IBM System Storage DS4000 FC 4Gbps PCI-X
Single/Dual Port HBA

IBM

Installation and User's Guide

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Single/Dual Port HBA

Installation and User's Guide

Note: Before using this information and the product it supports, be sure to read the general information under Appendix B, "Notices," on page 35.

First Edition (March 2006)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

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

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

Statement 2:

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

IEC 825-11993 CENELEC EN 60 825

Statement 3:

CAUTION:
Handling the cord on this product, or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer and birth defects or other reproductive harm. *Wash hands after handling.*

About this document

This book provides instructions for installing and customizing the configuration of your IBM System Storage™ DS4000 FC 4Gbps PCI-X Single/Dual Port HBA and connected devices. It also provides information on troubleshooting your IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA.

Who should read this document

This document is intended for system operators and service technicians who have extensive knowledge of fibre channel and network technology.

FAStT product renaming

IBM® has renamed some FAStT family products. Table 1 identifies each DS4000 product name with its corresponding previous FAStT product name. Note that this change of **product name only** indicates no change in functionality or warranty. All products listed below with new names are functionally-equivalent and fully-interoperable. Each DS4000 product retains full IBM service as outlined in service contracts issued for analogous FAStT products.

Table 1. Mapping of FAStT names to DS4000 Series names

Previous FAStT Product Name	Current DS4000 Product Name
IBM TotalStorage® FAStT Storage Server	IBM TotalStorage DS4000
FAStT	DS4000
FAStT Family	DS4000 Mid-range Disk System
FAStT Storage Manager vX.Y (for example v9.10)	DS4000 Storage Manager vX.Y (for example v9.10)
FAStT100	DS4100
FAStT600	DS4300
FAStT600 with Turbo Feature	DS4300 Turbo
FAStT700	DS4400
FAStT900	DS4500
EXP700	DS4000 EXP700
EXP710	DS4000 EXP710
EXP100	DS4000 EXP100
FAStT FlashCopy®	FlashCopy for DS4000
FAStT VolumeCopy	VolumeCopy for DS4000
FAStT Remote Mirror (RM)	Enhanced Remote Mirroring for DS4000
FAStT Synchronous Mirroring	Metro Mirroring for DS4000
	Global Copy for DS4000 (New Feature = Asynchronous Mirroring without Consistency Group)
	Global Mirroring for DS4000 (New Feature = Asynchronous Mirroring with Consistency Group)

DS4000 Storage Subsystem installation tasks - General overview

Table 2 provides a sequential list of many installation and configuration tasks that are common to most DS4000 configurations. When you install and configure your DS4000 storage subsystem, refer to this table to find the documentation that explains how to complete each task.

See also: The *DS4000 Storage Server and Storage Expansion Enclosure Quick Start Guide* provides an excellent overview of the installation process.

Table 2. Where to find DS4000 installation and configuration procedures

	Installation task	Where to find information or procedures
1	Plan the installation	• DS4000 Storage Manager Concepts Guide • DS4000 Storage Manager Installation and Support Guide for AIX, HP-UX, Solaris and Linux on POWER • DS4000 Storage Manager Installation and Support Guide for Windows 2000/Server 2003, NetWare, ESX Server, and Linux • DS4100 Storage Server Installation, User's, and Maintenance Guide • DS4300 Fibre Channel Storage Server Installation and User's Guide • DS4400 Fibre Channel Storage Server Installation and Support Guide • DS4500 Fibre Channel Storage Server Installation and Support Guide • DS4800 Storage Subsystem Installation, User's, and Maintenance Guide
2	Mount the DS4000 storage subsystem in the rack	• DS4800 Installation, User's, and Maintenance Guide • DS4400 and DS4500 Rack Mounting Instructions • DS4300 Rack Mounting Instructions • DS4100 Installation, User's and Maintenance Guide
3	Mount the DS4000 EXP storage expansion unit in the rack	• DS4000 EXP100 Storage Expansion Unit Installation, User's and Maintenance Guide • DS4000 EXP700 and EXP710 Storage Expansion Enclosures Installation, User's, and Maintenance Guide • DS4000 EXP810 Storage Expansion Enclosures Installation, User's, and Maintenance Guide • FAStT EXP500 Installation and User's Guide
4	Route the storage expansion unit Fibre Channel cables	• DS4100 Fibre Channel Cabling Instructions • DS4300 Fibre Channel Cabling Instructions • DS4400 Fibre Channel Cabling Instructions • DS4500 Fibre Channel Cabling Instructions • DS4800 Installation, User's, and Maintenance Guide
5	Route the host server Fibre Channel cables	• DS4100 Fibre Channel Cabling Instructions • DS4300 Fibre Channel Cabling Instructions • DS4400 Fibre Channel Cabling Instructions • DS4500 Fibre Channel Cabling Instructions • DS4800 Installation, User's, and Maintenance Guide

Table 2. Where to find DS4000 installation and configuration procedures (continued)

	Installation task	Where to find information or procedures
6	Power up the subsystem	• DS4100 Storage Server Installation, User's, and Maintenance Guide • DS4300 Fibre Channel Storage Server Installation and User's Guide • DS4400 Fibre Channel Storage Server Installation and Support Guide • DS4500 Fibre Channel Storage Server Installation and Support Guide • DS4800 Storage Subsystem Installation, User's, and Maintenance Guide
7	Configure DS4000 network settings	• DS4100 Storage Server Installation, User's, and Maintenance Guide • DS4300 Fibre Channel Storage Server Installation and User's Guide • DS4400 Fibre Channel Storage Server Installation and Support Guide • DS4500 Fibre Channel Storage Server Installation and Support Guide • DS4800 Storage Subsystem Installation, User's, and Maintenance Guide
8	Zone the fabric switch (SAN-attached only)	• DS4000 Storage Manager Installation and Support Guide for AIX, HP-UX, Solaris and Linux on POWER • DS4000 Storage Manager Installation and Support Guide for Windows 2000/Server 2003, NetWare, ESX Server, and Linux • DS4000 Storage Manager Copy Services Guide (describes switch zoning for the Remote Mirror Option) • See also the documentation provided by the switch manufacturer
9	Install DS4000 Storage Manager software on the management station	• DS4000 Storage Manager Installation and Support Guide for AIX, HP-UX, Solaris and Linux on POWER • DS4000 Storage Manager Installation and Support Guide for Windows 2000/Server 2003, NetWare, ESX Server, and Linux • DS4000 Storage Manager online help (for post-installation tasks)
10	Install host software (failover drivers) on host server	
11	Start DS4000 Storage Manager	
12	Set the DS4000 Storage Manager clock	
13	Set the DS4000 Storage Manager host default type	

	Installation task	Where to find information or procedures
14	Verify DS4000 subsystem health	• DS4100 Storage Server Installation, User's, and Maintenance Guide • DS4300 Fibre Channel Storage Server Installation and User's Guide • DS4400 Fibre Channel Storage Server Installation and Support Guide • DS4500 Fibre Channel Storage Server Installation and Support Guide • DS4800 Storage Subsystem Installation, User's, and Maintenance Guide
15	Enable DS4000 Storage Manager premium feature keys	**Copy Services premium features** 　　　DS4000 Storage Manager Copy Services Guide **FC/SATA Intermix premium feature** 　　　DS4000 Fibre Channel and Serial ATA Intermix Premium Feature Installation Overview **Storage Partitioning (and general premium features information)** 　　　• DS4000 Storage Manager Concepts Guide 　　　• DS4000 Storage Manager Installation and Support Guide for AIX, HP-UX, Solaris and Linux on POWER 　　　• DS4000 Storage Manager Installation and Support Guide for Windows 2000/Server 2003, NetWare, ESX Server, and Linux
16	Configure arrays and logical drives	• DS4000 Storage Manager Installation and Support Guide for AIX, HP-UX, Solaris and Linux on POWER
17	Configure host partitions	• DS4000 Storage Manager Installation and Support Guide for Windows 2000/Server 2003, NetWare, ESX Server, and Linux
18	Verify host access to DS4000 storage	• DS4000 Storage Manager online help

Getting information, help, and service

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 IBM @server xSeries® or IntelliStation® system, and whom to call for service, if it is necessary.

Before you call

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

• Check all cables to make sure that they are connected.
• Check the power switches to make sure that the system is turned on.
• Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.

- Check for technical information, hints, tips, and new device drivers at the following Web site:

  www.ibm.com/servers/storage/support/disk/
- Use an IBM discussion forum on the IBM Web site to ask questions.

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

Using the documentation

Information about the xSeries or IntelliStation system and preinstalled software, if any, is available in the documents that come with your system. This includes printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions on how to use the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software.

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For DS4000 information, go to the following Web site:

  www.ibm.com/servers/storage/support/disk/

  The support page has many sources of information and ways for you to solve problems, including:
  - Diagnosing problems using the IBM Online Assistant
  - Downloading the latest device drivers and updates for your products
  - Viewing frequently asked questions (FAQ)
  - Viewing hints and tips to help you solve problems
  - Participating in IBM discussion forums
  - Setting up e-mail notification of technical updates about your products
- You can order publications through the IBM Publications Ordering System at the following Web site:

  www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi/
- For the latest information about IBM xSeries products, services, and support, go to the following Web site:

  www.ibm.com/eserver/xseries/
- For the latest information about IBM pSeries® products, services, and support, go to the following Web site:
  www.ibm.com/eserver/pseries/
- For the latest information about the IBM IntelliStation information, go to the following Web site:

  www-132.ibm.com/content/home/store_IBMPublicUSA/
  en_US/IntelliStation_workstations.html

- For the latest information about operating system and HBA support, clustering support, SAN fabric support, and Storage Manager feature support, see the TotalStorage DS4000 Interoperability Matrix at the following Web site:

  www.ibm.com/servers/storage/disk/ds4000/interop-matrix.html

Software service and support

Through IBM Support Line, for a fee you can get telephone assistance with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to the following Web site:

www.ibm.com/services/sl/products/

For more information about the IBM Support Line and other IBM services, go to the following Web sites:
- www.ibm.com/services/
- www.ibm.com/planetwide/

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to the following Web site for support telephone numbers:

www.ibm.com/planetwide/

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

Fire suppression systems

A fire suppression system is the responsibility of the customer. The customer's own insurance underwriter, local fire marshal, or a local building inspector, or both, should be consulted in selecting a fire suppression system that provides the correct level of coverage and protection. IBM designs and manufactures equipment to internal and external standards that require certain environments for reliable operation. Because IBM does not test any equipment for compatibility with fire suppression systems, IBM does not make compatibility claims of any kind nor does IBM provide recommendations on fire suppression systems.

