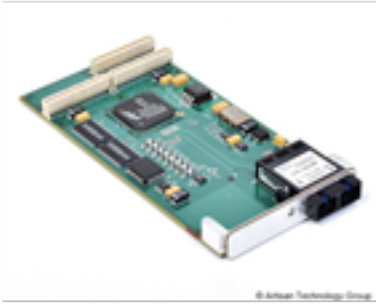
Curtiss-Wright FX100

Fiber Channel PMC Module



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FibreXpress®

FX100 Hardware Reference for PCI, PMC, and CPCI Cards

Document No. F-T-MR-F1PCIPMC-A-0-A9

Systran®

FOREWORD

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Revised: January 29, 2004

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(937) 252-5601

Declarations and Marks

This equipment complies with the EU Electromagnetic Compatibility and Low Voltage Directives 89/336/EEC and 73/23/EEC respectively. Compliance with these standards implies conformance with interference and generic immunity and safety standards applicable for this type of information technology equipment. In accordance with European Community directives, a Declaration of Conformity has been made and is on file.

CE

This equipment complies with the requirements of CSA C22.2 950-95 and UL 1950 applicable for this type of information technology equipment. Certificates of Conformance have been issued for this equipment.

C US

This equipment complies with FCC Part 15 Rules and Regulations for a Class B digital device. These limits are designed to provide reasonable protection against harmful interference in a restricted environment. 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 and other communication devices. However, there is no guarantee that interference will not occur in a particular installation. Operation of this product is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference.

NOTE:

The above CE and FCC declarations apply to these FX100 products:

- FHM3-PC4MW000-00 PCI with Short Wavelength Laser media interface.
- FHM3-PC4SW000-00 PCI with Long Wavelength Laser media interface.
- FHM3-PM4MW000-00 PMC with Short Wavelength Laser media interface.
- FHM3-PC4SW000-00 PMC with Long Wavelength Laser media interface.

In addition, the above CSA declaration applies to these FX100 products:

- FHM3-PM4MW000-00 PMC with Short Wavelength Laser media interface.
- FHM3-PM4SW000-00 PMC with Long Wavelength Laser media interface.
- FHM3-PM4C3000-00 PMC with 1x3 copper media interface.
- FHM3-PM4HS000-00 with HSSDC copper media interface.

Declarations for other product variations covered in this manual are pending.

Required copies of declarations of conformity and/or certificates of conformance are available upon request through your sales representative.

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

Special Instructions/Instructions spéciales/Besondere Hinweise

Data Transceiver Module

FX100 PMC Series

Keycode for the Modules

1. FHM3-PM4MW000-00 PMC with Short Wavelength optical transceiver media interface
2. FHM3-PM4SW000-00 PMC with Long Wavelength optical transceiver media interface
3. FHM3-PM4CW000-00 PMC with 1x3 copper media interface
4. FHM3-PM4HW000-00 PMC with HSSDC copper media interface

Rated Voltage/Tension estimée/Nennspannung/:	DC 5 V
Rated Current Input/ Courant d'entrée estimé/Nennaufnahme:	0.8 A
Overall Dimensions/Dimensions globales/Abessungen:	2.915 inches by 5.866 inches 74 mm by 149 mm

Notes/Notes/Anmerkungen

Maximum Operating Temperature: 50° C.
Température opérationnelle maximale: 50° C.
Die maximale Umgebungstemperatur betraegt: 50° C.

Maximum Continuous Output Power not to exceed 4 watts.
Puissance maximale dissipée inférieure à 4 watts.
Die maximale Ausgangleistung sollte 4 watts nicht ueberschreiten.

PMC modules are Class III devices with class 1 integrated lasers.
Les modules PMC sont des périphériques de Catégorie III utilisant des lasers de Catégorie I.
Die PMC Module sind Geräte der Schutzklasse III mit integriertem Laser der Laserclass 1.

PMC modules fall under EN60950 Information Technology Equipment. End use customers have to meet all EN60950 requirements when installing the modules into the end product.

Les modules PMC dépendent de la note EN60950 sur les équipements technologiques. Les utilisateurs finaux doivent être conformes à la note EN60950 lorsqu'ils intègrent le module dans le système définitive.

Die PMC Module sind nur zum Einbau fuer IT Geräte nach EN 60950. Alle Anforderungen nach VDE 0805: 1997-11+A11:1998-8 müssen beim Einbau in das Engerät eingehalten werden.

Caution: Avoid direct eye contact with laser.
Evitez tout contact du laser avec les yeux.
Actung: Vermeiden Sie direkten Augenkontakt mit dem Laser.

Only service personal can install the PMC modules.
Les modules PMC ne doivent être installés que par des techniciens qualifiés.
Der Einbau der PMC Module darf nur durch Service Personnel durchgeführt werden.

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1. INTRODUCTION

1.1 How To Use This Manual

1.1.1 Purpose

This manual describes how to install, set up, and run the FibreXpress FX100 PCI, PMC, and CompactPCI cards. Hereafter in this manual "CompactPCI" is referred to as "CPCI."

1.1.2 Scope

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

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.*
- *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 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.
- *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 Cards and Backplanes,* Revision 1.0, October 1, 1999; PICMG 2.10.
- *Fibre Channel, A Technical Overview* - available from Systran.
- *LinkXchange LX1500e Crossbar Switch Hardware reference Manual*, (Doc. No. F-T-MR-LX1500E), Systran Corp.
- *LinkXchange LX2500 Crossbar Switch Hardware reference Manual*, (Doc. No. F-T-MR-LX2500), Systran Corp.
- Systran Corp. – www.systran.com.
- Fibre Channel Association - www.fibrechannel.com.
- T11 Home page – www.t11.org.
- University of New Hampshire Interoperability Lab – www.iol.unh.edu/consortium/index.html.
- CERN Fibre Channel Homepage – www.cern.ch/HSI/fcs.
- Medusa Labs – www.medusalabs.com.
- Solution Technologies – www.soltechnology.com.
- PCI Special Interest Group – www.pcisig.com.
- QLogic Corp. – www.qlc.com.

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.

- Phone: (937) 252-5601 or (800) 252-5601
- E-mail: support@systran.com
- Fax: (937) 252-1349
- World Wide Web address: www.systran.com

1.5 Ordering Process

To learn more about Systran products or to place an order, please use the following contact information. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

- Phone: (937) 252-5601 or (800) 252-5601
- E-mail: info@systran.com
- World Wide Web address: www.systran.com

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2. PRODUCT OVERVIEW

2.1 Overview

Systran's FibreXpress FX100 PCI, PMC, and CPCI cards are based upon ANSI and Fibre Channel (FC) standards, and are designed to meet the requirements of the real-time computing industry. The FC standards' superior interconnect capabilities provide easy scalability while the exceptional communication design results in data transfer rates up to 200 MB/s.

The FX100 cards are designed to optimize data throughput, reduce the host processor load, provide the maximum amount of flexibility, and require a minimum user effort. This is achieved by integrating the Fibre Channel interface, PCI bus interface, FC SCSI protocol, and FC IP protocol with a RISC processor. This implementation assures that the maximum data transfer rates can be attained without burdening the host machine.

The FX100 cards are available with four different media options:

- Short Wavelength optical transceiver
- Long Wavelength optical transceiver
- HSSDC copper transceiver
- 1x3 copper transceiver

The four different transceivers are described in more detail in section 2.3.3.

Figures 2-1 through 2-9 show the FX100 PCI, PMC, and CPCI cards with different media options.

NOTE: The Long Wavelength laser media is not shown in this manual, but is similar in appearance to the Short Wavelength laser media shown in Figures 2-1, 2-4, and 2-7.

