IBM FAStT FC-2 Host Bus Adapter

Installation and User's Guide

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Note: Before using this information and the product it supports, be sure to read the general information under Appendix B, “Warranty information” on page 27 and Appendix C, “Notices” on page 37.

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Safety

Before installing this product, read the Safety Information.

مج، يجب قراءة دات السلامة

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

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Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

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

To avoid a shock hazard:

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

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

Statement 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 statement

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

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About this book

This book provides instructions for installing and customizing the configuration of your IBM® FAStT FC-2 Host Bus Adapter and connected devices. It also provides information on troubleshooting your IBM FAStT FC-2 Host Bus Adapter.

How this book is organized

Chapter 1, “Preparing and installing the IBM FAStT FC-2 Host Bus Adapter” on page 1 describes the IBM FAStT FC-2 Host Bus Adapter. This chapter includes an overview of the IBM FAStT FC-2 Host Bus Adapter features and contains the information and instructions needed to prepare and install the IBM FAStT FC-2 Host Bus Adapter.

Chapter 2, “Troubleshooting” on page 7 covers the types of installation problems that can cause the IBM FAStT FC-2 Host Bus Adapter to function incorrectly.

Chapter 3, “Installing the FAStT FC-2 Adapter device drivers and updating the BIOS code” on page 9 provides information for updating the IBM FAStT FC-2 Host Bus Adapter BIOS code.

Chapter 4, “Using IBM Fast!UTIL” on page 15 provides detailed configuration information for users who want to customize the configuration of the IBM FAStT FC-2 Host Bus Adapter and connected Fibre Channel devices.

Chapter 5, “Adapter operating environment and specifications” on page 21 contains the IBM FAStT FC-2 Host Bus Adapter operating environment and specification information.

Appendix A, “Getting help, service, and information” on page 23 describes how to obtain help, service, and information about IBM products.

Appendix B, “Warranty information” on page 27 provides warranty statements for the IBM FAStT FC-2 Host Bus Adapter.

Appendix C, “Notices” on page 37 provides product notices.

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Notices used in this book

This book contains certain notices to highlight information.

The notices and their definitions are:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices or data. An attention notice is placed just before the instruction or situation in which damage could occur.

Chapter 1. Preparing and installing the IBM FAStT FC-2 Host Bus Adapter

This chapter contains instructions for preparing and installing the IBM FAStT FC-2 Host Bus Adapter and describes the adapter components.

Overview

The IBM FAStT FC-2 Host Bus Adapter is a 2 Gb high-performance, direct memory access (DMA), bus master, Fibre Channel host adapter designed for high-end systems. The function and performance are derived from the ISP2310 chip (see Figure 2 on page 4), making this IBM FAStT FC-2 Host Bus Adapter a leading-edge host adapter.

The ISP2310 chip combines a powerful, reduced instruction set computer (RISC) processor, a Fibre Channel protocol manager (FPM) with one 2 Gb Fibre Channel transceiver, and a peripheral component interconnect (PCI) or peripheral component interconnect-extended (PCI-X) local bus interface in a single-chip solution. The IBM FAStT FC-2 Host Bus Adapter supports all Fibre Channel (FC) peripheral devices that support private-loop direct attach (PLDA) and fabric-loop attach (FLA).

The IBM FAStT FC-2 Host Bus Adapter connects the following:

- Mainframe computers
- Super computers
- Workstations
- Storage devices
- Servers

The IBM FAStT FC-2 Host Bus Adapter is referred to throughout this book as the FAStT FC-2 Adapter.

Fibre Channel defined

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

Using a Fibre Channel Arbitrated loop (FC-AL), 126 Fibre Channel devices can be supported, compared to 15 SCSI devices with Ultra SCSI.

The FAStT FC-2 Adapter uses a multimode shortwave optical interface for distances up to 500 meters.

The FAStT FC-2 Host Adapter is a 2Gb Fibre Channel device that supports data transfer rates up to 200 MB per second half-duplex and 400 MB per second full-duplex on optical interfaces.

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FAStT FC-2 Adapter features

The FAStT FC-2 Adapter has the following features:

- Compliance with Intel® PCI Local Bus version 2.2 specification
- Compliance with peripheral component interconnect-extended (PCI-X) addendum, revision 1.0 to the Intel PCI Local Bus version 2.2 specification
- Compliance with Third Generation Fibre Channel Physical and Signaling Interface (PC-PH-3), revision 9.2
- Compliance with Fibre Channel Arbitrated Loop (FC-AL-2) standard
- Compliance with U.S. and international safety and emissions standards
- Support for direct memory access (DMA)
- Support for bus master
- Fast!UTIL basic input/output system (BIOS) utility program to customize the configuration parameters on the FAStT FC-2 Adapter and attached drives
- Support for Fibre Channel protocol SCSI (FCP-SCSI) and Fibre Channel Internet protocol (FCP-IP)
- Support for point-to-point fabric connection (F-PORT FABRIC LOGIN)
- Support for Fibre Channel service (Classes 2 and 3)

Preinstallation procedures

Before you begin the FAStT FC-2 Adapter installation, do the following:

- Read “Handling static-sensitive devices” on page 3.
- Read “What you need for the installation” on page 3.
- Write down the serial number of the FAStT FC-2 Adapter. Each adapter has a unique serial number. If the nonvolatile random access memory (NVRAM) is damaged, the system will prompt you for the FAStT FC-2 Adapter serial number. Figure 1 shows the serial number label location.

