

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



Installation and User's Guide

QLogic 8 Gb Intelligent Pass-thru Module for IBM
BladeCenter and QLogic 20-Port 8 Gb SAN Switch
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Note: Before using this information and the product it supports, read Appendix C, "Warranty," on page 53 and the general information in Appendix D, "Notices," on page 71.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

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

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

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

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

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

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



DANGER

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

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



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

Statement 8:



CAUTION:

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



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

Chapter 1. The QLogic 8 Gb Intelligent Pass-thru Module and QLogic 20-Port 8 Gb SAN Switch Module

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

- Installing, removing, and replacing the following types of I/O modules:
 - QLogic 8 Gb Intelligent Pass-thru Module for IBM® BladeCenter®
 - QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter
- Enabling the I/O module and its external ports
- Using the information panel, LEDs, and external ports on the I/O module
- Configuring the I/O module through a Telnet interface
- Configuring the I/O module through a Web browser interface
- Upgrading and expanding the functionality of the I/O module
- Performing basic troubleshooting tasks and solving problems with the I/O module
- Getting help, service, and technical assistance

Notes:

1. Throughout this document, including the references to screen contents, the QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter, or QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter, is generically referred to as the I/O module or the switch module. With respect to certain screen contents or titles, an I/O module might be referred to as a switch module or switch, because the term *switch module* or *switch* appears on those screens.

For the purpose of brevity:

- The QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter is specifically referred to as the pass-thru module.
 - The QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter is specifically referred to as the full fabric module.
2. Unless otherwise stated, references to the BladeCenter unit apply to all BladeCenter units that support the I/O module. As of the date of this document, the following devices are examples of applicable BladeCenter units:
 - BladeCenter E unit (also known as BladeCenter Type 8677)
 - BladeCenter H unit
 - BladeCenter HT unit
 - BladeCenter S unit
 - BladeCenter T unit
 3. Unless otherwise stated, references to the blade server apply to all blade servers that support the I/O module and expansion card.
 4. The illustrations in this document might differ slightly from your hardware.
 5. The screens that are described or referred to in this document might differ slightly from the screens that are displayed by your system. Screen content varies according to the type of BladeCenter unit and the firmware versions and optional devices that are installed.
 6. Unless otherwise stated, references to the management module apply only to the BladeCenter Advanced Management Module, which is the only type of management module that supports the I/O module.

The QLogic Intelligent Pass-thru Module for IBM BladeCenter supports a fully interoperable solution for seamless integration of the Fibre Channel initiators to an existing fabric. The Intelligent Pass-thru Module for IBM BladeCenter uses industry-standard Node port ID virtualization (NPIV) technology to provide a cost-effective connectivity solution for the IBM BladeCenter unit.

The pass-thru module is a Fibre Channel component that contains the following 20 ports:

- 14 internal transparent host (TH) ports to connect to the blade-server bays in the BladeCenter unit
- Six external transparent fabric (TF) Fibre Channel user ports to connect to external Fibre Channel devices

The QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter is a full fabric module and a Fibre Channel component that has expanded functionality and contains 20 ports. The QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter supports a higher speed switch for BladeCenter system configurations and offers scalability in external-storage area network (SAN) size and complexity, and enhanced system-management capabilities.

The QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter has the following ports:

- 14 internal ports to connect to the blade-server bays in the BladeCenter unit
- Six external Fibre Channel user ports to connect to external Fibre Channel devices

Notes:

- For additional information about the ports, see “Features, specifications, and standards” on page 5 and Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27.
- For additional information about the available optional software features and product upgrades, see Chapter 6, “Upgrading and expanding the functionality of the I/O module,” on page 41.

You can manage and configure the I/O module through multiple interfaces.

- A Telnet connection to the embedded command-line interface (CLI)
For additional information, see Chapter 4, “Configuring the I/O module through a Telnet interface,” on page 33.
- A Web browser (QuickTools) interface
For additional information, see Chapter 5, “Configuring the I/O module through the QuickTools Web interface,” on page 37.
- The Enterprise Fabric Suite 2007 application
The Enterprise Fabric Suite 2007 application supports an intuitive graphical interface that you can use to configure multiple I/O modules through other connected storage area network (SAN) devices from a single interface. For additional information, see the *QLogic 8 Gb Intelligent Pass-thru Module and 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Enterprise Fabric Suite 2007 User Guide* at <http://support.qlogic.com>.
For additional information about the ports, see Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27.

For installation details, see Chapter 2, “Installing, removing, replacing, and enabling an I/O module,” on page 15. For details about the status of the I/O module and its external ports and network connections, see Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27. For additional information about I/O modules and other BladeCenter components, see the BladeCenter documentation that comes with these devices.

To support each I/O module that you install in the BladeCenter unit, you must also install a compatible expansion card in each blade server that you want to communicate with the I/O module. In this environment, the expansion card operates as a host bus adapter (HBA). For additional information, see “Expansion card requirements” on page 16.

The following types of optional devices are compatible with the QLogic 8 Gb I/O modules:

- Fibre Channel expansion cards
- Combo Ethernet and Fibre Channel expansion cards
- 8 Gb SFP+ Short Wave Optic Transceiver, also known as an SFP+ module or short wave optical transceiver

You can obtain up-to-date information about the QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter, QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter, and other IBM products at <http://www.ibm.com/systems/support/>.

At <http://www.ibm.com/support/mysupport/>, you can create a personalized support page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly e-mail notifications about new technical documents, search for information and downloads, and access various administrative services.

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

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

Notes:

1. Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.
2. Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, expansion cards, and optional compatible devices for the I/O modules, BladeCenter units, and blade servers.
3. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported BladeCenter units, blade servers, expansion cards, and optional compatible devices for the I/O modules, BladeCenter units, and blade servers.
4. For details about installation, configuration, and use of compatible devices, see the documentation that comes with these devices.
5. This document might contain references or links to other companies' Web sites, also known as *non-IBM Web sites*. As of the date of this document, the addresses of non-IBM Web sites are correct. However, these addresses might

be updated after this document has been published. Certain conditions apply to the use of non-IBM Web sites. For additional information, see Appendix D, “Notices,” on page 71.

6. You can install up to two pass-thru modules or two 20-port full fabric modules in a BladeCenter unit. Do not install a pass-thru module and a full fabric module in the same BladeCenter unit.
7. You can find detailed hardware and software information, including documentation, about IBM products at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>.
8. You can find detailed hardware and software information, including documentation, about BladeCenter devices at <http://publib.boulder.ibm.com/infocenter/systems/scope/blades/index.jsp> or <http://publib.boulder.ibm.com/infocenter/systems/scope/bladecenter/index.jsp>.

Record information about the I/O module in Table 1. You can find this information on the labels on the I/O module. For an illustration that shows the locations of these labels, see “Major components of the I/O module” on page 13. You will need this information when you register the I/O module with IBM. You can register the I/O module at <http://www.ibm.com/support/mysupport/>. The product name and serial number are required for registration. Depending on the type of product, additional information might be required for registration.

Table 1. Product information

Product name	☐ QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter or ☐ QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter
Model number	_____
Serial number	_____
Worldwide name (WWN) Note: The worldwide name (WWN) is on the same label as the media access control (MAC) address.	_____
Media access control (MAC) address 1	_____
Other MAC addresses	_____ _____

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

Features, specifications, and standards

This section supports a summary of the features, specifications, and standards that apply to the I/O module.

The I/O module has the following features:

The switch module must provide battery protected real time clock functions. The date and time shall be set during switch manufacturing, and the battery should provide a minimum of 1 year protection of the real time clock.

- Firmware installation

Use the QuickTools Web interface, Enterprise Fabric Suite 2007 application, or CLI to install and activate new firmware.

- Support for Non-Disruptive Code Load Activation (NDCLA)

Note: This feature is supported only on certain blade server models. For information about the features that apply to your blade server, contact your IBM marketing representative or authorized reseller.

- Registered State Change Notification (RSCN)

The I/O module supports RSCN as described in FC-FLA. RSCN enables an agent to register for change events in the fabric and attached devices.

- Interoperability

The I/O module supports standards-based FC-SW2 interoperability. Fibre Channel switches that connect to the I/O-module external ports must support Node port ID Virtualization (NPIV).

- NPIV mode

The pass-thru module is a 20-port Fibre Channel NPIV switch with six external ports and 14 internal ports. The module concentrates multiple blade servers into the external ports. The external ports connect to external Fibre Channel switches that support NPIV. The internal ports connect directly to blade servers through the enclosure backplanes.

The pass-thru module presents one or more blade servers per port to the fabric. The module expands the fabric, but, unlike a full fabric switch, it does not count against the fabric domain.

Note: A node port is also known as an N_port.

- Error detection

The I/O module supports the following error-detection methods:

- Cyclic redundancy check (CRC)
- 8-byte and 10-byte conversion
- Parity
- Long frame and short frame
- D_ID mismatch
- S_ID mismatch

- Frame bundling
The I/O module supports the following frame bundling methods:
 - No frame bundling; - Frames are intermixed from different sources at will.
 - Soft lockdown: The I/O module waits for the sequence to be completed or a gap in the frame traffic to occur before it services requests from a different port.
- Configurable Fabric Address Notification (FAN)
A FAN, as described in FC-FLA, is sent out by the fabric after an initialization event (usually a loop initialization port) to each attached NL_Port. The purpose of the FAN is to inform the attached NL_Ports of the fabric node name, port name, and fabric address.
- Support for Call Home function
- Support for Domain Name Service (DNS)
- Support for Internet protocol (IP) Version 6
- Support for Internet protocol security (IPsec)
- Support for separate trap community strings for each trap address
- Support for Simple Network Management Protocol (SNMP) Version 3
- Support for vital product data (VPD)

Table 2 contains a summary of the specifications, standards, and protocols that apply to the I/O module.

