following minimum hardware and software:

- Microsoft® Windows® XP, Windows 2000, or Red Hat Linux®
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe® Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

## Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your system and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD or DVD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
  - If you are using a Windows operating system, insert the CD into the CD drive and click **Start --> Run**. In the **Open** field, type  
`e:\win32.bat`

where *e* is the drive letter of the CD or DVD drive, and click **OK**.

- If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the `/mnt/cdrom` directory:  
`sh runlinux.sh`

Select your BladeCenter product from the **Product** menu. The **Available Topics** list displays all the documents for your BladeCenter product. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Ctrl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

---

## Notices and statements in this document

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

The following notices and statements are used in this document:

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

- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

---

## Features, specifications, and standards

The following features, specifications, and standards apply to the expansion card:

- Compliance with U.S. and international safety and emissions standards
- Connection to 1000BASE-TX environments
- Full-duplex (FDX) capability, enabling simultaneous transmission and reception of data on the Ethernet local area network (LAN)
- Failover support
- Preboot Execution Environment (PXE) support
- Support for direct memory access (DMA)
- Support for bus mastering
- Fast!UTIL basic input/output system (BIOS) utility program to customize the configuration parameters on the expansion card and attached drives
- Support for Fibre Channel protocol SCSI (FCP-SCSI) and Fibre Channel Internet protocol (FCP-IP)
- Support for point-to-point fabric connection (F-port fabric login)
- Support for Fibre Channel service (classes 2 and 3)
- Support for remote startup (boot) operations
- Support for BladeCenter Open Fabric Manager
- Support for Fibre Device Management Interface (FDMI) standard (VESA standard)
  - Support provided that is by the device drivers for the operating systems that are listed in Chapter 3, “Updating the boot code and firmware and installing device drivers,” on page 21.
  - FDMI varies by operating system.
- Persistent binding
- Logical unit number (LUN) masking
- I<sup>2</sup>C circuitry to provide vital product data (VPD) functions to and from the management modules
- QLogic Service Set Identification (SSID)
- Four internal ports
  - Two copper serializer/deserializer (SERDES) interfaces to the redundant I/O-module bay locations.
  - Two 1 Gb Ethernet ports (1 and 3).
  - Two 8 Gb Fibre Channel ports (2 and 4).
  - Internal ports operate at 2 Gbps, 4 Gbps, and 8 Gbps Fibre Channel rates, with auto-detect speeds based on the switch modules that are installed in the BladeCenter chassis.
  - For Fibre Channel operation: When connecting to an optical pass-thru module (OPM), the internal ports operate at 2 Gbps speeds (no auto-negotiation).
- Two internal LEDs per port
- Support for full-duplex operation
- Overlapping protection domains (OPD) on both data and control paths
- Uses converters for all power rails

Table 2 on page 10 contains additional specifications for the expansion card.

Table 2. Additional expansion-card specifications

Type	Specification
Ethernet specifications	1 Gb Ethernet controller on each port
Fibre Channel specifications	<ul style="list-style-type: none"> <li>• Multi-ID and Node port (N_Port) virtualization allows a single port to acquire multiple N_Port IDs.</li> <li>• 8 Gbps Fibre Channel (FC) to PCI Express x8</li> <li>• 8 Gbps/4 Gbps/2 Gbps auto-negotiation</li> <li>• Support for full-duplex operation</li> <li>• Bandwidth: 8 Gb per second maximum at half-duplex and 16 Gb per second maximum at full-duplex per port</li> <li>• 1600 Mbps (full-duplex) per port</li> <li>• Support for FCP-SCSI initiator and target operation</li> <li>• Support for point-to-point fabric connection: F-Port Fabric Login</li> <li>• Support for Fibre Channel Arbitrated Loop (FCAL) public loop profile: Fibre Loop-Port (FL-Port) Login</li> <li>• Support for FCAL-2 FL-Port Login</li> <li>• Support for Fibre Channel services class 2 and 3</li> <li>• Overlapping protection domains (OPD) on both data and control paths</li> <li>• 1600 Mbps (full-duplex) per port</li> <li>• 200000 input/output processes per port</li> <li>• Enhanced Hardware Assist Firmware Tracing (EHAFT) for capturing Fibre Channel and firmware traces</li> <li>• Copper interface ac coupled</li> <li>• PCI Express Interface: A PCI Express host blade server interface is required on the expansion card. This interface must comply with the PCI Express Local Bus 2.0 Specification.</li> </ul>
Processor	<p>Single-chip design with two completely independent, dual-channel serial ports, with the following features:</p> <ul style="list-style-type: none"> <li>• A 1 Gb Ethernet controller</li> <li>• An 8 Gb Fibre Channel controller.</li> <li>• Reduced instruction set computer (RISC) processor</li> <li>• Integrated serializer/deserializer (SERDES)</li> <li>• Receive direct memory access (DMA) sequencer</li> <li>• Frame buffer</li> <li>• Five-channel DMA controller</li> <li>• Processor operation at 100/133 MHz</li> </ul>
Host data transfer	Burst data transfers up to 1 Gb per second
Application-specific integrated circuit (ASIC) internal static random-access memory (SRAM)	<ul style="list-style-type: none"> <li>• Error-correcting code (ECC) protected</li> <li>• 1 MB internal high-speed SRAM per port</li> </ul>
Random-access memory (RAM)	512 KB sync burst static random-access memory (SRAM) per channel supporting parity protection
BIOS read-only memory (ROM)	BIOS ROM 1 MB of flash memory (the flash is field programmable)

Table 2. Additional expansion-card specifications (continued)

