

Emulex Virtual Fabric Adapter (CFFh) for IBM
BladeCenter



Installation and User's Guide

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BladeCenter



Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 21; read the *IBM Safety Information* and the *IBM Systems Environmental Notices and User Guide*; and read the *Warranty and Support Information* document for your device on the *IBM Documentation CD*.

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Contents

Safety	v
Chapter 1. Introduction	1
Features and specifications	2
Operating-system support	3
Option package contents	3
Related documentation	3
The IBM Documentation CD	6
Hardware and software requirements	6
Using the Documentation Browser	6
Notices and statements in this document	7
Chapter 2. Installing an expansion card	9
Installation guidelines	9
Media Access Control (MAC) addresses	9
Handling static-sensitive devices	10
Installing the expansion card	10
Installing device drivers and firmware	13
Replacing an expansion card	14
Appendix A. Getting help and technical assistance	17
Before you call	17
Using the documentation	17
Getting help and information from the World Wide Web	18
Software service and support	18
Hardware service and support	18
IBM Taiwan product service	19
Appendix B. Notices	21
Trademarks	22
Important notes	22
Electronic emission notices	23
Federal Communications Commission (FCC) statement	23
Industry Canada Class A emission compliance statement	24
Avis de conformité à la réglementation d'Industrie Canada	24
Australia and New Zealand Class A statement	24
United Kingdom telecommunications safety requirement	24
European Union EMC Directive conformance statement	24
Taiwanese Class A warning statement	25
Chinese Class A warning statement	25
Japanese Voluntary Control Council for Interference (VCCI) statement	25
Korean Class A warning statement	26

Index 27

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.

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

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.

This device is intended for use with UL Listed IBM BladeCenters.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 21:



CAUTION:

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

Chapter 1. Introduction

This *Installation and User's Guide* contains instructions for installing an Emulex Virtual Fabric Adapter (CFFh) for IBM BladeCenter in an IBM® BladeCenter blade server.

Note: The Emulex Virtual Fabric Adapter (CFFh) for IBM BladeCenter is referred to throughout this document as the expansion card.

The expansion card provides two 10 Gbps (gigabit per second), full duplex Ethernet links between a blade server and Ethernet switch modules in the BladeCenter I/O-module bays. The first port physically links to the switch module in I/O-module bay 7 and the second port physically links to the switch module in I/O-module bay 9. The expansion card interfaces to the blade server through the PCI Express bus.

The expansion card provides networking interface with options that support iSCSI functionality with storage networking functionality as well as Fibre Channel over Ethernet (FCoE) functionality for convergence of Fibre Channel (FC) traffic onto 10 Gb enhanced Ethernet (EE) fabric.

The expansion card has two modes of operation: standard physical NIC mode (pNIC) or virtual NIC (vNIC) mode. The default operating mode is vNIC mode.

The pNIC or vNIC operating mode can be selected using the UEFI (Unified Extensible Firmware Interface) adapter configuration function of the blade server. When the blade server restarts, the UEFI System Settings screen provides an Emulex NIC Configuration Utility option.

In vNIC mode, each physical port appears to the blade server as four virtual NICs. The default bandwidth for each vNIC is 2.5 Gbps. To support vNIC mode operation, the expansion card must communicate with a Blade Network Technologies (BNT) 10-port 10 Gb Ethernet Switch Module (GbESM-24-10G), that provides independent control for each vNIC. The vNICs can be configured into groups, have their bandwidth adjusted in 100 Mbps increments, and have virtualization enabled or disabled.

In pNIC mode, the expansion card can operate as a standard 10 Gbps two port Ethernet expansion card. When in pNIC mode, the expansion card functions with any available 10 Gb switch or 10 Gb pass-thru module installed in I/O module bays 7 and 9.

See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of I/O modules that are compatible with the expansion card.

