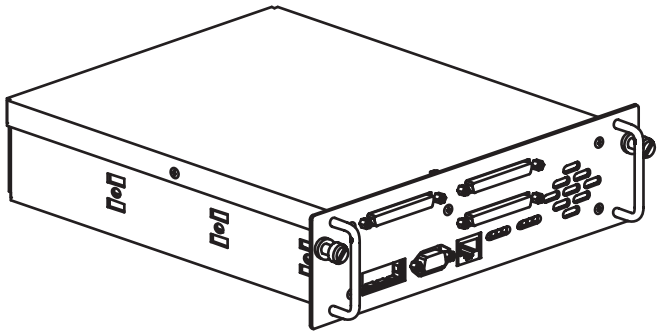
adic

Scalar 100 FCR-1 Module

Installation and Operating Guide



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ADIC® Scalar 100 FCR-1 Module

Fibre Channel-to-SCSI

User Manual

Revision A

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Copyright Notice

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ADIC® Scalar 100 FCR Module

Fibre Channel-to-SCSI

User Manual
Revision A
4/19/00

Safety Instructions

Failure to follow these safety instructions can result in serious injury or death.

WARNING

A WARNING denotes a hazard that can cause personal injury.

CAUTION

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

Grounding

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

Servicing

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

Warranty

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

Laser Safety

See page *ix* for laser safety instructions.

Regulatory Statements

Federal Communications Commission Notice (US Only)

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

IEC Statement (Worldwide)

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

Canadian Notice (Avis Canadien)

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

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

European Union Notice

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

EN55022 (CISPR 22) – Electromagnetic Interference
EN50082-1 (IEC801-2, IEC801-3, IEC801-4) – Electromagnetic Immunity
EN60950 (IEC950) – Product Safety

VCCI Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＢ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

German Statements

Sicherheitshinweise

WARNUNG

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

ACHTUNG

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

Schutzerdung

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

Wartung/Instandsetzung

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

WARNUNG

Oeffnen Sie niemals das Gehaeuse ! Gefahr des Elektrischen Schlages !

WARNUNG

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

WARNUNG

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

WARNUNG

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

Regulatory Approvals

Product Safety

- EN 60950 (IEC 950) 2nd Edition 1991 including Amendments 1(1992), 2 (1993), 3 (1995), 4(1996)
- EN 60825-1 European Laser Approvals Class 1
- CB Scheme Report and Certificate valid and conforming with IEC 950 2nd Edition, including Amendments 1(1992), 2 (1993), 3 (1995), 4(1996) and all group deviations listed in latest revision of CB Bulletin No. 86A I
- UL Approval to UL1950 3rd. Edition
- CSA Approval through use of the cUL marking in compliance with CSA C22.2 950 1995 3rd. Edition
- TÜV Approval for the "GS" mark in compliance with EN 60950 (VDE 0805/11.92) 2nd Edition 1991 including Amendments 1(1992), 2 (1993), 3 (1995), 4 (1996)

EMI/EMC

- FCC part 15 Class B requirements using the EN 55022 (CISPR 22) Class B limits and the ANSI C63.4 procedures.
- C.I.S.P.R. 22 requirements using the EN 55022 (CISPR 22) Class B limits. Testing Radiated Emissions at 10 Meters, and Conducted Emissions with line voltages of 120VAC/60Hz, and 230VAC/50Hz.
- Canadian Approval with compliance to ICES-003 Class-B. This coincides with the FCC part 15 Class B requirements.
- CE compliance with the following standards for the EMC and LVD directives for Europe:

EN55024:1998	Information Technology Equipment, Immunity Characteristics, Limits and Methods of Measurements
EN 61000-4-2	Electrostatic Discharge 4kV contact, 8kv air discharges
EN 61000-4-4	Electrical Fast Transients, 2kV I/O, 4kV power
EN 61000-4-5	Surge, 2kV
EN 61000-4-6	Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
EN 61000-4-8	Power Frequency Magnetic Field Immunity Test
EN 61000-4-11	Voltage Dips and Interruptions
EN 61000-3-2	Harmonics, and Flicker
EN 61000-3-3	Voltage Fluctuations
ENV 50204	Radiated RF Immunity 900MHz @ 10V/m

Laser Safety

Certification and Classification Information

This product uses a Gigabit Interface Converter (GBIC) to interface with Fibre Channel links. The Optical GBIC shipped with this product contains an internal laser. In the USA, any optical GBIC shipped with this unit is certified as a Class 1 laser product and conforms to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR Subchapter J.

Outside the USA, any GBIC shipped with this product is certified as a Class 1 laser component that conforms to the requirements contained in the International Electrotechnical Commission (IEC) standard 825 (1994) and Amendment 1 (1990) along with the CENELEC (European Committee for Electrotechnical Standardization) European Normalization standard EN 60825 (1992).

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

Certifications include one or more of the following:

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

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

Class 1 Laser Product Laser Klasse 1 Luckan 1 Laserlaite

The following information provides the typical operational parameters for the Optical Laser GBIC included with the Scalar 100 FCR Module.

Laser Information

Parameter	Shortwave	Longwave
Nomenclature	100-M5-SN-I	100-SM-LC-L
Spectral Centre Wavelength	770-850nm	1300nm
Operating Range	2m-500m	2m-10km
Launch Power Max	1.3 dBm	-3 dBm
Launch Power Min	-7 dBm	
Receive Power Min	-13 dBm	-20 dBm
Receive Power Max	1.3 dBm	-3 dBm
Extinction Ratio	6 dB	9 dB
TX Deterministic Jitter	20 ps	20 ps
Fiber Diameter	50um	9um
Class	Multimode	Single-mode
Nominal Bit Rate	1062.5 Mbits	1062.5 Mbits
OFC	none	none

Class 1 Laser Products are not considered hazardous.

Product Information

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

WARNING

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

Usage Restrictions

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

Chapter 1

Introducing the ADIC Scalar 100 FCR-1 Module

Designed for the Scalar 100 Library, the ADIC Scalar 100 FCR-1 Module Fibre Channel-to-SCSI Storage Router provides connectivity between a Fibre Channel Switched Fabric (FC-SW) or Fibre Channel Arbitrated Loop (FC-AL), and three Fast/Wide/Ultra-2 SCSI buses.

How the Scalar 100 FCR-1 Module Works

The Scalar 100 FCR-1 Module is a storage router that translates the Fibre Channel Protocol (FCP) to and from three SCSI buses so devices on these two types of media can communicate with each other. It attaches to either a Fibre Channel or SCSI host, and transfers the command, data, and status information to SCSI or Fibre Channel targets. Packets are transferred transparently by the Scalar 100 FCR-1 Module from host to targets and vice versa.

The Scalar 100 FCR-1 Module provides interconnection between for three SCSI buses and a Fibre Channel Arbitrated Loop or Switched Fabric. It takes advantage of Fibre Channel's ability to encapsulate SCSI protocol packets to allow a host with a FC or SCSI adapter to access SCSI or FC peripheral devices transparently over a FC connection.

Figure 1-1. Fibre Channel-to-SCSI configuration

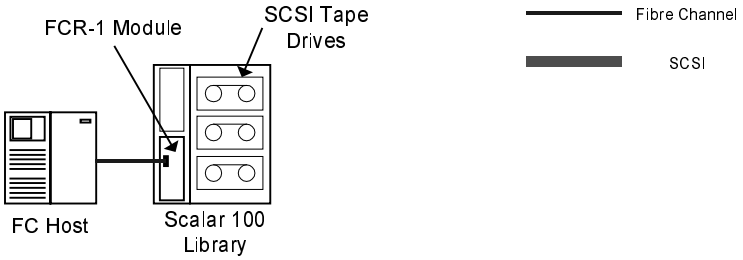


Figure 1-1 shows a Fibre Channel-to-SCSI configuration. Through the Scalar 100 FCR-1 Module, any host on the Fibre Channel loop can access the tape drive and library on each SCSI bus. Figure 1-2 shows the exterior side of the Scalar 100 FCR-1 Module.