Type	Specification
Nonvolatile random-access memory (NVRAM)	NVRAM 512 bytes, field programmable NVRAM: 4 MB flash memory, 2 MB per port, field programmable
Onboard DMA	Five-channel DMA controller for each port: transmit, receive, command, auto-request, and auto-response DMA controller for each port: transmit and receive
Frame buffer first in, first out (FIFO)	Integrated 4 KB transmit and 6 KB receive frame buffer First In First Out (FIFO) for each data channel
Connectors (internal only)	200-pin board-to-board for PCI Express
Dimensions	Approximately 15.9 cm x 12.5 cm (6.26 in. x 4.92 in.)
Random-access memory (RAM)	<ul style="list-style-type: none"> <li>• Error-correcting code (ECC) protected</li> <li>• 1 MB internal high-speed SRAM per port</li> </ul>
Operating power	Approximately 15 watts or 51.2 British thermal units (Btu) per hour



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## Chapter 2. Installing and removing an expansion card

This chapter provides information about and instructions for installing an expansion card in a blade server or storage-expansion unit, and removing an expansion card from a blade server or storage-expansion unit.

In this document, the descriptions and illustrations of the expansion-card installation and removal procedures pertain to installing the expansion card on a blade server system board and removing the expansion card from a blade server system board. The procedures for installing the expansion card in a storage-expansion unit and removing the expansion card from a storage-expansion unit are similar to the procedures for installing the expansion card on a blade server system board and removing the expansion card from a blade server system board. Your blade server or storage-expansion unit might be different from the devices that appear in the illustrations in this document. For additional information, see the documentation that comes with your blade server or storage-expansion unit.

To support each I/O module that you install in the BladeCenter unit, you must also install a compatible expansion card, such as an Ethernet or Fibre Channel expansion card, in each blade server that you want to communicate with the I/O module. The QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter is compatible with various types of I/O modules, including the following devices:

- QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter
- QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter

**Note:** For detailed information about these I/O modules, see the *Installation and User's Guide* and other documents that comes with these I/O modules.

The maximum number of expansion cards that you can install in the BladeCenter unit varies according to the type of BladeCenter unit that you are using, because each type of BladeCenter unit supports a different number of blade servers. You can install one expansion card per blade server.

### 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.
- Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, I/O modules, and optional devices for the I/O modules, BladeCenter units, and blade servers.  
See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported BladeCenter units, blade servers, I/O modules, and optional devices for the I/O modules, BladeCenter units, and blade servers.

For details about installation, configuration, and use of compatible devices, see the documentation that comes with these devices.

- 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/>.

The QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter supports Ethernet and Fibre Channel networks and devices. Before you install this combo expansion card into a blade server, review the information about the BladeCenter I/O-module information in Table 3. For additional information, see “Technology overview” on page 4.

Table 3. Expansion card connections to expansion card ports

BladeCenter unit I/O-module bays	CFFh expansion card support	CFFh expansion card ports
7 (upper left interconnect-module bay) 7 – Inside a multi-switch interconnect module (MSIM) in a BladeCenter H or other supported BladeCenter unit	Ethernet	1
8 (upper right interconnect-module bay) 8 – Inside an MSIM in a BladeCenter H or other supported BladeCenter unit	Fibre Channel	2
9 (lower left interconnect-module bay) 9 – Inside an MSIM in a BladeCenter H or other supported BladeCenter unit	Ethernet	3
10 (lower right interconnect-module bay) 10 – Inside an MSIM in a BladeCenter H or other supported BladeCenter unit	Fibre Channel	4

See the following BladeCenter documentation for additional information. These documents are described in “Related documentation” on page 5.

- The *Installation and User’s Guide* for your blade server or storage-expansion unit
- The *Installation Guide* for your BladeCenter unit
- The *Installation and User’s Guide* or *Installation Guide* for your I/O module.
- The *Multi-Switch Interconnect Module for IBM BladeCenter Installation and User’s Guide*

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## Installation guidelines

Before you install the expansion card in the blade server or storage-expansion unit 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 15, 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 expansion card, 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 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 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/>.
- If your blade server supports Concurrent KVM (cKVM) or modular flash drive optional devices, you can install these optional devices in the same blade server as the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter. However, if the expansion card has already been installed in the blade server and you plan to install the IBM BladeCenter Concurrent KVM Feature Card or an optional modular flash drive in the blade server or remove these devices from the blade server, you must first remove the expansion card from the blade server, as described in “Removing the expansion card from a blade server” on page 19.

## 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.

Cables are *not* required for the expansion card. If you must install cables for other BladeCenter optional devices, see the IBM *Configuration and Options Guide* at <http://www.ibm.com/servers/eserver/xseries/cog/>. If you must install cables for 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.

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## Installing the expansion card in a blade server

To install the expansion card in a blade server or storage-expansion unit, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 14.
2. Turn off the blade server, if you have not already done so.
3. If the blade server is installed in the BladeCenter unit, remove it. (For instructions, see the documentation that comes with your BladeCenter unit.)
4. Carefully place the blade server on a flat, static-protective surface.
5. Remove the cover from the blade server or storage-expansion unit. For instructions, see the *Installation and User’s Guide* that comes with your blade server or storage-expansion unit and the documentation that comes with your BladeCenter unit.
6. If you have not already done so, touch the static-protective package that contains the expansion card to any *unpainted* metal surface of the BladeCenter unit or any *unpainted* metal surface on any other grounded rack-component for at least 2 seconds.
7. Remove the new expansion card from its static-protective package.
8. Locate the expansion-card connectors on the system board in the blade server, as shown in Figure 1 on page 17.
9. If you have not already done so, check for protective covers over the connectors on the underside of the expansion card and over the system-board blade-expansion connector.
  - If there are protective covers over the connectors on the underside of the expansion card, remove them.
  - If there is a protective cover over the system-board blade-expansion connector, also known as the PCI Express expansion-card connector on the system board, remove the protective cover. The protective cover contains the words “BLADE EXPANSION.” In Figure 1 on page 17, the PCI Express

connector is the large rectangular expansion-card connector on the right side of the system board. This connector is indicated by the down arrow immediately above it.

