IBM TotalStorage FAStT FC2-133
Dual Port Host Bus Adapter

Installation and User's Guide

Read Before Using

The IBM License Agreement for Machine Code is included in this book. Carefully read the agreement. By using this product you agree to abide by the terms of this agreement and applicable copyright laws.

GC26-7532-00

IBM TotalStorage FAStT FC2-133
Dual Port Host Bus Adapter

Installation and User's Guide

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Note: Before using this information and the product it supports, be sure to read the general information under "Notices" on page 27.

First Edition (March 2003)

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Safety

Before you install this product, read the Safety information.

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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.

The following Danger notices and Caution notices are printed in English throughout this document. For translations of these notices, see *IBM Safety Information*.

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

Statement 3:

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

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

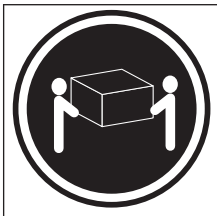
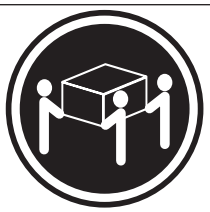
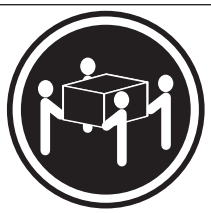
DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following. **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

Class 1 Laser statement

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

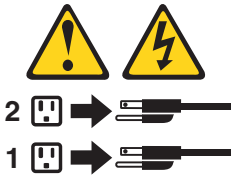
Statement 4:

		
≥ 18 kg (39.7 lb)	≥ 32 kg (70.5 lb)	≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8:

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

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

About this document

This document provides instructions on how to install and customize the configuration of your IBM TotalStorage™ FAStT FC2-133 Dual Port Host Bus Adapter (part number 24P8053) and connected devices. It also provides information on how to troubleshoot your IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter.

The IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter is hereafter referred to as the FAStT FC2-133.

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 installation process overview

The following flow chart gives an overview of the installation process for the FAStT hardware and the FAStT Storage Manager. The arrows in the flow chart indicate the current publications that cover, in detail, each step in the installation process.

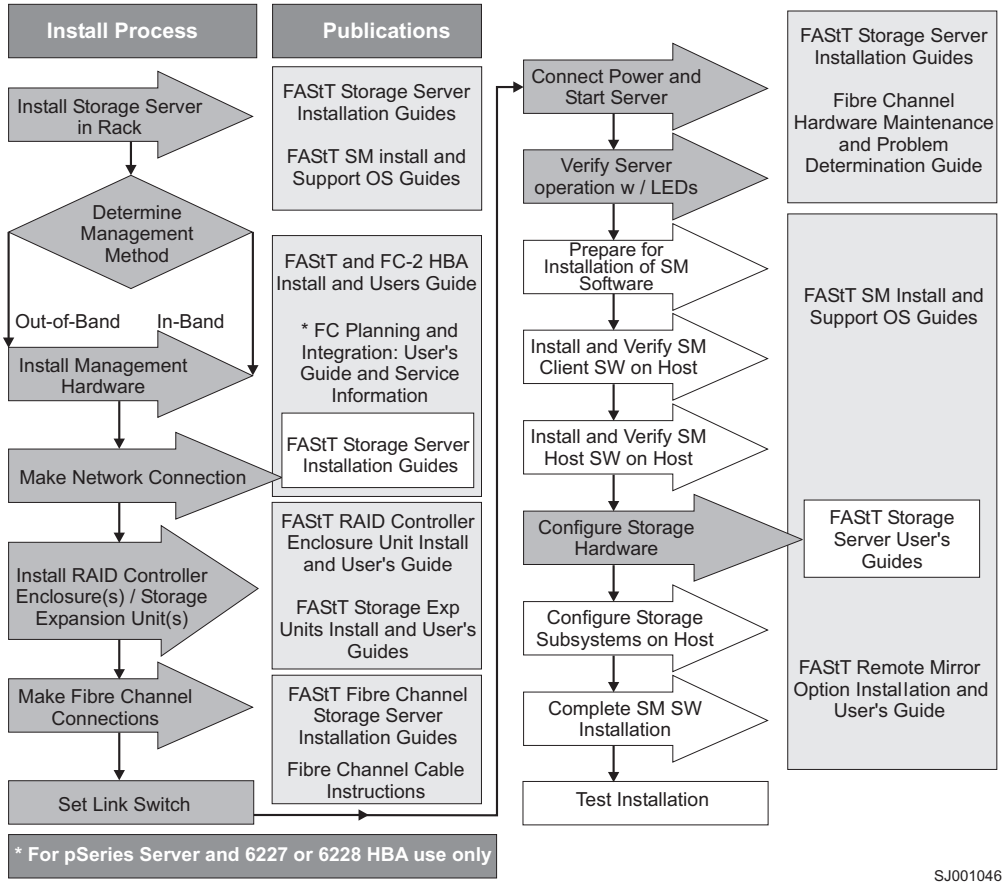


Figure 1. FAStT installation process by publication flow chart

FAStT documentation

The following three tables present an overview of the FAStT900 Fibre Channel Storage Server and FAStT Storage Manager document libraries, as well as related publications. Each table lists documents that are included in the libraries and where to locate information that you need to accomplish common tasks.

FAStT900 Fibre Channel Storage Server library

Table 1 associates each document in the FAStT900 Fibre Channel Storage Server library with its related common user tasks.

Table 1. TotalStorage FAStT900 Fibre Channel Storage Server document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
FAStT900 Installation and Support Guide, GC26-7530	X	X		X		
FAStT900 Fibre Channel Cabling Instructions, 24P8135	X	X				
FAStT900 User's Guide, GC26-7534				X	X	X
FAStT Host Adapter Installation and User's Guide, 59P5712		X			X	
FAStT FC-2 Host Bus Adapter Installation and User's Guide, GC26-7532		X			X	
FAStT FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823		X			X	
Fibre Channel Planning and Integration: User's Guide and Service Information, SC23-4329	X	X			X	X
FAStT Management Suite Java User's Guide, 32P0081					X	X

Table 1. TotalStorage FAStT900 Fibre Channel Storage Server document titles by user tasks (continued)

FAStT Hardware Maintenance Manual and Problem Determination Guide, GC26-7528						X

FAStT Storage Manager 8.3 library

Table 2 associates each document in the FAStT Storage Manager library with its related common user tasks.

Table 2. TotalStorage FAStT Storage Manager Version 8.3 titles by user tasks

Title	**User Tasks**					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
Installation and Support Guide for Windows NT and Windows 2000, GC26-7522	X		X	X		
Installation and Support Guide for Linux, GC26-7519	X		X	X		
Installation and Support Guide for Novell NetWare, GC26-7520	X		X	X		
Installation and Support Guide for UNIX and AIX Environments, GC26-7521	X		X	X		
FAStT Remote Mirror Option Installation and User's Guide, 48P9821	X		X	X	X	
IBM FAStT Storage Manager Script Commands (see product CD)				X		
IBM FAStT Storage Manager Version 7.10 Concepts Guide, 25P1661	X	X	X	X	X	X

FAStT Storage Manager related documents

Table 3 associates each of the following documents related to FAStT Storage Manager operations with its related common user tasks.

Table 3. TotalStorage FAStT Storage Manager related document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
IBM FAStT500 RAID Controller Enclosure Unit Installation Guide, 59P6244		X			X	
IBM FAStT500 RAID Controller Enclosure Unit User's Reference, 48P9847		X			X	
IBM Netfinity Fibre Channel Cabling Instructions, 19K0906		X				
IBM FAStT200 and FAStT200 HA Storage Servers Installation and User's Guide, 59P6243		X			X	
IBM FAStT200 Fibre Channel Cabling Instructions, 21P9094		X				
IBM TotalStorage FAStT EXP700 Storage Expansion Unit Installation and User's Guide, 32P0178		X		X		
IBM FAStT EXP500 Installation and User's Guide, 59P5637		X		X		
IBM Fibre Channel SAN Configuration Setup Guide, 25P2509	X		X	X	X	

How this document is organized

Chapter 1, “Preparing and installing the FAStT FC2-133”, on page 1 describes the FAStT FC2-133. This chapter includes an overview of the FAStT FC2-133 features and contains the information and instructions needed to prepare and install the FAStT FC2-133.