Notes:

1. The Emulex Virtual Fabric Adapter (CFFh) is available from IBM in two versions; 10GbE adapter with separate storage protocol upgrades or a feature enable (iSCSI/FCoE) adapter.
2. A feature upgrade key (IBM part number 49Y4265) is required to enable either the iSCSI or FCoE feature on the adapter. See <http://www.emulex.com/ibm/licensing> for detailed information on product feature activation.

This document provides the following information about the expansion card:

- Installation procedure
- Procedures for determining and updating the firmware and device drivers
- Troubleshooting information

The expansion card comes with a one-year limited warranty. For information about your warranty, see the *Warranty and Support Information* document for your device on the IBM *Documentation* CD. You can obtain up-to-date information about the expansion card and other IBM BladeCenter products at <http://www.ibm.com/systems/bladecenter/>.

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/>.

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

For service or assistance, see Appendix A, "Getting help and technical assistance," on page 17.

Features and specifications

The expansion card has the following features:

- Full-duplex (FDX) capability
- Bus-mastering support
- Direct memory access (DMA) support
- NIC failover support
- Serial Over LAN (SOL) support

- IBM BladeCenter Open Fabric Manager (BOFM) support for pNIC mode
- Preboot Execution Environment (PXE) support
- Compliance with U.S. and international safety and emissions standards

The expansion card has the following specifications.

Table 1. Expansion-card specifications

Type	Specification
Host data transfer	PCI Express Generation 2
Form-factor	BladeCenter CFFh
Modes	2-port pNIC and 8-port vNIC
NVRAM	Programmable flash modules
Dimensions	Approximately 15.9 cm x 12.5 cm (6.26 in. x 4.92 in.)
Operating power	Approximately 10 watts
Communication module	<ul style="list-style-type: none">• TCP offload engine (TOE)• Full fast-path TCP offload• TCP/IP checksum offload• TCP/IP segmentation offload

Operating-system support

The following operating systems support the expansion card:

- Microsoft Windows Server 2003 (x86 and x64)
- Microsoft Windows Server 2008 (x86 and x64)
- Microsoft Windows Server 2008 Release 2 (x64 only)
- Red Hat Linux Advanced Server
- SUSE Linux Enterprise Server (SLES)
- VMware

Option package contents

The expansion-card option package contains the following items:

- An Emulex Virtual Fabric Adapter (CFFh) for IBM BladeCenter
- IBM *Documentation* CD

Related documentation

The following documentation is provided on the IBM *Documentation* CD:

- This *Installation and User's Guide*
- *Safety Information*

This PDF document contains translated versions of the caution and danger statements that appear in the documentation for the expansion card. Each caution and danger statement has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

In addition to this *Installation and User's Guide*, the following related documentation is available from <http://www.ibm.com/systems/support/>:

- IBM BladeCenter blade server *Installation and User's Guide*
This document provides information about your blade server and BladeCenter unit.
- *Problem Determination and Service Guide*
This PDF document contains information to help you solve problems yourself, and it contains information for service technicians.
- IBM BladeCenter *Interoperability Guide*
This document provides instructions to install the blade server in the interconnect module. For the latest version of this document, go to <http://www.ibm.com/systems/support/> and search for "BladeCenter Interoperability Guide."

To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, click **BladeCenter**.
3. Under **Popular links**, click **Publications lookup**.

For information about teaming and failover options for the expansion card blade server connections, see the Emulex Ethernet Software CD. See "Installing device drivers and firmware" on page 13 for instructions for locating the CD on the IBM Web site.

For information about configuring vNIC mode for the expansion card using the Blade Network Technologies (BNT) 10-port 10 Gb Ethernet Switch Module (GbESM-24-10G), refer to the documentation and manuals provided on the IBM Web site for the I/O module. This information is found under Product Support, BladeCenter H Chassis, and Networking areas of the IBM Web site.

The IBM Documentation CD

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

Hardware and software requirements

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

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

Using the Documentation Browser

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

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

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

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

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

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

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

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

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

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM *Support* CD. 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.