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- IBMLink from Canada: STARPUBS at TORIBM
- IBM Mail Exchange: USIB3WD at IBMMAIL

Be sure to include the name and order number of the document and, if applicable, the specific location of the text you are commenting on, such as a page number or table number.

You can also mail your comments by using the Reader Comment Form in the back of this manual or direct your mail to:

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How this book is organized

Chapter 1, "Preparing and installing the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA," on page 1 describes the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA. This chapter includes an overview of the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA features and contains the information and instructions needed to prepare and install the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA.

Chapter 2, "Installing the FC 4Gbps PCI-X Adapter device drivers and updating the BIOS code," on page 9 provides information for updating the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA BIOS code.

Chapter 3, "Configuring the FC 4Gbps PCI-X Adapter with Fast!UTIL," on page 23 provides detailed configuration information for users who want to customize the configuration of the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA and connected Fibre Channel devices.

Chapter 4, "FC 4Gbps PCI-X Adapter operating environment and specifications," on page 29 contains the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA operating environment and specification information.

Chapter 5, "Troubleshooting," on page 31 covers the types of installation problems that can cause the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA to function incorrectly.

Appendix A, "Accessibility," on page 33 provides information about alternate keyboard navigation, which is a DS4000 Storage Manager accessibility feature. Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

Appendix B, "Notices," on page 35 provides product notices.

Appendix C, "European Directive About Product Recycling and Disposal," on page 39 provides information about European standards for recycling and disposal.

Appendix D, "Battery Return Program," on page 41 provides information about the proper disposal and/or recycling of batteries.

Appendix E, "Cable Warning," on page 43 discloses the possible hazards associated with handling cables for this product or cords associated with accessories sold with this product.

Appendix F, "Additional DS4000 documentation," on page 45 provides references to other DS4000 publications.

Notices used in this document

The caution and danger statements used in this book also appear in the multilingual *Safety Information* book provided with your IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

The following types of notices and statements are used in this book:

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

Chapter 1. Preparing and installing the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA

This chapter contains instructions for preparing and installing the IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA and describes the adapter components. The IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA is referred to throughout this book as the FC 4Gbps PCI-X Adapter.

Overview

The IBM System Storage DS4000 FC 4Gbps PCI-X Single/Dual Port HBA is a 4Gbps 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 ISP2422 chip (see Figure 2 on page 4) making this FC 4Gbps PCI-X Adapter a leading-edge host adapter.

The ISP2422 chip combines a powerful, reduced instruction set computer (RISC) processor, a Fibre Channel protocol manager (FPM) with one 4 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 FC 4Gbps PCI-X Adapter supports all Fibre Channel (FC) peripheral devices that support private-loop direct attach (PLDA) and fabric-loop attach (FLA).

The FC 4Gbps PCI-X Adapter connects the following:
- Mainframe computers
- Super computers
- Workstations
- Storage devices
- Servers

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 small computer system interface (SCSI) devices with Ultra SCSI.

The FC 4Gbps PCI-X Adapter uses a multimode shortwave optical interface for distances up to 500 meters when operating at 1Gbps, 300 meters when operating at 2Gbps, and 150 meters when operating at 4Gbps.

The FC 4Gbps PCI-X Adapter is a 4Gbps Fibre Channel device that supports data transfer rates up to 400MB per second half-duplex and 800MB per second full-duplex on optical interfaces.

FC 4Gbps PCI-X Adapter features

The FC 4Gbps PCI-X Adapter has the following features:

- 64-Bit, PCI-X 2.0 266 MHz, compatible with 66/33 MHz PCI and 133/100/66 MHz PCI-X.
- Conforms to PCI Local Bus Specification, revision 2.3 and 3.0, PCI-X Protocol Addendum to the PCI Local Bus Specification, revision 2.0a, PCI-X Electrical and Mechanical Addendum (revision 2.0a) to the PCI Local Bus Specification, PCI Bus Power Management Interface Specification revision 1.1, PCI Hot Plug Specification, revision 1.0.
- Compliance with SCSI-3 Fibre Channel Protocol (SCSI-FCP), Fibre Channel Physical and Signaling Interface (FC-PH), Fibre Channel 2nd Generation (FC-PH-2), Third Generation Fibre Channel Physical and Signaling Interface (FC-PH-3), Fibre Channel-Arbitrated Loop (FC-AL-2), Fibre Channel Fabric Loop Attachment Technical Report (FC-FLA), Fibre Channel-Private Loop Direct Attach Technical Report (FC-PLDA), Fibre Channel Tape (FC-TAPE) profile, SCSI Fibre Channel Protocol-2 (FCP-2), Second Generation FC Generic Services (FC-GS-3), Third Generation FC Generic Services (FC-GS-3), Fibre Channel Framing and Signaling (FC-FS) Physical Specification.
- Compliance with U.S. and international safety and emissions standards.
- Support for 4/2/1Gbps auto-negotiation (4.2480/2.1240/1.0625 Gbps) data rates.
- Support for 100,000 IOPS and higher.
- Support for 400 MBps maximum at half-duplex, 800 MBps maximum at full-duplex.
- Fast!UTIL basic input/output system (BIOS) utility program to customize the configuration parameters on the FC 4Gbps PCI-X Adapter and attached drives.
- Support for Point-to-point (N_Port), arbitrated loop (NL_Port), and switched fabric (N_Port), Support for F_Port and FL_Port login. 2,048 concurrent logins and 2,048 active exchanges.
- Support for Fibre Channel service (Classes 2 and 3).
- Support for Fibre Channel protocols FCP (SCSI-FCP), IP (FC-IP), FICON® (FC-SB-2), FC-TAPE (FCP-2).
- Storage Networking industry association (SNIA) HBA application programming interface (API), and storage management interface specification (SMI-S) compliant.
- Managed by the SANsurfer® FC HBA Manager.

Preinstallation procedures

Before you begin the FC 4Gbps PCI-X Adapter installation, do the following:

- Read "Handling static-sensitive devices" on page 3.
- Read "What you need for the installation" on page 4.
- Write down the serial number of the FC 4Gbps PCI-X Adapter. Each adapter has a unique serial number. If the nonvolatile random access memory (NVRAM) (also referred to as NOVRAM) is damaged, the system prompts you for the FC 4Gbps PCI-X Adapter serial number. Figure 1 on page 3 shows the serial number label location.

Figure 1. FC 4Gbps PCI-X Adapter serial number label

Components shown in Figure 2:

1. Yellow, Green, and Amber LEDs for port 1
2. Port 1 (top), port 2 (bottom)

   Note: Port 2 and LEDs for port 2 are for the dual port FC 4Gbps PCI-X Adapter
   only.
3. Yellow, Green, and Amber LEDs for port 2
4. 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 FC 4Gbps PCI-X Adapter in your server, you will need a small Phillips screwdriver. Depending on your configuration, you might need the following two items:

- An LC-LC Fibre Channel Cable[1] (enables you to connect Fibre Channel nodes to a loop)
- LC-SC Fibre Channel Cable[1] (enables you to connect an LC-LC Fibre Channel cable to a device that requires an SC connector)

FC 4Gbps PCI-X Adapter components

Figure 2 identifies the FC 4Gbps PCI-X Adapter components that are referred to in this book.

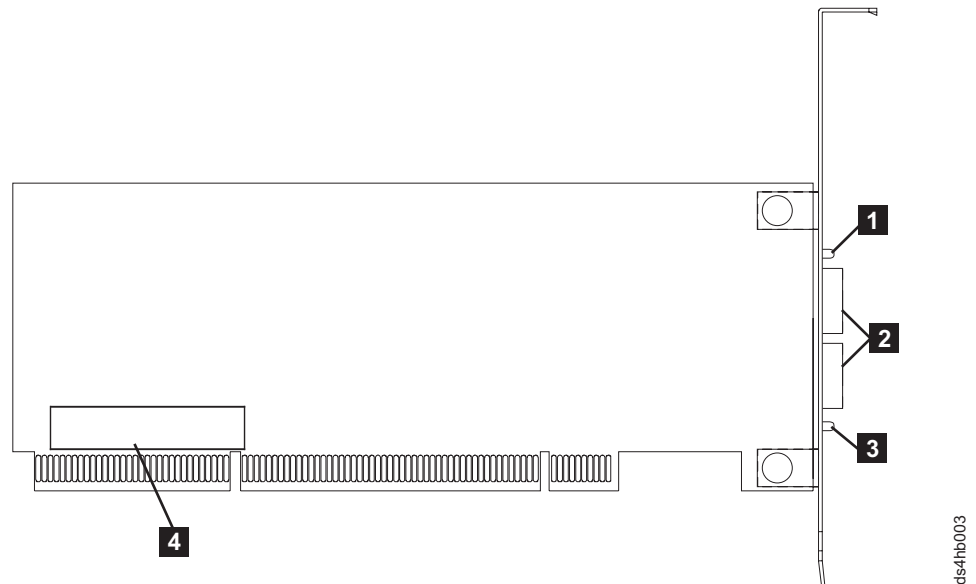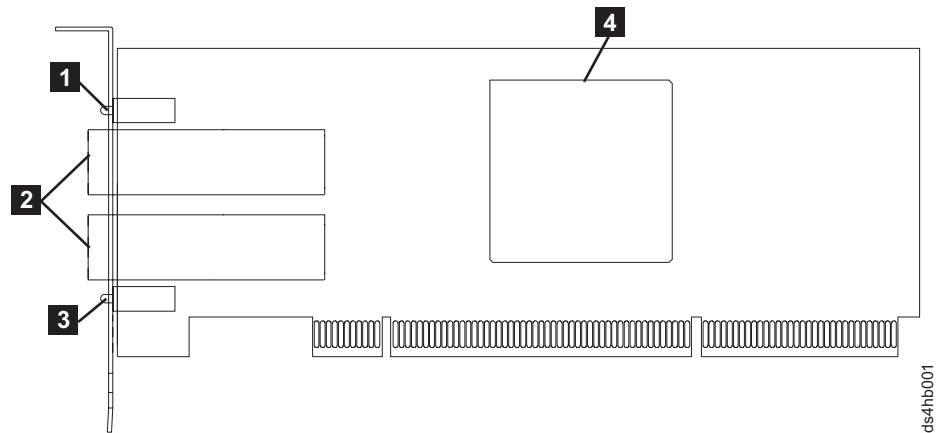*Figure 2. FC 4Gbps PCI-X Adapter components*

Components shown in Figure 3:

1. Yellow, Green, and Amber LEDs for port 1
2. Port 1 (top), port 2 (bottom)

   Note: Port 2 and the LEDs for port 2 are for the dual port adapter, only.
3. Yellow, Green, and Amber LEDs for port 2
4. ISP2422

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1. This option does not come with the FC 4Gbps PCI-X Host Bus Adapter. It must be ordered separately.