Table 2. I/O-module specifications, standards, and protocols

Fibre Channel standards and protocols:

- **Fibre Channel standards:**
 - FC-PH version 4.3
 - FC-PH-2
 - FC-PH-3
 - FC-AL version 4.5
 - FC-AL-2 Rev 7.0
 - FC-FLA
 - FC-GS-3
 - FC-FG
 - FC-PLDA
 - FC-Tape
 - FC-VI
 - FC-SW-2
 - Fibre Channel Element MIB RFC 2837
 - Fibre Alliance MIB version 4.0
- **Fibre Channel protocols:**
 - Fibre Channel service classes: Class 2 and class 3
 - Operation modes: Fibre Channel class 2 and class 3, connectionless
 - External port type:
 - Full fabric mode: Generic loop port (GL_port)
 - Transparent mode: Transparent fabric port (TF_port)
 - Internal port type:
 - Full fabric mode: Fabric port (F_port)
 - Transparent mode: Transparent host port/NPIV mode (TH_port)
 - Support for up to 44 host NPIV logins

Table 2. I/O-module specifications, standards, and protocols (continued)

Fibre Channel standards and protocols (continued): • Fibre Channel protocols (continued): – Port characteristics: - External ports are automatically detected and self- configuring - Port LEDs illuminate at startup – Number of Fibre Channel ports: 6 external ports and 14 internal ports – Scalability: Up to 239 switches maximum depending on your configuration – Buffer credits: 16 buffer credits per port – Maximum frame size: 2148 bytes (2112 byte payload) – Standards-based FC FC-SW2 Interoperability – Support for up to a 255 to 1 port-mapping ratio – Media type: Small form-factor pluggable plus (SFP+) module – 2 Gb fabric port speed: 1.0625 or 2.125 Gbps (gigabits per second) – 2 Gb fabric latency: Less than 0.4 µsec – 2 Gb fabric aggregate bandwidth: 80 Gbps at full duplex – System processor: PowerPC® – Fabric point-to-point bandwidth: 2 Gbps or 8 Gbps at full duplex – 4 Gb switch speed: 4.250 Gbps – 4 Gb switch fabric point-to-point: 4 Gbps at full duplex – 4 Gb switch fabric aggregate bandwidth: 160 Gbps at full duplex – 8 Gb switch speed: 8.5 Gbps – 8 Gb switch fabric point-to-point: 8 Gbps at full duplex – 8 Gb switch fabric aggregate bandwidth: 320 Gbps at full duplex – Maximum frame size: 2148 bytes (2112 byte payload) – Nonblocking architecture to prevent latency
I/O-module maintainability: • Diagnosis: Power-on self-test (POST) is performed on all functional components except the SFP or SFP+ module. Port operational tests include internal, external, and online tests. • User interface: Light-emitting diode (LED) indicators
Fabric management: • Management methods: – Enterprise Fabric Suite 2007 application – Telnet interface and command-line interface (CLI) – QuickTools Web interface • I/O-module simple network management protocol (SNMP) agent: Enables a network management workstation to receive configuration values, traffic information, and Fibre Channel failure data through SNMP and the Ethernet interface
Dimensions: • Width: 118.1 mm (4.65 in.) • Height: 29.5 mm (1.16 in.) • Depth: 276.4 mm (10.88 in.) • Weight: 0.93 kg (2.05 lb)

Table 2. I/O-module specifications, standards, and protocols (continued)

Environmental:

- Temperature and altitude:
 - Operating:
 - 10°C to 52° C (50°F to 125.6° F) at an altitude of 0 to 914 m (0 to 3000 ft)
 - 10°C to 49° C (50°F to 120.2° F) at an altitude of 0 to 3000 m (0 to 10 000 ft)
 - Non-operating: -40°C to 65° C (-40°F to 149° F) at an altitude of 0 to 12 000 m (0 to 39 370 ft)
- Humidity:
 - Operating: 8% to 80%, noncondensing
 - Non-operating: 5% to 80%, noncondensing

I/O-module regulatory certifications:

- Electrical:
 - Power source loading: 3.75 amps maximum at 12 V dc
 - Heat output: 35 watts maximum
 - Operating voltage: 12 V dc
 - Circuit protection: Internally fused
- Emissions standards:
 - FCC Title 47 CFR Part 15 Subpart B Class A (USA)
 - VCCI Class A ITE, April 2003 (Japan)
 - ICES-003 issue 3 (Canada)
 - A4EN55022 level A (EC)
 - Voltage fluctuations: EN 61000-3-3
 - Harmonics: EN 61000-3-2
 - Immunity: EN55024: 1998
 - C-Tick - AS/NZS CISPR 22 (Australia/New Zealand)
 - CE Mark - EN55022:1998 + A2:2003 and EN55024:1998 + A1:2001 + A2:2003
 - MIC Notice No. 2001-115 and No. 2001-116 (Korea)
 - GOST 29216-91 (Russia)
 - CISPR 22 Class A
 - BSMI CNS 13438 (Taiwan)
 - Communique No. 2004/9 and No. 2004/22 (Turkey)
 - EMC.CVG, 28 October 2002 (Saudi Arabia)
 - GB 9524:1998 (China)

Related documentation

This *Installation and User's Guide* contains instructions for setting up, installing, removing, configuring, and troubleshooting the I/O module. This document also contains general information about the I/O module and information about upgrading and expanding the functionality of the I/O module. This document is provided on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* that comes with the I/O module. Follow the instructions in this *Installation and User's Guide* after you read the *IBM Important Notices* document that comes with the I/O module.

Notes:

- The most recent versions of this *Installation and User's Guide* and all other BladeCenter documentation are at <http://www.ibm.com/systems/support/>.
- The *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* might contain additional information. Use the subdirectories to help you find information quickly.

IBM documentation

To complete your system installation, configuration, operation, and troubleshooting requirements, you must follow the instructions in the documentation that comes with your BladeCenter components. The following related IBM documentation comes with the expansion card, I/O module, BladeCenter unit, blade server, or other BladeCenter devices that you have purchased. This documentation contains important, useful information to help you with the setup, installation, configuration, operation, and troubleshooting processes for these devices. This documentation is available at <http://www.ibm.com/systems/support/>:

- *IBM Important Notices*

Read this document before you install the I/O module in the BladeCenter unit. This document contains the warranty information, safety information, and environmental notices that apply to all class A devices. The product-specific documentation is provided on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* that comes with this product.

- Expansion card *Installation and User's Guide*

Each type of expansion card has a customized *Installation and User's Guide* that contains detailed information about the expansion card, which is compatible with the 8 Gb I/O modules. These I/O modules contain connectors for the blade servers in which the expansion card is installed.

This document and other related documents are on the *Support CD* that comes with this product.

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

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

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

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

- Before you can use the BladeCenter unit or install I/O modules, blade servers, or other devices in the BladeCenter unit, you must correctly install and configure at least one compatible management module in the BladeCenter unit. To do this, follow the instructions in these documents, in accordance with the type of management module that your BladeCenter unit supports:

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

- *Multi-Switch Interconnect Module for IBM BladeCenter Installation and User's Guide*

This document contains instructions for installing a multi-switch interconnect module (MSIM) in a BladeCenter unit. This document also contains instructions for installing an I/O module in an MSIM.

- *IBM BladeCenter SAN Solutions Guide*

This document provides user-oriented information about how the BladeCenter Fibre Channel optional devices are used to provide different SAN storage solutions for different application requirements.

- *IBM BladeCenter Fibre Channel I/O Interoperability Guide*

This document provides detailed Fibre Channel I/O-module configuration data and step-by-step configuration procedures for integrating the BladeCenter unit into other vendor switch fabrics. Each vendor configuration includes an initial integration checklist, configuration limitations, supported-I/O-module and firmware versions, specific management-application operations, and a successful-integration checklist.

- *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 language.

- *IBM Problem Determination and Service Guide*

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

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

In addition, you might have to review the *IBM Configuration and Options Guide*, which contains information about which small form-factor pluggable (SFP) or small form-factor pluggable plus (SFP+) module and cable are required to connect the I/O module to other network or storage devices. This document is available in both HTML and PDF from <http://www.ibm.com/servers/eserver/xseries/cog/>.

The updated BladeCenter documentation also is available from the IBM Systems Information Center. To check for updated information, complete the following steps.

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

For more information about documentation requirements, see “Using the documentation” on page 51.

QLogic documentation

The following related QLogic Corporation documentation is available from the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD*, the main QLogic Web site, <http://www.qlogic.com/>, or the QLogic Technical Support Web site, <http://support.qlogic.com>. Additional related documentation also is available from this Web site. See this Web site for the most recent versions of all related QLogic documentation.

Note: The titles of certain QLogic Corporation documentation and the names of certain QLogic Corporation software products contain references to the year 2007. However, the QLogic firmware and software have been upgraded to incorporate the features and functions of the pass-thru module and the full fabric module.

- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter QuickTools Switch Management Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter QuickTools Switch Management Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module and 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Enterprise Fabric Suite 2007 User Guide*
- *QLogic Fibre Channel Switch Event Message Guide*
- *QLogic CIM Agent Reference Guide*
- *QLogic SNMP Reference Guide*
- *End User License Agreement (EULA)*
- Readme files
- Instructions

To obtain relevant QLogic documentation for device drivers, the QuickTools program, and other tools, go to <http://www.ibm.com/systems/support/> and enter the search term QLogic to list and access the applicable Web sites.

Inventory checklist

Make sure that the shipping carton contains the following items:

- One of the following types of Fibre Channel I/O modules:
 - QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter
 - QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter
- The *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD*, which contains the following documents:
 - *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter and QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Installation and User's Guide* (this document)
 - The documents listed in "QLogic documentation" on page 11
 - *End User License Agreement (EULA)*
 - *Safety Information*
- IBM *Important Notices* document

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

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM *BladeCenter Documentation* CD and at <http://www.ibm.com/systems/support/>. Each caution and danger statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

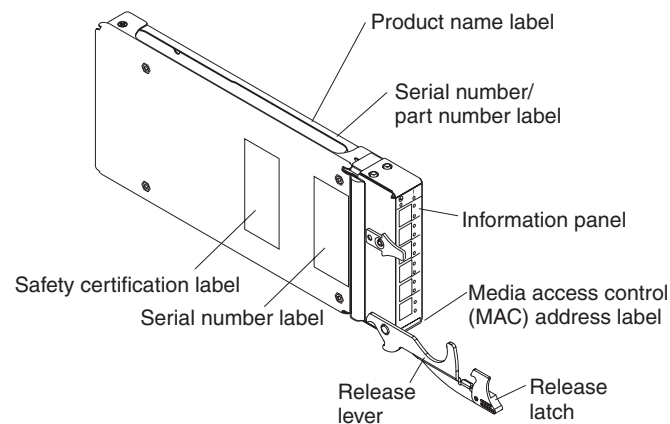
- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice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

Major components of the I/O module

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

Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. Your I/O module might have labels that are not shown in the following illustration. For example, the worldwide name (WWN) is on the same label as the media access control (MAC) address.