Chapter 2. Installing an expansion card

This chapter provides instructions for installing an expansion card in your blade server or expansion unit. The following documents provide related information:

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

Installation guidelines

Before you install the expansion card, read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 10. This information will help you work safely.

Make sure that you are using the latest versions of device drivers and firmware for your blade server, management module, and I/O modules that are used by the expansion card. Go to <http://www.ibm.com/systems/support/> for the latest information about upgrading the device drivers and firmware for BladeCenter components. See the latest instructions in the documentation that comes with the updates.

Before you install an expansion card into a blade server or expansion unit, consider the following information.

Table 2. I/O-module bay expansion-card ports

I/O-module bay	2-port pNIC mode	8-port vNIC mode
7	Port 1, MAC 1	Port 1, MAC 1, 2, 3, 4
8	Not applicable	Not applicable
9	Port 2, MAC 5	Port 2, MAC 5, 6, 7, 8
10	Not applicable	Not applicable

Media Access Control (MAC) addresses

Media Access Control (MAC) addresses have been assigned and installed on the expansion card. Each port has a MAC address. In vNIC mode, eight MAC addresses are sequentially assigned from the base MAC address, MAC 1.

Only MAC 1 and MAC 5 show in pNIC mode. These two base MAC addresses are part of the expansion card vital product data (VPD). Initially, the BladeCenter Open Fabric Manager (BOFM) application can update the two base MAC addresses. Full eight-vNIC MAC address update support requires advanced BOFM features that are provided by the IBM Director application.

Handling static-sensitive devices

Attention: Static electricity can damage the expansion card 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 damage from electrostatic discharge, observe the following precautions:

- When you work on a BladeCenter unit that has an electrostatic discharge (ESD) connector, use a wrist strap when you handle modules, optional devices, or blade servers. To work correctly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the BladeCenter unit).
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to any *unpainted* metal surface of the BladeCenter unit or any *unpainted* metal surface on any other grounded component in the rack you are installing the device in for at least 2 seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into the blade server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not put the device on the blade server cover or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Installing the expansion card

Figure 1 on page 12 shows installation of the expansion card in a typical blade server system board; the procedure for installing the card in an expansion unit is similar. The appearance of your blade server or expansion unit might be different. See the documentation that came with your blade server or expansion unit for more information.

To install the expansion card, complete the following steps:

1. Read the safety information that begins on page v and the guidelines in “Handling static-sensitive devices” on page 10.
2. If the blade server is installed in the BladeCenter unit, remove it (see the documentation that came with your BladeCenter unit for instructions).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover or expansion-unit cover (see the documentation that came with your BladeCenter unit for instructions).
5. Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter® unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.
6. Check the blade expansion connector on both the expansion card and the blade server for gray protective covers, and if present, remove them.
7. Hold the expansion card at an approximate 30° angle and slide the card into mounting post until the card-guide holes are aligned with the locator pins on the mounting posts. When the holes are properly aligned over the pins, the card will pivot down slightly.
8. Press down firmly on the “Press to Install” label on the expansion card until the connector on the expansion card is fully seated into the connector on the blade server.

