SGI™ Fibre Channel PCI Option Board and XIO Option Board Owner's Guide

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About This Guide

This guide describes the SGI fibre channel option cards, or host bus adapters (HBAs):

- SGI fibre channel Peripheral Component Interconnect (PCI) board with one copper high-speed style-2 balanced connector (PCI-FC-1PCOP) and SGI fibre channel PCI board with one SC optical connector (PCI-FC-1POPT)

  The PCI option boards are designed for PCI slots in SGI Origin 200 and Origin 200 Gigachannel systems, and connect to SGI fibre channel storage options, the SGI Fibre Channel Hub, and the SGI 8-port or 16-port fibre channel switch.

- SGI XIO board with one copper high-speed style-2 balanced connector (XT-FC-1PCOP) and SGI XIO board with one SC optical connector (XT-FC-1POPT)

  The single-port option boards are designed for XIO slots in SGI Origin 2000, Origin 200 Gigachannel, and Silicon Graphics Onyx2 servers and graphics workstations, and connect to SGI fibre channel storage options, the SGI Fibre Channel Hub, and the SGI 8-port or 16-port fibre channel switch.

- SGI XIO board with two copper DB-9 connectors

  The SGI FC XIO option board (XT-FC-2P) provides two fibre channel ports per board for the Origin 2000, Origin 200 Gigachannel, and Onyx2 systems to connect to SGI fibre channel storage options or to the SGI Fibre Channel Hub. It does not support fabric (fibre channel switches). This board is available in a different format (X9-FC-2P) for the OCTANE chassis.

Audience

This guide is written for owners and users of a Fibre Channel PCI or XIO option board. It presumes general knowledge of fibre channel technology, knowledge of the host system in which the option board is installed, and knowledge of the fibre channel devices to which the option board ports are to be cabled.

Structure of This Document

This guide consists of the following chapters:

- Chapter 1, "Fibre Channel Option Board Features," describes Fibre Channel option boards.
- Chapter 2, "Fibre Channel Basics," provides a brief introduction to the fibre channel standard, architecture, and applications, with regard to SGI fibre channel options.
- Chapter 3, "Fibre Channel Option Board Cabling," describes cables and connections for the boards.

Note: For information on installing the XIO or PCI board, see your workstation or server owner's or installation guide. For Origin 2000 and Onyx2 systems, only qualified support personnel may install XIO boards and set up storage options.

Other Documentation

Besides this manual, have available the owner's or installation guide for the server or workstation in which the Fibre Channel board is installed, and the owner's guide(s) for the peripheral device(s) with which the Fibre Channel board is to interface. If you do not have these guides, you can find the information online in the following locations:

- IRIS InSight Library: from the Toolchest, choose Help > Online Books > SGI EndUser or SGI Admin, and select the applicable owner's or hardware guide.
- Technical Publications Library: if you have access to the Internet, enter the following URL in your Web browser location window: http://techpubs.sgi.com/library/

For a full description of related fibre channel products, see the latest versions of the following:

- SGI fibre channel storage options: *Origin FibreVault and Fibre Channel RAID Owner's Guide*
- SGI Fibre Channel Hub: *Fibre Channel Hub Owner's Guide*
- switches: manuals included with the products

Chapter 1

Fibre Channel Option Board Features

The SGI fibre channel option boards (host bus adapter boards) provide interconnect capability between SGI servers or workstations and various SGI fibre channel storage and interconnect options. Fibre Channel enclosures can be RAID or JBOD ("just a bunch of disks").

This chapter describes the Fibre Channel XIO and PCI option boards that interface between the host system and fibre channel peripherals:

Fibre Channel PCI Option Boards

The half-size 33 MHz SGI PCI fibre channel option boards (PCI-FC-1PCOP and PCI-FC-1POPT) support fibre channel sustained data transfer rates of up to 100 MB/sec with half duplex operation. They provide a high-performance interface between an SGI Origin 200 or Origin 200 Gigachannel host system and the following:

- fibre channel storage (direct connection): one fibre channel arbitrated loop (FC-AL or FCAL) interface can control up to 110 fibre channel disks, such as SGI fibre channel storage options
- SGI 8-port or 16-port switch
- SGI Fibre Channel Hub

This section consists of the following:

Required IRIX Version

The PCI fibre channel option boards require IRIX version 6.5; version 6.5.4 or later is preferred. (Note that the SGI SAN product requires 6.5.5, with a specific patch or later.)

PCI Board Versions

The PCI board is available in two versions, one with a copper fibre channel connector and one with an optical fibre channel connector. Either type of PCI board can be inserted into an Origin 200 or Origin 200 Gigachannel chassis.

Table 1-1 summarizes the SGI FC PCI boards.

Table 1-1 SGI Fibre Channel PCI Boards

Connection	Marketing Code	Part Number
Copper	PCI-FC-1PCOP	9210190
Optical	PCI-FC-1POPT	9210191

Figure 1-1 shows each fibre channel PCI board.

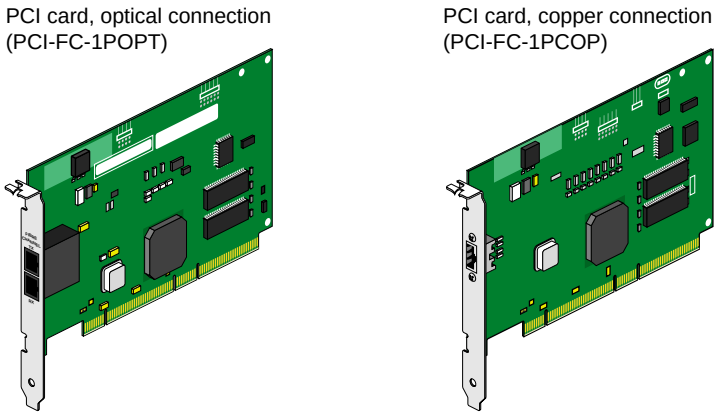

Figure 1-1 Fibre Channel PCI Boards

PCI Board Connectors

The connector on the optical version of the fibre channel PCI board is a standard SC connector.