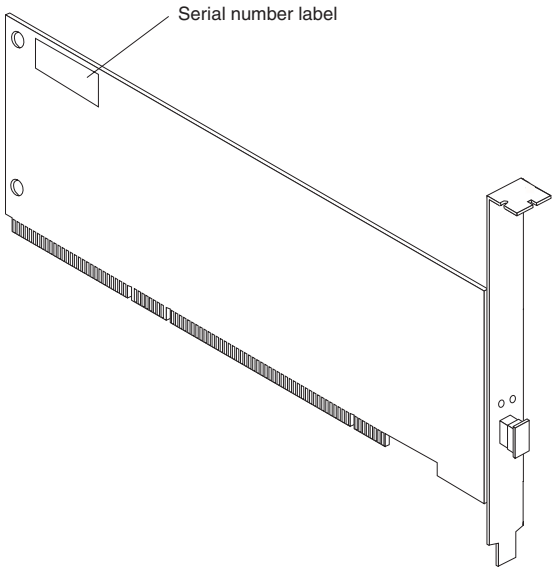

Figure 1. FAStT FC-2 Adapter serial number label

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective package 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 possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit 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 your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

What you need for the installation

To install the FAStT FC-2 Adapter in your server, you need the following two items:

- A small Phillips screwdriver
- An LC-LC Fibre Channel Cable[1]

1. This option does not come with the IBM FAStT FC-2 Host Bus Adapter and must be ordered separately.

FAStT FC-2 Adapter components

Figure 2 identifies the FAStT FC-2 Adapter (QLA2310) components that are referred to in this chapter.

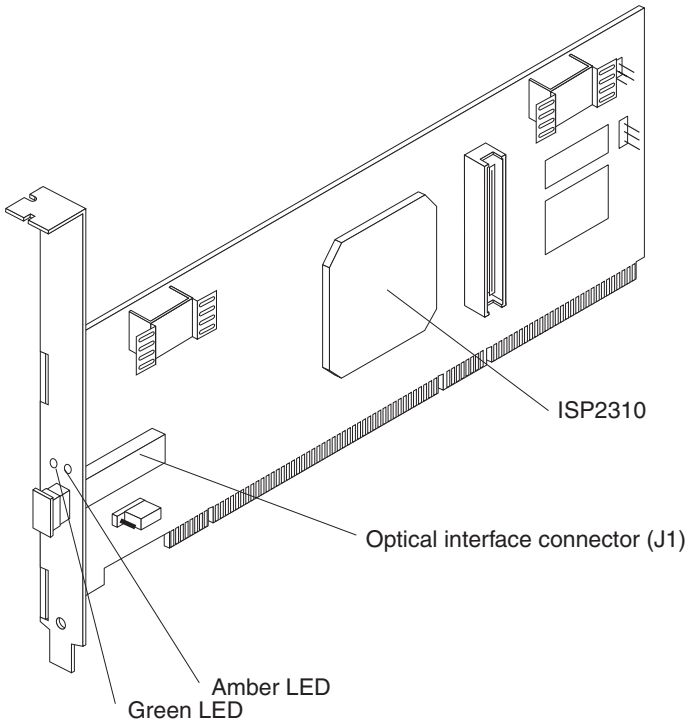

Figure 2. FAStT FC-2 Adapter components

Table 1 describes the green and amber light emitting diodes (LEDs) and the activity of the FAStT FC-2 Adapter.

Table 1. IBM FAStT FC-2 Adapter activity

Green LED	Amber LED	Activity
On	On	Power
On	Off	Online
Off	On	Signal required
Off	Flashing	Loss of synchronization
Flashing	Flashing	Firmware error

Installing the FAStT FC-2 Adapter

Attention: To avoid damage to your fiber-optic cables, follow these guidelines:

- Do not route the cable along a folding cable-management arm.
- When attaching fiber-optic cables to a Fibre Channel device on slide rails, leave enough slack in the cables so that they do not bend to a radius smaller than 38 mm (1.5 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can snag on other Fibre Channel devices in the rack.
- Do not overtighten the cable straps or bend the cables to a radius smaller than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point and be sure that the cable is well supported.

The FAStT FC-2 Adapter comes with an attached standard 3U adapter bracket as shown in Figure 2 on page 4. An additional Low Profile 2U bracket also comes with the adapter. Before you install the FAStT FC-2 Adapter, verify whether you need the Fibre Channel Low Profile 2U adapter bracket. If you need to install the Low Profile 2U bracket, go to step 1. Otherwise go to step 2.

1. To install the Fibre Channel Low Profile 2U adapter bracket, do the following:
   a. Remove your FAStT FC-2 Adapter from the static-protective package. Set the adapter down on a nonconductive, static-protected surface (place it component side up). Do not place the adapter on your system unit cover or on a metal table.
   b. Use your small Phillips screwdriver to carefully remove the two bracket screws from your 3U adapter (you will reuse the two adapter screws). Take off the 3U bracket and set it aside.
   c. Align the two screw holes in the 2U adapter bracket with the two screws holes on the adapter. Using the two screws you removed in step 1a, secure the bracket to the adapter.
   d. Return the adapter to the static-protective package until you are ready for installation.
2. Check the system board and make any configuration changes needed to accommodate the FAStT FC-2 Adapter.

   Note: The FAStT FC-2 Adapter is self-configuring; however, some system boards require manual configuration. For example, some systems have a PCI Device Configuration menu in the system board setup BIOS code where you must enable host adapters, bus-master slots, and interrupt request (IRQ) levels. If the system board supports triggering, use level triggering for the FAStT FC-2 Adapter. For system specific configuration, refer to the documentation that comes with your server, or contact your IBM technical support representative to determine if your system board requires configuration.
3. Turn off the peripheral devices, then the server.
4. Disconnect the power cords.
5. Remove the server cover.
6. Remove the expansion slot cover. Refer to the documentation that comes with the server to determine the expansion slot cover type and detailed instructions. Choose any PCI bus-master slot that supports bus mastering. Most system boards automatically assign an IRQ level and interrupt line. If your system

board does not automatically assign an IRQ level and interrupt line, you must assign an IRQ level and use interrupt line A for this PCI bus-master slot.

- Some system boards have two kinds of PCI bus slots: master and subordinate. The FAStT FC-2 Adapter must be in a PCI bus-master slot. (Some system boards have PCI bus-master slots that are shared with on-board devices. The FAStT FC-2 Adapter does not work in shared PCI bus-master slots.)
- PCI connectors vary among system board manufacturers. The FAStT FC-2 Adapter is a 64-bit PCI device that can function in a 32-bit PCI bus-master slot.