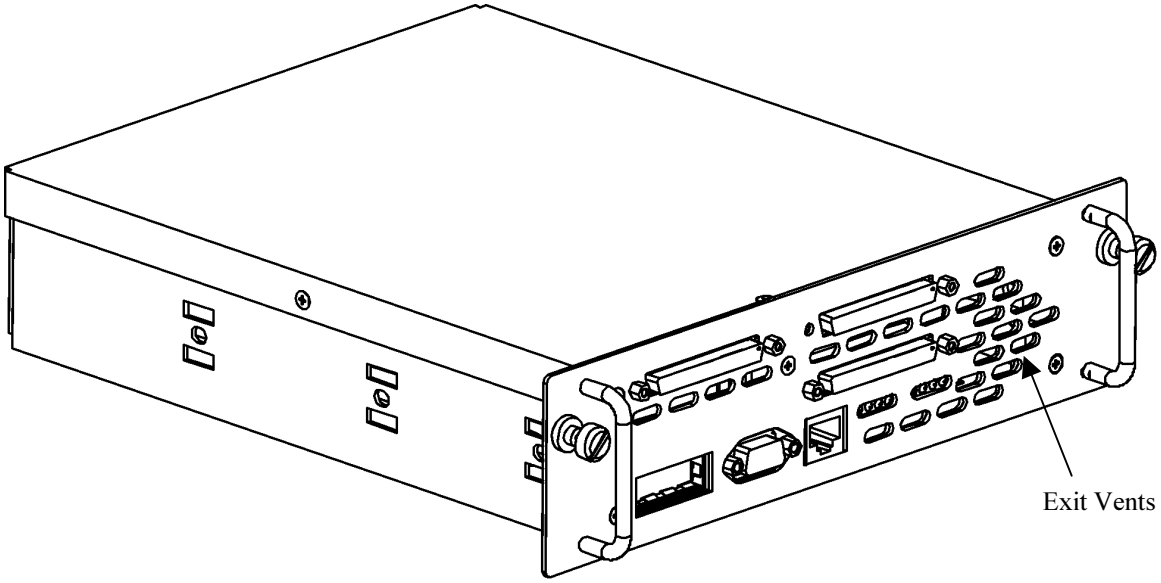


Figure 1-2. Illustration of Scalar 100 FCR-1 Module

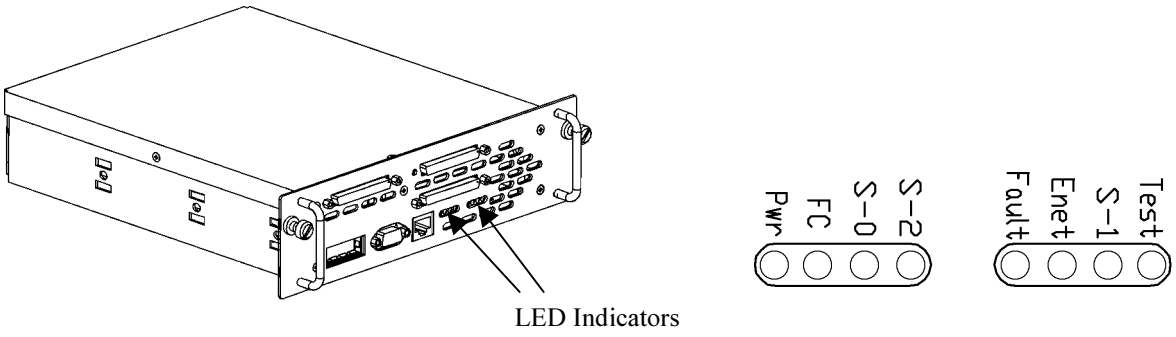
The air exit vents shown in Figure 1-2 provide cooling for the unit during operation and should always remain unobstructed. The air intake vents are located on the rear side.

SCSI and Fibre Channel interfaces are found on the exterior side of the Scalar 100 FCR-1 Module. In addition, Ethernet and Serial interfaces provide the means for configuring and managing the unit. The LED's (operation indicators) provide basic status information about the unit. For proper operation of the Scalar 100 FCR-1 Module, cable connections should remain securely in place.

Operation LED Indicators

The Scalar 100 FCR-1 Module is equipped with exterior side LED indicators (refer to Figure 1-3 below) for monitoring overall unit status.

Figure 1-3. Scalar 100 FCR-1 Module LEDs



The LED functionality is detailed below:

- The *Pwr* indicator turns on when power is applied to the router. Lack of power indication suggests the unit being turned off, a problem with the power supplied to the unit, or an internal problem with the unit.
- The *Fault* indicator is lit when the Scalar 100 FCR-1 Module detects a fault condition. Faults can occur as a result of Power On Self Test (POST) failure or operational failures. It is normal for this indicator to flash on when the unit is powered up or reset. If the fault indicator stays lit, contact ADIC support.
- The *FC* indicator shows Fibre Channel activity when lit. If this indicator fails to light at all, or stays continually lit without corresponding SCSI bus activity, it may indicate a problem with the Fibre Channel link. Verify the Fibre Channel Configuration.
- The *Enet* indicator signifies Ethernet activity when lit. If the light fails to flicker, or if it stays continuously lit, it may indicate a problem with the network connection. Verify the network connection. The port must be connected to a 10/100BaseT Ethernet network to function properly.
- The *S-0, S-1, and S-2* indicators show SCSI activity (when lit) on the bus indicated (Bus 0, 1, or 2). This should only occur briefly during power up or configuration, and relatively often when the unit is transferring data. If the SCSI indicator stays continually lit without corresponding target device activity, it may indicate a problem with the SCSI bus configuration. Verify the SCSI bus configuration.
- The *Test* indicator is reserved for special diagnostics and should only be used by an authorized service representative.

Operating as Both a SCSI and Fibre Channel Device

The Scalar 100 FCR-1 Module is both a SCSI and a Fibre Channel device operating on a SCSI bus and Fibre Channel network simultaneously.

The SCSI Side

On a SCSI bus, the Scalar 100 FCR-1 Module acts as a SCSI initiator or target passing requests from hosts on the Fibre Channel network to target devices on the SCSI bus. Each Scalar 100 FCR-1 Module SCSI bus uses one or more SCSI IDs. The default Initiator ID is 7 and can be changed when configuring the Scalar 100 FCR-1 Module.

The Fibre Channel Side

In a Fibre Channel loop, the Scalar 100 FCR-1 Module is identified by a single Arbitrated Loop Physical Address (AL_PA) or a fabric assigned Source ID. Once the address is acquired, any host on the Fibre Channel loop can access the devices on a SCSI bus transparently over a FC connection.

Mapping Devices

To allow Fibre Channel and SCSI devices to address each other, the Scalar 100 FCR-1 Module creates tables mapping device identifiers for Fibre Channel to SCSI and for SCSI to Fibre Channel. During Scalar 100 FCR-1 Module configuration, you can choose the mapping methods and, in certain cases, customize device mappings. See Chapter 3 for more information about address modes and their configurations.

Processing SCSI Information

The following section describes how the Scalar 100 FCR-1 Module processes SCSI information. Figure 1-4 illustrates steps 1 through 5 of the process.

1. A FC host issues a command. The FC host encapsulates the command in the FCP protocol and sends the packet to the Scalar 100 FCR-1 Module.

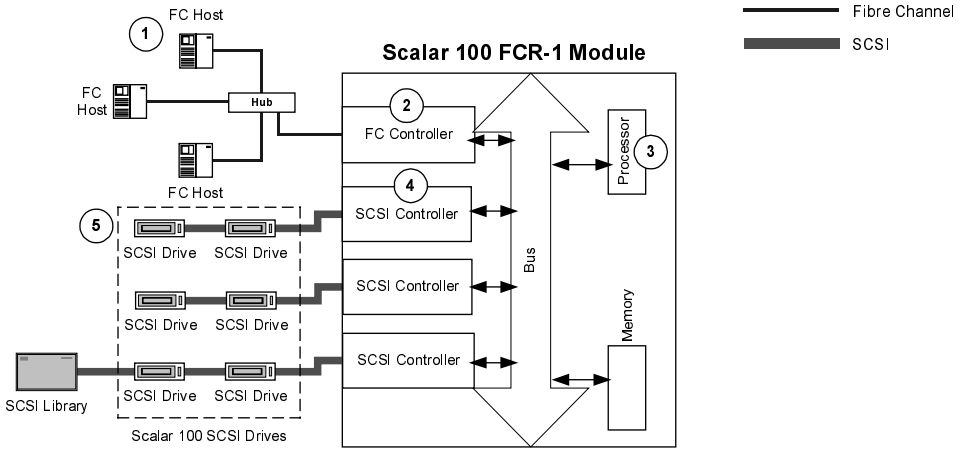
2. The FC controller in the Scalar 100 FCR-1 Module receives the packet, interprets the FC information, and places the packet in buffer memory.

3. The Scalar 100 FCR-1 Module's processor interprets the information and programs a SCSI controller to process the transaction.