Figure 1-2 shows pin assignments for the high-speed style-2 balanced cable connector (copper cabling interface) on the copper version of the single-channel PCI board.

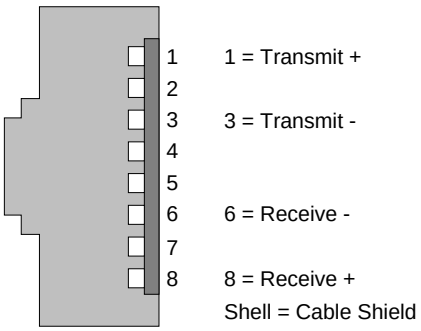

Figure 1-2 PCI Board Style-2 Cable Connector Pin Assignments

Installing the PCI Option Boards

For information on installing PCI boards in the Origin 200 or Origin 200 Gigachannel chassis, see the *Origin200 and Origin200 Gigachannel Maintenance Guide*.

Fibre Channel XIO Option Boards

SGI provides two types of fibre channel XIO option board:

- single-channel XIO boards for Origin 2000, Onyx2, and Origin 200 Gigachannel systems (XT-FC-1PCOP and XT-FC-1POPT)
- dual-channel XIO boards for Origin 2000, Onyx2, and Origin 200 Gigachannel (XT-FC-2P) and for Octane systems (X9-FC-2P)

These option boards and their installation are discussed in separate subsections:

- "Single-Channel XIO Option Boards for Fabric" on page 4
- "Dual-Channel XIO Option Boards" on page 7
- "Installing the XIO Option Boards" on page 12

Single-Channel XIO Option Boards for Fabric

This section describes the single-channel XIO option boards (XT-FC-1PCOP and XT-FC-1POPT) for Origin 2000, Onyx2, and Origin 200 Gigachannel systems in the following subsections:

- "Required IRIX Version" on page 4
- "Single-Channel Board Features" on page 5
- "Single-Channel XIO Board Versions" on page 5
- "Single-Channel XIO Board Connectors" on page 6
- "Single-Channel XIO Board LEDs" on page 7

Required IRIX Version

The single-channel XIO option boards (XT-FC-1PCOP and XT-FC-1POPT) boards require IRIX version 6.5; version 6.5.4 or later is preferred. (Note that the SGI SAN product requires 6.5.5, with a specific patch, or later.)

Single-Channel Board Features

The half-size SGI single-channel fibre channel option boards (host bus adapter boards) provide a high-performance interface between an SGI host system and the following:

- fibre channel storage (direct connection): one FC-AL interface can control up to 110 fibre channel disks, such as those available from SGI
- SGI 8-port or 16-port fibre channel switch
- SGI Fibre Channel Hub or other hub

These 33 MHz boards support fibre channel sustained data transfer rates of up to 100 MB/sec with half-duplex operation.

Single-Channel XIO Board Versions

Table 1-2 summarizes the SGI single-channel XIO boards.

Table 1-2 Single-Channel XIO Option Boards for Fabric

Connection	Marketing Code	Part Number
Copper	XT-FC-1PCOP	013-2810-001
Optical	XT-FC-1POPT	013-2815-001

Figure 1-3 shows each single-channel XIO board.

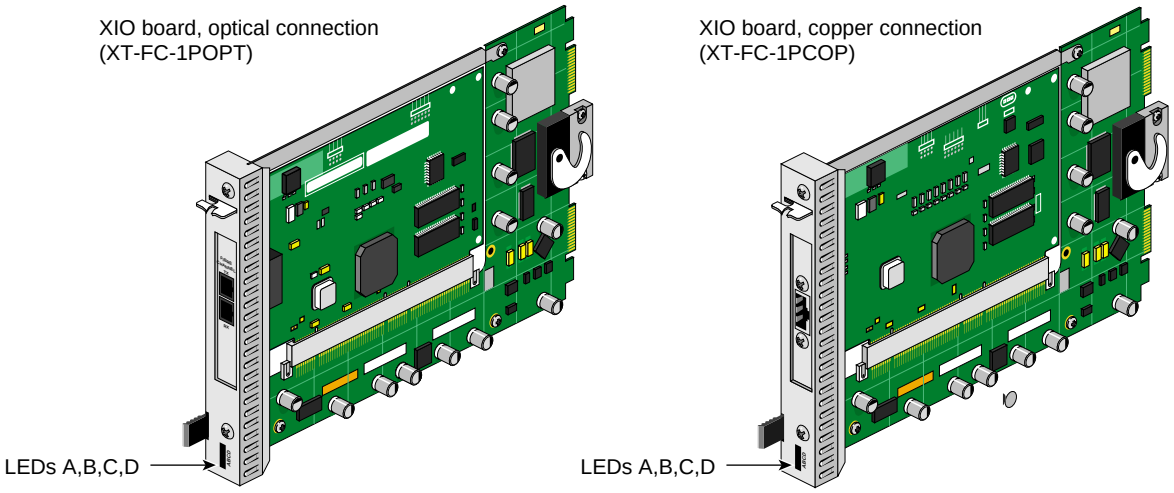

Figure 1-3 Single-Channel XIO Boards

Single-Channel XIO Board Connectors

The connector on the optical version of the single-channel XIO board is a standard SC connector.

Figure 1-4 shows pin assignments for the high-speed style-2 balanced cable connector (copper cabling interface) on the copper version of the single-channel XIO board.

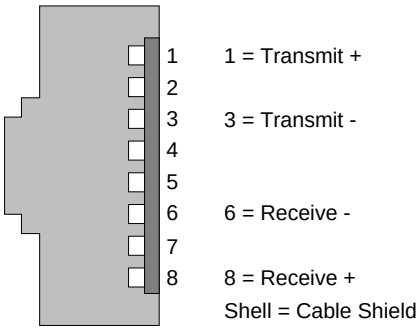

Figure 1-4 Single-Channel XIO Board Style-2 Cable Connector Pin Assignments

Single-Channel XIO Board LEDs

Figure 1-3 points out the four LEDs on the outer part of the single-channel XIO option. When illuminated, the LEDs are green. Table 1-3 summarizes LED operation.