Chapter 2, “Updating the FAStT FC2-133 BIOS code and installing device drivers”, on page 9 provides information for updating the FAStT FC2-133 BIOS code.

Chapter 3, “Configuring the FAStT FC2-133 with Fast!UTIL”, on page 17 provides detailed configuration information for users who want to customize the configuration of the FAStT FC2-133 and connected fibre channel devices.

Chapter 4, “Adapter operating environment and specifications”, on page 23 contains the FAStT FC2-133 operating environment and specification information.

Chapter 5, “Troubleshooting”, on page 25 covers the types of installation problems that can cause the FAStT FC2-133 to function incorrectly.

″Notices″ on page 27 provides product notices.

Notices used in this document

The caution and danger statements that this document uses also appear in the multilingual *Safety Information* document provided with your IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety document.

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

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 IBM Support Web site:

  www.ibm.com/pc/support
- 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 your 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 for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software.

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 FAStT information, go to the following Web site:

  www.ibm.com/pc/support

  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:

  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 the IBM IntelliStation information, go to the following Web site:

www.ibm.com/pc/intellistation

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.

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  starpubs@us.ibm.com

  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.
- Mail or fax

  Fill out the Readers' Comments form (RCF) at the back of this document and return it by mail or fax (1-800-426-6209) or give it to an IBM representative. If the RCF has been removed, you can address your comments to:

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  RCF Processing Department
  Dept. M86/Bldg. 050-3
  5600 Cottle Road
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  U.S.A

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Chapter 1. Preparing and installing the FAStT FC2-133

This chapter contains instructions on how to prepare and install the IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter. It also describes the adapter components.

Overview

The IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter (part number 24P8053) is a 2-Gbps high-performance, direct memory access (DMA), bus master, fibre channel (FC) host adapter designed for high-end systems. The function and performance are derived from the ISP2312 chip (see Figure 3 on page 4), making the FAStT FC2-133 a leading-edge host adapter.

The ISP2312 chip combines a powerful, reduced instruction set computer (RISC) processor, a fibre channel protocol manager (FPM) with two 2-Gbps fibre channel transceivers, and a peripheral component interconnect (PCI) or peripheral component interconnect-extended (PCI-X) local bus interface in a single-chip solution. The FAStT FC2-133 supports all fibre channel peripheral devices that support private-loop direct attach (PLDA) and fabric-loop attach (FLA).

The FAStT FC2-133 connects the following hardware:

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

Fibre channel defined

Fibre channel is a high-speed data transport technology used for mass storage and networking. By 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 FAStT FC2-133 uses multimode shortwave optical interfaces for distances up to 550 meters (1804 feet) when operating at 1 Gbps or up to 300 meters (984 feet) when operating at 2 Gbps. The FAStT FC2-133 supports data transfer rates up to 200 MB per second half-duplex and 400 MB per second full-duplex on optical interfaces.

For more information about fibre channel technology, see the SCSI-3 Fibre Channel Protocol (SCSI-FCP) standard.

FAStT FC2-133 features

The FAStT FC2-133 has the following features:

- Compliance with Intel® PCI Local Bus version 2.2 specification
- Compliance with peripheral component interconnect-extended (PCI-X) addendum, revision 1.0 to the Intel PCI Local Bus version 2.2 specification
- Compliance with Third Generation Fibre Channel Physical and Signaling Interface (PC-PH-3), revision 9.2

- Compliance with fibre channel arbitrated loop (FC-AL-2) standard
- Compliance with U.S. and international safety and emissions standards
- Support for direct memory access (DMA)
- Support for bus master
- Fast!UTIL basic input/output system (BIOS) utility program to customize the configuration parameters on the FAStT FC2-133 and attached drives
- Support for fibre channel protocol SCSI (FCP-SCSI) and fibre channel Internet protocol (FCP-IP)
- Support for point-to-point fabric connection (F_PORT FABRIC LOGIN)
- Support for fibre channel service (Classes 2 and 3)
- Two independent channels on a single HBA

Preinstallation procedures

Before you begin the installation, do the following actions:

- Read “Handling static-sensitive devices” on page 3.
- Read “What you need for the installation” on page 3.
- Write down the serial number of the FAStT FC2-133. 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 FAStT FC2-133 serial number. Figure 2 shows the serial number label location.

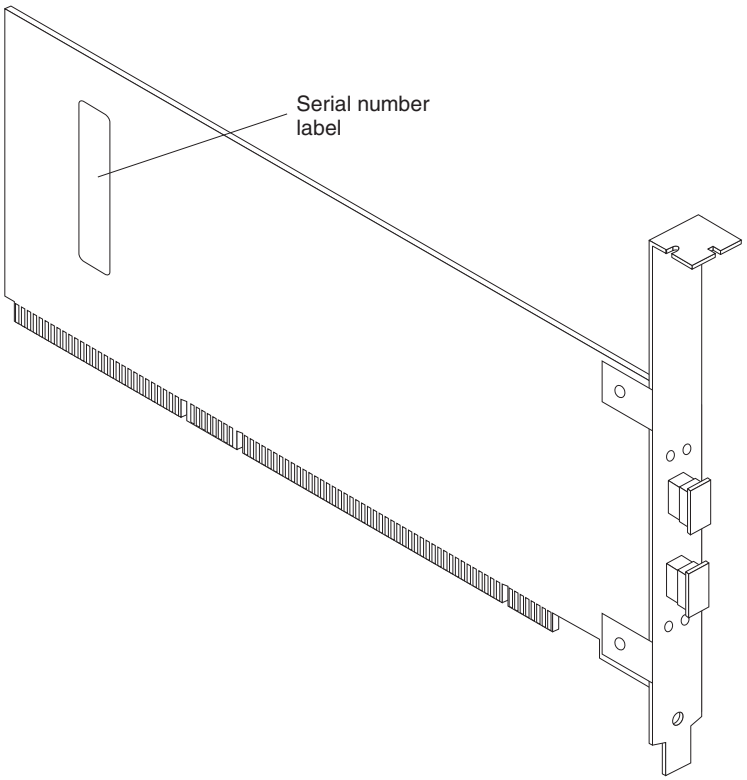

Figure 2. FAStT FC2-133 serial number label

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, the installer should hold the device and touch an unpainted metal part of the system unit for at least 2 seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

What you need for the installation

To install the FAStT FC2-133 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)

FAStT FC2-133 components

Figure 3 on page 4 identifies the FAStT FC2-133 components that are referred to in this document.

1. These cables do not come with the IBM TotalStorage FAStT FC2-133 Host Bus Adapter. You must order them separately.

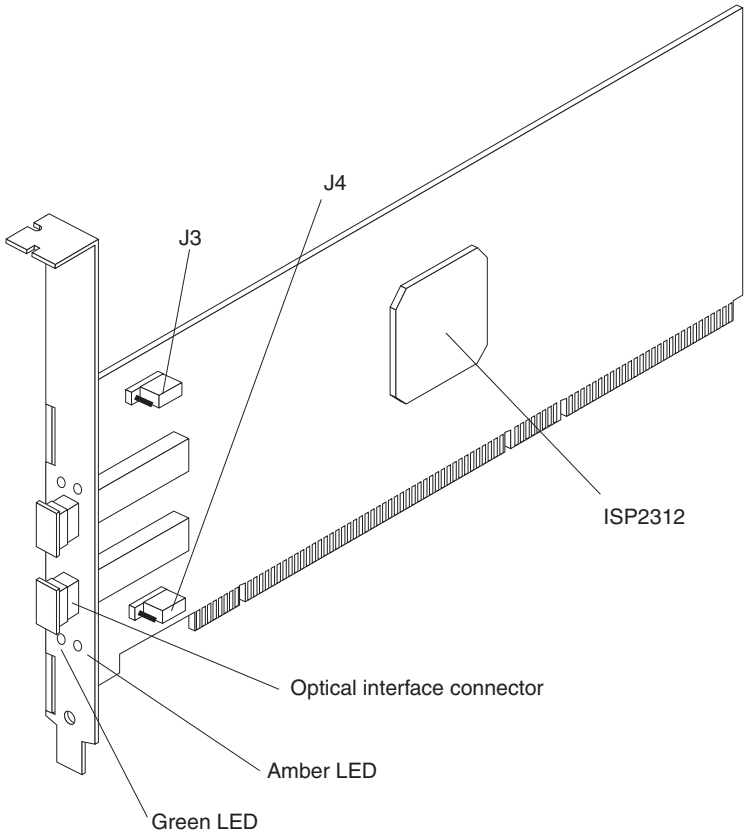

Figure 3. FAStT FC2-133 components

Each port has its own set of status light emitting diodes (LEDs). Table 4 describes the green and amber LEDs and the activity of the FAStT FC2-133. For more information about the FAStT FC2-133 LED activity and troubleshooting, refer to the *IBM TotalStorage FAStT Hardware Maintenance Manual and Problem Determination Guide*.