4. The SCSI controller sends the command to the SCSI drive.

5. The SCSI drive interprets the command and prepares to either read or write data.

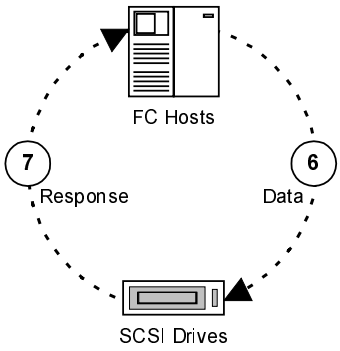
Figure 1-4. Information processing



6. Data flows between the FC host and SCSI drive through payload buffers. See Figure 1-5.

7. Response information flows from the SCSI drive back to the FC host. See Figure 1-5.

Figure 1-5: Flow of Data and Responses



Extended Copy

Extended Copy utilizes ANSI-Standard SCSI-3 Extended Copy functionality to increase overall system performance. By allowing the server to off-load certain backup tasks to the storage router, Extended Copy frees up valuable CPU resources on the server to provide full availability of mission critical applications.

Figure 1-6. Server Requests a Backup Operation

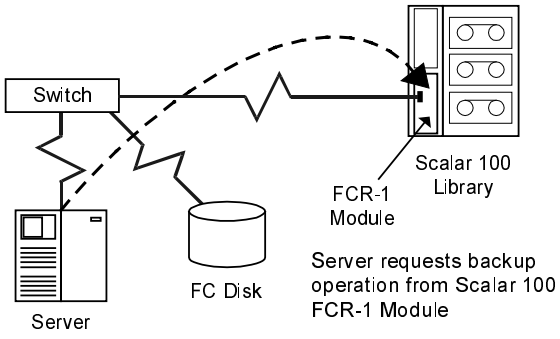
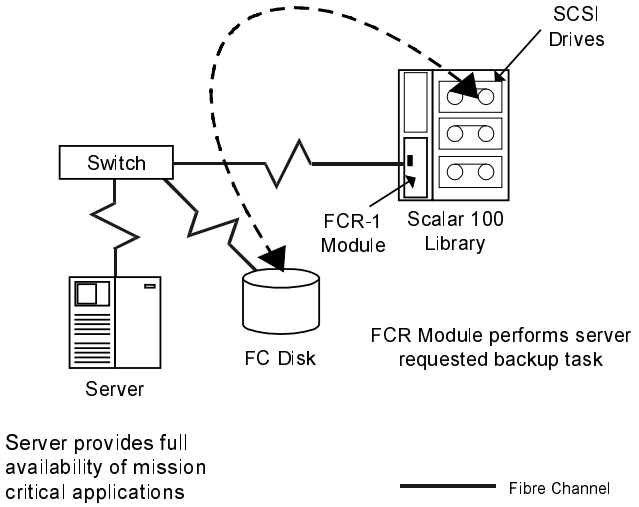


Figure 1-7. Router Performs Server Requested Backup



Scalar 100 FCR-1 Module Features

Fibre Channel Features

- Fibre Channel Initiator Mode
- Single 1.0625 Gbps port
- Fibre Channel Arbitrated Loop (FC-AL) and Switched Fabric (FC-SW) topologies
- Supports FCP-2 error recovery protocol as specified in FCP-2 rev. 03 for use with streaming devices (such as tape) and medium changers
- Private Loop Direct Attach (PLDA) profile compliant
- Class 3 connection with SCSI-FCP protocol
- Copper and Optical GBIC (Shortwave or Longwave)

SCSI Bus Features

- SCSI Initiator Mode
- Three auto-negotiating SCSI buses (Narrow, Wide, Fast, Ultra-2)
- Ultra-2 Wide SCSI for data transfer up to 80MB/s per bus
- Simultaneous commands, tagged command queuing and disconnect/reconnect
- Middle of bus configuration with external termination
- SCSI-2 and SCSI-3 protocols
- Connection type is 68-pin D shell, P type connectors
- High Voltage Differential (HVD) or
  Low Voltage Differential/Single-Ended (LVD/SE) termination

Configuration Features

- Serial DB-9 connector for terminal access
- Ethernet RJ-45 connector for FTP, Telnet and Web browser access
- Field-upgradable firmware
- SCC (SCSI only), Indexed, and Automatic addressing modes

Management Features

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

Other Features

- Fibre Channel activity LED
- SCSI Bus activity LEDs
- Ethernet activity LED
- Power LED
- Fault LED
- Airflow with internal fan

Scalar 100 FCR-1 Module Benefits

Centralization – The Scalar 100 FCR-1 Module enables existing storage to be moved to a central location to improve security, simplify management and lower Total Cost of Ownership.

Connectivity – Fibre Channel storage networks with SCSI devices can share data and increase address space.

Consolidation – The Scalar 100 FCR-1 Module allows multiple servers to share storage resources, including tape drives and tape libraries.

Distance – Span from hosts to SCSI devices is increased from 25 meters to 10 kilometers, facilitating remote storage for disaster recovery.

Interoperability – The Scalar 100 FCR-1 Module operates in numerous lab tested configurations.

Reliability – Low error rates, robust error recovery and flow control of the Scalar 100 FCR-1 Module provide enterprise-level integrity data delivery.

Scalability – Point-to-point links can be expanded to multi-initiator links supporting interconnected servers, tape drives and tape libraries.

Scalar 100 FCR-1 Module Specifications

Operating Environment

- 0 to 50 °C
- 5 to 80% Relative Humidity (non-condensing)

Non-operating Environment

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

Chapter 2

Installing the Scalar 100 FCR-1 Module

This chapter describes how to install the Scalar 100 FCR-1 Module, including factors to consider when unpacking the unit for the first time. The Scalar 100 FCR-1 Module is designed only for use with Scalar 100 Libraries. Read this chapter carefully and completely before working with the Scalar 100 FCR-1 Module.

Location

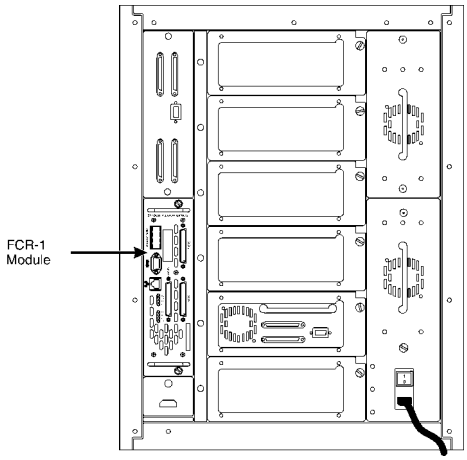


Figure 2-1. Location

Refer to Figure 2-1 to see where the FCR-1 Module should be located in the Scalar 100 Library.

Unpacking the Box

Unpack the shipping container of the Scalar 100 FCR-1 Module in an area clear of any clutter using the following instructions:

1. Remove all items from the shipping container. Check each one for damage. Keep the Scalar 100 FCR-1 Module in the protective bag until you are ready to install it.

2. Refer to the packing slip or contents list to make sure you received all the equipment you ordered. If an item is missing, contact your sales representative immediately.

3. Select a location that ensures the exit vents are clear of obstructions so air can flow freely through the unit.

4. Do not connect any devices or cables to the Scalar 100 FCR-1 Module until the Scalar 100 FCR-1 Module is securely installed.

Installation

Installation Procedure:

1. Remove the Scalar 100 FCR-1 Module from the protective bag.

2. Power off the Scalar 100 Library.

3. Loosen the two thumbscrews on the empty filler plate located next to the Library SCSI connectors (See Figure 2-1) and pull the plate from the chasis.

4. Install the Scalar 100 FCR-1 Module in the empty bay (See Figure 2-2).

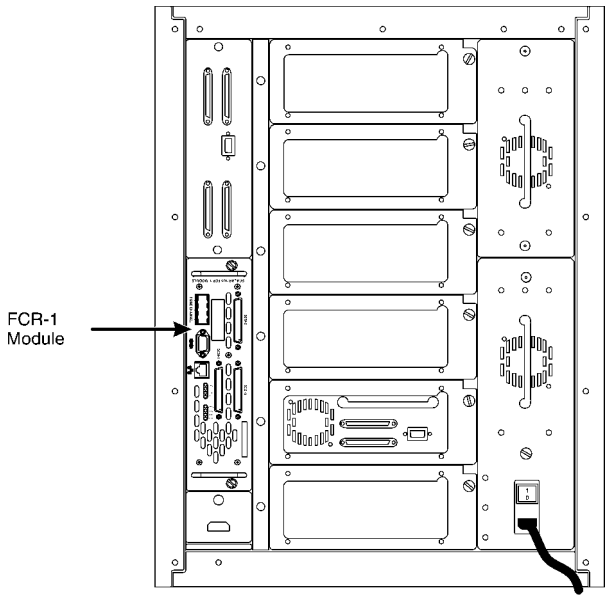


Figure 2-2. Installing FCR-1 Module

5. Tighten the thumbscrews for the Scalar 100 FCR-1 Module.

6. Install the SCSI cables between the Scalar 100 FCR-1 Module (see Figure 2-4) and the appropriate drive connectors and library SCSI connector (See Figure 2-3).