Table 1-3 XIO-to-PCI Converter LED Operating Modes

LED	Purpose	Illuminated	Dark
A	33 MHz PCI clock	PCI clock functioning at 33 MHz	PCI clock not functioning at 33 MHz
B	100 MHz PCI clock	PCI clock functioning at 100 MHz	PCI clock not functioning at 100 MHz
C	Buffer status	Buffer full	Buffer not full
D	Maximum retry timeout status	Maximum retry timeout in process	Maximum retry timeout not in process

Dual-Channel XIO Option Boards

This section describes the dual-channel XIO option boards for Origin 2000, Onyx2, Octane, and Origin 200 Gigachannel systems in the following subsections:

Required IRIX Version

Both dual-channel XIO option boards (XT-FC-2P and X9-FC-2P) require IRIX 6.5 or later, or IRIX 6.4.1 and the June 1999 patch set.

Dual-Channel Board Features

The half-size dual-channel XIO boards (XT-FC-2P and X9-FC-2P) provide the high-performance interface between an SGI workstation or server with an XIO slot and FC-AL interfaces, which connect to fibre channel disk enclosures or the SGI Fibre Channel Hub or another hub. (See Chapter 2, "Fibre Channel Basics," for an explanation of fibre channel topology and architecture.)

The dual-channel XIO boards support fibre channel Class 3 operations as a loop port (L_Port). The firmware supports Class 3 and FC-AL (arbitrated loop) transfers only. For details on ports and FC-AL, see Chapter 2.

Note: These boards do not support fabric, that is, fibre channel switches. For such support, use the single-channel XIO option boards discussed in "Single-Channel XIO Option Boards for Fabric" on page 4.

Dual-Channel XIO Board Versions

The SGI dual-channel XIO board is available in two versions, as summarized in Table 1-4.

Table 1-4 Dual-Channel XIO Option Boards

Platform	Marketing Code	Part Number
Origin 2000, Origin 200, and Onyx2	XT-FC-2P	030-0927-00x
Octane	X9-FC-2P	013-2119-00x

The two versions have identical functionality and differ only in mechanical aspects appropriate to the platforms for which they are intended:

- The version for Origin 2000, Origin 200, and Onyx2 servers and graphics workstations has the hook actuator for the compression connector on the system midplane.
- The version for Octane workstations lacks the hook actuator, which is not needed for this platform and would prevent installation of the board.

Figure 1-5 shows the dual-channel XIO board and connectors (version for Origin 2000, Origin 200, and Onyx2 servers and graphics workstations). Figure 1-5 does not show the board version for Octane workstations, which lacks the hook actuator.

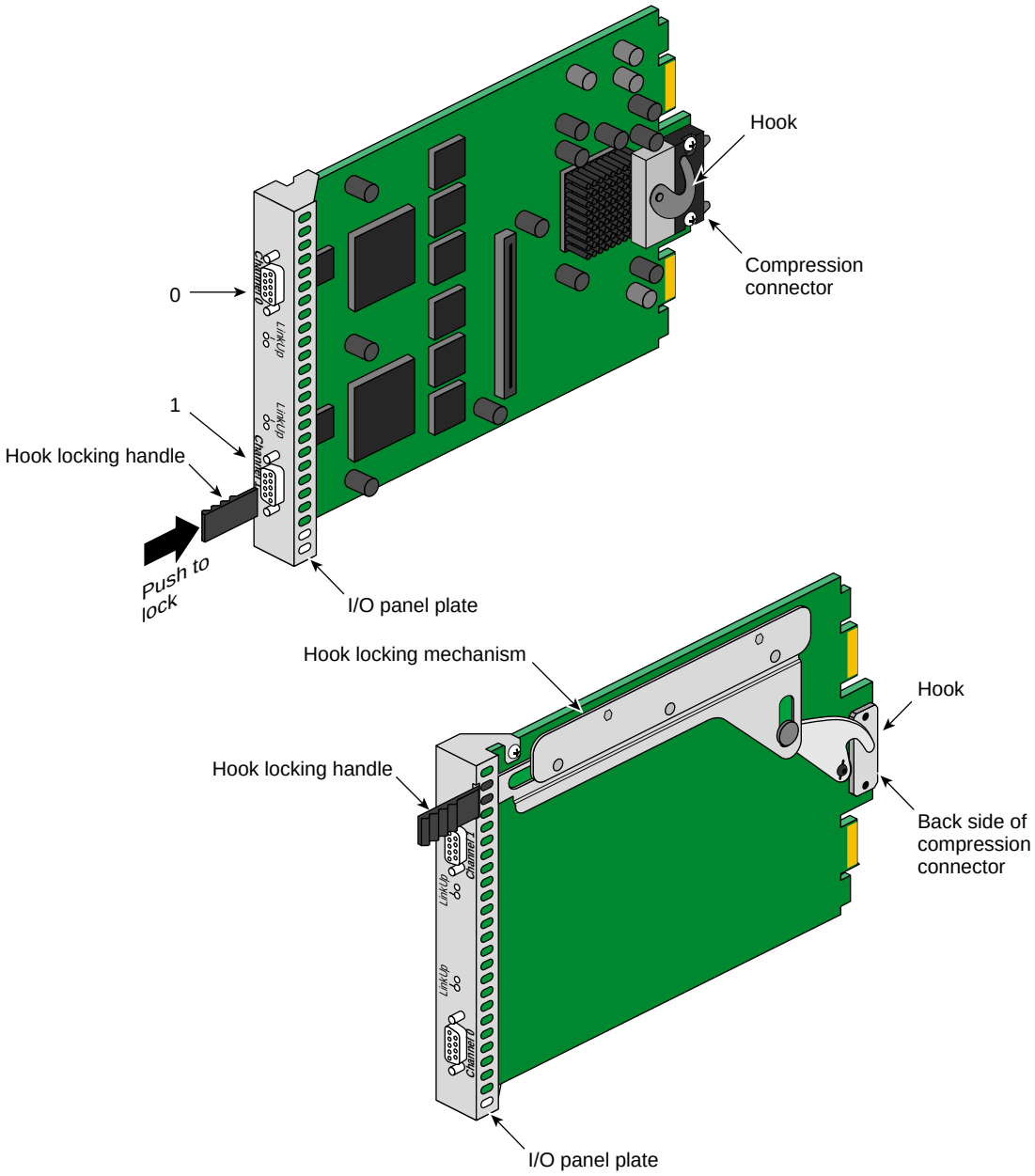

Figure 1-5 Dual-Channel XIO Board and Features (Origin 2000/Onyx2 Version)

