

**adic**

FCR 200

# **Operator Guide**

 Advanced Digital Information Corp.

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## Overview

This manual contains information and instructions necessary for the safe operation of the FCR200 Fibre Channel-to-SCSI Routers. The topics discussed in this chapter are:

- Overview
- Intended Audience
- Organization
- Associated Documents
- Explanation of Symbols and Notes
- Assistance

## Intended Audience

This guide is intended for operators, trained customer specialists, and maintenance personnel of the service partner who interact with the FCR200.

## Organization

This publication contains chapters detailing the operation of the FCR200. The chapters topics include:

- |           |   |
|-----------|---|
| Chapter 1 | <i>Introduction</i> - Describes the overview, intended audience, organization, associated documents, explanation of symbols and notes, and how to obtain additional assistance. |
| Chapter 2 | <i>Description</i> - Describes general information about the FCR200.  |
| Chapter 3 | <i>Safety</i> - Describes the hazard symbols, messages, safety features, and operational considerations for the safe operation of the FCR200.                                   |
| Chapter 4 | <i>Installation</i> - Describes the functional installation of the FCR200.  |
| Chapter 5 | <i>Understanding the Configuration</i> - Describes the configuration considerations for the FCR200.   |
| Chapter 6 | <i>Configuration</i> - Describes the configuration of the FCR200.   |

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Chapter 7	<i>Troubleshooting</i> - Describes troubleshooting techniques and hints.
Appendix A	<i>Ethernet Assignments</i> - Outlines the Ethernet cable connections.
Appendix B	<i>Fibre Channel Interface and Commands</i> - Describes specific commands supported by the FCR200.
Appendix C	SCSI Interface and Commands - Describes specific information about the SCSI Inquiry command.
Appendix D	<i>Addressing, Structures, and Operation</i> - Describes various addressing schemes for devices.
Appendix E	<i>Reference Standards</i> - List applicable standards.
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## Associated Documents

None.

## Explanation of Symbols and Notes

The following symbols and highlighted passages note important information.



Detailed explanations for the above symbols are provided in *Safety Instructions* on page 3-3.

<1> + <2>	Press these keys simultaneously.
<i>Italics</i>	Headline, e. g., Chapter Name, <i>Description</i>
<b>Bold</b>	Special Term, e. g., <b>Utilities</b> .
Courier	Terms appearing on the operating panel, switch position, e. g., ON, OFF

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## Federal Communication Commission Notice (US Only)

The Federal Communications Commission (in 47 CFR 15.105) has specified that the following notice be brought to the attention of the users of this product.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference 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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

## IEC Statement (Worldwide)

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

## Canadian Notice (Avis Canadien)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## European Union Notice

Products with the CE Marking comply with both the EMC directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission or the European Community. Compliance with these directives implies conformity to the following European Norms (in brackets are equivalent international standards):

EN55022 (CISPR 22)      Electromagnetic Interference

EN50082-1 (IEC801-2, IEC801-3, IEC801-4)  
Electromagnetic Immunity

## VCCI Statement (Japan)

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according to EN 45014	
<b>Manufacturer's Name:</b>	Advanced Digital Information Corporation
<b>Manufacturer's Address:</b>	11431 Willows Road Redmond, Washington 98052 U.S.A.
	21-23 Av. Saint-Fiacre F-78100 Saint-Germain-en-Laye France
<b>declares, that the product:</b>	
<b>Product (Produit, Erzeugnis):</b>	Fiber Channel/SCSI Router
<b>Model Numbers (Marque Commercial, Warenbezeichnung):</b>	FCR 200
<b>conforms to the following international standards,</b>	
<b>Emissions:</b>	EN 50081-1, EN 55022 Class A
<b>Immunity:</b>	EN 50082-1:1995 IEC 801-2, IEC 801-3, IEC 801-4 ENV 50204
<b>Safety:</b>	EN 60950
<b>Quality:</b>	ISO 9001
<b>Supplementary Information:</b>	
<b>Signature:</b> Signatures on file	<b>Signature:</b> Signatures on file
<b>Full Name:</b> _____	<b>Full Name:</b> _____
<b>Position:</b> _____	<b>Position:</b> _____
<b>Date:</b> _____	<b>Date:</b> _____
<b>Place:</b> Redmond, WA USA	<b>Place:</b> Saint-Germain-en-Laye, France

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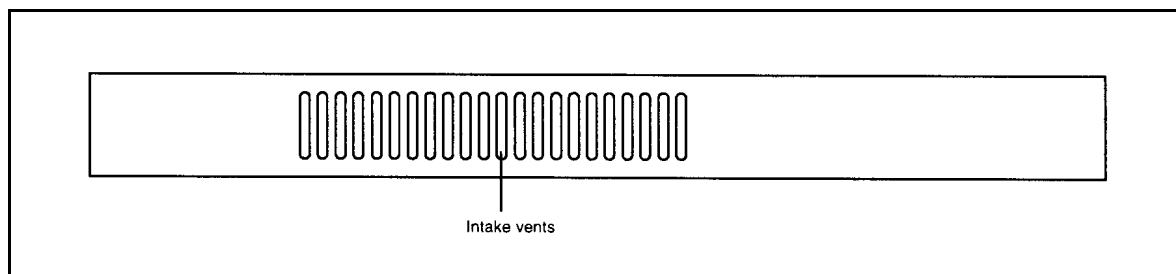
## ■ Introducing the FCR200

The FCR200 is a member of the Fibre Channel-to-SCSI Router product family. See Figure 2-1 and Figure 2-2.

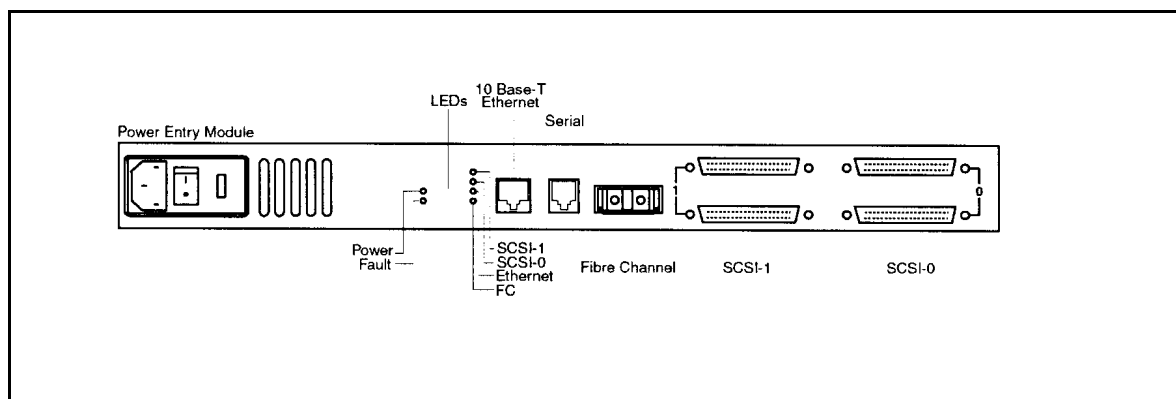
The FCR200 provides connectivity between a Fibre Channel Switched Fabric (FC-SW) or Arbitrated Loop (FC-AL), and two Fast/Wide/Ultra SCSI buses.

Supported devices include:

- Initiator Devices – Fibre Channel and SCSI hosts
- Direct Access Devices – RAID Controllers, Disk drives, JBODs
- Sequential Access Devices – Tape drives
- Changer Devices – Tape and Magneto-Optical Libraries



**Figure 2-1** Front panel of the FCR200



**Figure 2-2** Back panel of the FCR200

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## FCR200 Features

### Fibre Channel Features

- Fibre Channel initiator and target modes
- Single 1.0625 Gbps port
- Fibre Channel Arbitrated Loop (FC-AL) and Switched Fabric (FC-SW) topologies
- Private Loop Direct Attach (PLDA) profile compliant
- Class 3 connection with SCSI-FCP protocol
- Optical GBIC
- FC-Tape Compliant

### SCSI Bus Features

- SCSI initiator and target modes
- Two auto-negotiating SCSI buses (Narrow, Wide, Fast, Ultra)
- Ultra Wide SCSI for data transfer up to 40 MB/s per bus
- Connection for up to 30 devices (15 per bus)
- Simultaneous commands, tagged command queuing and disconnect/reconnect
- Middle of bus configuration with external termination
- SCSI-2 and SCSI-3 protocols
- 68-pin D shell, P type connectors
- Differential or single-ended
- Disk, tape, optical and changer devices
- SCC, Indexed and Automatic addressing modes

### Configuration Features

- Serial RJ-11 connector for terminal access
- Ethernet RJ-45 connector for FTP, Telnet and Web browser access
- Easy field-upgradable firmware

### Management Features

- Out-of-band Ethernet TCP/IP
- SNMP with private MIB support



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# FCR200 Specifications

## Physical Specifications

- Internal power supply with power switch and detachable power cord
- Fibre Channel activity LED
- SCSI Bus 1 activity LED
- SCSI Bus 0 activity LED
- Ethernet activity LED
- Power LED
- Fault LED
- Airflow with internal fan
- Rack mount or desktop enclosure

## Physical Dimensions

- Width 43.18cm (17.00 inches)
- Depth 22.82cm (8.98 inches)
- Height 4.31cm (1.70 inches, 1U)
- Weight 3.18 kg (7 lbs)

## Operating Environment

- 5 to 40 °C
- 5 to 80% Relative Humidity (non-condensing)

## Non-operating Environment

- -40 to +55 °C
- 0 to 92% Relative Humidity (non-condensing)

## Power

- 100 - 240 VAC, Auto Sensing
- 50/60 Hz, 1.0 Amps

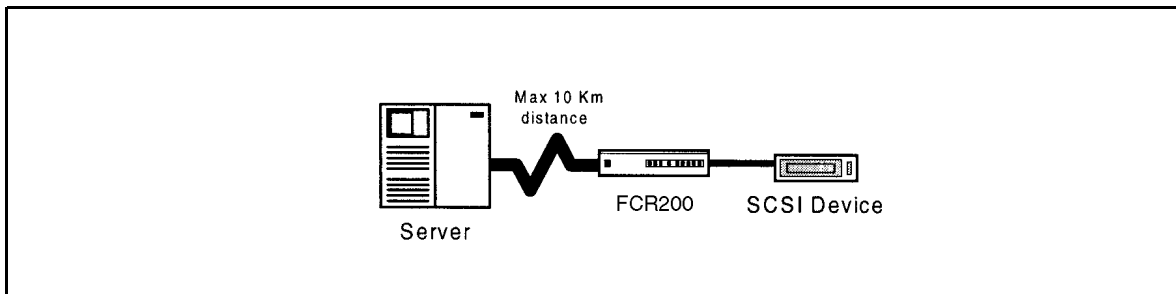
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## FCR200 Benefits

### Point-to-Point

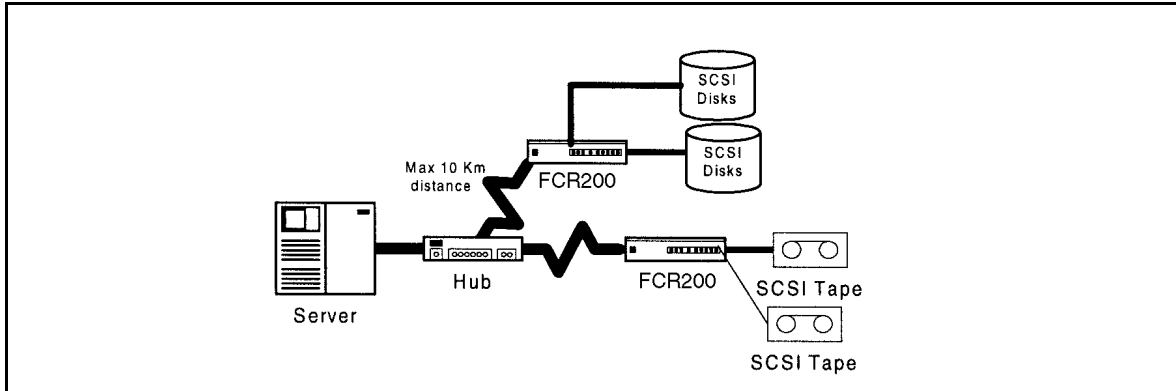
See Figure 2-3 for a point to point illustration.



**Figure 2-3** Single Initiator to Single Target

### Single Initiator

See Figure 2-4 for a single initiator to multiple target illustration.



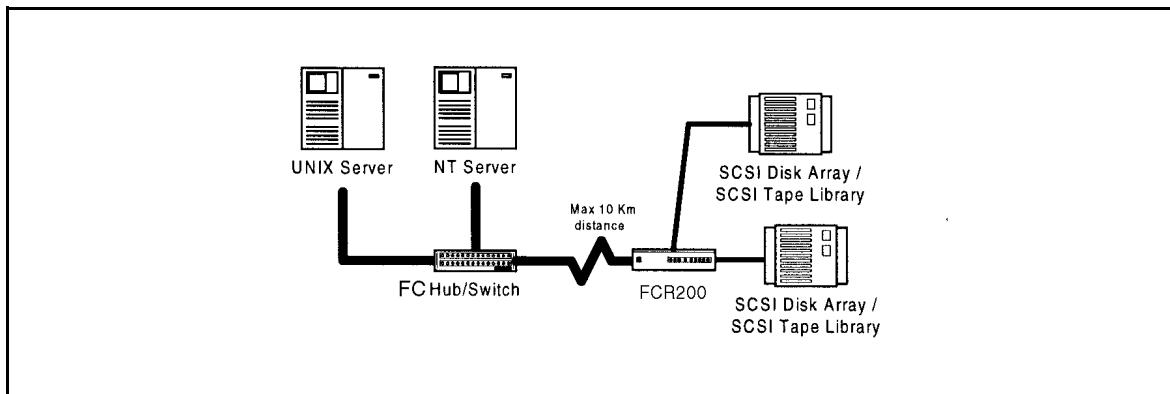
**Figure 2-4** Single Initiator to Multiple Targets

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## Multiple Initiators

See Figure 2-5 for multiple initiators to single or multiple targets illustration.



**Figure 2-5** Multiple Initiators to Single or Multiple Targets

Availability	With two units, dual loop attachment provides redundancy and no single point of failure.
Connectivity	SCSI devices may be attached to Fibre Channel storage networks to share data and increase address space.
Distance	SCSI cable length from hosts to devices is increased from 25m to 10,000m, facilitating remote or disaster tolerant sites.
Performance	100 Mbytes/sec Fibre Channel (200 Mbytes/sec bi-directional) offers increased bandwidth when distributing data across multiple SCSI devices.
Reliability	Low error rates, robust error recovery and flow control provide an enterprise with reliable data delivery.
Scalability	Point-to-point links can be expanded to multi-initiator links supporting interconnected servers, tape drives, tape libraries, disk drives and disk arrays.
Flexibility	Allows Fibre Channel initiators to communicate with SCSI targets, as well as SCSI initiators to communicate with Fibre Channel targets, simultaneously.

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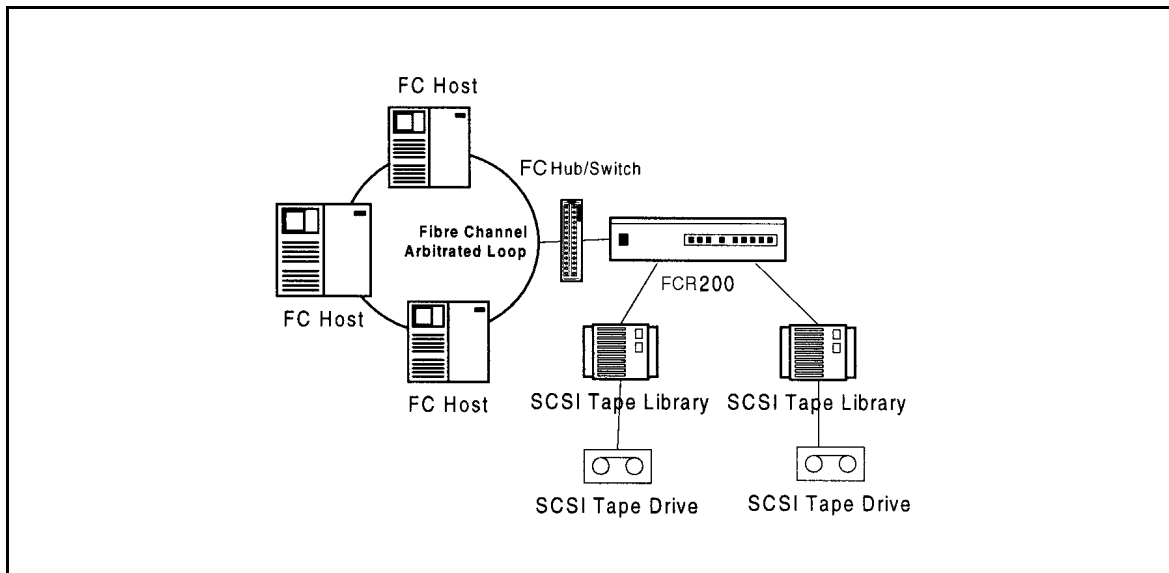
Consolidation	Allows multiple servers to share storage resources, including tape drives, tape libraries, disk drives and disk arrays.
Centralization	Enables existing storage to be moved to a central location to simplify management and maintenance, and to improve security.
Lower TCO	Improving storage management, maintenance and security can lower Total Cost of Ownership (TCO) for enterprise storage.

