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FibreXpress®

FX200
Hardware Reference Manual for PCI, PMC, and CPCI Cards

Document No. F-T-MR-F2PCPMCP-A-0-A6

Systran®

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Revised: February 4, 2004

Systran Corporation
4126 Linden Avenue
Dayton, OH 45432-3068 USA
(800) 252-5601(U.S. only)
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NOTE:

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- FHJ1-PC5MW000-00 PCI with Short Wavelength Laser media interface.
- FHJ1-PM5MW000-00 PMC with Short Wavelength Laser media interface.
- FHJ1-PM5SW000-00 PMC with Long Wavelength Laser media interface.
- FHJ2-PM5MW000-00 Dual-Port PMC with Short Wavelength Laser media interface.
- FHJ2-PM5SW000-00 Dual-Port PMC with Long Wavelength Laser media interface.
- FHJ2-CP5MW000-00 Dual-Port CPCI with Short Wavelength Laser media interface.
- FHJ2-CP5SW000-00 Dual-Port CPCI with Long Wavelength Laser media interface.

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CAUTION: Changes or modifications to this product, not expressly approved by Systran, could void your authority under the provisions above to operate this equipment.

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1. INTRODUCTION

1.1 How To Use This Manual

1.1.1 Purpose

This manual describes how to install, setup, and run the FibreXpress FX200 PCI, PMC, Dual Port (DP) PMC, and DP CompactPCI (CPCI) cards.

1.1.2 Scope

The information in this manual is intended for information systems personnel, system coordinators, or highly skilled network users. You need at least a systems-level understanding of general computer processing, memory, and hardware operation to effectively use this manual.

1.1.3 Style Conventions

- Called functions are italicized. For example, *OpenConnect()*
- Data types are italicized. For example, *int*
- Function parameters are bolded. For example, **Action**
- Path names are italicized. For example, *utility/sw/cfg*
- File names are bolded. For example, **config.c**
- Path file names are italicized and bolded. For example, ***utility/sw/cfg/config.c***
- Hexadecimal values are written with a "0x" prefix. For example, 0x7e
- For signals on hardware products, an 'Active Low' is represented by prefixing the signal name with a slash (/). For example, /SYNC
- Code and monitor screen displays of input and output are boxed and indented on a separate line. Text that represents user input is bolded. Text that the computer displays on the screen is not bolded. For example:

```
C:\ls
file1          file2              file3
```

- Large samples of code are Courier font, at least one size less than context, and are usually on a separate page or in an appendix.

1.2 Related Information

- *ANSI Z136.2-1988 American National Standard for the Safe Use of Optical Fiber Communication Systems Using Laser Diode and LED Sources*.
- *CompactPCI Hot Swap Specification*, *Revision 1.0*, August 3, 1998; PICMG 2.1.
- *CompactPCI Specification*, *Revision 3.0*, October 1, 1999; PICMG 2.0; *CompactPCI Power Interface Specification, Revision 1.0*, October 1, 1999; *PICMG 2.11; Keying of CompactPCI Boards and Backplanes, Revision 1.0*, October 1, 1999; PICMG 2.10.
- *Draft Standard for a Common Mezzanine Card Family: CMC*; IEEE P1386, Draft 2.0, April 4, 1995.
- *Draft Standard Physical and Environmental Layers for PCI Mezzanine Cards: PMC*, IEEE P1386.1, Draft 2.0, April 4, 1995.

- *Fibre Channel Arbitrated Loop (FC-AL) Specification, Revision 4.5*, June 1995; Produced by the ANSI X3T9.3 standards group.
- *Fibre Channel, A Technical Overview* - available from Systran.
- *Fibre Channel Fabric Generic Requirements (FC-FG) Specification, Revision 2.0*, October 12, 1993; Produced by the ANSI X3T9.3 standards group.
- *Fibre Channel Physical and Signaling Interface (FC-PH), Revision 4.3*, June 1, 1994; Produced by the ANSI X3T9.3 standards group.
- *Fibre Channel Physical and Signaling Interface-2 (FC-PH-2), Revision 7.3*, January 5, 1996; Produced by the ANSI X3T11 standards group.
- *Fibre Channel Physical and Signaling Interface-3 (FC-PH-3), Revision 8.6*, April, 1996; Produced by the ANSI X3T11 standards group.
- *IEC 825-1984 Radiation Safety of Laser Products, Equipment Classification, Requirements, and User's Guide*, 2 parts, 1993.
- *PCI Local Bus Specification, Revision 2.2*, December 8, 1998; PCI Special Interest Group.
- *Small Form Factor Transceiver Multisource Agreement* (SFF MSA), July 5, 2000
- CERN Fibre Channel Homepage - www.cern.ch/HSI/fcs/fcs.html
- JNI Corp. - www.jni.com
- Medusa Labs - www.medusalabs.com
- PCI Special Interest Group - www.pcisig.com
- Systran Corp. - www.systran.com
- T11 Home page - www.t11.org
- University of New Hampshire Interoperability Lab - http://www.iol.unh.edu/consortiums/fc

1.3 Quality Assurance

Systran Corporate policy is to provide our customers with the highest quality products and services. In addition to the physical product, the company provides documentation, sales and marketing support, hardware and software technical support, and timely product delivery. Our quality commitment begins with product concept, and continues after receipt of the purchased product.

Systran's Quality System conforms to the ISO 9001 international standard for quality systems. ISO 9001 is the model for quality assurance in design, development, production, installation and servicing. The ISO 9001 standard addresses all 20 clauses of the ISO quality system, and is the most comprehensive of the conformance standards.

Our Quality System addresses the following basic objectives:

- Achieve, maintain and continually improve the quality of our products through established design, test, and production procedures.
- Improve the quality of our operations to meet the needs of our customers, suppliers, and other stakeholders.
- Provide our employees with the tools and overall work environment to fulfill, maintain, and improve product and service quality.
- Ensure our customer and other stakeholders that only the highest quality product or service will be delivered.

The British Standards Institution (BSI), the world's largest and most respected standardization authority, assessed Systran's Quality System. BSI's Quality Assurance division certified we meet or exceed all applicable international standards, and issued

Certificate of Registration, number FM 31468, on May 16, 1995. The scope of Systran's registration is: "Design, manufacture and service of high technology hardware and software computer communications products." The registration is maintained under BSI QA's bi-annual quality audit program.

Customer feedback is integral to our quality and reliability program. We encourage customers to contact us with questions, suggestions, or comments regarding any of our products or services. We guarantee professional and quick responses to your questions, comments, or problems.

1.4 Technical Support

Technical documentation is provided with all of our products. This documentation describes the technology, its performance characteristics, and includes some typical applications. It also includes comprehensive support information, designed to answer any technical questions that might arise concerning the use of this product. We also publish and distribute technical briefs and application notes that cover a wide assortment of topics. Although we try to tailor the applications to real scenarios, not all possible circumstances are covered.

Although we have attempted to make this document comprehensive, you may have specific problems or issues this document does not satisfactorily cover. Our goal is to offer a combination of products and services that provide complete, easy-to-use solutions for your application.

If you have any technical or non-technical questions or comments, contact us. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

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- E-mail: **support@systran.com**
- Fax: **(937) 252-1349**
- World Wide Web address: www.systran.com

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- E-mail: **info@systran.com**
- World Wide Web address: www.systran.com

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2. PRODUCT OVERVIEW

2.1 Overview

The FX200 cards belong to Systran's family of FibreXpress (FX) products. The FX200 operates at 2.125 Gbps, and when multiple FX200 cards are connected in a network, the resultant FibreXpress system is a fully compliant Fibre Channel (FC) standards-based network, meeting the requirements of the real-time computing industry. The superior communication and interconnect capabilities of the FC standard are maximized by Systran's FX200 product.

The FX200 cards are based on a "system on a chip" design. This is achieved by integrating the PCI bus interface, the FC interface and an embedded RISC based I/O engine into a single chip. The FX200 implements SCSI Fibre Channel Protocol (FCP) and Internet Protocol (IP) in hardware eliminating the need for the user to deal directly with the FC interface. The FX200 makes full use of the FC theoretical maximum bandwidth, allowing 200 MBps data transfer rates (400 MBps in Full-Duplex mode).

The standard FX200 product supports both the 1.0625 Gbps and the 2.125 Gbps rates, and automatically detects and switches to the appropriate rate. Thus, the FX200 cards can interoperate with other FC devices at 1.0625 or 2.125 Gbps.

FX200 software drivers are available for the FX200 cards. The FX200 software drivers support several protocols under a variety of popular operating environments. These drivers are continually being developed at Systran. Contact Systran for more information concerning which versions and platforms of the FX200 drivers are currently supported. This manual does not address driver installation or interface. Refer to the appropriate software driver manual for information on installation and use of the software drivers.

Card specifications are provided in Appendix A. Ordering information is provided in Appendix B.

2.2 Product Ruggedization Levels

The FX200 products are offered at three different ruggedization levels. Each ruggedization level is organized to address different operational applications. These levels are defined below.

Standard and ruggedized environmental conditions are defined in Appendix A. Current FX200, standard and ruggedized, products are listed in Appendix B.

2.2.1 Standard

FX200 products designed to meet this level are intended for use in sheltered, benign environments such as laboratories or light commercial office applications. They use readily available components and require normal convection airflow for proper cooling. No special environmental design or manufacturing processes are required.

2.2.2 Rugged 1

Rugged 1 FX200 products are designed for the temperatures, vibrations, and shocks typically found in light to moderate industrial applications. Conformal coating is applied

to protect the product from the effects of high humidity and other aggressive components in the atmosphere such as salt and sand.

2.2.3 Rugged 2

Rugged 2 FX200 products are designed for the extended temperatures, vibrations, and shocks typically found in heavy industrial and some military applications. The same conformal coating requirements for Rugged 1 apply to Rugged 2.

2.3 FX200 PCI Card

Systran's FibreXpress FX200 PCI card is an ANSI-Standard card for FC communications on host nodes. Figure 2-1 shows the FX200 PCI-X Single-Channel card.

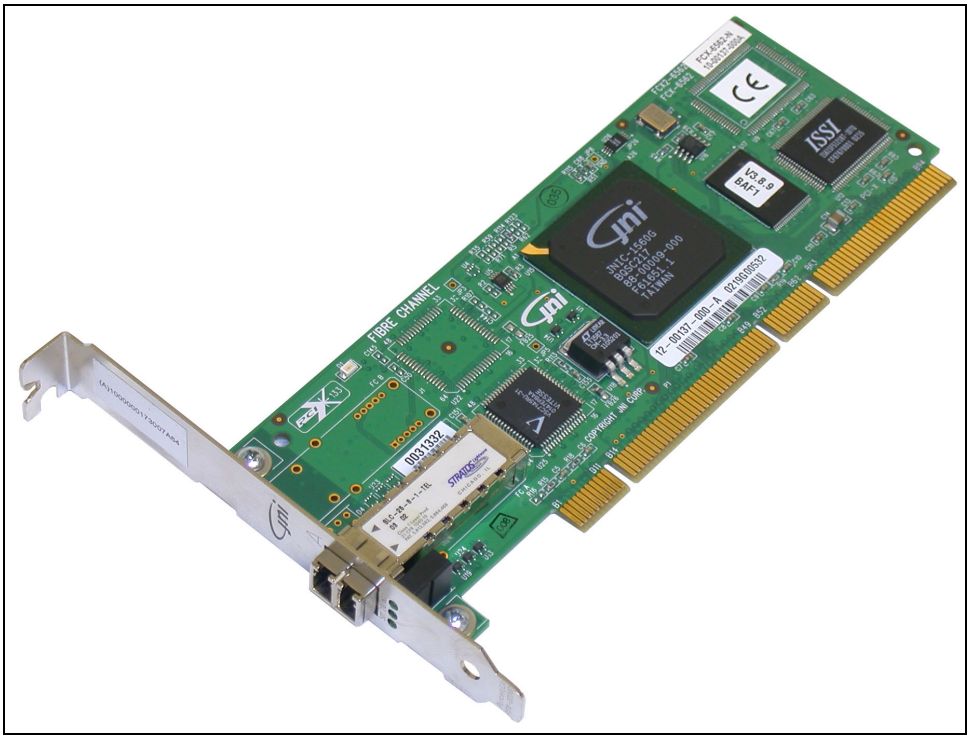


Figure 2-1 FX200 PCI-X Single-Channel Card

2.3.1 Card Features

The FX200 PCI card has the following features:

HOST (PCI) INTERFACE

- 33/66 MHz PCI clock rate.
- 50-133 MHz PCI-X clock rate.
- 32 or 64-bit data path.
- 528 MB/s burst transfer data rate at 64-bit, 66 MHz.
- 1.064 GB/s burst transfer data rate at 64-bit, 133 MHz.
- Zero-wait state transfers with cache line streaming.
- Fewer than one interrupt per command completion.
- Independent DMA channels for receive, transmit, and command.
- Programmable priority for the DMA channels.
- 64-bit addressing.

- Dual address cycle capable.
- Power management registers.
- Operates in both +5.0 V and 3.3 V systems.
- Compatible with +5.0 V and 3.3 V PCI signaling levels.
- PCI 2.2 , PC99, and PCI-X compliant.
- Small Form Factor (SFF) Short Wavelength (850 nm) Laser module with LC connector.

2.4 FX200 PMC Card

Systran's FibreXpress FX200 PMC card, also called Host Bus Adapter (HBA), is an ANSI-Standard card for FC communications on host nodes. The FX200 PMC card mounts onto any PMC-compliant carrier. The FX200 PMC card provides the interconnection for a wide range of popular bus architectures and for other FC products that comply with ANSI FC standard revision 4.3. Figure 2-2 shows the FX200 PMC card.

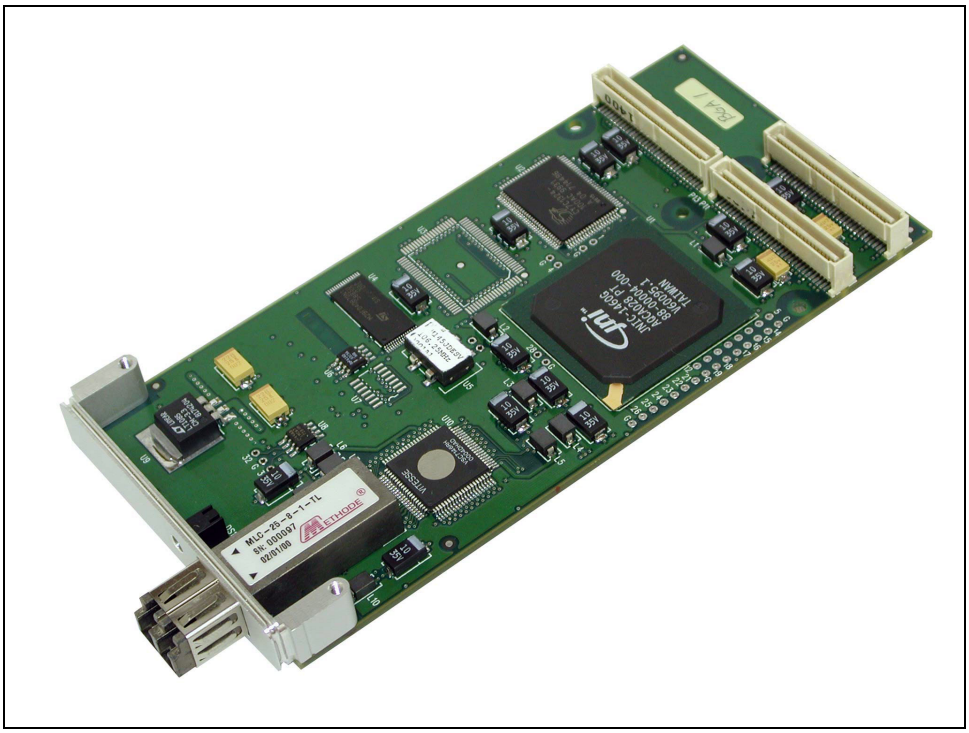


Figure 2-2 FX200 PMC Card

2.4.1 Card Features

The FX200 PMC card has the following features:

HOST (PCI) INTERFACE

- 33/66 MHz PCI clock rate.
- 32 or 64-bit data path.
- 528 MB/s burst transfer data rate at 64-bit, 66 MHz.
- Zero-wait state transfers with cache line streaming.
- Fewer than one interrupt per command completion.
- Independent DMA channels for receive, transmit, and command.
- Programmable priority for the DMA channels.
- 64-bit addressing.

