IBM

QLogic 8Gb Fibre Channel Expansion Card (CIOv)
for IBM BladeCenter

Installation and User's Guide

IBM

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Note: Before using this information and the product it supports, read the general information in Appendix B, "Warranty," on page 27 and "Notices" on page 49; and read the *IBM Safety Information* and the *IBM Systems Environmental Notices and User Guide* on the IBM *Documentation CD*.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1

DANGER

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

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

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

Statement 21:

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

Chapter 1. Introduction

This *Installation and User's Guide* contains instructions for installing your QLogic 8Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter in an IBM® BladeCenter® blade server.

For the latest compatibility information related to this expansion card, see http://www.ibm.com/servers/eserver/serverproven/compat/us/

This document contains information about:
- Installing and configuring the QLogic 8Gb Fibre Channel Expansion Card.
- Updating the firmware and device drivers of the QLogic 8Gb Fibre Channel Expansion Card.

Note:
1. The illustrations in this document might differ slightly from your hardware.
2. The QLogic 8Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter is also referred to throughout this document as the expansion card. The IBM BladeCenter unit is also referred to throughout this document as the BladeCenter unit.

The expansion card is a Fibre Channel device that has two configurable adapter ports. Communication signals are routed from the Fibre Channel high-speed connector on the Fibre Channel expansion card through the blade server to I/O-module bay 3 and bay 4 in the BladeCenter unit.

Notes:
1. The modules in I/O-module bay 3 and bay 4 must support Fibre Channel operation.
2. When using the expansion card with the Optical Pass Through Module option, the expansion card must be used at 2 Gb Fibre Channel Data Rate speed. To change the Data Rate speed setting of the expansion card, please refer to Chapter 4, "Using Fast!UTIL," on page 13 or Chapter 6, "Using the SANsurfer application," on page 21.
3. If you are using the 8 Gb expansion card with the BladeCenter T unit, the ports operate at 2 Gbps (Gigabits per second) mmwhen a Fibre Channel I/O module is installed in bay 3 or bay 4. If you are using the 8 Gb expansion card with the BladeCenter HT unit, the ports operate at 4 Gbps.

Your expansion card comes with a one-year limited warranty. For information about your warranty, see Appendix B, "Warranty," on page 27. You can obtain up-to-date information about your expansion card and other IBM server products at http://www.ibm.com/systems/support/.

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

For service or assistance, see Appendix A, "Getting help and technical assistance," on page 25.

Fibre Channel overview

Fibre Channel technology is outlined in the SCSI-3 Fibre Channel Protocol (SCSI-FCP) standard. Fibre Channel is a high-speed data transport technology 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 8 Gbps (Gigabits per second) optical ports on the I/O modules. The expansion card provides up to 16 Gb of full-duplex bandwidth per port.

Features and specifications

The expansion card has the following features:
- 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)
- Extensible Firmware Interface (EFI) Configuration Utility

The expansion card has the following specifications:

Table 1. Expansion card specifications

Type	Specification
Fibre Channel specifications	• Bandwidth: 8 Gb per second maximum at half-duplex and 16 Gb per second maximum at full-duplex per port • Support for both FCP-SCSI and IP protocols • Support for point-to-point fabric connection: F-Port Fabric Login • Support for Fibre Channel Arbitrated Loop (FCAL) public loop profile: Fibre Loop-(FL-Port)-Port Login • Support for Fibre Channel services class 2 and 3 • Support for FCP SCSI initiator and target operation • Support for full-duplex operation • Copper interface ac coupled
Processor	Single-chip design with two completely independent 8 Gb serial Fibre Channel ports. Each port provides: • RISC processor • Integrated serializer/deserializer • Receive direct memory access (DMA) sequencer • Frame buffer • Five-channel DMA controller
Host data transfer	64-bit, 100 MHz bus-master DMA data transfers to 800 MB per second
RAM	1 MB sync burst SRAM per channel supporting parity protection
BIOS ROM	BIOS ROM 1 MB of flash memory (the flash is field programmable)