Table 4. FAStT FC2-133 activity

Green LED	Amber LED	Activity	Description
On	On	Power	The FAStT FC2-133 is receiving power from the PCI or PCI-X slot but is not initialized by the adapter firmware.
On	Off	Online	The FAStT FC2-133 is successfully initialized by the adapter firmware and is in a ready state. The adapter firmware is initialized when you load the adapter BIOS code, press Ctrl+Q, or load the operating system driver.
Off	On	Signal acquired	The FAStT FC2-133 firmware is performing or waiting to perform fibre channel loop initialization.

Table 4. FAStT FC2-133 activity (continued)

Green LED	Amber LED	Activity	Description
Off	Flashing	Loss of synchronization	The FAStT FC2-133 has detected a loss of synchronization condition from the adapter fibre channel receiver and is attempting to resynchronize. A loss of synchronization condition might occur when a degraded optical signal is received from the LC-LC fibre channel cable or optical interface connector.
Flashing	Flashing	Firmware error	The FAStT FC2-133 firmware has detected an unrecoverable error condition.

Installing the FAStT FC2-133

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

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

The FAStT FC2-133 comes with an attached standard 3U adapter bracket, as shown in Figure 3 on page 4. A Low Profile 2U bracket also comes with the adapter. Before you install the FAStT FC2-133, verify whether you need the fibre channel Low Profile 2U adapter bracket. If you need to install the Low Profile 2U bracket, go to step 1. Otherwise, go to step 2.

1. Complete the following steps to install the fibre channel Low Profile 2U adapter bracket:
   a. Remove your FAStT FC2-133 from the static-protective package. Set the adapter down on a nonconductive, static-protected surface (place it component side up). Do not place the adapter on your system unit cover or on a metal table.
   b. Use your small Phillips screwdriver to carefully remove the two bracket screws from your 3U adapter (you will reuse the two adapter screws). Take off the 3U bracket and set it aside.
   c. Align the two screw holes in the 2U adapter bracket with the two screws holes on the adapter. Using the two screws you removed in step 1a, secure the bracket to the adapter.
   d. Return the adapter to the static-protective package until you are ready for installation.
2. Check the system board and make any configuration changes needed to accommodate the FAStT FC2-133.

   Note: The FAStT FC2-133 is self-configuring; however, some system boards require manual configuration. For example, some systems have a PCI Device Configuration menu in the system board setup BIOS code where

you must enable host adapters, bus-master slots, and interrupt request (IRQ) levels. If the system board supports triggering, use level triggering for the FAStT FC2-133. 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 you install your adapter into a PCI bus-master slot, note the following points:
   - Some system boards have two kinds of PCI bus slots: master and subordinate. The FAStT FC2-133 must be in a PCI bus-master slot. (Some system boards have PCI bus-master slots that are shared with on-board devices. The FAStT FC2-133 does not work in shared PCI bus-master slots.)
   - PCI connectors vary among system board manufacturers. The FAStT FC2-133 Adapter is a 64-bit PCI device that can function in a 32-bit PCI bus-master slot.
   - The FAStT FC2-133 is designed and tested to operate at PCI bus speeds up to 66 MHz and PCI-X bus speeds up to 133 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 FAStT FC2-133 into a PCI bus-master slot that does not conform to the PCI specification, you might damage the FAStT FC2-133.
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 one of the optical interface connectors on the FAStT FC2-133. Connect the other end to a fibre channel device. You can connect another device to the unused optical interface connector.
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:

```
QLogic Corporation
QLA2312 PCI Fibre Channel ROM BIOS Version X.XX
Copyright (C) QLogic Corporation 1993-2002 All Rights Reserved.
www.qlogic.com

Press <Ctrl+Q> for Fast!UTIL

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

To display the fibre channel devices, press Ctrl+Q, and then use the Fast!UTIL program. See Chapter 3, “Configuring the FAStT FC2-133 with Fast!UTIL”, on page 17 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 25 for problem solving information.

If the information displayed is correct, go to Chapter 2, “Updating the FAStT FC2-133 BIOS code and installing device drivers”, on page 9 for detailed instructions on how to update the FAStT FC2-133 BIOS code.

Chapter 2. Updating the FAStT FC2-133 BIOS code and installing device drivers

After you install your FAStT FC2-133, you must update the adapter BIOS code, update the nonvolatile random access memory (NVRAM), and install the adapter device drivers.

Important: The BIOS Update Utility treats each of the two fibre channel ports of the FAStT FC2-133 adapter as a separate port. This means that if you program the flash or NVRAM using the I/O address of one FAStT FC2-133 port, you must repeat the same process to program the other FAStT FC2-133 port.

To update the adapter BIOS code, you can use the BIOS Update Utility on the Support CD that comes with the adapter (see "Updating the BIOS code and NVRAM from the Support CD") or you can create and use a BIOS Update Utility diskette (see "Updating the BIOS code and NVRAM from the BIOS Update Utility diskette" on page 12).

To install the adapter device drivers, see "Installing the FAStT FC2-133 device drivers" on page 16.

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

Updating the BIOS code and NVRAM from the Support CD

To update the FAStT FC2-133 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. See "Using the flasutil command prompt".
- flasutil BIOS Update Utility menu. Use this method to select a command-line option from the menu. See "Using the flasutil BIOS Update Utility menu" on page 11.

Using the flasutil command prompt

Complete the following steps to update your FAStT FC2-133 BIOS code and NVRAM:

1. Insert the *IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Support* CD into the CD-ROM drive. Restart the server. Your server starts to a DOS prompt.
2. Update the BIOS code in the flash utility. From the DOS prompt, type:

   ```
   flasutil /f
   ```

   and press Enter.
3. Update the NVRAM. From the DOS prompt, type:

   ```
   flasutil /l
   ```

   and press Enter.
4. Update the standard BIOS defaults in the flash utility to the new defaults from the NVRAM files. From the DOS prompt, type:

   ```
   flasutil /u
   ```

and press Enter.

5. To review additional command-line options that you can use, go to "Command-line options". Then return to step 6.
6. Remove the CD from the CD-ROM drive and restart the server.
7. Go to "Installing the FAStT FC2-133 device drivers" on page 16.

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:

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

Notes:

1. All of the listed options are supported and you can run them from the command line. Options /L, /D, /U, /N, /T, and /X might not display.
2. The command-line option is not case-sensitive. Either /f or /F can be used to initiate the adapter flash BIOS update.

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

- To write NVRAM on all FAStT host adapters in a system without being prompted for an I/O address, type:

  ```
  flasutil /L
  ```

  and press Enter.
- To save the existing flash code to file QL2342RM.SAV, type:

  ```
  flasutil /W F600
  ```

  and press Enter.

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

  ```
  flasutil /L f400
  ```

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

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

  and press Enter.
- To write NVRAM and flash all adapters, type:

  ```
  flasutil /L /F
  ```

  and press Enter.
- To save NVRAM to file QL1xNVRM.SAV, type:

  ```
  flasutil /D
  ```

  and press Enter.
- To update BIOS NVRAM defaults, type:

  ```
  flasutil /U
  ```

  and press Enter.
- To verify NVRAM in all adapters, type:

  ```
  flasutil /X
  ```

  and press Enter.

Using the flasutil BIOS Update Utility menu

Complete the following steps to update the FAStT FC2-133 BIOS code and NVRAM by using the flasutil BIOS Update Utility menu:

1. Insert the *IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Support* CD into the CD-ROM drive. Restart the server. Your server starts to a DOS prompt.
2. From the DOS prompt, type:

   ```
   flasutil
   ```

   and press Enter.
3. A list of adapters and I/O addresses displays. At the command prompt, type the appropriate I/O address and press Enter.
4. The following option menu displays:

```
F = Write Flash
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 NOVRAM
A = Write NOVRAM and defaults
D = Copy NOVRAM to file:QLxxNVRM.SAV
U = Update BIOS NOVRAM defaults
X = Verify NOVRAM
```

Notes:

a. All of the listed options are supported and you can run them from the command line. Options L, A, D, U, and X might not display. The command-line option is not case-sensitive.
b. You can configure each adapter with more than one option.

5. Type the letter for the option you want and press Enter.
6. If you have additional adapters installed, if you want to program the other port of the adapter, or if you want to configure your adapter with more than one option, continue with step 7. Otherwise, go to step 8.
7. Repeat steps 2 through 5 for each additional adapter or port, or if you want to configure your adapter with more than one option.
8. Remove the CD from the CD-ROM drive and restart the server.
9. Go to "Installing the FAStT FC2-133 device drivers" on page 16.

Updating the BIOS code and NVRAM from the 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 on how to create and use 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 NT®, Windows® 2000, or Linux operating system.

Creating the BIOS Update Utility diskette

Create the BIOS Update Utility diskette by copying the image you need from the *IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Support* CD or by downloading the image from the following Web site:

www.ibm.com/pc/support

For Microsoft Windows NT 4.0 or Windows 2000

Complete the following steps to create a BIOS Update Utility diskette for Microsoft Windows NT 4.0 or Windows 2000 from the *IBM TotalStorage FAStT FC2-133 Host Bus Adapter Support* CD:

1. Insert the *IBM TotalStorage FAStT FC2-133 Dual Port 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\23x0\2342_xxx.img a:
   ```

   Where *d* is the CD-ROM drive and *a* is the diskette drive.
4. Press Enter.
5. Remove the *IBM TotalStorage FAStT FC2-133 Dual Port 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 TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Support* CD:

1. Insert the *IBM TotalStorage FAStT FC2-133 Dual Port 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/23x0/2342_xxx.img of=/dev/diskettedevicefile bs=32
   ```

   and press Enter.
6. Unmount the CD-ROM by typing:

   ```
   unmount /mnt
   ```
7. Remove the *IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Support* CD from the CD-ROM drive.
8. Remove the diskette from the diskette drive and label the diskette appropriately.

Updating the BIOS code and NVRAM from the diskette

To update the BIOS code and NVRAM using the BIOS Update Utility from the diskette, use one of the following methods:

- flasutil command prompt. Use this method to type in command-line options. See "Using the flasutil command prompt".
- flasutil BIOS Update Utility menu. Use this method to select a command-line option from the menu. See "Using the flasutil BIOS Update Utility menu" on page 15.

Important: The BIOS Update Utility treats each of the two fibre channel ports of the FAStT FC2-133 adapter as a separate port. This means that if you program the flash or NVRAM using the I/O address of one FAStT FC2-133 port, you must repeat the same process to program the other FAStT FC2-133 port.

Using the flasutil command prompt

Complete the following steps to update the BIOS code and NVRAM using the flasutil command prompt:

1. 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. Update the BIOS in the flash utility. From the DOS prompt, type:

   ```
   flasutil /f
   ```

   and press Enter.
3. Update the NVRAM. From the DOS prompt, type:

   ```
   flasutil /l
   ```

   and press Enter.
4. Update the standard BIOS defaults in the flash utility to the new defaults from the NVRAM files. From the DOS prompt, type:

   ```
   flasutil /u
   ```

   and press Enter.

5. To review additional command-line options that you can use, continue with "Command-line options". Otherwise, continue with step 6.
6. Remove the diskette from the diskette drive and restart the server.
7. Go to "Installing the FAStT FC2-133 device drivers" on page 16.

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:

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

Notes:

a. All of the listed options are supported and you can run them from the command line. Options /L, /D, /U, /N, /T, and /X might not display.
b. The command-line option is not case-sensitive. Either /f or /F can be used to initiate the adapter flash BIOS update.

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

- To write NVRAM on all FAStT host adapters in a system without being prompted for I/O address, type:

  ```
  flasutil /L
  ```

  and press Enter.
- To save the existing flash code to file QL2342RM.SAV, type:

  ```
  flasutil /W F600
  ```

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

```
flasutil /L f400
```

and press Enter.

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

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

and press Enter.

- To write NVRAM and flash all adapters, type:

```
flasutil /L /F
```

and press Enter.

- To save NVRAM to file QL1xNVRM.SAV, type:

```
flasutil /D
```

and press Enter.

- To update BIOS NVRAM defaults, type:

```
flasutil /U
```

and press Enter.

- To verify NVRAM in all adapters, type:

```
flasutil /X
```

and press Enter.

Using the flasutil BIOS Update Utility menu

Complete the following steps to update your BIOS code and NVRAM using the flasutil BIOS Update Utility:

1. 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. 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
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 NOVRAM
A = Write NOVRAM and defaults
D = Copy NOVRAM to file:QLxxNVRM.SAV
U = Update BIOS NOVRAM defaults
X = Verify NOVRAM
```

Notes:

a. All of the listed options are supported and you can run them from the command line. Options L, A, D, U, and X might not display. The command-line option is not case-sensitive.

b. You can configure each adapter with more than one option.

6. Type the letter for the option you want and press Enter.
7. If you have additional adapters installed, if you want to program the other port of the adapter, or if you want to configure your adapter with more than one option, continue with step 7. Otherwise, go to step 9.
8. Repeat steps 2 through 5 for each additional adapter or port, or if you want to configure your adapter with more than one option.
9. Remove the CD from the CD-ROM drive and restart the server.
10. Go to “Installing the FAStT FC2-133 device drivers”.

Installing the FAStT FC2-133 device drivers

The device drivers and installation instructions for the following supported operating systems are provided on the *IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Support* CD:

- Microsoft Windows
- Windows NT
- Novell NetWare
- Linux

The driver installation instructions are in a readme file located in the appropriate operating system directory.

Note: For the latest supported operating systems, versions of the device drivers, utilities, and documentation, go to the following Web site:

www.ibm.com/pc/support

Chapter 3. Configuring the FAStT FC2-133 with Fast!UTIL

This chapter provides detailed configuration information for advanced users who want to customize the configuration of the FAStT FC2-133 and the connected fibre channel devices. You can configure the adapter using the Fast!UTIL utility.

Starting Fast!UTIL

To access Fast!UTIL, press Ctrl+Q during the adapter BIOS initialization (it might take a few seconds for the Fast!UTIL menu to display). Fast!UTIL prompts you to select the adapter you want to configure. After you change the settings that are described in the "Configuration Settings menu options" section, Fast!UTIL restarts your system to enable the new parameters.

Important: If the configuration settings are incorrect, your FAStT FC2-133 will not function properly. Do not modify the default configuration settings unless you are instructed to do so by an IBM support representative or the installation instructions. The default settings are for a typical Microsoft Windows installation. Refer to the FAStT FC2-133 adapter driver readme file for the appropriate operating system for required NVRAM setting modifications for that operating system.

Configuration Settings menu options

The menu options described in this section configure the fibre channel devices and the FAStT FC2-133 to which they are attached. The Configuration Settings menu displays several options that you can use to configure your adapter and attached devices.

Host Adapter Settings

You can access the Host Adapter Settings option from the Configuration Settings menu. The current default settings for the host adapter are listed in Table 5 and are described in this section. You can modify the following default host adapter settings.

Table 5. Modifiable Host adapter default settings

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

Host adapter BIOS: When this option is set to Disabled, the read-only memory (ROM) BIOS code on the FAStT FC2-133 is disabled, freeing space in upper memory. You must enable this setting if you are starting your operating system from an external fibre channel hard disk that is attached to the FAStT FC2-133. The default is Disabled.

Frame size: This setting specifies the maximum frame length supported by the FAStT FC2-133. The default size is 2048. If you are using F_Port (point-to-point) connections, use the default for maximum performance.

Loop reset delay: When you reset the fibre channel loop, the firmware does not initiate any loop activity for the number of seconds specified in this setting. The default is 5 seconds.

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

Hard loop ID: When the adapter hard loop ID is set to Enabled, the adapter uses the ID specified in this setting. The default ID is 125. If there are multiple host bus adapters in the fibre channel loop, each adapter must be assigned a unique address.