- Dual address cycle capable.
- Power management registers.
- Operates in both +5.0 V and 3.3 V systems.
- Compatible with +5.0 V and 3.3 V PCI signaling levels.
- PCI2.2 and PC99 compliant.
- Small Form Factor (SFF) Short Wavelength (850 nm) Laser module with LC connector.
- HSSDC copper modules.
- SFF Long Wavelength (1300 nm) Laser module with LC connector.
- Ruggedized versions available (see Section 2.2).

2.5 FX200 Dual Port (DP) PMC Card

Systran's FibreXpress FX200 DP PMC card, also called Host Bus Adapter (HBA), is an ANSI-Standard card for FC communications on host nodes. The FX200 DP PMC card mounts onto any PMC-compliant carrier. The FX200 DP PMC can be easily recognized by the two FC physical media interfaces (Ports A and B) mounted on the front end of the card. This dual-port interface provides many useful features for the FX200 DP PMC cards. Most importantly, it monitors the status of Ports A and B for signal-detect changes. On the event of gaining signal detect(s); the port(s) will be automatically included in the loop. On the event of losing signal detect(s); the port(s) will be automatically bypassed from the loop.

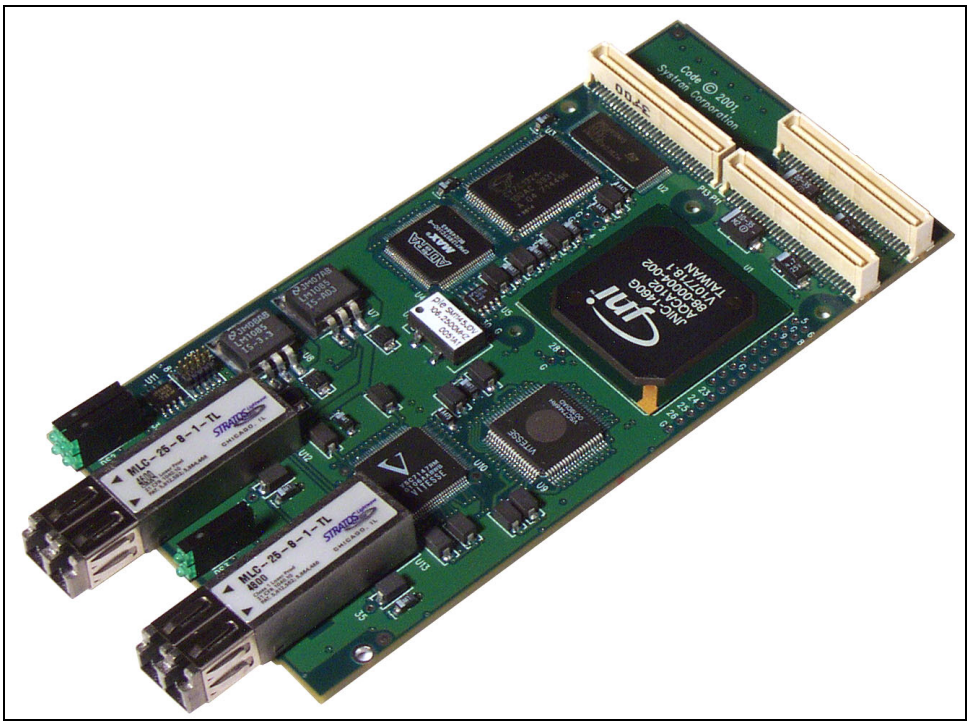


Figure 2-3 FX200 DP PMC

By default, the FX200 DP PMC card is configured in "Auto Mode" to free the user from having to configure the dual-port interface. In Auto Mode, the user may simple add or remove connections to other FC nodes as needed without altering the configuration of the FX200 DP PMC card. However, some applications may require unique setups where the Auto Mode feature is not practical. In these advanced applications, the dual-port interface can be manually configured. Refer to the appropriate software driver manual for

information regarding manual control of the dual-port interface. Figure 2-4 displays a block diagram of the dual-port interface of the FX200 DP PMC cards.

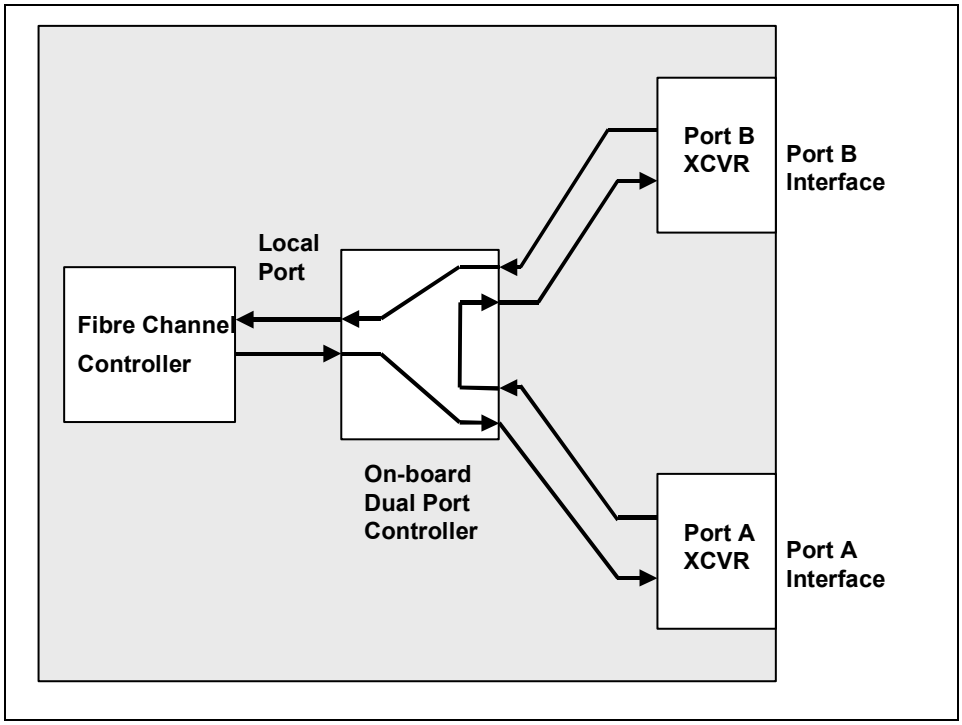


Figure 2-4 Block Diagram of Dual-port interface

2.5.1 Card Features

The FX200 DP PMC card has the following features:

HOST (PCI) INTERFACE

- 33/66 MHz PCI clock rate.
- 32 or 64-bit data path.
- 528 MB/s burst transfer data rate at 64-bit, 66 MHz.
- Zero-wait state transfers with cache line streaming.
- Fewer than one interrupt per command completion.
- Independent DMA channels for receive, transmit and command.
- Programmable priority for the DMA channels.
- 64-bit addressing.
- Dual address cycle capable Power management registers.
- Operates in both +5.0 V and 3.3 V systems.
- Compatible with +5.0 V and 3.3 V PCI signaling levels .
- PCI2.2 and PC99 Compliant.
- SFF Short Wavelength (850 nm) Laser modules with LC connector.
- SFF Long Wavelength (1300 nm) Laser modules with LC connector.
- HSSDC copper modules.
- Ruggedized versions available (see Section 2.2).

2.6 FX200 Dual Port CPCI Card

Systran's FibreXpress FX200 DP CPCI card is an ANSI-Standard card for FC communications on host nodes. Figure 2-5 displays the FX200 DP CPCI card. The FX200 DP CPCI is easily recognized by the two FC physical media interfaces (Ports A and B) mounted on the front end of the card. This dual-port interface provides many useful features for the FX200 DP CPCI cards. Most importantly, it monitors the status of Ports A and B for signal-detect changes. On the event of gaining signal detect(s), the port(s) will be automatically included in the loop. On the event of losing signal detect(s); the port(s) will be automatically bypassed from the loop.

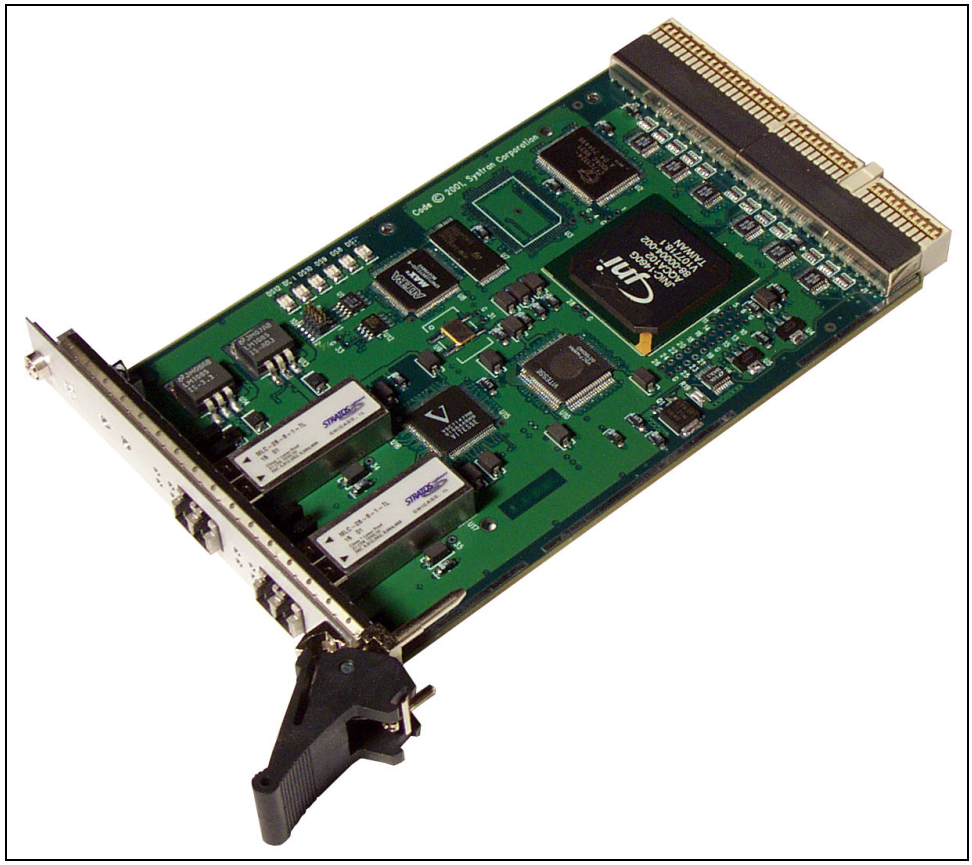


Figure 2-5 FX200 DP CPCI

By default, the FX200 DP CPCI card is configured in "Auto Mode" to free the user from having to configure the dual-port interface. In Auto Mode, the user may simple add or remove connections to other FC nodes as needed without altering the configuration of the FX200 DP CPCI card. However, some applications may require unique setups where the Auto Mode feature is not practical. In these advanced applications, the dual-port interface can be manually configured. Refer to the appropriate software driver manual for information regarding manual control of the dual-port interface. Figure 2-6 displays a block diagram of the dual-port interface of the FX200 DP CPCI cards.

The FX200 DP CPCI card provides Basic Hot Swap capability in accordance with the CompactPCI Hot Swap Specification, PICMG 2.1 R1.0. This allows insertion of card into a powered system, without adversely affecting system operation (operator must manually load appropriate driver upon card insertion); system reconfiguration and fault recovery

with no system down time, and system isolation of faulty boards with continuous operation.

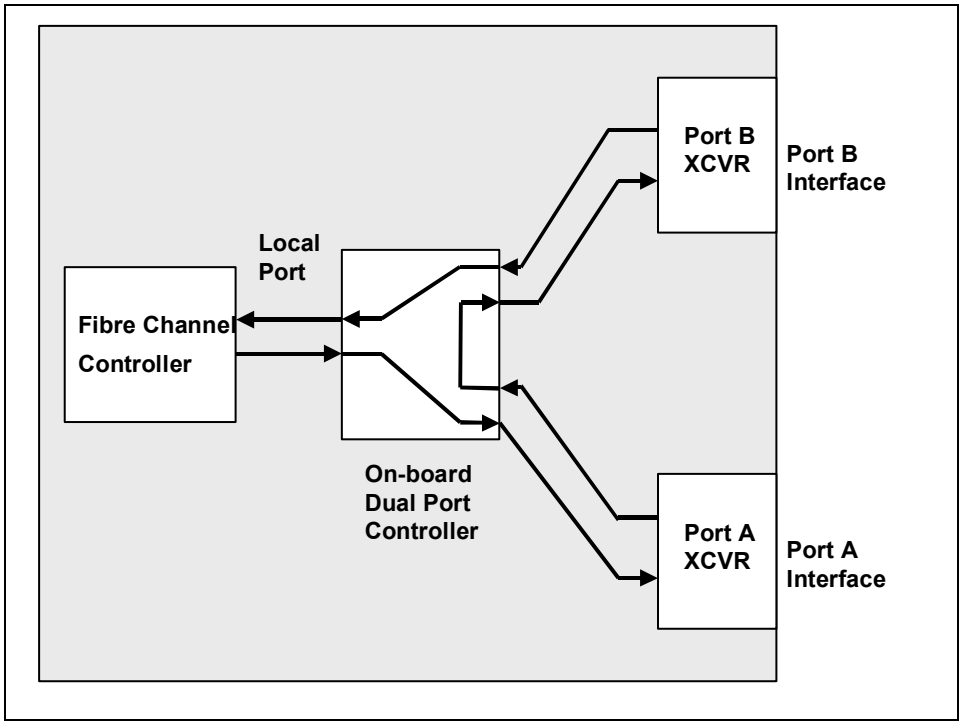


Figure 2-6 Block Diagram of the Dual-port interface

2.6.1 Card Features

The FX200 DP CPCI card has the following features:

FACEPLATES

- The FX200 DP CPCI cards are shipped with both a 3U and 6U faceplate.

HOST (PCI) INTERFACE

- 33/66 MHz PCI clock rate.
- 32 or 64-bit data path.
- 528 MB/s burst transfer data rate at 64-bit, 66 MHz.
- Zero-wait-state transfers with cache line streaming.
- Fewer than one interrupt per command completion.
- Independent DMA channels for receive, transmit and command.
- Programmable priority for the DMA channels.
- 64-bit addressing.
- Dual address cycle capable Power management registers.
- Operates in both +5.0 V and 3.3 V systems.
- Compatible with +5.0 V and 3.3 V PCI signaling levels.
- SFF Short Wavelength (850 nm) Laser modules with LC connector.
- SFF Long Wavelength (1300 nm) Laser modules with LC connector.
- PCI specification 2.2 and CompactPCI Core Specification, PICMG 2.0 R3.0.
- Provides Basic Hot Swap capability in accordance with the CompactPCI Hot Swap Specification, PICMG 2.1 R1.0.

- Allows insertion of card into a powered system, without adversely affecting system operation (operator must manually load appropriate driver upon card insertion).
- Allows system reconfiguration and fault recovery to occur with no system down time.
- Allows a system to isolate faulty boards and continue operation.

2.7 FX200 Features

The following features are supported by the FX200 hardware. Refer to the FX200 API guide to determine which of these features the FX200 device driver supports.

- 1.0625 or 2.125 Gbps Full-Duplex Fibre Channel data rate.
- 200 MB/s and 400 MB/s (Full-Duplex) data rate.
- Auto Link Speed Negotiation.
- Concurrent FCP and IP protocol support.
- Concurrent Target and Initiator Mode Support.
- Up to 1,278 concurrent, active Exchanges supported.
- Up to 126 AL_PA Aliases.
- Switched Fabric, Arbitrated Loop, and Point-to-Point support.
- Support for Class 1, 2, 3, and intermix services.
- Full-Duplex and Dynamic Half-Duplex support.
- Raw frame handling.
- Internal Loopback Mode.
- Programmable removal from loop.
- Fibre Channel Analyzer mode.
- FC-AL-2 rev. 7.0 compliant.
- Up to 16 million simultaneous SCSI Targets supported.