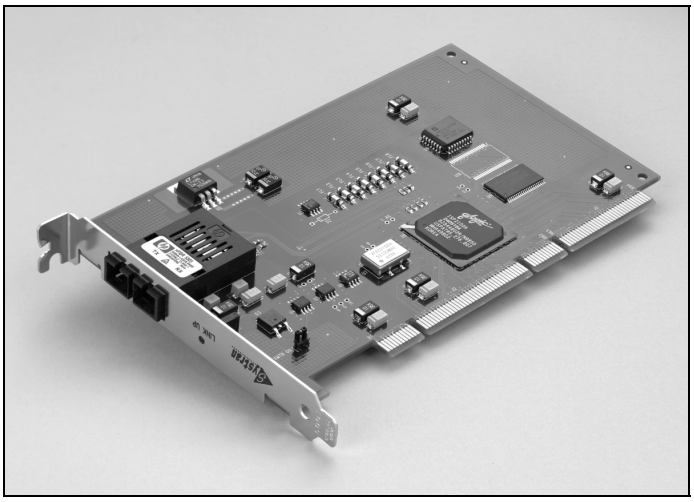


Figure 2-1 FX100 PCI Card with Short Wavelength Laser Media

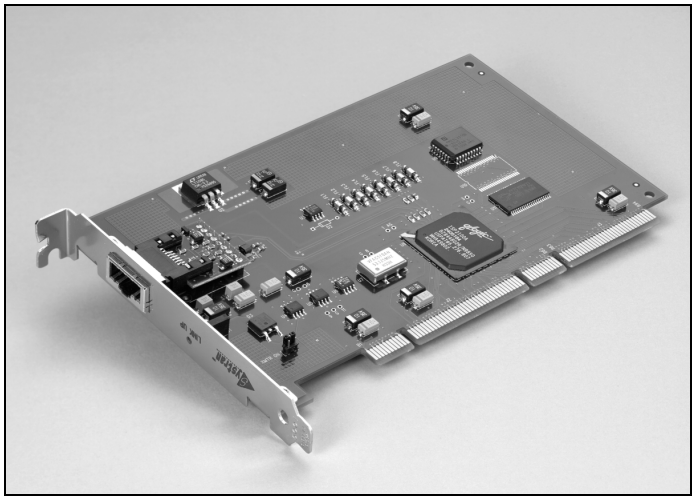


Figure 2-2 FX100 PCI Card with HSSDC Copper Media

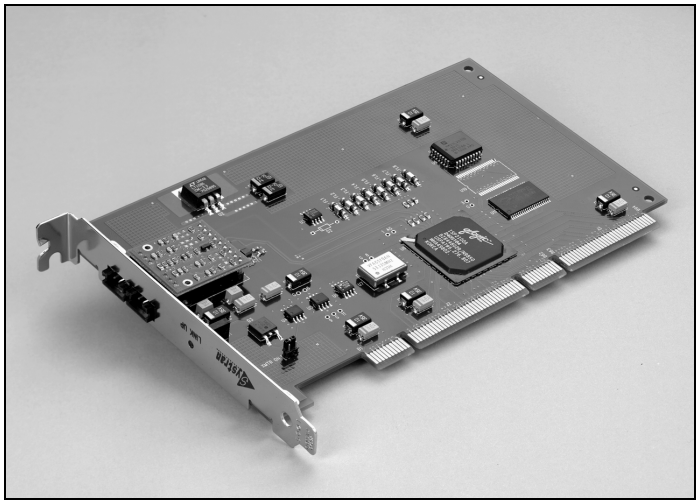


Figure 2-3 FX100 PCI Card with 1x3 Copper Media

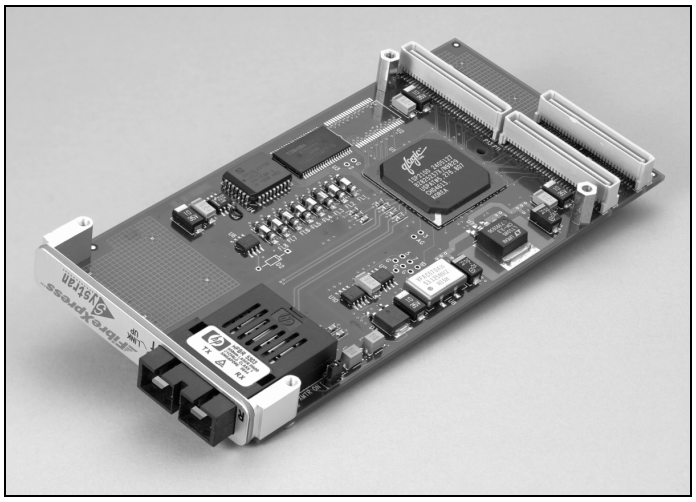


Figure 2-4 FX100 PMC Card with Short Wavelength Laser Media

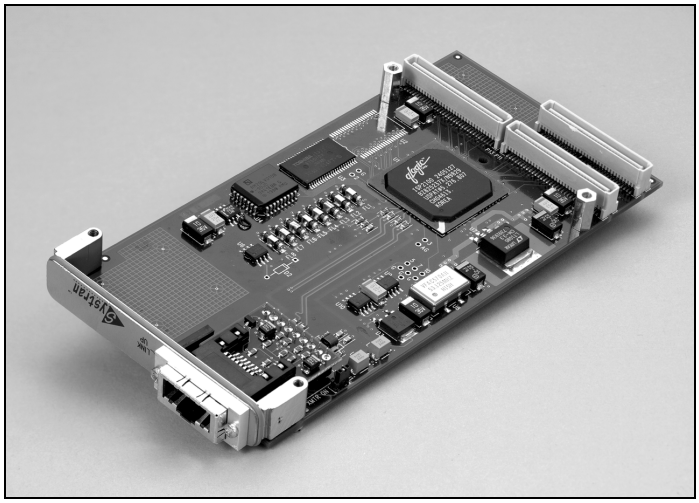


Figure 2-5 FX100 PMC Card with HSSDC Copper Media

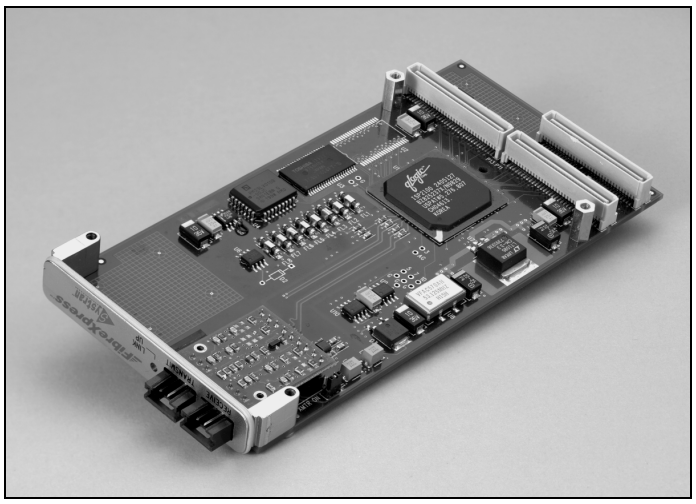


Figure 2-6 FX100 PMC Card with 1x3 Copper Media

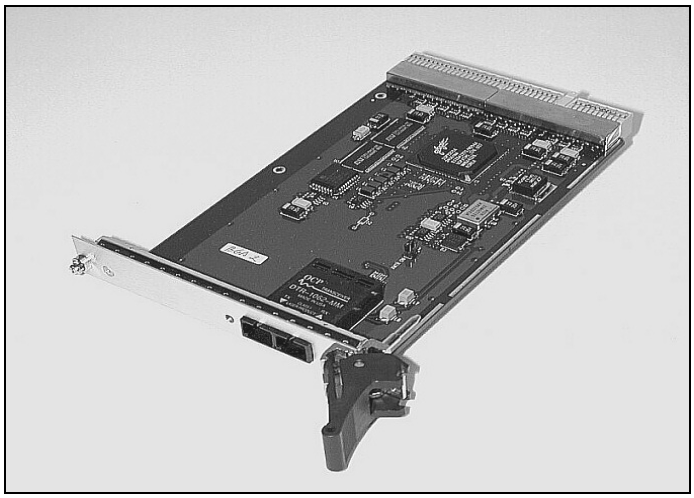


Figure 2-7 FX100 CPCI Card with Short Wavelength Laser Media

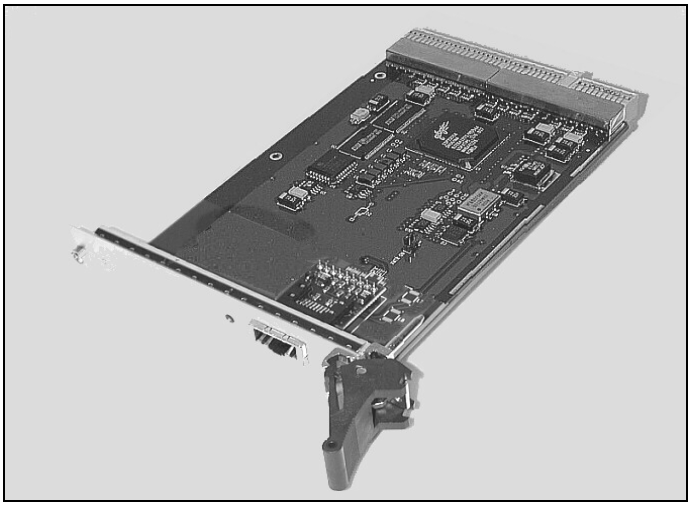


Figure 2-8 FX100 CPCI Card with HSSDC Copper Media

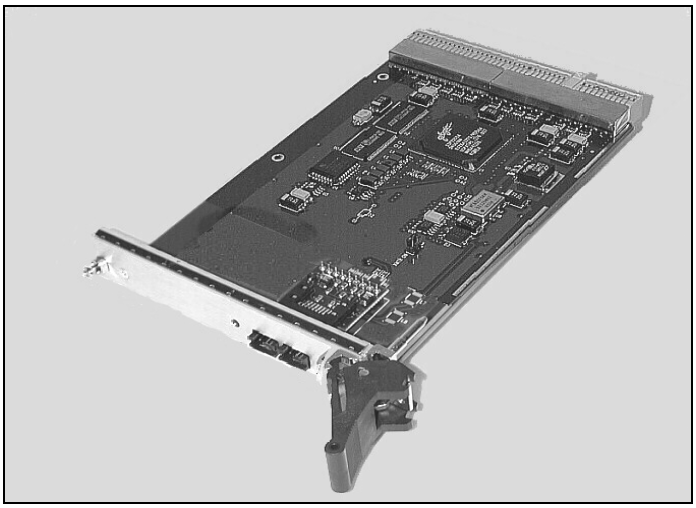


Figure 2-9 FX100 CPCI Card with 1x3 Copper Media

2.2 Fibre Channel Applications

Fibre Channel communication provides a practical, inexpensive, and easily scalable solution for achieving high-speed gigabit per second data transfers. In entry-level systems, a hub can link up to 126 individual nodes together on a single loop. For more demanding applications, fabric switches can be used to link separate loops and nodes. Each node can be up to 10 km away from another (using Long Wavelength optical transceivers).