## How the FCR200 Works

The FCR200 is a storage router that translates Fibre Channel Protocol (FCP) to and from two SCSI buses so devices on these two types of media can communicate with each other. It attaches to either a Fibre Channel or SCSI host, and transfers the command, data, and status information to SCSI or Fibre Channel targets. The host passes packets to SCSI or Fibre Channel targets as if the FCR200 were just another device along the path.

The FCR200 provides connections for two SCSI buses and a Fibre Channel Arbitrated Loop or Switched Fabric. It takes advantage of Fibre Channel's ability to encapsulate SCSI protocol packets to allow a host with a FC or SCSI adapter to access SCSI or FC peripheral devices transparently over a FC connection.

Figure 2-6 on page 2-9 shows a Fibre Channel-to-SCSI configuration. Through the FCR200 router, any host on the Fibre Channel loop can access the tape drive and library on each SCSI bus.



**Figure 2-6** Fibre Channel-to-SCSI Configuration

## Operating as Both a SCSI and Fibre Channel Device

The router is both a SCSI and Fibre Channel device operating on a SCSI bus and Fibre Channel network simultaneously.

### The SCSI Side

On a SCSI bus, the FCR200 acts as a SCSI initiator passing requests from hosts on the Fibre Channel network to target devices on the SCSI bus. Each FCR200 SCSI bus uses a single SCSI ID. The default ID is 7 and can be changed when configuring the FCR200.

### The Fibre Channel Side

In a Fibre Channel loop, the FCR200 is identified by a single Arbitrated Loop Physical Address (AL\_PA) or a fabric assigned Source ID. Once the address is acquired, any host on the Fibre Channel loop can access the devices on a SCSI bus transparently over a FC connection.

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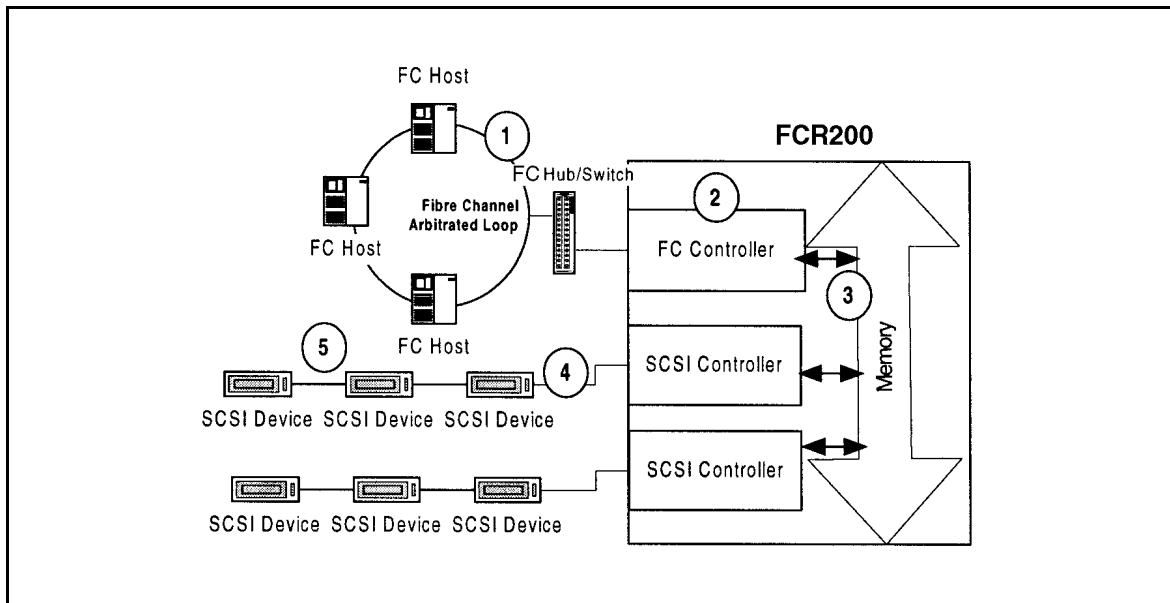
## ■ Mapping Devices

To allow Fibre Channel and SCSI devices to address each other, the FCR200 creates a table that maps device identifiers between Fibre Channel and SCSI. During FCR200 configuration, you can choose the mapping method and, in certain cases, customize the device mappings. See *Chapter 5* for more information about address modes and their configurations.

## ■ Processing SCSI Information

The following describes how the router processes SCSI information. Refer to Figure 2-7 on page 2-11.

- 1 A FC host issues a command. The FC host encapsulates the command in the FCP protocol and sends the packet to the FCR200.
- 2 The FC port in the FCR200 receives the packet, interprets the FC information, and places the packet in buffer memory.
- 3 The FCR200's processor interprets the information and programs a SCSI controller to process the transaction.
- 4 The SCSI controller sends the command to the SCSI device (target).
- 5 The target interprets the command and prepares to either read or write data.



**Figure 2-7** Information processing

- 6 Data flows between the host and target through DirectFlow™ payload buffers.
- 7 Response information flows from the SCSI target back to the FC host.

## ■ Processing Fibre Channel Information

The FCR200 processes information from the SCSI bus host by requesting operations of targets on a Fibre Channel Storage Area Network (SAN). The information is processed using the same method as described in the previous section, except it begins with the SCSI host bus issuing commands and the information passing through the FCR200 to the FC SAN.





# 3

## Safety

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## Safety Instructions

### WARNING



*A WARNING denotes a hazard that can cause personal injury.*

### CAUTION



**A CAUTION denotes a hazard that can cause hardware or software damage.**

## Grounding

This product is a Safety Class 1 product and has a protective earthing terminal. There must be an uninterruptible safety earth ground from the main power source to the product's input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, disconnect the power cord until the ground has been restored.

## Servicing

Any servicing, adjustment, maintenance, or repair must be performed only by authorized service-trained personnel. There are no operator serviceable parts in this product.

## Warranty

If you have any questions about the warranty of this product, contact a sales representative.

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## German Statements

### Sicherheitshinweise

#### WARNUNG



*Eine WARNUNG bezieht sich auf eine Gefahr, die zu Verletzung von Personen fuehren kann.*

#### ACHTUNG



**Ein ACHTUNG bezieht sich auf eine Gefahr, die zu Schaden am Geraet oder Verlust von Daten fuehren kann.**

## Schutzerdung

Dieses Produkt ist ein Schutzklasse I Geraet und hat einen Anschluss fuer Schutzerdung. Ein ununterbrochener Schutzleiter von der Stromquelle zum Schutzleiteranschluss des Geraetes oder dem Netzkabel ist unbedingt notwendig. Bei Anzeichen von Beeintraehtigung dieser Schutzeinrichtung, trennen Sie die Netzzufuehrung bis die Schutzerdung wieder einwandfrei ist.

## Wartung/Instandsetzung

Jegliche Wartung, Instandsetzung oder Einstellung muss durch einen qualifizierten, autorisierten Fachmann durchgefuehrt werden. Das Geraet enthaelt keinerlei zu wartende Teile fuer den Benutzer.

#### WARNUNG



*Oeffnen Sie niemals das Gehaeuse! Gefahr des Elektrischen Schlages!*

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**WARNUNG**



*Das Netzteil ist bestimmt und zertifiziert fuer einen Netzspannungsbereich von 100 – 240 V ~.*

**WARNUNG**



*Die Geraetesicherung darf nur mit einer Sicherung des gleichen Typs und Nennwerten ersetzt werden.*

**WARNUNG**



*Zur Vermeidung der Gefahr eines Elektrischen Schlages, oeffnen Sie das Gehaeuse unter keinen Umstaenden.*

## **Laser Safety**

### **Certification and Classification Information**

This product uses Gigabit Interface Converters (GBIC) to interface with Fibre Channel links. Optical GBICs shipped with this product contain internal lasers. In the USA, all optical GBICs shipped with this unit are certified as Class 1 laser products and conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR Subchapter J.

Outside the USA, all GBICs are certified as Class 1 laser components that conform to the requirements contained in the International Electrotechnical Commission (IEC) standard 825 (1994) and Amendment 1 (1990) along with the CENELEC (European Committee for Electrotechnical Standardization) European Normalization standard EN 60825 (1992).

If other than the shipped optical GBICs are used with this product then the user is required to insure that the optical GBIC being used meets all of the above requirements. If the GBIC is not certified then this product's laser safety certification becomes null-and-void.

Certifications include one or more of the following:

- Recognized Component by Underwriters Laboratories
- Certified by the Canadian Standard Association
- Certified by VDE (Germany) and/or Certified by Statens Provningsanstalt (SP) in Sweden

The following shows the Class 1 information label specified in IEC 825 and CENELEC HD 482 51. This label is attached to this product.

Class 1 Laser Product Laser Klasse 1 Luckan 1 Laserlaite
--

The following information provides the typical operational parameters for the Optical Laser GBIC included with the FCR200.

Parameter	Shortwave	Longwave
Nomenclature	100-M5-SN-I	100-SM-LC-L
Spectral Centre Wavelength	770-850nm	1300nm
Operating Range	2-500m	2-10km
Launch Power Max	1.3 dBm	-3 dBm
Launch Power Min	-7 dBm	
Receive Power Min	-13 dBm	-20 dBm
Receive Power Max	1.3dBm	-3 dBm
Extinction Ratio	6 dB	9 dB
TX Deterministic Jitter	20 ps	20 ps
Fibre Diameter	50um	9um
Class	Multi-mode	Single-mode

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Parameter	Shortwave	Longwave
Nominal Bit Rate	1061.5 Mbaud	1062.5 Mbaud
OFC	none	none

Class 1 Laser Products are not considered hazardous.

## Product Information

Each Fibre Channel communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength of 780 or 1300 nanometers.

**WARNING**



*There are no user maintenance or service operations or adjustments to be performed on any of the GBIC modules.*

## Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and points of access may emit laser radiation above the Class 1 limits established by the IEC and U.S. DHHS.





# 4

## Installation

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## Installing the FCR200

This chapter describes how to setup and install the FCR200. This includes unpacking the FCR200 for the first time, factors to consider when installing the FCR200, either desktop or rack installation instructions, and connecting to different types of devices. Read this chapter carefully and completely before working with the FCR200.

A number of factors need to be considered in planning the installation of the FCR200. These factors include the location of the unit, the use of the unit, and the type of devices to which the unit will be attached.

## Location

The FCR200 Router can be placed on a desktop or mounted in a standard 19-inch rack depending on the specific requirements of the installation. The operating environment should meet the requirements found in *Chapter 2*. If you plan to use the router on a tabletop, attach the stick-on feet to the bottom of the router to protect the surface.

### **Note**

The FCR200 contains a cooling fan mounted in the rear of the enclosure and intake vents on the front of the enclosure. The rear fan vent and the front intake vents should remain clear of obstructions to ensure proper airflow.

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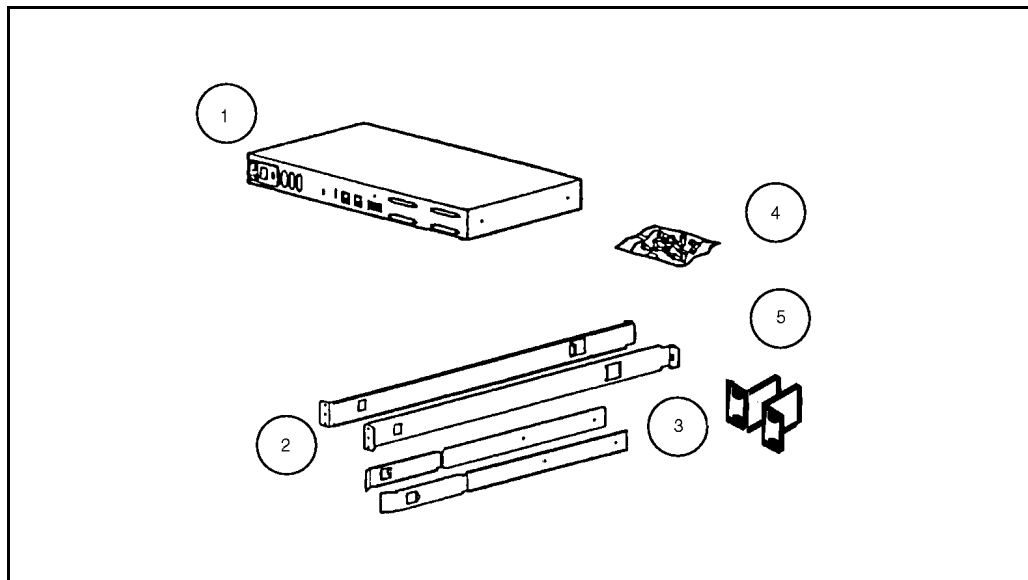
## Unpacking the Box

- 1 Remove all items from the shipping container. Check each one for damage. Keep the FCR200 in the protective bag until you are ready to install it.
- 2 Refer to the packing slip or contents list to make sure you received all the equipment you ordered. If an item is missing, contact your sales representative immediately.
- 3 Select a location that ensures the front intake vents and rear fan are clear of obstructions so air flows freely through the router.
- 4 Do not connect any devices or cables to the FCR200 until the device is secured in a rack or placed securely on a flat, level surface.

## Mounting the FCR200 in a Rack

Follow the directions below to mount the FCR200 in a standard rack. Slide rails are optional.

### Materials Needed:



**Figure 4-1** Materials Needed

- 
- 
- 1 FCR200
  - 2 Left and right mounting rails (optional)
  - 3 Slide rails (optional)
  - 4 Mounting screws (8 torx screws and 4 phillips screws) and cage nuts
  - 5 Left and right ears

## Required tools:

- Phillips screwdriver
- Standard Torx screwdriver set

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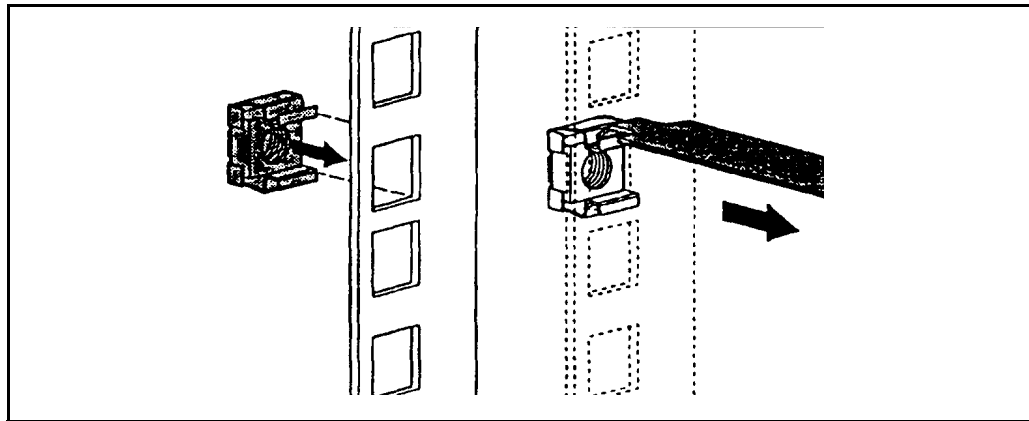
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## Installation Procedure

### Note

Place the FCR200 so the rear fan vent and the front intake vents remain clear of obstructions to ensure proper airflow.

- 1 Remove the router from the protective bag.
- 2 Determine where the FCR200 will be mounted.
- 3 Remove any blanking panels and other equipment from the chosen rack location.
- 4 Install the cage nuts on the vertical mounting rails in the rear of the rack cabinet in accordance with the desired mounting method.