10. Align the expansion card over the system board in the blade server, as shown in Figure 1, so that the expansion-card connectors on the reverse side of the expansion card are correctly aligned above the matching expansion-card connectors on the system board in the blade server.
11. Install the expansion card as shown in Figure 1.
  - a. Make sure that the card-guide holes are aligned.
  - b. At an angle, slide the card into the mounting posts that are shown in Figure 1. Then, gently pivot the card into the expansion-card connectors.
  - c. To correctly seat the expansion card in the blade server, press down firmly on the expansion card.

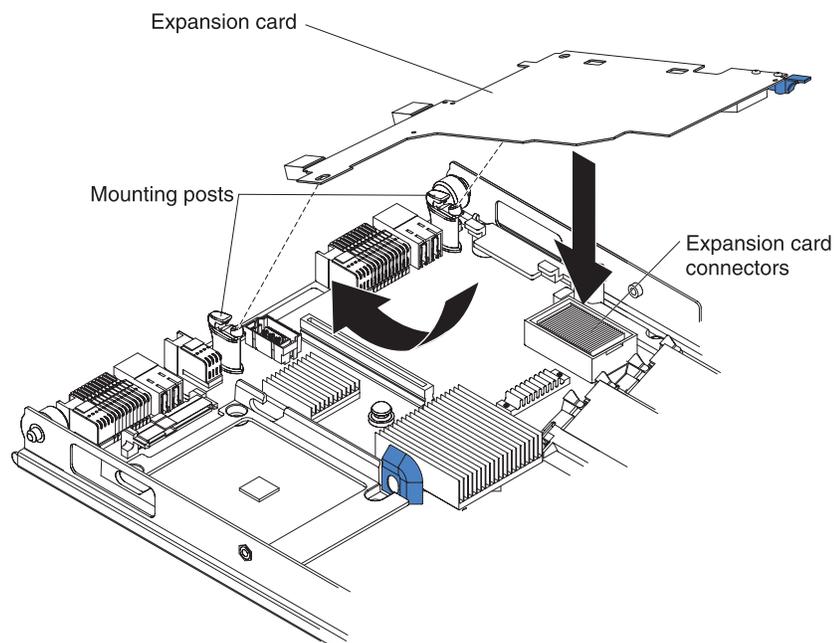


Figure 1. Installing the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) in a blade server

12. Make sure that you are using the latest versions of device drivers, utilities, firmware code, and BIOS code for the expansion card, your blade server, the management module, and the I/O modules that are used by the expansion card. If these items are not current, the BladeCenter unit might not recognize the expansion card and might not turn it on.

If necessary, install the latest versions of device drivers, utilities, firmware code, and BIOS code for the previously listed devices.

To download the most recent device drivers, utilities, firmware updates, BIOS code updates, and expansion-card 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. Also see the *Installation and User's Guide* for your blade server for additional information.

13. Reinstall the cover on the blade server or storage-expansion unit. For instructions, see the *Installation and User's Guide* that comes with your blade server or storage-expansion unit, and the documentation that comes with your BladeCenter unit.
14. Reinstall the blade server in the BladeCenter unit. For instructions, see the documentation that comes with your BladeCenter unit. Turn on the blade server, and continue with your BladeCenter system activities.

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## Configuring a command session

After you install the expansion card, turn on the blade server; then, use the following list to determine how to set up a command session:

- If the blade server supports local console connection through the management-module switch control of the keyboard/video/mouse (KVM) to the blade server, see the *Installation and User's Guide* for the blade server for instructions.
- If the blade server does *not* support local console connection, see the *Installation and User's Guide* for the blade server for instructions for setting up a command session with the blade server.

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## Removing the expansion card from a blade server

To remove the expansion card from a blade server or storage-expansion unit, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 14.
2. Turn off the blade server, if you have not already done so.
3. If the blade server is installed in the BladeCenter unit, remove it (see the documentation that comes with your BladeCenter unit for instructions).
4. Carefully place the blade server on a flat, static-protective surface.
5. Remove the cover from the blade server or storage-expansion unit. For instructions, see the *Installation and User's Guide* that comes with your blade server or storage-expansion unit and the documentation that comes with your BladeCenter unit.

**Attention:** To prevent damage to the connectors on the system board and the expansion card, carefully perform the following steps.

6. Remove the expansion card, as shown in Figure 2:
  - a. Rotate the handle on the expansion card labeled “RELEASE ONLY” to the vertical position, while you gently pull upward on the edge of the expansion card near the “Press to Install” label.
  - b. At an angle, slide the expansion card out of the mounting posts.
  - c. Gently lift the expansion card straight up and out of the blade server.

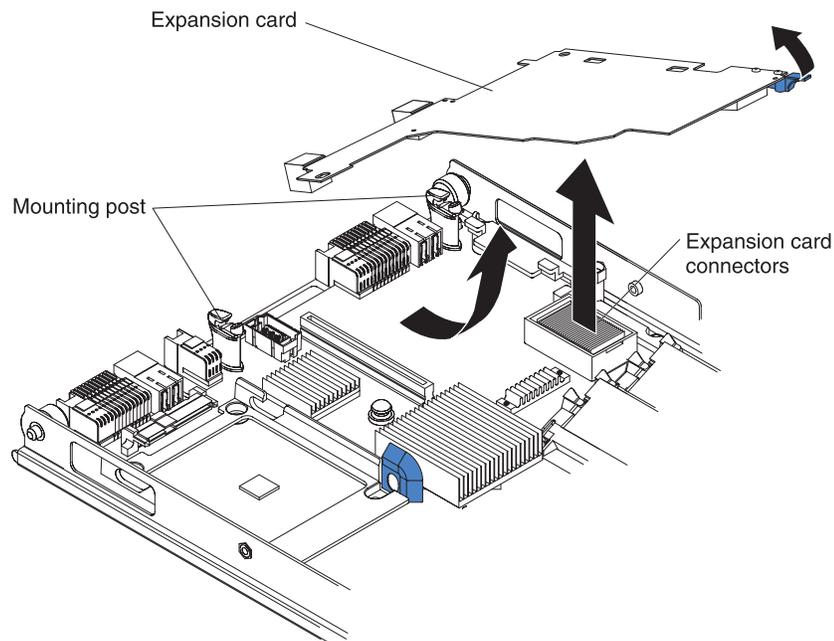


Figure 2. Removing the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) from a blade server