2.8 Fibre Channel Interface

There are two interfaces on the FX200 card:

- A PCI bus interface used for communication with a host computer.
- A physical media or Fibre Channel interface used for communication with other Fibre Channel entities.

2.8.1 Host Bus Interface

The host bus interface for the FX200 is the PCI bus. All communications with the FX200 are handled through the appropriate FX200 device driver. The FX200 card is mapped into PCI memory and I/O space. The card operates as a PCI Bus initiator, target, or interrupting device as required according to the operation currently being carried out.

2.8.2 Fibre Channel Physical Media Interface Options

The following physical media interface options are available for the FX200:

- SFF Short Wavelength (850 nm) Laser module with LC connector.
- SFF Long Wavelength (1300 nm) Laser module with LC connector.
- HSSDC copper module.

The specifications for each media type are described in Section A.3 of Appendix A. The desired media is specified when ordering. Order numbers for each option are shown in Section B.1 of Appendix B. Contact Systran regarding the availability of media options.

2.9 Fibre Channel Applications

Fibre Channel communication provides a practical, inexpensive, yet scalable solution for achieving high-speed gigabit per second data transfer among workstations, mainframes, supercomputers, desktop computers, storage devices, and display devices. Distributed processors, storage devices, and peripherals can connect to one another over distances of up to 10 km per link (using Long Wave Optical Transceivers). Hubs can link up to 126 individual nodes together on a single loop and can provide fault isolation by bypassing failed nodes. Fabric switches can be used to link separate loops and can be cascaded to allow several thousand nodes to communicate and share data.

Fibre Channel is ideal for the following applications:

- High-performance storage area network (SAN).
- Large (multiple terabyte) databases and data warehouses.
- Storage backup systems and recovery.
- Server clusters.
- Network based storage.
- Real-time applications.
- Digital audio/video networks.
- Digital imaging.
- Embedded military sensor, processing, and displays.
- Industrial control systems.

Contact Systran for assistance in implementing your particular Fibre Channel application.

2.10 Topologies

The versatile FX200 card operates in topologies specified by the Fibre Channel standard. These topologies are:

- Point-to-Point (two-node arbitrated loop).
- Arbitrated Loop.
- Switched Fabric.

2.10.1 Point-to-Point Connection

A point-to-point connection, using the FX200 cards, is created as a two-node arbitrated loop. To do this, the fiber-optic cable of Node 1 is connected to the receiver of Node 2, and vice versa. Data flows from the transmitter of one node to the receiver of the other node, as shown in Figure 2-7.

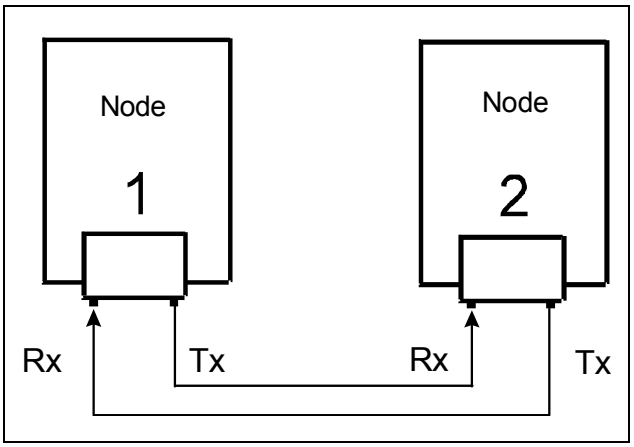


Figure 2-7 Point-to-Point Connection

A point-to-point connection, using the FX200 Dual Port PMC or CPCI cards, is created as a two-node arbitrated loop. To do this, the fiber-optic cable connected to the transmitter of Port B of Node 1 is connected to the receiver of Port A on Node 2, and vice versa. Data flows from the transmitter of one node to the receiver of the other node, as shown in Figure 2-8. For fault tolerance, a second pair of fiber-optic cables can be added between the unconnected ports of Node 1 and Node 2. Therefore, on the event of a cable break the point-to-point connection remains operational.

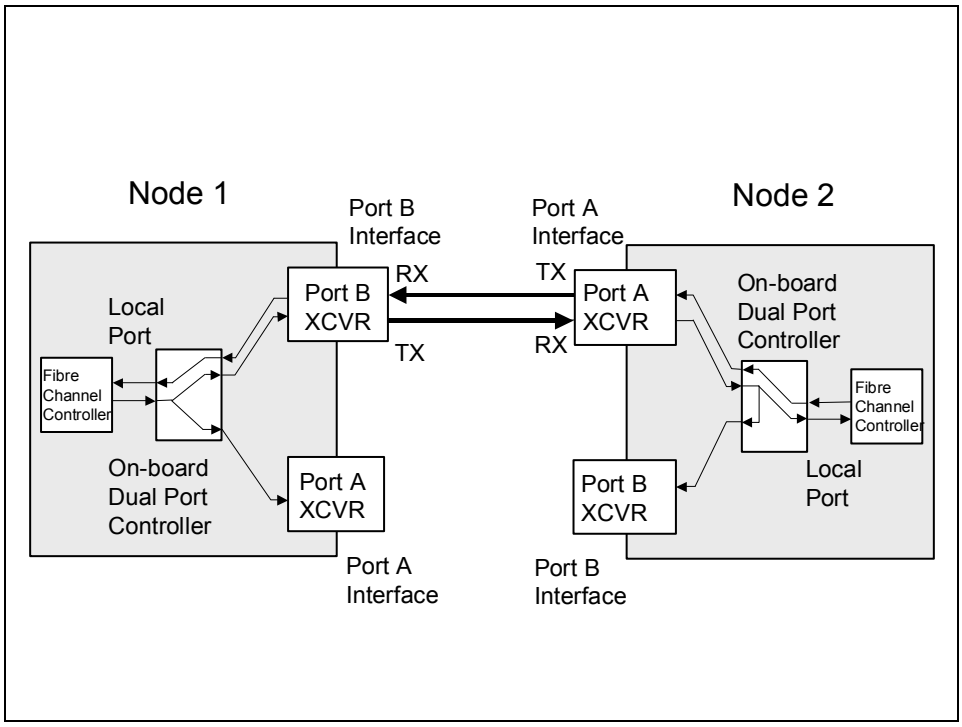


Figure 2-8 Point-to-Point Connection on Dual Port Cards

2.10.2 Arbitrated Loop Without Hub

To configure the FX200 PCI or PMC in an arbitrated loop without a hub, the fiber-optic cable transmitter of the up-stream node is connected to the receiver of the down-stream node. Data flows from the transmitter of one node to the receiver of the next node as shown in Figure 2-9.

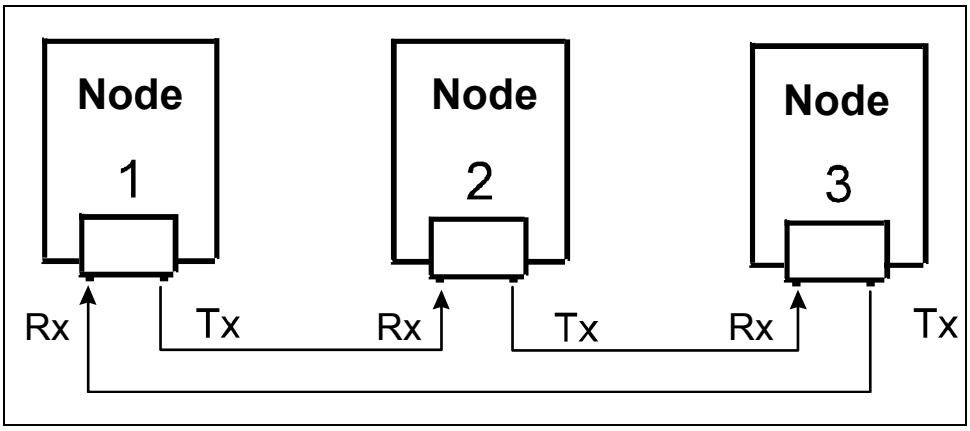


Figure 2-9 Arbitrated Loop without Hub

To configure the FX200 DP PMC or CPCI in an arbitrated loop without a hub, the fiber-optic cable transmitter of Port B of the up-stream node is connected to the receiver of Port A of the down-stream node. Data flows from the transmitter of one node to the receiver of the next node as shown in Figure 2-9.

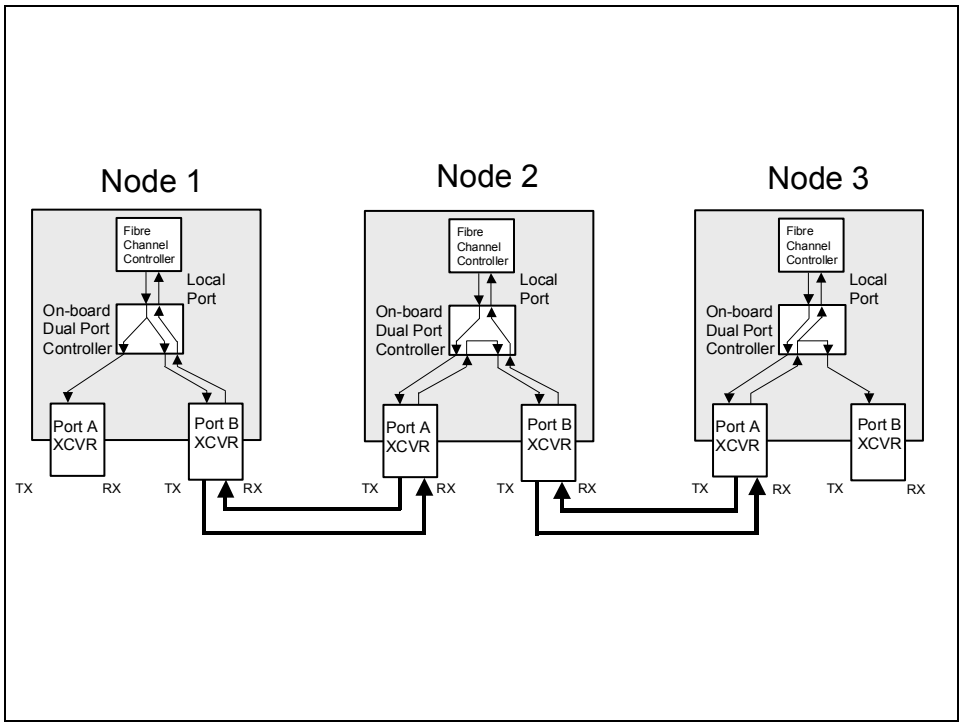


Figure 2-10 Arbitrated Loop on Dual Port Cards without Hub

To achieve the arbitrated loop topology similar to that shown in Figure 2-9, the fiber-optic cables need to be split. However, only the Short Wavelength optical and Long Wavelength optical cables can be split. The HSSDC cables cannot be split.

2.10.3 Arbitrated Loop With Hub

Another arbitrated loop configuration method is with a Fibre Channel hub, such as Systran's LX2500 Crossbar Switch. It provides fault detection and isolation, without the need to split cables. It is also easily configurable and allows individual nodes to be switched in and out of a loop.

To configure the FX200 PCI or PMC in an arbitrated loop connection with a hub, each node's transmitter and receiver are connected to the hub as shown in Figure 2-11.

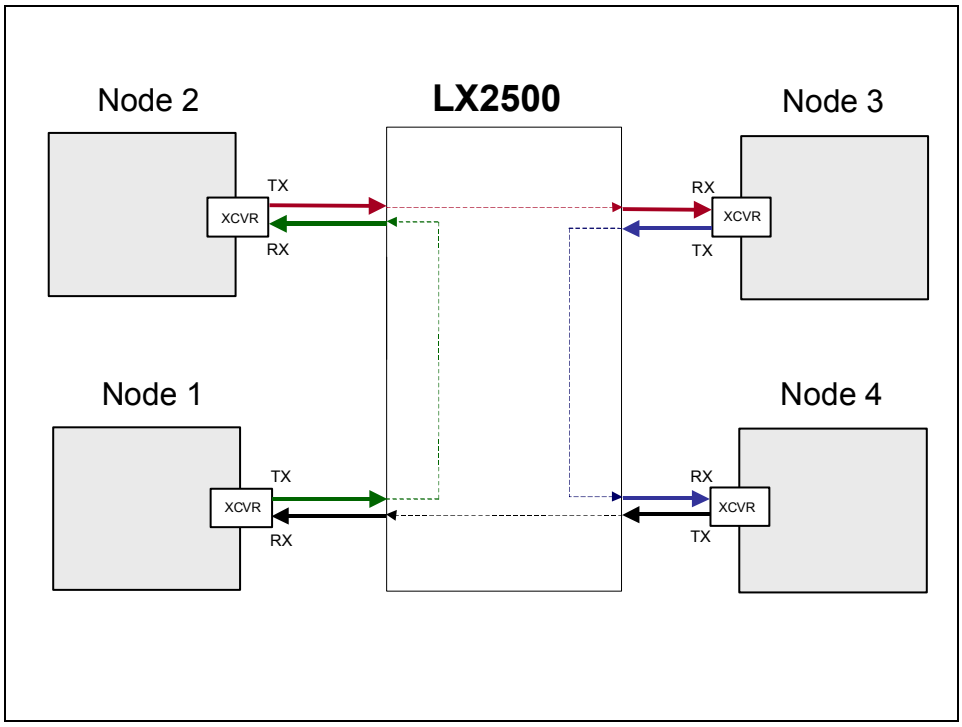


Figure 2-11 Arbitrated Loop with Hub

Figure 2-11 demonstrates the ability of the LX2500 to automatically isolate a failed node while leaving the remaining original loop intact. In this example, the LX2500 has isolated Node 4 due to loss of signal detect. Powering Node 4 down has caused this port to be isolated by the LX2500. This functionality assures that a single node failure will not result in an entire loop failure.

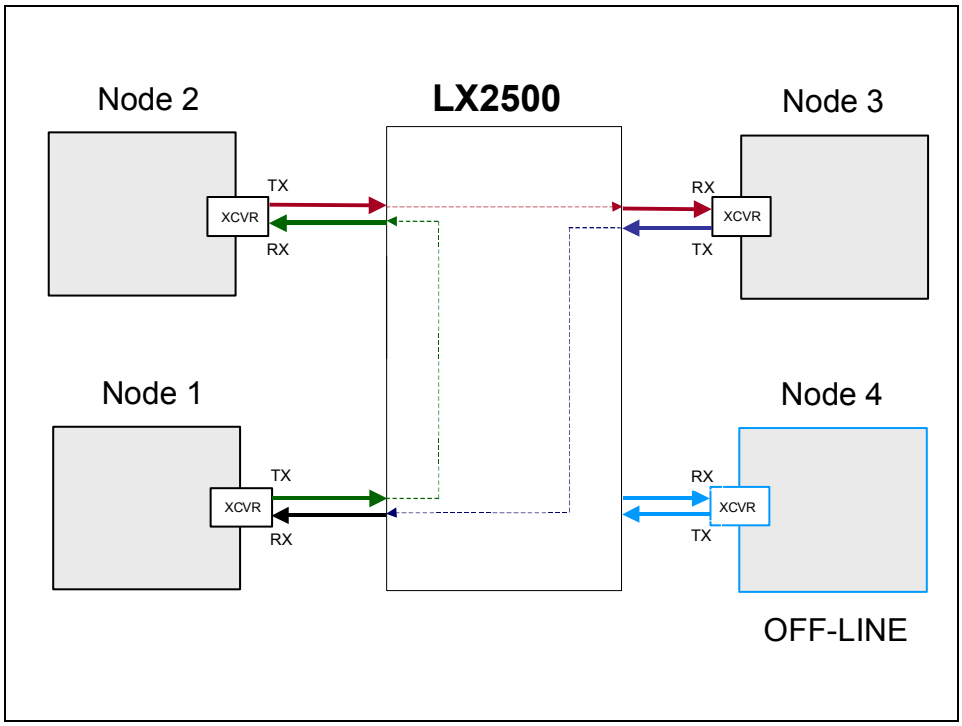


Figure 2-12 Arbitrated Loop with Hub, with Node 4 Off-Line

To configure the FX200 Dual Port PMC or CPCI in an arbitrated loop connection with a hub, each node's transmitter and receiver are connected to the hub as shown in Figure 2-13. Once again, Systran's LX2500 Crossbar Switch is used to provide fault detection and isolation for the arbitrated loop. In the figure below, extra cable connections have been made at points 5 and 6. These connections provide backup routes for the LX2500 to provide additional fault tolerance.