**Figure 4-2** Cage Nut Installation

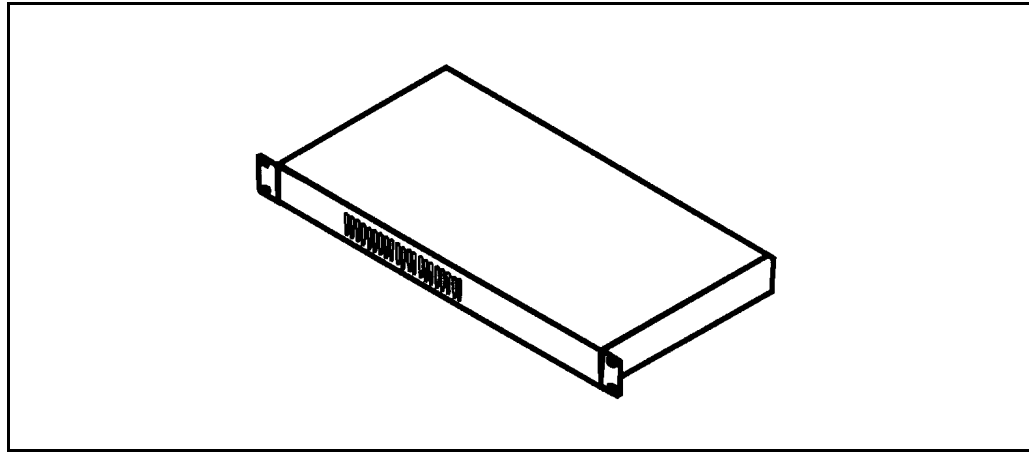
## Ear Rail Mounting

### **WARNING**



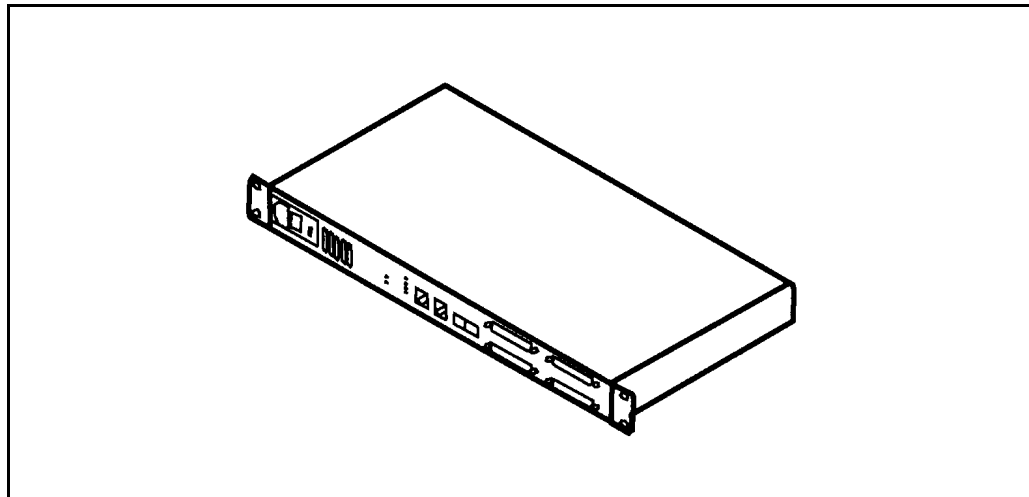
*To reduce injury or equipment damage, the mounting bracket must be level. If the brackets are not level, the FCR200 cannot be installed properly.*

If you are mounting the FCR200 in the front of the rack with the connectors facing the back or in the back of the rack with the connectors facing the front, attach the mounting ears, using phillips screws, as shown in Figure 4-3 on page 4-7.



**Figure 4-3** Mounting at Front of rack

If you are mounting the FCR200 in the front of the rack with the connectors facing the front or in the back of the rack with the connectors facing the back, attach the mounting ears as shown in Figure 4-4.



**Figure 4-4** Mounting at back of Rack

- 1 Attach each bracket to the mounting rail, using two torx screw on each side. Tighten the screws securely.

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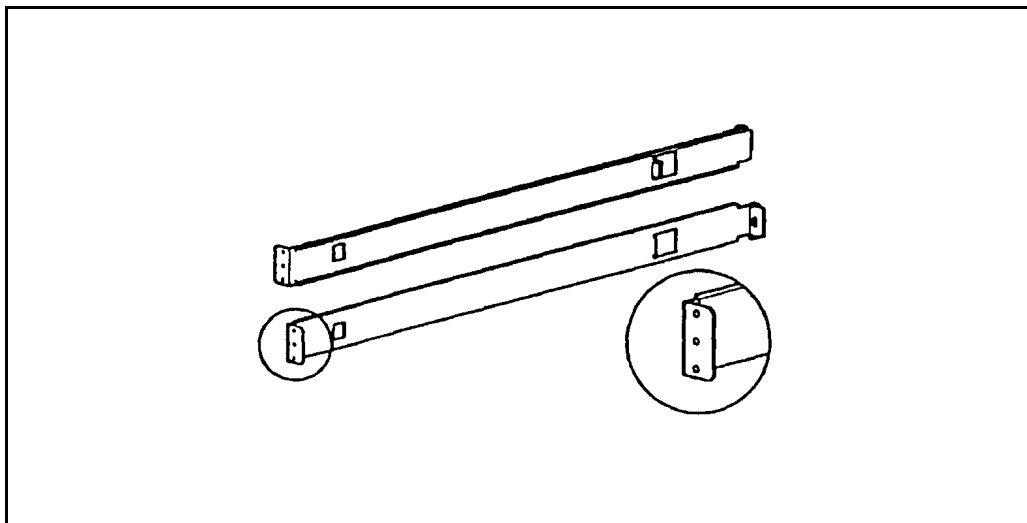
## Slide Rail Mounting (Optional)

**WARNING**



*To reduce injury or equipment damage, the mounting bracket must be level. If the brackets are not level, the FCR200 cannot be installed properly.*

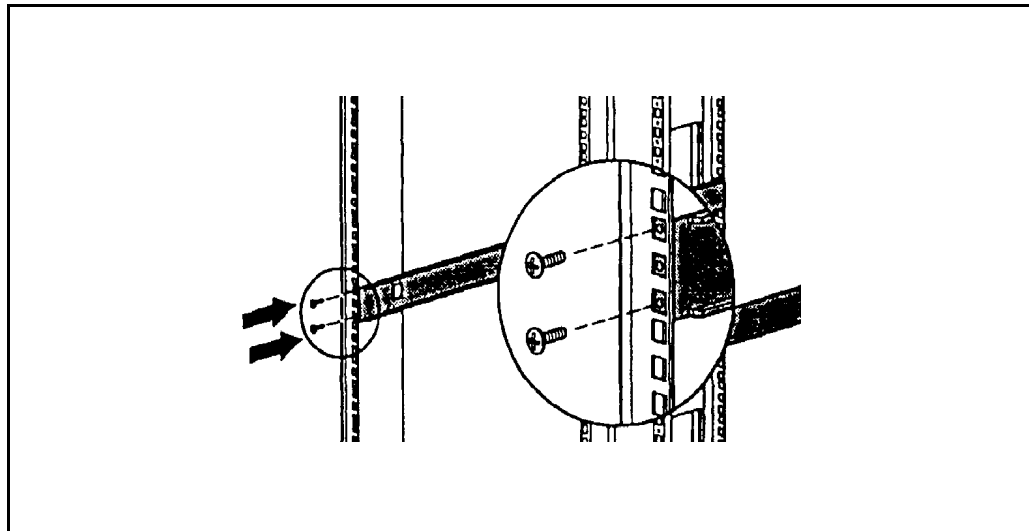
- 1 Locate the front of the mounting brackets



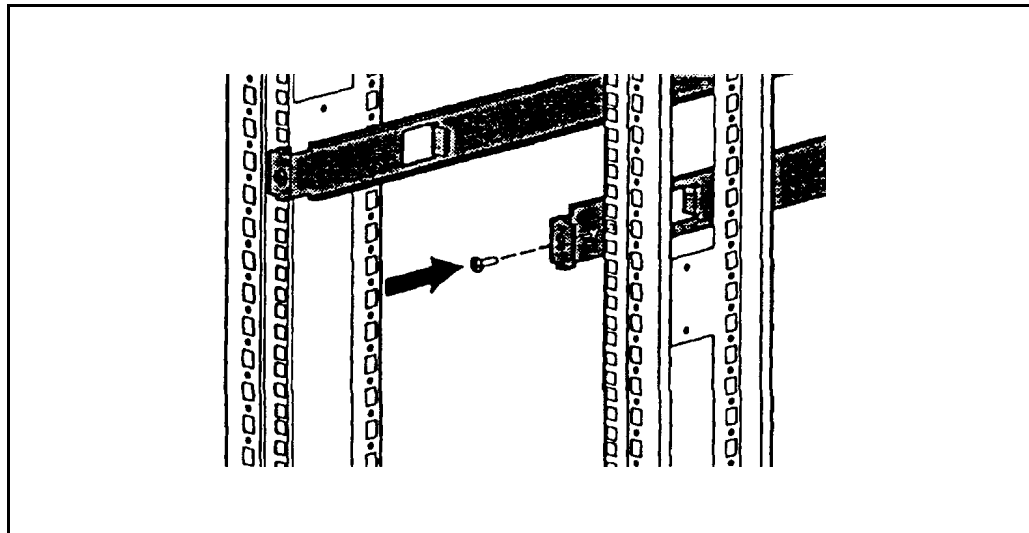
**Figure 4-5** Front of Mounting Brackets

- 2 Attach the brackets to the front mounting rails, using two torx screws on each side. Be sure to use only the top and bottom holes in each bracket. (The middle holes will be used to attach the front cover panel after the unit is installed.) Tighten the screws securely.



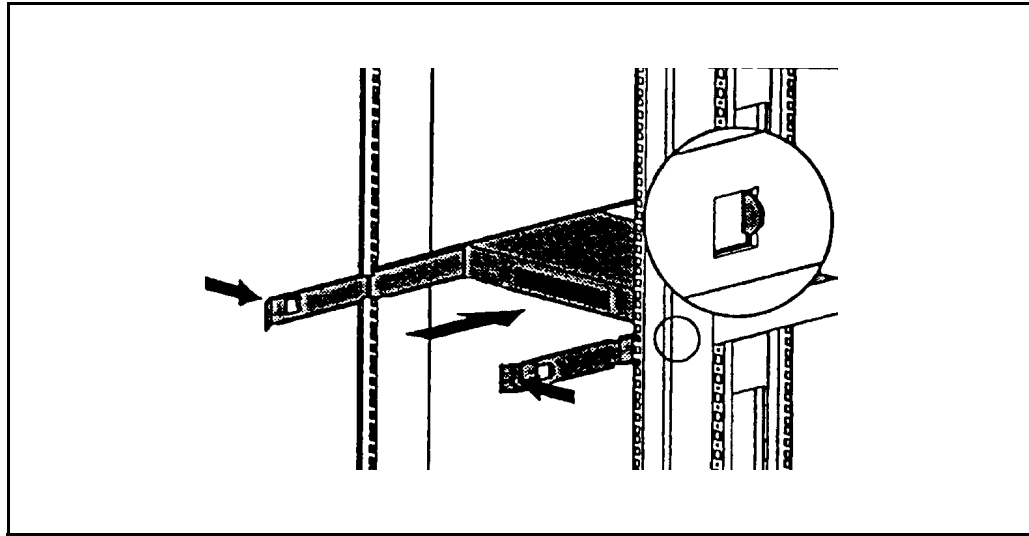


**Figure 4-6** Attaching the Brackets



**Figure 4-7** Attaching Brackets

- 3 Attach the slide rails to the FCR200 using two torx screws on each side. Slide the unit back into the rack and push in on the front tabs until the rails snap into place.



**Figure 4-8** Attaching Side Rails

Once the FCR200 is installed, you are ready to connect it to the other system components.

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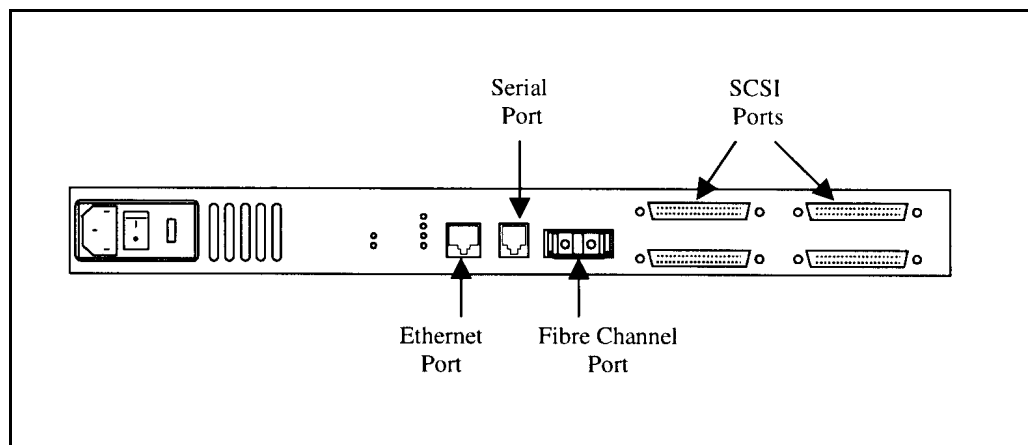
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## Interfaces and Connections

There are four types of physical interfaces to the FCR200:

- Fibre Channel
- SCSI
- RS-232 (Serial port)
- Ethernet

The RS-232 and Ethernet ports are used primarily for FCR200 configuration and management. MIB information for each interface is discussed later in this chapter.



**Figure 4-9** Port Locations

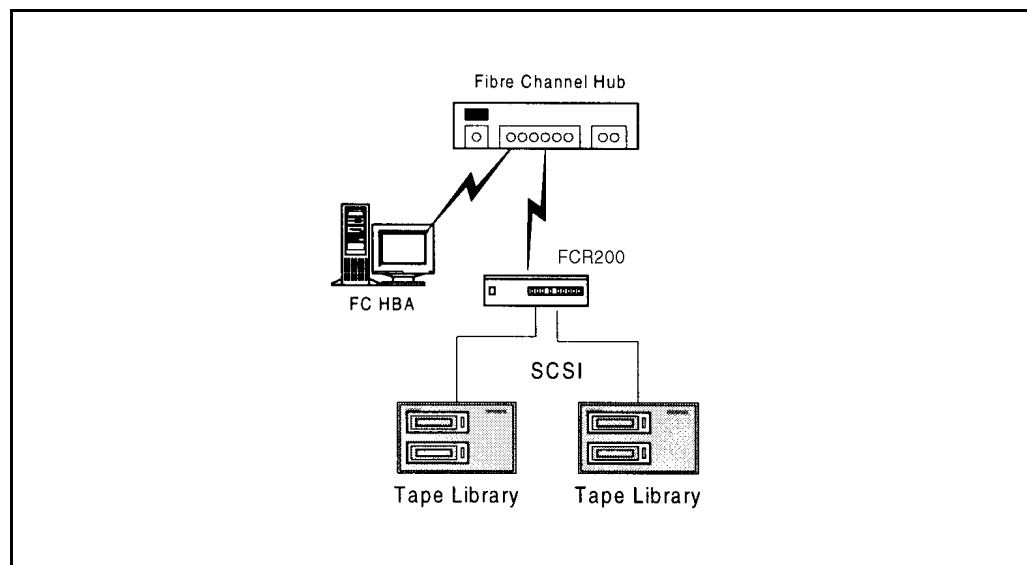
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## Fibre Channel Connection

Before connecting the FCR200 to other Fibre Channel devices, it is important to understand the configuration requirements of the environment to which it will be connected. Failure to correctly configure a Fibre Channel device may impair the operation of the storage area network to which it is attached.

Typical installations will have the FCR200 connected to either an Arbitrated Loop or Switched Fabric environment. For an arbitrated loop, the unit can be directly attached to the Fibre Channel host bus adapter or target device, in a point to point fashion. Arbitrated loops also allow for the use of Fibre Channel hubs, to which the unit can be directly attached. In Fibre Channel switched environments, the switch is directly attached to the FCR200.



**Figure 4-10** Configuration with Tape library

Both switches and hubs may allow for individual ports to be configured for different media types. The FCR200 must be connected to the hub or switch port with the appropriate cabling for the media type in use on both the FCR200 and the port to which it is connected.

The FCR200 supports various Fibre Channel media types through the use of an external Gigabaud Interface Converter (GBIC).

Available media types include:

**Copper Support**

1.0625 Gbaud HSSDC connector  
or 1.0625 Gbaud DB9 connector

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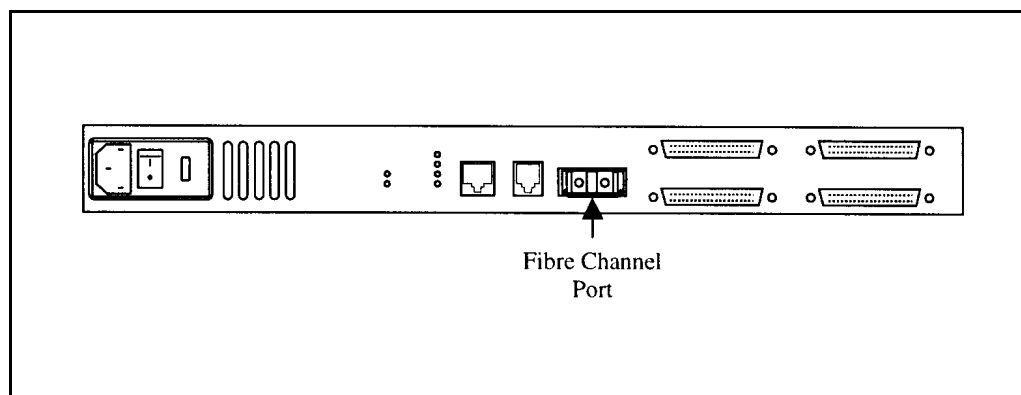
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**Multi-Mode Fiber Support** 1.0625 Gbaud Dual SC connectors

**Single-Mode Fiber Support** 1.0625 Gbaud Dual SC connectors

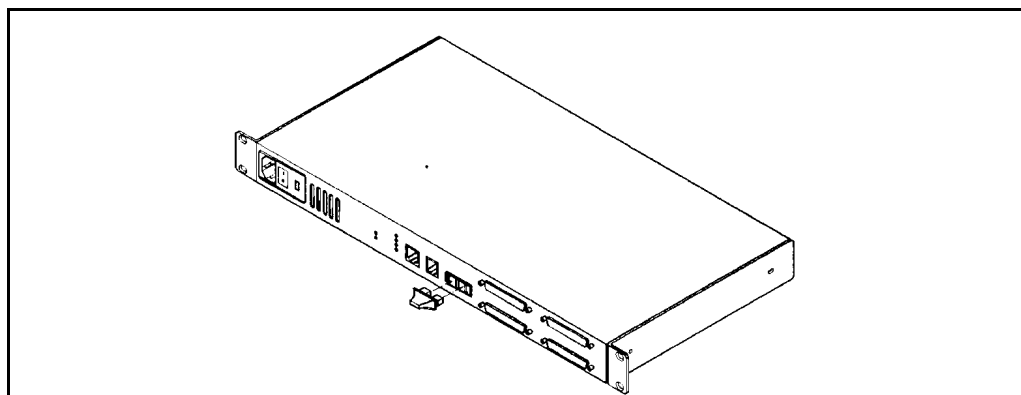
To connect the FCR200 to the Fibre Channel Storage Area Network:

- 1 Locate the Fibre Channel port on the back of the FCR200.