Dual-Channel XIO Board Connectors

Each dual-channel XIO board has two nine-pin (DB-9) female connectors, labeled **Channel 0** and **Channel 1**. Each channel can control up to 110 fibre channel disks. Figure 1-6 shows pin assignments.

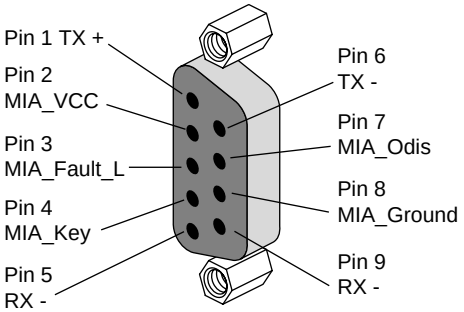

Figure 1-6 Dual-Channel Board Connector Pin Assignments

Both a copper and an optical interface are supported. The native interface is copper, as is standard for FC-AL. To use an optical cable, you must attach a media interface adapter, which is described in "Optional Media Interface Adapter (MIA).".

Dual-Channel XIO Board LEDs

Each connector on the board has a pair of LEDs. The LEDs have these functions:

- The green LED (**LinkUp**) lights and remains on when the board is successfully initialized.
- The orange LED lights and remains on when the loop is successfully initialized.

Optional Media Interface Adapter (MIA)

SGI provides an optional fiber optic media interface adapter (MIA) to enable a connection between the dual-channel XIO option board's DB-9 connectors and fiber optic cabling. For these connections, SGI supports optical cabling distances of 25, 100, or 300 meters. The MIA is used with 62.5 µm optical cable.

The marketing code for the MIA (X-F-OE-KIT) includes two modules (part number 9980952), one for each end of an optical cable.

The MIA uses a shortwave laser (CD-ROM laser) with a wavelength of 780 nm. A full-duplex module, it converts photons to electrons in one direction, and converts electrons to photons in the other direction.

An industry-standard duplex SC connection supplies the external fiber optic connection. This connection consists of two parts: the female part is in the MIA and the male part is on the fiber optic cable connector, as indicated in Figure 1-7. This connection is keyed.

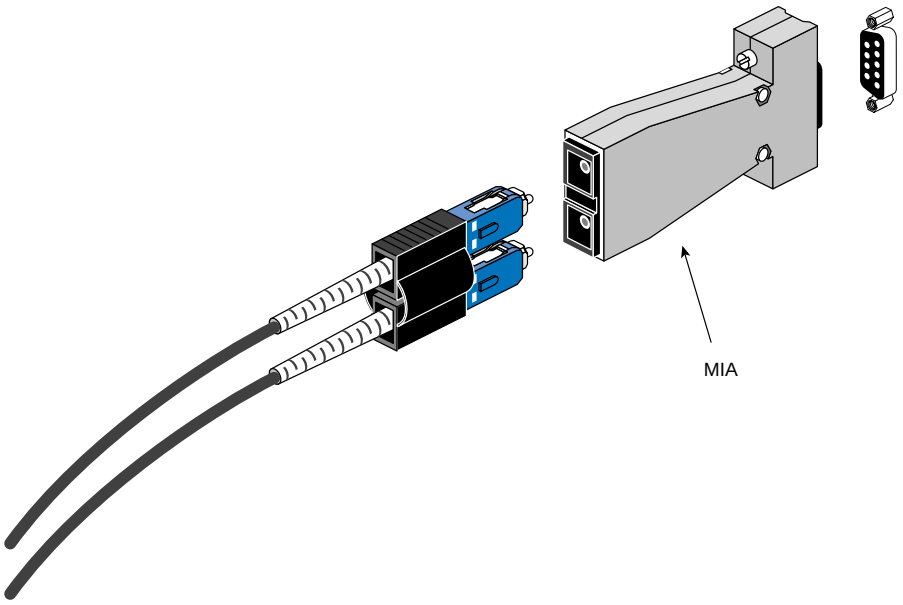

Figure 1-7 Media Interface Adapter (MIA) for Optical Cables

Transceivers (SerDes) embedded on each board convert 8-bit parallel user data to 10-bit differential serial signals (8B10) and vice versa. They also provide frame synchronization, word alignment, and clock recovery for incoming serial data.

For incoming serial data, two recovered clocks at 53.125 MHz for odd or even bytes are provided as outputs on two pins, 180 degrees out of phase. Any required equalization to compensate for high-frequency losses for copper cables (by attenuating the lower frequencies to match) is supplied externally to the Fibre Channel option board. Serial data in both directions between the transformer and the external connector is AC-coupled via a capacitor.

If the dual-channel XIO option board loses power or the physical fibre channel connection is broken, the link that the board is attached to becomes inoperable. High-availability loop configurations require the use of a fibre channel hub.

Installing the XIO Option Boards

The board installation process depends on the type of Silicon Graphics workstation or server you have.

- Origin 2000 and Onyx2 workstations and servers: Contact your factory-authorized field service personnel.
- All other applicable SGI workstations and servers, such as Octane and Origin 200 Gigachannel: See the owner's guide, maintenance guide, or installation guide. If you do not have these guides, the information is also online; see "Other Documentation" on page xii in "About This Guide."