Table 3 describes the yellow, green, and amber light emitting diodes (LEDs) and the activity of the FC 4Gbps PCI-X Adapter. For more information about the FC 4Gbps PCI-X Adapter LED activity, see the *IBM System Storage DS4000 Problem Determination Guide*.

Table 3. FC 4Gbps PCI-X Adapter activity

Yellow LED	Green LED	Amber LED	Activity	Description
Off	Off	Off	Power off	The server adapter is not receiving power. The server is powered off.
On	On	On	Power on (before firmware initialization)	The FC 4Gbps PCI-X Adapter is receiving power from the PCI or PCI-X slot but is not initialized by the adapter firmware.
Flashing	Flashing	Flashing	Power on (after firmware initialization)	The FC 4Gbps PCI-X Adapter is successfully initialized by the adapter firmware and is in a ready state. The adapter firmware is initialized when the adapter BIOS code is loaded, Ctrl-Q is pressed, or the operating system driver is loaded.
Flashing alternately	Flashing alternately	Flashing alternately	Firmware error	The FC 4Gbps PCI-X Adapter firmware has detected an unrecoverable error condition.
Off	Off	On/Flashing	Online	1Gbps link / I/O activity
Off	On/Flashing	Off	Online	2Gbps link / I/O activity
On/Flashing	Off	Off	Online	4Gbps link / I/O activity
Flashing	Off	Flashing	Beacon	The adapter is responding to a Beacon command from an HBA management program.

Installing the FC 4Gbps PCI-X Adapter

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

- Do not route the cable along a folding cable-management arm.
- For devices on slide rails, leave enough slack in the cables so that they do **not** bend to a diameter of less than 76 mm (3 in.) or to a radius less than 38 mm (1.5 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can be damaged by other devices in the rack cabinet.
- Do not use plastic cable ties in place of the provided cable straps.
- Do not overtighten the cable straps or bend the cables to a diameter of less than 76 mm (3 in.) or a radius less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Be sure that the cable is well supported.
- The following are the recommended *maximum* cable lengths.
    - 1Gbps: 500 meters 50/125 µm fiber, 300 meters 62.5/125 µm fiber
    - 2Gbps: 300 meters 50/125 µm fiber, 150 meters 62.5/125 µm fiber
    - 4Gbps: 150 meters 50/125 µm fiber, 70 meters 62.5/125 µm fiber

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.**

The FC 4Gbps PCI-X 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 FC 4Gbps PCI-X Adapter, verify whether you need the Fibre Channel Low Profile 2U adapter bracket. If you need to install the Low Profile 2U bracket, continue with step 1. Otherwise, go to step 2.

1. Complete the following steps to install the Fibre Channel Low Profile 2U adapter bracket:

a. Remove your FC 4Gbps PCI-X 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 (#1) 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 FC 4Gbps PCI-X Adapter.

   Note: The FC 4Gbps PCI-X 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 FC 4Gbps PCI-X 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, turn off the server.

4. Disconnect the power cords.

5. Remove the server cover.

6. Choose a 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. Before installing your adapter into a PCI bus-master slot, note the following:

   • Some system boards have two kinds of PCI bus slots: master and subordinate. The FC 4Gbps PCI-X 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 FC 4Gbps PCI-X Adapter does not work in shared PCI bus-master slots.)

   • PCI connectors vary among system board manufacturers. The FC 4Gbps PCI-X Adapter is a 64-Bit PCI device that can function in a 32-Bit PCI bus-master slot.

   • The FC 4Gbps PCI-X Adapter is designed and tested to operate at PCI bus speeds up to 66 MHz and PCI-X bus speeds up to 266 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. Remove the expansion slot cover. Before you remove the cover, refer to the documentation that comes with the server for specific removal instructions.

   Attention: If you try to install the FC 4Gbps PCI-X Adapter into a PCI bus-master slot that does not conform to the PCI specification, you might damage the FC 4Gbps PCI-X Adapter.

8. Align the adapter with the expansion slot. Carefully press the adapter into the PCI bus-master slot until it is fully seated and secure.

9. Connect one end of an LC-LC Fibre Channel cable to the optical interface connector on the FC 4Gbps PCI-X Adapter. Connect the other end to a Fibre Channel device.
10. Carefully install and secure the server cover.
11. Connect the power cables.
12. Turn on all external Fibre Channel devices; then, turn on the server. The following information is displayed if the server has an Intel® 32-Bit processor (IA-32), Intel Extended Memory 64-Bit Technology (EM64T) processor, or an Advanced Micro Devices 64-Bit (AMD-64) architecture:

    Note: This BIOS banner does not display when the adapter is in a server with an Intel 64-Bit processor (IA-64) or a Sun SPARC processor architecture.

    Single port adapter:

    ```
    QLogic Corporation
    QLA2460 PCI Fibre Channel ROM BIOS Version X.XX
    Copyright (C) QLogic Corporation 1993-2005 All Rights Reserved.
    www.qlogic.com

    Press <Ctrl+Q> for Fast!UTIL

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

    Dual port adapter:

    ```
    QLogic Corporation
    QLA2462 PCI Fibre Channel ROM BIOS Version X.XX
    Copyright (C) QLogic Corporation 1993-2005 All Rights Reserved.
    www.qlogic.com

    Press <Ctrl+Q> for Fast!UTIL

    BIOS for Adapter 0 is disabled

    BIOS for Adapter 1 is disabled
    ```

To display the Fibre Channel devices, press Ctrl+Q, and then use the Fast!UTIL program. See Chapter 3, "Configuring the FC 4Gbps PCI-X Adapter with Fast!UTIL," on page 23 for detailed utility program information.

If the information displayed is not correct and you have checked the adapter configuration, go to Chapter 5, "Troubleshooting," on page 31 for problem solving information.

If the information displayed is correct, go to Chapter 2, "Installing the FC 4Gbps PCI-X Adapter device drivers and updating the BIOS code," on page 9 for detailed instructions on how to update the FC 4Gbps PCI-X Adapter BIOS code.

Chapter 2. Installing the FC 4Gbps PCI-X Adapter device drivers and updating the BIOS code

Note: For the latest information about supported operating systems, versions of device drivers, utilities, and documentation, go to http://www-1.ibm.com/ servers/storage/support/disk/.

After installing your FC 4Gbps PCI-X Adapter, you must perform one of the following two steps.

1. Install the adapter device driver followed by the QLogic® SANsurfer Pro Utility program and update the adapter BIOS code and nonvolatile random access memory (NVRAM) using the SANsurfer program.

   or

2. Update the adapter BIOS code and nonvolatile random access memory (NVRAM) via a bootable CD-ROM or diskette, using the flasutil utility program, then install the adapter device drivers.

Note: Step 1 is the recommended method for updating the adapter BIOS and NVRAM.

Installing the FC 4Gbps PCI-X Adapter device drivers

The device drivers and installation instructions for the following supported operating systems are provided on the *IBM System Storage DS4000 FC 4Gbps PCI-X Host Bus Adapter Support* CD:

- Microsoft® Windows® 2000 and Server 2003
- Novell® NetWare®
- Linux®

For additional instructions, see the README files for the appropriate operating systems, which are located in the corresponding operating system directories.

Note: For the latest information about supported operating systems, versions of device drivers, utilities, and documentation, go to http://www-1.ibm.com/ servers/storage/support/disk/.

To update the adapter BIOS code when the adapter is installed in the server with an Intel 32-Bit processor (IA-32), an Intel Extended Memory 64-Bit Technology (EM64T) processor, or Advanced Micro Devices 64-Bit (AMD-64) architecture only, you can use the BIOS Update Utility on the Support CD that comes with the adapter; or you can create and use a BIOS Update Utility diskette. When the adapter is installed in a server with an Intel 64-Bit processor (IA-64), see the README in the PCI-X HBA EFI driver package, for instructions about how to load the EFI driver (instead of BIOS code) and update the NVRAM settings of the adapter.

Notes:

1. The recommended method of updating the BIOS and the adapter NVRAM settings is to use the QLogic SANsurfer Pro Utility software.

2. For the dual port version of the FC 4Gbps PCI-X Adapter, there is only one flash BIOS image for both ports; however, each port will have its own NVRAM setting.

Installing the QLogic SANsurfer Pro Utility

The installation files for the QLogic SANsurfer Pro Utility, for Microsoft Windows 2000 and Server 2003, Novell NetWare, or Linux platforms, can be found in either the *SANSurfer_FAStT-MSJ* folder on the DS4000 Storage Manager host software CD or in the downloadable Web package at the DS4000 Technical Support Web site, at www.ibm.com/servers/storage/support/disk/.

SANSurfer Pro Utility installation and system requirements

The SANSurfer Pro Utility installation and system requirements are found in the README files that come with the utility program.

Installing on Windows and Novell NetWare platforms

Note: If SANSurfer is already installed, uninstall it prior to installing a new copy.

To perform the SANSurfer Pro Utility installation Windows and Novell NetWare platforms, you must execute four steps.

1. Double-click on the executable installation file, which will have a name similar to *sansurfer2.0.30b62_windows_install-i.exe*, for example; then follow the on-screen instructions.
2. At the ″Choose Product Features″ screen, select either option *a.* or *b.* of the two preconfigured installation sets listed below; or, select ″Custom″ to define an installation set.
   a. ALL GUIs and ALL Agents to install the SANsurfer FC HBA Manager, the SANsurfer FC HBA Manager, and SANsurfer Switch Manager GUIs, including the FC and iSCSI (Windows, Linux, or Solaris) agents,

      or

   b. SANsurfer FC HBA Manager to install only the SANsurfer FC HBA Manager GUI.

      Notes:

      1) To install the Novell NetWare agent, you must select ″Custom″ and then select the ″SANsurfer FC Windows NT® 4/2000/2003 Agent″ box, when you are presented with the ″Choose Product Component″ window.

      2) Do not select the following installation sets unless they are applicable to your configuration. These functions are not supported by the DS4000 storage subsystem product support.
      - SANsurfer Switch Manager GUI, to install only the SANsurfer Switch Manager GUI. This option is for managing QLogic switches only.
      - iSCSI GUI and Agent, to install the SANsurfer iSCSI HBA Manager GUI, including the iSCSI (Windows, Linux, or Solaris) agent.
      - SANsurfer iSCSI HBA Manager, to install only the SANsurfer iSCSI HBA Manager (GUI, not the iSCSI (Windows, Linux, or Solaris) agent).