**Figure 4-11** Fibre Channel Port

- 2 Remove the rubber protector from the GBIC, as shown in Figure 4-12, and push the metal latch down to lock it into place.



**Figure 4-12** Removal of GBIC Protector

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**WARNING**



*The FCR200 has been qualified with a specific set of GBICs. Using a GBIC that has not been qualified may cause the FCR200 to operate improperly or to void approval and certifications*

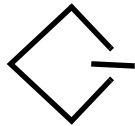
- 3 With the FCR200 powered off, connect the FCR200 into your Fibre Channel environment using the appropriate cabling. The connectors on the FCR200 are keyed. Be sure to insert the cable connectors in the proper orientation.

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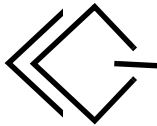
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## SCSI Connection

The FCR200 supports Fast/Ultra Wide SCSI. The FCR200 is factory configured to support either a Single-Ended or Differential SCSI bus. Four 68-pin D-shell connectors are located on the rear panel of the unit, allowing the unit to be attached in the middle or at the end of a SCSI bus. If the FCR200 is located at one end of the SCSI bus, an external terminator should be installed. Two terminators are provided with the FCR200.



Single-Ended SCSI support is indicated by this symbol on the rear of the FCR200.

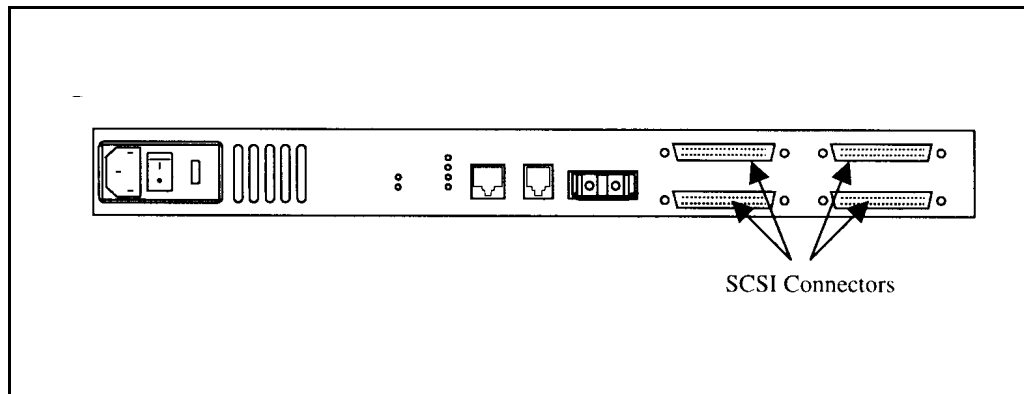


Differential SCSI support is indicated by this symbol on the rear of the FCR200.

The FCR200 supplies termination power (TERMPWR) on each SCSI bus. A self-resetting fuse is used that will reset after the fault is cleared.

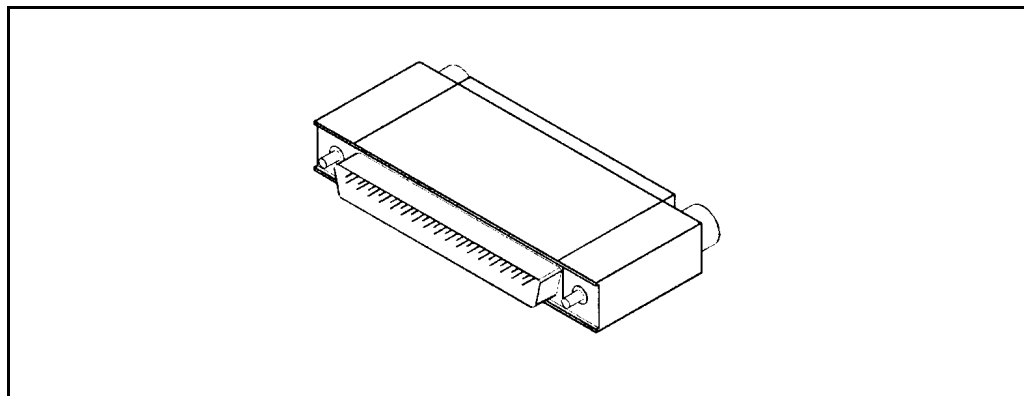
To connect the FCR200 to a SCSI bus:

- 1 Power off your SCSI devices.
- 2 Connect a SCSI cable to one of the SCSI connectors on the back of the router. If necessary, use a narrow-to-wide adapter.
- 3 Connect the other end of the SCSI cable to the next SCSI device on the bus.
- 4 If the FCR200 is at the end of the SCSI bus, place the terminator provided with the router on the FCR200's other SCSI connector on the same bus. If the router is not at the end of the bus, attach a second SCSI cable to the other SCSI connector. Use a narrow-to-wide adapter, if necessary. Connect this cable to the next device on the bus.



**Figure 4-13** FCR200 SCSI Connection

- 5 Make sure that each bus is terminated correctly. The device at each end of each bus must be terminated.



**Figure 4-14** SCSI Terminator

- 6 Power on your SCSI devices.
- 7 After all the SCSI devices have completed their individual POSTs, power on the FCR200.



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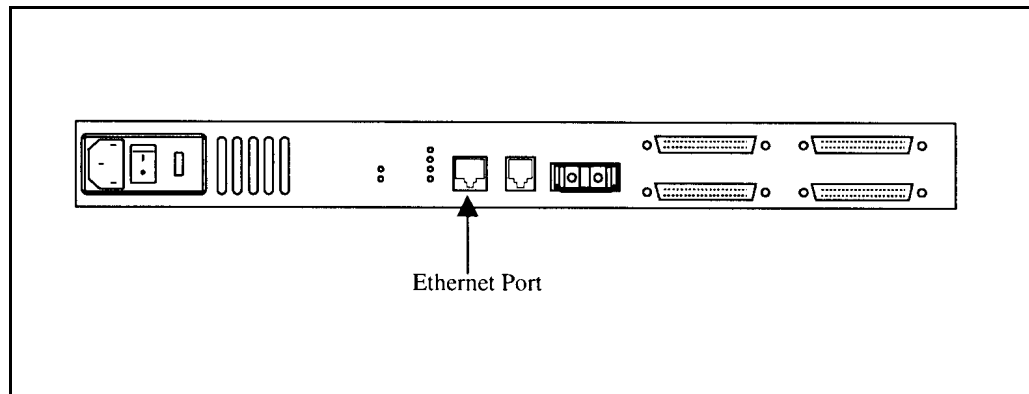
## Ethernet Connection

10BaseT Ethernet connectivity is used to provide enhanced management and configuration capabilities. The RJ-45 connector on the unit can be directly connected to a standard 10BaseT Ethernet network.

Configuration is required to set the IP network address to allow for use of the configuration capabilities of this port. Refer to *Chapter 6* for details on setting the IP network address.

Ethernet capabilities include Telnet for configuration, FTP and TFTP for firmware upgrades, and SNMP for configuration and management.

 **Note**  
The FCR200 contains a unique Ethernet MAC address that is assigned during the manufacturing process.



**Figure 4-15** FCR200 Ethernet Port

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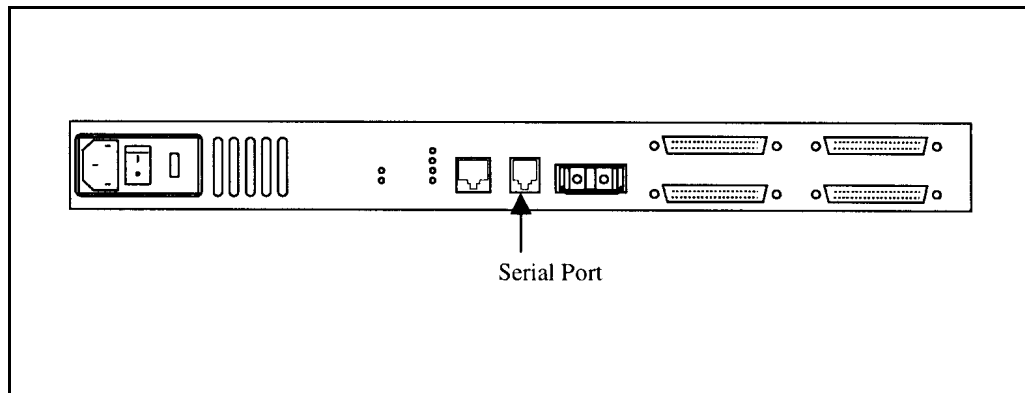
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## Serial Port Connection

The RJ11 connector on the rear panel of the FCR200 provides an RS-232 connection that can be used to configure the FCR200, monitor diagnostic status, or to update the program stored in the FCR200's Flash memory. A cable is provided with the unit to connect to a DB-9 serial connection. Further information on the operations allowed via the RS-232 port is provided in *Chapter 6*.

The RS-232 port operates with the following settings:

Baud Rate:	Autobaud (9600, 19200, 38400, 57600, or 115200)
Data Bits:	8
Stop Bits:	1
Parity:	None
Flow Control:	None



**Figure 4-16** FCR200 Serial Port

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## Autobaud Feature

The autobaud feature automatically configures the baud rate on the FCR200. Once you set the baud rate in the terminal emulation program, wait until the FCR200 completes the Power On Self Test (POST) and then the Firmware Initialization process. This can take up to 90 seconds. Then press the Enter key five or six times and the FCR200 will automatically detect the baud rate and configure the router. The baud rate is then saved in the FCR200's configuration and will be retained through future power cycles.

 **Note**

Hitting the Enter key before the POST has completed has no effect on the autobaud feature. Wait until both the POST and the Firmware Initialization processes have completed before hitting the ENTER key. This may take up to 90 seconds.

The baud rate in the terminal emulation program must be set at 9600, 19200, 38400, 57600, or 115200 for the autobaud feature to recognize it. The FCR200 will not function properly at any other baud rate.

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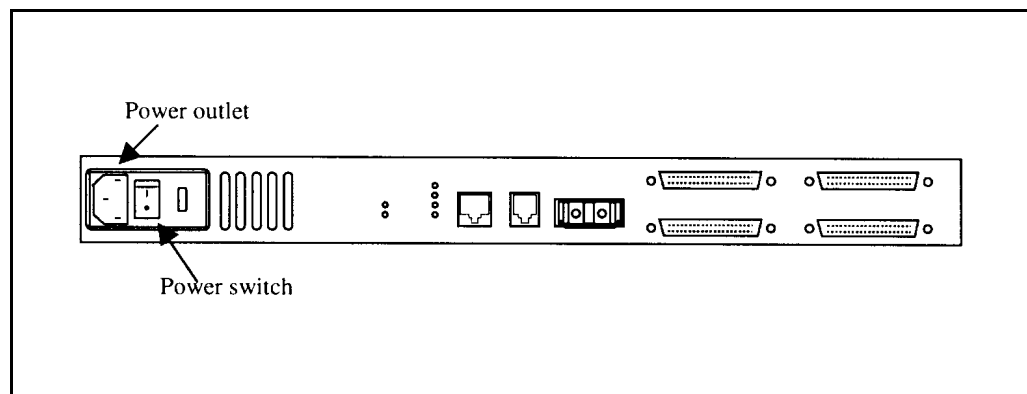
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## Connecting the Power Cord

The power cord shipped with the FCR200 is a 120 VAC three-conductor power cord for use in the United States or Canada. If you are planning to use another input voltage or if you plan to use the FCR200 outside of the U.S. or Canada, you must supply your own power cord.

To connect the power cord to the FCR200:

- 1 Make sure the FCR200's power is switched off. See Figure 4-17 for the location of the power switch on the back of the router.
- 2 Connect the female end of the power cord to the power connector on the back of the FCR200.
- 3 Plug the male end of the power cord into the power source.



**Figure 4-17** FCR200 Power Switch and Outlet

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## Management Information Base (MIB)

A MIB (Management Information Base) is an element used in network management with SNMP (Simple Network Management Protocol) and a management station running a management application, such as Hewlett Packard's Open View. The management application uses GETs and SETs to get system information and set system environment variables.

The ADIC private MIB can be accessed via Ethernet and is both a diagnostic and a configuration tool for the FCR200.

The following sections outline what MIB information is available for each interface type on the ADIC MIB. For more information on accessing the ADIC MIB, contact a support representative.

## MIB Fibre Channel Interface Information

Fibre Channel data reported includes frame and packet information, upper layer protocol (ULP) type (FCP or IP), and other Fibre Channel specific information. Draft MIBs for Fibre Channel N\_Ports and F\_Ports are in the public domain.

The ADIC private MIB includes:

- Groups for Fibre Channel configuration
- Fibre Channel port physical table
- Fibre Channel port statistics
- SCSI-to-Fibre Channel mapping
- Fibre Channel-to-SCSI mapping

## MIB SCSI Interface Information

The MIB gathers SCSI information for management purposes. This specific MIB provides information about the following:

- Number of I/O operations per bus
- Number of disconnects
- Abort count
- Number of bus resets
- Vital Product Data (VPD) from Inquiry command for each SCSI device
- SCSI configuration information

This information can be found in the SCSI Statistics Table, SCSI Config Group, and the SCSI Product Data Groups of the ADIC private MIB.

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## MIB Ethernet and Serial Interfaces Information

The Ethernet interface is used for configuration and management, so total traffic flow is relatively low. The basic Ethernet configuration items are found in the Management Interfaces (MI) Table.

**The serial port is provided for user configuration. The serial port baud rate will be kept in the MI Table.**

# 5

## Understanding the Configuration

Understanding the FCR200 Configuration .....	5-3
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Indexed Addressing .....	5-6
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SCC Addressing .....	5-8
SCSI Host to Fibre Channel Target Configuration .....	5-8





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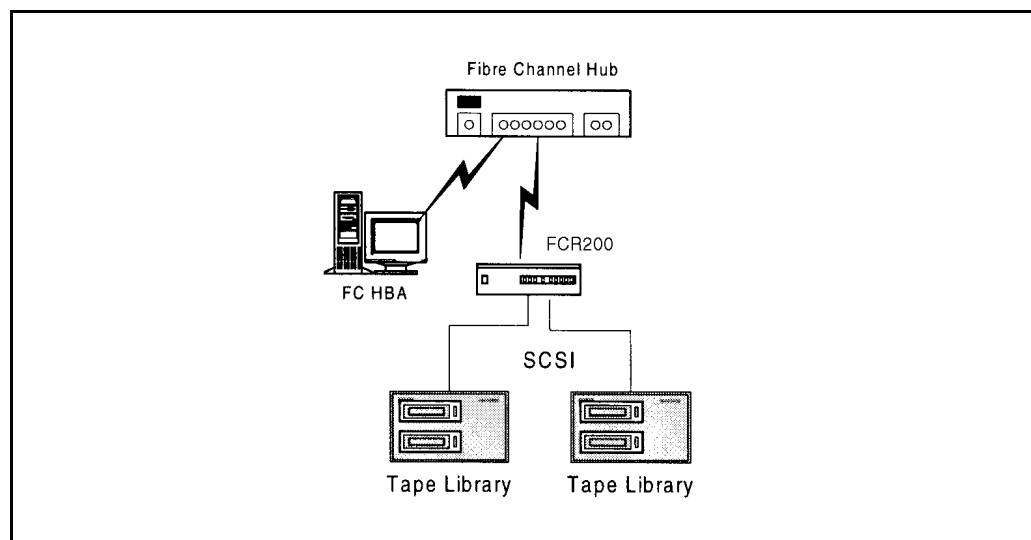
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## Understanding the FCR200 Configuration

Of primary importance in configuring the FCR200 is determining the mode of operation required. The unit can be configured to support Fibre Channel hosts communicating with SCSI targets, or SCSI hosts communicating with Fibre Channel targets. The default configuration of the unit allows for Fibre Channel hosts to connect to SCSI targets. Configuration is needed in some cases to modify the method in which this occurs, as well as to support SCSI hosts communicating with Fibre Channel targets. Other functions and features can be configured as well, and are discussed further in this chapter.