These qualities make Fibre Channel ideal for the following applications:

- High-performance storage area networks
- 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

2.3 FX100 PCI, PMC, and CPCI Cards

The versatile FX100 card operates in all of the topologies specified by the Fibre Channel standard. Those topologies are:

- Point-to-point
- Switched fabric
- Arbitrated loop

2.3.1 Features

The FX100 PCI and PMC cards are available with an ISP2100A ASIC or an ISP2200A ASIC. The FX100 CPCI card is available with an ISP2200A ASIC only. Table 2-1 summarizes the differences between the two ASICs:

Table 2-1 ASIC Types

	ISP2100A	ISP2200A
Fibre Channel Protocols		
Supports Fibre Channel SCSI (FCP-SCSI)	YES	YES
Supports Fibre Channel IP (FC-IP)	NO	YES
64-bit PCI Bus		
Fully backward compatible to 32-bit	YES	YES
Host Bus Speeds		
Operates at 33MHz only	YES	NO
Operates at 33MHz and 66MHz	NO	YES
Systran Proprietary Protocols		
Supports FibreXpress Raw Initiator API	YES	YES
Supports FibreXpress Lightweight Protocol API	YES	YES
FC Topologies		
Supports Point-to-Point topology	NO	YES
Supports Arbitrated Loop topology	YES	YES
Supports Fabric Switch topology	YES	YES
Supports Fabric F-Port	NO	YES
Supports Fabric FL-Port	YES	YES
Maximum Throughput	100 MB/s	200 MB/s
Fibre Channel Bit Rate	1.0625 Gbps	1.0625 Gbps
Miscellaneous		
Supports FC Class 3 service	YES	YES
Supports Full Duplex	NO	YES
Supports dual address cycles (64-bit addressing)	YES	YES
Maximum of one bus interrupt per I/O operations	YES	YES
Contains 3 channel DMA controller for command, transmit, and receive	YES	YES

Additionally, all FX100 cards have the following features:

- Available in optical and copper media (see section 2.3.3)
- Status LED to indicate link status

2.3.2 Interfaces

There are two interfaces on the FX100 cards:

- A Fibre Channel interface used for communication with other Fibre Channel entities
- A host bus interface used for communication with the host computer

The host bus interface is used to map the FX100 card into memory and I/O space. The card operates as a Local Bus master, slave, or interrupting device as described below:

- The bus master function is used to perform transfers between the three independent DMA (Direct Memory Access) channels (command, transmit, and receive) and host memory.
- The slave function is used primarily to initiate SCSI I/O commands. This is accomplished via a message style protocol, which uses mailboxes as the communication interface between the host processor and the on-card controller.
- A PCI interrupt is provided to indicate to the host processor when a SCSI I/O command has been completed or when an exception has occurred.

2.3.3 Fibre Channel Physical Media Interface Options

The following physical media interface options are available for the FX100:

- Short Wavelength Laser (850 nm)
- Long Wavelength Laser (1300 nm)
- HSSDC Copper
- 1x3 Copper

The specifications for each media type are described in Appendix A. The desired media is specified when ordering. Order numbers for each option are shown in Appendix B.

2.3.4 Faceplates

The FX100 PCI and PMC cards are shipped with standard-sized faceplates. The FX100 CPCI cards are shipped with both a 3U and 6U faceplate.

2.4 Design Specifications

The FX100 PCI, PMC, and CPCI cards were designed in accordance with the following specifications:

FX100 PCI:

- *PCI Local Bus Specification*, Revision 2.2, December 8, 1998: PCI Special Interest Group.

FX100 PMC:

- *Draft Standard Physical and Environmental Layers for PCI Mezzanine Cards: PMC*, IEEE P1386.1, Draft 2.0, April 4, 1995.

FX100 CPCI:

- *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 Cards and Backplanes*, Revision 1.0, October 1, 1999: PICMG 2.10.

2.5 Accessories

Systran offers the following accessories for the FX100 cards:

- Software Drivers
- Cables
- LinkXchange family of switches

2.5.1 Software Drivers

Systran's FX100 software drivers provide a common application-programming interface (API) across different host computers and operating systems. The following operating systems are supported:

- Windows NT
- VxWorks
- IRIX
- Solaris
- LynxOS
- Linux

The FX100 software drivers include file system, Internet Protocol (IP), FXLP, and FXRI support. All drivers do not support all platforms. For further information on these drivers, and platforms supported, please contact Systran.

2.5.2 Cables

Several cabling accessories are available to support the desired FX100 copper and fiber-optical physical media interface options.

Table 2-2 Cabling Accessories

Cable Types	Description	Max. Distance
Short Wavelength	62.5/125 μm Multimode Optical Fiber	300 meters
Long Wavelength	9/125 μm Singlemode Optical Fiber	10 kilometers
HSSDC Copper	150 Ω Shielded Quad Cable, equalized	30 meters
1x3 Copper	150 Ω Twinaxial Cable	10 meters

Descriptions and order numbers for various cable lengths and types are given in Appendix B.

2.5.3 LinkXchange Family of Switches

Systran's LinkXchange family of switches provides the following features:

- Up to 32 nonblocking media-specific I/O ports
- Up to 2.5 Gbps/port baud rate in each direction
- 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 is available via an RS-232 port
- Can be connected to a modem and controlled from a remote location

For more detailed information regarding Systran's switch features and operation, contact Systran and request a copy of the *LinkXchange LX1500E Crossbar Switch Hardware Reference Manual* or *LinkXchange LX21500 Crossbar Switch Hardware Reference Manual* or visit our web site.

2.6 Functional Blocks

The FX100 card performs four main functions:

- Interfaces with the PCI Local Bus
- Performs FC-0 Fibre Channel physical media interface (copper or optical)
- 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)

All functions, with the exception of the FC-0 interface, are performed by the QLogic ISP2x00A ASIC. The Fibre Channel physical media interface and the RISC SRAM are the only external components needed to support the ISP2x00A. The block diagram is shown in Figure 2-10.

NOTE: The QLogic ISP2100A and ISP2200A will be referred to throughout this manual as ISP2x00A. Anything that is exclusive to the ISP2100A or ISP2200A will be described as such.

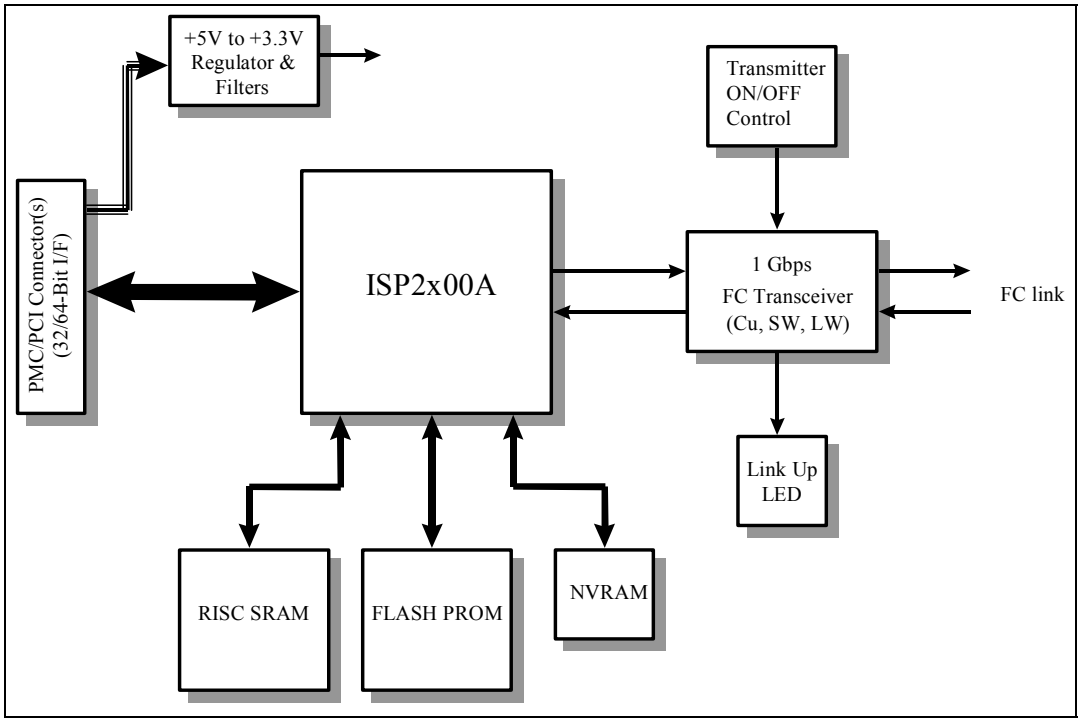


Figure 2-10 FX100 Block Diagram

2.6.1 PCI, PMC, and CPCI Connectors

These connectors simply provide the electrical and mechanical interface to the 64-bit PCI bus for the PCI, PMC, or CPCI versions of the FX100 cards. These can also be installed in a 32-bit PCI, PMC, or CPCI system.