  Attention: If you try to install the FAStT FC-2 Adapter into a PCI bus-master slot that does not conform to the PCI specification, you might damage the FAStT FC-2 Adapter.
- The FAStT FC-2 Adapter is designed and tested to operate at PCI bus speeds of up to 66 MHz.
- The FAStT FC-2 Adapter is designed and tested to operate at PCI-X bus speeds up to 100 MHz.
- PCI and PCI-X slots look the same. If the server contains both PCI and PCI-X bus-master slots, refer to the documentation that comes with the server to determine the slot type.

7. Align the adapter with the expansion slot. Carefully press the adapter into the PCI bus-master slot until it is fully seated and secure.
8. Connect one end of an LC-LC Fibre Channel cable to the optical interface connector (located at J1) on the FAStT FC-2 Adapter. Connect the other end to a Fibre Channel device. (See Figure 2 on page 4 for the location of the J1 connector.)
9. Carefully install and secure the server cover.
10. Connect the power cables.
11. Turn on all external Fibre Channel devices; then, turn on the server. The following information is displayed:

```
QLogic Corporation
QLA2300 PCI Fibre Channel ROM BIOS Version X.XX
Copyright (C) QLogic Corporation 1993-2001 All Rights Reserved.
www.qlogic.com

Press <Ctrl+Q> for Fast!UTIL

BIOS for Adapter 0 is disabled
ROM BIOS not installed
```

To display the Fibre Channel devices, press Ctrl+Q, and then use the Fast!UTIL program. See Chapter 4, “Using IBM Fast!UTIL” on page 15 for detailed utility information.

If the information displayed is not correct and you have checked the adapter configuration, go to Chapter 2, “Troubleshooting” on page 7 for problem solving information.

If the information displayed is correct, go to Chapter 3, “Installing the FAStT FC-2 Adapter device drivers and updating the BIOS code” on page 9 for detailed instructions on how to update the FAStT FC-2 Adapter BIOS code.

Chapter 2. Troubleshooting

There are three types of installation problems that might cause your FAStT FC-2 Adapter to function incorrectly:

- Hardware problems
- System configuration problems
- Fibre Channel problems

If you are having problems, use the following information to help you determine the cause of the problem and the action to take.

Hardware problems

Take the following actions to determine if your installation problem is caused by the hardware:

- Verify that all adapters are installed securely.
- Verify that all cables are attached securely to the correct connectors. Be sure that one end of the LC-LC Fibre Channel cable is attached to the optical interface connector (located at J1 on the adapter) and that the other end is connected to the Fibre Channel device.
- Verify that the FAStT FC-2 Adapter is installed correctly and is fully seated in the expansion slot. Check for interference due to nonstandard PCI connectors.
- Verify that the Fast!UTIL data-rate setting is correct. Refer to “Extended Firmware Settings” on page 18. The Fast!UTIL data-rate setting must match the speed of the device to which you are connected.
- Verify that all peripheral devices are turned on. See “Scan Fibre Channel devices” on page 20 for information about displaying attached Fibre Channel devices.

System configuration problems

To verify that your installation problem is caused by the system configuration, check your server to ensure that it is configured properly (see “Installing the FAStT FC-2 Adapter” on page 5).

Note: All PCI-compliant and PCI-X-compliant systems automatically detect 32-bit or 64-bit adapters and set the appropriate bus speed (for example, 33 MHz or 66 MHz).

If you still have a system configuration problem, refer to the documentation that comes with your server, or contact your IBM technical-support representative to determine if your system board requires special configuration.

Fibre Channel problems

To determine if your installation problem is caused by an attached Fibre Channel device, do the following:

- Verify that all of the Fibre Channel devices were turned on before you turned on the server.
- Ensure that all cables are connected properly.
- Verify that you configured your RAID storage subsystems using the utilities provided by the manufacturer.

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- If your Fibre Channel switch supports zoning, make sure that your peripheral device is configured to the same switch zone as the FAStT FC-2 Adapter. For more information, refer to your Fibre Channel switch documentation.

Chapter 3. Installing the FAStT FC-2 Adapter device drivers and updating the BIOS code

After you install your FAStT FC-2 Adapter, you are ready to install the device drivers for the adapter and update the adapter BIOS code.

After you install the adapter device drivers, you must update the FAStT FC-2 Adapter BIOS code using the BIOS Update Utility that is provided on the Support CD. To update the adapter BIOS code, you can use the BIOS Update Utility from the bootable Support CD or you can create and use a BIOS Update Utility diskette.

Installing the FAStT FC-2 Adapter device drivers

To install the IBM FAStT FC-2 Host Bus Adapter device drivers, refer to the *IBM FAStT FC-2 Host Bus Adapter Support* CD that comes with the adapter for the following:

- Adapter device drivers
- Installation instructions (see README)

For the latest device drivers and installation instructions, go to the http://www.ibm.com/pc/support IBM Web site.

The device drivers for the following supported operating systems are provided with your FAStT FC-2 Adapter:

- Microsoft® Windows® 2000
- Windows NT® Version 4.0
- Novell NetWare Version 5.1
- Linux®

Note: Always check for the latest versions of the device drivers, utilities, and documentation on the http://www.ibm.com/pc/support/ IBM Web site.

Continue with “Updating the FAStT FC-2 Adapter BIOS code from the Support CD”.