For more information about the components of the information panel, see Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27. For more information about the MAC address, see the applicable QuickTools switch management guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

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

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

I/O module preinstallation checklist

The following items are I/O module preinstallation requirements and considerations.

- Make sure that you are using BladeCenter components that are compatible with the I/O modules, BladeCenter units, and blade servers.

For a list of the types of supported BladeCenter units, see Chapter 1, “The QLogic 8 Gb Intelligent Pass-thru Module and QLogic 20-Port 8 Gb SAN Switch Module,” on page 1. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported blade servers, expansion cards, and optional compatible devices. Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, expansion cards, and optional compatible devices for the I/O modules, BladeCenter units, and blade servers.

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

- Make sure that you are using the latest version of firmware code for the BladeCenter Advanced Management Module and all other BladeCenter components.

If necessary, install the latest version of firmware code for the BladeCenter Advanced Management Module or other BladeCenter components. To download the most recent firmware updates, go to <http://www.ibm.com/systems/support/> for the latest information about upgrading the firmware code for BladeCenter components. The instructions are in the documentation that comes with the updates.

- Make sure that compatible expansion cards are installed in the blade servers or other blade devices that you want to communicate with the I/O modules. For additional information about the expansion card requirements for I/O modules, see “Expansion card requirements” on page 16.
- The BladeCenter unit supports a maximum of two I/O modules, in I/O-module bays 3, 4, 8, and 10. You can install I/O modules in the following I/O-module bay combinations:
 - You can install an I/O module in I/O-module bay 3 or 4 or in both I/O-module bays 3 and 4 of the BladeCenter unit.
 - You can install an I/O module inside a multi-switch interconnect module (MSIM) in I/O-module bay 8 or 10 or in both I/O-module bays 8 and 10 of the BladeCenter unit.
 - You can install an I/O module in I/O-module bay 3 or 4 of the BladeCenter unit, and another I/O module inside an MSIM in I/O-module bay 8 or 10 of the BladeCenter unit.
 - If you are installing only one I/O module and your expansion card does not require that your I/O module be installed in an MSIM in this system configuration, install the I/O module in I/O-module bay 3 of the BladeCenter unit.

- If you are installing only one I/O module and your expansion card requires that your I/O module be installed in an MSIM in this system configuration, install the I/O module inside the MSIM in I/O-module bay 8 of the BladeCenter unit.

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

- If the I/O modules will be installed in an MSIM in I/O-module bays of the BladeCenter unit, make sure that the I/O modules are in the correct (supported) I/O-module bays, and that a supported expansion card is installed in your blade server. For additional information, see Table 3 on page 17 and the *Installation and User's Guide* that comes with the device.
- When the I/O module is installed in a BladeCenter HT unit, the internal ports operate at 4 Gbps, and the external ports operate at speeds up to 8 Gbps.
- When the I/O module is installed in a BladeCenter T unit, the internal ports operate at 2 Gbps, and the external ports operate at speeds up to 8 Gbps.
- Configuration requirements for the I/O module and the BladeCenter unit might vary. You can obtain up-to-date information about the I/O module and the BladeCenter unit at <http://www.ibm.com/systems/bladecenter/>.
- The blade servers or BladeCenter units that are described or shown in this document might be different from your blade server or BladeCenter unit. For additional information, see the documentation that comes with your blade server or BladeCenter unit.
- If you encounter a problem with using the BladeCenter components or during the I/O module installation procedure, see “Troubleshooting checklist” on page 46 for additional information.

Expansion card requirements

A compatible expansion card or host bus adapter (HBA) must be installed in each blade server or other blade device that you want to communicate with the I/O module. The following devices are examples of compatible expansion cards for the I/O module:

- Fibre Channel expansion cards
- Combo Ethernet and Fibre Channel expansion cards

For additional information about these expansion cards, see the applicable *Installation and User's Guide* on the *Support CD* that comes with these products.

Expansion cards determine the BladeCenter unit I/O-module bays that can support each I/O module. The expansion card has two Fibre Channel ports. To enable the I/O module to communicate with a blade server or other blade device, at least one of the previously specified supported types of I/O modules must be installed in the BladeCenter unit. For details about installation, configuration, and use of an expansion card, see the documentation that comes with the expansion card.

If an I/O module is installed in a device, such as an MSIM, in I/O-module bays of the BladeCenter unit, this configuration requires a specific type of expansion card to support the device and to communicate with a blade server or other blade device. The expansion card must be installed in the blade server or other blade device. For additional information, including the applicable I/O-module bays and expansion-card ports, see the documentation that comes with the expansion card and the device in which the I/O module is installed.

Table 3 summarizes the bay and port interconnections for each I/O module and expansion card. In this table, the bay numbers correspond to the I/O-module bays in the BladeCenter unit. Installing a second I/O module enables a redundant path and a separate Fibre Channel connection from the blade server or other blade device to the external devices on the Fibre Channel network and SAN. Thus, the second I/O-module port connection in Table 3 allows for dual paths from the blade server or other blade device to the external Fibre Channel devices.

Installing a second I/O module in the BladeCenter unit provides a backup I/O module in case one I/O module fails. Both I/O modules must be of the same type if I/O modules are installed in both I/O-module bays 3 and 4 of the BladeCenter unit or inside an MSIM in both I/O-module bays 8 and 10 of the BladeCenter unit.

Table 3. I/O-module bay/expansion-card port correlation

Standard I/O-module bay in BladeCenter unit	Fibre Channel I/O-module function
3 (See the notes in this table.)	Port 0 connection on the Fibre Channel expansion card in the BladeCenter unit
4 (See the notes in this table.)	Port 1 connection on the Fibre Channel expansion card in the BladeCenter unit
8 (upper right interconnect-module bay) 8 – Inside an MSIM in the BladeCenter H or BladeCenter HT unit (in the slots on the right side of the MSIM) See the notes in this table.	Port 0 connection on the Fibre Channel expansion card in the BladeCenter unit
10 (lower right interconnect-module bay) 10 – Inside an MSIM in the BladeCenter H or BladeCenter HT unit (in the slots on the right side of the MSIM) See the notes in this table.	Port 1 connection on the Fibre Channel expansion card in the BladeCenter unit
Notes: - As of the date of this document, only Fibre Channel I/O modules can be installed in the indicated I/O-module bays that are listed in this table. The other I/O-module bays do not support the types of 8 Gb I/O modules that are discussed in this document. - For additional information about the applicable I/O-module bays and expansion-card ports, see the documentation that comes with the BladeCenter unit and the expansion card. - An I/O module can also be installed in other I/O configurations, such as within an MSIM configuration. For additional information about configuration requirements, see the applicable product documentation that comes with the device.	

Installation guidelines

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

- Read the safety information that begins on page v, “Handling static-sensitive devices” on page 19, and the safety statements in the BladeCenter unit documentation. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the blade server or BladeCenter unit, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component on the I/O module, blade server, or BladeCenter unit indicates that the component can be hot-swapped, which means that if the BladeCenter unit and operating system support hot-swap capability, you can remove or install the component while the BladeCenter unit is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- You do not have to turn off the BladeCenter unit to install or replace any of the hot-swap modules on the rear of the BladeCenter unit.
- When you install an I/O module in the BladeCenter unit, you must also install a compatible I/O expansion card in the blade server to support the I/O module.
- When you are finished working on the blade server or BladeCenter unit, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the BladeCenter unit and other IBM products, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

System reliability guidelines

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

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

Cable requirements for the I/O module are described in the IBM *Configuration and Options Guide* at <http://www.ibm.com/servers/eserver/xseries/cog/>. See the documentation that comes with the blade server for cable-routing information.

Handling static-sensitive devices

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

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

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

Installing an I/O module

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

1. Make sure that you are using the latest versions of device drivers, utilities, firmware code, and BIOS code for the following devices:
 - The expansion cards in the BladeCenter unit and in the blade servers
 - The blade servers
 - The management module
 - The 8 Gb I/O modules and controller that are used by the expansion cards in the BladeCenter unit
 - Other I/O modules that are used by the expansion cards in the blade servers

If the device drivers, utilities, firmware code, and BIOS code are not current, the BladeCenter unit might not recognize one or more of the following devices, and the BladeCenter unit or these devices might not be able to start.

- The expansion cards
- The 8 Gb I/O modules
- Other I/O modules

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

To download the most recent device drivers, utilities, firmware updates, BIOS code updates, and expansion card boot code updates, go to <http://www.ibm.com/systems/support/> for the latest information about upgrading the device drivers, firmware, and BIOS code for BladeCenter components. The instructions are in the documentation that comes with the updates. Also see the *Installation and User's Guide* for your blade server for additional information.

2. Read the safety information that begins on page v and "Installation guidelines" on page 18.
3. Remove the acoustic attenuation module, if one is installed, from the BladeCenter unit.

Depending on the type of BladeCenter unit that you are using, the acoustic attenuation module is on the front or rear of the BladeCenter unit. For more information, see the documentation that comes with the BladeCenter unit.

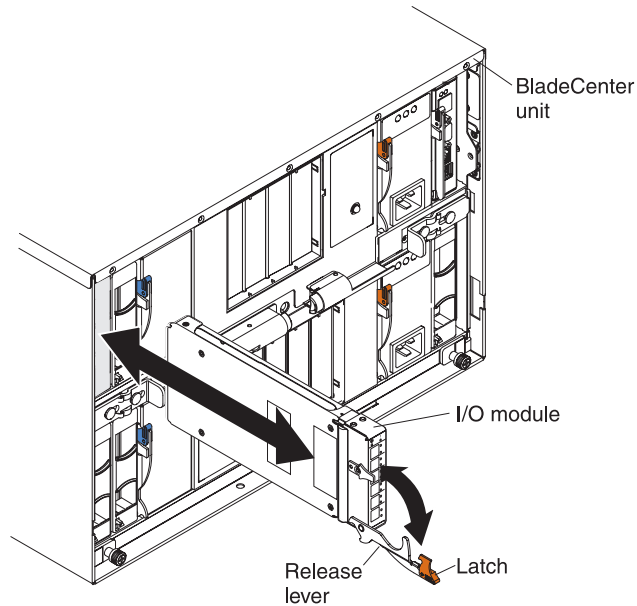
4. Make sure that the BladeCenter unit is turned on, the green dc power LED on each power module is lit, and the green OK LED on the management module is lit.
5. Select one or two I/O-module bays in which to install an I/O module. For information about the supported I/O-module bays, see "I/O module preinstallation checklist" on page 15.