2.6.2 +5V to +3.3V Regulator

This regulator and its associated filter network provides a clean +3.3 V to the ISP2x00A. 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.

2.6.3 ISP2x00A ASIC

The ISP2x00A ASIC performs virtually all of the Fibre Channel functions of the FX100 card. It relieves the host from the burden of dealing with the Fibre Channel interface by implementing the SCSI and IP Fibre Channel protocols. This allows for a simple, message style host communication interface. The ISP 2x00A includes:

- PCI interface
- RISC processor
- Separate Fibre Channel receive and transmit buffers
- Fibre Channel protocol manager (FPM) and serializer/deserializer (SERDES)

PCI INTERFACE

The PCI interface supports the following:

- 64-bit bus master interface for fetching IOCBs and data transfers
- 64-bit host memory addressing (dual address cycle)
- Backward compatible to 32-bit PCI
- Three-channel DMA controller
- 16-bit slave interface for communication with host
- Pipelined DMA registers for efficient scatter/gather operations
- 32-bit DMA transfer counter for I/O transfer length of up to four gigabytes
- Support for PCI cache commands
- Support for subsystem ID
- 3.3 V and 5.0 V tolerant PCI I/O buffers

RISC PROCESSOR

The RISC processor is responsible for managing the ISP2x00A resources and data flow and for executing SCSI and IP I/O commands built by the host and stored in host memory as IOCBs. The RISC processor receives requests to process IOCBs from the host via its internal mailbox registers. The RISC processor can execute multiple IOCBs simultaneously and each I/O operation is handled from start to finish without host intervention. A maximum of one PCI interrupt is generated per I/O operation.

FIBRE CHANNEL RECEIVE/TRANSMIT BUFFERS

Two independent Fibre Channel receive/transmit frame buffers exist. Each allows up to 2 KB frame payloads and multiple frames.

FIBRE CHANNEL PROTOCOL MANAGER

The FPM supports/provides the following:

- Support for one Fibre Channel loop
- 200 MB/s sustained data transfer rate
- Gigabit serial interface
- 8B/10B encoder/decoder
- FC-AL state machine

The FPM transmits and receives at the full Fibre Channel rate of 1.0625 Gbps. The FPM manages the data flow to/from the receive/transmit buffers and the Fibre Channel interface. Frame delimiters and frame control are automatically handled by the FPM. The SERDES is included as part of the FPM.

2.6.4 RISC SRAM

The RISC SRAM supports the ISP2x00A. The SRAM contains the firmware that is executed by the ASIC's internal RISC processor. The firmware is downloaded into the SRAM by the FX100 device driver software when the device driver is initialized. The firmware is included as part of the device driver.

2.6.5 FLASH PROM and NVRAM

The FLASH PROM and NVRAM store information related to the configuration and initialization of the ISP2x00A. These components are under the control of the device driver and not accessible to the user.

2.6.6 Fibre Channel Physical Media Interface

The Fibre Channel Physical Media interface includes either an optical transceiver (shortwave or longwave) or a copper transceiver (HSSDC or 1x3). The customer chooses the desired interface at the time of ordering.

2.6.7 Transmitter ON/OFF Control

Some Fibre Channel hubs will switch a node into a loop when the hub detects the node's media transmitter is turned on. If the FX100 were powered up on a hub type loop that has multiple initiators, the loop would be brought down until the FX100 is initialized. This is because the ASIC used on the FX100 is designed in such a way that no Fibre Channel traffic will pass through the FX100 until the ISP2x00A is initialized.

The FX100 employs a control circuit that keeps the media transmitter off until the Systran FX100 device driver initializes the card. This feature is not under user control but can be disabled via a jumper located on the card.

By moving the jumper to the XMTR ON position, the control circuit is bypassed and the media transmitter is always turned on when the card is on.

See section 3.4 for details on the location and setting of this jumper.

2.6.8 “Link Up” LED

A front panel LED (labeled “Link Up”) indicates when there is activity on the Fibre Channel physical media. This LED does not indicate valid data. For optical media, the LED indicates the up-stream laser transmitter is on. For copper media, the LED indicates the up-stream transmitter is transmitting bits.

3. INSTALLATION

3.1 Installation Procedures

To install the FX100 card, follow the steps below:

1. Unpack the card.
2. Inspect the card.
3. Configure the card.
4. Install the card.
5. Connect the cables.
6. Activate the card.

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 FX100 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 a 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 FX100 card, please keep the original shipping materials for this purpose.

Any optional equipment is shipped in separate cartons.

3.3 Inspect the Card

The FX100 card consists of a single card with a physical media interface. Compare the part numbers of the card to the packing slip to ensure you received the proper card. If the card was damaged in shipping, notify Systran or your supplier immediately.

3.4 Configure the Card

There is only one jumper requiring configuration. This is the J1 jumper shown in Figures 3-1 through 3-3. As described in section 2.6.7, this jumper configures the media transmitter control circuit. If you are using a Systran FX100 device driver, do nothing with this jumper. If you are not using a Systran FX100 device driver, you may bypass the control circuit and have the media transmitter always turned on when the card is on by moving the jumper to the XMTR ON position.