Updating the FAStT FC-2 Adapter BIOS code from the Support CD

To update the FAStT FC-2 Adapter BIOS code and non-volatile random access memory (NOVRAM) using the BIOS Update Utility on the Support CD, use one of following two methods:

- The flasutil command prompt
- The flasutil BIOS Update Utility menu

Using the flasutil command prompt (from the Support CD)

To update your FAStT FC-2 Adapter BIOS code and NOVRAM, do the following:

1. Insert the *IBM FAStT FC-2 Host Bus Adapter Support* CD into the CD-ROM drive. Restart the server. Your server will start to a DOS prompt.
2. From the DOS prompt, type:

   ```
   flasutil /f /l
   ```
3. Press Enter.
4. Type:

   ```
   flasutil /u
   ```

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5. Press Enter.
6. Type:

```
flasutil /?
```

The following command-line options display:

```
/L xxxx = Write NOVRAM, adapter address = xxxx
    If no address specified then write NOVRAM to all adapters
/F xxxx = Write Flash, adapter address = xxxx
    If no address specified then write Flash to all adapters
/D xxxx = Copy NOVRAM to file: QL1xNVRM.SAV, adapter address = xxxx
/U xxxx = Update BIOS NOVRAM defaults, adapter address = xxxx
    If no address specified then write then update all adapters
/W xxxx = Copy Flash to file: QL1xROM.SAV, adapter address = xxxx
/N <filename.ext> = Use <filename.ext> instead of NVRMxx0.DAT
/O <filename.ext> = Use <filename.ext> instead of QLxxROM.BIN
/I = Ignore Subsystem ID
/P = Program all adapters
/M = Don't prompt for I/O address
/Q = Quiet Mode, no messages will be displayed
/S xxxx = Display serial number of adapter at address xxxx
    If no address specified then display the serial number of all adapters
/V xxxx = Display current version number of BIOS on adapters at address xxxx
    If no address specified then display the BIOS version of all adapters
/C xxxx = Verify Flash of adapter at address xxxx
    If no address specified verify the Flash of all adapters
/T = Multiport Fibre Channel adapter
/X xxxx = Verify NOVRAM of adapter at address xxxx
```

Command-line option examples

The following are additional command-line options that you can use.

To write NOVRAM on all FAStT Host Adapters in a system without being prompted for I/O address, type:

```
flasutil /L
```

To write NOVRAM and flash to all adapters, type:

```
flasutil /L /F
```

To make the new settings the defaults, type:

```
flasutil /U
```

To write NOVRAM to the adapter at I/O address f400, type:

```
flasutil /L f400
```

To write NOVRAM and flash an adapter at I/O address f800, type:

```
flasutil /L f800 /F f800
```

Using the flasutil BIOS Update Utility menu (from the Support CD)

To update the FAStT FC-2 Adapter BIOS code using the flasutil BIOS Update Utility menu, do the following:

1. Insert the *IBM FAStT FC-2 Host Bus Adapter Support* CD into the CD-ROM drive. Restart the server. Your server will start to a DOS prompt.
2. From the DOS prompt, type:

   ```
   flasutil
   ```

3. Press Enter.

   If you have more than one adapter, a list of adapters and their I/O addresses displays. If you have only one adapter, the following list of options displays.

   ```
   L = Write NOVRAM
   F = Write Flash
   A = Write NOVRAM and defaults
   D = Copy NOVRAM to file:QLxxNVRM.SAV
   W = Copy Flash to file: QLxxROM.SAV
   U = Update BIOS NOVRAM defaults
   S = Display serial number
   V = Display current BIOS version
   C = Verify Flash
   X = Verify NOVRAM
   ```

4. At the command prompt, type the appropriate I/O address and press Enter.

Note: You can run the utility from the command line with the options as /*y*, where *y* is the option required.

Updating the FAStT FC-2 Adapter BIOS code from the BIOS Update Utility diskette

If you can not use the bootable Support CD to update the adapter BIOS code, you can create a diskette using the Support CD. Instructions for creating and using the diskette are described in the following sections.

Creating the BIOS Update Utility diskette

Create the BIOS Update Utility diskette by copying the image you need from the *IBM FAStT FC-2 Host Bus Adapter Support* CD or from the http://www.ibm.com/pc/support/ IBM Web site.

For Microsoft Windows 95, Windows 98, Windows NT 4.0, or Windows 2000

To create a BIOS Update Utility diskette for Microsoft Windows 95, Windows 98, Windows NT 4.0, or Windows 2000 from the *IBM FAStT FC-2 Host Bus Adapter Support* CD, do the following:

1. Insert the *IBM FAStT FC-2 Host Bus Adapter Support* CD into the CD-ROM drive.
2. At the command prompt, type:

   ```
   d:\tools\dsk4w32 d:\images\biosnvrm\23x0\2300_xxx.img a:
   ```

   Where *d* is the CD-ROM drive and *a* is the diskette drive.
3. Press Enter.

4. Remove the *IBM FAStT FC-2 Host Bus Adapter Support* CD from the CD-ROM drive.
5. Remove the diskette from the diskette drive and label the diskette appropriately.

For Linux

To create a BIOS Update Utility diskette for Linux from the *IBM FAStT FC-2 Host Bus Adapter Support* CD, do the following:

1. Insert the *IBM FAStT FC-2 Host Bus Adapter Support* CD into the CD-ROM drive and restart the server.
2. At the command prompt, type:

   ```
   mount -t iso9660/dev/cdromdevicefile /mnt
   ```

   Where *cdromdevicefile* is the specific device file for the CD-ROM block device.
3. Press Enter.
4. Type:

   ```
   dd if=/mnt/images/biosnvrm/23x0/2300_xxx.img of=/dev/diskettedevicefile bs=32
   ```
5. Press Enter.
6. Unmount the CD-ROM by typing:

   ```
   unmount /mnt
   ```
7. Remove the *IBM FAStT FC-2 Host Bus Adapter Support* CD from the CD-ROM drive.
8. Remove the diskette from the diskette drive and label the diskette appropriately.
9. To update your adapter BIOS code, go to “Using the flasutil command prompt (from the diskette)” or “Using the flasutil BIOS Update Utility menu (from the diskette)” on page 13.