A typical configuration would have a Fibre Channel host connecting via an arbitrated loop to the FCR200, with SCSI target devices attached to the FCR200. This configuration, using a tape library and drives, is represented in Figure 5-1.

The factory default configuration of the unit allows such a configuration to work without further configuration in most cases. It should, however, be recognized that more complex installations or specific application requirements may require one or more configuration elements to be changed from the default settings.



**Figure 5-1** Configuration with tape library

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An understanding of the basic characteristics of Fibre Channel and SCSI devices is recommended before configuring the FCR200.

## ■ General Fibre Channel Configuration

On a Fibre Channel arbitrated loop, the FCR200 appears at a single Arbitrated Loop Physical Address (AL\_PA). Fibre Channel devices support two methods for obtaining an AL\_PA, these being soft or hard addressing. The FCR200 can be configured to use soft addressing (default) or hard addressing with a selected value.

### ■ Soft Addressing

When acquiring a soft address, the FCR200 acquires the first available loop address starting from address 0. In this mode, the FCR200 automatically obtains an available address and participates on the loop, as long as there is at least one address available on the loop that is connected to the FCR200. Fibre Channel supports up to 126 devices on an arbitrated loop.

### ■ Hard Addressing

When acquiring a hard address, the FCR200 attempts to acquire the AL\_PA value that was specified by user configuration. If the desired address is not available at loop initialization time, the FCR200 comes up on the loop in non-participating mode. This allows the loop to continue to operate, although the unit will not be accessible via the Fibre Channel interface. This would occur when another device on the arbitrated loop has acquired the same address as that configured on the FCR200.

Hard addressing is recommended for environments where it is important that the device addresses do not change. Device address changes can affect the mapping represented by the host operating system to the application, and have adverse effects. An example of such an environment would be a tape library installation, where the application configuration requires fixed device identification for proper operation. Hard addressing will insure that the device identification to the application will remain constant.

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When connected to a Fibre Channel Switch, the FCR200 is identified to the switch as a unique device by the factory programmed World Wide Name (WWN). No further configuration is needed, although the WWN can be configured to a user-defined value through the configuration interface.

## General SCSI Configuration

The FCR200 appears on each SCSI bus as a single initiator. The default initiator ID is 7, and can be set via configuration to any valid SCSI address. No other devices on the SCSI bus may use this address.

The FCR200 provides the capability to reset the SCSI buses during the boot cycle. This allows the devices on a SCSI bus to be in a known state. Configuration allows this feature to be enabled or disabled. This feature is enabled in the default configuration.

The FCR200 negotiates for the maximum values for transfer rates and data width on a SCSI bus. If an attached device does not allow the full rates, the unit will use the rates negotiated for that device. Negotiation is on a device specific basis, so the unit can support a mix of device types on the same bus.

## Fibre Channel Host to SCSI Target Configuration

This section describes the configuration of the FCR200 when acting as a target to a Fibre Channel Initiator, passing FCP requests through to SCSI target devices.

This is configured as the default, using soft addressing on the Fibre Channel loop and auto addressing for the target device mapping. Auto addressing is described further in this section.

The FCR200 automatically detects if it is connected to a loop or a switch, and will use the appropriate type without further configuration.

## Address Mapping

The FCR200 supports three addressing methods for mapping SCSI targets to Fibre Channel Hosts:


**Indexed Addressing**      Allows you to edit and maintain a static address mapping table.

---

---

**Auto Addressing** Automatically creates a new address mapping table every time the FCR200 is power cycled.

**SCC Addressing** Implements the SCSI-3 Controller Commands SCSI storage array addressing to address SCSI devices attached to the FCR200.

 **Note**  
The SCSI bus number corresponds to the physical SCSI port on the back of the FCR200.

SCSI Targets are selected by mapping the appropriate values into the FCP LUN field, and correlating a Fibre Channel LUN value to a SCSI Bus:Target:LUN value. The FCR200 acts as a single initiator on each SCSI bus, defaulting to ID 7. All commands passed through to a SCSI bus originate from this SCSI ID.

As an example, SCSI bus 0 corresponds to SCSI port 0 on the rear of the FCR200. SCSI bus 1 corresponds to SCSI port 1.

## Indexed Addressing

Indexed Addressing allows for generic Fibre Channel host bus adapters to access SCSI devices attached to the FCR200. This is done by use of a table which is indexed by sequential FCP LUN values, indicating selected BUS:TARGET:LUN devices.

**Table 5-1** Indexed Addressing

FPC LUN Value	SCSI BUS:TARGET:LUN
0	0:0:0
1	0:1:0
2	0:2:0
3	0:3:0
4	0:4:0
5	0:5:0
6	0:6:0
	0:7:0 occupied by initiator ID
7	0:8:0
(...)	(...)

**Table 5-1** Indexed Addressing

FPC LUN Value	SCSI BUS:TARGET:LUN
14	0:15:0
15	0:0:1
16	0:1:1
(...)	(...)

The Indexed Addressing table has the structure shown in Table 5-1. The FCR200 will allow up to 80 device entries to be mapped. The index table can be manually edited, and is then saved to FLASH memory. Configuration assists allow for the table to be filled in order of increasing target, or LUN, as may be desired for the specific requirements needed. An assist is also provided to perform device discovery, and fill the table in the order that devices are discovered on a SCSI bus.

Indexed Addressing mode is recommended for environments where device configuration may change, and a fixed mapping from the application to the target devices is required. An example of such an environment is where hot plug devices may be used, thereby changing the order of devices on a SCSI bus.

## Auto Addressing

The Auto Addressing option is similar to Indexed Addressing, but with the distinction that the table used is created through SCSI device discovery upon power up or reset, and not otherwise retained. As the unit performs device discovery on a SCSI bus, the Index table is filled with adjacent FCP LUNs referencing each subsequent SCSI device. The host system will then detect every attached device without voids, allowing full device discovery to the host. This allows easy configuration in environments where device ordering is not important, and hot plugging of SCSI devices will not occur. Configuration allows for discovery to be performed in order of target or LUN, as desired for the specific environment.

Auto Addressing, target mode is configured as the default mode of the FCR200.

---

---

## SCC Addressing

The FCR200 implements the SCSI-3 Controller Commands (SCC) (X3T10 Project 1047D Revision 6b 01-July-96) SCSI storage array addressing to address SCSI devices attached to the FCR200. The Access Method used is the SCC Logical Unit Addressing method.

In SCC Addressing mode, the FCR200 will respond to FCP commands, as in a SCC controller device. A subset of the SCC behavior is implemented. LUN mappings corresponding to the SCC Peripheral Device Addressing are interpreted as controller commands, and are acted on by the FCR200 directly. LUN mappings using SCC Logical Unit addressing are routed to the appropriate SCSI BUS:TARGET:LUN and processed accordingly.

Further description of the FCR200 implementation of SCC addressing is in *Appendix D*.

## SCSI Host to Fibre Channel Target Configuration

This section describes the configuration of the FCR200 when acting as a target to a SCSI Initiator, passing requests through to Fibre Channel targets.

SCSI-to-Fibre Channel mapping is implemented in a fashion similar to Fibre Channel-to-SCSI Indexed Addressing mode. The FCR200 responds to commands issued to a set of configured SCSI IDs, and maps these to Fibre Channel AL\_PA/LUN values. The following table indicates a possible mapping for SCSI LUN to Fibre Channel AL\_PA:LUN.

**Table 5-2** SCSI-to-Fibre Target:Channel Address Mapping

SCSI BUS:TARGET:LUN	Fibre Channel	
	AL_PA	LUN
0:0:0	0xEF	0
0:1:0	0x02	0
0:2:0	0x04	0
0:3:0	0x08	0
0:4:0	0x0F	0

---

---

**Table 5-2** SCSI-to-Fibre Target:Channel Address Mapping

SCSI BUS:TARGET:LUN	Fibre Channel	
	AL_PA	LUN
0:4:1	0x10	0
0:4:2	0x17	0
0:4:3	0x18	0

The Index Table is edited to represent the desired mapping, and saved to FLASH memory.

In addition to configuring the address mapping, SCSI-to-Fibre Channel mode requires that a SCSI interface on the FCR200 be configured to respond to specified SCSI IDs. This is done through the SCSI configuration menu. Target ID's enabled for the FCR200 must be unique on the SCSI bus, with the exception that the initiator ID used on the FCR200 should also be used as a single target ID. For example, in SCSI-to-Fibre Channel mode, one of the targets must have the same ID as the FCR200.



**Note**

The initiator and Target ID's must be assigned before the address table can be configured.





# 6

## Configuration

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## Configuring the FCR200

A menu structure is used to configure the FCR200 through the serial and telnet interfaces. The currently selected menu and the firmware version currently executing will be displayed. Menu items are selected by entering the number of the menu desired, and exited by entering an 'X'. In general, the configuration options present in the serial interface correspond to those available through SNMP and telnet.

 **Note**

Menus are not case sensitive. Enter uppercase and lowercase characters interchangeably when selecting from menus.

The FCR200 Configuration Program allows the user to control many configuration settings through the FCR200 serial interface. Among these are:

- Baud rate of the serial port
- Fibre Channel address
- SCSI initiator and target IDs
- Ethernet IP and MAC addresses
- Fibre Channel-to-SCSI mapping
- SCSI-to-Fibre Channel mapping
- Trace level settings

 **Note**

Unless otherwise indicated, all configuration options set do not take effect until the next boot cycle of the FCR200 unit.

Configuration settings may be changed and saved.

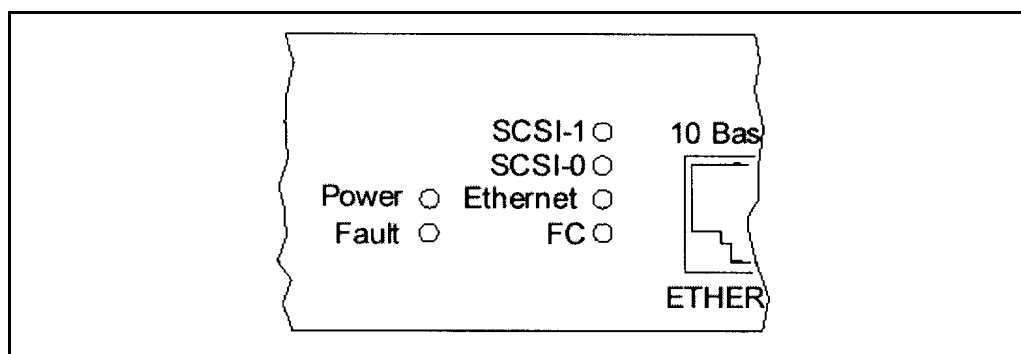
---

---

## Operation Indicators

The FCR200 router is equipped with rear panel LED indicators for monitoring overall router status. The LED functionality is detailed below. See Figure 6-1.

<i>Power</i>	This green indicator turns on when power is applied to the router.
<i>Fault</i>	This amber indicator lights up during POST, then remains dark unless the FCR200 experiences a processor problem.
<i>SCSI 1</i>	This green indicator signifies SCSI 1 activity when lit.
<i>SCSI 0</i>	This green indicator signifies SCSI 0 activity when lit.
<i>Fibre Channel</i>	This green indicator signifies Fibre Channel activity when lit.
<i>Ethernet</i>	This green indicator signifies Ethernet activity when lit.



**Figure 6-1** FCR200 LEDs

---

---

## Host Device Configuration

The host system using a Fibre Channel Host Bus Adapter (HBA) will typically map Fibre Channel devices into the existing device mapping scheme used by that operating system. This usually results in the Fibre Channel HBA mapping Fibre Channel AL\_PA's to SCSI target addresses. The HBA will claim enough SCSI bus entries to allow for 125 Fibre Channel targets to map to SCSI Bus:Target entries. This is usually done by a fixed mapping of AL\_PA to Bus:Target. In such a configuration, the FCR200 corresponds to a Bus:Target identifier, with the SCSI devices attached to the FCR200 appearing as logical units (LUNs). In addition, operating systems can extend the available SCSI limit of 15 per bus.

Although this is not an issue for the operating system or most applications, there are cases where older applications can have expectations about what are valid SCSI ID's, and not deal correctly with certain mappings. In particular, applications have been seen to have difficulties addressing target ID's greater than 15 (e.g. 16 and up). This problem can be resolved by configuring the FCR200 to use hard addressing, and setting the AL\_PA used by the unit to a value that the HBA will map to an ID with a value less than 16.

For example, depending on the FC HBA, if the hard AL\_PA selection is 1, the address is 1. If the selection is 125, the AL\_PA address is 0xEF. Some FC HBA's will configure differently, so verify the AL\_PA by toggling to hard addressing and selecting an address.

## Device Management

The FCR200 can be managed through the RS-232 port, over Ethernet via Telnet, or via SNMP. FTP and TFTP are also supported for firmware downloads.

### Serial

The serial port allows for configuration of all device characteristics.

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## Ethernet

The 10BaseT Ethernet port must first be configured via the serial port with an appropriate IP address and subnet mask prior to use unless the default values are to be used. Default values are IP address 1.1.1.1, and a subnet mask of 255.255.255.0.

## SNMP

The FCR200 includes SNMP management support. SNMP is transported via the Ethernet connection (10BaseT port). SNMP support allows configuration and management using any standard SNMP management tool. SNMP data is defined in the SNMP MIB. ADIC provides a private MIB for configuration of the FCR200. The ADIC private MIB includes all objects configurable from the terminal user interface. The ADIC private MIB also includes some Fibre Channel and SCSI statistics which are not accessible via the serial interface. SNMP support also includes Traps, which are used to notify a SNMP management console of various conditions.

The objects defined in the ADIC private MIB are specific to the ADIC products.

For a copy of the ADIC private MIB, contact a service representative.

## Communicating with the FCR200

The FCR200 is designed to function directly out of the shipping container with no special configuration required. However, you have the ability to monitor various aspects of the FCR200's performance by connecting a terminal or terminal emulator to the serial port on the rear of the router.

The FCR200 is designed to communicate with any operating system that utilizes a terminal emulator. For example, you can use Hyperterminal on Windows NT 4.0. If your computer uses another operating system, be sure the baud rate, data bits, stop bits, parity, and terminal emulation are set as specified in Table 6-1 on page 6-7.

**Table 6-1** Connection Properties

Type	Setting
Baud rate	9600, 19200, 38400, 57600, or 115200 <sup>a</sup>
Data bits	8
Parity	None
Stop bits	1
Flow control	None

a. For more information on the Autobaud feature, refer to *Chapter 4*.

## Setting Up Serial Port Communications

Leave the FCR200 turned off until you have set up serial port communications with your host computer.

To set up serial communications with the FCR200:

- 1 Plug the serial cable provided with the FCR200 into one of your computer's serial ports (for example, COM1 or COM2) and the FCR200's serial port.
- 2 Start your terminal interface program.
- 3 Set the terminal interface program to use the appropriate COM port.
- 4 Specify the following settings for the port:
  - Baud rate: 9600, 19200, 38400, 57600, or 115200
  - Data bits: 8
  - Parity: None
  - Stop bits: 1
  - Flow control: None
- 5 Power on the FCR200.



### Note

Before powering on the FCR200, make sure all the devices on each SCSI bus are powered on and have finished performing their self tests. The devices on your Fibre Channel Storage Area Network should be powered on also.

---

---

## Power Up Menu

When you turn the FCR200's power switch, a series of messages similar to the following appear:

```
Performing Power-on Self Test ...
Monitor-flash Check Sum ..... passed
Program-store Main RAM ..... passed
Trace Buffer in Main RAM ..... passed
PCI Protocol RAM (16Mb) ..... passed
SCSI Script RAM (I) ..... passed
SCSI Script RAM (II) ..... passed

Initialize Ports ...
Fibre-channel port Single-frame Sequence Loopback .... passed
Fibre-channel port Multiple-frame Sequence Loopback .. passed
Ethernet Port Loopback ..... passed
SCSI Port (I) Loopback ..... passed
SCSI Port (II) Loopback ..... passed

Self test completed successfully

Select which mode to boot:
  1. Fibre Channel/SCSI Router
  2. Diagnostic Monitor
```

### Note

If messages are not on your screen, recheck your computer's serial port settings and press Enter five or six times. Make sure the baud rate is set to one of the values listed in Table 6-1.

The default boot mode is 1) Fibre Channel/SCSI Router and will be automatically selected if you wait three seconds. The main menu appears:



---

---

FCR200 Configuration

Version: X.X.XXXX

- 1) Perform Configuration
- 2) Display Status of Power-on Self Test
- 3) Display Trace and Assertion History
- 4) Reboot
- 5) Download a New Revision of the Firmware

Command >

The main menu allows for various operations to be performed on the FCR200.