7. If you are replacing the expansion card, follow the installation instructions in step 6 on page 16 through step 13 on page 18. If you are not replacing the expansion card, continue with step 8 on page 20.

8. Reinstall the cover on the blade server or storage-expansion unit. For instructions, see the *Installation and User's Guide* that comes with your blade server or storage-expansion unit, and the documentation that comes with your BladeCenter unit.
9. Reinstall the blade server in the BladeCenter unit. For instructions, see the documentation that comes with your BladeCenter unit. Turn on the blade server, and continue with your BladeCenter system activities.

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## Chapter 3. Updating the boot code and firmware and installing device drivers

After you install the expansion card, make sure that the latest boot code and firmware are installed; then, install the device drivers.

### Notes:

1. The supported operating systems vary, depending on the types of blade servers and other hardware that you are using and the software packages that you are using.
2. For the latest information about operating-system support, versions of device drivers, utilities, and documentation, see <http://www.ibm.com/systems/support/>.
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. 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 addresses of non-IBM Web sites are correct. However, these addresses might be updated after this document has been published. Certain conditions apply to the use of non-IBM Web sites. For additional information, see Appendix C, "Notices," on page 61.

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### Installing the device drivers

The latest device drivers, utilities, documentation, and installation instructions for supported operating systems are provided at <http://www.ibm.com/systems/support/>:

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### Customizing the configuration of the expansion card

After you install the device drivers, to customize the configuration of the expansion card, complete the following steps:

1. Configure the Fibre Channel host bus adapters (HBAs) for the expansion card. To do this, use the IBM Fast!UTIL utility or the QLogic SANsurfer application. For instructions, see Chapter 4, "Using Fast!UTIL," on page 23 or Chapter 5, "Using the SANsurfer application," on page 29.
2. Configure and manage the other Fibre Channel devices, including local and remote devices, in your system. To do this, use the QLogic SANsurfer application. For instructions, see Chapter 5, "Using the SANsurfer application," on page 29.



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## Chapter 4. Using Fast!UTIL

This chapter provides detailed configuration information for advanced users who want to customize the configuration of the expansion card when it is installed in a supported BladeCenter blade server. You can configure the expansion card through the Fast!UTIL utility.

**Note:** For information about the types of compatible BladeCenter units and blade servers, contact your IBM marketing representative or authorized reseller. For a list of supported BladeCenter units and blade servers, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>. For details about installation, configuration, and use of compatible BladeCenter units and blade servers, see the documentation that comes with these devices.

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### Starting Fast!UTIL

Start or restart the blade server. On the blade server control panel, press the keyboard/video/mouse select button. To access Fast!UTIL, press Ctrl+Q during the expansion-card BIOS initialization (it might take a few seconds for the Fast!UTIL menu to be displayed). The expansion card has dual adapter ports that can be configured separately with Fast!UTIL. After you change the settings that are described in “Using the Configuration Settings menu,” Fast!UTIL restarts the blade server to enable the new parameters.

**Important:** If the configuration settings are incorrect, the expansion card might not function correctly. Do not modify the default configuration settings unless you are instructed to do so by an IBM support representative or in these installation instructions.

---

### Using the Configuration Settings menu

**Note:** For information about Remote Boot options, contact your IBM technical-support representative, or review the documentation that comes with your blade server or storage-expansion unit, see <http://www.ibm.com/systems/support/>.

Use the options that are described in this section to configure the expansion card. The **Configuration Settings** menu displays several options that you can use to configure your expansion card.

### Selecting the host adapter

Use this option to select, configure, or view either of the two I/O port addresses on the expansion card.

## Configuring the host adapter

To access this option, select **Host Adapter Settings**. The modifiable settings for the expansion card are listed in Table 4 and are described in this section. The expansion card is always point-to-point connected in the blade server or storage-expansion unit with an I/O module that supports Fibre Channel operation.

Table 4. Modifiable expansion-card settings

Setting	Options
Host adapter BIOS	Enabled or disabled
Frame size	512, 1024, 2048
Loop reset delay	0 - 60 seconds
Adapter hard loop ID	Enabled or disabled
Hard loop ID	0 - 125
Spin up delay	Enabled or disabled
Connection options	0, 1, 2
Fibre Channel tape support	Disabled, Enabled
Data rate	0, 1, 2, 3

**Note:** The loop reset delay, adapter hard loop ID, and hard loop ID settings are not applicable.

**Host adapter BIOS:** When this option is disabled, the read-only memory (ROM) BIOS code on the expansion card is disabled, freeing space in upper memory.

**Frame size:** This setting specifies the maximum frame length that the expansion card supports.

**Spin up delay:** When this option is enabled, the BIOS code waits up to 5 minutes to find the first drive.

**Connection options:** This setting defines the type of connection (loop or point-to-point) or connection preference (see Table 5).

Table 5. Expansion-card connection options

Option	Type of connection
0	Loop only
1	Point-to-point only
2	Loop preferred; otherwise, point-to-point

**Fibre Channel tape support:** This setting is reserved for Fibre Channel tape support.

Table 6 describes the data-rate options for the expansion card.