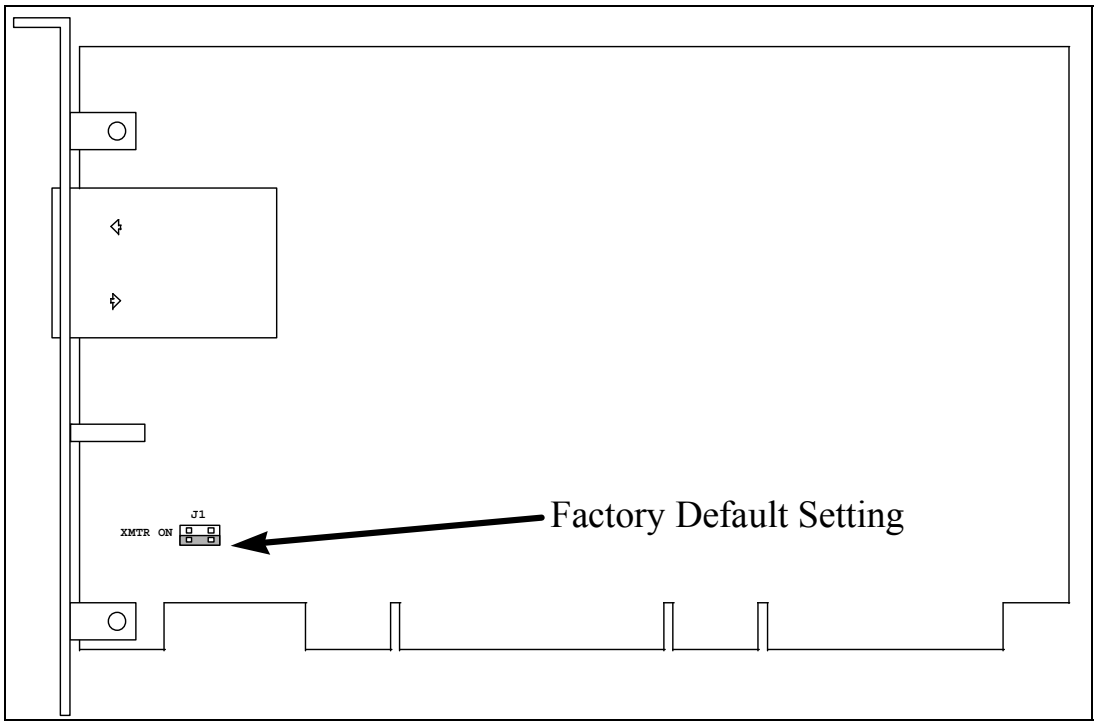


Figure 3-1 FX100 PCI J1 Jumper Location

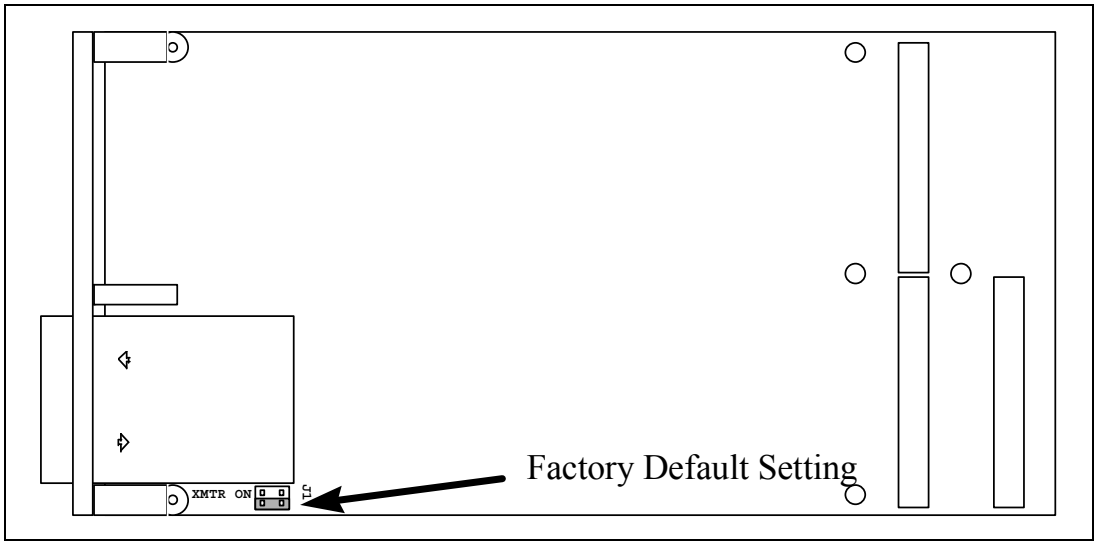


Figure 3-2 FX100 PMC J1 Jumper Location

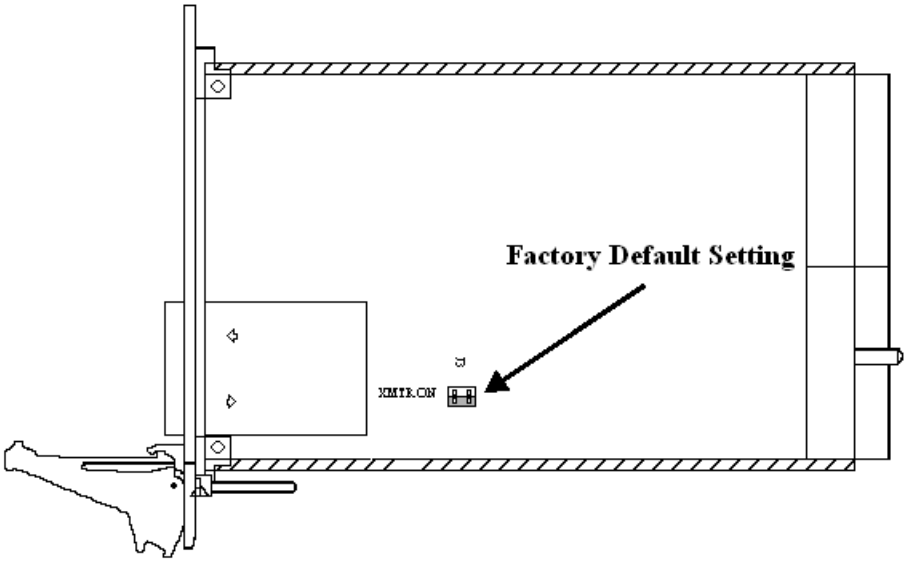


Figure 3-3 FX100 CPCI J1 Jumper Location

3.5 Install the Card

WARNING: Turn off all power to your operating system before attempting to install the FX100 cards.

FX100 cards require one slot on the host computer.

3.5.1 FX100 PCI Card

To install the FX100 PCI card, push the card into the mother card, as shown in Figure 3-4, steps 1 and 2, until it is firmly seated. Install the mounting screw as shown in step 3.

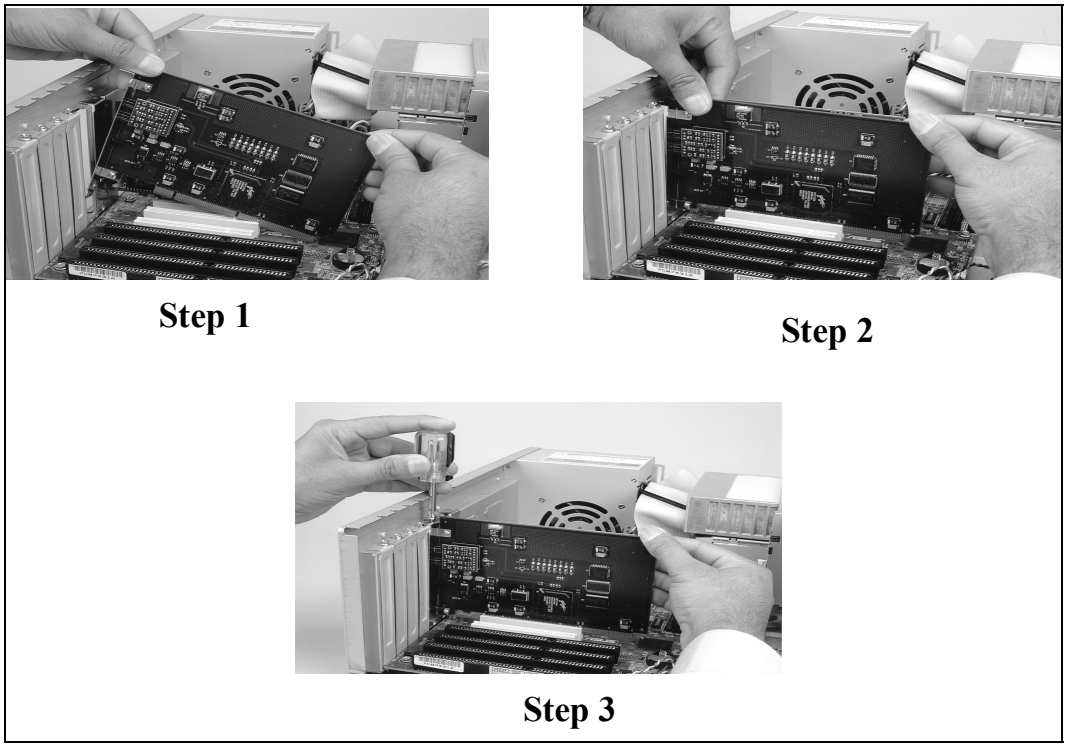


Figure 3-4 FX100 PCI Card Installation

3.5.2 FX100 PMC Card

To install the FX100 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 3-5, 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.

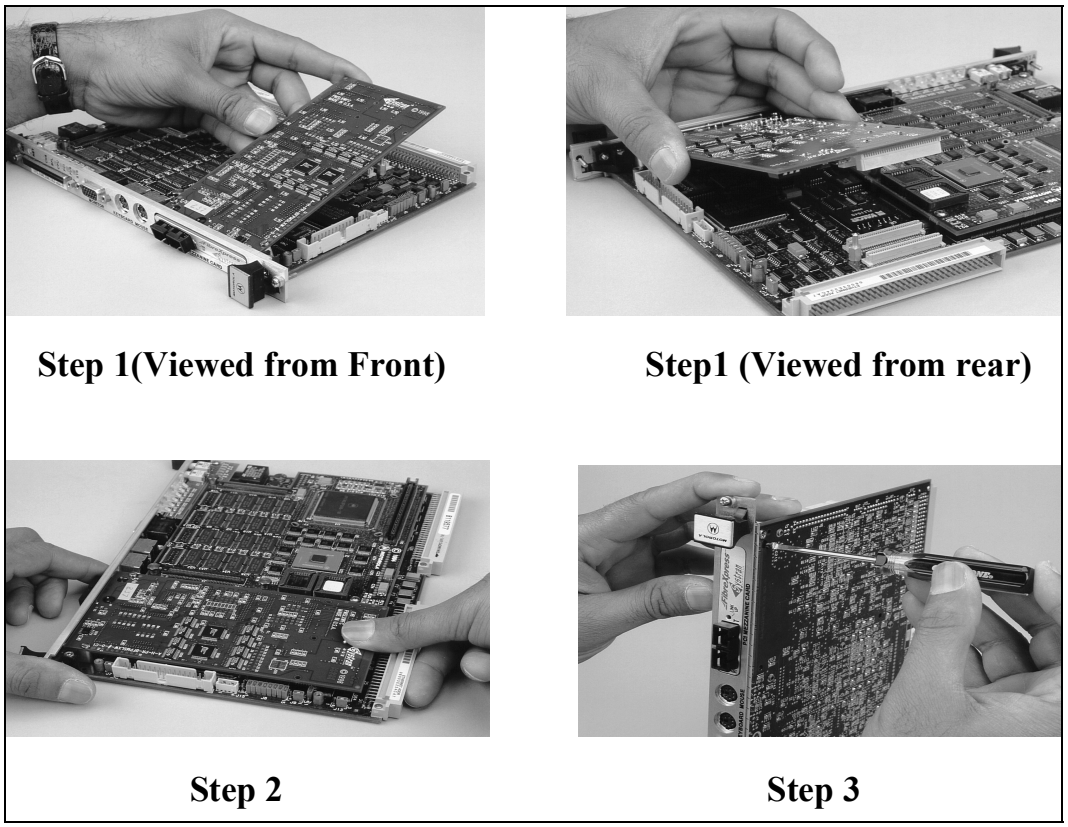
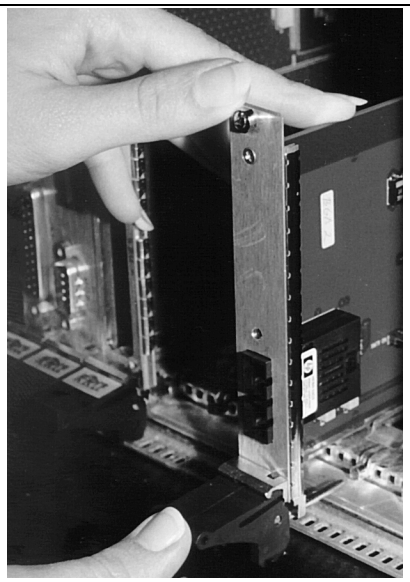


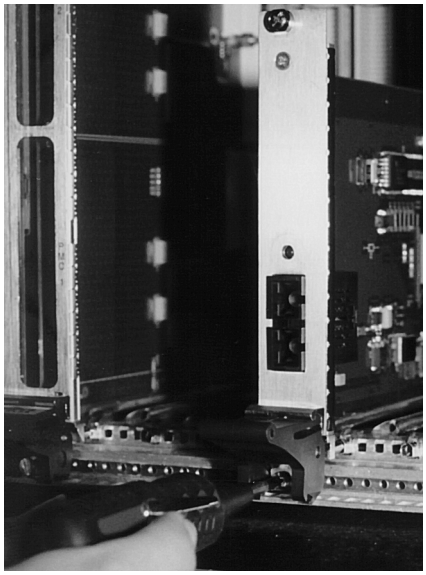
Figure 3-5 FX100 PMC Card Installation

3.5.3 FX100 CPCI Card

To install the FX100 CPCI card, push the card into the mother card, as shown in Figure 3-6, steps 1 and 2, until it is firmly seated, then install the mounting screw.