Using the flasutil command prompt (from the diskette)

To update your FAStT FC-2 Adapter BIOS code and NOVRAM using the flasutil command prompt, do the following:

1. Insert the BIOS Update Utility diskette that you created into drive A and restart the server. Your server will start to a DOS prompt.
2. From the DOS prompt, type:

   ```
   flasutil /f /l
   ```
3. Press Enter.
4. Type:

   ```
   flasutil /u
   ```
5. Press Enter.
6. Type:

   ```
   flasutil /?
   ```

The following command-line options display:

```
/L xxxx = Write NOVRAM, adapter address = xxxx
    If no address specified then write NOVRAM to all adapters
/F xxxx = Write Flash, adapter address = xxxx
    If no address specified then write Flash to all adapters
/D xxxx = Copy NOVRAM to file: QL1xNVRM.SAV, adapter address = xxxx
/U xxxx = Update BIOS NOVRAM defaults, adapter address = xxxx
    If no address specified then write then update all adapters
/W xxxx = Copy Flash to file: QL1xROM.SAV, adapter address = xxxx
/N <filename.ext> = Use <filename.ext> instead of NVRMxx0.DAT
/O <filename.ext> = Use <filename.ext> instead of QLxxROM.BIN
/I = Ignore Subsystem ID
```

```
/P = Program all adapters
/M = Don't prompt for I/O address
/Q = Quiet Mode, no messages will be displayed
/S xxxx = Display serial number of adapter at address xxxx
    If no address specified then display the serial number of all adapters
/V xxxx = Display current version number of BIOS on adapters at address xxxx
    If no address specified then display the BIOS version of all adapters
/C xxxx = Verify Flash of adapter at address xxxx
    If no address specified verify the Flash of all adapters
/T = Multiport Fibre Channel adapter
/X xxxx = Verify NOVRAM of adapter at address xxxx
/L xxxx = Write NOVRAM, adapter address = xxxx
```

Command-line options

The following are additional command-line options that you can use.

To write NOVRAM on all FAStT Host Adapters in a system without being prompted for the I/O address, type:

```
flasutil /L
```

To write NOVRAM and flash to all adapters, type:

```
flasutil /L /F
```

To make the new settings the defaults, type:

```
flasutil /U
```

To write NOVRAM to the adapter at I/O address f400, type:

```
flasutil /L f400
```

To write NOVRAM and flash an adapter at I/O address f800, type:

```
flasutil /L f800 /F f800
```

Using the flasutil BIOS Update Utility menu (from the diskette)

To update your FAStT FC-2 Adapter BIOS code and NOVRAM using the flasutil BIOS Update Utility, do the following:

1. Insert the BIOS Update Utility diskette into drive A and restart the server. Your server will start to a DOS prompt:
2. From the DOS prompt, type:

   ```
   flasutil
   ```

   If you have more than one adapter, a list of adapters and their I/O addresses displays. If you have only one adapter, the following list of options displays.

   ```
   L = Write NOVRAM
   F = Write Flash
   A = Write NOVRAM and defaults
   D = Copy NOVRAM to file:QLxxNVRM.SAV
   W = Copy Flash to file: QLxxROM.SAV
   U = Update BIOS VNOVRAM defaults
   S = Display serial number
   V = Display current BIOS version
   C = Verify Flash
   X = Verify NOVRAM
   ```
3. At the command prompt, type the appropriate I/O address and press Enter.

Note: You can run the utility from the command line with the options as /*y*, where *y* is the option required.

Chapter 4. Using IBM Fast!UTIL

This chapter provides detailed configuration information for advanced users who want to customize the configuration of the FAStT FC-2 Adapter and the connected Fibre Channel devices. You can configure the adapter using the Fast!UTIL utility.

Starting Fast!UTIL

To access Fast!UTIL, press Ctrl+Q during the adapter BIOS initialization (it might take a few seconds for the Fast!UTIL menu to appear). If you have more than one FAStT FC-2 Adapter, Fast!UTIL prompts you to select the adapter you want to configure. After changing the settings, Fast!UTIL restarts your system to load the new parameters.

Important: If the configuration settings are incorrect, your FAStT FC-2 Adapter will not function properly.

Fast!UTIL options

This section describes the Fast!UTIL options. The first option on the Fast!UTIL Options menu is Configuration Settings. The settings configure the Fibre Channel devices and the FAStT FC-2 Adapter to which they are attached.

Host Adapter Settings

You can access this option from the Configuration Settings menu in Fast!UTIL by selecting **Host Adapter Settings**. The current default settings for the host adapter are listed in Table 2 and are described in this section.

Table 2. Host adapter settings

Setting	Options	Default
Host adapter BIOS	Enabled or Disabled	Disabled
Frame size	512, 1024, 2048	2048
Loop reset delay	0-60 seconds	5 seconds
Adapter hard loop ID	Enabled or Disabled	Enabled
Hard loop ID	0-125	125

Host adapter BIOS: When this option is set to Disabled, the ROM BIOS code on the FAStT FC-2 Adapter is disabled, freeing space in upper memory. This setting must be enabled if you are starting from a Fibre Channel hard disk that is attached to the FAStT FC-2 Adapter. The default is Disabled.

Frame size: This setting specifies the maximum frame length supported by the FAStT FC-2 Adapter. The default size is 2048. If you are using F-Port (point-to-point) connections, the default is best for maximum performance.

Loop reset delay: After resetting the loops, the firmware does not initiate any loop activity for the number of seconds specified in this setting. The default is 5 seconds.

Adapter hard loop ID: This setting forces the adapter to use the ID specified in the Hard loop ID setting. The default is Enabled.

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Hard loop ID: When the adapter hard loop ID is set to Enabled, the adapter uses the ID specified in this setting. The default ID is 125.

Note: The FAStT FC-2 Host Adapter settings and default values will vary, based on the version of BIOS code installed for the adapter.

Selectable Boot settings

You can access the Selectable Boot settings option from the Configuration Settings menu. When this option is set to Enabled, you can select the node name from which you want to start up (boot). When this option is set to Enabled, the node will start from the selected Fibre Channel hard disk, ignoring any IDE hard disks attached to your server. When this option is set to Disabled, the Boot ID and Boot LUN parameters have no effect.