Spin up delay: When this setting is Enabled, the BIOS code waits up to five minutes to find the first drive. The default is Disabled.

Note: The FAStT FC2-133 settings and default values will vary, based on the version of BIOS code installed for the adapter.

There are specific host-adapter settings that you cannot modify. Table 6 describes these host-adapter settings and gives examples.

Note: See the device driver installation instructions for the required operating-system specific modifications to the NVRAM.

Table 6. Nonmodifiable Host adapter settings and examples

Setting	Example
BIOS address	CD400
Revision	1.25
Adapter serial number	E59719
Interrupt level	3
Adapter port name	210000E08B07C703

BIOS address: The BIOS address is the I/O address where the BIOS code is stored when you press Ctrl+Q or 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 will be 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 FAStT FC2-133 Single Port and FC2-133 Dual Port adapters in the same bus or server. The level of BIOS code loaded does not affect other adapters with earlier BIOS code levels.

Revision: The BIOS revision is the revision number of the loaded BIOS code, which is from the first FAStT FC2-133 that the server recognizes. Each FAStT FC2-133 in the server will have the same BIOS code revision number because only one BIOS code instance is loaded.

Adapter serial number: The adapter serial number is located on the noncomponent side of the adapter. See Figure 2 on page 2 for the location of the serial number label.

Interrupt level: The interrupt level is the interrupt that is used by the FAStT FC2-133. The interrupt level can change when the operating system is installed.

Adapter port name: This is the worldwide port name.

Selectable Boot Settings

You can access the Selectable Boot Settings option from the Configuration Settings menu. When this option is set to Enabled, you can select the 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 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 attached to the FAStT FC2-133, select the attached fibre channel hard disk from the system BIOS menu.

Note: The Selectable Boot Settings option for the FAStT FC2-133 applies to only fibre channel hard disk drives.

Restore Default Settings

You can access the Restore Default Settings option from the Configuration Settings menu. This option the FAStT FC2-133 default settings and NVRAM.

Note: The default NVRAM settings are the adapter settings that were saved the last time an NOVRAM update operation was executed 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 NOVRAM settings since the adapter was installed, the factory settings are loaded.

Raw NOVRAM Data

You can access the Raw NOVRAM Data option from the Configuration Settings menu. This option displays the adapter NVRAM contents in hexadecimal format. This is a troubleshooting tool. You cannot modify the data.

Advanced Adapter Settings

You can access the Advanced Adapter Settings option from the Configuration Settings menu. The current default settings for the FAStT FC2-133 are listed in Table 7 and are described in this section.

Table 7. Advanced adapter settings

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

Table 7. Advanced adapter settings (continued)

Setting	Options	Default
IOCB allocation	1-512 buffers	256 buffers
Extended error logging	Enabled or Disabled	Disabled

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

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

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

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

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

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

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

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

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

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

Extended Firmware Settings

You can access the Extended Firmware Settings option from the Configuration Settings menu. The current default settings for the FAStT FC2-133 are listed in Table 8 on page 21 and are described in this section.

Table 8. Extended firmware settings

Setting	Options	Default
RIO operation mode	0, 5	0
Connection Options	0, 1, 2	2
Fibre channel tape support	Enabled or Disabled	Disabled
Interrupt delay timer	0-255	0
Data rate	0, 1, 2	2

RIO operation mode: This setting specifies the reduced interrupt operation (RIO) mode, if supported by the software device driver. The RIO mode enables you to post multiple command completions in a single interrupt (see Table 9). The default is 0.

Table 9. RIO options and operation modes

Option	Operation mode
0	No multiple responses
5	Multiple responses with minimal interrupts

Connection options: This setting defines the type of connection (loop or point-to-point) or connection preference (see Table 10). The default is 2.

Table 10. Connection options

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

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

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

Data rate: This setting determines the data rate (see Table 11). The default setting is 2.

Table 11. Data rate options

Option	Data rate
0	1 Gbps
1	2 Gbps
2	Auto select

Scan Fibre Channel Devices

You can access the Scan Fibre Channel Devices option from the Configuration Settings menu. Use this option to scan the fibre channel loop and list all the

connected devices by loop ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when you are configuring your FAStT FC2-133 and attached devices.

Fibre Channel Disk Utility

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

You can access the Fibre Channel Disk Utility option from the Configuration Settings menu. Use this option to scan the fibre channel loop bus and list all the connected devices by loop ID. You can select a disk device and perform a low-level format or verify the disk media or data.

Loopback Data Test

You can access the Loopback Data Test option from the Configuration Settings menu. Use this option to verify the adapter basic transmit and receive functions. A fibre channel loop back connector option must be installed into the optical interface connector on the FAStT FC2-133 before starting the test. See Figure 3 on page 4 for the location of the optical interface connector.

Select Host Adapter

You can access the Select Host Adapter option from the Configuration Settings menu. Use this 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. Adapter operating environment and specifications

This chapter contains the FAStT FC2-133 operating environment and specification information.

Table 12 provides information about the operating environment for the FAStT FC2-133.

Table 12. Adapter operating environment

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

Table 13 provides information about the specifications for the FAStT FC2-133.

Table 13. Adapter specifications

Type	Specification
Host bus	Conforms to Intel *PCI Local Bus Specification*, revision 2.2 and the *PCI-X Addendum*, revision 1.0.
PCI/PCI-X signaling environment	3.3 V and 5.0 V buses supported
PCI/PCI-X transfer rate	• Support for 32 bit and 64 bit PCI bus at 33 MHz and 66 MHz • Support for 64 bit PCI-X bus at 50 MHz, 100 MHz, and 133 MHz • PCI transfer rate 264 MB per second maximum burst rate for 33 MHz operation (ISP2312 chip) • Support for dual address bus cycles
Fibre channel specifications	• Fiber-optic media (shortwave multimode 50 micron cable) • Bus transfer rate: 200 MB per second maximum at half-duplex and 400 MB per second maximum at full-duplex. • Interface chip: ISP2312 (PCI-X QLA23xx boards) • Support for both FCP-SCSI and IP protocols • Support for point-to-point fabric connection: F_Port Fabric Login • Support for FCAL public loop profile: FL_Port Login • Support for fibre channel services class 2 and 3 • Support for FCP SCSI initiator and target operation • Support for full-duplex operation
Processor	Single-chip design that includes a RISC processor, fibre channel protocol manager, PCI or PCI-X DMA controller, and integrated serializer/deserializer (SERDES) and electrical transceivers that can auto-negotiate a data rate of 2 Gbps per second.
Host data transfer	64-bit, bus-master DMA data transfers to 1056 MB per second

Table 13. Adapter specifications (continued)

Type	Specification
RAM	RAM 256 KB of SRAM supporting parity protection
BIOS ROM	BIOS ROM 128 KB of flash ROM in two 64 KB, software selectable banks. The flash is field programmable.
NVRAM	NVRAM 256 bytes, field programmable
Onboard DMA	Five-channel DMA controller: two data, one command, one auto-DMA request, and one auto-DMA response.
Frame buffer FIFO	Integrated 4 KB transmit and 6 KB receive frame buffer FIFO for each data channel
Connectors (external)	• Two LC-style connectors that supports non-OFC, multimode fiber-optic cabling using a small form factor (SFF) fiber-optic transceiver module. • Support 50/125 FC cable length up to 550 meters when operating at 1 Gbps or up to 300 meters when operating at 2 Gbps.
Form factor	5.15 cm x 16.93 cm (2.5 in. x 6.7 in.)
Operating power	Less than 15 watts

Chapter 5. Troubleshooting

The following four types of installation problems might cause your FAStT FC2-133 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: Refer to the *IBM TotalStorage FAStT Hardware Maintenance Manual and Problem Determination Guide* for additional troubleshooting and debugging procedures.

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 connectors (located at J1 and J2 on the adapter) and that the other end is connected to the fibre channel device.
- Verify that the FAStT FC2-133 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 “Extended Firmware Settings” on page 20.
- Verify that all peripheral devices are turned on. See “Scan Fibre Channel Devices” on page 21 for information about how to display attached fibre channel devices.

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 “Configuration Settings menu options” on page 17.

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 FAStT FC2-133. For more information, refer to your fibre channel switch documentation.