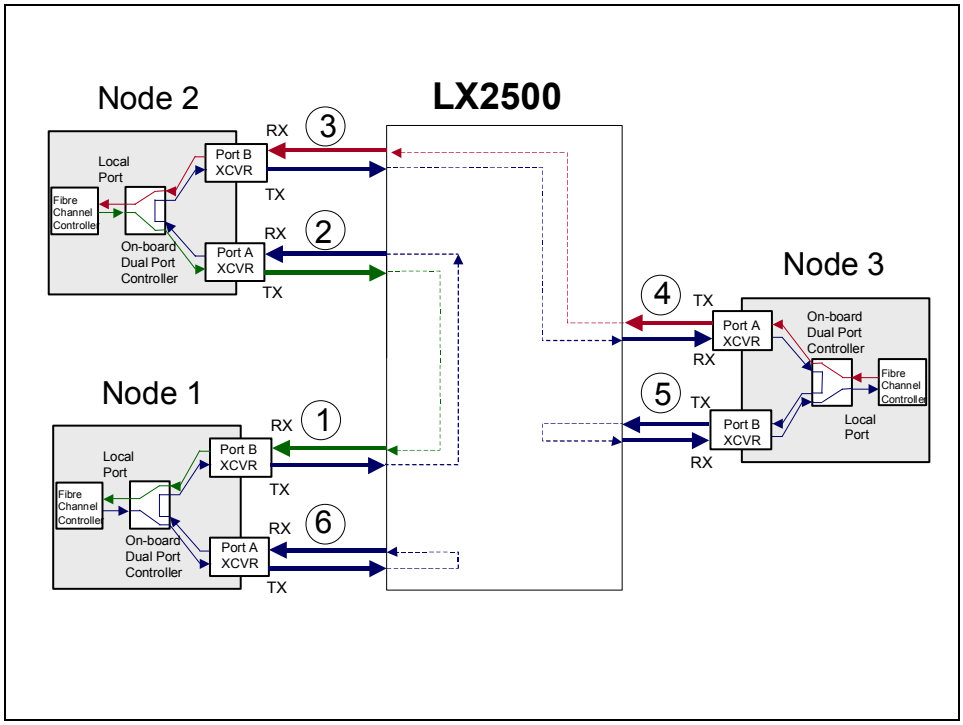


Figure 2-13 Arbitrated Loop with Hub

Figure 2-14 demonstrates the LX2500's ability to automatically isolate a failed node while leaving the remaining original loop intact. In this example, the LX2500 has isolated Node 3 due to loss of signal detect. A cable break at point 4 in Figure 2-13 has caused the LX2500 to switch Node 3's Port A out of the loop. As Node 3's Port A is isolated, the LX2500 switches to the backup loop connecting Node 2's Port B to Node 3's Port B (points 3 and 5 in Figure 2-14). This functionality assures that a single port failure will not result in an entire arbitrated loop failure.

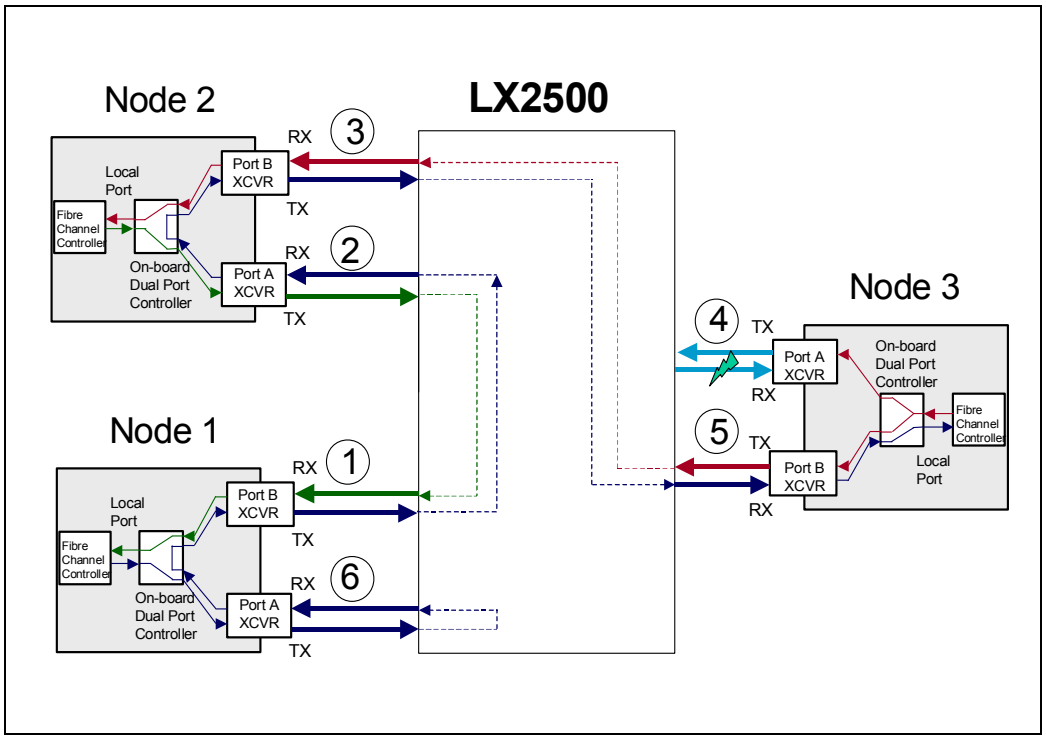


Figure 2-14 Arbitrated Loop with Hub, with Cable Break on Node 3

2.11 Accessories

Systran offers the following accessories for the FX200 cards:

- Software Drivers.
- LinkXchange LX2500 Crossbar Switch (LX2500).
- Fiber Optic and Copper Cables.

2.11.1 Software Drivers

Systran's FX200 software drivers provide a common application-programming interface (API) across different host computers and operating systems. The following operating systems are supported:

- Windows 2000
- VxWorks
- Solaris
- Linux

Contact Systran for versions and platforms that are currently available.

2.11.2 LinkXchange LX2500 Crossbar Switch (LX2500)

Systran's LX2500 Crossbar Switch provides the following features:

- Up to 32 non-blocking media-specific I/O ports.
- Up to 2.5 Gbps/port baud rate (port card dependent).
- Support for multiple point-to-point, loop, and broadcast communication links simultaneously.
- Automatic I/O Port fault isolation.
- Multiple media options.
- Out-of-band control through an RS-232 port.
- Can be connected to a modem and controlled from a remote location.

For more detailed information regarding LX2500 features and operation, contact Systran and request a copy of the *LinkXchange LX2500 Crossbar Switch Hardware Reference Manual* or visit our web site.

2.11.3 Cables

Several cabling accessories are available to support the desired FX200 fiber-optic physical media interface options.

- Short Wavelength: Multimode Optical Fiber.
- Long Wavelength: Singlemode Optical Fiber.
- HSSDC Copper

Descriptions and order numbers for various cable lengths and types are shown in Section B.2 of Appendix B.

2.12 Functional Blocks

The FX200 card performs four main functions:

- Interfaces with the PCI Local Bus.
- Performs FC-0 Fibre Channel physical media interface (optical only).
- Performs FC-1 and FC-2 transmission and framing and signaling protocol (except basic and extended link services).
- Implements FC-4, SCSI Upper Layer Protocol (FCP-SCSI) and Internet Protocol (IP).

All functions, with the exception of the FC-0 interface, are performed by the JNIC-1X60 ASIC. This ASIC is the heart of the FX200 and requires very little support circuitry. The Fibre Channel physical media interface, the Serializer/Deserializer (SERDES), the SRAM, and the Serial EEPROM (SEEPROM) are the only external components needed to support the JNIC-1X60. Each individual functional block is now described. The block diagram is shown in Figure 2-15.

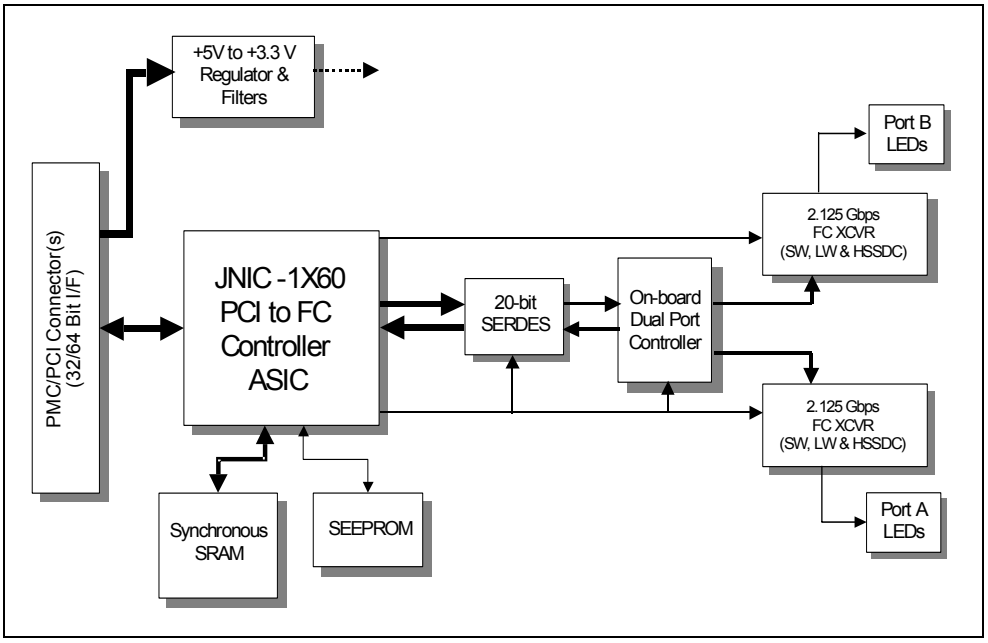


Figure 2-15 FX200 Block Diagram

2.12.1 PCI, PMC, DP PMC, and DP CPCI Connectors

These connectors simply provide the electrical and mechanical interface to the 64-bit PCI bus for the FX200 PCI, PMC, DP PMC, and DP CPCI cards. These can be installed in a 32-bit PMC or CPCI system, also.

2.12.2 +5 V to +3.3 V Regulator

This regulator, and its associated filter network, provides a clean +3.3 V to the JNIC-1X60. An on-card regulator was chosen in lieu of the +3.3 V provided by the PCI bus to control the noise content and quality of this voltage.

2.12.3 JNIC-1X60 ASIC

This ASIC performs virtually all of the FC functions of the FX200 card. The JNIC-1X60 relieves the host from the burden of dealing with the FC interface by implementing the SCSI FCP and IP protocol in hardware and firmware. This allows for a simple, message style host communication interface. The JNIC-1X60 includes a PCI interface, RISC I/O Engine, separate FC receive and send buffers, and FC Send, Receive, and Arbitrated Loop control. The JNIC-1X60 also provides interfaces to external devices such as the Synchronous SRAM, SEEPROM, and the SERDES.

2.12.4 Synchronous SRAM

The Synchronous SRAM provides storage for the current FCP and/or IP I/O commands that are being executed by the JNIC-1X60. This memory is not accessible to the user.

2.12.5 Serial EEPROM (SEEPROM)

The SEEPROM stores information related to the configuration and initialization of the JNIC-1X60. Information such as the World Wide Name is stored here. The SEEPROM is under the control of the device driver and not accessible to the user.

2.12.6 Serializer/Deserializer (SERDES)

The SERDES is a Vitesse VSC7146 part. It is responsible for converting parallel 20-bit 8B/10B encoded FC data words from the JNIC-1X60 into serial format for transmission onto the FC physical media. Conversely, serial FC data is received from the physical media, converted to 20-bit parallel format, and sent to the JNIC-1X60.

2.12.7 Dual Port Controller (DPC)

The DPC is a Vitesse VSC7147 part. This part provides the dual-port interface between the SERDES and the FC physical media on the FX200 DP PMC and DP CPCI cards. This part is responsible recovering the incoming signal, remove any jitter, and retransmit signal to the SERDES or to the second transceiver on the card. The DPC is configured in "Auto Mode" by default, so the DPC will automatically include freshly activated nodes or can bypass node that have lost signal detect. In addition, the DPC can be configured in manual mode where the user can manually include or bypass nodes as necessary. Refer to the appropriate software driver manual for information regarding manual control of the dual-port interface.

2.12.8 Fibre Channel Physical Media Interface

The FC Physical Media interface includes an SFF optical transceiver (shortwave or longwave) with LC type connectors or a copper transceiver (HSSDC). The customer chooses the desired wavelength at the time of ordering. Contact Systran regarding the availability of media options.

2.12.9 Status LEDS

"LINK UP" LED

A front panel LED signals activity on the Fibre Channel physical media. In addition, this LED indicates that good signals are being received be the JNIC-1X60 ASIC. The LED is deasserted upon Loss of Sync, Loop Failure, or Loss of Signal.

- The Link Up LED is labeled "LINK UP" on the front panels of the FX200 PMC and DP CPCI cards.
- The Link Up LED is labeled "LU" on the front panel of the FX200 DP PMC cards.

"AUTO MODE" LED

A front panel LED indicates when the FX200 card is configured to automatically detect or bypass any node connected to one of the dual ports of the FX200 DP PMC or DP CPCI cards. If the DPC is configured in manual mode, this LED will not be illuminated. This LED is only available on the FX200 DP PMC or DP CPCI cards.

- The Auto Mode LED is labeled "AUTO MODE" on the front panels of the FX200 DP CPCI cards.
- The Auto Mode LED is labeled "AM" on the front panels of the FX200 DP PMC cards.

"SIGNAL DETECT" LEDS

The Signal Detect (SD) LED indicates activity on the FC physical media. A single SD LED is present on the FX200 PCI and two SD LEDs on the FX200 DP CPCI (Port A or Port B). These LEDs do not indicate valid data; they only signal that the up-stream transmitter is on. These LEDs are only available on the FX200 PCI and FX200 DP CPCI cards.

- The Signal Detect LEDs are labeled “SD” on the front panels of the FX200 PCI and FX200 DP CPCI cards.

“RATE” LEDS

Two front-panel LEDs indicate if Port A or B are receiving data at 1.0625 or 2.125 Gbps rates. These LEDs are only available on the FX200 PCI, FX200 DP PMC or FX200 DP CPCI cards.

- The rate LED is labeled “2G” on the front panels of the FX200 PCI cards.
- The rate LEDs are labeled “RATE” on the front panels of the FX200 DP CPCI cards.
- The rate LED is labeled “AR” for Port A on the front panels of the FX200 DP PMC cards.
- The rate LED is labeled “BR” for Port B on the front panels of the FX200 DP PMC cards.

“SEL A” AND “SEL B” LEDS

Two front-panel LEDs indicate if Port A or B are enabled. If the DPC is configured in auto mode Ports A or B will be enabled upon receiving valid signals from the physical media. Otherwise, these LEDs will be illuminated following commands from host. These LEDs are only available on the FX200 DP CPCI cards

- The Port A and B LEDs are labeled “SEL” on the front panels of the FX200 DP CPCI cards.
- Port A’s select LED is labeled “AS” for Port A on the front panels of the FX200 DP PMC cards.
- Port B’s select LED is labeled “BS” for Port B on the front panels of the FX200 DP PMC cards.