      Click ″Next.″
3. Choose the ″Destination Location.″ (The default is: <*Windows system drive*>:\Program Files\QLogic Corporation\SANsurfer.)
4. If you are installing the SANSurfer NetWare Agent, the installation will display a ″Choose Destination Location″ screen. Use the ″Browse″ button to point to the \SYSTEM directory on the NetWare *SYS* volume. The installer will automatically save the agent in the appropriate NetWare volume.

> **Note:** Remember, the drive letter must be mapped to the root of the NetWare *SYS* volume.

5. When you are prompted to enable the QLogic failover configuration, do *not* enable it. (IBM recommends the use of the RDAC multipath driver as the DS4000 LUN failover/failback driver, in a Microsoft Windows environment or the Novell NetWare native multipath device driver in a NetWare environment.)

   The following are known limitations.

   - The DS4000 storage products do not support the use of SANSurfer to configure failover and failback paths or IO load balancing for the DS4000 storage subsystem logical drives (LUNs) using the QLogic failover version (QLDirect) of the FC HBA device driver in Microsoft Windows environments. IBM only supports the use of DS4000 RDAC multipath device driver in conjunction with the non-failover version of the QLogic FC HBA device driver.

   - The DS4000 storage products do not support the use of LUN masking or HBA configuration wizard/functions; neither do the DS4000 storage products support non-Fibre Channel HBA functions, such as QLogic SANSwitch or iSCSI HBA functions.

   - The QLogic SANSurfer Pro Utility program (formerly known as IBM FAStT MSJ program) must not be left installed on X64 servers with Microsoft Windows Server 2003 64-Bit edition, while the servers are running IOs to DS4000 storage subsystems. Install the QLogic SANSurfer® Pro Utility program if you need to perform FC HBA updates or diagnostics; then, uninstall it immediately after you have completed these tasks.

   - There is no 64-Bit version of the QLogic SANSurfer Pro Utility program (formerly known as FAStT MSJ) for Windows Server 2003 IA64 or x64 editions. You must use the 32-Bit version of the QLogic SANSurfer Pro Utility program for the Windows Server 2003 64-Bit edition. Uninstall the QLogic SANSurfer Pro Utility program when the diagnostics are complete; otherwise, the program could cause the server to crash in heavy IO loads.

   > **Note:** For information about other possible program limitations, please see the README file.

If you have questions about installing the QLogic SANsurfer Pro Utility, please see the README file, which may have a name, for example, like *readme_SANsurfer_FAStMSJ_win32_NW.txt*.

Installing on the Linux platform

> **Note:** If SANSurfer is already installed, uninstall it prior to installing a new copy.

GUI installation

To perform the SANSurfer Pro Utility installation on a Linux platform, you must execute four steps.

1. Open a shell (command prompt), and change to the directory that contains the installation file, which might for example, be named *sansurfer2.0.30b62_linux_install-i.bin*.

2. At the prompt, type the command to start the program installation wizard.

   `sh ./program_name`

   where, *program_name* is

   `sansurfer2.0.30b62_linux_install-i.bin`

3. At the ″Choose Product Features″ screen, select either option *a.* or *b.* of the two preconfigured installation sets listed below; or, select ″Custom″ to define an installation set.

   a. ALL GUIs and ALL Agents to install the SANsurfer FC HBA Manager, the SANsurfer FC HBA Manager, and SANsurfer Switch Manager GUIs, including the FC and iSCSI (Windows, Linux, or Solaris) agents,

      or

   b. SANsurfer FC HBA Manager to install only the SANsurfer FC HBA Manager GUI.

      • SANsurfer Switch Manager GUI, to install only the SANsurfer Switch Manager GUI. This option is for managing QLogic switches only.

      • iSCSI GUI and Agent, to install the SANsurfer iSCSI HBA Manager GUI, including the iSCSI (Windows, Linux, or Solaris) agent.

      • SANsurfer iSCSI HBA Manager, to install only the SANsurfer iSCSI HBA Manager (GUI, not the iSCSI (Windows, Linux, or Solaris) agent).

        Note: Do not select the following installation sets unless they are applicable to your configuration. These functions are not supported by the DS4000 storage subsystem product support.

        – SANsurfer Switch Manager GUI, to install only the SANsurfer Switch Manager GUI. This option is for managing QLogic switches only.

        – iSCSI GUI and Agent, to install the SANsurfer iSCSI HBA Manager GUI, including the iSCSI (Windows, Linux, or Solaris) agent.

        – SANsurfer iSCSI HBA Manager, to install only the SANsurfer iSCSI HBA Manager (GUI, not the iSCSI (Windows, Linux, or Solaris) agent).

      Click ″Next.″

4. QLogic SANsurfer installs in the */opt/QLogic_Corporation/SANsurfer* directory. The launch script is located in the */usr* directory. The *qlremote* is installed in the */usr/local/bin* directory.

5. When you are prompted to enable the QLogic failover configuration, do *not* enable it. (IBM recommends the use of the RDAC multipath driver, as the DS4000 LUN failover/failback driver, in a Linux environment.)

   The following are known limitations.

   • The DS4000 storage products do not support the use of SANSurfer to configure failover and failback paths or IO load balancing for the DS4000 storage subsystem logical drives (LUNs) using the QLogic failover version (QLDirect) of the FC HBA device driver in a Linux environment. IBM only supports the use of DS4000 RDAC multipath device driver in conjunction with the non-failover version of the QLogic FC HBA device driver.

   • The DS4000 storage products do not support the use of LUN masking or HBA configuration wizard/functions: neither do the DS4000 storage products support non-Fibre Channel HBA functions, like QLogic SANSwitch or iSCSI HBA functions.

   Note: For information about other possible program limitations, please see the README file.

If you want to perform a command-line installation of the QLogic SANsurfer Pro Utility, or a command-line installation of only the *qlremote* agent, or if you have

questions about the installation, please see the instructions in the
readme_SANsurfer_FAStMSJ_Linux_IA32.txt file.

Using the QLogic SANsurfer Pro Utility

This section provides an overview of the QLogic SANsurfer Pro Utility program.
Experienced users can use this program to customize the configuration of the FC
4Gbps PCI-X Adapter when it is installed in a server.

QLogic SANsurfer Pro Utility overview

The SANsurfer Pro Utility program is used to manage the IBM FC 4Gbps and
2Gbps PCI-X Adapters (FC HBAs) in a storage area network (SAN). It is a
network-capable application that can connect to and configure FC 4Gbps PCI-X
Adapters in remote servers, enabling centralized management and configuration of
an entire SAN containing components and storage devices.

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

You can also perform the following operations:

Disable (unconfigure) a device on a host bus adapter
>   When a device is set as unconfigured, it is not recognized by the adapter
    and is not accessible to the adapter on that server.

Enable a device
>   This operation adds a device and makes it accessible to the adapter on that
    system.

Note: The diagnostic functions of the SANsurfer Pro Utility program are available
for all supported operating systems.

SANsurfer Pro Utility features

Use the SANsurfer Pro Utility program to perform the following tasks:
- Set the SANsurfer Pro Utility program options
- Connect to hosts for managing FC 4Gbps PCI-X Adapters installed in the hosts
- Disconnect from a host
- View detailed event and alarm-log information
- Use host-to-host SAN configuration policies
- Configure port devices
- Use logical unit number (LUN) level configuration
- Monitor in real time to determine when failovers occur, using the Failover
  Watcher
- Control host-side agent operations, including setting of the host agent polling
  interval
- Review host adapter information, including:
  - General information
  - Statistics
  - Information about attached devices

- Link status for attached device
- Perform adapter functions, including:
  - Configuring the adapter NVRAM settings
  - Executing fibre diagnostics (read/write buffer loopback tests)
  - Performing flash updates on an adapter
  - Performing NVRAM updates on an adapter
- Manage configurations:
  - Save configurations for offline policy checks and SAN integrity
  - Load configurations from a file if the host is offline for policy checks and SAN integrity
- Confirm security

SANsurfer Pro utilities

Within the SANsurfer Pro Utility program, there are other utilities that you can use to update I/O expansion card firmware and perform adapter-level configurations on a host-connected adapter. Please refer to the online help for more information.

Notes:

1. Not all features of the SANsurfer program are supported for all supported operating systems. Please refer to the operating system-specific README file for information about possible program limitations.
2. If you are prompted for a password, the default password is *config*.

The steps listed in the "Using SANsurfer Pro Update Option ROM Utility to update the BIOS" section are generally the correct steps needed to update the NVRAM BIOS; however, these steps might not be exact, taking into account all of the possible program windows that could be displayed in an exact sequence. Also, if you are using a newer version of the SANsurfer program, the steps might have a different sequence.

Using SANsurfer Pro Update Option ROM Utility to update the BIOS

Use the Update Option ROM Utility in the SANsurfer Pro Utility program to update the adapter BIOS code. The latest version of 4Gbps Fibre Channel Adapter BIOS code is available from http://www-1.ibm.com/servers/storage/support/disk/. The BIOS code file is a binary (*.bin*) file; for example, *q24mfxxx.bin*.

To update the flash BIOS firmware, complete the following steps:

1. Make sure that the device drivers for the FC 4Gbps PCI-X Single/Dual Port HBA (PCI-X) Adapters are installed on the host containing the adapters; if the correct device drivers are not installed on the host where the adapters reside, the SANsurfer program will not list the FC 4Gbps PCI-X adapters. If the server where the SANsurfer program is installed is *not* the host server containing the FC 4Gbps PCI-X Adapters, make sure that the SANsurfer agent is installed on the host server and that the host server's Ethernet port is in the same IP subnet as the server where the SANsurfer program *is* installed.
2. Double-click the SANsurfer Pro Utility program icon to start the SANsurfer Pro Utility application.
3. When the Connect to Host window is displayed, click "Connect," to connect to the preferred host.
4. Next, a configuration wizard window displays, asking you to start the wizard. Click "No," and the configuration wizard window closes.

5. In the SANsurfer FC HBA window, in the ″FC HBA″ tab on the left pane, select the port under the newly installed FC 4Gbps PCI-X Adapters; the ″Information″ tab in the right pane displays all the information about the new adapters.