---

---

## Perform Configuration

The configuration menu allows the administrator to configure the various options on the FCR200. For any configuration changes to take effect, you must reboot the FCR200.

### **Note**

Menus are not case sensitive. Enter uppercase and lowercase characters interchangeably when selecting from menus.

```
Configuration Menu
Version: X.X.XXXX

1) Baud Rate Configuration
2) Fibre Channel Configuration
3) SCSI Configuration
4) Ethernet Configuration
5) Fibre Channel to SCSI Mapping Configuration
6) SCSI to Fibre Channel Mapping Configuration
7) Trace Settings Configuration

A) Save Configuration
B) Restore Configuration
C) Reset Configuration to Factory Defaults

X) Return to main menu
```

---

---

## Baud Rate Configuration

This option changes the baud rate used on the serial port. Select 1) – 5) for appropriate baud rate setting. If you are using the Autobaud feature, it will not be necessary to set a baud rate. See *Chapter 4* for more information on using the autobaud feature.

```
Baud Rate Configuration Menu
Version: X.X.XXXX

1) 9600      2) 19200
3) 38400    4) 57600
5) * 115200

X) Return to previous menu
```

## Fibre Channel Configuration

This option allows for setting the Fibre Channel Address method, hard address value, and WWN overrides.

```
Fibre Channel Configuration Menu
Version: X.X.XXXX

Current Fibre Channel Configuration:

World Wide Name High:
World Wide Name Low:
Use Hard ALPA: No

1) Change World Wide Name High
2) Change World Wide Name Low
3) Toggle Hard ALPA Usage

X) Return to previous menu
```

When configuring the Fibre Channel AL\_PA, the FCR200 will present a list of loop addresses along with the corresponding AL\_PA. The user selects the loop address desired.

---

---

## SCSI Configuration

This option allows for setting the SCSI Initiator ID, enabling SCSI target IDs, and setting the SCSI bus reset behavior.

```
SCSI Configuration Menu
Version: X.X.XXXX
Bus 0, Current SCSI Configuration:

Initiator SCSI ID: 7
Target SCSI ID(s):
Reset SCSI Bus on Boot: Yes

1) Change Initiator SCSI ID
2) Add Target SCSI ID
3) Remove Target SCSI ID
4) Toggle SCSI Reset Operation

X) Return to previous menu
```

Press the Enter key to toggle between SCSI Bus 0 and SCSI Bus 1.

```
SCSI Configuration Menu
Version: X.X.XXXX
Bus 1, Current SCSI Configuration:

Initiator SCSI ID: 7
Target SCSI ID(s):
Reset SCSI Bus on Boot: Yes

1) Change Initiator SCSI ID
2) Add Target SCSI ID
3) Remove Target SCSI ID
4) Toggle SCSI Reset Operation

X) Return to previous menu
```

When mapping SCSI Target ID's for SCSI host to Fibre Channel Target capability, the user must first enable the target ID before proceeding to modify the mapping table for that device.

---

---

## Ethernet Configuration

This option allows for the network IP address and mask to be set, as well as allowing the Ethernet MAC address to be overridden.

```
Ethernet Configuration Menu
Version: X.X.XXXX
Current Ethernet Configuration:

Ethernet Physical Address : 30:30:45:30:30:32
IP Address                : 38.152.100.150
Subnet Mask               : 255.255.255.0

1) Change Ethernet Physical Address
2) Change IP Address
3) Change IP Subnet Mask
4) Change SNMP Settings
5) Change security Settings

X) Return to previous menu
```

## Fibre Channel-to-SCSI Mapping Configuration

This option allows selecting the addressing mode of the FCR200, as well as displaying attached devices. The menu to modify the Indexed addressing table is also accessed through this menu.

```
Fibre Channel to SCSI Configuration Menu
Version: X.X.XXXX
Current Fibre Channel to SCSI Mapping Mode is Indexed

1) Display Attached SCSI Devices, LUN Priority
2) Display Attached SCSI Devices, Target ID Priority
3) Display Attached SCSI Devices, Bus Number Priority
4) Change the Fibre Channel to SCSI Mapping Mode
5) Show/Edit Fibre Channel to SCSI Mapping Mode

X) Return to previous menu
```

---

---

When configuring Indexed addressing, the user is presented a table with the current mappings. The user can then select a table entry by FCP LUN and specify the associated BUS:TARGET:LUN. Alternately, the user can fill with one of multiple preset patterns, or with the list of currently attached SCSI devices. The user then saves these values in FLASH memory, where they are retained across future device resets or power cycles.

## Changing the Fibre Channel-to-SCSI Mapping Mode

This option allows the user to select the appropriate Fibre Channel-to-SCSI mapping mode on the FCR200. The options are SCC addressing, Indexed addressing, and Auto addressing. Auto addressing allows you to assign one of three mapping priorities:

<i>LUN priority</i>	fills the table according to ascending LUN order.
<i>Target ID priority</i>	Fills the table according to ascending SCSI Target ID (SCSI device address ID) order.
<i>Bus Number priority</i>	Fills the table in ascending SCSI Bus Number (SCSI port ID number) order.

```
Fibre Channel to SCSI Mapping Mode Configuration Menu
Version: X.X.XXXX
Current Fibre Channel to SCSI Mapping Mode is Auto-assigned
Bus Number Priority

1) Set to SCC
2) Set to Indexed
3) Set to Auto-assigned, LUN Priority
4) Set to Auto-assigned, Target ID Priority
5) Set to Auto-assigned, Bus Number Priority

X) Return to previous menu
```

---

---

## ■ ■ ■ SCSI-to-Fibre Channel Mapping Configuration

This option allows modification of the table mapping SCSI Target:LUN values to Fibre Channel Node:LUN values.

Configuration of these devices is similar to that for indexed addressing, without the user assists. Prior to configuring these tables, the user must enable the SCSI target and initiator addresses desired to enable the mapping for that SCSI device.

## ■ ■ ■ Trace Settings Configuration

This option allows trace levels to be set. This should not be modified in normal operation, as performance degradation may result.

```
Trace Setting
Version: X.X.XXXX
Level 0 : On      Level 1 : On
Level 2 : Off     Level 3 : Off
Level 4 : Off     Level 5 : Off
Level 6 : Off     Level 7 : Off

U) Update Current Operating Trace Levels
X) Return to previous menu
```

Further information on using this interface can be later in this chapter.

## ■ ■ ■ Save Configuration

This option saves the current configuration state in FLASH, and updates the saved previous configuration state.

## ■ ■ ■ Restore Last Saved Configuration

This option restores the most recent previously saved configuration. This can be useful when configuration changes are made, but the user wishes to return to the previously configured state.

---

---

## Reset Configuration to Factory Defaults

This option resets all configuration options to the factory defaults.

## Display POST Status

This option displays the results of the most recent power on self test (POST). The POST test results are shown below.

```
                Status of Power-on Self Test
                Version: X.X.XXXX

Serial Port Loopback ..... passed
Monitor-flash Check Sum..... passed
Program-store Main RAM ..... passed
Trace Buffer in Main RAM ..... passed
PCI Protocol RAM ..... passed
SCSI Script RAM (I) ..... passed
SCSI Script RAM (II) ..... passed
Fibre-channel port Single-frame Sequence Loopback .... passed
Fibre-channel port Multiple-frame Sequence Loopback .. passed
Ethernet Port Loopback ..... passed
SCSI Port (I) Loopback ..... passed
SCSI Port (II) Loopback ..... passed

Press Any Key to Continue ...
```



---

---

## Display Trace and Assertion History

This option allows for internal trace state information to be dumped to the serial port and captured. This is useful to debug installation issues, and can be provided to the service representative for failure analysis. Further information on using this interface can be located in the troubleshooting section of this manual.

```
Trace Dump Menu
Version: X.X.XXXX

1) Display Trace for Current Boot Cycle
2) Display Trace for Previous Boot Cycle
3) Display Trace for Last Assertion Failure
4) Display History of Assertion Failures
5) Clear Current Trace Buffer

X) Return to previous menu
```

## Reboot

The reboot function restarts the FCR200. This will cause selected configuration options to take effect.

**This will result in all current operations being interrupted. Do not reboot the unit during normal operation.**

---

---

## Download Firmware

The FCR200 uses a serial connection using the XMODEM protocol to update the firmware. In order to update the firmware the FCR200 must be connected to a terminal emulation program supporting XMODEM transfers. This menu item does not appear when accessing the configuration menus through telnet.

From the main menu, the user must select the “Download a new revision of the Firmware” command to start the download procedure.

### To Download Firmware

Once the message “Downloading” appears in the emulator utility:

- 1 Use the Transfer→Send File option in the terminal emulator utility.
- 2 Select the location of the firmware. Use the “Browse” button, if you need help finding it.
- 3 Make sure you select XMODEM as the protocol.
- 4 Press the “Send” button.
- 5 The firmware will begin to download.

When the download is complete, the system verifies that the firmware image was successfully written to the FLASH memory and then reboots the FCR200. Upon reboot, the FCR200 detects that there is a newly downloaded firmware image and copies that image to the boot sector of the FLASH and then boots with that image. At that point the FCR200 is using the new firmware image.

The following figure shows what you might see on your terminal when you download a new revision of the firmware:

---

---

FCR200 Configuration

Version: X.X.XXXX

- 1) Perform Configuration
- 2) Display Status of Power-on Self Test
- 3) Display Trace and Assertion History
- 4) Reboot
- 5) Download a New Revision of the Firmware

Command >5

Download Firmware Menu

This will replace the current version of the firmware.  
A reboot will also be performed as part of this process.  
Are you sure (Y/N)? **y**

Please begin xmodem firmware transfer ...  
\_\_\_\_\_ (**transmit Firmware image via XMODEM**)

Performing Power-on Self Test ...  
(...)  
Self Test completed successfully

Select which mode to boot :  
1. Fibre Channel/SCSI Router  
2. Diagnostic Monitor

Seconds left 1 : 1  
Verifying Firmware Checksum ...  
Updating Firmware ...  
Target Name : ADIC  
Attaching Network interface lnPci0 ... Done  
Attaching Network Interface lo0 ... Done  
NFS Client Support not Included.  
Initializing sioc ...  
SCRIPTS start @ 0x88002000 (3520)  
BRIDGE: Bridge Timed Out SCSI Req on Bus 0 Target 0 LUN 0.  
Check Cable.  
Initialized Successfully

---

---

## Configuring the FCR200's Ethernet Port

If you plan to use Ethernet to configure the FCR200, you must first set up serial communications with the FCR200 to configure the Ethernet port's address.

The FCR200 provides an Ethernet port for connection to a standard 10BaseT Ethernet network. You can use Ethernet to perform the following activities:

- Configure the FCR200 through Telnet. The configuration menus accessed via the serial port will be disabled when a telnet session is connected. When logging in for a telnet session, use "root" as the user name and "password" as the password.
- Upgrading the FCR200's firmware. You can use FTP or TFTP to send a new firmware image to the FCR200.

If you plan to use the Ethernet port, you must first configure its address. You can set the physical address, IP address, and IP subnet mask. The physical address is assigned to an Ethernet adapter by ADIC. The IP address is used to route information in a TCP/IP network. The IP subnet mask is used to establish a path to a default TCP/IP gateway.

To change the Ethernet physical address, IP address, or IP subnet mask, select 4) Ethernet Configuration from the Configuration menu.

---

---

## SNMP Configuration

The SNMP Configuration menu allows for various SNMP options to be configured. This includes Trap manager IP address, community names, and Trap priority.

```
SNMP Configuration Menu
Version: X.X.XXXX
Current SNMP Configuration:

Community Name for GET : pub
Community name for SET : priv

Traps are Disabled

1) Change Community Name for GET
2) Change Community Name for SET
3) Toggle Trap

X) Return to previous menu
```

## Toggle Trap

SNMP Trap Enable allows Trap reporting to be turned on and off. If SNMP Traps are disabled, no Trap events are sent.

Press 3) to enable Trap events.

---

---

## SNMP Configuration with Traps Enabled

```
SNMP Configuration Menu
Version: X.X.XXXX
Current SNMP Configuration:

Community Name for GET : pub
Community name for SET : priv
Manage IP Address for Traps : 1.1.1.1

Traps are Enabled for Events of Any Priority

1) Change Community Name for GET
2) Change Community Name for SET
3) Toggle Trap
4) Change Manager IP Address for Traps
5) Decrease Trap Priority
6) Increase Trap Priority

X) Return to previous
```

### GET and SET Community Names

The SNMP GET community name is checked for each GET request received by the FCR200. The community name in the SNMP packet must match the community name configured here for the SNMP GET request to be successfully completed. Configure your SNMP manager to have the same GET and SET community names as the FCR200.

### IP Address for Traps

The Trap Manager IP address is the address used for sending Traps. Typically, this is the IP address of the machine using the Network Management Program and/or a MIB browser.

### Trap Priority

The SNMP Trap Priority determines which traps will be sent to the specified Trap IP Address. Events having a priority equal to or higher than the configured priority will be sent first.

# 7

## Troubleshooting

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## ■ Troubleshooting

Various problems can arise when configuring and using the FCR200. This section is provided to help guide the user through some of the basic methods of identifying faults in the setup and configuration of the unit.

Most problems are found in the initial installation. In general, it is wise to check all connections and review the configuration before proceeding with further trouble analysis. Simplify the installation if possible, reducing it to the most basic configuration then adding elements one at a time and verifying the operation at each step.

## ■ Indicators

The LED indicators on the FCR200 are useful for diagnosing various problems.

- The *Power* indicator turns on when power is applied to the router. Lack of power indication suggests the unit being turned off, a problem with the power supplied to the unit, or an internal problem with the unit.
- The *Fault* indicator is lit when the FCR200 detects a fault condition. Faults can occur as a result of Power On Self Test (POST) failure or operational failures. It is normal for this indicator to flash on when the unit is powered up or reset. If the fault indicator stays lit, contact customer support.
- The *SCSI 1* indicator shows SCSI 1 activity when lit. This should only occur briefly during power up or configuration, and relatively often when the unit is transferring data. If the SCSI indicator stays continually lit without corresponding target device activity, it may indicate a problem with the SCSI bus configuration. Verify the SCSI bus configuration.
- The *SCSI 0* indicator shows SCSI 0 activity when lit. This should only occur briefly during power up or configuration, and relatively often when the unit is transferring data. If the SCSI indicator stays continually lit without corresponding target device activity, it may indicate a problem with the SCSI bus configuration. Verify the SCSI bus configuration.

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- 
- The *Fibre Channel* indicator shows Fibre Channel activity when lit. If this indicator fails to light at all, or stays continually lit without corresponding SCSI bus activity, it may indicate a problem with the Fibre Channel link. Verify the Fibre Channel Configuration.
  - The *Ethernet* indicator signifies Ethernet activity when lit. If the light fails to flicker, or if it stays continually lit, it may indicate a problem with the network connection. Verify the network connection. The port must be connected to a 10BaseT Ethernet network to function properly.

## Basic Verification

### Verify SCSI Bus Configuration

Problems with SCSI bus configuration are common. Basic operation of a SCSI bus can be checked by using the configuration menu to view attached SCSI devices. See *Chapter 6* for more information. Other conditions to look for include:

- Termination – Problems with termination can cause intermittent or hard failure. A SCSI bus must be terminated on both ends, and only both ends. Termination issues when both narrow and wide devices are on the same bus are common.
- Bus Type – Single-Ended devices cannot be mixed with Differential devices on the same bus. Similarly, Single-Ended terminators cannot be used on Differential buses, and Differential terminators cannot be used on a Single-Ended bus.
- Device ID – Each device on a SCSI bus must have a unique ID. Also check the configured ID's for the FCR200 to verify these are not in use by other devices on the same SCSI bus.
- Cabling – Check SCSI cables to verify they are functional. SCSI rules for total length, distance between devices, and stub length must be adhered to. Connections should also be checked and resealed if necessary.

- 
- 
- SCSI Devices – Verify SCSI devices can be seen in the configuration menu of the FCR200. Select “Perform Configuration” from the first menu. Then select “Fibre Channel to SCSI Mapping Configuration.” You must then enter a “1” for LUN priority, “2” for Bus priority, or a “3” for Target, in order to view the list of SCSI devices. If the FCR200 can not see the devices, verify SCSI configuration and cabling.

## Verify Fibre Channel Connection

If SCSI devices are recognized on the SCSI buses, but do not appear to the Fibre Channel host, it may be that the Fibre Channel link is not established. Most hubs and switches have link indicators, showing link status. When the FCR200 is connected and powered on, this link indicator should show a good link. If it does not, check the cabling or connections. As a means of verifying link integrity when connected to a functional host, disconnecting then reconnecting the Fibre Channel cable should cause momentary activity of this indicator as the link re-initializes. Also verify that the media type of the FCR200 and attached hub, HBA, or switch are of corresponding types. When using optical media, verify that the attached device is using non-OFC type optical devices.

## Verify SCSI Devices in NT

If running FC-to-SCSI mapping mode, open the NT Control Panel, select “SCSI Adapters,” and double click on the FC HBA. The SCSI devices should be listed.