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Important notes

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

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

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1024 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

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

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

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Electronic emission notices

Class B statements

This device has been tested to the FCC limits and found compliant to the Class B limits when installed in a host system found compliant to the Class B limits.

Federal Communications Commission (FCC) statement

IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no

guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

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

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

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

Tested To Comply
With FCC Standards
FOR HOME OR OFFICE USE

Industry Canada Class B emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Japanese electromagnetic interference (EMI) statement

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

Industry Canada Class A emission compliance statement

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Avis de conformité à la réglementation d'Industrie Canada

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United Kingdom telecommunications safety requirement

Notice to Customers

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

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This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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Glossary

This glossary provides definitions for the terminology used for the IBM TotalStorage FAStT900. This glossary also provides definitions for the terminology used for the IBM TotalStorage FAStT Storage Manager.

This glossary defines technical terms and abbreviations used in this document. If you do not find the term you are looking for, see the *IBM Glossary of Computing Terms* located at: www.ibm.com/networking/nsg/nsgmain.htm

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- *Information Technology Vocabulary* by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.
- *IBM Glossary of Computing Terms*. New York: McGraw-Hill, 1994.

The following cross-reference conventions are used in this glossary:

See Refers you to (a) a term that is the expanded form of an abbreviation or acronym, or (b) a synonym or more preferred term.

See also Refers you to a related term.

Abstract Windowing Toolkit (AWT). A Java graphical user interface (GUI).

accelerated graphics port (AGP). A bus specification that gives low-cost 3D graphics cards faster access to main memory on personal computers than the usual PCI bus. AGP reduces the overall cost of creating high-end graphics subsystems by using existing system memory.

access volume. A special logical drive that allows the host-agent to communicate with the controllers in the storage subsystem.

adapter. A printed circuit assembly that transmits user data (I/Os) between the internal bus of the host system and the external fibre channel link and vice versa. Also called an I/O adapter, host adapter, or FC adapter.

advanced technology (AT) bus architecture. A bus standard for IBM compatibles. It extends the XT bus architecture to 16 bits and also allows for bus mastering, although only the first 16 MB of main memory are available for direct access.

agent. A server program that receives virtual connections from the network manager (the client program) in an SNMP-TCP/IP network-managing environment.

AGP. See *accelerated graphics port*.

AL_PA. See *arbitrated loop physical address*.

arbitrated loop. A shared 100 MBps fibre channel transport structured as a loop and supporting up to 126 devices and one fabric attachment. A port must successfully arbitrate before a circuit can be established.

arbitrated loop physical address (AL_PA). One of three existing fibre channel topologies, in which two to 126 ports are interconnected serially in a single loop circuit. Access to the FC-AL is controlled by an arbitration scheme. The FC-AL topology supports all classes of service and guarantees in-order delivery of FC frames when the originator and responder are on the same FC-AL. The default topology for the disk array is arbitrated loop. An arbitrated loop is sometimes referred to as Stealth Mode.

auto volume transfer/auto disk transfer (AVT/ADT). A function that provides automatic failover in case of controller failure on a storage subsystem.

AVT/ADT. See *auto volume transfer/auto disk transfer*.

AWT. See *Abstract Windowing Toolkit*.

basic input/output system (BIOS). Code that controls basic hardware operations, such as interactions with diskette drives, hard disk drives, and the keyboard.

BIOS. See *basic input/output system*.

BOOTP. See *bootstrap protocol*.

bootstrap protocol (BOOTP). A Transmission Control Protocol/Internet Protocol (TCP/IP) protocol that a diskless workstation or network computer use to obtain its IP address and other network information such as server address and default gateway.

bridge. A SAN device that provides physical and transport conversion, such as fibre channel to SCSI bridge.

bridge group. A bridge and the collection of devices connected to it. Bridge Groups are discovered by the SANavigator tool and displayed with a gray background on the Physical and Data Path Maps.

broadcast. A method of sending an SNMP request for information to all the devices on a subnet that use a single special request. Because of its efficiency, the SANavigator tool sets its default method of discovery to broadcast. However, a network administrator might disable this method on the network router.

cathode ray tube (CRT). An electrical device for displaying images by exciting phosphor dots with a scanned electron beam. CRTs are found in computer VDUs and monitors, televisions, and oscilloscopes.

CDPD. See *cellular digital packet data*.

cellular digital packet data (CDPD). A wireless standard that provides two-way, 19.2 kps packet data transmission over existing cellular telephone channels.

CGA. See *color graphics adapter*.

client. A computer system or process that requests a service of another computer system or process that is typically referred to as a server. Multiple clients can share access to a common server.

color graphics adapter (CGA). An early, now obsolete, IBM video display standard for use on IBM PCs. CGA displays 80 x 25 or 40 x 25 text in 16 colors, 640 x 200 pixel graphics in two colors or 320 x 200 pixel graphics in four colors.

command. Any selection on a dialog box or elsewhere in the user interface that causes the SANavigator tool to perform a task.

community strings. The name of a community contained in each SNMP message. SNMP has no standard mechanisms for verifying that a message was sent by a member of the community, keeping the contents of a message private, or for determining if a message has been changed or replayed.

CRC. See *cyclic redundancy check*.

CRT. See *cathode ray tube*.

cyclic redundancy check (CRC). (1) 1) A redundancy check in which the check key is generated by a cyclic algorithm. (2) 2) An error detection technique performed at both the sending and receiving stations.

dac. See *disk array controller*.

dar. See *disk array router*.

DASD. See *Direct-Access Storage Device*.

device type. Identifier used to place devices in the physical map, such as the switch, hub, storage.

direct access storage device (DASD). IBM mainframe terminology for a data storage device by which information can be accessed directly, instead of by-passing sequentially through all storage areas. For example, a disk drive is a DASD, in contrast with a tape drive, which stores data as a linear sequence.

direct memory access (DMA). The transfer of data between memory and an input/output (I/O) device without processor intervention.

disk array controller (dac). A disk array controller device that represents the two controllers of an array. See also *disk array controller*.

disk array router (dar). A disk array router that represents an entire array, including current and deferred paths to all logical unit numbers (LUNs) (hdisks on AIX). See also *disk array controller*.

DMA. See *direct memory access*.

domain. The most significant byte in the N_Port Identifier for the FC device. It is not used in the FC-SCSI hardware path ID. It is required to be the same for all SCSI targets logically connected to an FC adapter.

DRAM. See *dynamic random access memory*.

dynamic random access memory (DRAM). A storage in which the cells require repetitive application of control signals to retain stored data.

E_Port. An expansion port that connects the switches for two fabrics (also used for McData ES-1000 B ports).

ECC. See *error correction coding*.

EEPROM. See *Electrically Erasable Programmable Read-Only Memory*.

EGA. See *enhanced graphics adapter*.

electrically eErasable programmable read-only memory (EEPROM). A type of non-volatile storage device that can be erased with an electrical signal. Writing to EEPROM takes much longer than reading. It also can only be reprogrammed a limited number of times before it wears out. Therefore, it is appropriate for storing small amounts of data that are changed infrequently.

electrostatic discharge (ESD). The flow of current that results when objects that have a static charge come into close enough proximity to discharge.

enhanced graphics adapter (EGA). An IBM video display standard that provides text and graphics with a

resolution of 640 x 350 pixels of 16 colors. It emulates the Color/Graphics Adapter (CGA) and the Monochrome Display Adapter (MDA) and was superseded by the Video Graphics Display (VGA).

enhanced small disk interface (ESDI). A hard disk controller standard that allows disks to communicate with computers at high speeds. ESDI drives typically transfer data at about 10 megabits per second, although they are capable of doubling that speed.

error correction coding (ECC). A method for encoding data so that transmission errors can be detected and corrected by examination of the data on the receiving end. Most ECCs are characterized by the maximum number of errors they can detect and correct.

error detection coding. A method for encoding data so that errors that occur during storage or transmission can be detected. Most error detection codes are characterized by the maximum number of errors they can detect. The simplest form of error detection is by using a single added parity bit or a cyclic redundancy check. Adding multiple parity bits can detect not only that an error has occurred, but also which bits have been inverted, thereby indicating which bits should be re-inverted to restore the original data.

ESD. See *electrostatic discharge*.