Note: If you plan to use a blade server or other blade device to communicate with an I/O module, a compatible expansion card must be installed in that blade server or blade device. For additional information about the expansion card requirements for I/O modules, see "Expansion card requirements" on page 16.

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

9. Make sure that the release latch on the I/O module is in the open position (perpendicular to the I/O module), as shown in the following illustration. Depending on the type of BladeCenter unit that you are using, the installation procedure requires either a vertical or horizontal orientation for the I/O module. The following example shows a vertical orientation for installing an I/O module in the BladeCenter unit. For information about installing an I/O module in your BladeCenter unit, see the documentation that comes with the BladeCenter unit.

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



10. Slide the I/O module into the applicable I/O-module bay until it stops.
11. Push the release latch on the front of the I/O module to the closed position. After you insert and lock the I/O module, it is turned on, and a power-on self-test (POST) occurs to verify that the I/O module is operating correctly.

Notes:

- a. The I/O module takes approximately 90 seconds to complete the POST. When the I/O module is turned on, an LED test occurs. All LEDs are lit and remain lit for approximately 5 seconds; then, all the LEDs except the OK LED turn off. The OK LED is lit at startup; then, POST proceeds as described in the next step.
 - b. If an external port on a full fabric module is disabled, the corresponding LED continues to flash synchronously until the port is enabled through the management module.
 - c. To maintain proper airflow, make sure that the ventilation areas on the sides of the blade server are not blocked.
12. Make sure that the LEDs on the I/O module indicate that it is operating correctly. (For LED locations, see “Information LEDs” on page 28.)
- When the POST starts, make sure that the green OK LED on the I/O module is on during the startup process. The POST tests the condition of firmware, memory, data paths, and switch logic and uses the amber fault LED on the I/O module to indicate pass or fail conditions.

- Make sure that the green OK LED and the fault LED on the I/O module are both off, to indicate that the switch logic has successfully completed the POST.

Note: If the fault LED on the I/O module continues to be lit, the POST has failed. Make sure that the BladeCenter unit is powered on and the BladeCenter unit LEDs are lit. If POST has failed, see the *QLogic Fibre Channel Switch Event Message Guide* for diagnostic information. You can find this document on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

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

13. If you have a second I/O module to install, repeat step 6 on page 20 through step 12 on page 21; otherwise, go to step 14.
14. If you are using the external I/O-module ports, you can connect an SFP+ module to external Fibre Channel port 0 and Fibre Channel ports 15 through 19. For SFP+ module installation instructions, see the documentation that comes with the SFP+ module.

Note: An SFP+ module does not come with the I/O module but is required if you want to use external I/O-module ports.

15. Use LC-LC or LC-SC fiber-optic cables to connect the I/O-module external ports to external Fibre Channel devices. For more information, see the documentation that comes with the cables.

Note: You can remove and replace an SFP+ module while the I/O module is operating without damaging the I/O module or the SFP+ module. However, transmission on the affected port is interrupted until the SFP+ module and cables are installed. See the documentation that comes with the connected Fibre Channel device for information about installation, configuration, and startup sequence.

16. Replace the acoustic attenuation module, if you removed it in step 3 on page 20.
17. Enable the new I/O module and its external ports through the management module, as described in “Enabling the I/O module and its external ports” on page 25.

For additional information about the management module and enabling ports through the management module, see the following documents at <http://www.ibm.com/systems/support/>:

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

Removing or replacing an I/O module



CAUTION:

If the I/O module is defective, remove it and replace it as described in this section. Then, remove the battery from the defective I/O module as described in Appendix A, “Removing the battery,” on page 49. The I/O module battery contains lithium and can explode if the battery and I/O module are not properly used, handled, or disposed of.

Recycle or dispose of the battery and defective I/O module as required by local ordinances or regulations. For additional information, see “Product recycling and disposal” on page 73 and “Battery return program” on page 74.

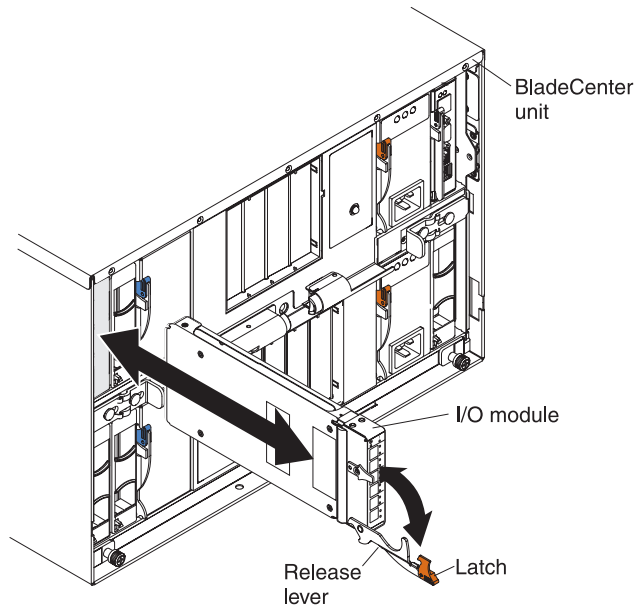
To remove or replace an I/O module, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 18.
2. If the BladeCenter unit has an acoustic attenuation module, remove it. See the documentation for the BladeCenter unit for instructions.
3. Disconnect the LC-LC or LC-SC cables from the two external ports on the SFP+ module. Removing these cables disrupts the network connection from the external Fibre Channel port to any connected external Fibre Channel devices. For removal instructions, see the documentation that comes with the cables.
4. Remove any SFP+ modules from the I/O-module external Fibre Channel ports. For removal instructions, see the documentation that comes with the SFP+ module.

5. Pull the release latch toward the bottom of the I/O module. The I/O module moves out of the bay approximately 0.6 cm (0.25 inch). Make sure that the release latch on the I/O module is in the open position (perpendicular to the I/O module), as shown in the following illustration.

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

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



6. Slide the I/O module out of the bay and set it aside.
7. Place either another I/O module or a filler module in the bay.
Important: Complete this step within 1 minute (see steps 11 and 12 on page 21 for more information).
8. If you placed another I/O module into the bay and if you are using the external I/O-module ports, insert any SFP+ modules that you removed (in step 4 on page 23) into external Fibre Channel port 0 and Fibre Channel ports 15 through 19. For installation instructions, see the documentation that comes with the SFP+ module.
9. Use LC-LC or LC-SC fiber-optic cables to connect the I/O-module external ports to external Fibre Channel devices. For more information, see the documentation that comes with the cables.
10. Replace the acoustic attenuation module, if you removed it in step 2 on page 23.

11. Enable the new I/O module and its external ports through the management module, as described in “Enabling the I/O module and its external ports.”
For additional information about the management module and enabling ports through the management module, see the following documents at <http://www.ibm.com/systems/support/>:
 - BladeCenter unit *Installation and User's Guide*
 - *BladeCenter Management Module Installation Guide*
 - *IBM BladeCenter Management Module User's Guide*

Enabling the I/O module and its external ports

After you install an I/O module, you must make sure that the I/O module and its six external ports are enabled before you can configure the Fibre Channel fabric through the I/O module. To do this, use the BladeCenter Advanced Management Module.

Notes:

- For additional information about the management module and its configuration requirements, including the requirements for enabling ports, see the following documents at <http://www.ibm.com/systems/support/>:
 - BladeCenter unit *Installation and User's Guide*
 - *BladeCenter Management Module Installation Guide*
 - *IBM BladeCenter Management Module User's Guide*
 - *IBM BladeCenter Management Module Command-Line Interface Reference Guide*
- The contents of all management-module Web-interface pages vary according to the type of BladeCenter unit that you are using and the firmware versions and optional devices that are installed.
- The 14 internal I/O-module ports correspond to the connectors for the blade servers that you can attach to the BladeCenter unit.
- For the location of the six external ports, see the illustrations in Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27.

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

1. Start a management-module session by using a Web browser to connect to the BladeCenter Advanced Management Module. To do this, use the Advanced Management Module Internet protocol (IP) address. The BladeCenter management-module Web-interface page opens.
2. In the Advanced Management Module window, under **I/O Module Tasks** (in the left pane), click **Admin/Power/Restart**. The I/O Module Power/Restart window opens.
 - If the I/O module is not powered on, continue with step 3.
 - If the I/O module is powered on, continue with step 5 on page 26.
3. In the main window, select the I/O module that you want to turn on by selecting the check box in the first column.

4. Click **Power On Module(s)** at the bottom of the table. The I/O module is powered on, and a power-on self-test (POST) is performed. This might take several moments. At the end of the process, the following actions occur:
 - a. In the table, the power (**PWR**) status column changes to ON.
 - b. In the table, the **Power On Self Test (POST) Status** column displays: [POST results available: FF: Module completed POST successfully.] For additional POST values, see Chapter 8, “Solving problems,” on page 45.
 - c. The green OK LED on the I/O module is lit. For additional information about LEDs, see Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27.
5. In the Advanced Management Module main window, scroll down to the **I/O Module Advanced Setup** choice.
6. From the drop-down menus, select the applicable I/O module.
Important: Do not skip step 7. If you skip step 7, the ports will not operate.
7. Select **Enable** for the external ports.
8. Click **Save**. The I/O module and its external ports are now fully operational, and you can configure the Fibre Channel fabric through the I/O module.

Chapter 3. Information panel LEDs and external Fibre Channel ports

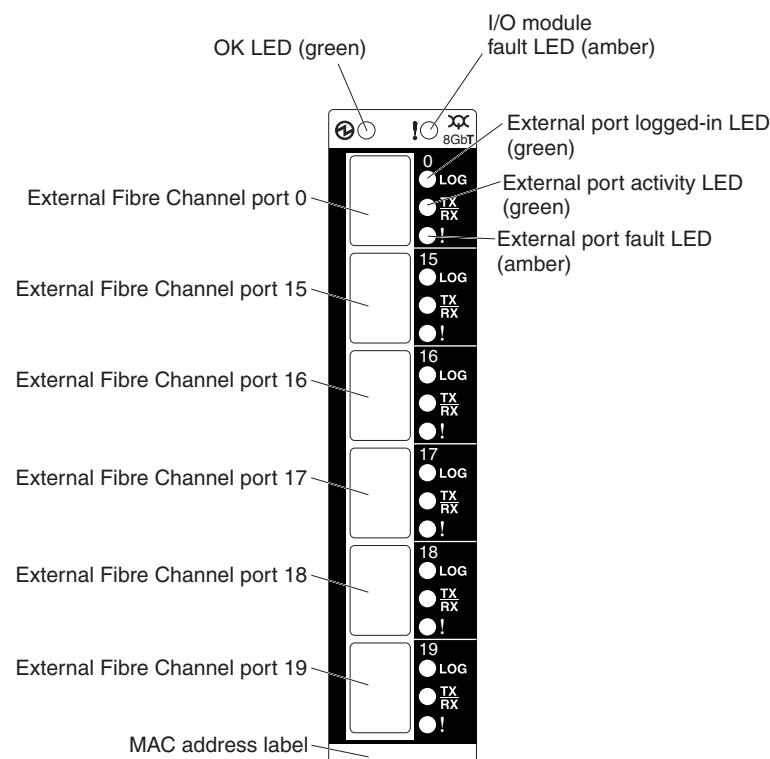
This chapter describes the information panel and LEDs on the I/O module and identifies the external Fibre Channel ports on the information panel. For additional information about the ports, see “Features, specifications, and standards” on page 5.