Table 6. Expansion-card data-rate options

Option	Data rate
0	1 GB per second <b>Note:</b> This option <i>is not</i> available for this expansion card.
1	2 GB per second
2	Auto select
3	4 GB per second
4	8 GB per second

**Note:** The expansion-card settings and default values vary according to the version of BIOS code that is installed for the expansion card.

There are specific expansion-card settings that you cannot modify. Table 7 describes these settings and gives examples.

**Note:** See the device-driver installation instructions for the required operating-system-specific modifications to the NVRAM.

Table 7. Nonmodifiable expansion-card settings and examples

Setting	Example
BIOS address	CD400
BIOS revision	1.04
Adapter serial number	E59719
Interrupt level	3
Adapter port name	210000096B07C703

**BIOS address:** The BIOS address is the expansion-card I/O address where the BIOS code is stored when you press Ctrl+Q. This is the address of the BIOS code in ROM shadow memory.

**BIOS revision:** The BIOS revision is the revision number of the loaded BIOS code on the expansion card.

**Adapter serial number:** This number is for manufacturing use only. It does not correlate to external labels or to the adapter port name of the expansion card.

**Interrupt level:** The interrupt level is the interrupt that is used by the expansion card. The interrupt level can change when the operating system is installed.

**Adapter port name:** This is the worldwide port name of the expansion card.

## Configuring the selectable boot settings

To access this option, select **Selectable Boot Settings**. For more information about boot settings, contact your IBM technical-support representative.

## Restoring default settings

This option is in the **Configuration Settings** menu. It restores the expansion-card default NVRAM settings.

## Accessing Raw NVRAM data

This option displays the expansion card NVRAM contents in hexadecimal format. This is a troubleshooting tool; you cannot modify the data.

## Accessing advanced adapter settings

Use this option to view and set the advanced adapter settings that are described in Table 8.

Table 8. Expansion-card advanced adapter settings

Setting	Options
Execution throttle	1 - 256
LUNs per target	0, 8, 16, 32, 64, 128, 256
Enable LIP reset	Yes or No
Enable LIP full login	Yes or No
Enable target reset	Yes or No
Login retry count	0 - 255
Port down retry count	0 - 255
IOCB allocation	1 - 512 buffers
Extended error logging	Enabled or Disabled
RIO operation mode	0, 5, 6
Interrupt delay timer	0 - 255

**Execution throttle:** This setting specifies the maximum number of commands that can run on any one port. When a port reaches its execution throttle, Fast!UTIL does not run any new commands until the current command is completed. The valid options for this setting are 1 through 256.

**LUNs per target:** This setting specifies the number of logical unit numbers (LUNs) per device. Multiple LUN support is typically for redundant array of independent disk (RAID) enclosures that use LUNs to map drives.

**Enable LIP reset:** This setting determines the type of loop initialization process (LIP) reset that is used when the operating system initiates a bus reset routine. When this option is set to **Yes**, the device driver initiates a global LIP reset to clear the target device reservations. When this option is set to **No**, the device driver initiates a global LIP reset with full login.

**Enable LIP full login:** This setting instructs the application-specific integrated circuit (ASIC) chip to log in to all ports after any LIP.

**Enable target reset:** This setting enables the device drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued.

**Login retry count:** This setting specifies the number of times the software tries to log in to a device.

**Port down retry count:** This setting specifies the number of times the software retries a command to a port that is returning port-down status.

**IOCB allocation:** This setting specifies the maximum number of buffers from the firmware buffer pool that are allocated to any one port.

**Extended error logging:** When set to **Enabled**, this setting provides additional error and debugging information to the Microsoft Windows operating system event error log.

**RIO operation mode:** This setting specifies the reduced interrupt operation (RIO) mode, if it is supported by the software device driver. When the expansion card is in RIO mode, you can post multiple command completions in a single interrupt (see Table 9).

*Table 9. Expansion-card RIO options and operation modes*

Option	Operation mode
0	No multiple responses
5	Multiple responses with minimal interrupts
6	Interrupt when interruption delay timer expires or no action

**Interrupt delay timer:** This setting contains the value (in 100-microsecond increments) that is used by a timer to set the wait time between accessing a set of handles and generating an interrupt using direct memory access (DMA).

## Scanning for Fibre Channel devices

Use this option to scan and list all the connected devices. Information about each device is listed (for example, vendor name, product name, and revision). This information is useful when you are configuring the expansion card and attached devices.

## Using the Fibre Channel disk utility

The Fibre Channel disk utility is not supported with the expansion card.

## Performing a loopback data test

This option is not available with your BladeCenter configuration.

## Using ExitFast!UTIL

After you complete the configuration, use this option to exit the menu and restart the blade server.



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## Chapter 5. Using the SANsurfer application

This chapter provides an overview of the QLogic SANsurfer application, which can be used by advanced users to customize the configuration of the expansion card when it is installed in a blade server. For more detailed information, see the SANsurfer application online help.

**Note:** For information about the types of compatible BladeCenter units and blade servers, contact your IBM marketing representative or authorized reseller. For a list of supported BladeCenter units and blade servers, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>. For details about installation, configuration, and use of compatible BladeCenter units and blade servers, see the documentation that comes with these devices.

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### Overview of the QLogic SANsurfer application

The QLogic SANsurfer application is used to configure a storage area network (SAN) environment that is made up of Fibre Channel host bus adapters (HBAs). It is a network-capable application that can connect to and configure remote systems, enabling centralized management and configuration of an entire SAN that contains HBA components, storage devices, and host systems.