6. In the row of tabs at the top of the right pane in the SANsurfer program window, click on the ″Utilities″ tab. Then, in the center of the Utilities information pane you will find seven buttons: click on the ″Update Option ROM″ button. This will start the BIOS update. Select the appropriate BIOS file and click ″OK,″ when you are prompted to enter the file name of the new BIOS firmware.

7. When the BIOS has been updated, the Option ROM Save window displays. Click ″OK″ to save the changes.

8. Repeat Steps 5 through 7 to update the BIOS for other FC HBAs in the host server. Reboot the server if you have completed the updates; or, proceed to the "Using the SANsurfer Pro Update NVRAM Utility to update the NVRAM" section, if you want to update the adapter NVRAM.

Important: Because there is only one BIOS image per adapter, the Update Option ROM button will not be enabled when you select the second port of a dual port FC 4Gbps PCI-X Adapter.

Using the SANsurfer Pro Update NVRAM Utility to update the NVRAM

Use the Update NVRAM Utility in the SANsurfer Pro Utility program to update the adapter NVRAM firmware. The latest version of 4Gbps Fibre Channel Adapter NVRAM firmware is available from http://www-1.ibm.com/servers/storage/support/disk/. The NVRAM firmware file is a data (*.dat*) file; for example, *nvram200.dat*.

To update the NVRAM firmware, complete the following steps:

1. Make sure that the device drivers for the FC 4Gbps PCI-X Single/Dual Port HBA (PCI-X) Adapters are installed on the host containing the adapters; if the correct device drivers are not installed on the host where the adapters reside, the SANsurfer program will not list the new adapters. If the server where the SANsurfer program is installed is *not* the host server containing the new adapters, make sure that the SANsurfer agent is installed on the host server and that the host server's Ethernet port is in the same IP subnet as the server where the SANsurfer program *is* installed.

2. Double-click the SANsurfer Pro Utility program icon to start the SANsurfer Pro Utility application.

3. When the Connect to Host window is displayed, click ″Connect,″ to connect to the preferred host.

4. A configuration wizard window displays, asking you to start the wizard. Click ″No,″ and the configuration wizard window closes.

5. In the SANsurfer FC HBA window, in the ″FC HBA″ tab on the left pane, select the port under the newly installed FC 4Gbps PCI-X Adapters; the ″Information″ tab in the right pane displays all the information about the new adapters.

6. In the center of the Utilities information pane you will find three buttons: click on the ″Update NVRAM″ button.

7. You are then prompted to enter the file name for the new NVRAM firmware update.

8. Enter the file name of the NVRAM firmware update. Click ″OK″ to complete the update, or click ″Cancel″ to cancel the update.

When you click ″OK,″ the SANsurfer Pro Utility program verifies the content of the new file and updates the firmware. If the firmware update fails, an error message displays.

Important:

1. Because there are two NVRAM setting areas per dual port FC 4Gbps PCI-X Adapter (one NVRAM setting area for each port), you must select each of the ports separately and perform the NVRAM update for each port, provided you want to update the NVRAM settings on both ports.

2. Updating the NVRAM firmware resets all of the NVRAM settings to the default. After updating the NVRAM firmware, you must reenter all custom configuration settings required for your specific operating system.

Updating the FC 4Gbps PCI-X Adapter BIOS code using the Support CD or a BIOS Update Utility diskette

You can also update the FC 4Gbps PCI-X Adapter BIOS code using the Support CD that is shipped with the adapter, or you can create a BIOS Update Utility diskette from the Support CD (see the "Creating the FC 4Gbps PCI-X Adapter BIOS Update Utility diskette" on page 21 section).

Whether you want to use the Support CD or the BIOS Update Utility diskette, just follow the instructions in the common sections, "Using the flasutil command prompt" or "Using the flasutil BIOS Update Utility menu" on page 20. Some of the steps in the common sections will be designated for using either the CD or the diskette and will be appropriately labeled CD or Diskette.

To update the DS4000 FC 4Gbps PCI-X Adapter BIOS code and NVRAM using the BIOS Update Utility on the Support CD, choose one of the following methods:

- flasutil command prompt. Use this method to type in command-line options.
- flasutil BIOS Update Utility menu. Use this method to select a command-line option from the menu.

Using the flasutil command prompt

Complete the following steps to update your DS4000 FC 4Gbps PCI-X Adapter BIOS code and NVRAM, using the flasutil command prompt.

1. CD: Insert the *IBM System Storage DS4000 FC 4Gbps PCI-X Host Bus Adapter Support* CD into the CD-ROM drive. Restart the server. Your server starts to a DOS prompt.

   Diskette: Insert the BIOS Update Utility diskette that you created into the diskette drive and restart the server. Your server starts to a DOS prompt.

2. To update the BIOS code in the flash utility, do the following:

   From the DOS prompt, type:

   `flasutil /i /FB xxxx /o BiosFirmwarefile.bin`

   where

   `BiosFirmwarefile.bin`

   is the name of the BIOS firmware file (if the BIOS firmware file name is omitted, flasutil will look for a firmware file named, *ql24rom.bin*), and xxxx is the adapter address. If xxxx is omitted, then the program will attempt to flash all of the adapters in the host with this firmware file.

   Press "Enter."

   Caution: If the */FB* option is not specified when attempting to flash the FC 4Gbps PCI-X Adapter BIOS, the BIOS image will not be correctly flashed into the adapter's BIOS area.

3. The flasutil program will display the existing version of the BIOS, the newer BIOS version, and a message telling you if the update was successful or unsuccessful.

The following output example resembles the output you might see upon execution of the `flasutil /i /FB xxxx /o BiosFirmwarefile.bin` command, where, for this example, `2300` is substituted for `xxxx`.

```
QLogic NOVRAM and FLASH Programming Utility Version 1.55
Copyright (C) QLogic Corporation 1998-2005. All rights reserved.


    Current version of QLA2462 flash BIOS at I/O Address 2300 is 1.04
    New version of QLA2462 flash BIOS at I/O Address 2300 is 1.09
    Programming QLA2462 flash at I/O Address 2300
    Verifying QLA2462 flash at I/O Address 2300
    Flash at I/O Address 2300 Verified Successfully
    Programming rest of 1 meg flash at I/O Address 2300
    ...
    Flash at I/O Address 2300 Programmed Successfully

C:\
```

Note: For the `flasutil /i /FB 2400 /o Biosfirmwarefile.bin` command, where 2400 is the I/O address of the second port of a dual port FC 4Gbps PCI-X Adapter, there is no update status due to there being only one BIOS area per adapter. This BIOS area is referred to via the I/O address of the first port of a dual port FC 4Gbps PCI-X Adapter.

The following output example resembles the output you might see upon execution of the `flasutil /i /FB 2400 /o Biosfirmwarefile.bin` command.

```
QLogic NOVRAM and FLASH Programming Utility Version 1.55
Copyright (C) QLogic Corporation 1998-2005. All rights reserved.

C:\
```

4. To update the NVRAM, do the following:

From the DOS prompt, type:

```
flasutil /i /l xxxx /n NVRAMfile.DAT
```

where `NVRAMfile.DAT` is the name of the NVRAM setting file (there must also be a companion file with the same NVRAM file name, having the *.def* file extension, instead of the *.dat* file extension. If the NVRAM setting file name is omitted, flasutil will look for NVRAM files with the following names; *nvram24.dat* and *nvram24.def*), and xxxx is the adapter address. If xxxx is omitted, then the program will attempt to flash all of the adapters in the host with this NVRAM file.

Press "Enter."

Note: If this is a dual port adapter and the adapter address is specified, you need to run this command twice (using both port addresses) to update the NVRAM on both ports.

5. Press "Enter."

6. The flasutil program will display the existing version of the NVRAM, the newer NVRAM version, and a message telling you if the update was successful or unsuccessful.

7. To update the standard NVRAM defaults in the adapter to the new defaults from the NVRAM files, do the following:

At the DOS prompt, type:

```
flasutil /i /u xxxx
```

where xxxx is the adapter address. If xxxx is omitted, then the program will attempt to change (on all of the adapters in the host) the standard NVRAM defaults in the adapter, to the new defaults from the NVRAM files.

8. Press "Enter."

9. The flasutil program will display the existing version of the NVRAM, the newer NVRAM version, and a message telling you if the update was successful or unsuccessful.

The following output example resembles the output you might see upon execution of the `flasutil /i /u xxxx /n NVRAMfile.DAT` command, where, for this example, 2300 is substituted for xxxx.

```
QLogic NOVRAM and FLASH Programming Utility Version 1.55
Copyright (C) QLogic Corporation 1998-2005. All rights reserved.

   Programming QLA2422 NOVRAM at Address 2300
   NOVRAM at Address 2300 Loaded Successfully
   Updating flash at I/O Address 2300
   Verifying flash at I/O Address 2300
   Flash at I/O Address 2300 Verified Successfully

C:\
```

10. To update the FC 4Gbps PCI-X Adapter BIOS version number, type

```
vpd /a /u
```

and press "Enter."

Note: IBM does not support any `vpd` program options, other than `/a` and `/u`.

The following output example resembles the output you might see upon execution of the `vpd /a /u` command.

```
Processing all adapters...
   2422 at address 2300  [1077.2422.1077.0134.0]
   Reading vpd from nvram...
   Reading versions from flash...
   Updating vpd in nvram...
   Verifying...
   Verify passed
   2422 at address 2400  [1077.2422.1077.0134.1]
   Reading vpd from nvram...
   Reading versions from flash...
   Updating vpd in nvram...
   Verifying...
   Verify passed

C:\
```

Note: This example shows what would be displayed when there is one QLA2462 adapter installed in the server, with port I/O addresses 2300 and 2400.

11. To review additional command-line options that you can use, go to "Command-line options"; then, continue with Step 12.

12. CD: Remove the CD from the CD-ROM drive and restart the server.

Diskette: Remove the diskette from the diskette drive and restart the server.