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

Information panel and internal connectors

The front panel of the I/O module contains the following components, as shown in the following illustration:

- Information LEDs that display the status of the I/O module and its network connections. For additional information, see “Information LEDs” on page 28.
- Six external Fibre Channel ports to connect Fibre Channel devices and switches. These ports are identified as ports 0, 15, 16, 17, 18, and 19 in the I/O-module configuration menus and are labeled 0, 15, 16, 17, 18, and 19 (from top to bottom) on the I/O module.



In the I/O-module configuration menus, the internal connectors are numbered 1 through 14 on the pass-thru module and the full fabric module.

Notes:

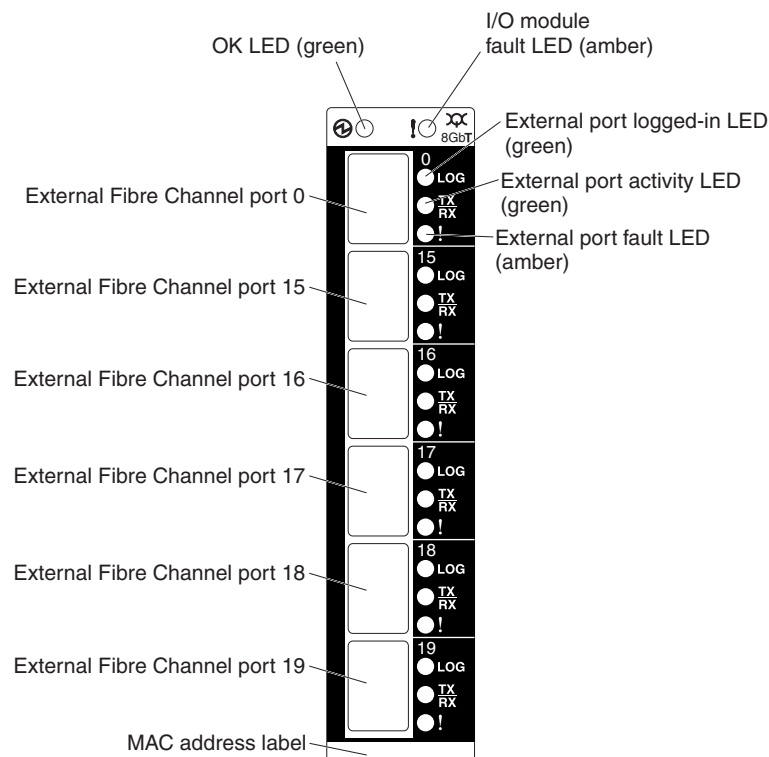
- The information panel is also known as the front panel.
- In the pass-thru module, the internal ports are logically mapped to the external ports. Use the QLogic management tools to view and modify the default internal

to external logical port mapping. For additional information, see the applicable QLogic management guide for your I/O module.

- An IBM BladeCenter H unit has 14 internal ports. All licensed internal ports are accessible.
- An IBM BladeCenter HT unit has 12 internal ports. Ports 13 and 14 are not available on the I/O module. All other licensed internal ports are accessible.
- An IBM BladeCenter T Type 8720 or 8730 unit has eight internal ports. Ports 9 through 14 are not available on the I/O module. All other licensed internal ports are accessible.
- An IBM BladeCenter S unit has 6 internal ports. Ports 7 through 14 are not available on the I/O module. All other licensed internal ports are accessible.

Information LEDs

The front panel of the I/O module has multiple sets of LEDs. The OK and ! (I/O module fault) LEDs at the top of the I/O module represent I/O-module status. The other sets of LEDs represent the status of each external Fibre Channel port. The port LEDs are external port logged-in (LOG), external port activity (TX/RX), and external port fault (!). The following illustration shows the locations of these LEDs on the I/O module.



Notes:

- An amber LED on the BladeCenter unit is lit when a system error or event has occurred. To identify the error or event, check the other LEDs on the I/O module, and check the BladeCenter management-module event log or the switch system log.
- When the I/O module is turned on, an LED test occurs. All LEDs are lit and remain lit for approximately 5 seconds; then, all the LEDs except the OK LED turn off. The OK LED is lit at startup; then, POST proceeds as described in step 12 on page 21.
- Before you can use the I/O module and its external ports, you must make sure that these devices are enabled. For additional information, see “Enabling the I/O module and its external ports” on page 25.
- If an external port on a full fabric module is disabled, the corresponding LED continues to flash synchronously until the port is enabled through the management module.

For additional information about the management module and enabling ports through the management module, see the following documents at <http://www.ibm.com/systems/support/>:

- BladeCenter unit *Installation and User's Guide*
- BladeCenter Management Module *Installation Guide*
- IBM BladeCenter Advanced Management Module *User's Guide*
- For additional information about diagnostics, see the applicable documentation at <http://www.ibm.com/systems/support/>, on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>:
 - BladeCenter *Installation and User's Guide*
 - *Problem Determination and Service Guide*
 - *Hardware Maintenance Manual and Troubleshooting Guide*
 - *QLogic Fibre Channel Switch Event Message Guide*
 - *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter QuickTools Switch Management User Guide*
 - *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter QuickTools Switch Management Guide*

LED states and colors

After you install the I/O module in the BladeCenter unit, the I/O-module LEDs become active. There are four possible LED states: off, lit, flickering, and flashing. The lit (steady) LEDs and flashing LEDs can be green or amber. A flickering LED can only be green.

The LEDs might display any of these states and colors during startup, POST, or other diagnostic tests. This is typical and does not indicate a problem, unless the LEDs indicate a problem after all the startup (boot) processes and diagnostic tests have been completed.

Any errors that are detected during POST are written to the system log. This log is accessible through the **show logging logfile** command in the switch CLI. For information about this command, see the applicable command-line interface guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

For information about error messages, see the *QLogic Fibre Channel Switch Event Message Guide* on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

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

System status LEDs

The two LEDs in the first row at the top of the I/O module represent the I/O module status. These LEDs are the green OK LED and the amber I/O module fault LED. Table 4 contains a description of each system status LED on the information panel of the I/O module.

Table 4. I/O-module system status LED descriptions

LED name	LED description
OK	This green LED is at the top left of the I/O module on the front panel. This LED is lit at startup. Note: When this LED is lit, the following LEDs are also lit: • The green dc power LED on each power module in the BladeCenter unit • The green OK LED on the management module
! (I/O module fault)	This amber LED is at the top right of the I/O module on the front panel. This LED indicates that the I/O module has a fault. If the I/O module fails the POST, this fault LED is lit. Note: This LED is also known as the system-error LED or the switch fault LED.

Fibre Channel external port status LEDs

There are three port LEDs directly to the right of each of the six Fibre Channel external ports on the front panel of the I/O module. These LEDs indicate the logged-in, activity, and fault status of that Fibre Channel external port.

Table 5 contains a description of each port LED on the information panel.

Table 5. I/O-module Fibre Channel external port status LED descriptions

LED name	LED description
External port logged-in (LOG)	There are six green external port logged-in (LOG) LEDs. The external port logged-in LED is the top LED directly to the right of the corresponding port. When one of these LEDs is lit, it indicates that there is a connection (or link) to a device on that port.
External port activity (TX/RX)	There are six green external port activity (TX/RX) LEDs. The external port activity LED is the middle LED directly to the right of the corresponding external port. When one of these LEDs flashes, it indicates that data is being received or transmitted (that is, activity is occurring) on that port. The flash frequency is proportional to the amount of traffic on that port.

Table 5. I/O-module Fibre Channel external port status LED descriptions (continued)

LED name	LED description
External port fault (!)	There are six amber external port fault (!) LEDs. The external port fault LED is the bottom LED directly to the right of the corresponding external port. When an external port fault LED is lit, it indicates that the external port has failed the internal, external, or online port diagnostics tests that are performed with the QuickTools interface application or CLI.

LED activities and diagnostic flash patterns

Table 6 contains descriptions of the activities and corresponding diagnostic flash patterns for the I/O-module LEDs.

Table 6. I/O-module LED activities and diagnostic flash patterns

LED name	LED activity/diagnostic flash pattern
OK	This LED is lit at startup.
! (I/O module fault)	- The LED is off during initialization or when the I/O module is in normal operation. - The LED is lit during LED test or to indicate a system fault during a POST failure, thermal fault, or other critical I/O module fault. - The LED does not flash.
External port logged-in (LOG)	- The LED is off when the corresponding external port is not logged in. - The LED is lit when the corresponding external port is logged in or during the LED test. - The LED pattern indicates the following conditions: - Logged in: The LED is lit. - Logging in: The LED flashes at 1-second intervals. - Beacon location: The LED flashes at 1-second intervals. - Error: The LED flashes two times per second. - The corresponding external port is disabled: The LED flashes at 1-second intervals.
External port activity (TX/RX)	- The LED is off when the corresponding external port is not logged in or when the port is logged in and there is no external port activity. - The LED is lit during the LED test. - The LED flashes when external port activity performs a normal send or receive operation.
External port fault (!)	- The LED is off when external port diagnostics starts and is completed without error. - The LED is lit when external port diagnostics discovers an external port error. - The LED does not flash.

Chapter 4. Configuring the I/O module through a Telnet interface

The I/O module contains a Telnet server. This server enables a Telnet client to establish a Telnet session with the I/O module to retrieve information or to configure parameters through the command-line interface (CLI). You can perform a variety of fabric and switch-management tasks through an Ethernet connection by using the CLI.