“GOOD” LEDS

Two front-panel LEDs indicate if Port A or B have signal detects and the DPC has verified that the signals being received on Port A or B are valid FC data. These LEDs are only available on the FX200 DP CPCI cards. This LED is labeled “GOOD” on the front panels of the FX200 DP CPCI cards.

“ACTIVITY” LED

A front-panel LED indicates Data Transmit activity. This LED is only available on the FX200 PCI and is labeled “Act.”

3. INSTALLATION

3.1 Installation Procedures

The FX200 cards require only one slot on the host computer backplane, and a fiber-optic or HSSDC cable connection.

3.2 Unpack the Card



CAUTION: Exercise care regarding the static environment. Use an anti-static mat connected to a wristband when handling or installing the FX200 card. Failure to do this may cause permanent damage to the components on the card.

Follow the steps below to unpack the card:

1. Put on the wristband attached to an anti-static mat.
2. Remove the card and anti-static bag from the carton.
3. Place the bag on the anti-static mat.
4. Open the anti-static bag and remove the card.
5. In the unlikely event that you should need to return your FX200 card, please keep the original shipping materials for this purpose.

Any optional equipment is shipped in separate cartons.

3.3 Inspect the Card

The FX200 consists of a single card with a physical media interface. If the card was damaged in shipping, immediately notify Systran Corporation or your supplier.

3.4 Configure the Card

There are no user-configurable options on the FX200 card.

3.5 Install the Card

WARNING: Turn off all power to your system before attempting to install the FX200 PCI, PMC and DP PMC cards.

3.5.1 FX200 PCI Card

To install the FX200 PCI card, push the card into the motherboard as shown in Figure 3-1, steps 1 and 2, until it is firmly seated. Install the mounting screw as shown in step 3.

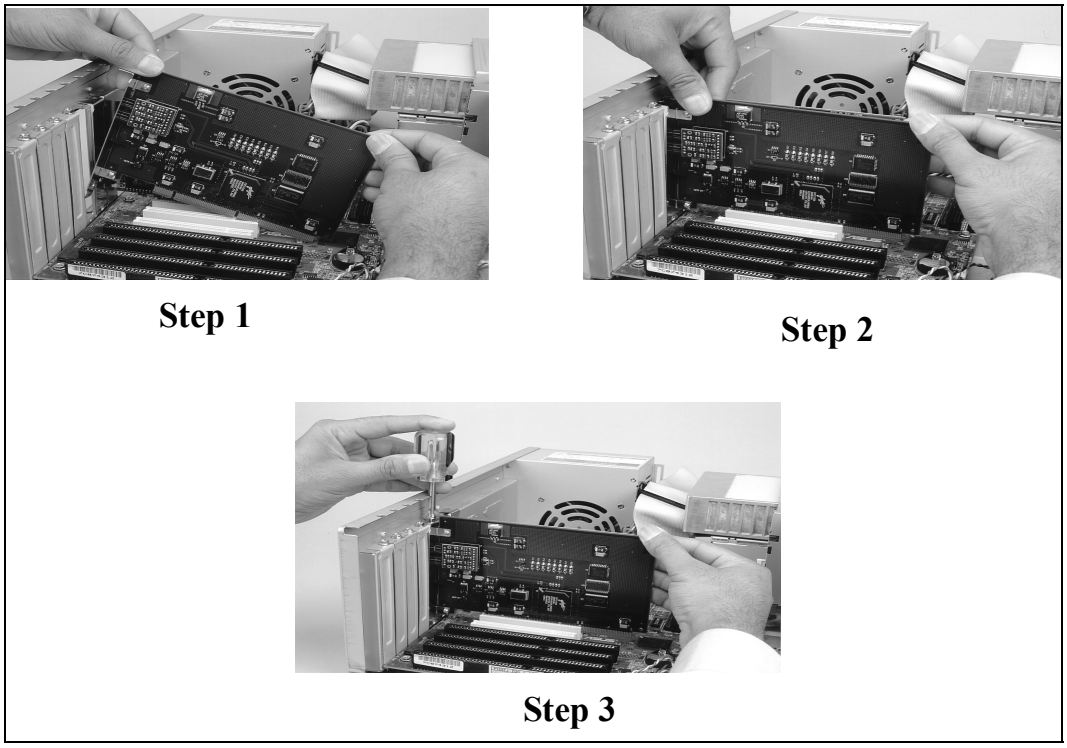


Figure 3-1 FX200 PCI Card Installation

3.5.2 FX200 PMC or DP PMC Card

To install the FX200 PMC card, insert the card into an available slot by inserting the faceplate into the cutout on the carrier until it butts up against the mating connector as shown in Figure 3-2 in steps 1 and 2. Then firmly push the connectors together. Install the four mounting screws through the PCB of the host SBC to fasten it in place, as shown in step 3.

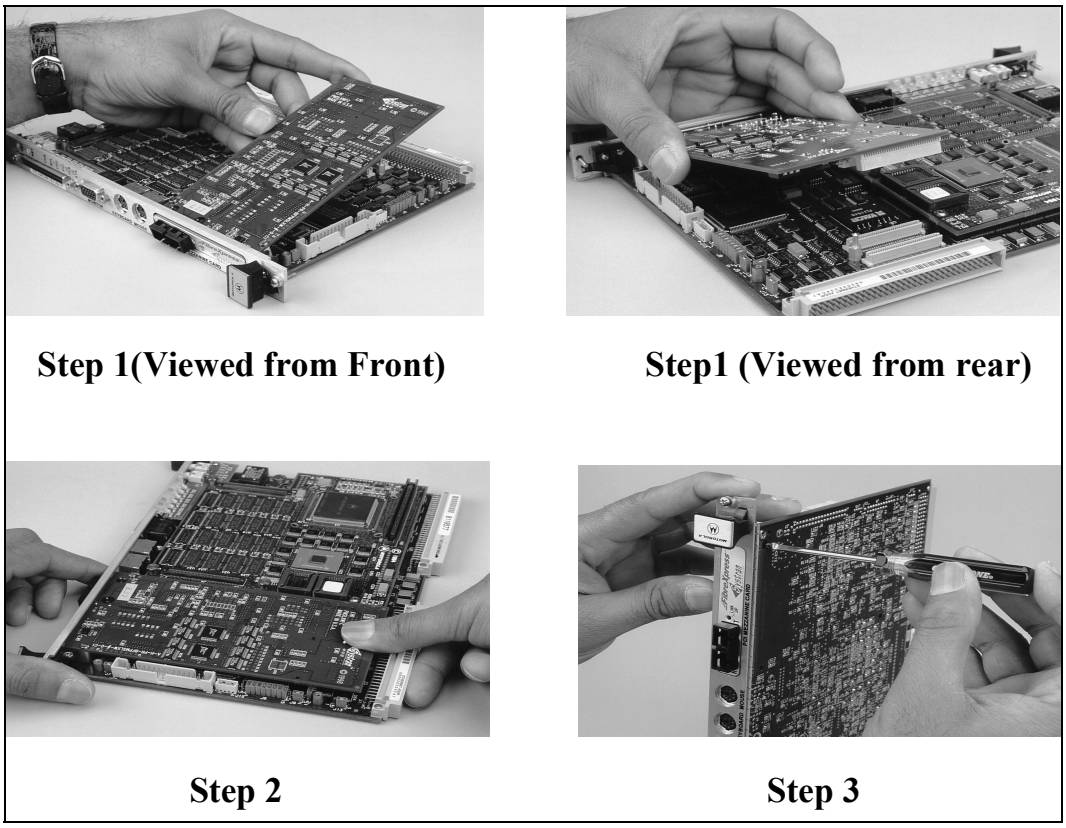


Figure 3-2 FX200 PMC Card Installation

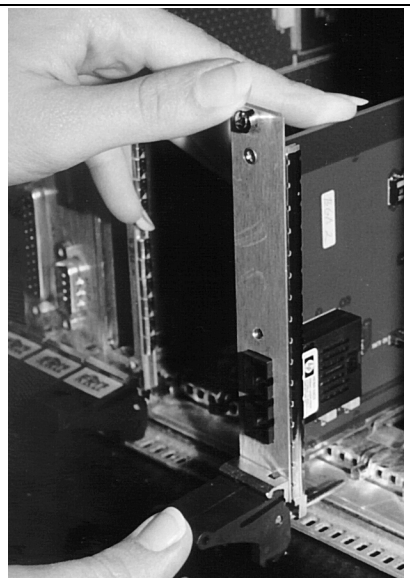
3.5.3 FX200 DP CPCI Card

The DP CPCI cards are shipped with both 3U and 6U faceplates. The 3U faceplate is installed by default. To replace the 3U faceplate with the 6U faceplate:

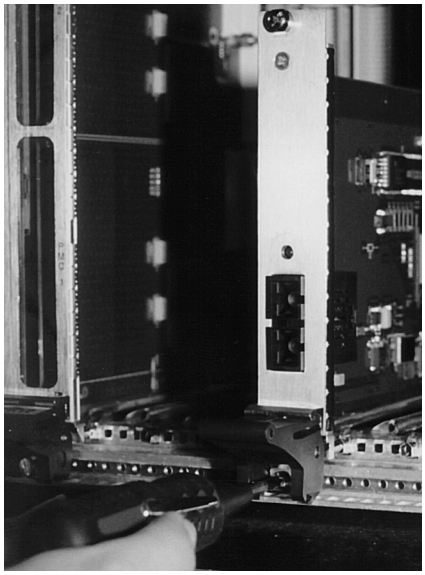
1. Using a standard Phillips-head screwdriver, remove the two holding screws, located just behind the faceplate.
2. Remove the 3U faceplate.
3. Position the 6U faceplate on the card and reinsert the holding screws.

CAUTION: If the host chassis and system board support Hot Swap Specification PICMG 2.1 Revision 1.0, the CPCI card may insert into a powered system. Otherwise, the host chassis's power should be OFF to ensure that no damage is done.

To install the FX200 DP CPCI card, push the card into the mother board, as shown in Figure 3-3, until it is firmly seated (step 1), then install the mounting screw (step 2).



Step 1



Step 2

Figure 3-3 FX200 DP CPCI Card Installation

3.6 Connect the Cables

3.6.1 Fiber-Optic Cable

The typical FX200 network communication architecture consists of FX200 cards connected by fiber-optic cable. The recommended distance between each node of the network depends on the type of cable used. Refer to Section A.2 in Appendix A for more information.

Fiber-optic cable Precautions

CAUTION: Fiber-optic cables are made of glass and may break if crushed or bent in a loop with less than a 2-inch radius.

Look at the cable ends closely before inserting them into the physical media connector. If debris is inserted into the transmitter/receiver connector, it may not be possible to clean the connector out and could result in damage to the transmitter or receiver lens. Hair, dirt, and dust can interfere with the light signal transmission.

Use an alcohol-base wipe to clean the cable ends.

The optional fiber-optic cables may be shipped in a separate carton. Remove the protective caps on the fiber-optic transmitters and receivers as well as the ones on the fiber-optic cables. These protective caps should be replaced when cables are not in use or in the event the node must be returned to the factory. Attach the fiber-optic cables to the connectors on the FX200 card. Figure 3-4 and Figure 3-5 depict the types of fiber-optic connectors needed for the FX200 card.

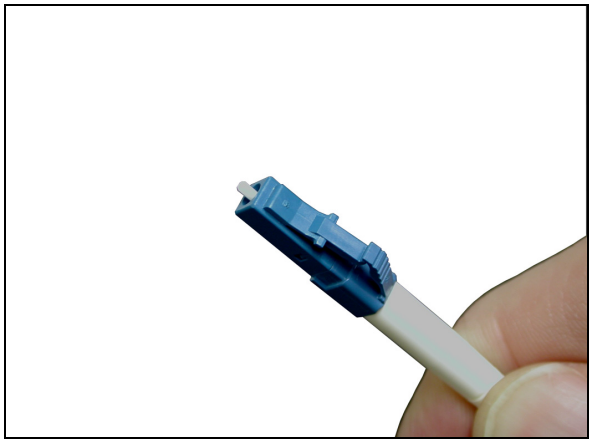


Figure 3-4 Fiber-optic Simplex LC Connector

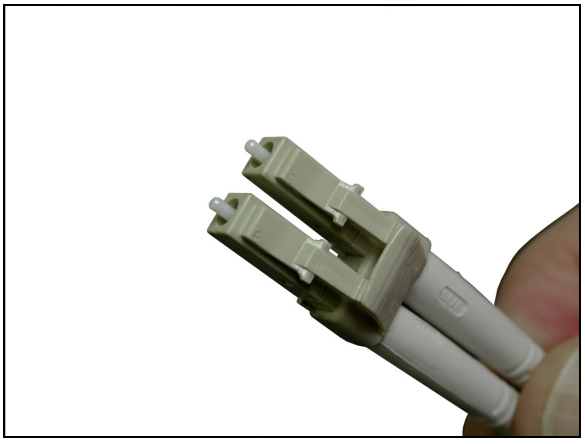


Figure 3-5 Fiber-optic Duplex LC Connector

Fiber-optic cables can be purchased from Systran Corporation. The recommended fiber-optic cable is 50/125 µm for multimode cable and 9/125 µm for singlemode cable. See Appendix B for fiber-optic cable order numbers.

3.6.2 Copper Media Configuration

Copper media interfaces on the FX200 cards use HSSDC connectors ("Style-2") with Shielded Quad cable, terminated with connectors as shown in Figure 3-6. The HSSDC receptacle, used on the FX200 cards, is displayed in Figure 3-7. This figure also indicates the contact pin locations and Table 3-1 contains the pin assignments.

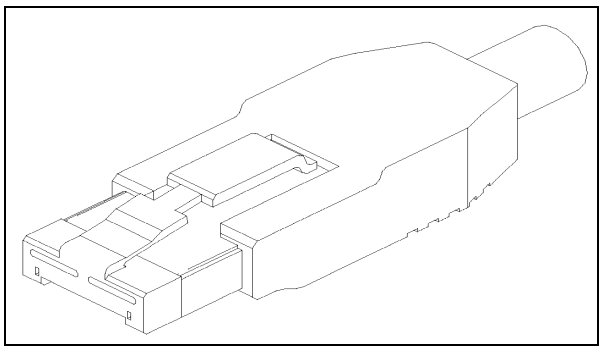


Figure 3-6 HSSDC Copper Connector

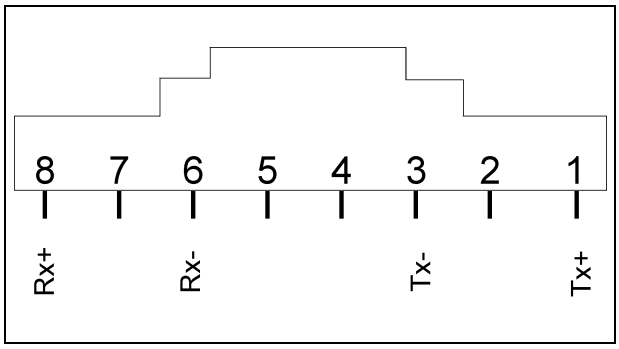


Figure 3-7 HSSDC Connector Pin Assignment

Table 3-1 HSSDC Receptacle Pin Assignments

Pin Number	Pin Description
1	Transmit +
2	No Connect (NC)
3	Transmit -
4	NC
5	NC
6	Receive -
7	NC
8	Receive +

To insure data integrity, care must be taken when selecting the appropriate HSSDC cable assembly for the FX200 application. Length boundaries for HSSDC cable assemblies are determined by the data rate of the application and if equalization circuits are present. Application operating at 2.125 Gbps must use equalized HSSDC cables, if cable lengths are greater than 2 meters. However, applications operating at 1.0625 Gbps must use equalized HSSDC cables when cable lengths exceed 20 meters.

Contact Systran for more information concerning which FX200 cards currently support HSSDC copper media. HSSDC cables are available for purchase. See Appendix B for available HSSDC cable order numbers.

3.6.3 Topologies

Refer to Section 2.8 for information on topologies; Point-to-Point (two-node arbitrated loop), Switched Fabric, and Arbitrated Loop.