   See the *SCSI Connection* section of this chapter for specific instructions.

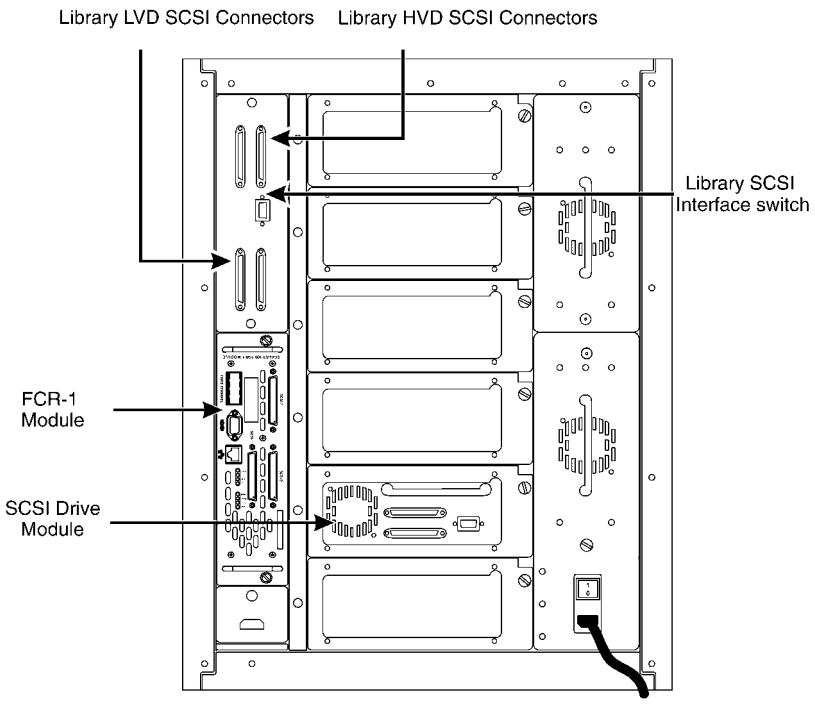


Figure 2-3. SCSI connectors

Recommended cabling is as follows:

a. Connect the SCSI cable from SCSI-0 on the FCR-1 Module to the library SCSI connector, followed by drive 1, and finally to drive 2. Ensure proper termination at the end of the SCSI bus.

b. Similarly, connect the SCSI cable from SCSI-1 on the FCR-1 Module but this time to drive 3 and drive 4. Ensure proper termination at the end of the SCSI bus.

c. Connect the SCSI cable from SCSI-2 on the FCR-1 Module to drive 5 and drive 6. Ensure proper termination at the end of the SCSI bus.

7. Connect the Fibre Channel cable to the FCR-1 Module (See the *Fibre Channel Connection* section of this chapter for specific instructions.).

8. Power on the Scalar 100 Library.

Interfaces and Connections

There are four types of data interfaces to the Scalar 100 FCR-1 Module:

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

The RS-232 and Ethernet ports are used primarily for Scalar 100 FCR-1 Module configuration and management.

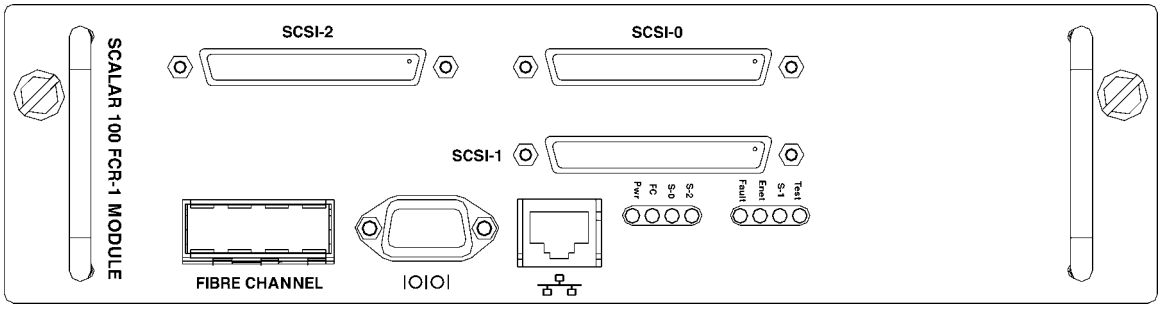


Figure 2-4. Port locations

Fibre Channel Connection

Before connecting the Scalar 100 FCR-1 Module to other Fibre Channel devices, it is important to understand the configuration requirements of the environment to which it will be connected. Failure to correctly configure a Fibre Channel device may impair the operation of the storage area network to which it is attached.

Typical installations will have the Scalar 100 FCR-1 Module connected to either an Arbitrated Loop or Switched Fabric environment. For an Arbitrated Loop, the unit can be directly attached to the Fibre Channel host bus adapter or target device, in a point-to-point fashion. Arbitrated Loops also allow for the use of Fibre Channel hubs, to which the unit can be directly attached. In Fibre Channel switched environments, the switch is directly attached to the Scalar 100 FCR-1 Module.

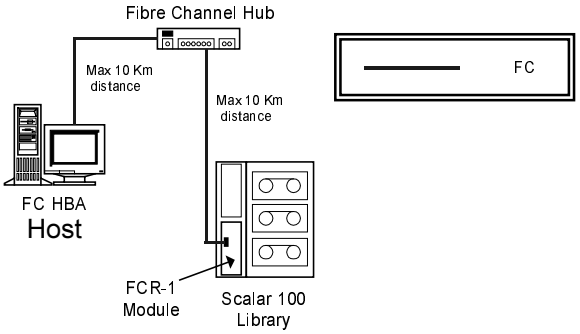


Figure 2-5. Configuration with Scalar 100 library

Both FC switches and hubs may allow for individual ports to be configured for different media types. The Scalar 100 FCR-1 Module must be connected to the hub or switch port with the appropriate FC cabling for the media type in use on both the Scalar 100 FCR-1 Module and the port to which it is connected.

The Scalar 100 FCR-1 Module supports various Fibre Channel media types through the use of an external Gigabit Interface Converter (GBIC).

Available media types include:

Copper Support - 1.0625 Gbit DB-9 connector

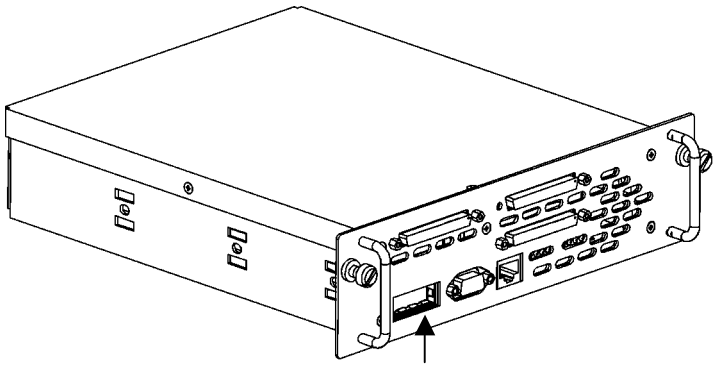
Multi-Mode Fiber Support - 1.0625 Gbit Dual SC connector

Single-Mode Fiber Support - 1.0625 Gbit Dual SC connector

To connect the Scalar 100 FCR-1 Module to the Fibre Channel Storage Area Network:

1. Locate the Fibre Channel port on the exterior side of the Scalar 100 FCR-1 Module.

Figure 2-6. Fibre Channel port



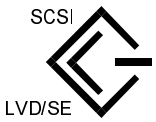
2. Remove the rubber protector from the GBIC in the Fibre Channel port, see Figure 2-6.

WARNING ***The Scalar 100 FCR-1 Module has been qualified with a specific set of GBICs. Using a GBIC that has not been qualified by ADIC may cause the Scalar 100 FCR-1 Module to operate improperly. See the Laser Safety section of this manual for more information.***

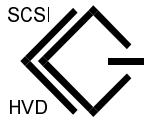
3. With the Scalar 100 FCR-1 Module powered off, connect the Scalar 100 FCR-1 Module into your Fibre Channel environment using the appropriate cabling. The FC optical connectors on the Scalar 100 FCR-1 Module are keyed. Be sure to insert the cable connectors in the proper orientation.