  For the dual-channel XIO board for Octane systems (X9-FC-2P), specific installation documentation is included with this option, namely, the *OCTANE™ XIO Standalone Option Board Installation Guide*.

Chapter 2

Fibre Channel Basics

This chapter provides a brief overview of fibre channel with regard to SGI fibre channel options. It briefly explains

For more information, contact or see the following:

- ANSI Fibre Channel standards: Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, USA (303)-397-0271 or (800)-854-7179 (U.S. and Canada)
- Fibre Channel Association (FCA): http://www.fca.org
- Fibre Channel Loop Community (FCLC): http://fclc.org
- Storage Networking Industry Association (SNIA) http://snia.org

Note: Some information in this chapter was derived from the Fibre Channel Loop Community (FCLC) Web site, and the Fibre Channel Association (FCA) technical information Web site.

The Fibre Channel Standard

Fibre channel is the general name of an integrated set of standards being developed by the American National Standards Institute (ANSI). The fibre channel standard defines a high-speed data transfer interface that can be used to connect workstations, mainframes, supercomputers, storage devices, and displays. The fibre channel standard addresses the need for very fast transfers (specified up to 4 gigabits per second) of large amounts of information. Currently, fibre channel's main use is as an interface to storage.

Conceived as a generic, efficient physical transport system that can support multiple protocols, the standard also relieves system manufacturers of the burden of supporting the variety of channels and networks currently in place, because it provides one standard for networking, storage, and data transfer. Note that this SGI implementation is for communication with mass storage systems only.

Fibre channel can provide a general transport vehicle for Upper Level Protocols (ULPs), including the Intelligent Peripheral Interface (IPI) and Small Computer System Interface (SCSI) command sets, high-performance parallel interface (HIPPI) data framing, Internet Protocol (IP), and IEEE 802.2. Proprietary and other command sets can also use and share the fibre channel, although such use is not defined as part of the fibre channel standard and is not supported by SGI host systems. The SGI implementation currently supports only the SCSI fibre channel protocol.

Note: For a description of SGI fibre channel storage options, see the *Origin FibreVault and Fibre Channel RAID Owner's Guide*.

Networks, Channels, and Fibre Channel

The two most common peripheral protocols for device communication in the computer industry are networks and channels.

Networks

- involve I/O interfaces that usually support many small transactions with relatively high overhead due to software involvement in the flow of information
- allow a host or device in the network to communicate with any other device
- operate in an open, unstructured, and unpredictable environment

Channels

- supply peripheral I/O interface to a host and transport large amounts of data between the host and peripherals
- keep data processing overhead to a minimum by handling data transfer in hardware, with little or no software involvement once an I/O operation begins
- operate in a closed, structured, and predictable environment where all devices that can communicate with a host are known in advance and any change requires host software or configuration table changes

Fibre channel technology attempts to combine the best of these two methods into an I/O interface that meets the needs of both channel users and network users. Fibre channel communications can be conducted over copper twinax, twisted pair, or optical fiber.

Fibre Channel technology provides different interconnect topologies to serve the combined needs of channel and network usages. These topologies are

- fabric
- arbitrated loop, including point-to-point

Currently, SGI supports both these topologies.

Fabric Topology

A fabric is an active, intelligent interconnect scheme for fibre channel servers and storage. Fabric topology permits dynamic interconnections between nodes through ports connected to the fabric.

A fibre channel switch is the cornerstone of the fabric, supporting connectivity of a range of host and storage types. Switches can be cascaded for more complex configurations. Parallel fabrics can provide redundancy. SGI provides an 8-port and a 16-port switch with a number of cabling options. See “Connections for SGI Fibre Channel Options” on page 23 in Chapter 3 for details of connections.

Arbitrated Loop Topology

In fibre channel arbitrated loop (FC-AL or FCAL) topology, each port arbitrates for access to the loop. Ports that “lose” the arbitration act as repeaters of all traffic on the loop. The loop is a dedicated transmit channel and a dedicated receive channel that are clad together into one cable to form a loop out and back. This protocol allows up to 127 ports connected in a serial loop (one FL_Port and 126 NL_Ports). SGI supports a maximum of 110 disks in a single rack.

Ports are called Node Ports (N_Ports), Node_Loop Ports (NL_Ports), Fabric_Ports (F_Ports), or Fabric_Loop Ports (FL_Ports).

An NL_Port represents each disk in a disk array. Each NL_Port sees all messages and passes messages not addressed to that port. Ports passing messages are said to be in “repeat mode.”

The SGI Fibre Channel Hub, an intelligent digital hub for FC-AL storage clusters, provides gigabit-speed storage connectivity, network management, data reliability, and module network scalability for SGI storage configurations. The hub uses copper cabling, and optical cabling with MIAs. Its ten FC-AL ports can function as a single loop, can be segmented into two five-port loops, or can be connected (cascaded) with one more Fibre Channel Hub to form one 18-port loop.

Point-to-Point Topology

In point-to-point host applications, two ports are connected to a link. The transmitter of each port is connected directly to the receiver of the opposite port. This topology limits the number of connections that can be made across the wire.

Fibre Channel Applications

Figure 2-1 shows fibre channel in the overall Origin 2000 and Onyx2 I/O structure.