3.7 Memory Map

The PCI BIOS maps the FX200 into PCI memory and I/O space on power-up. If using the FX200 card in a system that does not provide this address assignment mechanism, the Systran FX200 driver software assigns the addresses. Alternatively, any custom software written for the card must provide this address assignment.

3.8 Activate the Card

Power up the system after the hardware is installed and cables are connected. If you purchased Systran's FX200 driver software with your Systran card, install the driver according to the instructions provided with the software. Systran's driver software comes with some simple applications that allow you to test the card and verify it is working correctly. The API Guide provides instructions on how to use the sample applications. Source code is also provided with the sample applications to show you how to write your own applications using Systran's API calls to the driver.



NOTE: If you are not using Systran's FX200 driver software, proprietary information on how to interface with the JNIC-1X60 ASIC is covered by Non-Disclosure Agreements between Systran and JNI. Contact Customer Support at Systran for more information.

3.9 Troubleshooting

If the system does not boot correctly, power-down the system, reseat the card and double-check cable connections. If problems persist, call Systran's Customer Support at **(800) 252-5601** for assistance.

Please be prepared to supply the following information:

Host Machine: _____
OS Name: _____
OS Version: _____
Bus Interface: _____
FX200 Card S/N: _____
Error Messages: _____
The last action you performed: _____

3.10 Maintenance

No routine maintenance is required for the FX200 nodes beyond that which is required for the host computer system.

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4. OPERATION

4.1 Overview

Due to the complex nature of the on-board dual-port interface used on the FX200 DP PMC and CPCI cards, this chapter provides some insight on how to interact with the DP interface.

4.2 Theory of operation

The function of FX200 cards is to take data from the host bus interface and transmit it across a link, or take data from the link and pass it to the host bus interface. The functions of the FX200 cards are performed in the topologies specified by the Fibre Channel standard. Refer to Section 2.8 for information on topologies; Point-to-Point (two-node Arbitrated Loop), Switched Fabric, and Arbitrated Loop.

4.2.1 FX200 Dual Port Operation

The FX200 DP PMC and CPCI boards perform many operations once FC data is present at one or both of the dual port receivers. Upon entering the receive path of either Port A or B, the incoming data passes through a Clock and Data Recovery Unit (CDR). The CDR retransmits and removes jitter from the recovered data, thus insuring the signal received is in good condition. The CDR unit is paired with a Signal Detect Unit (SDU). The SDU monitors the output of the CDR for valid Fibre Channel data. If the CDR detects valid FC data is present at the receiver of either Port A or B, a signal is communicated to the on-board Dual Port Controller (DPC). Based on the information generated by the SDU, the DPC will include or bypass the incoming signal(s) to ports A and B automatically.

Figure 4-1 through Figure 4-4 provide a clear and concise presentation on the functionality of the dual-port interface used on the FX200 DP cards. These figures display how the cards are configured as an Arbitrated Loop, both on-board as well as all external cable connections. In addition, the locations of Port A and B have been noted on all nodes, as well as the internal routing to the FC ASIC.

Figure 4-1 displays how the FX200 DP cards respond when Node 1 begins to generate FC data. Data begins flowing from Node 1's FC ASIC through Port A and Port B. Once the FC data passes out of Node 1, the transceivers on Port A (Node 0) and Port B (Node 2) begin generating signal detects. However, the FX200 continues to bypass these ports until the SDU and CDR units have indicated signal detect(s) and valid FC data to the DPC. Following the notification of the status signals from the SDU and CDR units, the DPC includes Port A (Node 0) and Port B (Node 2) on the Arbitrated Loop. The same is true for Port B (Node 1); Port B is bypassed until a valid FC input signal is present at the SDU and CDR units.

At this stage, the status LEDs on the front panel indicate the following:

NODE 0

- Auto Mode LED
- Link Up LED

- Signal Detect on Port A LED (FX200 DP CPCI only)

NODE 1

- Auto Mode LED

NODE 2

- Auto Mode LED
- Link Up LED
- Signal Detect on Port B LED (FX200 DP CPCI only)

Refer to Section 2.10.9 for more information concerning status LEDs.

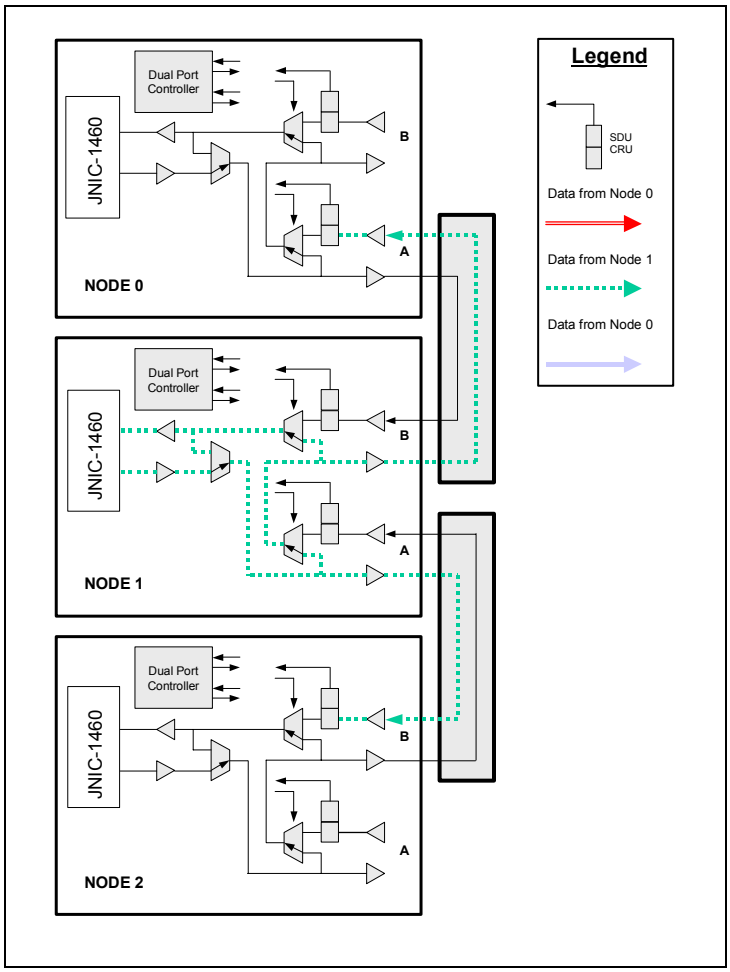


Figure 4-1 Node 1 Generates FC Data

Figure 4-2 displays how the FX200 DP cards respond when Node 2 begins to generate FC data. In addition, at this stage the DPCs have included Port A (Node 0) and Port B (Node 2) on the Arbitrated Loop, which is documented in Figure 4-2. Data begins flowing from Node 2's FC ASIC to Ports A and B. Since no cable is present at Port A, the FC data is routed to the transmitter at Port B. Once the FC data passes out of Node 2, the transceiver on Port A (Node 1) begins generating signal detect. However, the FX200 continues to bypass this port until the SDU and CDR units indicate signal detect and valid FC data to the DPC. Following the notification of the status signals from the SDU and CDR units, the DPC includes Port A (Node 1) on the Arbitrated Loop.

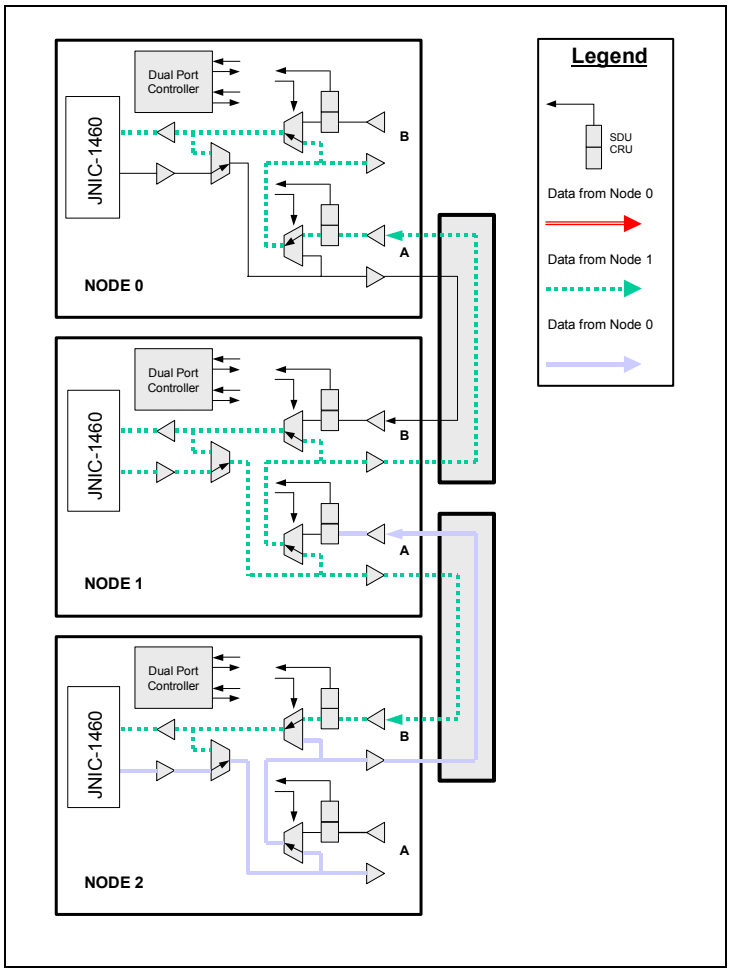


Figure 4-2 Node 2 Generates FC Data

At this stage, the status LEDs on the front panel indicate the following:

NODE 0

- Auto Mode LED
- Link Up LED
- Signal Detect on Port A LED (FX200 DP CPCI only)
- SEL A LED
- Good LED on Port A (FX200 DP CPCI only)

NODE 1

- Auto Mode LED
- Signal Detect on Port A LED (FX200 DP CPCI only)
- Link Up LED

NODE 2

- Auto Mode LED
- Link Up LED
- Signal Detect on Port B LED (FX200 DP CPCI only)
- SEL B LED
- Good LED on Port B (FX200 DP CPCI only)

Refer to Section 2.10.9 for more information concerning status LEDs.

Figure 4-3 displays how the FX200 DP cards respond when Node 0 begins to generate FC data. In addition, at this stage the DPC has included Port A (Node 1) and Port A (Node 0) on the Arbitrated Loop and has been documented in Figure 4-3. Data begins flowing from Node 0's FC ASIC to Port A. Since no cable is present at Port B, the FC data bypasses the transmitter at Port B. Once the FC data passes out of Node 0, the transceiver on Port B (Node 1) begins generating signal detect. However, the FX200 continues to bypass this port until the SDU and CDR units have indicated signal detect, and valid FC data to the DPC. Following the notification of the status signals from the SDU and CDR units, the DPC includes Port B (Node1) on the Arbitrated Loop.

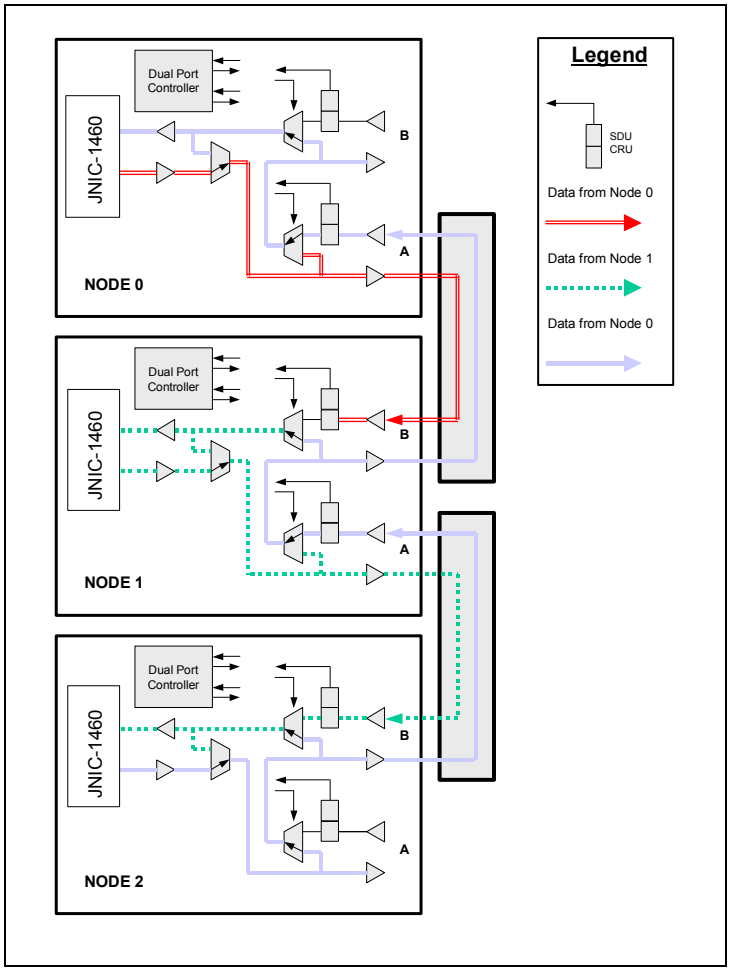


Figure 4-3 Node 0 Generates FC Data

At this stage, the status LEDs on the front panel will be lit as follows:

NODE 0

- Auto Mode LED
- Link Up LED
- Signal Detect on Port A LED (FX200 DP CPCI only)
- SEL A LED
- Good LED on Port A (FX200 DP CPCI only)

NODE 1

- Auto Mode LED
- Signal Detect on Port A LED (FX200 DP CPCI only)
- Link Up LED
- SEL A LED
- Good LED on Port A (FX200 DP CPCI only)
- Signal Detect on Port B LED (FX200 DP CPCI only)

NODE 2

- Auto Mode LED
- Link Up LED
- Signal Detect on Port B LED (FX200 DP CPCI only)
- SEL B LED
- Good LED on Port B (FX200 DP CPCI only)

Refer to Section 2.10.9 for more information concerning status LEDs.

Figure 4-4 displays the completed configuration for an Arbitrated Loop using the FX200 DP cards. As the figure shows, the DPC has included Port B (Node 1) thus completing the final connection of the Arbitrated Loop.

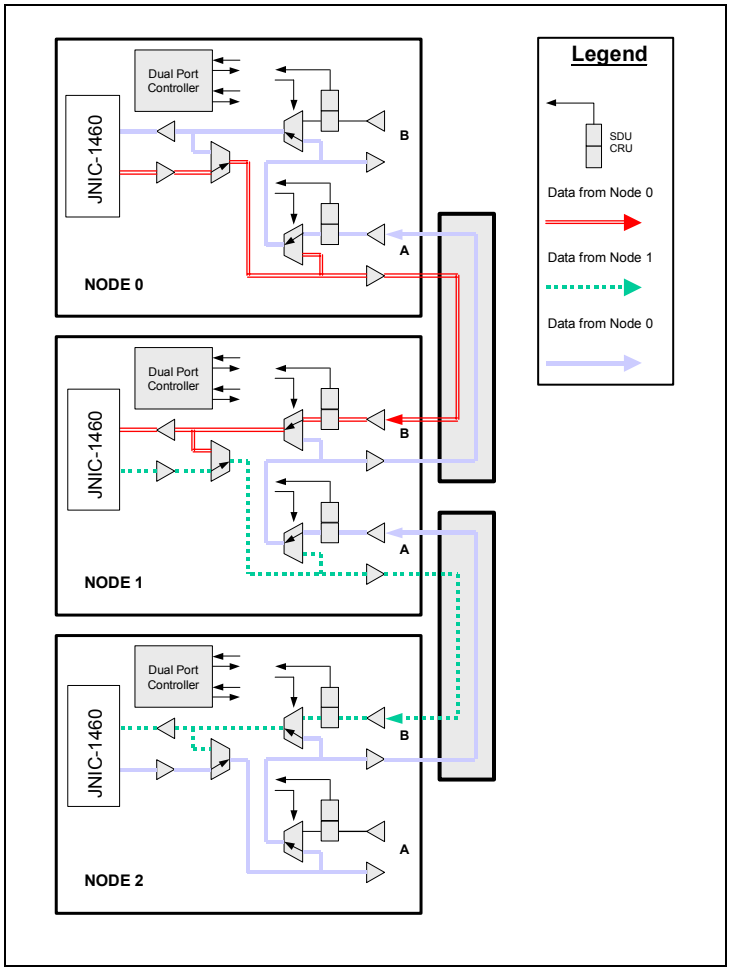


Figure 4-4 Completed Arbitrated Loop Configuration

At this stage, the status LEDs on the front panel indicate the following:

NODE 0

- Auto Mode LED
- Link Up LED
- Signal Detect on Port A LED (FX200 DP CPCI only)
- SEL A LED
- Good LED on Port A (FX200 DP CPCI only)

NODE 1

- Auto Mode LED
- Signal Detect on Port A LED (FX200 DP CPCI only)
- Link Up LED
- SEL A LED
- Good LED on Port A (FX200 DP CPCI only)
- Signal Detect on Port B LED (FX200 DP CPCI only)
- Sel B LED
- Good LED on Port B (FX200 DP CPCI only)

NODE 2

- Auto Mode LED
- Link Up LED
- Signal Detect on Port B LED (FX200 DP CPCI only)
- SEL B LED
- Good LED on Port B (FX200 DP CPCI only)

Refer to Section 2.10.9 for more information concerning status LEDs.