SCSI Connection

The Scalar 100 FCR-1 Module supports Fast/Ultra-2 Wide SCSI. The Scalar 100 FCR-1 Module is factory configured to support either a LVD/Single-Ended or HVD SCSI bus. Three 68-pin D-shell connectors are located on the exterior side of the unit, allowing the unit to be attached in the middle or at the end of a SCSI bus. If the Scalar 100 FCR-1 Module is located at one end of the SCSI bus, an external terminator should be installed. Be sure internal termination is set.



LVD/Single-Ended SCSI support is indicated by this symbol on the exterior side of the Scalar 100 FCR-1 Module.

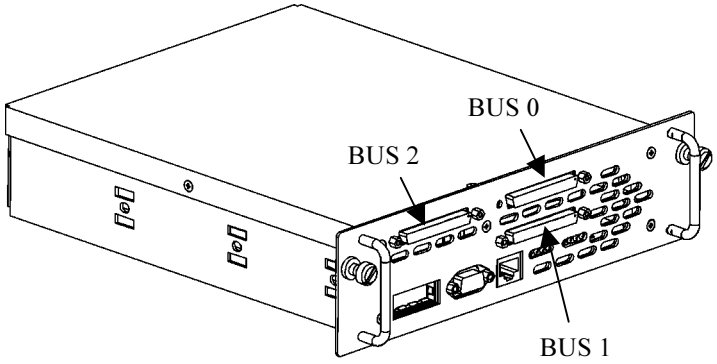


HVD SCSI support is indicated by this symbol on the exterior side of the Scalar 100 FCR-1 Module.

The Scalar 100 FCR-1 Module supplies termination power (TERMPWR) to each SCSI bus. An internal self-resetting fuse in the TERMPWR circuit is used that will reset after a fault is cleared.

By default, the Scalar 100 FCR-1 Module is automatically terminated.

Figure 2-7. Scalar 100 FCR-1 Module SCSI connection



Ethernet Connection

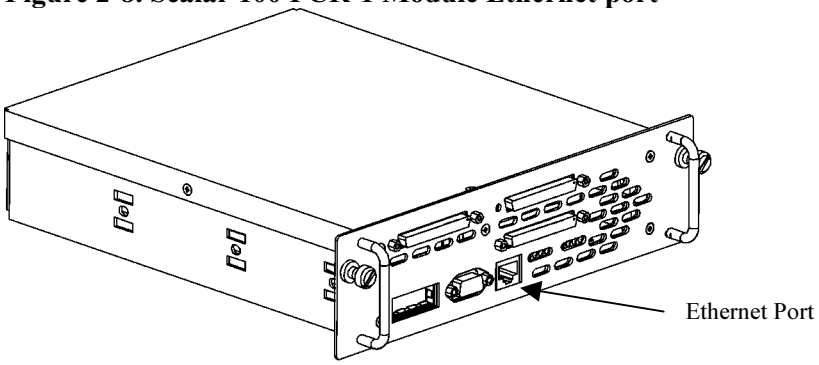
10/100BaseT Ethernet connectivity provides enhanced management and configuration capabilities. The RJ-45 connector on the unit can be directly connected to a standard 10/100BaseT Ethernet network.

Configuration is required to set the IP network address to allow for use of the configuration capabilities of this port. Refer to Chapter 4 for details on setting the IP network address.

Note	The Scalar 100 FCR-1 Module contains a unique Ethernet MAC address that is assigned during the manufacturing process.

Ethernet capabilities include Telnet, SNMP, and a Web Interface for configuration and management. FTP and TFTP are also supported for firmware upgrades.

Figure 2-8. Scalar 100 FCR-1 Module Ethernet port



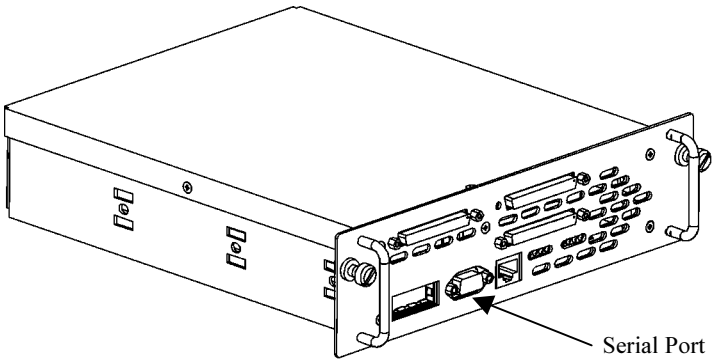
Serial Port Connection

The DB-9 connector on the exterior side of the Scalar 100 FCR-1 Module provides a serial port compliant with the EIA 562 standard but which is also compatible with RS-232 signaling levels. The serial connection can be used to configure the Scalar 100 FCR-1 Module, monitor diagnostic status, or to update the firmware stored in the Scalar 100 FCR-1 Module's FLASH memory. A cable is provided with the unit to connect to a DB-9 serial connection.

The Serial port operates with the following settings:

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

Figure 2-9. Scalar 100 FCR-1 Module Serial port



Autobaud Feature

The autobaud feature automatically configures the baud rate on the Scalar 100 FCR-1 Module. Once you set the baud rate in the terminal emulation program, wait until the Scalar 100 FCR-1 Module completes the Power-On Self Test (POST) and then the Firmware Initialization process. This can take up to 90 seconds. Then press the **Enter** key slowly 7 or 8 times and the Scalar 100 FCR-1 Module will automatically detect the baud rate. The baud rate is then saved in the Scalar 100 FCR-1 Module's configuration and will be retained through future power cycles.

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

The baud rate in the terminal emulation program must be set at 9600, 19200, 38400, 57600, or 115200 for the autobaud feature to recognize it. The Scalar 100 FCR-1 Module will not function properly at any other baud rate.

Chapter 3

Overview of the Scalar 100 FCR-1 Module Configuration

The Scalar 100 FCR-1 Module can be configured through one of various user interfaces over the serial port via a terminal or terminal emulation utility or over Ethernet via a Telnet utility, Internet Web browser, or SNMP management tool.

Before attempting to configure the Scalar 100 FCR-1 Module, a basic understanding of Fibre Channel and SCSI devices is recommended.

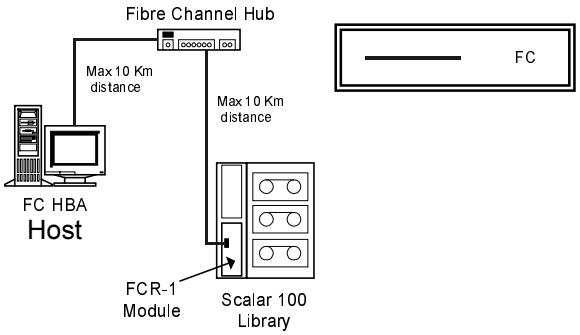
Note For information on SCSI standards, refer to publications from the X3T10 committee of ANSI (American National Standards Institute). For information on Fibre Channel standards, refer to publications from the X3T11 committee of ANSI. Approved American National Standards and Technical Reports may be purchased from:

ANSI
11 West 42nd Street
13th Floor
New York, NY 10036
Sales Dept: (212) 642-4900

Choosing the Right Configuration

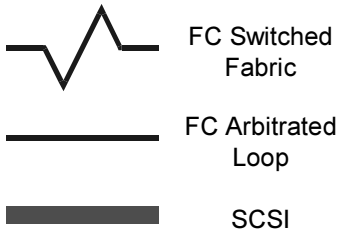
The factory default settings of the Scalar 100 FCR-1 Module permit the configuration shown in Figure 3-1 to work without any initial changes to settings in the Scalar 100 FCR-1 Module. However, with more complex configurations or certain application requirements, changes to the Scalar 100 FCR-1 Module settings may be required.

Figure 3-1. Example of Configuration



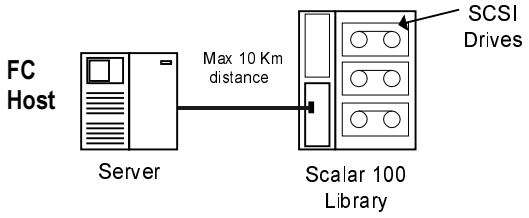
The first step in configuring the Scalar 100 FCR-1 Module is to determine the mode of operation required. The Scalar 100 FCR-1 Module can support Fibre Channel hosts communicating with SCSI targets.

The following symbols for SCSI and Fibre Channel (FC) connections are used by this manual for illustrations of Initiator Mode.