13. Go to "Installing the FC 4Gbps PCI-X Adapter device drivers" on page 9.

Command-line options

This section describes additional command-line options that you can use. Complete the following steps to review these command-line options:

1. At the DOS prompt, type:

   ```
   flasutil /?
   ```

2. Press "Enter."

   The following command-line options display:

   ```
   /L xxxx = Write NOVRAM to adapter address xxxx
            If no address specified then write NOVRAM to all adapters
   /F xxxx = Write Flash to adapter, adapter address = xxxx
   /FR xxxx = Write ISP2322/6322 Risc Code to Flash , adapter address = xxxx
   /FB xxxx = Write MultiFlash image to adapter, adapter address = xxxx
            If no address specified then write Flash to all adapters
   /D xxxx = Copy NOVRAM to file: QLxxNVR.SAV, adapter address = xxxx
   /W xxxx = Copy Flash to file: QLxxROM.SAV, adapter address = xxxx
   /U xxxx = Update Bios NOVRAM defaults, adapter address = xxxx
            If no address specified then Update all adapters
   /N <filename.ext> = Use <filename.ext> instead of NVRMxx.DAT
   /O <filename.ext> = Use <filename.ext> instead of QLxxROM.BIN
   /I      = Ignore Subsystem ID
   /M      = Program all adapters
   /Q      = Quiet Mode, no messages will be displayed
   /S xxxx = Display serial number of adapter at address xxxx
            If no address specified then display serial number of all adapters
   /V xxxx = Display current version number of BIOS on adapters at address xxxx
            If no address specified then display BIOS version of all adapters
   /C xxxx = Verify Flash of adapter at address xxxx
            If no address specified then verify Flash of all adapters
   /X xxxx = Verify NOVRAM of adapter at address xxxx
            If no address specified then verify NOVRAM of all adapters
   /Y xxxx = Display Port Name of adapter at address xxxx
            If no address specified then display Port Name of all adapters
   ```

Notes:

1. All of the options listed are supported and you can run them from the command-line. Options /L, /D, /U, /N, /T, and /X might not display.

2. **Caution:** Do not use the /F or /FR options to update the FC 4Gbps PCI-X Adapter BIOS (Flash). The /F option is used for updating the BIOS of the IBM FC2 or FC2-133 2 Gb Host Bus Adapters, only.

The following list describes examples of additional command-line options that you can use.

- To write NVRAM to all FC 4Gbps PCI-X Adapters in a system, without being prompted for an I/O address, type:

  ```
  flasutil /L
  ```

  Press "Enter."

- To save the existing flash code of the adapter at I/O address F600 to file *ql24rom.sav*, type:

  ```
  flasutil /W F600
  ```

  Press "Enter."

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

  ```
  flasutil /L f400
  ```

  Press "Enter."

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

  ```
  flasutil /L f800 /FB f800
  ```

  Press "Enter."

- To write NVRAM and flash all adapters, type:

  ```
  flasutil /L /FB
  ```

  Press "Enter."

- To update BIOS NVRAM defaults, type:

  ```
  flasutil /U
  ```

  Press "Enter."
- To verify NVRAM in all adapters, type:

  ```
  flasutil /X
  ```

  Press "Enter."

Using the flasutil BIOS Update Utility menu

Complete the following steps to update the DS4000 FC 4Gbps PCI-X Adapter BIOS code, using the flasutil BIOS Update Utility menu:

1. CD: Insert the *IBM System Storage DS4000 FC 4Gbps PCI-X Host Bus Adapter Support* CD into the CD-ROM drive. Restart the server. Your server starts to a DOS prompt.

   Diskette: Insert the BIOS Update Utility diskette into the diskette drive and restart the server. Your server starts to a DOS prompt.

2. From the DOS prompt, type:

   ```
   flasutil
   ```

3. Press "Enter."

4. If you have only one adapter installed, go to Step 5. If you have more than one adapter installed, a list of adapters and I/O addresses displays. At the command prompt, type the appropriate I/O address and press "Enter."

5. The following option menu displays.

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

   Notes:

   a. All of the listed options are supported and can be run from the command-line. Options L, A, D, U, and X might not display.

   b. **Caution:** Do not use the F or FR options to update the FC 4Gbps PCI-X Adapter BIOS (Flash). The /F option is used for updating the BIOS of the IBM FC2 or FC2-133 2 Gb Host Bus Adapters, only.

   c. Each adapter can be configured with more than one option.

   d. Because there is only one BIOS (Flash) area in a dual port FC 4Gbps PCI-X Adapter, entering option FB for the second port I/O address of a dual port adapter, will result in command completion with no BIOS status message displayed.

6. Type the letter for the option you want and press "Enter."

7. If you have additional adapters installed, or if you want to configure your adapter with more than one option, continue with Step 8; otherwise, go to Step 9.

8. Repeat Steps 2 through 6 for each additional adapter or if you want to configure your adapter with more than one option.
9. CD: Remove the CD from the CD-ROM drive and restart the server.

   Diskette: Remove the diskette from the disk drive, and restart the server.
10. Go to "Installing the FC 4Gbps PCI-X Adapter device drivers" on page 9.

Creating the FC 4Gbps PCI-X Adapter BIOS Update Utility diskette

If you cannot use the 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.

Note: For a Novell NetWare environment, you will need to unpack the BIOS Update Utility diskette using a server that is running a Microsoft® Windows® 2000 or Linux® operating system.

Creating the diskette

Create the BIOS Update Utility diskette by copying the image you need from the *IBM System Storage DS4000 PCI-X Host Bus Adapter Support* CD or by downloading the image from the http://www-1.ibm.com/servers/storage/support/disk/ Web site.

For Microsoft Windows 2000 or Server 2003

Complete the following steps to create a BIOS Update Utility diskette for Microsoft® Windows® 2000 or Server 2003 from the *IBM System Storage DS4000 FC 4Gbps PCI-X Host Bus Adapter Support* CD:

1. Insert the *IBM System Storage DS4000 PCI-X Host Bus Adapter Support* CD into the CD-ROM drive.
2. Insert a diskette into the diskette drive.
3. At the command prompt, type:

   ```
   d:\tools\dsk4w32 d:\images\biosnvrm\24xx\246x_xxx.img a:
   ```

   Where *d* is the CD-ROM drive and *a* is the diskette drive.
4. Press "Enter."
5. Remove the *IBM System Storage DS4000 PCI-X Host Bus Adapter Support* CD from the CD-ROM drive.
6. Remove the diskette from the diskette drive and label the diskette appropriately.

For Linux

Complete the following steps to create a BIOS Update Utility diskette for Linux from the *IBM System Storage DS4000 PCI-X Host Bus Adapter Support* CD:

1. Insert the *IBM System Storage DS4000 PCI-X Host Bus Adapter Support* CD into the CD-ROM drive and restart the server.
2. Insert a diskette into the diskette drive.
3. At the command prompt, type:

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

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

   ```
   dd if=/mnt/images/biosnvrm/24xx/246x_xxx.img of=/dev/diskettedevicefile bs=32
   ```
6. Press "Enter."
7. Unmount the CD-ROM by typing:

```
unmount /mnt
```

8. Remove the *IBM System Storage DS4000 PCI-X Host Bus Adapter Support* CD from the CD-ROM drive.

9. Remove the diskette from the diskette drive and label the diskette appropriately.

10. To update the DS4000 FC 4Gbps PCI-X Adapter BIOS code and NVRAM using the BIOS Update Utility from the diskette, choose one of the following methods:

    - flasutil command prompt. Use this method to type in command-line options.
    - flasutil BIOS Update Utility menu. Use this method to select a command-line option from the menu.

Chapter 3. Configuring the FC 4Gbps PCI-X Adapter with Fast!UTIL

This chapter provides detailed configuration information for advanced users who want to customize the configuration of the FC 4Gbps PCI-X Adapter and the connected fibre-channel devices. You can configure the adapter using the Fast!UTIL utility.

Starting Fast!UTIL

Important: If the configuration settings are incorrect, the FC 4Gbps PCI-X Adapter will not function properly. Do not modify the default configuration settings unless you are instructed to do so by an IBM technical support representative or by the installation instructions. The default NVRAM settings, which were loaded in the adapter at the factory, are for a typical Microsoft Windows installation. See the FC 4Gbps PCI-X Adapter device driver README file for the appropriate operating system to determine the required NVRAM setting modifications for that operating system.

Note: The recommended way to update the BIOS and the adapter NVRAM settings is to use the QLogic SANsurfer Pro Management Suite Java™ software, which can be downloaded from the following Web site:

http://www-1.ibm.com/servers/storage/support/disk/. Also see "Using the QLogic SANsurfer Pro Utility" on page 13

When the adapter is installed in the server with an Intel 32-Bit processor (IA-32), an Intel Extended Memory 64-Bit Technology (EM64T) processor, or an Advanced Micro Devices 64-Bit (AMD-64) architecture only, you can access Fast!UTIL by pressing Ctrl+Q during the BIOS initialization; it might take a few seconds for the Fast!UTIL menu to display. Fast!UTIL prompts you to select the adapter that you want to configure. After you change the settings that are described in "Host bus adapter settings" on page 24, Fast!UTIL restarts the system to enable the new parameters. When the adapter is installed in a server with an Intel 64-Bit processor (IA-64), see the README in the DS4000 FC 4Gbps PCI-X HBA EFI driver package, for instructions about how to modify the NVRAM adapter settings, or use the QLogic SANsurfer Pro Management Suite Java software to modify the NVRAM settings.

Accessing HBA settings through Fast!UTIL

The Fast!UTIL feature provides access to host bus adapter settings. To access this feature, simultaneously press and hold the ALT + Q keys or the Ctrl + Q keys during BIOS initialization. It may take a few seconds for the Fast!UTIL menu to appear. If more than one board is installed, Fast!UTIL prompts you to select a board to configure. After you change adapter settings, Fast!UTIL reboots your system to load the new parameters. Upon entering Fast!UTIL, the following selections are available on the Fast!UTIL Options menu:

- Configuration Settings
- Scan Fibre Devices
- Fibre Disk Utility
- Loopback Test
- Select Host FC 4Gbps PCI-X Adapter

- Exit FASt!UTIL

You can access the host bus adapter settings through the Configuration Settings menu in Fast!UTIL. See "Host bus adapter settings" and"Advanced FC 4Gbps PCI-X Adapter Settings" on page 25 for detailed information on the settings.

Host bus adapter settings

You can modify most of the host bus adapter settings. The current default settings for the host bus adapter are listed in "Advanced FC 4Gbps PCI-X Adapter Settings" on page 25. These settings are described following the table. You can modify the following default host bus adapter settings.

BIOS address

The BIOS address is the I/O address where the BIOS code is stored when you press Ctrl+Q or when you have the BIOS code enabled for starting from the root directory. This is the address of the BIOS code in ROM shadow memory. Multiple adapters can be installed in the server, but only one BIOS instance is loaded for all of the adapters.

Note: The BIOS code is loaded from the first port of the first adapter that the server recognizes. This code is used for all remaining DS4000 FC 4Gbps PCI-X Single Port and DS4000 FC 4Gbps PCI-X Dual Port adapters in the same bus or server. The level of BIOS code that is loaded does not affect other adapters with earlier BIOS code levels.