APPENDIX A

SPECIFICATIONS

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A.1 Hardware Specifications

A.1.1 FX200 PCI Card

Hardware Compatibility: ..... PCI Local Bus Revision 2.2
Physical Dimensions: ..... 6.6 in by 2.536 in (167.64 mm by 64.41 mm)
Weight:..... approximately TBD pounds (TBD grams)
Electrical Requirements:..... +TBD VDC, TBD Amps, TBD Watts
Temperature Range:
Operating ..... +0° to +50° C, with 200 LFPM air (minimum)*
Storage ..... -40° to +85° C
Network Line Transmission Rate:..... 1.0625 or 2.125 Gbps
Fibre Channel ASIC: JNIC-1560

Mean Time Between Failure (MTBF) **	**MIL-HDBK-217F**	**BELLCORE 332**
Short Wavelength Laser	TBD	TBD

A.1.2 FX200 PMC Card

Hardware Compatibility: ..... PCI Local Bus Revision 2.2
PMC IEEE P1386.1
CMC IEEE P1386
Physical Dimensions: ..... 2.915 in by 5.866 in (74 mm by 149 mm)
Weight:..... Approximately 0.25 pounds (115 grams)
Electrical Requirements:..... +5 VDC, 1 Amps, 5 Watts
Temperature Range:
Operating ..... +0° to +50° C, with 200 LFPM air (minimum)*
Storage ..... -40° to +85° C
Network Line Transmission Rate:..... 1.0625 or 2.125 Gbps
Fibre Channel ASIC: JNIC-1460

Mean Time Between Failure (MTBF) **	**MIL-HDBK-217F**	**BELLCORE 332**
Short Wavelength Laser	425,095	114,403
Long Wavelength Laser	424,373	114,350
HSSDC Copper	407,262	113,041

A.1.3 FX200 PMC Dual Port Card

Hardware Compatibility: ..... PCI Local Bus Revision 2.2
PMC IEEE P1386.1
CMC IEEE P1386

Physical Dimensions: ..... 2.915 in by 5.866 in (74 mm by 149 mm)

Weight:..... approximately 0.27 pounds (123 grams)

Electrical Requirements:..... +5 VDC, 1.6 Amps, 8 Watts

Temperature Range:

Operating ..... +0° to +50° C, with 200 LFPM air (minimum)*

Storage ..... -40° to +85° C

Network Line Transmission Rate:..... 1.0625 or 2.125 Gbps

Fibre Channel ASIC: JNIC-1460

Mean Time Between Failure (MTBF) **	MIL-HDBK-217F	BELLCORE 332
Short Wavelength Laser	248,776	93,534
Long Wavelength Laser	248,282	93,464
HSSDC Copper	236,648	60,225

A.1.4 FX200 Dual-Port CPCI Card

Hardware Compatibility: ..... CompactPCI Specification, Revision 3.0
CompactPCI Power Interface Specification, Revision 1.0
Keying of CompactPCI Boards and Backplanes, Revision 1.0
CompactPCI Hot Swap Specification, Revision 1.0

Physical Dimensions:

3U ..... 3.98 in by 7.063 in (100 mm by 179.3 mm)

Weight:..... approximately 0.40 pounds (181 grams)

Electrical Requirements:..... +5 VDC, 1.6 Amps, 8 Watts
+12 VDC, 0.0035 Amps, 0.042 Watts

Temperature Range:

Operating ..... +0° to +50° C, with 200 LFPM air (minimum)*

Storage ..... -40° to +85° C

Network Line Transmission Rate:..... 1.0625 or 2.125 Gbps

Fibre Channel ASIC: JNIC-1460

Mean Time Between Failure (MTBF) **	MIL-HDBK-217F	BELLCORE 332
Short Wavelength Laser	108,728	75,181
Long Wavelength Laser	107,732	75,136

* The Operating Temperature Range is limited by the Vitesse VSC7146. The case temperature of the VSC7146 must not exceed +90°C. Operating the FX200 card above the stated Operational Temperature Range may affect device reliability.

** The MTBF numbers are based on calculations using MIL-HDBK-217F, Appendix A; and Bellcore 332, Issue 6, for a ground-benign environment.

A.2 Ruggedized PMC Environmental Specifications

The FX200 products are offered at three different ruggedization levels. These levels are Standard, Rugged Level 1, and Rugged Level 2. Standard level operation specifications are defined in Sections A.1 of Appendix A. The specifications for Rugged Level 1 and Rugged Level 2 are defined in the following sections.

Current FX200, standard and ruggedized, products are listed in Appendix B.

A.2.1 Rugged Level 1

Temperature Range:	
Operating	-10° to +70° C
Storage	-40° to +85°C
Humidity Range:	
Operating	5% to 95% (noncondensing)
Storage	0% to 95% (noncondensing)
Altitude:	
Operating	25,000 ft steady; rapid decompression to 40,000 ft
Storage	25,000 ft
Vibration:	
Sine	10 g peak 10 Hz to 2 kHz
Random	.04 g^2/Hz 10 Hz to 2 kHz -6 dB/octave 1 kHz to 2 kHz
Shock	20 g peak ½ sine wave 11 ms duration
Conformal Coating	Acrylic HumiSeal 1B31*

* Ruggedized cards are coated with HumiSeal 1B31 acrylic conformal coating. This coating is qualified to MIL-I-46058C, Type AR. More detailed information on the coating can be found at the HumiSeal website http://www.humiseal.com/.

A.2.2 Rugged Level 2

Temperature Range:

Operating	-40° to +85° C
Storage	-40° to +85°C

Humidity Range:

Operating	5% to 95% (noncondensing)
Storage	0% to 95% (noncondensing)

Altitude:

Operating	25,000 ft steady; rapid decompression to 40,000 ft
Storage	25,000 ft

Vibration:

Sine	10 g peak 10 Hz to 2 kHz
Random	.1 g^2/Hz 10 Hz to 2 kHz -6 dB/octave 1 kHz to 2 kHz
Shock	30 g peak ½ sine wave 11 ms duration
Conformal Coating	Acrylic HumiSeal 1B31*

* Ruggedized cards are coated with HumiSeal 1B31 acrylic conformal coating. This coating is qualified to MIL-I-46058C, Type AR. More detailed information on the coating can be found at the HumiSeal website http://www.humiseal.com/.

A.3 Media Interface Specifications

A.3.1 Short Wavelength Laser Media Interface

Maximum Data Rate: ..... 2.125 Gbps

Compatibility: ..... 200-M5-SN-I (50 µm multimode fiber, no Open Fibre Control)

200-M6-SN-I (62.5 µm multimode fiber, no Open Fibre Control)

Connector:..... Duplex LC

Cable:..... 50/125 µm or 62.5/125 µm multimode fiber optic

Maximum Cable Length:

50 µm:..... 300 meters

62.5 µm:..... 150 meters

Transmit Power: ..... -10 to -5 dBm

Transmit Wavelength:..... 830 to 860 nm

Receive Wavelength: ..... 770 to 860 nm

Receive Power: ..... -16 to 0 dBm

A.3.2 Long Wavelength Laser Media Interface

Maximum Data Rate: ..... 2.125 Gbps

Compatibility: ..... 200-SM-LL-I (singlemode intermediate distance)

Connector:..... Duplex LC

Cable:..... 9/125 µm singlemode fiber optic

Maximum Cable Length:..... 10 kilometers*

Transmit Power: ..... -9.5 to –3 dBm

Transmit Wavelength:..... 1270 to 1355 nm

Receive Wavelength: ..... 1270 to 1355 nm

Receive Power: ..... -19 to –3 dBm

* Earlier versions of the Single-Channel and Dual-Port card with Transceiver part number FTRJ-1320-1 have a maximum cable length of 2 kilometers.

A.3.3 HSSDC Copper Media Interface: 1.0625 Gbps

Maximum Data Rate: ..... 1.0625 Gbps

Connector:..... HSSDC (“Style-2”)

Cable:..... 150-Ohm Shielded Quad copper

Maximum Cable Length:..... 30 meters

A.3.4 HSSDC Copper Media Interface: 2.125 Gbps

Maximum Data Rate: ..... 2.125 Gbps

Connector:..... HSSDC (“Style-2”)

Cable:..... 150-Ohm Shielded Quad copper

Maximum Cable Length:..... 15 meters

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APPENDIX B

ORDERING INFORMATION

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B.1 Cards

Systran offers the following FX200 cards:

B.1.1 PCI Cards

The following table lists the order numbers for the FX200 PCI card configurations currently available.

Order Number	Description
FHJ1-PC5MW000-00	PCI with short wavelength laser media interface

B.1.2 PMC Cards

The following table lists the order numbers for the FX200 PMC card configurations currently available.

Order Number	Description
FHJ1-PM5MW000-00	PMC with short wavelength laser media interface
FHJ1-PM5SW000-00	PMC with long wavelength laser media interface
FHJ1-PM5HS000-00	PMC with HSSDC Copper media interface
FHJ1-PM5MW000-R1	Ruggedized PMC with short wavelength laser media interface
FHJ1-PM5SW000-R1	Ruggedized PMC with long wavelength laser media interface
FHJ1-PM5HS000-R1	Ruggedized PMC with HSSDC Copper media interface
FHJ1-PM5MW000-R2	Ruggedized PMC with short wavelength laser media interface
FHJ1-PM5SW000-R2	Ruggedized PMC with long wavelength laser media interface
FHJ1-PM5HS000-R2	Ruggedized PMC with HSSDC Copper media interface

B.1.3 Dual-Port PMC Cards

The following table lists the order numbers for the FX200 Dual-Port PMC card configurations currently available.

Order Number	Description
FHJ2-PM5MW000-00	Dual-Port PMC with short wavelength Laser media interface
FHJ2-PM5SW000-00	Dual-Port PMC with long wavelength Laser media interface
FHJ2-PM5HS000-00	Dual-Port PMC with HSSDC Copper media interface
FHJ2-PM5MW000-R1	Ruggedized Dual-Port PMC with short wavelength Laser media interface
FHJ2-PM5SW000-R1	Ruggedized Dual-Port PMC with long wavelength Laser media interface
FHJ2-PM5HS000-R1	Ruggedized Dual-Port PMC with HSSDC Copper media interface
FHJ2-PM5MW000-R2	Ruggedized Dual-Port PMC with short wavelength Laser media interface
FHJ2-PM5SW000-R2	Ruggedized Dual-Port PMC with long wavelength Laser media interface
FHJ2-PM5HS000-R2	Ruggedized Dual-Port PMC with HSSDC Copper media interface

B.1.4 Dual-Port CPCI Cards

The following table lists the order numbers for the FX200 Dual-Port CPCI card configurations currently available.

Order Number	Description
FHJ2-CP5MW000-00	Dual-Port CPCI with Short Wavelength Laser media interface
FHJ2-CP5SW000-00	Dual-Port CPCI with Long Wavelength Laser media interface

B.2 Cables

Systran offers the following cables for use with its FX200 PMC cards:

B.2.1 Short Wavelength: Multimode Fiber-optic cable

The following table lists the order numbers for the simplex and duplex, 50/125 µm multimode fiber-optic cables, for use with the short wavelength laser media interface.

Simplex Part Number	Duplex Part Number	Length	Cable End 1	Cable End 2
FHAC-M1LC3000-00	FHAC-M2LC3000-00	3 meters	LC	LC
FHAC-M1LC5000-00	FHAC-M2LC5000-00	5 meters	LC	LC
FHAC-M1LC1001-00	FHAC-M2LC1001-00	10 meters	LC	LC
FHAC-M1LC2001-00	FHAC-M2LC2001-00	20 meters	LC	LC
FHAC-M1LC3001-00	FHAC-M2LC3001-00	30 meters	LC	LC
FHAC-M1LCxxxx-00	FHAC-M2LCxxxx-00	Custom	LC	LC

Simplex Part Number	Duplex Part Number	Length	Cable End 1	Cable End 2
FHAC-M1LCST03-00	FHAC-M2LCST03-00	3 meters	LC	ST
FHAC-M1LCST05-00	FHAC-M2LCST05-00	5 meters	LC	ST
FHAC-M1LCST10-00	FHAC-M2LCST10-00	10 meters	LC	ST
FHAC-M1LCST20-00	FHAC-M2LCST20-00	20 meters	LC	ST
FHAC-M1LCST30-00	FHAC-M2LCST30-00	30 meters	LC	ST

Simplex Part Number	Duplex Part Number	Length	Cable End 1	Cable End 2
FHAC-M1SCLC01-00	FHAC-M2SCLC01-00	1 meter	SC	LC
FHAC-M1SCLC03-00	FHAC-M2SCLC03-00	3 meters	SC	LC
FHAC-M1SCLC05-00	FHAC-M2SCLC05-00	5 meters	SC	LC
FHAC-M1SCLC10-00	FHAC-M2SCLC10-00	10 meters	SC	LC
FHAC-M1SCLC20-00	FHAC-M2SCLC20-00	20 meters	SC	LC
FHAC-M1SCLC30-00	FHAC-M2SCLC30-00	30 meters	SC	LC

B.2.2 Long Wavelength: Singlemode Fiber-optic cable

The following table lists the order numbers for the simplex and duplex, 9/125 µm singlemode fiber-optic cables, for use with the long wavelength laser media interface.

Simplex Part Number	Duplex Part Number	Length	Cable End 1	Cable End 2
FHAC-S1LC3000-00	FHAC-S2LC3000-00	3 meters	LC	LC
FHAC-S1LC5000-00	FHAC-S2LC5000-00	5 meters	LC	LC
FHAC-S1LC1001-00	FHAC-S2LC1001-00	10 meters	LC	LC
FHAC-S1LC2001-00	FHAC-S2LC2001-00	20 meters	LC	LC
FHAC-S1LC3001-00	FHAC-S2LC3001-00	30 meters	LC	LC
FHAC-S1LCxxxx-00	FHAC-S2LCxxxx-00	Custom	LC	LC

Simplex Part Number	Duplex Part Number	Length	Cable End 1	Cable End 2
FHAC-S1SCLC01-00	FHAC-S2SCLC01-00	1 meter	SC	LC
FHAC-S1SCLC03-00	FHAC-S2SCLC03-00	3 meters	SC	LC
FHAC-S1SCLC05-00	FHAC-S2SCLC05-00	5 meters	SC	LC
FHAC-S1SCLC10-00	FHAC-S2SCLC10-00	10 meters	SC	LC
FHAC-S1SCLC20-00	FHAC-S2SCLC20-00	20 meters	SC	LC
FHAC-S1SCLC30-00	FHAC-S2SCLC30-00	30 meters	SC	LC

B.2.3 HSSDC Copper: 1.0625 Gbps Equalized

The following table lists the order numbers for the HSSDC copper, 150-ohm, 1.0625 Gbps equalized, shielded quad cable.