Table 1. Expansion card specifications (continued)

Type	Specification
NVRAM	NVRAM 512 bytes, field programmable
Onboard DMA	Five-channel DMA controller for each port: transmit, receive, command, auto-request, and auto-response
Frame buffer FIFO	Integrated 4 KB transmit and 6 KB receive frame buffer First In First Out (FIFO) for each data channel
Connectors (internal only)	CIOv connector
Dimensions	Approximately 8.4 cm x 5.3 cm (3.31 in. x 2.09 in.)
Operating power	Approximately 10 watts

Option package contents

The expansion-card option package includes the following items:
- QLogic 8Gb Fibre Channel Expansion Card.
- The *QLogic 8Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter Documentation CD* .
- *Important Notices* .

Related documentation

The following documentation is provided on the QLogic 8Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter *Documentation* CD.
- This *Installation and User's Guide*
- *Safety Information*

  This multilingual document contains translated versions of the caution and danger statements that appear in the documentation for your server. Each caution and danger statement has an assigned number, which you can use to locate the corresponding statement in your native language.
- *Environmental Notices and User Guide*

  This document contains translated environmental notices.

In addition to this *Installation and User's Guide*, the following related documentation is available from the IBM Web site at http://www.ibm.com/systems/support/:
- IBM BladeCenter blade server *Installation and User's Guide*

  This document provides installation and configuration information about your blade server and BladeCenter unit.
- IBM BladeCenter blade server *Problem Determination and Service Guide*

  This document provides information about your blade server and BladeCenter unit that will help you solve problems yourself. It also contains information for service technicians.
- IBM *BladeCenter SAN Solutions Guide*

  This document provides a user-oriented discussion about how the BladeCenter Fibre Channel options 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 all BladeCenter documents are available at http://www.ibm.com/systems/bladecenter/.

The IBM Documentation CD

The IBM *Documentation* CD contains documentation for your QLogic 8Gb Fibre Channel Expansion Card (CIOv) in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

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 RAM
- Adobe® Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation CD

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 presents the information in the language for that region (if available). If a topic 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 DVD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users:
  - If you are using a Windows operating system, insert the CD into the DVD drive, and click **Start** → **Run**. In the **Open** field, type:

    `e:\win32.bat`

    where *e* is the drive letter of your DVD drive, and click **OK**.
  - If you are using a Red Hat Linux, insert the CD into the DVD drive; then, run the following command from the /mnt/cdrom directory:

    `sh runlinux.sh`

Select your 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 topics under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document appears 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 used in this document

The caution and danger statements used in this document are also in the multilingual *Safety Information* document provided on the IBM *Documentation* CD.

Each caution and danger statement is numbered for reference to the corresponding statement in the *Safety Information* document.

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

Chapter 2. Installing the expansion card

This chapter provides information for installing the expansion card in a blade server or expansion unit.

See the following BladeCenter documentation for additional information:

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

Installation guidelines

Before you begin installing the expansion card in your blade server, read the safety information beginning on page "Safety" on page v and the guidelines in "Handling static-sensitive devices." This information will help you work safely with your blade server and options.

Make sure that you are using the latest versions of device drivers and firmware for your blade server, management module, and I/O modules that are used by the expansion card. Go to the IBM support Web site, 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 came with the updates.

Before installing an expansion card into a blade server, consider the following BladeCenter I/O-module information:

Table 2. Expansion card connections to expansion card ports

BladeCenter I/O module bays	Expansion card support
3	Fibre Channel
4	Fibre Channel

Note: If I/O modules are installed in both I/O-module bays, both I/O modules must be of the same type. Installing a second I/O module in the BladeCenter unit provides a backup I/O module in case one I/O module fails.