The BIOS code in some new systems supports selectable boot, which supersedes the Fast!UTIL selectable boot setting. To start from a Fibre Channel hard disk attached to the FAStT FC-2 Adapter, select the attached Fibre Channel hard disk from the system BIOS menu.

Note: This option applies only to disk devices; it does not apply to CDs, tape drives, and other nondisk devices.

Adapter Hard ID settings

You can access this option from the Configuration Settings menu. It forces the FAStT FC-2 Adapter to use the selected hard ID (0-125). The default is set to 125.

Restore Default settings

You can access this option from the Configuration Settings menu. It restores the FAStT FC-2 Adapter default settings.

Raw NVRAM data

This option displays the adapter nonvolatile random access memory (NVRAM) contents in hexadecimal format. This is a troubleshooting tool; you cannot modify the data.

Advanced Adapter Settings

You can access this option from the Configuration Settings menu by selecting **Advanced Adapter Settings**. The current default settings for the FAStT FC-2 Adapter are listed in Table 3 and are described in this section.

Table 3. Advanced adapter settings

Setting	Options	Default
Execution throttle	1-256	256
Fast command posting	Enabled or Disabled	Disabled
>4GByte addressing	Enabled or Disabled	Disabled
LUNs per target	0, 8, 16, 32, 64, 128, 256	0
Enable LIP reset	Yes or No	No
Enable LIP full login	Yes or No	Yes
Enable target reset	Yes or No	Yes
Login retry count	0-255	30

Table 3. Advanced adapter settings (continued)

Setting	Options	Default
Port down retry count	0-255	30
Drivers load RISC code	Enabled or Disabled	Enabled
Enable database updates	Yes or No	No
Disable database load	Yes or No	No
IOCB allocation	1-512 buffers	256 buffers
Extended error logging	Enabled or Disabled	Disabled

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

Fast command posting: This setting decreases command execution time by minimizing the number of interrupts. The default is Enabled.

>4GByte addressing: Enable this option when the system has more than 4 GB of memory available. The default is Disabled.

LUNs per target: This setting specifies the number of LUNs per target. Multiple logical unit number (LUN) support is typically for redundant array of independent disks (RAID) enclosures that use LUNs to map drives. The default is 0.

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

Enable LIP full logon: This setting instructs the ISP chip to log into all ports after any LIP. The default is Yes.

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

Login retry count: This setting specifies the number of times the software tries to log into a device. The default is 30 retries.

Port down retry count: This setting specifies the number of times the software retries a command to a port that is returning port-down status. The default is 30 retries.

Drivers load RISC code: When this option is set to Enabled, the FAStT FC-2 Adapter uses the RISC firmware that is embedded in the software device driver. When this option is set to Disabled, the software device driver loads the RISC firmware found in the adapter BIOS code. The default is Enabled.

Note: To load the embedded device driver software, the device driver being loaded must support this setting. If the device driver does not support this setting, the result is the same as if this option is set to Disabled, regardless of the

setting. Leaving this option enabled ensures a certified combination of software device driver and RISC firmware.

Enable database updates: When this option is set to Enabled, the software can save the loop configuration information in flash memory as the system powers down. The default is No.

Disable database load: When this option is set to Enabled, the device database is read from the Registry during driver initialization. When this option is set to Disabled, the device database is created dynamically during device driver initialization. The default is No.

Note: This option usually applies to the Windows NT and Windows 2000 operating system environments.

IOCB allocation: This option specifies the maximum number of buffers from the firmware buffer pool that are allocated to any one port. The default setting is 256 buffers.

Extended error logging: This option provides additional error and debugging information to the operating system. When this option is set to Enabled, events are logged into the Windows NT Event Viewer or Windows 2000 Event Viewer (depending on the environment you are in). The default is Disabled.

Extended Firmware Settings

You can access this option from the Configuration Settings by selecting **Extended Firmware Settings**. The current default settings for the host adapter are listed in Table 4 and are described in this section.

Table 4. Extended firmware settings

Setting	Options	Default
Extended control block	Enabled or Disabled	Enabled
RIO operation mode	0, 1, 2, 3, 4	0
Connection Options	0, 1, 2	2
NonParticipating hard ID	Enabled or Disabled	Disabled
Class 2 service	Enabled or Disabled	Disabled
ACK0	Enabled or Disabled	Disabled
Fibre Channel tape support	Enabled or Disabled	Disabled
Fibre Channel confirm	Enabled or Disabled	Disabled
Command reference number	Enabled or Disabled	Disabled
Read transfer ready	Enabled or Disabled	Disabled
Response timer	0-255	0
Interrupt delay timer	0-255	0
Data rate	0-2	2

Extended control block: This setting enables all other extended firmware settings. The default is Enabled.

RIO operation mode: This setting specifies the reduced interrupt operation (RIO) modes, if supported by the software device driver. RIO modes enable posting

multiple command completions in a single interrupt (see Table 5). The default is 0.

Table 5. RIO operation modes

Option	Operation mode
0	No multiple responses
1	Multiple responses, 16-bit handles, interrupt host
2	Multiple responses, 32-bit handles, interrupt host
3	Multiple responses, 16-bit handles, delay host interrupt
4	Multiple responses, 32-bit handles, delay host interrupt

Connection options: This setting defines the type of connection (loop or point-to-point) or connection preference (see Table 6). The default is 2.

Table 6. Connection options

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

Nonparticipating hard ID: This setting is reserved. The default is Disabled.

Class 2 service: This setting enables Class 2 service parameters to be provided during all automatic logins (loop ports). The default is Disabled.

ACK0: This setting determines the type of acknowledgment (ACK) used. When this option is set to Enabled, sequence ACK is used. When this option is set to Disabled, frame ACK is used. The default is Disabled.

Note: You must enable the Class 2 service setting to use the ACK0 setting.

Fibre Channel tape support: This setting is reserved for Fibre Channel tape support. The default is Disabled.

Fibre Channel confirm: This setting enables the host to send the FCP confirmation frame when requested by the target. The default is Disabled.