Order Number	Description
FHAC-Q2HS1000-00	1 m cable
FHAC-Q2HS3000-00	3 m cable
FHAC-Q2HS5000-00	5 m cable
FHAC-Q2HS1001-00	10 m cable
FHAC-Q2HS2001-00	20 m cable
FHAC-Q2HS2501-00	25 m cable
FHAC-Q2HS3001-00	30 m cable

B.2.4 HSSDC Copper: 2.125 Gbps Equalized

The following table lists the order numbers for the HSSDC copper, 150-Ohm, 2.125 Gbps equalized, shielded quad cable.

Order Number	Description
FHAC-Q2HE1000-00	1 m cable
FHAC-Q2HE3000-00	3 m cable
FHAC-Q2HE5000-00	5 m cable
FHAC-Q2HE1001-00	10 m cable
FHAC-Q2HE1501-00	15 m cable

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GLOSSARY

1x3 ----------A 3-pin connector for use with copper media.

8B/10B ----------A data-encoding scheme developed by IBM for translating byte-wide data to an encoded 10-bit format.

AAL5----------ATM Adaptation Layer for computer data.

active ----------A term used to denote a port that is receiving a signal.

AL ----------See Arbitrated Loop.

ALPA ----------Arbitrated Loop Physical Address.

ANSI ----------American National Standards Institute.

AP ----------Access Point.

API ----------Applications Program Interface.

APID ----------Access Point Identification Number. A number ranging between 0 and 65535 that is assigned by the user to identify a process. All APID's attached to a single FX board must be unique.

arbitrated loop----------The simplest form of a Fabric topology. Has shared bandwidth, distributed topology. Interconnects NL_ports/FL_ports at the nodes/Fabric using unidirectional links. It has only one active L_port-L_port connection, so blocking is possible. A fairness algorithm ensures that no L_port is blocked from accessing the loop. Should any link in the loop fail, communication between all L_ports is terminated (see cross-point, point-to-point).

ASIC ----------Application Specific Integrated Circuit. An integrated circuit designed to perform a specific function. ASICs are typically made up of several interconnected building blocks and can be quite large and complex.

ATM ----------Asynchronous Transfer Mode. A network technology that transfers data in small 53-byte packets, and permits transmission over long distances. Proposed speeds range from 25 Mbps to 622 Mbps.

Auto-Speed Negotiation --------This feature enables FibreXpress FX200 cards to interoperate with existing FC devices at 1.0625 Gbps, and provides seamless transition to higher performance 2.125 Gbps devices.

bandwidth ----------The amount of data that can be transmitted over a channel.

baud----------A unit of speed in data transmission, usually equal to one bit per second.

Bi-Directional card ----------A FibreXtreme Simplex Link card with both source and destination capabilities.

BIOS ----------Basic Input/Output System.

bps----------bits per second.

broadcast----------Sending a transmission to all nodes on a network.

BSP----------Board Support Package. A set of software routines written by the OS vendor or SBC vendor that provides support for a particular SBC.

burst transfers ----------Messages are transmitted in a format that includes the initial address followed by all the data. Burst transfers eliminate the need for repeated addresses for each data block, permitting higher throughput.

channel ----------A point-to-point link that transports data from one point to another at the highest speed with the least delay, performing simple error correction in hardware. Channels are hardware intensive and have lower overhead than networks. Channels do not have the burden of station management.

channel network----------Combines the best attributes of both channel and network, giving high bandwidth, low latency I/O for client server. Performance is measured in transactions per second instead of packets per second.

circuit ----------Bi-directional path allowing communications between two L_Ports.

circuit-switched mode----------Data transfer through a dedicated connection (Class 1).

CMC ----------Common Mezzanine Card.

communications protocol-------A special sequence of control characters that are exchanged between a computer and a remote terminal in order to establish synchronous communication.

CRC----------Cyclic Redundancy Check. A code used to check for errors in Fibre Channel.

crossbar switch ----------Multipurpose, non-blocking 32-port cross-point switch for digital speeds up to 2.5 Gbps (See cross-point).

cross-point ----------Provides a bi-directional connection between a node (N_port) and the Fabric (F_port). Can be configured to be non-blocking by providing multiple paths between any two F_ports. Adding stations to a Fabric does not reduce the point-to-point channel bandwidth (see point-to-point).

datagram----------Type of data transfer for Class 3 service. Transfer has no confirmation of receipt and rapid data transmission.

dBm ----------decibels relative to one milliwatt.

destination only card ----------A FibreXtreme Simplex Link card that is only capable of receiving data.

direct connect links ----------An actual physical, dedicated connection between two devices with the entire bandwidth available to serve each direct link. Direct links provide a fast and reliable medium for sending large volumes of data.

DMA ----------Direct Memory Access.

DMA write----------The DMA engine on the bus controller writes the data from the host computer to the SRAM buffer, freeing the host CPU for other tasks. (FibreXpress board becomes a master for the bus.)

E_Port ----------Element Port. Used to connect fabric elements together.

ECL ----------Emitter Coupled Logic.

ethernet----------A widely used shared networking technology.

exchange ----------One or more sequences for a single operation that are not concurrent, but are grouped together.

F_Port ----------Fabric Port. The access point of the fabric for physically connecting the user's N_Port.

fabric----------A self-managed, active, intelligent switching mechanism that handles routing in Fibre Channel Networks.

fabric elements----------Another name for ports.

FC ----------Fibre Channel.

FC-AL ----------Fibre Channel Arbitrated Loop. Provides a low-cost way to attach multiple ports in a loop without hubs and switches.

FCP----------Fibre Channel Protocol. The mapping of the SCSI communication protocol over Fibre Channel.

FC-PH ----------Fibre Channel Physical interface. Fibre Channel Physical standard, consisting of the three lower levels, FC-0, FC-1, and FC-2.

FCSI----------Fibre Channel Systems Initiative is made up of IBM, Hewlett-Packard and Sun Microsystems. This group strives to advance Fibre Channel as an affordable, high-speed interconnection standard.

FC-SW----------Fibre Channel Switch Fabric standard. Formerly known as FC-XS: Fibre Channel Xpoint Switch. The crosspoint-switched fabric topology is the highest-performance Fibre Channel fabric, providing a choice of multiple path routings between pairs of F_ports.

Fibre Channel----------Fibre Channel (FC) is a serial data transfer interface technology operating at speeds up to 1 Gbps. It is defined as an open standard by ANSI. It operates over copper and fiber optic cabling at distances of up to 10 kilometers. Supported topologies include point-to-point, arbitrated-loop, and fabric switches.

FibreXpress ----------A Systran trademark name for a family of networking products that maximize the superior communication and interconnect capabilities of ANSI standard Fibre Channel. The FX200 series of 64-bit adapters support up to 200 MB per second (400 MB per second duplex) throughput. The FX100 series supports 100 MB per second throughput.

FibreXtreme----------A Systran trademark name for a family of networking products based on the original Simplex Link technology, Systran's FibreXtreme Serial FPDP Data Link moves data at a sustained 247 MB per second with microsecond latency. Supports up to 2.5 Gbps serial data link using a highly specialized communications protocol optimized for maximum data throughput.

FibreXtreme Simplex Link ----A high-speed, point-to-point, communication network capable of transfers in excess of 100 MB/s.

FIFO ----------first in first out

Firmware ----------Microprocessor executable code, typically for embedded type processors.

Flash ----------A type of Electrical Erasable Programmable Read Only Memory (EEPROM). Erased and written to in blocks vs. bytes.

FL_Port ----------Fabric Loop Port. Joins an arbitrated loop to the fabric.

FPDP----------Front Panel Data Port.

frame----------A linear set of transmitted bits that define a basic transport element. A frame is the smallest indivisible packet of data that is sent on the FC.

frame-switched mode ----------Data transfer is connectionless (Classes 2 and 3) and data transmission is in frames. The bandwidth is allocated on a link-by-link basis. Frames from same port are independently switched and may take different paths.

FTP application ----------A test application for transferring files from one computer to another.

FX ----------FibreXpress.

G_Port----------A port which can function as either an F_Port or an E_Port. Its function is defined at login.

Gbps----------Gigabits per second.

gigabit----------One billion bits, or one thousand megabits.

GLM ----------Gigabit per second Link Module. A Link Module that can be used for optical or copper media.

HANDLE ----------Abstraction for the *Handle* in Windows and *file descriptor* in Unix.

HBA----------Host Bus Adapter.

heartbeat----------A visual indicator that flashes periodically to indicate the embedded controller is functioning properly.

HIPPI ----------High Performance Parallel Interface. An 800 Mbps interface to supercomputer networks (previously called high-speed channel) developed by ANSI.

HSSDC ----------High Speed Serial Data Connectors and Cable Assemblies. A type of high-speed interconnect system which allows for transmission of data rates greater than 2 Gbps and up to 30 meters.

hunt group----------A group of lines that are linked so that one call to the group will find the line that is free. This provides the ability for more than one port to respond to the same alias address.

I/O ----------Input/Output.

IOCB----------I/O Control Block. A block of information stored in system memory, usually of fixed length, which contains control codes and data. The IOCB is created by a host computer and sent to some other computer. The IOCB contains command/instructions, data, and memory pointers intended to direct the other computer to perform some function.

inactive ----------A term used to denote a port that is not receiving a signal.

intermix ----------A Fibre-Channel-defined mode of service that reserves the full Fibre Channel bandwidth for a dedicated (Class 1) connection, but also allows connectionless (Class 2) traffic to share the link if the bandwidth is available.

IP ----------Internet Protocol is a data communications protocol.

IPI ----------Intelligent Peripheral Interface.

insertion delay ----------The amount of time the data is delayed for the insertion of FXSL framing protocol. It is measured from when the data becomes available at the FIFO to when the data is actually transmitted on the link. The actual values are either 188 ns in Mode-0 or Mode-1 (with no CRC), or 226 ns in Mode-2 or Mode-3 (with CRC).

KB ----------Kilobytes. IEEE convention: A capital K is used for binary (1024) kilo, and a lowercase k is used for decimal (1000) kilo.

Kb ----------Kilobits.

Kbps----------Kilobits per second.

L_Port ----------Loop Port. Either an FL_Port or an NL_Port that supports the arbitrated loop topology.

LAN ----------Local Area Network, typically less than 5 kilometers. Transmissions within a LAN are mostly digital, carrying data at rates above 1 Mbps.

latency ----------The delay between the initiation of data transmission and the receipt of data at its destination.

LCF----------Link_Control Facility. Provides logical interface between nodes and the rest of Fibre Channel.

Link Module----------A mezzanine board mounted on the board to interface between the board and the network.

longword ----------32-bit or 4-byte word.

LP----------Lightweight Protocol.

LX1500 ----------LinkXchange LX1500 Crossbar Switch.

LX2500 ----------LinkXchange LX2500 Crossbar Switch.

Mbps ----------Megabits per second.

MBps----------Megabytes per second.

MB----------Megabytes.

media----------Means of connecting nodes; either fibre optics, coaxial cable or unshielded twisted pair.

ms----------Milliseconds

mW ----------Milliwatt.

µs----------Microseconds

monitor ----------An application program used to display the status and change the configuration of the driver.

multicast----------A single transmission is sent to multiple destination N_ports, a one-to-many transmission. Multicasting provides a way for one host to send packets to a selective group of hosts.

N_Port ----------Node Port. A Fibre-Channel-defined entity at the node end of a link that connects to the fabric via an F-Port.

network----------Connects a group of nodes, providing the protocol that supports interaction among these nodes. Networks are software intensive, and have high overhead. Networks also operate in an environment of unanticipated connections. Networks have a limited ability to provide the I/O bandwidth required by today's applications and client/server architectures.

NL_Port ----------Node Loop Port. Joins nodes on an arbitrated loop.

node ----------A host computer and interface board. Each processor, disk array, workstation or any computing device is called a node. Connects to FC through a node port (N_Port).

normal write----------A host CPU writes data to the SRAM buffer through the bus and bus controller (FibreXpress board operates as a slave of the bus).

ns----------nanoseconds.

NVRAM----------Non-Volatile Random Access Memory. Generic term for memory that retains its contents when power is turned off.

OFC ----------Open Fibre Control. A safety interlock system used on some FC shortwave links.

one-to-many ----------One node transmits to multiple nodes. See broadcast, multicast.

operation ----------One of Fibre Channel's building blocks composed of one or more exchanges.

out-of-band control----------On the LinkXchange products, a method of issuing switch commands that does not use any bandwidth of the 32 switch ports.

PCB----------Printed Circuit Board.

PCI ----------Peripheral Component Interface.

PECL ----------Positive Emitter Coupled Logic.

PIO ----------Programmed Input/Output.

PMC----------PCI Mezzanine Card. Everything that is true for PCI cards is true for PMC except there is a footprint or card format change.

point-to-point ----------Bi-directional links that interconnect the N_ports of a pair of nodes. Non-blocking.

port----------A physical element through which information passes. It is an electrical or optical interface with a pair of wires or fibers—one each for incoming and outgoing data.

profiles----------Subsets of Fibre Channel standards that improve interoperability and simplify implementation. It is like a cross-section of FC, providing guidelines for implementing a particular application.

protocols----------Data transmission conventions encompassing timing, control, formatting, and data representation. This set of hardware and software interfaces in a terminal or computer allow it to transmit over a communication network, and these conventions collectively form a communications language.

retimed ----------"Retimed" port cards use a phase-locked loop to recover the clock from a serial data stream. They then use the recovered clock to strobe the data through a one-bit latch to minimize the accumulation of edge jitter. This process is sometimes called "reclocked." (Retimed port cards do *not* synchronize the data to a local crystal-controlled reference clock.) Non-retimed port cards do not clock the serial data stream at all. From a timing standpoint, they function as gate delays as the data passes asynchronously through them.

RISC ----------Reduced Instruction Set Computer. A type of microprocessor that executes a limited number of instructions that typically allows it to run faster than a Complex Instruction Set Computer (CISC).

RJ-45----------Short for Registered Jack-45. An eight-wire connector commonly used to connect computers onto a local-area network (LAN), especially Ethernet. RJ-45 connectors look similar to the RJ-11 connectors used for connecting telephone equipment, but they are somewhat wider.

SAP----------Service Access Point.

SBC----------Single Board Computer.

SCSI ----------Small Computer System Interface.

sequence ----------The unit of transfer, made up of one or more related frames for a single operation.

SFF ----------Small Form Factor. Based on SFF MSA.

SFF MSA----------Small Form Factor Transceiver Multisource Agreement (SFF MSA), July 5, 2000.

shared connect links ----------The ability to send and receive data without establishing a dedicated physical connection so that other devices can also use the medium. This shared link is more efficient for smaller data transmissions because the overhead of direct connect link is avoided.

SRAM----------Static Random Access Memory.

SRAM Transfer ----------Process in which the data is transferred from the host computer to the SRAM buffer by normal or by DMA write.

SFP ----------Small Form Factor Pluggable based on MultiSource Agreement (MSA), September 14, 2000, FO Transceiver Industry.

STP----------Shielded Twisted Pair. A type of cable media.

striping----------To multiply bandwidth by using multiple ports in parallel.

switched fabric----------(see the definition for “fabric”).

SYNC ----------FibreXtreme Simplex Link primitive used to synchronize the source and destination cards.

SYNC with DVALID----------A special case of the SYNC primitive occurring in the middle of a buffer of data.

source only card ----------A FibreXtreme Simplex Link card that is only capable of sending data.

TCP----------Transmission Control Protocol.

terminal application----------A test application that sends characters received from the keyboard and displays received characters.

throughput application ---------An application that tests the throughput for the given system.

time-out----------The time allotted for a native message to travel the network ring and return. If this time is exceeded, an automatic retransmission of the native message occurs.

topology----------Refers to the order of information flow due to logical and physical arrangement of stations on a network.

TTL ----------Transistor-Transistor Logic.

ULP ----------Upper Level Protocol.

VHDL----------Very high-speed integrated circuit Hardware Description Language.

VME ----------Acronym for VERSA-module Europe: bus architecture used in some computers.

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