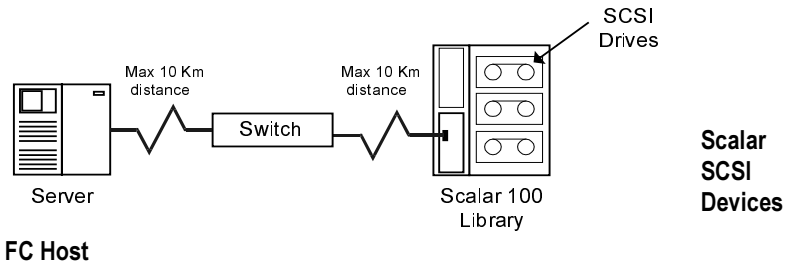


Initiator Mode Configurations

Point-to-Point Single FC host to single SCSI device. Uses Arbitrated Loop.



Single Initiator Single FC host to multiple SCSI devices. A hub in an arbitrated loop can be used in place of the switch shown below.



FC Arbitrated Loop Addressing

On a Fibre Channel Arbitrated Loop, each device appears as an Arbitrated Loop Physical Address (AL_PA). To obtain an AL_PA, two methods, called 'soft' and 'hard' addressing, can be used by Fibre Channel devices. The Scalar 100 FCR-1 Module can be configured to use either method. Soft addressing is the default setting. For hard addressing, the user specifies the AL_PA of the Scalar 100 FCR-1 Module.

Soft Addressing

When acquiring a soft address, the Scalar 100 FCR-1 Module acquires the first available loop address starting from address 0. In this mode, the Scalar 100 FCR-1 Module automatically obtains an available address and participates on the FC loop, as long as there is at least one address available on the loop that is connected to the Scalar 100 FCR-1 Module. Fibre Channel supports up to 126 devices on an Arbitrated Loop.

Hard Addressing

When acquiring a hard address, the Scalar 100 FCR-1 Module attempts to acquire the AL_PA value that was specified by user configuration. If the desired address is not available at loop initialization time, the Scalar 100 FCR-1 Module comes up on the FC loop using an available soft address. This allows the loop to continue to operate, although the unit will not be accessible via the Fibre Channel interface. This would occur when another device on the Arbitrated Loop has acquired the same address as that configured on the Scalar 100 FCR-1 Module.

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

When connected to a Fibre Channel switch, the Scalar 100 FCR-1 Module is identified to the switch as a unique device by the factory programmed World Wide Name (WWN).

Host Device Configuration

The host system using a Fibre Channel Host Bus Adapter (HBA) will typically map Fibre Channel devices into the existing device mapping scheme used by that operating system. Refer to the HBA manual for the mapping table. This usually results in the Fibre Channel HBA mapping Fibre Channel AL_PA's to SCSI target addresses. The HBA will claim enough SCSI bus entries to allow for 125 Fibre Channel targets to map to SCSI Bus:Target entries. This is usually done by a fixed mapping of AL_PA to Bus:Target. In such a configuration, the Scalar 100 FCR-1 Module corresponds to a Bus:Target identifier, with the SCSI devices attached to the Scalar 100 FCR-1 Module appearing as logical units (LUNs). In addition, operating systems can extend the available SCSI limit of 15 per bus.

Although this is not an issue for the operating system or most applications, there are cases where older applications can have expectations about what are valid SCSI IDs, and not deal correctly with certain mappings. In particular, applications have been seen to exhibit difficulties addressing target IDs greater than 15 (e.g. 16 and up). This problem can be resolved by

configuring the Scalar 100 FCR-1 Module to use hard addressing, and setting the AL_PA used by the unit to a value that the HBA will map to an ID with a value less than 16.

For example, depending on the FC HBA, if the hard AL_PA selection is 1, the address is 1. If the selection is 125, the AL_PA address is 0xEF. Some FC HBA's will configure differently, so verify the AL_PA by reviewing the documentation for the HBA.

SCSI Addressing

In Initiator Mode, the Scalar 100 FCR-1 Module appears on each SCSI bus as a single initiator. The default Initiator ID is 7, but it can be set via configuration to any valid SCSI address. No other devices on the SCSI bus may use this address. Note that the FC host itself is not connected to the bus.

The Scalar 100 FCR-1 Module provides the capability to reset SCSI buses during the Scalar 100 FCR-1 Module boot cycle. This allows the devices on a SCSI bus to be in a known state. Configuration provides for the SCSI bus reset feature to be enabled or disabled. The feature is enabled in the default configuration but should be disabled for configurations using multiple initiators, tape changers, or other devices that have long reset cycles, or are adversely affected by bus resets.

The Scalar 100 FCR-1 Module negotiates for the maximum values for transfer rates and bandwidth on a SCSI bus. If an attached SCSI device does not allow the full rates, the Scalar 100 FCR-1 Module will use the best rates it can negotiate for that device. Negotiation is on a device specific basis, so the unit can support a mix of SCSI device types on the same SCSI bus.

Initiator Mode: Fibre Channel-to-SCSI

This section describes the configuration of the Scalar 100 FCR-1 Module when in Initiator Mode – acting as a target to a Fibre Channel Initiator, passing Fibe Channel Protocol (FCP) requests through to SCSI target devices.

By default, the Scalar 100 FCR-1 Module is in Initiator Mode. The unit will use soft addressing on the Fibre Channel loop and auto addressing for the target device mapping. Auto addressing is described in more detail later in this chapter.

The Scalar 100 FCR-1 Module automatically detects if it is connected to a FC loop or a switch, and will use the appropriate protocol without further configuration.

Address Mapping

The Scalar 100 FCR-1 Module supports three addressing methods for mapping SCSI targets to Fibre Channel Initiators (Hosts):

- *Indexed Addressing* – Allows editing and maintenance of a static address mapping table.
- *Auto Addressing* – Automatically creates a new address mapping table every time the Scalar 100 FCR-1 Module is power cycled.
- *SCC Addressing* – Implements the SCSI-3 Controller Commands SCSI storage array addressing to address SCSI devices attached to the Scalar 100 FCR-1 Module.

SCSI Targets are selected by mapping the appropriate values into the FCP LUN field, and correlating a Fibre Channel LUN value to a SCSI Bus:Target:LUN value. The Scalar 100 FCR-1 Module acts as a single initiator on each SCSI bus, defaulting to ID 7. All commands passed through to a SCSI bus originate from this SCSI ID.

Note	The SCSI bus number corresponds to the physical SCSI ports on the back of the Scalar 100 FCR-1 Module. For example, SCSI bus 0 corresponds to SCSI port 0 on the rear of the Scalar 100 FCR-1 Module. SCSI bus 1 corresponds to SCSI port 1.

Indexed Addressing

Indexed Addressing allows for Fibre Channel host bus adapters (HBAs) to access SCSI devices attached to the Scalar 100 FCR-1 Module. This is done by use of a table, which is indexed by sequential FCP LUN values, indicating selected BUS:TARGET:LUN devices.

Table 3-1. Example of Indexed Addressing Table*

FCP LUN Value	SCSI BUS:TARGET:LUN
0x00	0:0:0
0x01	0:1:0
0x02	0:2:0
0x03	0:3:0
0x04	0:4:0
0x05	0:5:0
0x06	0:6:0
0x08	0:8:0
(…)	(…)
0x0E	0:15:0
0x0F	0:0:1
0x10	0:1:1
(…)	(…)

* *FCP LUN Value 0x07 is not shown because the associated SCSI BUS:TARGET:LUN is reserved for the default Initiator ID.*

The indexed addressing table has the structure shown in Table 3-1. The Scalar 100 FCR-1 Module will allow up to 80 device entries to be mapped. The index table can be manually edited, and is then saved to the Scalar 100 FCR-1 Module FLASH memory. The configuration menu has options allowing the table to be filled in order of increasing Bus, Target ID, or LUN, as may be desired for the specific requirements needed. Options are also provided to perform SCSI device discovery, and fill the table in the order that devices are discovered on a SCSI bus.

Indexed Addressing mode is recommended for environments where SCSI device configuration may change, and a fixed mapping from the application to the target devices is required. That is, if a SCSI device is removed from the SCSI bus, and the Scalar 100 Library is power cycled, then the FC-to-SCSI addressing for the remaining SCSI devices will not change and the SCSI devices can be replaced at the same address.

Auto Addressing

The Auto Addressing option is similar to Indexed Addressing, but with the distinction that the table used is created each time through SCSI device discovery upon power up or reset, and not otherwise retained. As the Scalar 100 FCR-1 Module performs device discovery on a SCSI bus, the table is filled with adjacent FCP LUNs referencing each subsequent SCSI device. The host system will then detect every attached device without voids, allowing full device discovery to the host. This allows easy configuration in environments where device ordering is not important, and hot plugging of SCSI devices will not occur. Configuration allows for discovery to be performed in order of Bus, Target ID or LUN, as desired for the specific environment.

In Auto Addressing, Bus Number order is configured as the default mode of the Scalar 100 FCR-1 Module.