If no devices are listed, verify the FCR200 configuration, FC HBA configuration, and cabling.

If devices are listed, verify FC HBA mapping mode or ALPA addresses on the FCR200.

If running SCSI-to-FC mapping mode, open the NT Control Panel, select “SCSI adapters,” and double click on the SCSI controller.

If no devices are listed, verify the FCR200 configuration, SCSI Controller configuration, and cabling.

Sometimes NT may need to be rebooted with all SCSI devices and the FCR200 left on before it will recognize the devices.

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## Verify Configuration

A number of configuration changes may result in an invalid configuration. If you are in doubt about the configuration, restore the FCR200 to the factory default configuration and proceed to configure the unit a step at a time, verifying the functionality of the configuration as changes are made.

## Verify Addressing

If working in FC-to-SCSI target mode and using Indexed or SCC Addressing, try swapping to Auto Addressing to see if this solves the problem.

## Verify Devices

It may be useful to connect the target devices you are attempting to use to the native interface to verify that the devices are functional. SCSI target devices can be connected to a host SCSI bus to verify they are functional.

## Verify Host Configuration

In some cases, it may be that the host bus adapter or driver may not be working properly. Check the configuration of these elements. It may be useful to check the release notes for the driver provided to see if there are any specific issues or required configuration. It may also be useful to ensure that you are using a current version of the host bus adapter driver.

## Verify HBA Device Driver Information

Check the HBA device driver Readme file for configuration specifics. An HBA may require a different configuration, depending on whether it is connected to a loop or a switch.

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## RS-232 Port Problems

If you experience trouble communicating with the RS-232 port, verify the host terminal emulation configuration. The FCR200 requires the baud rate to be set correctly, 8 data bits, 1 stop bit, and no parity. Flow control should be disabled, and may cause problems if set to 'hardware' or XON/XOFF. Some hosts may not support baud rates higher than 19200, so a lower baud rate may be required. If problems persist, you may want to check the cabling or try a different host. If a valid Ethernet IP address is configured, RS-232 configuration settings can also be set via SNMP and telnet.

## Contact Customer Support

If you are unable to resolve your issue, contact your service representative.

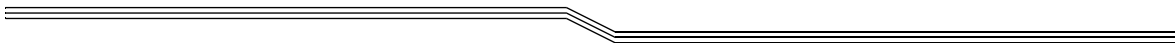
Customer support may ask that you provide trace data or other configuration information. Trace data is obtained by setting the appropriate trace levels in the configuration menu, and running the failing situation. The terminal emulator is set to capture information to a file, and the appropriate trace data is dumped to the serial port. This results in a standard text file that can be mailed or faxed to the support personnel.



# A

## Ethernet Assignments

RJ-11 Serial and RJ-45 Ethernet Pin Assignments ..... A-3

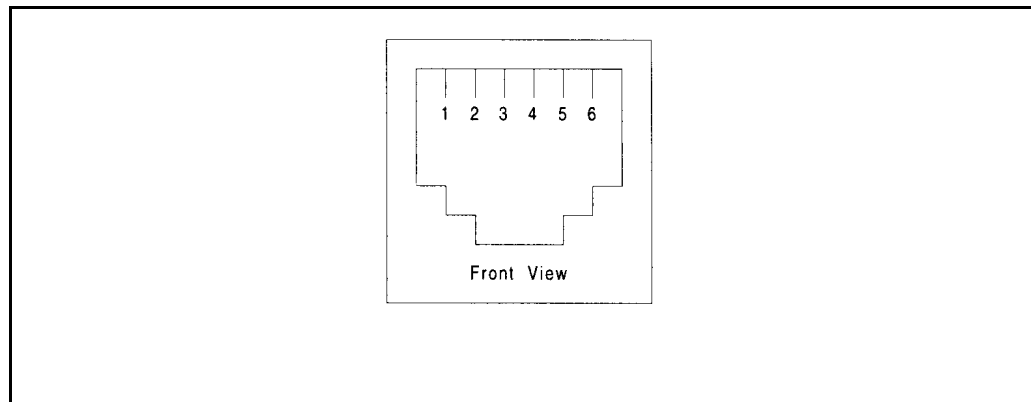






## RJ-11 Serial and RJ-45 Ethernet Pin Assignments

Pin Number	Function
Pin 1	No Connection
Pin 2	Ground
Pin 3	Transmit Data from FCR200
Pin 4	Receive Data to FCR200
Pin 5	RTS (Ready to Send)
Pin 6	CTS (Clear to Send)



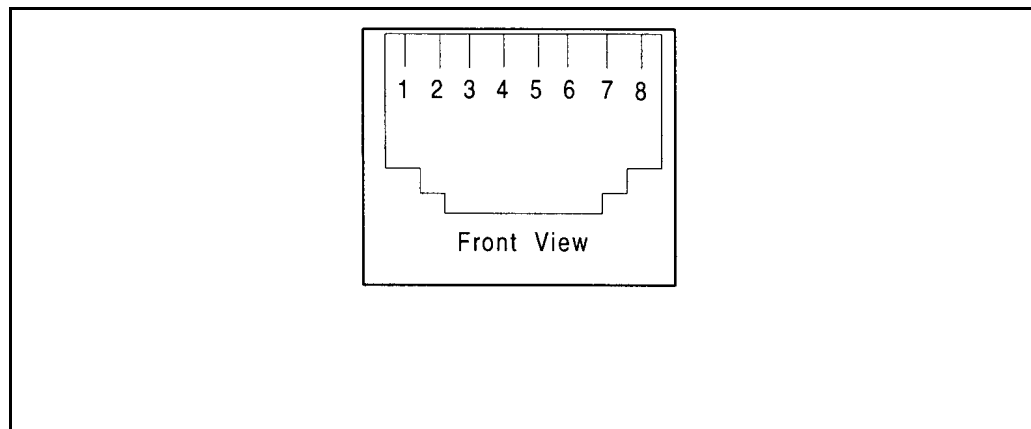
**Figure A-1** RJ-11 Pin Assignment

Pin Number	Function
Pin 1	Transmit Out +
Pin 2	Transmit Out -
Pin 3	Receive In +
Pin 4	No Connection

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Pin Number	Function
Pin 5	No Connection
Pin 6	Receive In -
Pin 7	No Connection
Pin 8	No Connection

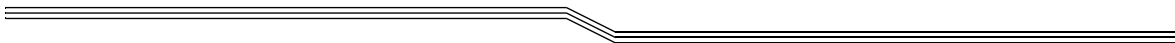


**Figure A-2** RJ-45 Pin Assignment

# B

## Fibre Channel Interface and Commands

Fibre Channel Interface and Commands .....	B-3
Download Command .....	B-3
Report LUNs Command .....	B-5
PRLI Data .....	B-6





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# Fibre Channel Interface and Commands

## Download Command

The Update Firmware command is used to download firmware to the FCR200 over Fibre Channel. Multiple Update Firmware Write Buffer commands will be required to accomplish the total transfer. All write commands except the final write will have 3-bit Mode field set to 0x06. The last write command in the sequence will have the Mode bits set to 0x07 to signify the end of transfer. Each Update Firmware write buffer command will return an FCP response. Update Firmware is successful when the FCP response returns 0x00 (success). When the download process is complete and the firmware image has been successfully written to FLASH, the FCR200 will respond to the last transfer with 0x00, then re-boot with the updated firmware. If any errors occur, the Controller will return an FCP\_RSP response RC value other than 0x00 and the FCR200 will abort the update. In this case, the FCR200 will not re-boot and the previous version of firmware will remain intact. The host will issue a Write Buffer command with:

**Table B-1** Download Write Command Buffer

Bits Bytes	7	6	5	4	3	2	1	0
0	Operation Code (0x3B)							
1	Reserved					Mode		
2	Buffer ID							
3 : 5	(MSB) Buffer Offset							(LSB)
6 : 8	(MSB) Parameter List Length							(LSB)
9	Control							
10	U (0x55)							
11	P (0x50)							

**Table B-1** Download Write Command Buffer

Bits Bytes	7	6	5	4	3	2	1	0
12	D (0x44)							
13	A (0x41)							
14	T (0x54)							
15	E (0x45)							



**Note**

Multiple Update Firmware commands will generally be required to transfer the entire program image from the host to the FCR200 DRAM. When the last data block is transferred (mode = 0x07) the FCR200 terminates data transfer and performs a CRC checksum on data received.

It is required that the FC initiator sends from the beginning of the firmware image to the end. No out of sequence Write Buffers are allowed.

If the CRC test is successful, the Controller will reboot. The FCR200 will use the newly updated firmware. If the CRC test fails, the image transferred to DRAM is discarded, and the controller continues to use the previous firmware image.

Multi-frame sequences are allowed. Transfer Length for each write must be less than or equal to 64KB (65536 bytes).

It is required that the Parameter list length be the same as the FCP\_DL field in the FCP\_CMND IU.

- Byte 2 set to 0x00,
- Bytes 6-8 set to length of outbound data length (maximum transfer length is 64K (0x10000)).
- The mode will be set to 0x06 for the first & middle Write Buffers and 0x07 for the last.

## Report LUNs Command

In SCC mode, the FCR200 supports the Report LUNs command. The Report LUNs command will return a list of Logical Unit Numbers that can receive commands. The format of the report LUNs command is as follows:

**Table B-2** Report LUN Command


Bits Bytes	7	6	5	4	3	2	1	0
0	Operation Code (0xA0)							
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6 : 9	(MSB) Allocation Length							(LSB)
10	Reserved							
11	Code Byte							

**Table B-3** Report LUN Parameter List

Bits Bytes	7	6	5	4	3	2	1	0
0 : 3	(MSB) LUN List Length							(LSB)
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
LUN List								

**Table B-3** Report LUN Parameter List

Bits Bytes	7	6	5	4	3	2	1	0
0 : 7	First LUN : Last LUN							

 **Note**  
The LUN list length is the number of LUNs times 8.

## PRLI Data

The FCR200 supports the discovery mechanism as described in the standard “Private Loop SCSI Direct Attach Rev. (section 10.3 - Target Discovery)”. The FCR200 returns the PRLI response data as specified in Table B-4.

**Table B-4** FCR200 PRLI Response Data

PRLI Command Code	0x20
Page Length	0x10
Payload Length	0x10
Type Code	0x8
Type Code Extension	0x0
OPA	0x0
RPA	0x0
IPE	0x1
Response Code	0x1
Originator Process Associator	0x0
Responder Process Associator	0x0
Initiator Function	0x1
Target Function	0x1
Command/Data Mixed Allowed	0x0
Data/Response Mixed Allowed	0x0



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**Table B-4** FCR200 PRLI Response Data

Read XFER_RDY Disabled	0x1
Write XFER_RDY Disabled	0x0



# C

## SCSI Interface and Commands

SCSI Interface and Commands .....	C-3
SCSI Inquiry Data .....	C-3



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# SCSI Interface and Commands

## SCSI Inquiry Data

The FCR200 returns the Inquiry Data as defined in Table C-1 when addressing the FCR200. The FCR200 rejects all other commands that are addressed to the FCR200.

**Table C-1** FCR200 Inquiry Data

Peripheral Qualifier	0x00
Peripheral Device Type	0x0C - Indicates Bridge/Router function
RMB	0x00
Device Type Qualifier	0x00
ISO Version	0x00
AENC	0x00
TrmIOP	0x00
Response Data Format	0x02 - SCSI-2 Inquiry Data Format
Additional Length	0x20
RelAdr	0x00
Wbus32	0x00
Wbus16	0x00
Sync	0x00
Linked	0x00
CmdQue	0x00
SftRe	0x00
Vendor ID	"CROSSRDS"
Product ID	"FCR200 "
Revision Level	"0.01"

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The FCR200 will only reply to a SCSI Inquiry when using 8-byte LUN field of 0x00's. Once the FCR200 has been detected, then the devices on the SCSI-2 can be detected using the SCC Logical unit addressing.

# D

## Addressing, Structures, and Operation

Addressing, Structures and Operation .....	D-3
SCC Addressing Option .....	D-5
Indexed Addressing Option .....	D-6
Auto Assigned Addressing Option .....	D-7





## Addressing, Structures and Operation

Fibre Channel and SCSI systems employ different methods of addressing devices. The inclusion of a bridge or router requires that a method of translating device IDs be implemented so that each SCSI device is mapped to the appropriate Fibre Channel LUN. The SCSI buses establish bus connections between devices. Targets on a SCSI bus may internally address logical units. The addressing of a specific SCSI device is represented by the BUS:TARGET:LUN triplet.

When a Fibre Channel initiator initializes on an arbitrated loop, the first order of business is to determine what devices exist on the loop. Device discovery is performed, and an FCP target device list is built. Each device is queried for FCP logical units. The logical units are the actual devices that the operating system will address. When an initiator addresses a logical unit, the LUN field used is consistent in form with the SCC defined fields. All current Fibre Channel host bus adapter drivers are consistent with these methods. The addressing used is the SCC Logical Unit Addressing and Peripheral Device Addressing methods, shown in Table D-1 and Table D-2. First level addressing is supported, so only the first 2 bytes of the 8 byte FCP LUN are used.

**Table D-1** SCC Addressing Structure

Bits Bytes	7	6	5	4	3	2	1	0
n	Address Method		Address Method Specific					
n+1	Address method Specific							

**Table D-2** Peripheral Device Addressing LUN Structure

Bits Bytes	7	6	5	4	3	2	1	0
n	0	0	Bus					
n+1	Target/LUN							

**Table D-3** SCC Logical Unit Addressing LUN Structure

Bits Bytes	7	6	5	4	3	2	1	0
n	1	0	Target					
n+1	Bus			LUN				

**Table D-4** Address Method Definition

Codes	Description
00	Peripheral Device Addressing Method
01	Volume Set Addressing Method
10	Logical Unit Addressing Method
11	Reserved

**Table D-5** Arbitrated Loop Node Number to ALPA Lookup Table

0:0x01	21:0x2E	42:0x52	63:0x74	84:0xA6	105:0xC9
1:0x02	22:0x31	43:0x53	64:0x75	85:0xA7	106:0xCA
2:0x04	23:0x32	44:0x54	65:0x76	86:0xA9	107:0xCB
3:0x08	24:0x33	45:0x55	66:0x79	87:0xAA	108:0xCC
4:0x0F	25:0x34	46:0x56	67:0x7A	88:0xAB	109:0xCD
5:0x10	26:0x35	47:0x59	68:0x7C	89:0xAC	110:0xCE
6:0x17	27:0x36	48:0x5A	69:0x80	90:0xAD	111:0xD1
7:0x18	28:0x39	49:0x5C	70:0x81	91:0xAE	112:0xD2
8:0x1B	29:0x3A	50:0x63	71:0x82	92:0xB1	113:0xD3
9:0x1D	30:0x3C	51:0x65	72:0x84	93:0xB2	114:0xD4
10:0x1E	31:0x43	52:0x66	73:0x88	94:0xB3	115:0xD5
11:0x1F	32:0x45	53:0x67	74:0x8F	95:0xB4	116:0xD6
12:0x23	33:0x46	54:0x69	75:0x90	96:0xB5	117:0xD9

**Table D-5** Arbitrated Loop Node Number to ALPA Lookup Table

0:0x01	21:0x2E	42:0x52	63:0x74	84:0xA6	105:0xC9
13:0x25	34:0x47	55:0x6A	76:0x97	97:0xB6	118:0xDA
14:0x26	35:0x49	56:0x6B	77:0x98	98:0xB9	119:0xDC
15:0x27	36:0x4A	57:0x6C	78:0x9B	99:0xBA	120:0xE0
16:0x29	37:0x4B	58:0x6D	79:0x9D	100:0xBC	121:0xE1
17:0x2A	38:0x4C	59:0x6E	80:0x9E	101:0xC3	122:0xE2
18:0x2B	39:0x4D	60:0x71	81:0x9F	102:0xC5	123:0xE4
19:0x2C	40:0x4E	61:0x72	82:0xA3	103:0xC6	124:0xE8
20:0x2D	41:0x51	62:0x73	83:0xA5	104:0xC7	125:0xEF

## ■ SCC Addressing Option

When the FCR200 is configured to use SCC addressing, the unit is capable of responding as a controller device to the FCP Initiator, or routing the FCP request to a specified BUS:TARGET:LUN triplet. When a request using the Peripheral Device Addressing Method is received (An FCP command with the LUN field with bits 7 and 6 of byte 0 are set to 0), the unit routes the request to the FCR200, which acts on the command directly. When a request using the Logical Unit Addressing Method is received (bits 7 and 6 set to 10b), the request is routed to the BUS:TARGET:LUN as specified in the defined field.


Host systems using SCC addressing will typically do initial device discovery using the Peripheral Device Addressing method. On issuing an INQUIRY command, the host will receive the FCR200 inquiry data (*Appendix C*), indicating the device type as a controller device. The host will then know on this basis that subsequent commands to attached devices will use the Logical Unit Addressing method. The host can perform discovery by either walking through the BUS:TARGET:LUN values as would a standard SCSI driver, or by issuing a REPORT LUNS command (*Appendix B*). This command is sent to the controller (using the Peripheral Device Addressing Method), and returns a table indicating attached devices. The host can then perform actions on these devices directly without having to perform discovery through all possible combinations.