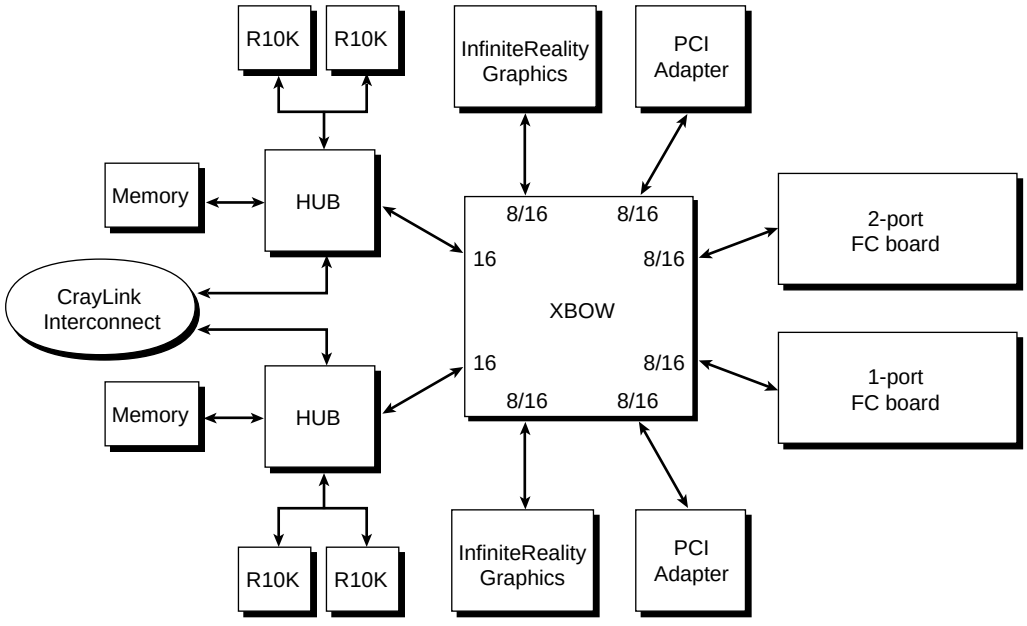

Figure 2-1 Fibre Channel in the Origin 2000 and Onyx2 I/O Structure

Fibre channel is useful for a variety of applications:

- scientific graphics and video markets, which use high bandwidth rates with large I/O requests
- fileserver and database markets, which must support large amounts of I/Os per second (IOPS) with relatively small random I/Os

  High-availability RAID is also a requirement for this market. Fibre channel RAID addresses the needs of this market by supporting several disks in a well-balanced access pattern on a single arbitrated loop. The arbitrated loop also provides an arbitration fairness scheme that prevents high-priority requests from starving low-priority requests. For more information on high availability and RAID within fibre channel options, see the *Origin FibreVault and Fibre Channel RAID Owner's Guide*.

Chapter 3

Fibre Channel Option Board Cabling

This chapter describes cables for the Fibre Channel XIO and PCI option board in the following sections:

Cables and GBICs for SGI Fibre Channel Options

For SGI fibre channel storage, copper cabling is standard and optical is optional. Note the following:

- Two 10-meter copper cables (DB-9 connectors at each end) are shipped with the Fibre Channel dual-channel XIO option boards.
- No cables are shipped with the single-channel XIO option boards or with the PCI option boards.
- No cables are included with the SGI Fibre Channel Hub or switches, or with the Origin FibreVault or Fibre Channel RAID enclosures.

  Cables can be ordered separately from SGI.

This section discusses cables for SGI fibre channel options in the following subsections:

FC Cables Available From SGI

Table 3-1 summarizes copper and optical cables available from SGI.

Table 3-1 SGI Fibre Channel Cabling Options

Cable	Length	Marketing Code	Part Number
FC optical cable (62.5 µm, for shortwave fiber optic transmissions)	3 m (9.8 ft)	X-F-OPT-3M	018-0656-001
	10 m (32.8 ft)	X-F-OPT-10M	018-0656-101
	25 m (82 ft)	X-F-OPT-25M	018-0656-201
	50 m (164 ft)	X-F-OPT-50M	018-0656-501
	100 m (328 ft)	X-F-OPT-100M	018-0656-301
Note: This 300 m cable is supported only with MIAs for use with the SGI Fibre Channel Hub and SGI fibre channel storage.	300 m (984 ft)	X-F-OPT-300M	018-0656-401
FC copper cable, high-speed style-2 balanced cable connector at each end	1 m (3.28 ft)	X-FSW-COP-1M	N/A
	3 m (9.8 ft)	X-FSW-COP-3M	N/A
	12 m (39.36 ft)	X-FSW-COP-12M	N/A
FC copper cable, high-speed style-2 balanced cable connector to DB-9	3 m (9.8 ft)	X-FS-COP-3M	N/A
	12 m (39.36 ft)	X-FS-COP-12M	N/A
	25 m (82 ft)	X-FS-COP-25M	N/A
FC copper cable with DB-9 at each end	0.3 m (1 ft)	X-F-COP-0.3M	9470156
Note: Two of these 10 m cables are included with each 2-port FC XIO board (XT-FC-2P and X9-FC-2P).	10 m (32.8 ft)	X-F-COP-10M	018-0570-001
	25 m (82 ft)	X-F-COP-25M	018-0571-001
Two media interface adapter (MIA) modules (FC copper-to-optical)	N/A	X-F-OE-KIT	9980952

Note: For characteristics of the cables, see Table 3-2.

Cable Characteristics

Table 3-2 summarizes characteristics for copper and fiber optic cables available from SGI.

Table 3-2 Characteristics of SGI FC Cables

Characteristic	Optical (X-F-OPT-*n*M)	Copper (X-FSW-COP-*n*M)	Copper (X-FS-COP-*n*M)	Copper (X-F-COP-*n*M)
Variant	100-M6-SN-I	100-TW-EL-S full-duplex (quad conductor)	100-TW-EL-S full-duplex (quad conductor)	100-TW-EL-S full-duplex (quad conductor)
Range	At least 175 m (depends on device)	12 m maximum	12 m with switch; 25 m point-to-point	25 m maximum
Transmitter	Optical laser: 780 nm	PECL	PECL	PECL
Medium	62.5 µm multimode SC, 160 MHz/km	1 m and 3 m: 30 gauge unequalized 12 m: 23 gauge unequalized	3 m: 30 gauge unequalized 12 m: 23 gauge unequalized 25 m: 23 m equalized	10 m and under: 30 gauge unequalized 12 m: 23 gauge unequalized 25 m: 24 gauge equalized
Connectors	SC duplex on each end	High-speed style-2 balanced on each end	Male DB-9; high-speed style-2 balanced	Male DB-9 on each end

Shortwave fiber is 62.5 µm or 50 µm multimode; longwave fiber is 9 µm single-mode.