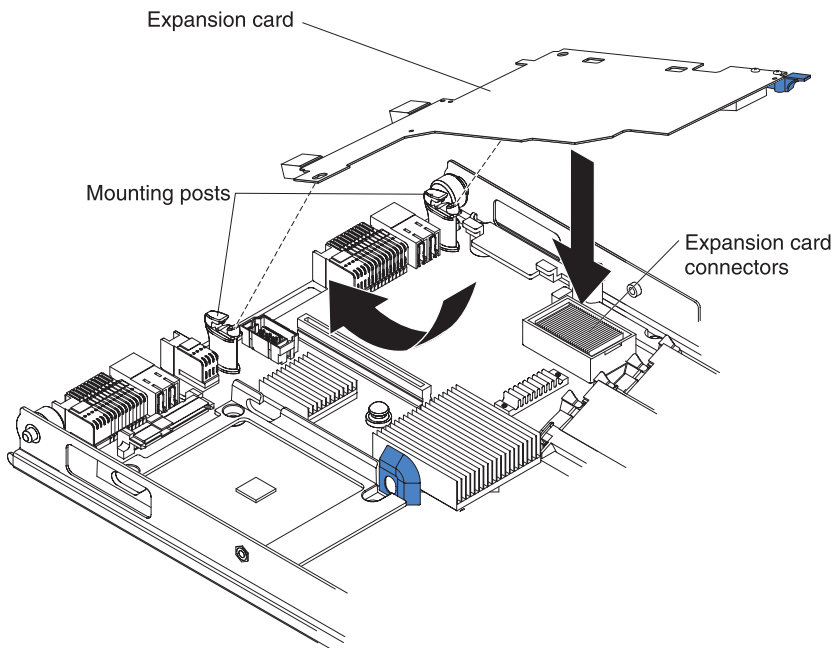


Figure 1. Installing the expansion card into a blade server

9. Replace the blade server cover or expansion-unit cover. See the documentation that came with your BladeCenter unit for instructions.
10. Install the blade server into the BladeCenter unit or expansion unit and turn on the blade server.
11. Install the expansion-card device driver. See “Installing device drivers and firmware” on page 13 for more information.
12. Verify that the latest-level firmware is installed. See “Installing device drivers and firmware” on page 13 for more information

Installing device drivers and firmware

The expansion card comes with the latest level of firmware that was available at the time of manufacture. After you install the expansion card, you must install the device drivers for the chosen operating system and verify that the latest firmware is installed. Note that periodic firmware updates are made available. See “Operating-system support” on page 3 for a list of supported operating systems.

Notes:

1. Before you install the device drivers and firmware, make sure that the following firmware for other BladeCenter devices is at the latest level:
 - Advanced management module
 - Blade server baseboard management controller (BMC) or integrated management module (IMM)
 - Blade server BIOS or UEFI
2. For Linux operating systems, use a command such as **ethtool -i devicename** to display the firmware levels.
3. XML and TML will be provided for updates via UXSP.
4. Updates for the communications module are included in the expansion card update.
5. The update requires a system restart. The update process might take up to eight minutes to complete.

To find the latest device drivers and firmware, complete the following steps:

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, select **BladeCenter**.
3. From the **Product family** list, select your blade server, and click **Go**.
4. From the **Refine results** list, select **Networking**, and click **Go** to display the Emulex Virtual Fabric Adapter choices.
5. Install the device drivers and firmware, using the instructions that are provided.

Installing the Virtual Fabric Adapter (VFA) driver in Windows provides two programs:

- OC NIC Teaming Manager
- EMULEX SMCLP Client2

See the Emulex Web site (<http://www.emulex.com/downloads/ibm/oneconnect-software-kits.html>) for information about using these programs.

Currently, the only recommended use of the SMCLP Client is for verifying the installed VFA firmware version. To verify the firmware version, complete the following steps:

1. Start the SMCLP Client2.
2. Type `cd /bladeengine0`, then press enter.
3. Type `show -d properties`, then press enter.

The VFA is configured using the BNT Virtual Fabric 10Gb Switch (VFS) Module. See the IBM Web site (<http://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lnocid=MIGR-5080814&brandind=5000020>) for information about using VFS to configure VFA.

To remove expansion card software from Microsoft Windows environments, use the Add/Remove Programs function of the operating system. This removes all communication module components and automatically restarts the system.

Replacing an expansion card

If you have to replace the expansion card, use the procedure in this section to install the replacement expansion card.

The expansion card is a Tier 1 customer replaceable unit (CRU). Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.

The CRU part number of the Emulex Virtual Fabric Adapter expansion card is 49Y4239.

For more information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document for your device on the IBM *Documentation CD*.