You can use the SANsurfer application to manage and control one or more expansion cards that are installed on local or remote systems. The SANsurfer application is used, along with problem determination procedures (PDPs), on new or existing installations to help diagnose Fibre Channel subsystem problems in adapters, controllers, and devices that are attached to the Fibre Channel fabric or loop.

You can also perform the following operations by using the SANsurfer application to configure devices in your system:

**Disable (unconfigure) a device on a host bus adapter**

When a device is set as unconfigured, it is not recognized by the HBA and is not accessible to the HBA on that system.

**Enable a device**

This operation adds a device and makes it accessible to the HBA on that system.

**Designate a path as an alternate or preferred path**

When a device is accessible from more than one adapter in the same system, you can assign one path as the preferred path and the other path as an alternative path. If the preferred path fails, the system switches to the alternative path to make sure that the transfer of data is not interrupted.

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### Installation and system requirements

Make sure that you are using the latest version of the SANsurfer application for the expansion card. Go to <http://www.ibm.com/systems/support/> for the latest information about the SANsurfer application. The latest instructions and system requirements are in the documentation that come with the applications.

---

## Using the functions of the SANsurfer application

You can use the SANsurfer application to perform the following tasks:

- Set the SANsurfer application options
- Connect to hosts
- Disconnect from a host
- View detailed event and alarm-log information
- Use host-to-host SAN configuration policies
- Configure port devices
- Use logical unit number (LUN) level configuration
- Monitor in real time to see when failovers occur, using the Failover Watcher
- Control host-side agent operations, including setting of the host agent polling interval
- Review host adapter information:
  - General information
  - Statistics
  - Information about attached devices
  - Link status for attached devices
- Perform adapter functions:
  - Configuring the adapter NVRAM settings
  - Executing fiber diagnostics (read/write buffer loopback tests)
  - Performing flash updates on an adapter
  - Performing NVRAM updates on an adapter
- Manage configurations:
  - Save configurations for off-line policy checks and SAN integrity
  - Load configurations from a file if the host is off-line for policy checks and SAN integrity
- Confirm security

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## Using the Update flash utility

Through the Utilities section of the SANsurfer application, you can update expansion-card firmware and perform adapter-level configurations on a host-connected adapter.

When you click **Update Flash** in the Utilities section of the SANsurfer application and the adapter accepts the update, the application prompts for the file name of the new flash boot firmware. The latest version of expansion-card firmware is available from <http://www.ibm.com/systems/support/>.

After you enter a valid firmware file name, click **OK** to complete the update, or click **Cancel** to abort. When you click **OK**, the SANsurfer application verifies the file name and format of the new file. If the file is valid, the application then compares the version of the file with the adapter flash version that is currently installed. If the installed adapter version is the same or newer than the file flash version that you are trying to install, the application asks whether you still want to update the firmware.

If the firmware update fails, an error message is displayed.

## Chapter 6. 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 41.

The replaceable components in Table 10 are Tier 1 CRUs.

Table 10. Replaceable components and corresponding CRU/FRU identifiers

Name of component	CRU/FRU identifier
QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter	<ul style="list-style-type: none"><li>• 44X1940 (Option)</li><li>• 44X1943 (Tier 1 CRU)</li></ul>

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 at <http://www.ibm.com/systems/support/>.
2. Cables are *not* required for the expansion card. If you must install cables for other BladeCenter optional devices, see the *IBM Configuration and Options Guide* at <http://www.ibm.com/servers/eserver/xseries/cog/>. If you must install cables for BladeCenter components, see the cable-routing information in the documentation that comes with the BladeCenter components and the cables.



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## Chapter 7. Solving problems

This chapter provides basic troubleshooting information to help you solve some problems that might occur while you are setting up the expansion card. If you are having a problem with the expansion card, 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 blade server. For more detailed information about troubleshooting the ServeRAID™ controller, see the following documents on the *Documentation CD* or at <http://www.ibm.com/systems/support/>.

- BladeCenter unit, blade server, or I/O module *Installation and User's Guide*
- Blade server *Problem Determination and Service Guide*

Make sure that you are using the latest versions of device drivers, utilities, firmware code, and BIOS code for the following devices. If these items are not at the latest levels, the BladeCenter unit might not recognize one or more of the following devices, and the BladeCenter unit or these devices might not be able to start.

- The expansion cards in the BladeCenter unit and in the blade servers
- The blade servers
- The management module
- The I/O modules and controller that are used by the expansion cards in the BladeCenter unit and in the blade servers

If necessary, install the latest versions of device drivers, utilities, firmware code, and BIOS code for the previously listed devices.

To download the most recent device drivers, utilities, firmware updates, BIOS code updates, and expansion-card 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. Also see the *Installation and User's Guide* for your blade server for additional information.

### Notes:

- For the latest version of the *IBM BladeCenter Management Module Command-Line Interface Reference Guide*, go to <http://www.ibm.com/systems/support/>.
- 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 addresses of non-IBM Web sites are correct. However, these addresses might be updated after this document has been published. Certain conditions apply to the use of non-IBM Web sites. For additional information, see Appendix C, "Notices," on page 61.
- Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.

- See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
- For details about installation, configuration, and use of compatible devices, see the documentation that comes with these devices.

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 39.

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## Hardware problems

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

- Before you begin your system hardware installation activities, make sure that you have all the hardware devices that are required to support the system configuration that you plan to use. Include the following preinstallation requirements. For additional information, see the documentation that comes with the devices that you are using.
- Make sure that the BladeCenter unit and the blade servers are compatible with the expansion card.
- Before you install the expansion card in a blade server, make sure that you are using a blade server that supports the expansion card.