Step 1



Step 2

Figure 3-6 FX100 CPCI Card Installation

3.6 Connect the Cables

If you are familiar with Fibre Channel and have already chosen your topology type, skip to section 3.1.2. Otherwise, continue reading for a brief description of Fibre Channel topologies.

3.6.1 Topologies

POINT-TO-POINT

Point-to-point is a defined topology type in the FC standards. It consists of exactly two nodes connected to each other. This topology allows full-duplex communication because control and data frames can be sent both directions simultaneously. The bi-directional communication results in a theoretical maximum throughput of 200 MB/s.

An example of point-to-point topology is shown in Figure 3-7.

Figure 3-7 Point-to-Point Topology

TX denotes the transmitting end of the cable, and RX denotes the receiving end. Point-to-point requires only one pair of cables.

ARBITRATED LOOP

Arbitrated loop is the most commonly used topology type defined in the FC standards. This topology allows for 2 to 126 nodes to be connected. Arbitrated loop operates at half-duplex because control and data is only sent in one direction on the loop. This results in a theoretical maximum throughput of 100 MB/s.

There are several ways to achieve an arbitrated loop configuration. For a smaller number of nodes, the fibre-channel cables can easily be physically connected in a ring by splitting the cables, as shown below in Figure 3-8. This example configuration requires two pair of cables.

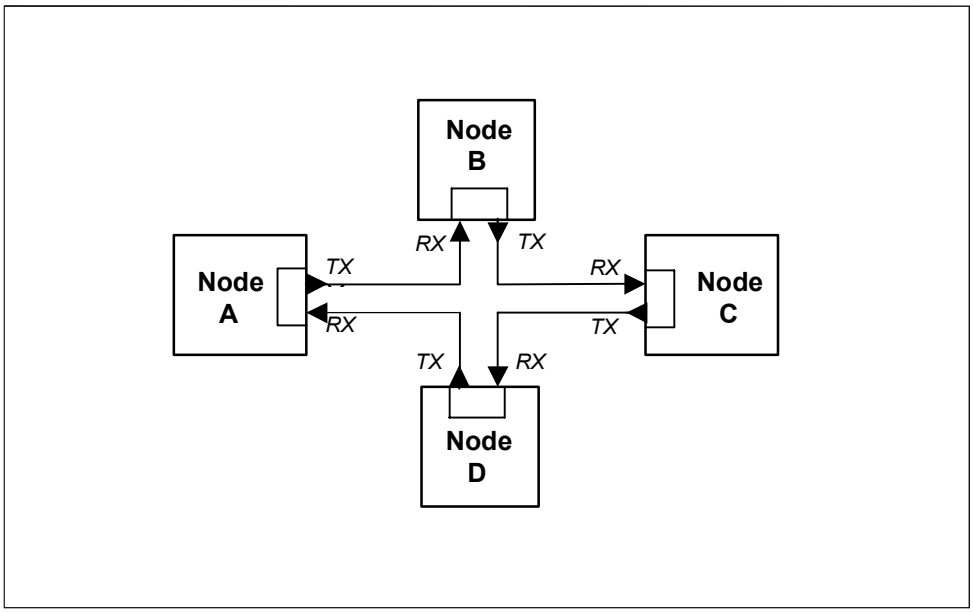


Figure 3-8 Arbitrated Loop without a Hub

While this arbitrated loop method is certainly possible with a large number of nodes, it is not very practical. The disadvantage of this method is its lack of fault isolation. If any of the connected nodes fails, the entire loop will fail.

Also, to achieve an arbitrated loop topology similar to the one shown in Figure 3-8, the fibre channel cables need to be split. However, only the 1x3 Copper, Short Wavelength optical, and Long Wavelength optical cables can be split. The HSSDC cables cannot be split.

ARBITRATED LOOP WITH HUB

Another arbitrated loop connection method is with a Fibre Channel hub, such as Systran's LinkXchange. It provides fault detection and isolation, without the hassle of splitting cables. It is also easily configurable and allows individual nodes to be switched in and out of a loop. Figure 3-9 shows how the hub could be used to connect four nodes.

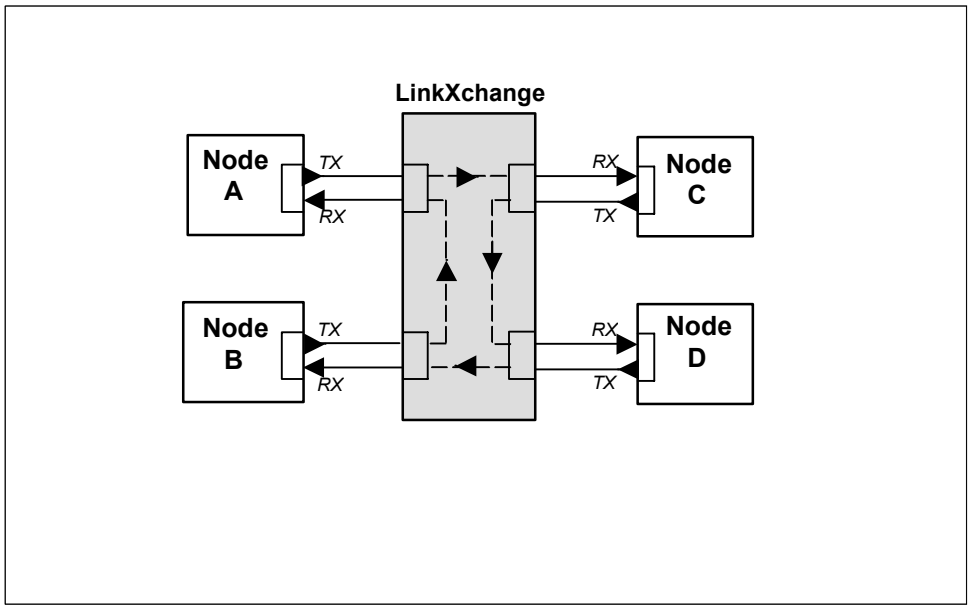


Figure 3-9 Arbitrated Loop with Hub

Figure 3-10 demonstrates the ability of LinkXchange to automatically isolate a failed node while leaving the remaining original loop intact. This functionality assures that a single node failure will not result in an entire loop failure.

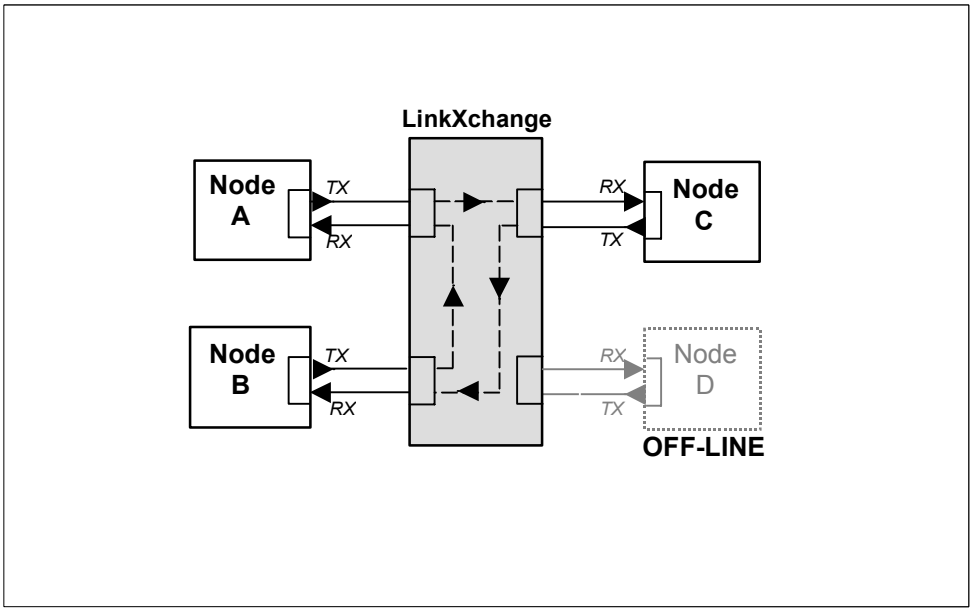


Figure 3-10 Arbitrated Loop with Hub, with Node D Off-Line

LinkXchange can also be used to manage multiple loops. Figure 3-11 gives an example of how the same four nodes could be connected into two different loops by using LinkXchange.