Cable Distances and Shielding

The SGI Silicon Graphics 62.5 µm optical cables support a maximum distance of 100 m or, with MIAs, 300 m.

The three types of SGI copper cable are fully shielded, full-duplex, balanced cables capable of supporting distances of 12 meters at the 1.0625 Gbaud transfer rate.

The shield on the DB-9 connector (used in X-F-COP-*n*M and X-FS-COP-*n*M) connects directly to the connector shield, providing a DC ground on both ends.

The high-speed style-2 connector (used in X-FSW-COP-*n*M and X-FS-COP-*n*M) also connects directly to the connector shield, providing a DC ground on both ends.

GBICs Available From SGI

GBICs (gigabit interface connectors) are adapters used on the SGI 8-port and 16-port fibre channel switches to interface with cables. Table 3-3 outlines GBICs available from SGI for its fibre channel switches.

Table 3-3 GBIC Kits for the SGI Fibre Channel Switch

GBIC Type	Kit Marketing Code	Quantity	Part Number	Use With These Cables
Copper	XCOPGBIC	6	9470357	X-FSW-COP-1M X-FSW-COP-3M X-FSW-COP-12M X-FS-COP-3M (unequalized) X-FS-COP-12M (unequalized) X-FS-COP-25M (equalized)
Shortwave optical	XSWOPTGBIC	6	9470358	X-F-OPT-3M X-F-OPT-10M X-F-OPT-25M
Longwave optical	XLWOPTGBIC	2	9470359	X-F-OPT-100M; also with longer cables not supplied by SGI

For short distances, a passive copper GBIC (XCOPGBIC) is available from SGI, which supports

- cabling for distances up to 12 m; use this cabling with the SGI 8-port and 16-port fibre channel switches
- cabling for distances up to 25 m and equalized 22 AWG cabling for distances up to 25 m; use this cabling for a direct connection to storage

For intermediate distances, a shortwave GBIC (XSWOPTGBIC) is available from SGI, which supports

- 62.5 µm optical cabling for distances up to 100 m (cables available from SGI)
- 50 µm optical cabling for distances up to 500 m (cables not available from SGI)

For long distances, a longwave GBIC (XLWOPTGBIC) is available from SGI, which supports optical cabling for distances to 10 km (cabling not available from SGI).

See “Cable Characteristics” on page 21 for more information on these cables. For distance considerations with respect to cables, see “Connections” on page 23.

Connections for SGI Fibre Channel Options

This section explains the various fibre channel option board connections and the cables required for each, in these subsections:

Connections

Table 3-4 lists the cables required for specific connections.

Table 3-4 SGI FC Cable Connections

From SGI FC Device	To SGI FC Device	Distance (m)	GBIC/MIA at Source Device	Cable and Type		GBIC/MIA at Target Device
PCI, style-2 copper connector (PCI-FC-1PCOP), or single-channel XIO board, style-2 copper connector (XT-FC-1PCOP)	FC storage	3 to 25	None	X-FS-COP-*n*M	Copper	None
	FC Hub	3 to 25	None	X-FS-COP-*n*M	Copper	None
	FC switch	1to 12	None	X-FSW-COP-*n*M	Copper	Copper GBIC
PCI, SC optical connector (PCI-FC-1POPT), or single-channel XIO board, SC optical connector (XT-FC-1POPT)	FC storage	3 to 100	None	X-F-OPT-*n*M	Optical	MIA
	FC Hub	3 to 100	None	X-F-OPT-*n*M	Optical	MIA
	FC switch	3 to 100	None	X-F-OPT-*n*M	Optical	SW GBIC
Dual-channel XIO board, copper DB-9 connector (XT-FC-2P, X9-FC-2P)	FC storage	0.3 to 25	None	X-F-COP-*n*M	Copper	None
		3 to 100	MIA	X-F-OPT-*n*M	Optical	MIA
	FC Hub	0.3 to 25	None	X-F-COP-*n*M	Copper	None
		3 to 100	MIA	X-F-OPT-*n*M	Optical	MIA
Fibre Channel Hub	FC storage	0.3 to 25	None	X-F-COP-*n*M	Copper	None
		3 to 100	MIA	X-F-OPT-*n*M	Optical	MIA
	FC Hub	0.3 to 25	None	X-F-COP-*n*M	Copper	None
8-port or 16-port fibre channel switch	FC storage	0.3 to 25	Copper GBIC	X-FS-COP-*n*M	Copper	None
		3 to 100	SW GBIC	X-F-OPT-*n*M	Optical	MIA
	FC Hub	0.3 to 25	Copper GBIC	X-FS-COP-*n*M	Copper	None
		3 to 100	SW GBIC	X-F-OPT-*n*M	Optical	MIA

For distances to 10 km, use a longwave GBIC and 50 µm fiber optic cabling; this cabling is not available from SGI.

For information on cabling SGI fibre channel storage options to the Fibre Channel XIO or PCI board, see the *Origin FibreVault and Fibre Channel RAID Owner's Guide*. In the case of Origin 2000 and Onyx2 systems, only qualified SGI support personnel can install the boards and cable the options.

Copper cabling is recommended over optical cabling for the following situations:

- Fibre channel switch is inside the fibre channel storage rack.
- Fibre channel switch is next to storage rack and uses the same ground.
- Switch is next to CPU and uses the same ground.
- A switch is cabled to another switch, for cost reasons (unless distance warrants use of optical cable).

Figure 3-1 diagrams example connections for SGI fibre channel options.