Command reference number: This setting is reserved for Fibre Channel tape support. The default is Disabled.

Read transfer ready: This setting is reserved. The default is Disabled.

Response timer: This setting contains the value (in 100-microsecond increments) used by a timer to limit the wait time for accumulating multiple responses. For example, if this field is 8, the time limit is 800 microseconds. The default is 0.

Interrupt delay timer: This setting contains the value (in 100-microsecond increments) used by a timer to set the wait time between accessing (DMA) a set of handles and generating an interrupt. The default is 0.

Data rate: This setting determines the data rate. When this setting is 1, the FAStT FC-2 Adapter runs at 2 Gb per second. When set to 2, the Fast!UTIL determines

what rate your system can accommodate and sets the rate accordingly. The default is 2 (the FAStT FC-2 Adapter runs at 1 Gb per second).

Scan Fibre Channel devices

Use this option to scan the Fibre Channel loop and list all the connected devices by loop ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when you are configuring your FAStT FC-2 Adapter and attached devices.

Fibre Channel disk utility

Attention: Performing a low-level format removes all data on the disk.

Use this option to scan the Fibre Channel loop bus and list all the connected devices by loop ID. You can select a disk device and perform a low-level format or verify the disk media.

Select host adapter

Use this option to select, configure, or view a specific adapter if you have multiple adapters in your system.

Chapter 5. Adapter operating environment and specifications

This chapter contains the FAStT FC-2 Adapter operating environment and specification information.

Table 7. Adapter operating environment

Environment	Minimum	Maximum
Operating temperature	0°C (32°F)	55°C (131°F)
Storage temperature	-20°C (-4°F)	70°C (158°F)
Relative humidity (noncondensing)	10%	90%
Storage humidity (noncondensing)	5%	95%

Table 8. Adapter specifications

Type	Specification
Host bus	Conforms to Intel *PCI Local Bus Specification*, revision 2.2 and the *PCI-X Addendum*, revision 1.0.
PCI/PCI-X signaling environment	3.3 V and 5.0 V buses supported
PCI/PCI-X transfer rate	• Support for 32 bit and 64 bit PCI bus at 33 MHz and 64 MHz • Support for 64 bit PCI-X bus at 50 MHz and 100 MHz • PCI transfer rate 264 MB per second maximum burst rate for 33 MHz operation (ISP2310 chip) • Support for dual address bus cycles
Fibre Channel specifications	• Bus type: fiber-optic media (shortwave 50 micron) • Bus transfer rate: 200 MB per second maximum at half-duplex and at 400 MB per second maximum full-duplex. • Interface chip: ISP2310 (PCI-X QLA23xx boards) • Support for both FCP-SCSI and IP protocols • Support for point-to-point fabric connection: F-Port Fabric Login • Support for FCAL public loop profile: FL-Port Login • Support for Fibre Channel services class 2 and 3 • Support for FCP SCSI initiator and target operation • Support for full-duplex operation
Processor	Single-chip design that includes a RISC processor, Fibre Channel protocol manager, PCI/PCI-X DMA controller, and integrated serializer/deserializer (SERDES) and electrical transceivers that can auto-negotiate a data rate of 2 Gb per second.
Host data transfer	64-bit, bus-master DMA data transfers to 528 MB per second
RAM	RAM 256 KB of SRAM supporting parity protection
BIOS ROM	BIOS ROM 128 KB of flash ROM in two 64 KB, software selectable banks. The flash is field programmable.
NVRAM	NVRAM 256 bytes, field programmable

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Table 8. Adapter specifications (continued)

Type	Specification
Onboard DMA	Five-channel DMA controller: two data, one command, one auto-DMA request, and one auto-DMA response.
Frame buffer FIFO	Integrated 4 KB transmit and 6 KB receive frame buffer FIFO for each data channel
Connectors (external)	• LC-style connector that supports non-OFC, multimode fiber-optic cabling using a small form factor (SFF) fiber-optic transceiver module. • Total cable length cannot exceed 500 meters.
Form factor	6.47 cm x 16.75 cm (2.54 in. x 6.6 in.)
Operating power	Less than 15 watts

Appendix A. Getting help, service, and information

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 computer, and whom to call for service should it be necessary.

Getting information

Information about your IBM server product and preinstalled software, if any, is available in the documentation that comes with your server. That documentation includes printed books, online books, README files, and help files. In addition, information about IBM products is available on the World Wide Web and through the IBM Automated Fax System.

Using the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM products and support. The address for the IBM Personal Computing home page is http://www.ibm.com/pc/.

You can find support information for your IBM products at http://www.ibm.com/pc/support/.

If you click **Profile** from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products.

You also can order publications through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada, you can receive, by fax, marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs).

You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine. In the U.S. and Canada, to access the IBM Automated Fax System, call 1-800-426-3395.

Getting help and service

If you have a problem with your server product, you will find a wide variety of sources available to help you.

Using the documentation and diagnostic programs

Many problems can be solved without outside assistance. If you experience a problem with your server product, the first place to start is the troubleshooting

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information in your IBM documentation. If you suspect a software problem, see the documentation, including README files and online help, that comes with the operating system or application program.

Most IBM server products come with a set of diagnostic programs that you can use to help you identify hardware problems. See the troubleshooting information in your IBM documentation for instructions on 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/pc/support/ and follow the instructions.

Calling for service

If you have tried to correct the problem yourself and still need help, during the warranty period, you can get help and information by telephone through the IBM HelpCenter®. The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make selected Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts. All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources.
- Configuration of BIOS as part of an installation or upgrade.
- Changes, modifications, or upgrades to device drivers.
- Installation and maintenance of network operating systems (NOS).
- Installation and maintenance of application programs.

Refer to your IBM Statement of Limited Warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.

Note: Response times vary; may exclude some holidays.

In addition, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface adapters
- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine type and model

- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Telephone numbers

Phone numbers are subject to change without notice. For the most up-to-date phone numbers, go to http://www.ibm.com/pc/support/ and click **Support Phone List**.