Handling static-sensitive devices

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

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

- When you work on a BladeCenter unit that has an electrostatic discharge (ESD) connector, use a wrist strap when you handle modules, optional devices, or

blade servers. To work correctly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the BladeCenter unit).

- 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 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 any *unpainted* metal surface of the BladeCenter unit or any *unpainted* metal surface on any other grounded component in the rack 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 blade server without setting down the device. If it is necessary to set down the device, place it back into its static-protective package. Do not place the device on your blade server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Installing the expansion card

Use these instructions to install the expansion card in a blade server.

The following illustration shows the location and installation of an expansion card in a blade server.

Note: The picture below may not represent the exact location of the expansion card in the blade server in which you are installing the card. Please refer to the blade server *Installation and User's Guide* for your blade for the exact location.
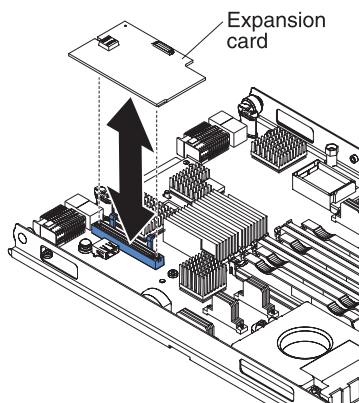
To install the expansion card, complete the following steps:

1. Before you begin, read "Safety" on page v and "Installation guidelines" on page 7.
2. If the blade server is installed in a BladeCenter unit, remove it (see the documentation that came with your BladeCenter unit for instructions).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover (see the documentation that came with your BladeCenter unit for instructions).

5. Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.
6. Locate the CIOv expansion connector.
7. Orient the connector on the expansion card with the CIOv expansion connector on the system board; then, press the card into the CIOv expansion connector.
8. Firmly press on the indicated locations to seat the expansion card.
9. Install the cover onto the blade server (see the documentation that came with your BladeCenter unit for instructions).
10. Install the blade server into the BladeCenter unit and turn on the blade server (see the documentation that came with your BladeCenter unit for instructions).

Replacing an expansion card

Use this procedure to replace an expansion card.

The expansion card is a 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.

See Appendix C, "Parts listing," on page 47 for the part number to order. For more information about the terms of the warranty and getting service and assistance, see Appendix B, "Warranty," on page 27.

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

To replace an expansion card, complete the following steps:
1. Before you begin, read "Safety" on page v.
2. If the blade server is installed in a BladeCenter unit, remove it (see the documentation that came with your BladeCenter unit for instructions).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover (see the documentation that came with your BladeCenter unit for instructions).
5. Locate the expansion card (see the documentation that came with your BladeCenter unit for instructions).
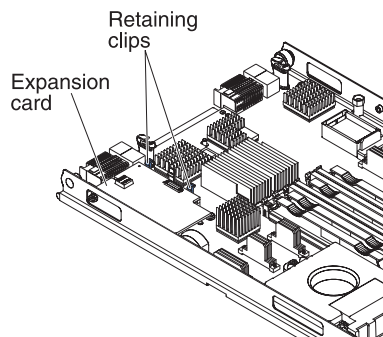
Attention: To prevent damage to the connectors on the system board and the expansion card, do not rock, tilt, pivot, or rotate the card during removal.

6. Apply equal pressure to lift up on both sides of the expansion card, on the connector side, to disconnect the expansion card from the expansion-card retaining clips, if present, and the expansion-card connector on the blade server.

7. Using your fingers, move the retaining clips away from the expansion card; then, lift the card out of the connector.
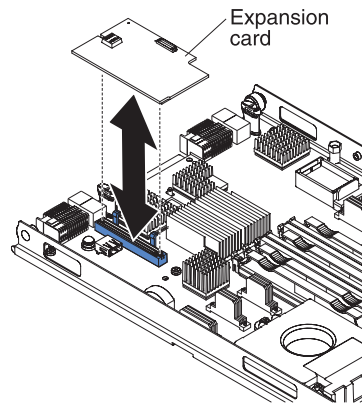
Expansion card

8. Install the replacement expansion card. See "Installing the expansion card" on page 8.

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 the firmware are installed; then, install the device drivers.