SCC Addressing

The Scalar 100 FCR-1 Module also implements the SCSI-3 Controller Commands (SCC) (X3T10 Project 1047D Revision 6b 01-July-96) SCSI storage array addressing as another option to configure your Scalar 100 Library. The Access Method used is the SCC Logical Unit Addressing method.

In SCC Addressing mode, the Scalar 100 FCR-1 Module will respond to FCP commands as a SCC controller device. A subset of the SCC behavior is implemented. Commands may be addressed to the Scalar 100 FCR-1 Module directly, or to attached SCSI devices, depending on the Fibre Channel LUN specified

Further description of the Scalar 100 FCR-1 Module implementation of SCC addressing is in Appendix D.

Configuration Methods

The Scalar 100 FCR-1 Module can be configured over the serial port via a terminal or terminal emulation utility or over Ethernet via a Telnet utility, Internet Web browser, or SNMP management tool. FTP and TFTP are also supported on Ethernet to upgrade firmware revisions.

Serial

The serial port allows for configuration of device characteristics from an attached terminal or terminal emulator. For instructions on use of the serial interface, refer to Chapter 4, *Configuring the Scalar 100 FCR-1 Module*.

Ethernet

The 10/100BaseT Ethernet port must first be configured via the serial port with an appropriate IP address, subnet mask, and gateway prior to use unless the default values are to be used. The factory default values that are used by the Scalar 100 FCR-1 Module are IP address 1.1.1.1, and a subnet mask of 255.255.255.0.

Telnet

The Scalar 100 FCR-1 Module is capable of holding Telnet sessions for configuration purposes. The configuration menus accessed via the serial port will be disabled when a Telnet session is connected. To open a Telnet session, the IP address of the Scalar 100 FCR-1 Module and a Telnet client utility are required.

From most Windows 9x and NT systems, users can start a Telnet session from the DOS (or Command) prompt using the following steps:

1. From the Windows Start menu, open the DOS (or Command) prompt window.

2. At the '>' prompt, enter the following command

   TELNET <IP address>

   where <IP address> is the IP address of the Scalar 100 FCR-1 Module. This will start a Telnet session window for the Scalar 100 FCR-1 Module.

3. Enter 'root' for the default user name and 'password' for the default password. It is recommended that you change the user name and password as soon as possible. See *Ethernet Configuration* in Chapter 4 for more information on setting up user names and passwords.

4. Access configuration options in the same way used for the serial interface.

5. To exit the Telnet session, select the **Disconnect** option from your Telnet client utility. In most Telnet utilities, this option is available as a menu item.

Web Management Interface

The Scalar 100 FCR-1 Module allows any standard Internet Web browser to view and change the Scalar 100 FCR-1 Module's configuration. Information is dynamically generated in an HTML format by the Scalar 100 FCR-1 Module so that Web browsers can access it.

To access the Web interface, enter the IP address of the FCR-1 Module into the Address field of a Web browser. Or, you can enter a URL using a host name defined by the user – for instance, http://Scalar100FCR. But, the user must define the host name on the DNS server first.

To make changes to settings, use standard keyboard and mouse controls to input information and then select the **Submit** button to send the changes to the Scalar 100 FCR-1 Module.

A user name and password will be required before any changes can be submitted. The default user name is "root" and the default password is "password."

Changes will not take effect until the next time the Scalar 100 FCR-1 Module reboots but the unit can be forced to reboot by selecting the **Reboot** option from the Diagnostics menu.

SNMP

The Scalar 100 FCR-1 Module includes SNMP management support. SNMP commands are transported via Ethernet. SNMP support allows configuration and management using standard SNMP management tools. Available data for SNMP is defined in the Scalar 100 FCR-1 Module's MIB.

ADIC provides a private MIB for the configuration of the Scalar 100 FCR-1 Module. The ADIC private MIB includes all objects configurable from the serial interface. The ADIC private MIB also includes some Fibre Channel and SCSI statistics that are not accessible via the serial interface. SNMP support also includes Traps, which are used to notify a SNMP management console of various conditions.

Chapter 4

Configuring the Scalar 100 FCR-1 Module

Because the various configuration methods of the Scalar 100 FCR-1 Module (described in Chapter 3, *Overview of the Scalar 100 FCR-1 Module Configuration*) offer such similar functionality, this chapter will describe specific configuration options from the perspective of the serial interface only. For an overview of using the other configuration methods available, see Chapter 3.

The Scalar 100 FCR-1 Module allows the user to access many configuration settings through the serial interface. Among these settings are:

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

All of the above settings may be changed and saved.

Note	Unless otherwise indicated, configuration changes take effect when the unit next powers on or reboots.

Communicating with the Scalar 100 FCR-1 Module

The Scalar 100 FCR-1 Module is designed to communicate with a terminal or any operating system utilizing a terminal emulator. For example, Windows 9x and NT 4.0 operating systems can use Hyperterminal. Be sure the baud rate, data bits, stop bits, parity, and flow control are set as specified in Table 4-1.

Table 4-1. Connection properties

Type	Setting
Baud rate	*9600, 19200, 38400, 57600, or 115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None or XON/XOFF

*See information on the Autobaud feature in Chapter 2.

Setting Up Serial Port Communications

Leave the Scalar 100 FCR-1 Module turned off until you have set up serial port communications with your host computer.

To set up serial communications with the Scalar 100 FCR-1 Module:

1. Plug the serial cable provided with the Scalar 100 FCR-1 Module into one of your computer's serial ports (for example, COM1 or COM2) and the Scalar 100 FCR-1 Module's serial port.

2. Start your terminal interface program.

3. Set the terminal interface program to use the appropriate COM port.

4. Specify the following settings for the port:

   Baud rate: 9600, 19200, 38400, 57600, or 115200
   Data bits: 8
   Parity: None
   Stop bits: 1
   Flow control: None or XON/XOFF

5. Power on the Scalar 100 FCR 1.6.

Power Up Messages

When you press the Scalar 100 FCR-1 Module's power switch to the on position (marked with a 'I' symbol), a series of messages similar to the following appear on the terminal or terminal emulation program:

```
ADIC_Scalar 100 FCR-1 Module    X.X\XXXXX
 CPU Program RAM           : XXXXXXXX
 PCI Protocol RAM          : XXXXXXXX
 SCSI Script RAM (I)       : XXXXXXXX
 SCSI Script RAM (II)      : XXXXXXXX
 Ethernet POST Test        : PASSED
 SCSI POST Test  (I)       : PASSED
 SCSI POST Test  (II)      : PASSED
 Fibre Channel POST        : PASSED

 Attaching network interface XXXXXX… done.
 Attaching network interface XXX... done.
 NFS client support not included.
 Initializing sioc...
 Initializing SCSI port 0   (Differential)
 SCRIPTS start @ 0x88002000 (4064)
 Initializing SCSI port 1   (Differential)
 SCRIPTS start @ 0x88006000 (4064)
 Bridge:
Self test completed successfully
```

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

The illustrations in this chapter use Xs to represent numeric values for certain data fields. In the above illustration, Xs are also used to show "X.X\XXXX" which represents the product release version and the revision of firmware.

Note If you do not see messages on your screen, re-check your computer's serial port settings and press Enter five or six times. In particular, make sure the baud rate is set to one of the values listed in Table 4-1.

The main menu appears as follows:

```
           ADIC Scalar 100 FCR-1 Module
         Version X.X XXXX

1) Perform Configuration
2) System Utilities
3) Display Trace and Assertion History
4) Reboot
5) Download a New Revision of The Firmware

Command >
```

The main menu allows for various operations to be performed on the Scalar 100 FCR-1 Module. Option **1)** is described in this chapter. For information on selections **2)** through **5)**, see Chapter 5, *Managing the Scalar 100 FCR-1 Module*.

Perform Configuration

The Perform Configuration menu allows the administrator to configure the various options on the Scalar 100 FCR-1 Module. For most configuration changes to take effect, you must reboot the Scalar 100 FCR-1 Module (see System Reboot under the System Utilities menu described in Chapter 5).

Note	Menus are not case sensitive. You can enter uppercase and lowercase characters interchangeably whenever menus indicate letters as choices.

```
                Configuration Menu
                  Version X.X XXXX

1) Baud Rate Configuration
2) Fibre Channel Configuration
3) SCSI Configuration
4) Ethernet Configuration
5) Fibre Channel to SCSI Mapping Configuration
6) SCSI to Fibre Channel Mapping Configuration
7) Trace Settings Configuration
8) Real-Time Clock Configuration

A) Save Configuration
B) Restore Last Saved Configuration
C) Reset and Save Configuration to Factory Defaults

X) Return to main menu
```

Baud Rate Configuration

This menu changes the baud rate used on the serial port. Select **1) – 5)** for appropriate baud rate setting. If you are using the Autobaud feature, it may not be necessary to set a baud rate. See Chapter 2 for more information on using the Autobaud feature.