ESDI. See *enhanced small disk interface*.

eXtended graphics array (XGA). An IBM advanced standard for graphics controller and display mode design introduced in 1990. XGA, used mostly on workstation-level systems, supports a resolution of 1024 x 768 pixels with a palette of 256 colors, or 640 x 480 with high color (16 bits per pixel). XGA-2 added 1024 x 768 support for high color and higher refresh rates, improved performance, and supports 1360 x 1024 in 16 colors.

F_Port. A port that supports an N_Port on a fibre channel switch.

fabric group. A collection of interconnected SAN devices discovered by the SANavigator tool and displayed with a blue background on the Physical and Data Path Maps.

fibre channel. A bi-directional, full-duplex, point-to-point, serial data channel structured for high performance capability. Physically, fibre channel interconnects devices, such as host systems and servers, FC hubs and disk arrays, through ports, called N_Ports, in one of three topologies: a point-to-point link, an arbitrated loop, or a cross point switched network, which is called a fabric. FC can interconnect two devices in a point-to-point topology, from two to 126 devices in an arbitrated loop. FC is a generalized transport mechanism that can transport any existing protocol, such as SCSI, in FC frames.

Fibre Channel Protocol for SCSI (FCP). A high-level fibre channel mapping layer (FC-4) that uses lower-level fibre channel (FC-PH) services to transmit SCSI command, data, and status information between a SCSI initiator and a SCSI target across the FC link by using FC frame and sequence formats.

field replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails. In some cases, a FRU might contain other field replaceable units.

FRU. See *field replaceable unit*.

general purpose interface bus (GPIB). An 8-bit parallel bus developed for the exchange of information between computers and industrial automation equipment.

GPIB. See *general purpose interface bus.*.

graphical user interface (GUI). A type of computer interface that presents a visual metaphor of a real-world scene, often of a desktop, by combining high-resolution graphics, pointing devices, menu bars and other menus, overlapping windows, icons, and the object-action relationship.

GUI. See *graphical user interface.*

HBA. See *host bus adapter.*

hdisk. An AIX term representing a logical unit number (LUN) on an array.

host. A system that is directly attached to the storage subsystem through a fibre-channel I/O path. This system is used to serve data (typically in the form of files) from the storage subsystem. A system can be both a storage management station and a host simultaneously.

host bus adapter (HBA). An interface between the fibre channel network and a workstation or server.

host computer. See *host*.

host group. The collection of HBAs and NASs in a fabric discovered by the SANavigator tool and displayed with a yellow background on the Physical and Data Path Maps.

hub. In a network, a point at which circuits are either connected or switched. For example, in a star network, the hub is the central node; in a star/ring network, it is the location of wiring concentrators.

IC. See *integrated circuit.*

IDE. See *integrated drive electronics.*

In-band. Transmission of management protocol over the fibre channel transport.

Industry Standard Architecture (ISA). A bus standard for IBM compatibles that allows components to be added as cards plugged into standard expansion slots. ISA was originally introduced in the IBM PC/XT with an 8-bit data path. It was later expanded to permit a 16-bit data path when IBM introduced the PC/AT.

initial program load (IPL). The part of the boot sequence during which a computer system copies the operating system kernel into main memory and runs it.

integrated circuit (IC). Also known as a *chip*. A microelectronic semiconductor device that consists of many interconnected transistors and other components. ICs are constructed on a small rectangle cut from a silicon crystal or other semiconductor material. The small size of these circuits allows high speed, low power dissipation, and reduced manufacturing cost compared with board-level integration.

integrated drive electronics (IDE). Also known as an Advanced Technology Attachment Interface (ATA). A disk drive interface based on the 16-bit IBM PC ISA in which the controller electronics reside on the drive itself, eliminating the need for a separate adapter card.

integrated services digital network (ISDN). A digital end-to-end telecommunication network that supports multiple services including, but not limited to, voice and data. ISDNs are used in public and private network architectures.

interrupt request (IRQ). A type of input found on many processors that causes the processor to suspend normal instruction execution temporarily and start executing an interrupt handler routine. Some processors have several interrupt request inputs that allow different priority interrupts.

Internet Protocol address. The unique 32-bit address that specifies the location of each device or workstation on the Internet. For example, 9.67.97.103 is an IP address.

IP address. See *Internet Protocol address*.

IPL. See *initial program Load.*

IRQ. See *interrupt request.*

ISA. See *Industry Standard Architecture.*

ISDN. See *Integrated Services Digital Network.*

isolated group. A collection of isolated devices not connected to the SAN but discovered by the SANavigator tool. The Isolated Group displays with a gray background near the bottom of the Physical and Data Path Maps.

Java Runtime Environment (JRE). A subset of the Java Development Kit (JDK) for end users and developers who want to redistribute the Java Runtime Environment (JRE). The JRE consists of the Java virtual machine, the Java Core Classes, and supporting files.

JRE. See *Java Runtime Environment*.

label. A discovered or user entered property value that is displayed underneath each device in the Physical and Data Path Maps.

LAN. See *local area network*.

LBA. See *logical block addressing*.

local area network (LAN). A computer network located on a user's premises within a limited geographic area.

logical block addressing (LBA). A hard disk sector addressing scheme in which the addressing conversion is performed by the hard disk firmware. LBA is used on all SCSI hard disks and on ATA-2 conforming IDE hard disks.

logical unit number (LUN). An identifier used on a small computer systems interface (SCSI) bus to distinguish among up to eight devices (logical units) with the same SCSI ID.

loop address. The unique ID of a node in fibre channel loop topology sometimes referred to as a Loop ID.

loop group. A collection of SAN devices that are interconnected serially in a single loop circuit. Loop Groups are discovered by the SANavigator tool and displayed with a gray background on the Physical and Data Path Maps.

loop port (FL_Port). An N_Port or F_Port that supports arbitrated loop functions associated with an arbitrated loop topology.

LUN. See *logical unit number*.

man pages. In UNIX-based operating systems, online documentation for operating-system commands, subroutines, system calls, file formats, special files, stand-alone utilities, and miscellaneous facilities. Invoked by the **man** command.

management information base (MIB). The information that is on an agent. It is an abstraction of configuration and status information.

MCA. See *micro channel architecture*.

MIB. See *management information base*.

micro channel architecture (MCA). IBM's proprietary bus that is used in high-end PS/2 personal computers. Micro Channel is designed for multiprocessing and functions as either a 16-bit or 32-bit bus. It eliminates potential conflicts that arise when installing new peripheral devices.

MIDI. See *musical instrument digital interface*.

model. The model identification assigned to a device by its manufacturer.

musical instrument digital interface (MIDI). A protocol that allows a synthesizer to send signals to another synthesizer or to a computer, or a computer to a musical instrument, or a computer to another computer.

NDIS. See *network device interface specification*.

network device interface specification (NDIS). An application programming interface (API) definition that allows DOS or OS/2 systems to support one or more network adapters and protocol stacks. NDIS is a 16-bit, Ring O (for the OS/2 operating system) API that defines a specific way for writing drivers for layers 1 and 2 of the OSI model. NDIS also handles the configuration and binding of these network drivers to multiple protocol stacks.

network management station (NMS). In the Simple Network Management Protocol (SNMP), a station that executes management application programs that monitor and control network elements.

NMI. See *non-maskable interrupt*.

NMS. See *network management station*.

non-maskable interrupt (NMI). A hardware interrupt that another service request cannot overrule (mask). An NMI bypasses and takes priority over interrupt requests generated by software, the keyboard, and other such devices and is issued to the microprocessor only in disastrous circumstances, such as severe memory errors or impending power failures.

N_Port. A node port. A fibre channel-defined hardware entity that performs data communications over the fibre channel link. It is identifiable by a unique Worldwide Name. It can act as an originator or a responder.

node. A physical device that allows for the transmission of data within a network.

nonvolatile storage (NVS). A storage device whose contents are not lost when power is cut off.

NVS. See *nonvolatile storage*.

NVSRAM. Nonvolatile storage random access memory. See *nonvolatile storage*.

Object Data Manager (ODM). An AIX proprietary storage mechanism for ASCII stanza files that are edited as part of configuring a drive into the kernel.

ODM. See *Object Data Manager*.

out-of-band. Transmission of management protocols outside of the fibre channel network, typically over Ethernet.