You can access a Telnet interface in two ways:

- In the BladeCenter unit management-module Web interface
- Through a terminal emulator program on a network-management workstation

For you to access the I/O module through a Telnet interface, the IP address and subnet masks must be compatible with the network-management workstation, and the network-management workstation must be connected to an external BladeCenter unit management-module Ethernet port.

Before you can configure the Fibre Channel fabric through the I/O module, the following configuration settings must be enabled in the management module:

- External ports
- External management over all ports

To enable the configuration settings in the management-module Web interface, click **I/O Module Tasks** → **Admin/Power/Restart**.

Important: Before you configure the I/O module, make sure that the management modules in the BladeCenter unit are correctly configured. The management module and the I/O module must be on the same IP subnet. For more information, see the applicable *BladeCenter Installation and User's Guide* documents on the at <http://www.ibm.com/systems/support/>. For more detailed information about configuring the I/O module, see the applicable QuickTools switch management guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support* CD or at <http://support.qlogic.com>.

Notes:

- Throughout this document, the management-module Web-based user interface is also known as the BladeCenter management-module Web interface.
- Throughout this document, the user name is also known as the login name or user ID for logging on to interfaces or programs.
- The screens that are described or referred to in this document might differ slightly from the screens that are displayed by your system. Screen content varies according to the type of BladeCenter unit and the firmware versions and options that are installed.
- When you are using a Telnet interface to configure the I/O module, be sure to configure your I/O module with the correct date and time information. See steps 5 through 7 on page 36 for additional information about setting the date and time of the I/O module.

Connecting to the I/O module

To use a Telnet interface (in VT100 compatible terminal mode) to access and control the I/O module, you must know the IP address of the I/O module and have an existing network connection. If you have to obtain the IP address for the I/O module or establish a network connection, contact your system or network administrator. Be sure to use the correct IP address in the required commands.

Establishing a Telnet session through the management module

To establish a Telnet session through the BladeCenter unit management module, complete the following steps:

1. In your browser, in the address bar, type `xxx.xxx.xxx.xxx`
where `xxx.xxx.xxx.xxx` is the IP address of the BladeCenter unit management-module interface.

Note: The default IP address for the BladeCenter unit management module is 192.168.70.125. If a new IP address has been assigned to the management module, use the new IP address instead of the default IP address.

2. Click **GO** or press Enter.
The Enter Network Password window opens.
3. At the login prompt, type the management-module user name. At the password prompt, type the management-module password. The user name and password are case sensitive and are the same as those that are used for management-module Web access. The default management-module user name is `USERID`, and the default password is `PASSW0RD`. (Note that the sixth character in `PASSW0RD` is a zero, not the letter *O*.)
The management-module Welcome window opens.
4. In the **Inactive session timeout value** field, select the timeout value for the Web session and click **Continue** or **Start Session**.

Note: If a user is logged in under the user name that you have entered, you are given the option to start a new session. Clicking **Start Session** terminates the existing session.

The management-module main window opens.

5. In the left navigation pane, under **I/O Module Tasks**, click **Configuration**.
The I/O Module Management window opens.
6. Depending on which I/O-module bay contains the installed I/O module, click the link for either I/O-module 3 or 4, or the applicable I/O-module bay (8 or 10) in a device, such as an MSIM.
The BladeCenter Management window opens.
7. Make sure that the IP address is the same in the **Current IP Configuration** and **New Static IP Configuration** areas.
8. Click **Advanced Configuration**.
The BladeCenter Switch Management window opens.
9. To start a Telnet session, scroll down to the **Start Telnet/Web Session** area and click **Start Telnet Session**.
10. At the login prompt, type the management-module user name. At the password prompt, type the management-module password. The user name and password are case sensitive and are the same as those that are used for management-module Web access. The default management-module user

name is USERID, and the default password is PASSWORD. (Note that the sixth character in PASSWORD is a zero, not the letter O.)

The Command Line Interface Shell window opens.

To open online help to view the available commands, type `help` and press Enter.

Note: For more information about password requirements and using the CLI, see the applicable documentation that is listed in “CLI command format” on page 36.

Continue with “CLI command format” on page 36.

Establishing a Telnet session through a terminal emulator program

You can access the I/O module through IP-enabled devices that are connected to the BladeCenter unit management module. An Ethernet connection to the management-module external ports on the BladeCenter unit is required. For more information, see the following documents at <http://www.ibm.com/systems/support/> :

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

To establish a Telnet session through a terminal emulator program, complete the following steps:

1. Open a command-line window on the network-management workstation.

Note: The IP addresses in the following step are the default IP addresses of the I/O modules. If new IP addresses have been assigned to the I/O modules, use the new IP addresses instead of the default IP addresses.

2. Type one of the following commands, depending on which I/O-module bay contains the installed I/O module.

If the I/O module is installed in I/O-module bay 3:

```
telnet 192.168.70.129
```

If the I/O module is installed in I/O-module bay 4:

```
telnet 192.168.70.130
```

If the I/O module is installed in a device, such as an MSIM, in I/O-module bay 8:

```
telnet 192.168.70.134
```

If the I/O module is installed in a device, such as an MSIM, in I/O-module bay 10:

```
telnet 192.168.70.136
```

3. Press Enter.

A Telnet command-prompt window opens.

4. At the login prompt, type the management-module user name. At the password prompt, type the management-module password. The user name and password are case sensitive and are the same as those that are used for management-module Web access. The default management-module user name is USERID, and the default password is PASSWORD. (Note that the sixth character in PASSWORD is a zero, not the letter O.)

The Command Line Interface Shell window opens.

5. Type `admin start` and press Enter to obtain administrator privileges.
6. Set the date and time of the I/O module by typing date `[MMDDhhmmCCYY]` where:
 - `[MM]` is the month
 - `[DD]` is the day
 - `[hh]` is the hour in 24-hour format
 - `[mm]` is the minute
 - `[CC]` represents the century identifier
 - `[YY]` represents the last two numbers of the yearFor example, the format for 28 March 28 2008 8:46 p.m. is date `032820462008`. Press Enter.
7. Type `admin end` and press Enter to exit from the administrator operating mode and return to the standard operating mode.

Note: For more information about password requirements and using the CLI, see the applicable documentation that is listed in “CLI command format.”

CLI command format

The information in this section is an overview of the CLI command format.

For detailed information about using CLI commands, see the applicable documentation at <http://www.ibm.com/systems/support/>, on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>:

- *IBM BladeCenter Management Module Command-Line Interface Reference Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Command Line Interface Guide*

A command is followed by one or more keywords. The following rules apply when you type keywords:

- Commands and keywords are lowercase and case sensitive.
- Required keyword values are shown in standard font: `[value]`. Optional values are shown in italics *[value]*.
- The underlined portion of each keyword indicates the abbreviated form that can be used. For example, the Delete keyword can be abbreviated as Del.

The CLI command syntax is as follows:

- keyword
- keyword *[value]*
- keyword *[value]* *[value 2]*

You can change items in brackets ([]) by typing a new value. You can use the Backspace and Delete keys to erase characters behind and in front of the cursor.

Chapter 5. Configuring the I/O module through the QuickTools Web interface

The I/O module contains a Web server interface known as QuickTools. This server enables a Web-based client to establish a Web-interface session with the I/O module to retrieve information or to configure parameters through a Web browser. You can perform a variety of fabric and switch-management tasks through an Ethernet connection through a Web browser.

You can access the management-module Web interface in two ways:

- In the BladeCenter management-module Web interface
- Through a Web browser on a network-management workstation

QuickTools is a graphical interface that requires a Web browser to view and manage the switch. For information about system requirements and supported Web browsers, see the following documents at <http://www.ibm.com/systems/support/>:

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

For you to access the I/O module through the Web interface, the IP address and subnet masks must be compatible with the network-management workstation, and the network-management workstation must be connected to an external BladeCenter unit management-module Ethernet port.

Before you can configure the Fibre Channel fabric through the I/O module, the following configuration settings must be enabled in the management module:

- External ports
- External management over all ports

To enable the configuration settings in the management-module Web interface, click **I/O Module Tasks** → **Admin/Power/Restart**.

Important: Before you configure the I/O module, make sure that the management modules in the BladeCenter unit are correctly configured. The management module and the I/O module must be on the same IP subnet. For more information, see the applicable *BladeCenter Installation and User's Guide* documents on the at <http://www.ibm.com/systems/support/>. For more detailed information about configuring the I/O module, see the applicable QuickTools switch management guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support* CD or at <http://support.qlogic.com>.

Notes:

- Throughout this document, the management-module Web-based user interface is also known as the BladeCenter management-module Web interface.
- Throughout this document, the user name is also known as the login name or user ID for logging on to interfaces or programs.
- The screens that are described or referred to in this document might differ slightly from the screens that are displayed by your system. Screen content varies according to the type of BladeCenter unit and the firmware versions and options that are installed.

Connecting to the I/O module

To use the QuickTools Web interface to access and control the I/O module, you must know the IP address for the I/O module and have an existing network connection. If you have to obtain the IP address of the I/O module or establish a network connection, contact your system or network administrator.

Establishing a Web-interface session through the management module

To establish a Web-interface session through the BladeCenter management module, complete the following steps:

1. In your browser, in the address bar, type `xxx.xxx.xxx.xxx`
where `xxx.xxx.xxx.xxx` is the IP address of the BladeCenter unit management-module interface.

Note: The default IP address for the BladeCenter unit management module is 192.168.70.125. If a new IP address has been assigned to the management module, use the new IP address instead of the default IP address.

2. Click **GO** or press Enter.
The Enter Network Password window opens.
3. At the login prompt, type the management-module user name. At the password prompt, type the management-module password. The user name and password are case sensitive and are the same as those that are used for management-module Web access. The default management-module user name is `USERID`, and the default password is `PASSW0RD`. (Note that the sixth character in `PASSW0RD` is a zero, not the letter *O*.)
The management-module Welcome window opens.
4. In the **Inactive session timeout value** field, select the timeout value for the Web session and click **Continue** or **Start Session**.

Note: If a user is logged in under the user name that you have entered, you are given the option to start a new session. Clicking **Start Session** terminates the existing session.

The management-module main window opens.