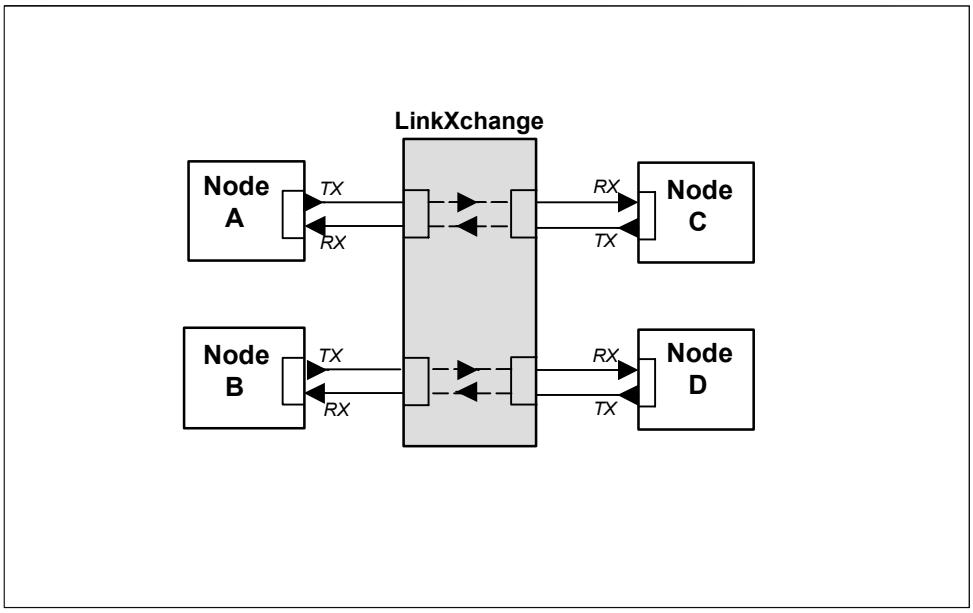


Figure 3-11 Two Arbitrated Loops with Hub

For more information about LinkXchange, refer to section 2.5.3.

3.6.2 Fiber-optic Configuration

The typical FX100 network communication architecture consists of FX100 cards connected by fiber-optic cable. The recommended distance between each node of the network depends on the type of cable used. Optical media must be used when the node-to-node distance is greater than 30 meters. Refer to 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 rubber boots on the fiber-optic transmitters and receivers as well as the ones on the fiber-optic cables. These rubber boots 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 FX100 card. Figure 3-12 depicts the type of fiber-optic connector (with the rubber boots removed) needed for the FX100 card.

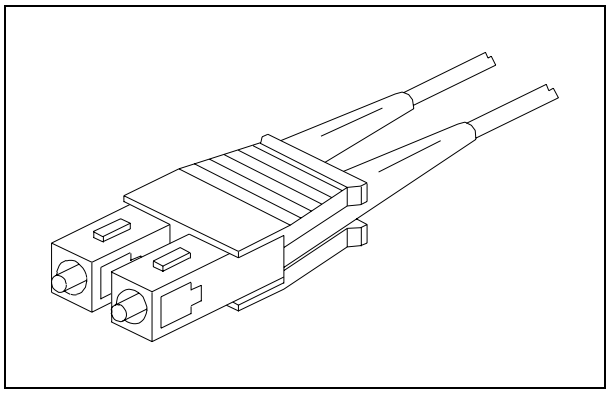


Figure 3-12 Fiber-optic SC Connector

3.6.3 Copper Media Configuration

Copper media interfaces on the FX100 cards use one of two types of shielded pair cables. Cards with HSSDC connectors use Shielded Quad cable, terminated with connectors as shown in Figure 3-13.

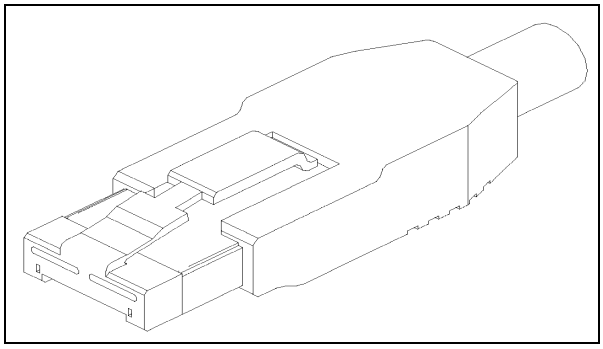


Figure 3-13 HSSDC Copper Connector

Cards with 1x3 connectors use Twinaxial cable terminated with the connectors shown in Figure 3-14. Refer to Appendix A for more information.

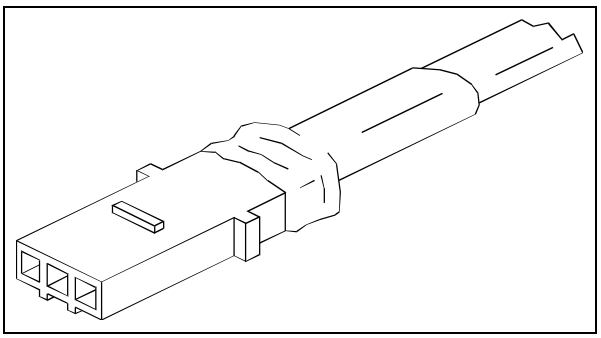


Figure 3-14 1x3 Copper Connector

3.7 Memory Map

The PCI BIOS maps the FX100 into PCI memory and I/O space on power-up. If the FX100 card is in a system that does not provide this address assignment mechanism, the Systran FX100 driver software will assign the addresses. Alternatively, any custom software written for the card must be designed to provide this address assignment.

3.8 Activate the Card

Now that the FX100 card is operational, please refer to the software installation manual for further information on operating the FX100 card. For information about application programming, please refer to the appropriate API guide.

NOTE: If you are NOT using Systran's FX100 driver software, contact Customer Support at Systran for information on writing your own driver software.

WARNING: FX100 cards installed in a PC system will cause the Qlogic Fast!UTIL utility to execute during system boot. Do not attempt to enter this utility or change any of the card parameters as this could render the card inoperable.

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, contact Systran Technical Support at **(800) 252-5601** or **support@systran.com** for assistance.

Please be prepared to supply the following information:

Host Machine: _____
OS Name: _____
OS Version: _____
ASIC Type: _____
Bus Interface: _____
FX100 Card S/N: _____
Error Messages: _____
The last action you performed: _____

3.10 Maintenance

No routine maintenance is required for the FX100 nodes beyond that which is required for the host computer system.

APPENDIX A

SPECIFICATIONS

TABLE OF CONTENTS

A.1 Standard Board Specifications

Hardware Compatibility:

PCI and PMC:	*PCI Local Bus Revision 2.2*
PMC only:	*PMC IEEE P1386.1* *CMC IEEE P1386*
CPCI:	*CompactPCI Specification, Revision 3.0* *CompactPCI Power Interface Specification, Revision 1.0* *Keying of CompactPCI Boards and Backplanes, Revision 1.0*

Physical Dimensions:

PCI:	4.200 in by 6.860 in (106.7 mm by 174.2 mm)
PMC:	2.915 in by 5.866 in (74 mm by 149 mm)
CPCI:	3.98 in by 7.063 in (100 mm by 179.3 mm)

Weight

PCI or PMC:	approximately 0.25 pounds (115 grams)
CPCI:	approximately 0.30 pounds (120 grams)

Electrical Requirements:

PCI/PMC/CPCI:	+5 VDC, 0.8 Amps, 4 Watts

Temperature Range:

Storage:	-40° to +85°C
Operating:	+0° to +50°C

Humidity Range:

Storage:	5% to 90% (noncondensing)
Operating:	20% to 80% (noncondensing)

Network Line Transmission Rate:	1.0625 Gbps
Fibre Channel ASIC:	QLogic ISP2100A or ISP2200A
FX100 Vendor ID:	0x1077
FX100 Device ID for the ISP2100A:	0x2100
FX100 Device ID for the ISP2200A:	0x2200
WWN:	0x10000090 e0xxyyyy xx = type of card yyyy = card's serial number

A.2 Rugged Level 1 Board Specifications

Rugged Level 1 boards have the same specifications as standard boards with the following environmental specifications:

Temperature Range:

- Storage: ..... -40° to +85°C
- Operating: ..... -10° to +70°C

Humidity Range:

- Storage: ..... 0% to 95% (noncondensing)
- Operating: ..... 5% to 95% (noncondensing)

Altitude:

- Storage: ..... 25,000 feet
- Operating: ..... 25,000 feet steady; rapid decompression to 40,000 feet

Vibration:

- Sine: ..... 10 g peak, 10 Hz to 2 kHz
- Random: ..... 0.04 g2/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

A.3 Media Interface Specifications

A.3.1 Short Wavelength Laser Media Interface

Data Rate:	1.0625 Gbps
Compatibility:	100-M5-SN-I (50 µm multimode fiber, no Open Fibre Control) 100M6-SN-I (62.5 µm multimode fiber, no Open Fibre Control)
Connector:	Duplex SC
Cable:	50/125 µm or 62.5/125 µm multimode fiber-optic
Maximum Cable Length:	300 meters
Transmit Power:	-10 to -4 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

Data Rate:	1.0625 Gbps
Compatibility:	100-SM-LL-I (singlemode intermediate distance) 100-SM-LC-L (singlemode long distance, low cost)
Connector:	Duplex SC
Cable:	9/125 µm singlemode fiber-optic
Maximum Cable Length:	10 km
Transmit Power:	-9 to –3 dBm
Transmit Wavelength:	1285 to 1330 nm
Receive Wavelength:	1100 to 1600 nm
Receive Power:	-20 to –3 dBm

A.3.3 HSSDC Copper Media Interface

Data Rate:	1.0625 Gbps
Compatibility:	100-TW-EL-S (shielded balanced cable)
Connector:	HSSDC (“Style-2”)
Cable:	150-ohm Shielded Quad copper
Maximum Cable Length:	Up to 30 meters with equalized cable Up to 25 meters with non-equalized cable

A.3.4 1X3 Copper Media Interface

Data Rate:	1.0625 Gbps
Compatibility:	100-TW-EL-S (shielded pair cable)
Connector:	1x3 header, .025 in. Square posts
Cable:	150-ohm Twinaxial copper

Maximum Cable Length: ..... 10 meters

NOTE: For copper cables, the actual maximum distance will vary according to the specific manufacturer, cable, and connectors used.