PCI local bus. See *peripheral component interconnect local bus*.

PDF. See *portable document format*.

peripheral component interconnect local bus (PCI local bus). A standard that Intel Corporation introduced for connecting peripherals. The PCI local bus allows up to 10 PCI-compliant expansion cards to be installed in a computer at a time. Technically, PCI is not a bus but a bridge or mezzanine. It runs at 20 - 33 MHz and carries 32 bits at a time over a 124-pin connector or 64 bits over a 188-pin connector. A PCI controller card must be installed in one of the PCI-compliant slots. The PCI local bus is processor independent and includes buffers to decouple the CPU from relatively slow peripherals, allowing them to operate asynchronously. It also allows for multiplexing, a technique that permits more than one electrical signal to be present on the PCI local bus at a time.

performance events. Events related to thresholds set on SAN performance.

polling delay. The time in seconds between successive discovery processes during which Discovery is inactive.

port. The hardware entity that connects a device to a fibre channel topology. A device can contain one or more ports.

portable document format (PDF). A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents. PDF files are compact; can be distributed globally by e-mail, the Web, intranets, or CD-ROM; and can be viewed with the Acrobat Reader, which is software from Adobe Systems that can be downloaded at no cost from the Adobe Systems home page.

private loop. A freestanding Arbitrated Loop with no fabric attachment.

program temporary fix (PTF). A temporary solution or bypass of a problem diagnosed by IBM in a current unaltered release of the program.

PTF. See *program temporary fix*.

RAM. See *random-access memory*.

random-access memory (RAM). A temporary storage location in which the central processing unit (CPU) stores and executes its processes.

read-only memory (ROM). Memory in which the user cannot changed stored data except under special conditions.

RDAC. See *redundant dual active controller*.

redundant dual active controller (RDAC). A controller, used with AIX and Solaris hosts, that provides a multipath driver for a storage subsystem. An RDAC is also known as redundant disk array controller.

red, green, blue (RGB). (1) Color coding in which the brightness of the additive primary colors of light, red, green, and blue are specified as three distinct values of white light. (2) Pertaining to a color display that accepts signals that represent red, green, and blue.

RGB. See *red, green, blue*.

ROM. See *read-only memory*.

router. A computer that determines the path of network traffic flow. The path selection is made from several paths based on information obtained from specific protocols, algorithms that attempt to identify the shortest or best path, and other criteria such as metrics or protocol-specific destination addresses.

SAN. See *storage area network*.

SCSI. See *small computer system interface*.

segmented loop ports (SL_Ports). SL_Ports allow you to divide a Fibre Channel Private Loop into multiple segments. Each segment can pass frames around as an independent loop and can connect through the fabric to other segments of the same loop.

serial storage architecture (SSA). An interface specification from IBM in which devices are arranged in a ring topology. SSA, which is compatible with SCSI devices, allows full-duplex packet multiplexed serial data transfers at rates of 20Mb/sec in each direction.

server. A functional hardware and software unit that delivers shared resources to workstation client units on a computer network.

server/device events. Events that occur on the server or a designated device that meet criteria that the user sets.

Simple Network Management Protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

SL_Port. See *segmented loop ports*.

small computer system interface (SCSI). A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

SNMP. See *Simple Network Management Protocol*.

SNMPv1. The original standard for SNMP is now referred to as SNMPv1, as opposed to SNMPv2, a revision of SNMP. See also *Simple Network Management Protocol*.

SNMP time-out. The maximum amount of time the SANavigator tool will wait for a device to respond to a request. The specified time applies to one retry only.

SNMP trap events. SNMP is based on a manager/agent model. SNMP includes a limited set of management commands and responses. The management system issues messages that tell an agent to retrieve various object variables. The managed agent sends a Response message to the management system. That message is an event notification, called a trap, that identifies conditions, such as thresholds, that exceed a predetermined value.

SRAM. See *static random access memory*.

SSA. See *serial storage architecture*.

static random access memory (SRAM). Random access memory based on the logic circuit known as flip-flop. It is called *static* because it retains a value as long as power is supplied, unlike dynamic random access memory (DRAM), which must be regularly refreshed. It is however, still volatile, meaning that it can lose its contents when the power is switched off.

storage area network (SAN). A network that links servers or workstations to disk arrays, tape backup subsystems, and other devices, typically over fibre channel.

storage management station. A system that is used to manage the storage subsystem. A storage management station does not need to be attached to the storage subsystem through the fibre-channel I/O path.

subnet. An interconnected but independent segment of a network that is identified by its Internet Protocol (IP) address.

super video graphics array (SVGA). A video display standard that Video Electronics Standards Association (VESA) created to provide high resolution color display on IBM PC compatible personal computers. The resolution is 800 x 600 4-bit pixels. Each pixel can therefore be one of 16 colors.

SVGA. See *super video graphics array*.

sweep method. A method of sending SNMP requests for information to all the devices on a subnet by sending the request to every device on the network. Sweeping an entire network can take a half an hour or more. If broadcast is disabled, the recommended method is to enter the individual IP addresses of the SAN devices into the SANavigator tool. This method produces good results without unnecessarily using time to wait for

responses from every IP address in the subnet, especially for IP addresses where no devices are present. There might, however, be times when a full subnet sweep will produce valuable diagnostic information about the network or a device's configuration.

switch. A fibre channel device that provides full bandwidth per port and high-speed routing of data by using link-level addressing.

switch group. A switch and the collection of devices connected to it that are not in other groups. Switch Groups are discovered by the SANavigator tool and displayed with a gray background on the Physical and Data Path Maps.

system name. Device name assigned by the vendor's third-party software.

TCP. See *Transmission Control Protocol*.

TCP/IP. See *Transmission Control Protocol/Internet Protocol*.

terminate and stay resident program (TSR program). A program that installs part of itself as an extension of DOS when it is executed.

TFT. See *thin-film transistor*.

thin-film transistor (TFT). A transistor created by using thin film methodology.

topology. The physical or logical arrangement of devices on a network. The three fibre channel topologies are fabric, arbitrated loop, and point-to-point. The default topology for the disk array is arbitrated loop.

TL_Ports. See *translated loop port*.

translated loop ports (TL_Ports). Each TL_Port connects to a private loop and allows connectivity between the private loop devices and *off loop* devices (devices not connected to that particular TL_Port).

Transmission Control Protocol (TCP). A communication protocol used in the Internet and in any network that follows the Internet Engineering Task Force (IETF) standards for internetwork protocol. TCP provides a reliable host-to-host protocol between hosts in packed-switched communication networks and in interconnected systems of such networks. It uses the Internet Protocol (IP) as the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of communication protocols that provide peer-to-peer connectivity functions for both local and wide-area networks.

trap. In the Simple Network Management Protocol (SNMP), a message sent by a managed node (agent function) to a management station to report an exception condition.

trap recipient. Receiver of a forwarded SNMP trap. Specifically, a trap receiver is defined by an IP address and port to which traps are sent. Presumably, the actual recipient is a software application running at the IP address and listening to the port.

TSR program. See *terminate and stay resident program*.

user action events. Actions that the user takes, such as changes in the SAN, changed settings, and so on. Each such action is considered a User Action Event.

vendor. Property value that the SANavigator tool uses to launch third-party software. Vendor property might be discovered but will always remain editable.

VGA. See *video graphics adapter*.

video graphics adapter (VGA). A computer adapter that provides high-resolution graphics and a total of 256 colors.

video random access memory (VRAM). A special type of dynamic RAM (DRAM) used in high-speed video applications, designed for storing the image to be displayed on a computer's monitor.

VRAM. See *video random access memory*.

WORM. See *write-once read-many*.

Worldwide Name (WWN). A registered, unique 64–bit identifier assigned to nodes and ports.

write-once read-many (WORM). Any type of storage medium to which data can be written only a single time, but can be read from any number of times. After the data is recorded, it cannot be altered. Typically the storage medium is an optical disk whose surface is permanently etched by using a laser in order to record information. WORM media are high-capacity storage devices and have a significantly longer shelf life than magnetic media.

WWN. See *worldwide name*.

XGA. See *eXtended graphics array*.

zoning. A function that allows segmentation of nodes by address, name, or physical port and is provided by fabric switches or hubs.

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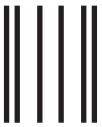

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