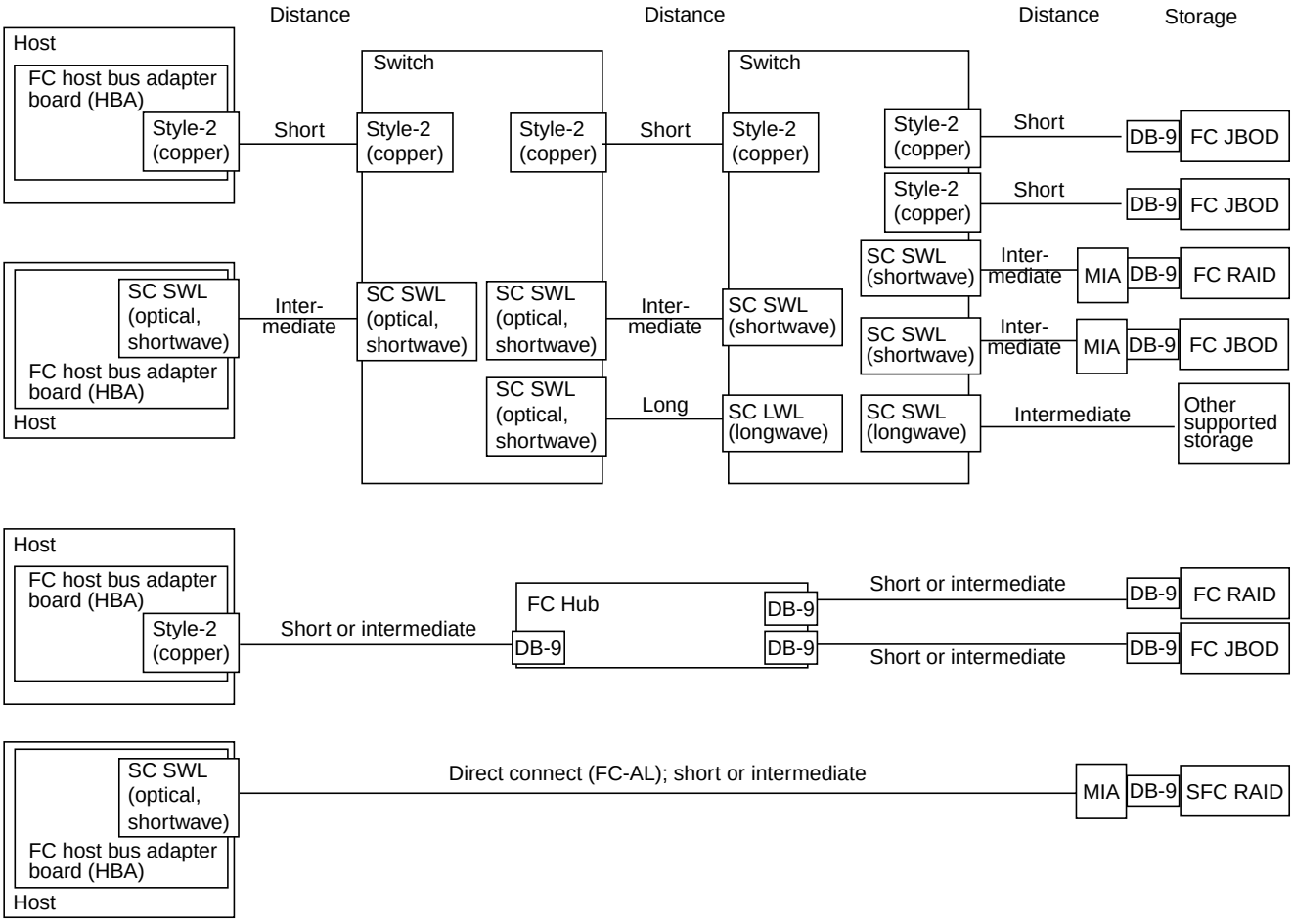

Figure 3-1 Example Connections for SGI Fibre Channel Options

In Figure 3-1:

- direct connect refers to a connection from HBA to storage
- short distances are 25 m or less, intermediate distances are 500 m or less, and long distances are 500 m to 10 km

Note: The use of SGI FC JBOD with the fibre channel switch is not supported in initial releases of the SGI SAN and switch products.

Caution: If a host system and a fibre channel enclosure are on separate building grounds, grounding problems may arise when this cabling is connected with a copper cable utilizing a DC ground shield on both ends. In this case, use fibre optic cabling to link host and enclosure. See "Checking the Grounding in Configurations Using Copper Cabling" for more information.

Cable Interoperability

To maintain acceptable quality and signal integrity, use only copper and optical cables from SGI with your SGI fibre channel enclosures. If you use both 62.5 µm and 50 µm fibre optic cabling in the same environment, use the same gauges for a patch cord and a trunk.

If your configuration uses cables and GBICs other than those available from SGI, support is limited.

Checking the Grounding in Configurations Using Copper Cabling

Grounding is very important in Origin family systems. Each chassis must be well grounded through its power connector. All chassis with XIO boards with copper cables connected to them must share the same transformer, be grounded through the same earthing rod, and be on the same branch circuit. If you have any doubts about the quality of the ground connection, consult a qualified electrician.

Use of an optical cable between the fibre enclosure(s) and the host XIO connection eliminates any problems related to common grounding.

Caution: Any difference in ground potential greater than 500 millivolts (0.5 volts) between two chassis connected by copper XIO cables can cause severe equipment damage and can create hazardous conditions.

The branch circuit wiring must have an insulated grounding conductor that is identical in size, insulation material, and thickness to the earthed and unearthed branch-circuit supply conductors. The grounding conductor should be green, with or without one or more yellow stripes. This grounding or earthing conductor should be connected to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator set. The power receptacles in the vicinity of the systems should all be of an earthing type, and the grounding or earthing conductors serving these receptacles should be connected to earth at the service equipment.

Cable Labels

Included in the fibre channel option board shipment is a label kit for identifying fibre channel cable connectors. After identifying (and perhaps diagramming) all cable connections for your configuration, it is a good idea to label each end of each cable before attaching the cable. You can also use these labels to identify, for example, the FC option board that is connected to a particular fibre channel storage enclosure, fibre rack, fabric, or loop.

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