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## Indexed Addressing Option

Indexed Addressing allows for host bus adapter drivers that only use Peripheral Device addressing to access SCSI devices attached to the FCR200 unit. This is done by use of a table which is indexed by sequential LUN values, indicating selected BUS:TARGET:LUN devices. It is not possible in this mode to address the FCR200 unit as a controller unit directly when using the Indexed Addressing option. The size of the table is equal to the number of busses times the number of targets per bus, less one initiator ID per bus, times the number of LUNs per target. The index table can be manually edited. Configuration tools allow for the table to be filled in order of increasing bus, target, or LUN, as may be desired for the specific requirements needed. A method is also provided to perform device discovery, and fill the table in the order that devices are discovered on the SCSI busses. As an example, if there are three devices connected to a SCSI bus at BUS:TARGET:LUN 0:0:0, 0:1:0 and 0:2:0, The Indexed table will look like Table D-6.

 **Note**  
The “-” indicates  
a null entry

**Table D-6** Example of Fibre Channel-to-SCSI Mapping

FC_LUN		BUS	TGT	LUN
0x00	→	0	0	0
0x01	→	0	1	0
0x02	→	0	2	0
0x03	→	-	-	-
:	:	:	:	:
:	:	:	:	:
0x0B	→	-	-	-
0x0C	→	-	-	-
0x0D	→	-	-	-
0x0F	→	-	-	-

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## Auto Assigned Addressing Option

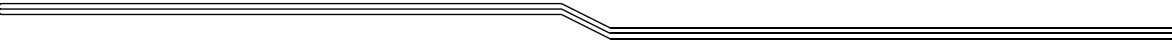
The Auto Assigned option is similar to the Indexed addressing, but with the distinction that the table used is created through SCSI device discovery on power up or reset, and not otherwise retained. As the unit performs device discovery on a SCSI bus, the Index table relating FCP LUN values is filled with adjacent FCP LUNs referencing each subsequent SCSI device. The host system will then detect every attached device without voids, allowing full device discovery to the host. This allows easy configuration in environments where device ordering is not important and hot plugging of SCSI devices will not occur. Tape libraries are excellent candidates for using Auto Assigned Addressing. Configuration allows for discovery to be performed in order of bus, target, or LUN as desired for the specific environment.



# E

## Reference Standards

Standards .....E-3







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## Standards

*Fibre Channel Physical and Signaling Interface (FC-PH)*, ANSI X3T9.3/Project 755D/Rev. 4.3, Contact: Global Engineering, 1-800-854-7179

Fibre Channel Protocol for SCSI (FCP)Rev 12

Fibre Channel Private Loop Direct Attach (FC-PLDA)

*Fibre Channel Arbitrated Loop (FC-AL)*, ANSI X3T11/Project 960D/Rev. 4.54, Contact: Globe Engineering, 1-800-854-7179

*GigaBaud Link Module (GLM) Family*, Fibre Channel System Initiative, FCSI-301-Revision 1.0

*Common FC-PH Feature Sets Profiles*, Fibre Channel Systems Initiative, FCSI-101-Rev. 3.1

*SCSI Profile*, Fibre Channel System Initiative, FCSI-201-Rev. 2.2

*FCSI IP Profile*, Fibre Channel System Initiative, FCSI-202-Rev. 2.1



# Glossary

Adapter

Device

## - A -

### **Adapter**

A printed circuit assembly that translates data between the FC host processor's internal bus and a different bus, such as SCSI.

### **Address**

See SCSI Addressing.

### **Addressing Mode**

Used to create a mapping table that maps devices on the SCSI bus to Fibre Channel logical units.

### **AL\_PA**

Arbitrated Loop Physical Address. A unique one-byte valid value, derived and used in an Arbitrated Loop Topology as defined in ANSI specification FC\_AL ver 4.5.

### **Arbitrated Loop**

See Fibre Channel - Arbitrated Loop. (ANSI specification FC\_AL ver 4.5).

### **Area**

The second byte of the N\_Port Identifier.

### **Auto-Assigned Mapping**

A menu item. The auto-addressing option creates a mapping table using devices discovered upon powering up or resetting the FCR200, that is not otherwise retained by the FCR200.

## - B -

### **Baud**

The unit of signaling speed, expressed as the maximum number of times per second the signal can change the state of the transmission line or other medium (units of baud are  $\text{sec}^{-1}$ ). **Note: With Fibre Channel scheme, a signal event represents a single transmission bit.**

### **Bus**

A means of transferring data between modules and adapters or between an adapter and SCSI devices. For a SCSI bus definition, see SCSI Bus.

## - C -

### **Channel**

A general term for a path on which electronic signals travel.

### **Clusters**

Two or more computers sharing the same resources on a communication link.

## - D -

### **Device**

See *FC Device* on page *gl-2* or *SCSI Device* on page *gl-5*.

**Differential**

An electrical signal configuration using a pair of lines for data transfer. The advantage of differential compared to single-ended configuration is a relative high tolerance for common-mode noise and crosstalk when used with twisted pair cables.

**Domain**

A FC term describing 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 a FC adapter.

**- E -****Exchange**

A FC term for the basic mechanism used for managing an operation. An exchange identifies information transfers consisting of one or more related nonconcurrent sequences that may flow in the same or opposite directions, but always in half duplex mode. An exchange is identified by an OX\_ID and an RX\_ID.

**- F -****Fabric**

A FC term describing a switched topology, which is one of the three existing FC topologies. Fabric elements interconnect various N\_Ports or NL\_Ports and are responsible for frame routing.

**Fast/Wide SCSI**

“Fast” and “Wide” are relative terms in comparing previous SCSI standards and products. “Fast,” as defined in SCSI-2, refers to a maximum synchronous transfer rate of 10 MHz. “Wide” refers to a data path of 16 bits.

**Fault LED**

During power up and self test, the FCR200 Fault LED comes on. After self test, if this LED remains on or comes on, the FCR200 has a problem with one of its components. During normal operation, this LED should be off. When the FCR200 is offline, this LED blinks.

**FC**

See *Fibre Channel (FC)*.

**FC-AL**

See *Fibre Channel - Arbitrated Loop (FC-AL)* on page *gl-3*.

**FC Adapter**

A printed circuit assembly that translates data between the FC host processor’s internal bus and the FC link.

**FC Device**

A device that uses Fibre Channel communications.

**FC Port**

An opening at the back of the FCR200 that provides a fiber optic connection between the FC adapter and the FC host.

**FC-SCSI Hardware Path ID**

A FC term describing a list of values showing the physical hardware path of the FC host to the target device.

Format: Bus\_Converter/  
Adapter\_Address.Protocol\_Type.Area.Port.Bus.Target.LUN

Example: 8/4.8.0.0.2.4.0

**Fiber**

The fiber optic cable made from thin strands of glass through which data in the form of light pulses is transmitted (LASER, LED). It is used for high-speed transmission over medium (200m) to long (10km) distances.

**Fibre**

A generic FC term used to cover all transmission media types specified in the Fibre Channel Physical Layer standard (FC-PH), such as optical fiber, copper twisted pair, and copper coaxial cable.

**Fibre Channel (FC)**

Logically, the Fibre Channel is a bidirectional, full-duplex, point-to-point, serial data channel structured for high performance data communication. Physically, the Fibre Channel is an interconnection of multiple communication ports, called N\_Ports, interconnected by a switching network, called a fabric, a point-to-point link, or an arbitrated loop. Fibre Channel is a generalized

transport mechanism that has no protocol of its own or native input/output command set, but can transport any existing Upper Level Protocols (ULPs) such as SCSI and IP.

#### **Fibre Channel - Arbitrated Loop (FC-AL)**

One of three existing Fibre Channel topologies, in which 2 to 126 devices are interconnected serially in a single loop circuit. The arbitrated loop topology supports all classes of service and guarantees in order delivery of frames when the source and destination are on the same loop.

#### **Fibre Channel Protocol for SCSI (FCP)**

FCP defines a Fibre Channel mapping layer (FC-4) that uses FC-PH services to transmit SCSI command, data, and status information between a SCSI initiator and a SCSI target. Using FCP enables transmission and receipt of SCSI commands, data and status, across the Fibre Channel using the standard Fibre Channel frame and sequence formats.

#### **Frame**

The smallest, indivisible unit of information transfer used by Fibre Channel. Frames are used for transferring data associated with a sequence. Frame size depends on the hardware implementation and is independent of the ULP or the application software.

### **- G -**

#### **Gigabaud Interface Converter (GBIC)**

A physical component that manages the functions of the FC-0 layer, which is the physical characteristic of the media and interface, including drivers, transceivers, connectors, and cables. Mounts on a FC adapter card and connects the FCR200 to a FC host. Also referred to as a Physical Link Module (PLM).

### **- H -**

#### **Hardware Path**

See *FC-SCSI Hardware Path ID* on page *gl-2*.

#### **Host Bus Adapter**

See *FC Adapter* on page *gl-2*.

#### **Indexed Addressing**

A menu name. It allows for generic Fibre Channel host bus adapters to access SCSI devices attached to the FCR200 using a table which is indexed by sequential LUN values.

#### **Initiator**

A SCSI device (usually a host system) that requests an operation to be performed by another SCSI device known as the target (for example, a SCSI disk or tape drive).

### **- L -**

#### **Link**

For Fibre Channel, it is a connection between two nodes, each having at least one N\_Port, interconnected by a pair of optical or copper links, one inbound and one outbound.

#### **Longwave**

Lasers or LEDs that emit light with wave lengths around 1300 nm. When using single mode (9 nm) fibre, longwave lasers can be used to achieve lengths greater than 2Km.

#### **Loop Address**

A FC term indicating the unique ID of a node in Fibre Channel loop topology, sometimes referred to as a Loop ID. Also a status type in the FC Status Menu, showing the FC Loop Address of the FCR200.

#### **Loop Port (L\_Port)**

A FC port that supports loops.

#### **LUN**

Logical Unit Number or Logical Unit; a subdivision of a SCSI target. For SCSI-3, each SCSI target supports up to sixteen LUNs (LUN-0 to LUN-16). Using LUNs, the FC host can address multiple peripheral devices that may share a common controller.

### **- M -**

#### **Management Information Base (MIB)**

A structured set of data variables, called objects, in which each variable represents some resource to be managed. A related collection of resources to be managed.

**Mapping Table**

A table which is indexed by sequential LUN values, indicating selected BUS:TARGET:LUN devices. It is used by the FCR200 to perform Fibre Channel-to-SCSI operations by default.

**MIB**

See *Management Information Base (MIB)* on page *gl-3*.

**Multiplexer**

A device that allows two or more signals to be transmitted simultaneously on a single channel.

**Motherboard**

The main PCA of the FCR200 that provides a physical and logical connection between Fibre Channel and SCSI devices.

**- N -****N\_Port**

A FC term defining a "Node" port. A FC-defined hardware entity that performs data communication over the FC link. It is identifiable by a unique Worldwide Name. It can act as an originator or a responder.

**N\_Port Identifier**

A FC term indicating a unique address identifier by which an N\_Port is uniquely known. It consists of a Domain (most significant byte), an Area, and a Port, each 1 byte long. The N\_Port identifier is used in the Source Identifier (S\_ID) and Destination Identifier (D\_ID) fields of a FC frame.

**Node Name**

A field value under the FC Status Menu. The unique FC identifier, a 64-bit value, the factory assigns to the FCR200.

**- O -****Offline**

Taking the FCR200 offline indicates that all SCSI and FC adapters in the FCR200 are offline.

Taking a SCSI adapter offline means ending inputs/outputs and suspending all transactions going from the FCR200 to the specified SCSI devices. The SCSI adapter is no longer active or available for access.

Taking a FC adapter offline means ending inputs/outputs and suspending all transactions going from the FCR200 to the specified FC device.

**Online**

For the FCR200, online indicates that at least one adapter in the FCR200 is active and available for access.

For a SCSI adapter, online indicates the SCSI adapter is active and available for access and input/output processing.

For a FC adapter, online indicates the FC adapter is active and available for access and input/output processing.

**Originator**

The Fibre Channel N\_Port responsible for starting an exchange. A FC originator is comparable to a SCSI initiator.

**- P -****Point-to-Point**

One of three existing FC topologies, in which two ports are directly connected by a link with no fabric, loop, or switching elements present. The FCR200 supports all topologies.

**Port Name**

A field value under the FC Status Menu; the FC port identifier; a 64-bit value the factory assigns to each FC adapter.

**POST**

See Power On Self Test.

**Power On Self Test (POST)**

A group of tests run when the FCR200 is powered on.

**Processor**

Contains the arithmetic and logic, control, and internal memory units that control the FCR200.

**- R -****Reset SCSI**

For a specific SCSI bus, the host clears all inputs and outputs and then resets the bus and all the devices connected to it.

**Responder**

The logical function in an N\_Port responsible for supporting the exchange initiated by the originator in another N\_Port. A FC responder is comparable to a SCSI target. The FCR200 is often the responder.

**Router**

A device which selectively forwards data between storage networks based on administratively defined preferences. The forwarding decision is based on paths between address mappings among dispersed initiators and targets.

**- S -****SCC Addressing**

A menu name. SCSI-3 Controller Commands (SCC) addressing is used to address SCSI devices attached to the FCR200 using the SCC logical unit addressing method. In SCC addressing mode, the FCR200 will respond to FCP commands as in a SCC controller device.

**SCSI**

Small Computer System Interface. An industry standard for connecting peripheral devices and their controllers to an initiator.

**SCSI Adapter**

A 16-bit fast/wide differential or 8-bit narrow single-ended physical connection between the FCR200 and the SCSI devices. Each SCSI adapter supports up to sixteen (for fast/wide) or eight (for narrow) SCSI devices, including itself.

**SCSI Addressing**

A fast/wide SCSI adapter supports up to 16 devices, including itself. Each device has its own unique SCSI address. The SCSI address of a device dictates the device's priority when arbitrating for the SCSI bus. SCSI address "7" has the highest priority. The next highest priority address is "6" followed by 5, 4, 3, 2, 1, 0, 15, 14, 13, 12, 11, 10, 9, 8, with "8" being the lowest priority address.

The fast/wide SCSI adapter is factory set to address 7. A narrow SCSI adapter supports up to eight devices, including itself. SCSI address "7" has the highest priority followed by 6, 5, 4, 3, 2, 1, and 0.

**SCSI Bus**

The means of transferring SCSI data between SCSI devices. It is an 8-bit or 16-bit bus that supports up to eight or sixteen devices (including itself), in any mix of initiators and targets, with the limitation that at least one initiator and one target must be present.

**SCSI Device**

A single unit on the SCSI bus, identifiable by a unique SCSI address. A SCSI device can act as an initiator or target. For SCSI-3, each SCSI device supports up to sixteen LUNs.

**SCSI Port**

An opening at the back of the FCR200 providing connection between the SCSI adapter and the SCSI bus.

**SCSI Status**

A menu name used to show the number of SCSI devices on the bus.

**Shortwave**

Lasers or LEDs that emit light with wavelengths around 780 nm or 850 nm. When using multimode fibre (50 nm), shortwave lasers can be used with FC links less than 500m. To achieve longer lengths, single-mode fibre is required. The preferred fibre core size is 50 micron as this fibre has large bandwidth so that the distance is limited by the fibre attenuation. A 62.5 micron core size is also supported for compatibility with existing FDDI installations. Fibre of this type has smaller bandwidth and, in this case, the distance is limited by the fibre bandwidth.

**SNMP**

Simple Network Management Protocol.

**Speed**

A status type in the FC Status Menu showing the speed (1063 Mbps) of the FC adapter.

**- T -****Target**

A SCSI device (usually the peripheral) that responds to an operation requested by a SCSI initiator (usually the host system). SCSI peripherals are targets, but for some commands (for example, a COPY command), the peripheral may need to act temporarily as an initiator.

**Terminator Block/Termination**

An electrical connection at each end of the SCSI bus composed of a set of resistors (or possibly other components). Its function is to provide a pull-up for open collector drivers on the bus, and also impedance matching to prevent signal reflections at the ends of the cable.

The SCSI bus requires termination at both ends of the bus. One end of the SCSI bus is terminated by the SCSI adapter's internal termination. The other end should have a terminator placed on the 68-pin high density SCSI connector on the last SCSI peripheral. If this device is not terminated, data errors may occur.

**Topology**

The physical or logical layout of nodes on a network. FC topologies include point-to-point, FC-AL, and Fabric. The FCR200 supports all topologies.

A status type in the FC Status Menu showing the type of FC topology being used.

**Trap**

In the context of SNMP, an unsolicited message sent by an agent to a management station. The purpose is to notify the management station of some unusual event.

**- V -****View Node Name**

A status type in the FC Status Menu showing the identification of the node.

**View Port Name**

A status type in the FC Status Menu showing the identification of the port.

**- W -****World Wide Name (WWN)**

A Name\_Identifier which is worldwide unique, and represented by a 64-bit unsigned binary value.



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