5. In the left navigation pane, under **I/O Module Tasks**, click **Configuration**.
The I/O Module Management window opens.
6. Depending on which I/O-module bay contains the installed I/O module, click the link for either I/O module 3 or 4, or the applicable I/O-module bay (8 or 10) in a device, such as an MSIM.
The BladeCenter Management window opens.
7. Make sure that the IP address is the same in the **Current IP Configuration** and **New Static IP Configuration** areas.
8. Click **Advanced Configuration**.
The BladeCenter Switch Management window opens.
9. To start a Web-interface session, scroll down to the **Start Telnet/Web Session** section and click **Start Web Session**.

The QuickTools Web interface security certificate check window opens.

Note: The QuickTools Web interface supports only single-switch management per session.

10. Click **Yes** to accept the security certificate.
The QuickTools Web interface Add a New Fabric window opens.
11. At the login name prompt, type the management-module user name. At the password prompt, type the management-module password. The login name and password are case sensitive and are the same as the user name and password that are used for management-module Web access. The default management-module user name is USERID, and the default password is PASSWORD. (Note that the sixth character in PASSWORD is a zero, not the letter O.)
12. Click the **Add Fabric** button.
13. If you receive a message indicating that the I/O module failed to respond to a request for a secure connection, click **Yes** to establish a nonsecure connection.
The QuickTools Web interface topology window opens.
In the I/O-module pane, a faceplate graphic is displayed. This graphic shows the BladeCenter chassis and the I/O-module external ports. In this graphic, a green square under a blade server indicates that a Fibre Channel HBA is logged in to the I/O module.

For more information about using the QuickTools Web interface and the CLI, see the applicable documentation at <http://www.ibm.com/systems/support/>, on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com:>

- *IBM BladeCenter Management Module Command-Line Interface Reference Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter QuickTools Switch Management Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter QuickTools Switch Management Guide*

Establishing a Web-interface session through a Web browser

You can access the I/O module by IP-enabled devices that are connected to the BladeCenter management module. An Ethernet connection to the management-module external ports on the BladeCenter unit is required. For more information, see the following documents at <http://www.ibm.com/systems/support/>:

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

To establish a Web-interface session through a Web browser, complete the following steps:

1. Open a supported Web browser on the network-management workstation.

Note: The IP addresses in the following step are the default IP addresses of the I/O modules. If new IP addresses have been assigned to the I/O modules, use the new IP addresses instead of the default IP addresses.

2. Type one of the following Web addresses in the address field, depending on which I/O-module bay contains the installed I/O module.
If the I/O module is installed in I/O-module bay 3:
`http://192.168.70.129`
If the I/O module is installed in I/O-module bay 4:
`http://192.168.70.130`
If the I/O module is installed in a device, such as an MSIM, in I/O-module bay 8:
`http://192.168.70.134`
If the I/O module is installed in a device, such as an MSIM, in I/O-module bay 10:
`http://192.168.70.136`
3. Press Enter.
4. Click **Yes** to accept the security certificate.
The QuickTools Web interface Add a New Fabric window opens.
5. At the login name prompt, type the management-module user name. At the password prompt, type the management-module password. The login name and password are case sensitive and are the same as the user name and password that are used for management-module Web access. The default management-module user name is USERID, and the default password is PASSWORD. (Note that the sixth character in PASSWORD is a zero, not the letter O.)
6. Click the **Add Fabric** button.
7. If you receive a message indicating that the I/O module failed to respond to a request for a secure connection, click **Yes** to establish a nonsecure connection.
The QuickTools Web interface topology window opens.
In the I/O-module pane, a faceplate graphic is displayed. This graphic shows the BladeCenter chassis and the I/O-module external ports. In this graphic, a green square under a blade server indicates that a Fibre Channel HBA is logged in to the I/O module.

For more information about using the QuickTools Web interface and the CLI, see the applicable documentation at <http://www.ibm.com/systems/support/>, on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support* CD or at <http://support.qlogic.com>:

- *IBM BladeCenter Management Module Command-Line Interface Reference Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Command Line Interface Guide*
- *QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter QuickTools Switch Management Guide*
- *QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter QuickTools Switch Management Guide*

Chapter 6. Upgrading and expanding the functionality of the I/O module

You can upgrade and expand the functionality of the I/O module by purchasing and installing optional software features. These features require a license.

There are several types of optional software features. As of the date of this document, these features have the names that are listed in Table 7. However, the names of these features are subject to change. Except where indicated in Table 7, these features are available for both the pass-thru module and the full fabric module. For additional information about these features, see the *QLogic 8 Gb Intelligent Pass-thru Module and 20-Port 8 Gb SAN Switch Module for IBM BladeCenter Enterprise Fabric Suite 2007 User Guide* and the other applicable documents that are listed in “QLogic documentation” on page 11.

Note: The titles of certain QLogic Corporation documentation and the names of certain QLogic Corporation software products contain references to the year 2007. However, the QLogic firmware and software have been upgraded to incorporate the features and functions of the pass-thru module and the full fabric module.

Table 7. Optional features

Optional feature	Description
QLogic SAN Doctor for IBM BladeCenter	This feature provides fabric troubleshooting and repairs for one I/O module.
QLogic Enterprise Fabric Suite 2007 for IBM BladeCenter	This feature provides an optional workstation graphical interface for all the I/O modules that are connected to the workstation.
QLogic Fabric Manager Support Renewal for IBM BladeCenter	This feature entitles users to the latest version of Enterprise Fabric Suite management software.
QLogic Enterprise Fabric Suite Major Release Upgrade for IBM BladeCenter	This feature is a future upgrade for QLogic Enterprise Fabric Suite 2007 for IBM BladeCenter.

Purchasing the optional software features

To activate and use the optional software features, you must purchase the corresponding software license. For information about the availability of these features, contact your IBM reseller or authorized IBM representative.

To purchase and obtain an optional software license, go to <http://www.ibm.com/systems/bladecenter/> and click **I/O modules**, or call IBM. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378). For all other countries, go to <http://www.ibm.com/planetwide/> for support telephone numbers. After you purchase the feature, you will receive a license key and activation instructions.

Before you can expand the functionality of the I/O module and install a new software license, you must determine the product serial number of the I/O module. Use Telnet to log in to the I/O module as described in Chapter 4, “Configuring the I/O module through a Telnet interface,” on page 33, and run the **show version** command to determine the value of the **Chassis Serial Number** data field. Record the serial number for future reference. For information about the **show version** command, see the applicable command-line interface guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

Installing the optional software feature

To install an optional software feature on the switch, you must add the corresponding software license to the list of software features for the switch by using one of the following methods:

- Use a Telnet interface to log in to the I/O module as described in Chapter 4, “Configuring the I/O module through a Telnet interface,” on page 33, and run the **feature add** *[license key]* command, where *[license key]* is the license key for the new feature. For information about this command, see the applicable command-line interface guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.
To make sure that the software license has been successfully added to the switch key, run the **feature log** command. For information about this command, see the applicable command-line interface guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.
- Use the Web-based QuickTools interface to log in to the I/O module, as described in Chapter 5, “Configuring the I/O module through the QuickTools Web interface,” on page 37. Then, follow the instructions in the applicable QuickTools switch management guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

For additional information about the license key requirements, see the applicable QuickTools switch management guide on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support CD* or at <http://support.qlogic.com>.

Chapter 7. Parts listing

Replaceable components are of three types:

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

For information about the terms of the warranty, see Appendix C, “Warranty,” on page 53.

The replaceable components in Table 8 are Tier 1 CRUs.

Table 8. Replaceable components and corresponding CRU/FRU identifiers

Name of component	CRU/FRU identifier
QLogic 8 Gb Intelligent Pass-thru Module for IBM BladeCenter	• 44X1907 (Option) • 44X1913 (Tier 1 CRU, assembly) • 44X1916 (FRU)
QLogic 20-Port 8 Gb SAN Switch Module for IBM BladeCenter	• 44X1905 (Option) • 44X1911 (Tier 1 CRU, assembly) • 44X1914 (FRU)
I/O module filler, single high	31R3303 (Tier 1 CRU)
IBM 8 Gb SFP+ Short Wave Optic Transceiver	44X1964 (Tier 1 CRU)

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

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

Notes:

1. The latest versions of these documents are at <http://www.ibm.com/systems/support/>.
2. Cable requirements for the I/O module are described in the IBM *Configuration and Options Guide* at <http://www.ibm.com/servers/eserver/xseries/cog/>. See the documentation that comes with the blade server for cable-routing information.

Chapter 8. Solving problems

This chapter provides basic troubleshooting information to help you solve some problems that might occur while you are setting up the I/O module. For more detailed information about troubleshooting the I/O module, see the applicable command-line interface guide and the *QLogic Fibre Channel Switch Event Message Guide* on the *QLogic 8 Gb Intelligent Pass-thru and SAN Switch Modules for IBM BladeCenter Support* CD or at <http://support.qlogic.com>.

If you cannot locate and correct a problem by using the information in this section, see Appendix B, “Getting help and technical assistance,” on page 51.

Running POST

To ensure that it is fully operational, the I/O module processes a series of tests during power-up or a restart (power-on self-test, or POST). These tests take approximately 90 seconds to complete. The management module reads the test results and displays them for you. The green OK LED is lit at startup; then, POST proceeds and continues until all of the required tests are completed. If the I/O module fails POST, the amber I/O-module error LED and the system-error LED on the BladeCenter unit are lit. An event is stored in the event log in the system status panel of the management module. The specific failure is displayed on the system status I/O-module panel of the management module.

Note: For the locations and descriptions of the I/O-module LEDs, see Chapter 3, “Information panel LEDs and external Fibre Channel ports,” on page 27.

POST errors

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

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

Note: For the latest version of the *IBM BladeCenter Management Module Command-Line Interface Reference Guide*, go to <http://www.ibm.com/systems/support/>

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

Table 9 describes the basic critical and noncritical failures. This abbreviated list is representative; it is not an exhaustive list. An error code is associated with each failure. Error codes are displayed on the Management Module Switch Information window. Be sure to note the applicable error code and corresponding failure. You might have to provide this information when you call for service. For details, see Appendix B, “Getting help and technical assistance,” on page 51.

Table 9. Abbreviated list of error codes for I/O-module critical and noncritical failures

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

Troubleshooting checklist

To reduce problems during system installation, configuration, and operation, observe the following guidelines:

- Make sure that the BladeCenter unit supports the 8 Gb I/O modules and the types of blade servers that support the expansion cards.