Country		**Telephone number**
Austria	Österreich	01-24 592 5901
Belgium - Dutch	Belgie	02-210 9820
Belgium - French	Belgique	02-210 9800
Canada	Toronto only	416-383-3344
Canada	Canada - all other	1-800-565-3344
Denmark	Danmark	45 20 82 00
Finland	Suomi	09-459 6960
France	France	02 38 55 74 50
Germany	Deutschland	07032-1549 201
Ireland	Ireland	01-815 9202
Italy	Italia	02-7031 6101
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-514 5770
Norway	Norge	66 81 11 00
Portugal	Portugal	21-791 51 47
Spain	España	91-662 49 16
Sweden	Sverige	08-477 4420
Switzerland	Schweiz/Suisse/Svizzera	058-333 0900
United Kingdom	United Kingdom	01475-555 055
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

In all other countries or regions, contact your IBM reseller or IBM marketing representative.

International Warranty Service

If you travel with your server product or relocate it to a country where your server machine type is sold and serviced by IBM or by IBM resellers who are authorized to perform warranty service, International Warranty Service is available for your server product.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your server product is eligible for International Warranty Service and to view a list of the countries where service is available, go to http://www.ibm.com/pc/support/, and click **Warranty Lookup**. Eligible IBM server products are identified by their four-digit machine types. For more information about International Warranty Service, see Service Announcement 601-034 at http://www.ibm.com/. Click **Support & downloads**, click **Announcement letters**, and click **Announcements search**. In the **Search by letter number only** field, type `601-034`, and click **Search**.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region.

For more information about these services, contact your IBM marketing representative.

Appendix B. Warranty information

This appendix contains the warranty period for your product, information about obtaining warranty service and support, and the IBM Statement of Limited Warranty.

Warranty period

Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country or region where service is performed.

Machine - IBM FAStT FC-2 Host Bus Adapter **Warranty period** - Three years

Warranty service and support

With the original purchase of an IBM server product, you have access to extensive support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of non-IBM software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of machine code or licensed internal code that is designated as customer installable.

If you do not register your server with IBM, you might be required to present proof of purchase to obtain warranty service.

Before you call for service

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your server and software.

Most computers, operating systems, and application programs come with information that contains troubleshooting procedures and explanations of error

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messages and error codes. The information that comes with your server also describes the diagnostic tests that you can perform.

If you suspect a software problem, refer to the information for the operating system or application program.

Calling for service

Please have the following information ready:

- Machine type, model, and serial number
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

To find the telephone number for the HelpCenter nearest you, see “Telephone numbers” in the “Getting information, help, and service” chapter.

IBM Statement of Limited Warranty Z125-4753-06 8/2000

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. 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, from IBM or your reseller. 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. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM Warranty for Machines: IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM’s Official Published Specifications (“Specifications”). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded.

Extent of Warranty: The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

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Items Not Covered by Warranty: 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 via telephone with “how-to” questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

Warranty Service: To obtain warranty service for a Machine, contact IBM or your reseller. If you do not register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide warranty service, provides without charge certain types of repair and exchange service to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. At its discretion, IBM or your reseller will 1) either repair or exchange the failing Machine and 2) provide the service either at your location or a service center. IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units (called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to you for replacement by you. You must return all defective CRUs to IBM within 30 days of your receipt of the replacement CRU. You are responsible for downloading designated Machine Code and Licensed Internal Code updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its 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. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to
1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
   b. secure all programs, data, and funds contained in a Machine;
   c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
   d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

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.

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

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST SAVINGS, EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

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

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

Governing Law: *The following is added after the first sentence:*Any litigation arising from this Agreement will be settled exclusively by the court of Rio de Janeiro.

NORTH AMERICA

Warranty Service: *The following is added to this Section:* To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

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.

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

The IBM Warranty for Machines: *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, LAOS, AND VIETNAM

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.

The following is added to this Section: Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and binding for the parties without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. 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 before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. 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.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of Hong Kong Special Administrative Region.

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;
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, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

Governing Law: *The following sentence is added to this Section:*Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

NEW ZEALAND

The IBM Warranty for Machines: *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 this Section:* Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

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.

Warranty Service: If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, 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. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, 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.

If you purchase an IBM Machine in a Middle Eastern 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 authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law: The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) 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, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal, and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

The IBM Warranty for Machines: *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 six months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund 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.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *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.

EGYPT

Limitation of Liability: *The following replaces item 2 in this Section:* as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this Section:*In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: *(items 1 and 2 unchanged)*.

IRELAND

Extent of Warranty: *The following is added to this Section:* Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces items one and two of the first paragraph of this Section:*1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and 2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph:*In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than: 1. *(unchanged)* 2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim. *Applicability of suppliers and resellers (unchanged).*

The following replaces the third paragraph of this Section: Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: *(items 1 and 2 unchanged)* 3) indirect damages, even if IBM or your reseller is informed of their possibility.

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.

UNITED KINGDOM

Limitation of Liability: *The following replaces items 1 and 2 of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim;

The following item is added to this paragraph: 3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

Appendix C. Notices

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Linux is a registered trademark of Linus Torvalds.

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

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Important notes

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

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

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1000000 bytes, and Gb stands for approximately 1000000000 bytes.

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

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

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

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

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

Electronic emission notices

This device has been tested to the FCC limits and found compliant to the Class B limits when installed in a personal computer. When used in other information technology equipment, FCC compliance will be defined by the system. Refer to the documentation that comes with the host system for the appropriate FCC emission statement when this adapter is installed in equipment other than personal computers.

Federal Communications Commission (FCC) statement

IBM FAStT FC-2 Host Bus Adapter

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. 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.

Responsible party:
International Business Machines Corporation
New Orchard Road
Armonk, NY 10504
Telephone: 1-919-543-2193

Tested To Comply With FCC Standards
FOR HOME OR OFFICE USE

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 89/336/EEC 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.

Taiwan electrical emission 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。

Japanese Voluntary Control Council for Interference (VCCI) statement

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