A.4 Mean Time Between Failure Data

The MTBF numbers in the following table are based on calculations using Appendix A of MIL-HDBK-217F for a ground-benign environment.

Media Interface Type	PCI MTBF (hr)	PMC MTBF (hr)	CPCI MTBF (hr)
Short Wavelength Laser	347,328	318,318	320,950
Long Wavelength Laser	346,834	317,913	320,539
HSSDC Copper	335,321	308,213	310,680
1x3 Copper	335,321	308,213	310,680

The MTBF numbers in the following table are based on calculations using Bellcore 332, Issue 6, for a ground-benign environment.

Media Interface Type	PCI MTBF (hr)	PMC MTBF (hr)	CPCI MTBF (hr)
Short Wavelength Laser	830,266	693,951	806,300
Long Wavelength Laser	827,518	692,030	803,708
HSSDC Copper	764,858	647,659	744,473
1x3 Copper	764,858	647,659	744,473

APPENDIX B

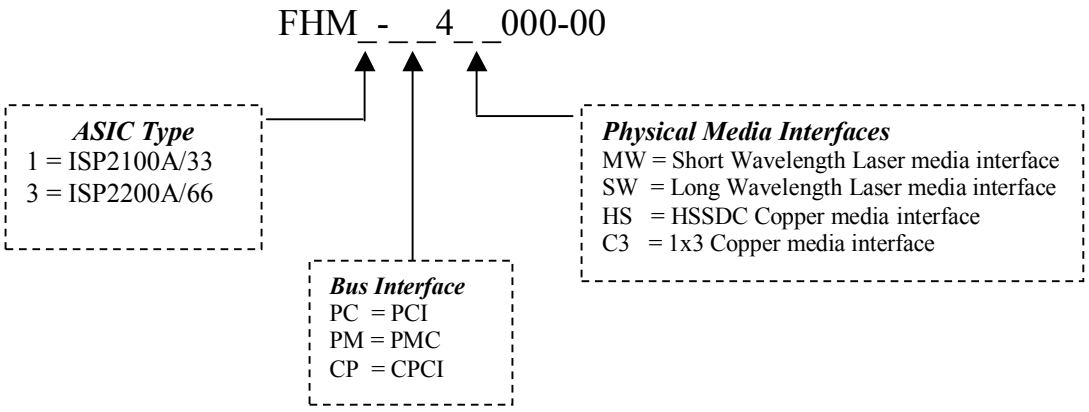
ORDERING INFORMATION

TABLE OF CONTENTS

TABLES

B.1 FX100 Boards

The following Systran FX100 boards listed below are available. Please use the following diagram to determine your appropriate part number:



For example, the part number for an FX100 board with an ISP2200A/66 ASIC, CPCI bus interface, and a Short Wavelength Laser media interface would be:

- FHM3-CP4MW000-00

NOTE: The following combinations are not available:

FHM1-CP4xx000-00

Please call Systran for the latest options list.

B.1.1 FX100 PCI Boards

The following tables list the order numbers for the FX100 PCI board configurations currently available.

Table B-1 FX100 PCI Boards w/ISP2100A/33 ASIC

Order Number	Description
FHM1-PC4MW000-00	PCI with Short Wavelength Laser media interface
FHM1-PC4SW000-00	PCI with Long Wavelength Laser media interface
FHM1-PC4C3000-00	PCI with 1x3 Copper media interface
FHM1-PC4HS000-00	PCI with HSSDC Copper media interface

Table B-2 FX100 PCI Boards w/ISP2200A/66 ASIC

Order Number	Description
FHM3-PC4MW000-00	PCI with Short Wavelength Laser media interface
FHM3-PC4SW000-00	PCI with Long Wavelength Laser media interface
FHM3-PC4C3000-00	PCI with 1x3 Copper media interface
FHM3-PC4HS000-00	PCI with HSSDC Copper media interface

B.1.2 FX100 PMC Boards

The following tables list the order numbers for the FX100 PMC board configurations currently available.

Table B-3 FX100 PMC Boards w/ISP2100A/33 ASIC

Order Number	Description
FHM1-PM4MW000-00	PMC with Short Wavelength Laser media interface
FHM1-PM4SW000-00	PMC with Long Wavelength Laser media interface
FHM1-PM4C3000-00	PMC with 1x3 Copper media interface
FHM1-PM4HS000-00	PMC with HSSDC Copper media interface

Table B-4 FX100 PMC Boards w/ISP2200A/66 ASIC

Order Number	Description
FHM3-PM4MW000-00	PMC with Short Wavelength Laser media interface
FHM3-PM4SW000-00	PMC with Long Wavelength Laser media interface
FHM3-PM4C3000-00	PMC with 1x3 Copper media interface
FHM3-PM4HS000-00	PMC with HSSDC Copper media interface
FHM3-PM4MW000-R1	Rugged Level 1 PMC with Short Wavelength Laser media interface
FHM3-PM4HS000-R1	Rugged Level 1 PMC with HSSDC Copper media interface

B.1.3 FX100 CPCI Boards

The following tables list the order numbers for the FX100 CPCI board configurations currently available.

Table B-5 FX100 CPCI Boards w/ISP2200A/66 ASIC

Order Number	Description
FHM3-CP4MW000-00	CPCI with Short Wavelength Laser media interface
FHM3-CP4SW000-00	CPCI with Long Wavelength Laser media interface
FHM3-CP4C3000-00	CPCI with 1x3 Copper media interface
FHM3-CP4HS000-00	CPCI with HSSDC Copper media interface

B.2 Cables

Systran offers the following cables for use with its FX100 PCI, PMC, and CPCI boards:

B.2.1 Short Wavelength: Multimode Fiber-optic Cable

The following table lists the order numbers for the duplex, 62.5/125 µm multimode fiber-optic cables with dual SC connectors, for use with the short wavelength laser media interface.

Table B-6 Short Wavelength Cables

Order Number	Description
FHAC-M2SC3000-00	3 m duplex cable
FHAC-M2SC5000-00	5 m duplex cable
FHAC-M2SC1001-00	10 m duplex cable
FHAC-M2SC2001-00	20 m duplex cable
FHAC-M2SC3001-00	30 m duplex cable
FHAC-M2SCxxxx-00	Custom duplex cable (call your sales representative for details)

B.2.2 Long Wavelength: Singlemode Fiber-optic Cable

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

Table B-7 Long Wavelength Cables

Order Number	Description
FHAC-S2SC3000-00	3 m duplex cable
FHAC-S2SC5000-00	5 m duplex cable
FHAC-S2SC1001-00	10 m duplex cable
FHAC-S2SC2001-00	20 m duplex cable
FHAC-S2SC3001-00	30 m duplex cable
FHAC-S2SCxxxx-00	Custom duplex cable (call your sales representative for details)

B.2.3 HSSDC Copper: 150-Ohm Shielded Quad Cable

The following table lists the order numbers for the shielded quad cable with HSSDC connectors, for use with the HSSDC copper media interface.

Table B-8 Shielded Quad Cable

Order Number	Description
FHAC-Q2HS1000-00	1 m cable, equalized
FHAC-Q2HS3000-00	3 m cable, equalized
FHAC-Q2HS5000-00	5 m cable, equalized
FHAC-Q2HS1001-00	10 m cable, equalized
FHAC-Q2HS2001-00	20 m cable, equalized
FHAC-Q2HS2501-00	25 m cable, equalized
FHAC-Q2HS3001-00	30 m cable, equalized
FHAC-Q2H95000-00	5 m cable, HSSDC to 9-pin D-sub
FHAC-Q2H35000-00	5 m cable, HSSDC to two 1x3 connectors

B.2.4 1x3 Copper: 150-Ohm Twinaxial Cable

The following table lists the order numbers for the simplex, shielded twinaxial cable with 1x3 connectors, for use with the 1x3 copper media interface.

Table B-9 Shielded Twinaxial Cable

Order Number	Description
FHAC-G13D4000-00	4 m simplex cable
FHAC-G13D1001-00	10 m simplex cable
FHAC-G93T4000-00	4 m duplex cable, two 1x3 connectors to 9-pin D-sub

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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