The following types of blade servers *do not* support the QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter:

- HS20
- JS20
- LS20
- If you install the expansion card into a IBM BladeCenter Storage Expansion Unit 3, the two 1GB Ethernet ports are *not* functional. Only the 8GB Fibre Channel ports are supported in this expansion unit.
- Make sure that the I/O modules are compatible with the target expansion cards that you want to communicate with these I/O modules. Where applicable, certain I/O modules in the BladeCenter unit must support the target expansion cards in the blade server.
- Make sure that the expansion card is correctly installed in the blade server. For additional information, see the *Installation and User's Guide* that comes with the blade server.
- Make sure that the blade server is correctly installed in the BladeCenter unit.
- Make sure that the utility device-driver parameters are correct.
  - If the expansion card is installed in a blade server that supports the video function, see Chapter 4, “Using Fast!UTIL,” on page 23 or Chapter 5, “Using the SANsurfer application,” on page 29 for additional information.
  - If the expansion card is installed in a blade server that *does not* support the video function, you can use the QLogic SANsurfer application from a remote host through a network connection to the blade server in which the expansion card is installed. You can also configure the expansion card remotely by running the QLogic SANsurfer application from an IBM Director console.
  - See the troubleshooting section of the documentation that comes with the applicable QLogic 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*.

- Make sure that all installed Fibre Channel and Ethernet modules are correctly installed in the bays of the Multi-Switch Interconnect Module for IBM BladeCenter (MSIM):
  - Fibre Channel modules must be installed in MSIM bay 8 or bay 10.
  - Ethernet modules must be installed in MSIM bay 7 or bay 9.

**Note:** Installing a second I/O module in the BladeCenter unit provides a backup I/O module in case one I/O module fails. Both I/O modules must be of the same type, in the previously specified I/O-module bay combinations in the BladeCenter unit.

- Make sure that all peripheral devices are correctly connected to the I/O modules, turned on, and operating correctly.

**Notes:**

1. For additional information, see the documentation that comes with the peripheral devices.
2. If the expansion card is installed in a supported BladeCenter blade server, see the documentation that comes with the blade server for information about displaying attached Ethernet or Fibre Channel devices.
3. Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
4. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
5. For details about installation, configuration, and use of compatible devices, see the documentation that comes with these devices.

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## Software problems

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

- 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 expansion card are at the latest levels.
- Make sure that you are using the correct expansion-card NVRAM settings for the storage area network (SAN) and operating system.

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## 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 Ethernet or Fibre Channel 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 all parameters, internal devices, and external devices have been enabled, where required. These devices might include the I/O module and its internal and external ports.

For additional information, see the documentation that comes with the management module and the applicable utility programs and devices.

If you still have a system-configuration problem, you must 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.

**Note:** For additional information about configuration requirements, see the documentation that comes with your BladeCenter unit, blade server, and other BladeCenter components.

---

## Ethernet device problems

To determine whether your problem is caused by an attached Ethernet device, perform the following tasks.

- Make sure that the expansion card is *not* installed in an IBM BladeCenter Storage Expansion Unit 3. The two 1GB Ethernet ports are *not* functional when the expansion card is installed in this expansion unit.
- Make sure that an I/O module that supports Ethernet operation is correctly installed in bay 7 or bay 9 of a Multi-Switch Interconnect Module for IBM BladeCenter (MSIM).

**Note:** Installing a second I/O module in the BladeCenter unit provides a backup I/O module in case one I/O module fails. Both I/O modules must be of the same type, in the previously specified I/O-module bay combinations in the BladeCenter unit.

- Make sure that the blade server is turned on.
- Make sure that the BladeCenter expansion-card settings are the correct values:
  - See the troubleshooting section of the documentation that comes with the applicable Broadcom 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*.
- Make sure that all parameters, internal devices, and external devices have been enabled, where required. These devices might include the I/O module and its internal and external ports.

For additional information, see the documentation that comes with the management module and the applicable utility programs and devices.

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## Fibre Channel device problems

To determine whether your problem is caused by an attached Fibre Channel device, perform the following tasks:

- Make sure that an I/O module that supports Fibre Channel operation is correctly installed in bay 8 or bay 10 of a Multi-Switch Interconnect Module for IBM BladeCenter (MSIM).

**Note:** Installing a second I/O module in the BladeCenter unit provides a backup I/O module in case one I/O module fails. Both I/O modules must be of the same type, in the previously specified I/O-module bay combinations in the BladeCenter unit.

- Make sure that the blade server is turned on.
- Make sure that the BladeCenter expansion-card settings are the correct values:
  - If the expansion card is installed in a blade server that supports the video function, see the following chapters for additional information:
    - Chapter 4, “Using Fast!UTIL,” on page 23
    - Chapter 5, “Using the SANsurfer application,” on page 29
  - If the expansion card is installed in a blade server that *does not* support the video function, you can use the QLogic SANsurfer application from a remote host through a network connection to the blade server in which the expansion card is installed. You can also configure the expansion card remotely by launching the QLogic SANsurfer application from an IBM Director management console.
  - See the troubleshooting section of the documentation that comes with the applicable QLogic 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*.
- Make sure that all parameters, internal devices, and external devices have been enabled, where required. These devices might include the I/O module and its internal and external ports.

For additional information, see the documentation that comes with the management module and the applicable utility programs and devices.



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## 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.

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### 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.

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### 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/>.

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### 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/>.

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## 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).

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## Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Find a Business Partner** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/>. 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.

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## 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

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## 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.

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### IBM Statement of Limited Warranty Z125-4753-10 08/2008

#### 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. For purposes of this Statement of Limited Warranty, “IBM” means the IBM entity that provided your Machine to you or to your reseller—for example, International Business Machines Corporation in the U.S. or IBM World Trade Corporation or the local IBM entity in your country.