Note: For the latest information about supported operating systems, versions of device drivers, utilities, and documentation, go to http://www.ibm.com/systems/support/.

Installing the device drivers

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

Customize the configuration of the expansion card:
- If the expansion card is installed in a BladeCenter HSxx or LSxx blade server, see Chapter 4, "Using Fast!UTIL," on page 13 or the documentation that came with your blade server for more information about customizing the configuration.
- If the expansion card is installed in a BladeCenter JSxx blade server, see Chapter 6, "Using the SANsurfer application," on page 21 or the documentation that came with your blade server for more information about customizing the configuration.

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 BladeCenter HSxx or LSxx blade server. You can configure the expansion card using the Fast!UTIL utility.

Starting Fast!UTIL

Start or restart the blade server. On the blade server control panel, press the keyboard/video/mouse (KVM) 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 changing the settings that are described in the "Using the Configuration Settings menu" section, Fast!UTIL restarts the blade server to enable the new parameters.

Important: If the configuration settings are incorrect, the expansion card might not function properly. 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 came with your blade server or storage-expansion unit, available at http://www.ibm.com/systems/support/.

Use the options 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. This section describes the following information:
- Selecting the expansion card
- Configuring the expansion card
- Configuring the selectable boot settings
- Restoring default settings
- Accessing Raw NVRAM data
- Configuring advanced adapter settings
- Scanning for Fibre Channel devices

Selecting the expansion card

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

Configuring the expansion card

To configure the expansion card, select **Host Adapter Settings**.

The default settings and the modifiable settings for the expansion card are listed in Table 3 and are described in this section. The expansion card is always point-to-point connected in the blade server or expansion unit with an I/O module that supports Fibre Channel operation.

Note: The expansion-card settings and default values will vary, based on the version of BIOS code installed for the expansion card.

Table 3. Modifiable expansion card settings

Setting	Options	Default
Host adapter BIOS	Enabled or disabled	Disabled
Frame size	512, 1024, 2048	2048
Loop reset delay	Unavailable	N/A
Adapter hard loop ID	Unavailable	N/A
Hard loop ID	Unavailable	N/A
Spin up delay	Enabled or disabled	Disabled
Connection Options	0, 1, 2	2
Fibre Channel tape support	Enabled or disabled	Enabled
Data rate	1, 2, 3, 4	2

- **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.
- **Hard loop delay:** This option is unavailable.
- **Loop reset delay:** This option is unavailable.
- **Adapter hard loop display:** This option is unavailable.
- **Hard Loop delay:** This option is unavailable.
- **Spin up delay:** When this option is enabled, the BIOS code waits up to 5 minutes to discover the first drive, which allows time for the BIOS code to become operational.
- **Connection options:** Table 4 defines the connection (loop or point-to-point) preference.

Table 4. Expansion card connection and data rate options

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

Note: See the device-driver installation instructions for the required operating-system-specific modifications to the NVRAM. There are specific expansion-card settings that you cannot modify. Table 5 on page 15 describes these settings and gives examples.

Table 5. Non-modifiable 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 installed 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 used by the expansion card. The interrupt level can change when the operating system is installed.
- – **Adapter port name:** The adapter-port name is the worldwide-port name of the expansion card.
- • **Fibre Channel tape support:** This setting is reserved for Fibre Channel tape support.
- • **Data rate:** This rate determines the data rate for the expansion card.

Table 6. Expansion card data rates

Option	Data rate
1	2 Gbps
2	Auto Select
3	4 Gbps
4	8 Gbps

Configuring the selectable boot settings

To configure the selectable boot settings, 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.