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

To remove the expansion card, complete the following steps:

1. Read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 10.
2. If the blade server is installed in the BladeCenter unit, remove it (see the documentation that came with your BladeCenter unit for instructions).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover or expansion-unit cover (see the documentation that came with your BladeCenter unit for instructions).
5. Locate the expansion card.

6. Rotate the handle on the expansion card labeled “RELEASE ONLY” to the vertical position while you gently pull upward on the edge of the expansion card near the “Press to Install” label.
7. Pivot the expansion card out of the connector and remove the card.

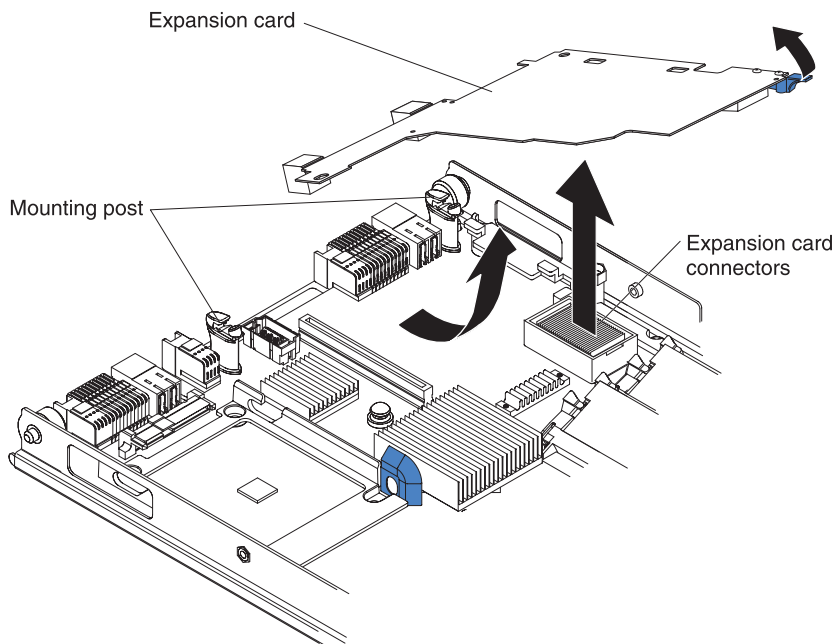


Figure 2. Removing the expansion card

8. Install the replacement expansion card. See “Installing the expansion card” on page 10 for the installation procedure.

Appendix A. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical

information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/systems/support/> and follow the instructions. Also, some documents are available through the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

You can receive hardware service through 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).

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IBM Taiwan product service

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

IBM Taiwan product service contact information:

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

Appendix B. Notices

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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.

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When attaching a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices supplied with the monitor.

Federal Communications Commission (FCC) statement

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

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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.

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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

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Index

A

assistance, getting 17

C

Class A electronic emission notice 23
client reference program 2
CRU part numbers 14

D

device drivers, installing 13
device drivers, removing 14
documentation 2, 3, 9
Documentation Browser 6
Documentation CD 3, 6

E

electronic emission Class A notice 23

F

FCC Class A notice 23
features and specifications 2, 3
firmware, installing 13
firmware, removing 14

G

getting help 17

H

hardware service and support 18
help, getting 17

I

I/O-module bays 9
IBM Support Line 18
installation guidelines 9
installation instructions 10
inventory checklist 3

M

MAC addresses 9
Media Access Control addresses 9

N

notes, important 22
notices 21
 electronic emission 23
 FCC, Class A 23
notices and statements 7

O

operating-system support 3
overview, expansion card 1

P

part numbers 14
ports, expansion card module 9

R

removal instructions 14

S

Safety Information document 4
software service and support 18
specifications and features 2, 3
statements and notices 7
static-sensitive devices, avoiding damage to 10
support, web site 17

T

telephone numbers 18
trademarks 22

U

United States electronic emission Class A
notice 23
United States FCC Class A notice 23

W

warranty 2
web site
 publication ordering 18
 support 17
 support line, telephone numbers 18



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