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/systems/support/machine\\_warranties/](http://www.ibm.com/systems/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, AND ANY WARRANTY OF TITLE OR NON-INFRINGEMENT. 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:

- a. 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, operation in other than the specified operating environment or improper maintenance by you or a third party;
- b. failure due to events beyond IBM's control;
- c. failure caused by a product for which IBM is not responsible;
- d. any non-IBM products, including those provided with, or installed on, an IBM Machine at your request;
- e. accessories, supply items and consumables (e.g. batteries and printer cartridges), and structural parts (e.g. frames and covers);
- f. service of Machine alterations; and
- g. 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, refer to the service documentation that shipped with your Machine for support assistance

and problem determination procedures. A copy of the service documentation for your Machine can also be found at the following IBM website: <http://www.ibm.com> under "Support and downloads".

If you are unable to resolve your problem with the service documentation, 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:

- a. 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;
- b. to obtain authorization from the owner to have IBM or its subcontractor or the reseller service a Machine that you do not own;
- c. where applicable, before service is provided:
  1. follow the service request procedures that IBM or its subcontractor or its reseller provides;
  2. backup and secure all programs, data, and funds contained in the Machine; and
  3. inform IBM or its subcontractor or the reseller of changes in the Machine's location;
- d. to provide IBM or its subcontractor or the reseller with sufficient and safe access to your facilities to permit IBM to fulfill its obligations;
- e. to allow IBM or its subcontractor or the reseller to install mandatory engineering changes, such as those required for safety;
- f. 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
- g. 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. 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's entire liability for all claims in the aggregate arising from or related to each Product will not exceed:

- a. damages for bodily injury (including death) and damage to real property and tangible personal property; and
- b. 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 **Ecuador**; 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 2<sup>nd</sup> 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 a and item b of this section:*

- a. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and
- b. 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 item a and item b of this section:*

- a. 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
- b. 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 last 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 last 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 last 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 paragraphs in **Western Europe** (Andorra, Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Romania, 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;** 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland;** 6) “the laws of Switzerland” in **Liechtenstein;** and 7) “the laws of Czech republic” in **Czech republic.**

#### **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; 7) 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;** 8) in **the United Kingdom;** both of us agree to submit all disputes relating to this Statement of Limited Warranty to the exclusive jurisdiction of the English courts; 9) in **Liechtenstein;** all of our rights, duties, and obligations are settled exclusively by the competent court of Zurich; and 10) “to the competent courts of Czech republic”.

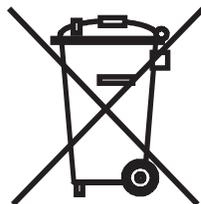
#### **Arbitration:**

*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) BATTERY DIRECTIVE**



**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.

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.

The retail price of batteries, accumulators and power cells includes the cost of the environmental management of their waste. For proper collection and treatment, contact your local IBM representative.

**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, LIECHTENSTEIN, 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:

- a. 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.

- b. **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:

- a. 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 in the aggregate 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").

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.

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.

- b. **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 paragraph is added to this section:*

The minimum warranty period for Machines is 12 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 the 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 "b":*

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.

- a. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
- b. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damages to your tangible property resulting from the negligence of IBM.
- c. Except as provided in items "a" and "b" 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 “a” 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:

- a. loss of, or damage to, data;
- b. special, indirect, or consequential loss; or
- c. 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.

## **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.

- a. IBM will accept unlimited liability for:
  1. death or personal injury caused by the negligence of IBM; and
  2. 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.
- b. 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.

- c. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items a and b 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 a 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:

- a. loss of, or damage to, data;
- b. special, indirect, or consequential loss;
- c. loss of profits, business, revenue, goodwill, or anticipated savings; or
- d. third party claims against you for damages.

**Part 3 - Warranty Information**

QLogic Ethernet and 8 Gb Fibre Channel Expansion Card (CFFh) for IBM BladeCenter

Country of Purchase	Warranty Period	Type of Warranty Service*	Service Level*
Worldwide	1 year	1	1
* See "Types of Warranty Service" and "Service Levels" for explanations of warranty-service types and service levels.			

Scheduling of a warranty service will depend upon the following: 1) the time your request for service is received, 2) Machine technology and redundancy, 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**

**Type 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 a Tier 1 (mandatory) or a Tier 2 (optional) CRU. Installation of a Tier 1 CRU 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.

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

At IBM's discretion you will receive CRU service or IBM or your reseller will repair 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.

**Type 6 - CRU and Courier or Depot Service**

At IBM's discretion you will receive CRU service or 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 of operation.

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

At IBM's discretion you will receive CRU service or 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 its installation and verification of operation.

**Type 8 - CRU and Machine Exchange Service**

At IBM's discretion you will receive specified CRU service or IBM will initiate shipment of a replacement Machine to your location. 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. You are responsible for its installation and verification of operation.

**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. Response times are based on local standard business days and working hours. Unless otherwise specified, all responses are measured from the time the customer contacts IBM for problem determination until IBM has resolved the problem remotely or scheduled service to be performed. Same Business Day Warranty Service (SBD) is based on local standard business days and working hours. Next Business Day Warranty Service (NBD) is based on commercially reasonable effort.

IBM encourages you to use available remote support technologies. Failure to install and use available remote connectivity tools and equipment for direct problem reporting, remote problem determination and resolution may result in an increased service level response-time due to resource requirements.

1. Next Business Day (NBD), 9X5
2. Same Business Day (SBD), 9X5
3. Same Day (SD), 24X7

**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 IBM Directory of Worldwide Contacts at the following IBM Internet website: <http://www.ibm.com/planetwide/>.



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## 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.

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**For Taiwan:** Please recycle batteries.



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## 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.

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### Industry Canada Class A emission compliance statement

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### Avis de conformité à la réglementation d'Industrie Canada

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### Australia and New Zealand Class A statement

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### 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.

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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

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European Community contact:  
IBM Technical Regulations  
Pascalstr. 100, Stuttgart, Germany 70569  
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