Configuring advanced adapter settings

Use this option to view and modify advanced adapter settings.

Table 7. Expansion card advanced-adapter settings

Setting	Options
Execution throttle	1 - 65535
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
Operation mode	0, 5, 6
Interrupt delay	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 logon:** 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.
- **Operation mode:**

Table 8. Expansion card operation modes

Option	Operation mode
0	Interrupt for every I/O completion
5	Interrupt when Interrupt delay timer expires
6	Interrupt when Interrupt delay timer expires or no action

- **Interrupt delay:** This setting contains the value (in 100-microsecond increments) 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.

Exiting Fast!UTIL

After you complete the configuration, select ExitFast!UTIL to exit the Fast!UTIL menu and restart the blade server.

Chapter 5. Using EFI

This chapter provides information for customizing the configuration of the expansion card when it is installed in an EFI-based blade server. You can configure the expansion card using the EFI Configuration utility, which provides features for the EFI environment that are similar to the Fast!Util utility.

Perform these steps to launch the EFI Configuration Utility:

1. Start or restart the blade server.
2. Press **F1**.
3. Select **System Settings**.
4. Select **Adapters and UEFI Drivers**.
5. Refresh the page and then select the expansion card to launch the EFI utility.

For more information about the EFI Configuration Utility, see the Qlogic support Web site at: http://www.qlogic.com/Support/default.aspx.

Chapter 6. Using the SANsurfer application

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

Overview of the QLogic SANsurfer application

The QLogic SANsurfer application is used to configure a storage area network (SAN) environment 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 containing 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 (FC) subsystem problems in adapters, controllers, and devices that are attached to the FC fabric or loop.

You can also perform the following operations 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 alternate path. If the preferred path fails, the system switches to the alternate path to make sure that the transfer of data is not interrupted.

Installation and system requirements

Make sure that you are using the latest version of the SANsurfer application for the expansion card. Go to the IBM support Web site at 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.

Features

The SANsurfer application lets you:
- 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 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, including:
  - General information
  - Statistics
  - Information about attached devices
  - Link status for attached device
- Perform adapter functions, including:
  - Configuring the adapter NVRAM settings
  - Executing fibre diagnostics (read/write buffer loopback tests)
  - Perform flash updates on an adapter
  - Perform 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

Utilities

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

Update flash

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 the IBM support Web site at http://www.ibm.com/systems/support/.

After you enter a valid firmware file name, click **OK** to complete with 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 you are trying to install, the application asks if you still want to update the flash.

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

Chapter 7. Troubleshooting

If you are having a problem, 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 *Hardware Maintenance Manual and Troubleshooting Guide* or in the *Problem Determination and Service Guide* for your blade server.

Make sure you are using the latest versions of device drivers and firmware for your blade server and management module. If these items are not up-to-date, the BladeCenter unit might not recognize the expansion card and might not turn it on. Go to the IBM support Web site at,http://www.ibm.com/systems/support/ for the latest information about upgrading the device drivers, firmware, and BIOS for BladeCenter components. The latest instructions are in the documentation that come with the updates.

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

- Make sure that the expansion card is installed correctly.
- Make sure that the SANsurfer application data-rate setting is correct:
  - If the expansion card is installed in a BladeCenter HSxx or LSxx blade server, see "Configuring the expansion card" on page 14 or the documentation that came with your blade server.
  - If the expansion card is installed in a BladeCenter JSxx blade server, see Chapter 6, "Using the SANsurfer application," on page 21 or the documentation that came with your blade server.
- Make sure that all peripheral devices connected to the I/O modules are turned on, operating properly, and are properly connected:
  - If the expansion card is installed in a BladeCenter HSxx or LSxx blade server, see "Scanning for Fibre Channel devices" on page 17 or the documentation that came with your blade server for information about displaying attached Fibre Channel devices.
  - If the expansion card is installed in a BladeCenter JSxx blade server, see Chapter 6, "Using the SANsurfer application," on page 21 or the documentation that came with your blade server or information about displaying attached Fibre Channel devices.
- Make sure that one or two I/O modules that support Fibre-Channel operation are installed in the correct I/O-module bays of the BladeCenter unit.