Notes:

- Contact your IBM marketing representative or authorized reseller for information about the types of compatible BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
- See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported BladeCenter units, blade servers, and optional devices for the I/O modules, BladeCenter units, and blade servers.
- For details about installation, configuration, and use of compatible devices, see the documentation that comes with these devices.
- Before you install an expansion card in a blade server, make sure that you are using a blade server that supports the expansion card.

Note: If the expansion card is installed in a supported BladeCenter blade server, see the documentation that comes with the blade server for information about displaying attached Fibre Channel devices.

- Make sure that the 8 Gb I/O modules are compatible with the target expansion cards that you want to communicate with the 8 Gb I/O modules. Where applicable, the 8 Gb I/O modules in the BladeCenter unit must support the target expansion cards in the blade server.
- Make sure that the other I/O modules are compatible with the target expansion cards that you want to communicate with these I/O modules. Where applicable, certain other I/O modules in the BladeCenter unit must support the target expansion cards in the blade server.
- Make sure that the 8 Gb I/O modules and all other I/O modules are correctly installed in the supported I/O-module bays of the BladeCenter unit. For detailed instructions and additional information about installing I/O modules into the BladeCenter unit, see your BladeCenter documentation and Chapter 2, “Installing, removing, replacing, and enabling an I/O module,” on page 15.

- Make sure that all expansion cards are installed correctly in a supported blade server. For instructions and additional information, see the *Installation and User's Guide* that comes with the blade server and the documentation that comes with the expansion cards.
- Make sure that the blade server is correctly installed in the BladeCenter unit. For instructions and additional information, see the *Installation and User's Guide* that comes with the blade server and the *Installation and User's Guide* that comes with the BladeCenter unit.
- Make sure that you are using the latest versions of device drivers, utilities, firmware code, and BIOS code for the following devices. If these items are not at the latest levels, the BladeCenter unit might not recognize one or more of the following devices, and the BladeCenter unit or these devices might not be able to start.
 - The expansion cards in the BladeCenter unit and in the blade servers
 - The blade servers
 - The management module
 - The 8 Gb I/O modules and controller that are used by the expansion card in the BladeCenter unit
 - Other I/O modules that are used by other expansion cards in the blade servers

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

To download the most recent device drivers, utilities, firmware updates, BIOS code updates, and expansion-card boot code updates, go to <http://www.ibm.com/systems/support/> for the latest information about upgrading the device drivers, firmware, and BIOS code for BladeCenter components. The instructions are in the documentation that comes with the updates. Also see the *Installation and User's Guide* for your blade server for additional information.

Note: For the latest version of the *IBM BladeCenter Management Module Command-Line Interface Reference Guide*, go to <http://www.ibm.com/systems/support/>.

- Make sure that the BladeCenter unit, blade server, and all other BladeCenter components are correctly configured. Also determine whether the system board in the blade server requires a special configuration.

When you are using a Telnet interface to configure the I/O module, be sure to configure your I/O module with the correct date and time information. See steps 5 through 7 on page 36 for additional information about setting the date and time of the I/O module.

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

- Make sure that all parameters, internal devices, and external devices have been enabled, where required. These devices include the I/O module and its external ports (see "Enabling the I/O module and its external ports" on page 25).

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

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

Note: For additional information, see the documentation that comes with the peripheral devices.

Appendix A. Removing the battery

This appendix contains instructions for removing the battery from an I/O module in the BladeCenter unit.

The I/O module contains a battery that is not a field replaceable or customer replaceable component. However, when the I/O module is no longer needed, remove the battery from the I/O module and recycle or properly dispose of both the I/O module and battery according to applicable local and national ordinances or regulations.



CAUTION:

If the I/O module is defective, remove it and replace it as described in “Removing or replacing an I/O module” on page 23. Read and observe the precautions for handling batteries in Safety Statement 2 on page viii. Then, remove the battery from the defective I/O module as described in this section. The I/O module battery contains lithium and can explode if the battery and I/O module are not properly used, handled, or disposed of.

To remove the battery from the I/O module, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 18.
2. If you have not already done so, remove the I/O module from the BladeCenter unit (see “Removing or replacing an I/O module” on page 23).
3. Remove the screws at the back of the I/O module that attach the switch cover to the switch base.
4. Remove the screws that attach the upper circuit board to the switch base.
5. Locate the round battery on the underside of the upper circuit board.
6. Remove the battery from the connector by inserting your fingertip under the battery and lifting the battery out of the connector. (If necessary, use a small flat-tip screwdriver to loosen the battery.)
7. Recycle or dispose of the battery and other I/O module components as required by local ordinances or regulations. For additional information, see “Product recycling and disposal” on page 73 and “Battery return program” on page 74.

Appendix B. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Find a Business Partner** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/>. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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

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 C. Warranty

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

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

Part 1 - General Terms

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. The terms of Part 2 replace or modify those of Part 1.

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. **NOTHING IN THIS STATEMENT OF LIMITED WARRANTY AFFECTS ANY STATUTORY RIGHTS OF CONSUMERS THAT CANNOT BE WAIVED OR LIMITED BY CONTRACT.**

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

What this Warranty Covers

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

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

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

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

Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

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

What this Warranty Does not Cover

This warranty does not cover the following:

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

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

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

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

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. Contact information for IBM is provided in Part 3. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

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

You are responsible for downloading or obtaining from IBM, and installing designated Machine Code (microcode, basic input/output system code (called "BIOS"), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes, however, you may be charged for that service.

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

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

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

Exchange of a Machine or Part

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

Your Additional Responsibilities

You agree:

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

- b. backup and secure all programs, data, and funds contained in the Machine; and
 - c. inform IBM or its subcontractor or the reseller of changes in the Machine's location;
- 4. to provide IBM or its subcontractor or the reseller with sufficient and safe access to your facilities to permit IBM to fulfill its obligations;
- 5. to allow IBM or its subcontractor or the reseller to install mandatory engineering changes, such as those required for safety;
- 6. when the type of warranty service requires that you deliver a failing Machine to IBM, you agree to ship it suitably packaged, as IBM specifies, to a location IBM designates. After the Machine has been repaired or exchanged, IBM will return the repaired Machine or provide a replacement Machine to you at its expense, unless IBM specifies otherwise. IBM is responsible for loss of, or damage to, your Machine only while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges; and
- 7. to securely erase from any Machine you return to IBM for any reason all programs not provided by IBM with the Machine, and data, including without limitation the following: 1) information about identified or identifiable individuals or legal entities ("Personal Data") and 2) your confidential or proprietary information and other data. If removing or deleting Personal Data is not possible, you agree to transform such information (e.g., by making it anonymous or encrypting it) so that it no longer qualifies as Personal Data under applicable law. You also agree to remove all funds from Machines returned to IBM. IBM is not responsible for any funds, programs not provided by IBM with the Machine, or data contained in a Machine that you return to IBM. You acknowledge that, to perform its responsibilities under this Statement of Limited Warranty, IBM may ship all or part of the Machine or its software to other IBM or third party locations around the world, and you authorize IBM to do so.

Limitation of Liability

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

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

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

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

DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Governing Law

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

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

Jurisdiction

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

Part 2 - Country-unique Terms

AMERICAS

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

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

BRAZIL

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

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

CANADA

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

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

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

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and
2. the amount of any other actual direct damages, up to the greater of \$100,000.00 or the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

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

laws in the Province of Ontario.

PERU

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

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

UNITED STATES

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

laws of the State of New York

ASIA PACIFIC

AUSTRALIA

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

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

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

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

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

laws of the State or Territory

CAMBODIA AND LAOS

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

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

CAMBODIA, INDONESIA, AND LAOS

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

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

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

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

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

HONG KONG S.A.R.

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

INDIA

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

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

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

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final

and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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

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

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

JAPAN

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

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

MACAU S.A.R.

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

MALAYSIA

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

NEW ZEALAND

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

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

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

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

PEOPLE’S REPUBLIC OF CHINA (PRC)

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

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

PHILIPPINES

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

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

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

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

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

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

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

SINGAPORE

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

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

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

How to Obtain Warranty Service:

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

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

If you purchase a Machine in one of the Western European countries, as defined above, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service.

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

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

1) “the laws of Austria” in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan;** 2) “the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Libya, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna;** 3) “the laws of Finland” in **Estonia, Latvia, and Lithuania;** 4) “the laws of England” in **Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe;** and 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland.**

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

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) **in Belgium and Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo,**

Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Libya, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 6) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 8) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

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

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

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

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

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

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

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

Except as otherwise provided by mandatory law:

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

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

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

FRANCE AND BELGIUM

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

Except as otherwise provided by mandatory law:

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

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

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

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

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

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

The following paragraphs are added to this section:

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

The second paragraph does not apply.

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

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

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

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

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

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

IRELAND

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

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

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

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

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

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

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.

2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.
3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

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

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

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

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

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

SWITZERLAND

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

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

TURKEY

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

The minimum warranty period for Machines is 2 years.

UNITED KINGDOM

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

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

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

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

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

- b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

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

Items for Which IBM is Not Liable

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

1. loss of, or damage to, data;
2. special, indirect, or consequential loss;
3. loss of profits, business, revenue, goodwill, or anticipated savings; or
4. third party claims against you for damages.

Part 3 - Warranty Information

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

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

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

Types of Warranty Service

1. Customer Replaceable Unit ("CRU") Service

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

2. On-site Service

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

3. Courier or Depot Service

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

4. Customer Carry-In or Mail-In Service

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

5. CRU and On-site Service*

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

6. CRU and Courier or Depot Service*

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

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

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

8. Machine Exchange Service

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

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

Service Levels

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

1. Next Business Day (NBD), 9X5

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

2. Same Business Day (SBD), 9X5

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

3. Same Day (SD), 24X7

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

IBM Contact Information

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

Appendix D. Notices

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

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Important notes

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

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 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 can 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 that are available from IBM.

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

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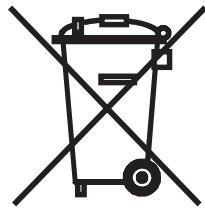
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Product recycling and disposal

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

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

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

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

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

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

L'étiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers

l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

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

Battery return program

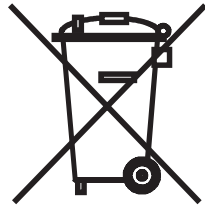
This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area.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

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

For Taiwan: Please recycle batteries.



For the European Union:



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

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

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

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

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

This notice is provided in accordance with Royal Decree 106/2008 of Spain: The retail price of batteries, accumulators, and power cells includes the cost of the environmental management of their waste.

For California:

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

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

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any

failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Korean Class A warning statement

이기는 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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