Revision

The BIOS revision is the revision number of the BIOS code that is loaded from the first FC 4Gbps PCI-X Adapter that the server recognizes. Each FC 4Gbps PCI-X Adapter in the server has the same BIOS code revision number because only one BIOS code instance is loaded.

FC 4Gbps PCI-X Adapter serial number

The adapter serial number is located on the noncomponent side of the adapter. See Figure 1 on page 3 for the location of the serial number label.

Interrupt level

The interrupt level is the interrupt that is used by the FC 4Gbps PCI-X Adapter. The interrupt level can change when the operating system is installed.

FC 4Gbps PCI-X Adapter port name

This is the worldwide port name.

Host adapter BIOS

When this setting is `Disabled`, the ROM BIOS on the FC 4Gbps PCI-X HBA is Disabled, freeing space in upper memory. This setting must be Enabled if you are booting from fibre channel disk drive attached to the PCI-X board. The default is Disabled.

Frame size

This setting specifies the maximum frame length supported by the FC 4Gbps PCI-X HBA. The default size is 2048, which provides maximum performance for F-Port (point-to-point) connections.

Loop reset delay

After resetting the loop, the firmware refrains from initiating any loop activity for the number of seconds specified in this setting. The default is 5 seconds.

FC 4Gbps PCI-X Adapter hard loop ID
  This setting forces the adapter to attempt to use the ID specified in the Hard Loop ID setting. The default is Disabled.

Hard loop ID
  If the FC 4Gbps PCI-X Adapter Hard Loop ID setting is Enabled, the adapter attempts to use the ID specified in this setting. The default ID is 0. You should set this ID to a unique value from 0-125 if there is more than one adapter connected to a FC-AL loop, and the FC 4Gbps PCI-X Adapter Hard Loop ID setting is Enabled.

Spin up delay
  When this bit is set, the BIOS will wait up to 5 minutes to find the first drive. The default setting is Disabled.

Connection Options
  This setting defines the type of connection (loop or point to point) or connection preference. The default is 2.

Fibre Channel Tape Support
  This setting enables FCP-2 recovery. The default is Disabled. You should change this setting to Disabled if the HBA is connected to a DS4000 storage server. The DS4000 storage server does not support a tape device through the same Fibre-Channel HBA from the host server.

Data Rate
  This setting determines the data rate. When this setting is 0, the FC 4Gbps PCI-X HBA runs at 1Gbps. When this setting is 1, the FC 4Gbps PCI-X HBA runs at 2Gbps. When this setting is 2, Fast!UTIL determines what rate your system can accommodate and sets the rate accordingly. The default is 2 (auto-configure). When the setting is 3, the FC 4Gbps PCI-X HBA runs at 4Gbps.

Table 4. FC 4Gbps PCI-X HBA data rates

Bits 15–13 (h)	Data rate
0	1 gigabit/second
1	2 gigabits/second
2	Auto-negotiated
3	4 gigabits/second
4–7	Reserved

Advanced FC 4Gbps PCI-X Adapter Settings

Access the following advanced host bus adapter settings through the Configuration Settings menu in Fast!UTIL and select Advanced FC 4Gbps PCI-X Adapter Settings. The default settings for the FC 4Gbps PCI-X HBA are as follows:

Execution Throttle
  This setting specifies the maximum number of commands executing on any one port. When the execution throttle of a port is reached, no new commands are executed until the current command finishes executing. The valid options for this setting are 1-256. The default is 256.

LUNs per Target
  This setting specifies the number of LUNs per target. Multiple LUN support is typically for redundant array of independent disks (RAID) servers that use LUNs to map drives. The default is 256.

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 setting is Yes, the driver initiates a global LIP reset to clear the target device reservations. When this setting is No, the driver initiates a global LIP reset with full login. The default is No.

Enable LIP Full Login

This setting instructs the ISP chip to log in again to all ports after any LIP. The default is Yes.

Enable Target Reset

This setting enables the 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 in to a device. The default is 30 retries for Microsoft Windows Operating System environment. Please review the device driver README for the correct setting in other operating system environments.

Port Down Retry Count

This setting specifies the number of seconds that the software waits before it retries a command to a port returning port down status. The default is 30 seconds. In a DS4000 storage server configuration with the maximum number of drive expansion enclosures or in MCSC configurations, you should increase this setting to 70.

Link Down Timeout

This setting specifies the number of seconds the software that the software waits for a link down to come up. The default is 30 seconds.

Extended Error Logging

This setting provides additional error and debug information to the operating system. When enabled, events are logged into the Windows Event Viewer. The default is Disabled.

Operation Mode

This setting specifies the reduced interrupt operation (RIO) modes, if supported by the software driver. RIO modes allow posting multiple command completions in a single interrupt. The default is 0.

Interrupt Delay Timer

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

Selectable boot settings

When you set the Selectable Boot Settings option to Enabled, you can select the worldwide port name of the fibre-channel hard disk from which you want to start up (boot). When this option is set to Enabled, the node starts from the selected fibre-channel hard disk, ignoring any IDE or SCSI hard disks that are 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 start up, which supersedes the Fast!UTIL selectable start up setting. To start from a fibre-channel

hard disk that is attached to the DS4000 FC 4Gbps PCI-X, select the attached fibre-channel hard disk from the system BIOS menu.

Note: The Selectable Boot Settings option for the DS4000 FC 4Gbps PCI-X applies to only fibre-channel hard disk drives.

Restore default settings

You can use the Restore Default Settings option to restore the DS4000 FC 4Gbps PCI-X default settings and NVRAM.

The default NVRAM settings are the adapter settings that were saved the last time an NVRAM update operation was run from the BIOS Update Utility program (option U or command line /U switch). If the BIOS Update Utility program has not been used to update the default NVRAM settings since the adapter was installed, the factory settings are loaded.

Note: After selecting Restore default settings, check the NVRAM settings (for example the host bus adapter and advanced adapter settings) against the values that are recommended in this document and in the device driver READMEs for the appropriate operating system.

Raw NVRAM data

You can use the Raw NVRAM Data option to display the adapter NVRAM contents in hexadecimal format. This is a troubleshooting tool. You cannot modify the data.

Scan fibre-channel devices

You can use the Scan Fibre Channel Devices 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 DS4000 FC 4Gbps PCI-X and attached devices.

Fibre-channel disk utility

Attention: When you perform a low-level format, it removes all data on the disk.

You can use the Fibre Channel Disk Utility option to scan the fiber-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 or data.

Loopback data test

You can use the Loopback Data Test option to verify the basic transmit and receive functions of the adapter. A fiber-channel loopback connector option must be installed into the optical interface connector on the DS4000 FC 4Gbps PCI-X before starting the test.

Select host adapter

You can use the Select Host PCI-X Adapter option to select, configure, or view a specific adapter if you have multiple adapters in your system.

ExitFast!UTIL

After you complete the configuration, use the ExitFast!UTIL option to exit the menu and restart the system.

Chapter 4. FC 4Gbps PCI-X Adapter operating environment and specifications

This chapter contains the DS4000 FC 4Gbps PCI-X Adapter operating environment and specification information.

Table 5. FC 4Gbps PCI-X Adapter operating environment

Environment	Minimum	Maximum
Operating temperature	10° C (50° F)	35° C (95° F)
Storage temperature	-20° C (-4° F)	70° C (158° F)
Relative humidity (noncondensing)	8%	80%
Storage humidity (noncondensing)	5%	95%

Table 6. FC 4Gbps PCI-X Adapter specifications

Type	Specification
Host bus	Conforms to *PCI Local Bus Specification*, revision 2.3 and 3.0, *PCI-X Protocol Addendum to the PCI Local Bus Specification*, revision 2.0a, *PCI-X Electrical and Mechanical Addendum* (revision 2.0a) to the *PCI Local Bus Specification*, *PCI Bus Power Management Interface Specification* revision 1.1, *PCI Hot Plug Specification*, revision 1.0
PCI/PCI-X signaling environment	3.3V (mode 1) and 1.5V (mode 2) 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, 100 MHz, and 133 MHz • Support for 64-Bit PCI-X 2.0 bus at 266 MHz • Support for dual address bus cycles
Fibre Channel specifications	• Fiber-optic media (shortwave multimode 50 micron cable) • Bus transfer rate: 400MB per second maximum at half-duplex and 800MB per second maximum at full-duplex • Interface chip: ISP2422 (PCI-X QLA24xx 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 or PCI-X DMA controller, and integrated serializer/deserializer (SERDES) and electrical transceivers that can auto-negotiate a data rate of 4 GB per second
Host data transfer	64-Bit, bus-master DMA data transfers to 2112 MB per second

Table 6. FC 4Gbps PCI-X Adapter specifications (continued)

Type	Specification
RAM	RAM 1 M of SRAM supporting parity protection
BIOS ROM	BIOS ROM 1 M of flash ROM, field programmable
NVRAM	NVRAM 2 KB, field programmable
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 when operating at 1Gbps and 300 meters when operating at 2Gbps
Form factor	6.94 cm x 16.75 cm (2.731 in. x 6.60 in.)
Operating power	Less than 15 watts

Chapter 5. Troubleshooting

The following four types of installation problems might cause your DS4000 FC 4Gbps PCI-X Adapter to function incorrectly:

- Hardware problems
- Software 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.

Note: Additional troubleshooting and debugging procedures are available in the *IBM System Storage DS4000 Hardware Maintenance Manual* and *IBM System Storage DS4000 Problem Determination Guide* at http://www-1.ibm.com/servers/storage/support/disk/.

Hardware problems

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

- 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 FC 4Gbps PCI-X 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. The Fast!UTIL data-rate setting must match the speed of the device to which you are connected. See "Host bus adapter settings" on page 24.
- Verify that all peripheral devices are turned on. See "Fibre Channel problems" on page 32 for information about displaying attached Fibre Channel devices.
- Verify that the adapter is ServerProven™ for the server model in which the adapter is installed. Verify that the latest BIOS is installed in the server.

Software problems

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

- Verify that the correct device driver is installed.
- Verify that your adapter is at the correct BIOS version.
- Verify that you have the correct adapter NVRAM settings for your Storage Area Network (SAN) and operating system.

System configuration problems

To determine if your installation problem is caused by the system configuration, check your server to ensure that it is configured properly. For more information, see "Host bus adapter settings" on page 24.

> **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, 66 MHz or 133 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, perform the following tasks:

- 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.
- If your Fibre Channel switch supports zoning, make sure that your peripheral device is configured to the same switch zone as the FC 4Gbps PCI-X Adapter. For more information, refer to your Fibre Channel switch documentation.