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

- Make sure that the correct device driver is installed. To download or get information about the latest supported device drivers, utilities, and documentation, go to http://www.ibm.com/systems/support/. Also see the *Installation and User's Guide* for your blade server for additional information.
- Make sure that the BIOS code in the expansion card is at the latest level.
- Make sure that you have the correct expansion-card NVRAM settings for your storage area network (SAN) and operating system.

To determine whether your installation problem is caused by the system configuration, check the blade server to ensure that it is configured properly:

- If the expansion card is installed in a BladeCenter HSxx or LSxx blade server, see "Using the Configuration Settings menu" on page 13 or the documentation that came with your blade server for additional information.
- If the expansion card is installed in a BladeCenter JSxx blade server, see Chapter 6, "Using the SANsurfer application," on page 21 or the documentation that came with your blade server for additional information.

If you still have a system configuration problem, see the documentation that comes with your IBM BladeCenter unit or contact your IBM technical support representative to determine whether your system board requires a special configuration.

To determine whether your installation 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 installed in I/O-module bay 3, I/O-module bay 4, or both I/O-module bays 3 and 4.
- Make sure that the blade server is turned on.
- Make sure that the expansion-card settings are set to the correct values:
  - If the expansion card is installed in a BladeCenter HSxx or LSxx blade server, see "Using the Configuration Settings menu" on page 13 or the documentation that came with your blade server.
  - If the expansion card is installed in a BladeCenter JSxx blade server, see the documentation that came with your blade server.

Appendix A. Getting help and technical assistance

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

Before you call

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

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

  Note: For some IntelliStation® models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.

- Go to the IBM support Web site at http://www.ibm.com/systems/support/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

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

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

IBM Taiwan product service

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

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

Appendix B. Warranty

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

IBM Statement of Limited Warranty Z125-4753-10 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.**g 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/.

__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-INFRINGMENT. 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 **Equador**; the civil judges of Quito for executory or summary proceedings (as applicable); 7) in **Mexico**; the courts located in Mexico City, Federal District; 8) in **Paraguay**; the courts of the city of Asuncion; 9) in **Peru**; the judges and tribunals of the judicial district of Lima,

Cercado; 10) in **Uruguay**; the courts of the city of Montevideo; 11) in Venezuela; the courts of the metropolitan area of the city of Caracas.

BRAZIL

Exchange of a Machine or Part:

Delete the last sentence:

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

CANADA

What this Warranty Covers:

The following replaces the 2nd paragraph to this section:

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

Limitation of Liability:

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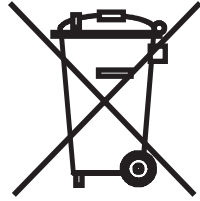
Notice: This mark applies only to countries within the European Union (EU).

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 8Gb Fibre Channel Expansion Card (CIOv) 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.

<u>Types of Warranty Service</u>

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/.

Appendix C. 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: 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 27.

Note: See the sample component illustration in "Installing the expansion card" on page 8.

Table 9. Part listing

Part number	Description	Component type
44X1948	QLogic 8Gb Fibre Channel Expansion Card (CIOv)	Tier 1 CRU

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> *North Castle Drive*
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Active Memory™	IBM	TechConnect®
Active PCI	IBM (logo)	Tivoli®
Active PCI-X	IntelliStation	Tivoli Enterprise

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Important notes

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

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

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

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

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

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

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

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

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

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Korean Class A warning statement

이 기기는 업무용으로 전자파 적합등록을 받은 기기
이오니, 판매자 또는 사용자는 이점을 주의하시기
바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에
서 비업무용으로 교환하시기 바랍니다.

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