In certain cases where the target device may not be able to auto-negotiate the Fibre-channel data rate properly, make sure that data rate setting on the FC 4Gbps PCI-X HBA matches the target device. For example, if the target device is operating at 2Gbps, set the FC 4Gbps PCI-X HBA data rate to 2Gbps.

Appendix A. Accessibility

This section provides information about alternate keyboard navigation, which is a DS4000 Storage Manager accessibility feature. Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

By using the alternate keyboard operations that are described in this section, you can use keys or key combinations to perform Storage Manager tasks and initiate many menu actions that can also be done with a mouse.

Note: In addition to the keyboard operations that are described in this section, the DS4000 Storage Manager 9.14 software installation package for Windows includes a screen reader software interface. To enable the screen reader, select Custom Installation when using the installation wizard to install Storage Manager 9.14 on a Windows host/management station. Then, in the Select Product Features window, select Java Access Bridge in addition to the other required host software components.

Table 7 defines the keyboard operations that enable you to navigate, select, or activate user interface components. The following terms are used in the table:

- *Navigate* means to move the input focus from one user interface component to another.
- *Select* means to choose one or more components, typically for a subsequent action.
- *Activate* means to carry out the action of a particular component.

Note: In general, navigation between components requires the following keys:

- **Tab** - Moves keyboard focus to the next component or to the first member of the next group of components
- **Shift-Tab** - Moves keyboard focus to the previous component or to the first component in the previous group of components
- **Arrow keys** - Move keyboard focus within the individual components of a group of components

Table 7. DS4000 Storage Manager alternate keyboard operations

Short cut	Action
F1	Open the Help.
F10	Move keyboard focus to main menu bar and post first menu; use the arrow keys to navigate through the available options.
Alt+F4	Close the management window.
Alt+F6	Move keyboard focus between dialogs (non-modal) and between management windows.

Table 7. DS4000 Storage Manager alternate keyboard operations (continued)

Short cut	Action
Alt+ underlined letter	Access menu items, buttons, and other interface components by using the keys associated with the underlined letters.
	For the menu options, select the Alt + underlined letter combination to access a main menu, and then select the underlined letter to access the individual menu item.
	For other interface components, use the Alt + underlined letter combination.
Ctrl+F1	Display or conceal a tool tip when keyboard focus is on the toolbar.
Spacebar	Select an item or activate a hyperlink.
Ctrl+Spacebar (Contiguous/Non-contiguous) AMW Logical/Physical View	Select multiple drives in the Physical View.
	To select multiple drives, select one drive by pressing Spacebar, and then press Tab to switch focus to the next drive you want to select; press Ctrl+Spacebar to select the drive.
	If you press Spacebar alone when multiple drives are selected then all selections are removed.
	Use the Ctrl+Spacebar combination to deselect a drive when multiple drives are selected.
	This behavior is the same for contiguous and non-contiguous selection of drives.
End, Page Down	Move keyboard focus to the last item in the list.
Esc	Close the current dialog (does not require keyboard focus).
Home, Page Up	Move keyboard focus to the first item in the list.
Shift+Tab	Move keyboard focus through components in the reverse direction.
Ctrl+Tab	Move keyboard focus from a table to the next user interface component.
Tab	Navigate keyboard focus between components or select a hyperlink.
Down arrow	Move keyboard focus down one item in the list.
Left arrow	Move keyboard focus to the left.
Right arrow	Move keyboard focus to the right.
Up arrow	Move keyboard focus up one item in the list.

Appendix B. Notices

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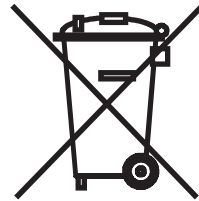
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Appendix D. Battery Return Program

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

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Appendix E. Cable Warning

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. **Wash hands after handling.**

Appendix F. Additional DS4000 documentation

The following tables present an overview of the IBM System Storage DS4000 Storage Manager, Storage Subsystem, and Storage Expansion Enclosure product libraries, as well as other related documents. Each table lists documents that are included in the libraries and what common tasks they address.

You can access the documents listed in these tables at both of the following Web sites:

www.ibm.com/servers/storage/support/disk/

www.ibm.com/shop/publications/order/

DS4000 Storage Manager Version 9 library

Table 8 associates each document in the DS4000 Storage Manager Version 9 library with its related common user tasks.

Table 8. DS4000 Storage Manager Version 9.1 titles by user tasks

Title	User tasks					
	Planning	Hardware installation	Software installation	Configuration	Operation and administration	Diagnosis and maintenance
IBM System Storage DS4000 Storage Manager Version 9 Installation and Support Guide for Windows 2000/Server 2003, NetWare, ESX Server, and Linux	✔		✔	✔		
IBM System Storage DS4000 Storage Manager Version 9 Installation and Support Guide for AIX®, UNIX®, Solaris and Linux on POWER™	✔		✔	✔		
IBM System Storage DS4000 Storage Manager Version 9 Copy Services User's Guide	✔		✔	✔	✔	
IBM System Storage DS4000 Storage Manager Version 9 Concepts Guide	✔	✔	✔	✔	✔	✔

DS4800 Storage Subsystem library

Table 9 associates each document in the DS4800 Storage Subsystem library with its related common user tasks.

Table 9. DS4800 Storage Subsystem document titles by user tasks

Title	User Tasks					
	Planning	Hardware Installation	Software Installation	Configuration	Operation and Administration	Diagnosis and Maintenance
IBM System Storage DS4800 Installation, User's and Maintenance Guide	✔	✔		✔	✔	✔
IBM System Storage DS4800 Installation and Cabling Overview		✔				
IBM TotalStorage DS4800 Controller Cache Upgrade Kit Instructions	✔	✔		✔		

DS4700 Storage Subsystem library

Table 10 associates each document in the DS4700 Storage Subsystem library with its related common user tasks.

Table 10. DS4700 Storage Subsystem document titles by user tasks

Title	User Tasks					
	Planning	Hardware Installation	Software Installation	Configuration	Operation and Administration	Diagnosis and Maintenance
IBM System Storage DS4700 Installation, User's and Maintenance Guide	✔	✔		✔	✔	✔
IBM System Storage DS4700 Storage Subsystem Fibre Channel Cabling Guide		✔				

DS4500 Fibre Channel Storage Server library

Table 11 associates each document in the DS4500 (previously FAStT900) Fibre Channel Storage Server library with its related common user tasks.

Table 11. DS4500 Fibre Channel Storage Server document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
IBM TotalStorage DS4500 Installation and Support Guide	✔	✔		✔		
IBM TotalStorage DS4500 Fibre Channel Cabling Instructions	✔	✔				
IBM TotalStorage DS4500 Storage Server User's Guide				✔	✔	✔
IBM TotalStorage DS4500 Rack Mounting Instructions	✔	✔				

DS4400 Fibre Channel Storage Server library

Table 12 associates each document in the DS4400 (previously FAStT700) Fibre Channel Storage Server library with its related common user tasks.

Table 12. DS4400 Fibre Channel Storage Server document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
IBM DS4400 Fibre Channel Storage Server User's Guide	✔	✔		✔	✔	✔
IBM DS4400 Fibre Channel Storage Server Installation and Support Guide	✔	✔		✔	✔	
IBM DS4400 Fibre Channel Cabling Instructions	✔	✔				

DS4300 Fibre Channel Storage Server library

Table 13 associates each document in the DS4300 (previously FAStT600) Fibre Channel Storage Server library with its related common user tasks.

Table 13. DS4300 Fibre Channel Storage Server document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
IBM TotalStorage DS4300 Fibre Channel Storage Server Installation and User's Guide	✔	✔		✔		
IBM TotalStorage DS4300 Rack Mounting Instructions	✔	✔				
IBM TotalStorage DS4300 Fibre Channel Cabling Instructions	✔	✔				
IBM TotalStorage DS4300 SCU Base Upgrade Kit		✔	✔			
IBM TotalStorage DS4300 SCU Turbo Upgrade Kit		✔	✔			
IBM TotalStorage DS4300 Turbo Models 6LU/6LX Upgrade Kit		✔	✔			

DS4100 SATA Storage Server library

Table 14 associates each document in the DS4100 (previously FAStT100) SATA Storage Server library with its related common user tasks.

Table 14. DS4100 SATA Storage Server document titles by user tasks

Title	User Tasks					
	Planning	Hardware Installation	Software Installation	Configuration	Operation and Administration	Diagnosis and Maintenance
IBM TotalStorage DS4100 Installation, User's and Maintenance Guide	✔	✔		✔	✔	✔
IBM TotalStorage DS4100 Cabling Guide		✔				

DS4000 Storage Expansion Enclosure documents

Table 15 associates each of the following documents with its related common user tasks.

Table 15. DS4000 Storage Expansion Enclosure document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
IBM System Storage DS4000 EXP810 Storage Expansion Enclosures Installation, User's, and Maintenance Guide	✔	✔		✔	✔	✔
IBM TotalStorage DS4000 EXP700 and EXP710 Storage Expansion Enclosures Installation, User's, and Maintenance Guide	✔	✔		✔	✔	✔
Fibre Channel Solutions - IBM DS4000 EXP500 Installation and User's Guide	✔	✔		✔	✔	✔
IBM System Storage DS4000 Hard Drive and Storage Expansion Enclosures Installation and Migration Guide	✔	✔				

Other DS4000 and DS4000-related documents

Table 16 associates each of the following documents with its related common user tasks.

Table 16. DS4000 and DS4000–related document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
IBM Safety Information					✔	
IBM TotalStorage DS4000 Quick Start Guide	✔	✔				
IBM TotalStorage DS4000 Hardware Maintenance Manual						✔
IBM System Storage DS4000 Problem Determination Guide						✔
IBM Fibre Channel Planning and Integration: User's Guide and Service Information	✔	✔			✔	✔
IBM TotalStorage DS4000 FC2-133 Host Bus Adapter Installation and User's Guide		✔			✔	
IBM TotalStorage DS4000 FC2-133 Dual Port Host Bus Adapter Installation and User's Guide		✔			✔	
IBM System Storage DS4000 Fibre Channel and Serial ATA Intermix Premium Feature Installation Overview	✔	✔	✔	✔		
IBM Netfinity Fibre Channel Cabling Instructions		✔				
IBM Fibre Channel SAN Configuration Setup Guide	✔		✔	✔	✔	

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Part Number: 39M5599

Printed in USA

(1P) P/N: 39M5599

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