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

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

X) Return to previous menu
```

The asterisk (*) symbol indicates the current setting for the baud rate.

Fibre Channel Configuration

This menu allows for setting the Fibre Channel Address method, Hard Address value, discovery mode, and WWN overrides.

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

Current Fibre Channel Configuration:

World Wide Name High: XxXXXXXXXX
World Wide Name Low: XxXXXXXXXX
Discovery Mode: Auto Discovery on Reboot Events

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

  X) Return to previous menu
```

Note	The settings for selections 1) thru 3) do not need to be changed under normal operating conditions.

- Select **1)** to enter a new value for the World Wide Name High.
- Select **2)** to enter a new value for the World Wide Name Low.
- Select **3)** to toggle the Discovery Mode among the following options:

  ```
  Manual Discovery Only
  Auto Discovery on Reboot Events
  Auto Discovery on Link Up Events
  ```

  Discovery Mode determines how the Scalar 100 FCR-1 Module will discover new Fibre Channel devices.

  Manual Discovery sets discovery of new devices to only occur after the user selects the **Initiate FC Discovery** option from the SCSI to Fibre Channel Configuration Menu. With this option, the ports are discovered but the devices behind the ports are not discovered.

  Auto Discovery allows the Scalar 100 FCR-1 Module to automatically discover all Fibre Channel devices when the router reboots or whenever link-up events occur, such as connecting cables or rebooting network hubs.

  Reboot Events is the default selection. Both the ports and the devices behind the ports are discovered.

  Link-up Events discovers both the ports and the devices behind the ports for the first link-up event. Subsequent link-up events will only discover the ports and not the devices behind the ports.

- Select **4)** to set the Hard AL_PA Usage to **Yes** or **No**. If set to **Yes**, a unique one-byte valid value (derived from an Arbitrated Loop Topology as defined in ANSI specification FC_AL

ver 4.5) is used for the Fibre Channel configuration. When configuring the Fibre Channel AL_PA, the Scalar 100 FCR-1 Module will present a list of loop addresses along with the corresponding AL_PA. From here, the user can select the loop address desired.

SCSI Configuration

This menu allows for setting the SCSI Initiator ID, adding and removing SCSI Target IDs, setting the SCSI bus reset behavior, changing the Discovery delay time, and setting the SCSI Termination mode.

```
          SCSI Configuration Menu
            Version X.X XXXX

Bus 0, Current SCSI Configuration:

    Initiator SCSI ID:  7
    Target SCSI ID(s):

    Reset SCSI Bus on Boot       : Yes
    SCSI Initial Discovery Delay : 2000 ms
    SCSI Termination             : Internal

        1) Change Initiator SCSI ID
        2) Add Target SCSI ID
        3) Remove Target SCSI ID
        4) Toggle SCSI Reset Operation
        5) Change Discovery Delay Time

        X) Return to previous menu
```

Press the Enter key to toggle to the SCSI Configuration menu for the next bus.

```
          SCSI Configuration Menu
             Version X.X XXXX

Bus 1, Current SCSI Configuration:

    Initiator SCSI ID:  7
    Target SCSI ID(s):

    Reset SCSI Bus on Boot       : Yes
    SCSI Initial Discovery Delay : 2000 ms
    SCSI Termination             : Internal

        1) Change Initiator SCSI ID
        2) Add Target SCSI ID
        3) Remove Target SCSI ID
        4) Toggle SCSI Reset Operation
        5) Change Discovery Delay Time

        X) Return to previous menu
```

- Select **1)** to change the Initiator SCSI ID. This is the ID for a Scalar 100 SCSI device that requests operations from Scalar 100 drives known as targets. This should be a unique ID on the bus. Default is 7.

- Select **2)** to add a Target SCSI ID. This adds an ID for a Scalar drive that responds to operation requests from the SCSI initiator. This must be setup before users can access **SCSI to Fibre Channel mapping** (from the SCSI to Fibre Channel Mapping Configuration menu).

Note	The setting for selection 2) does not need to be changed under normal operating conditions.

- Select **3)** to remove a Target SCSI ID. This option eliminates target IDs previously added.

- Select **4)** to toggle the SCSI reset operation between **Yes** and **No**. When set to **Yes**, the Scalar 100 FCR-1 Module will automatically discover SCSI devices after initial power up and after the library reboots.

- Select **5)** to change the discovery delay time for SCSI devices. This is the time that the Scalar 100 FCR-1 Module waits after a power-up or reboot before starting to discover SCSI devices. This value should be set to no less than 250ms, according to the SCSI standard for Reset-to-Selection Time. ADIC recommends you set the value to at least 2 seconds to ensure all SCSI devices complete their individual power-ups.

Ethernet Configuration

This option allows for setting up all Ethernet network settings including IP address, Subnet mask, IP gateway, SNMP and security settings, Ethernet mode, physical address, and hostname.

```
              Ethernet Configuration Menu
                   Version X.X XXXX


Ethernet Physical Address      : 08-06-07-05-03-09
IP Address                     : 1.1.1.1
Subnet Mask                    : 255.255.255.0
Hostname                       :
IP Gateway                     : 0.0.0.0
Ethernet Mode                  : 10/100Mbps (Auto-Neg)

   1) Change Ethernet Physical Address
   2) Change IP Address
   3) Change IP Subnet Mask
   4) Change SNMP Settings
   5) Change Security Settings
   6) Change IP Gateway
   7) Change Hostname
   8) Toggle Ethernet Mode

   X) Return to previous menu
```

- Select **1)** to change the Ethernet Physical Address, or MAC address, of the Scalar 100 FCR-1 Module. The Ethernet physical address is assigned to an Ethernet adapter by its manufacturer.

- Select **2)** to change the IP address of the Scalar 100 FCR-1 Module. The default for this setting is 1.1.1.1.

- Select **3)** to change the IP Subnet mask for the Scalar 100 FCR-1 Module. The default for this setting is 255.255.255.0.

- Select **4)** to access the SNMP Settings for the Scalar 100 FCR-1 Module, including the community names for GET and SET as well as SNMP Trap settings. For Trap settings, select the IP address of the device to send the SNMP trap notifications. SNMP Settings will be covered in more detail later in this chapter.

- Select **5)** to change security settings, including the user name and password. User names and passwords should be unique and kept confidential and it is recommended to use a combination of letters and numbers when creating user names and passwords.

- Select **6)** to change the IP gateway for the Ethernet network of the Scalar 100 FCR-1 Module.

- Select **7)** to change the hostname. This is an alphanumeric entry of one word up to 8 characters long.

- Select **8)** to toggle the Ethernet mode among the following options:

```
10Mps Only
100Mps (half duplex) Only
100Mps (full duplex) Only
10/100Mps  (Auto-Neg.)
```

Fibre Channel-to-SCSI Mapping Configuration

This option allows selecting the addressing mode of the Scalar 100 FCR-1 Module, as well as displaying attached devices when using the Scalar 100 FCR-1 Module in Initiator Mode. The menu to modify the Indexed addressing table is also accessed through this menu.

```
       Fibre Channel to SCSI Configuration Menu
                  Version X.X XXXX

Current Fibre Channel to SCSI Mapping Mode is Indexed

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

X) Return to Previous Menu
```

- Select **1)** to display attached SCSI devices according to ascending LUN order.

- Select **2)** to display attached SCSI devices according to ascending SCSI Target ID (SCSI device address ID) order.

- Select **3)** to display attached SCSI devices in ascending SCSI Bus Number (SCSI port ID number) order.

- Select **4)** to change the mode of Fibre Channel to SCSI Mapping to one of the following options:

```
1) Set to SCC
2) Set to Indexed
3) Set to Auto-assigned, LUN priority
4) Set to Auto-assigned, target ID priority
5) Set to Auto-assigned, bus number priority
```

  SCC addressing is used to address the Scalar drives attached to the Scalar 100 FCR-1 Module using the SCSI-3 Controller Commands method of logical unit addressing. In this mode, the Scalar 100 FCR-1 Module will respond to FCP commands as in a SCC controller device. The FC HBA must support this addressing method.

Indexed addressing presents the user a table with the current mappings. The user can then select a table entry by FCP LUN and specify the associated BUS:TARGET:LUN.

Auto-assigned addressing fills the table with one of multiple prioritizing schemes, or with the currently attached SCSI devices.

LUN priority – fills the table according to ascending LUN order.

Target ID priority – Fills the table according to ascending SCSI Target ID (SCSI device address ID) order.

Bus Number priority – Fills the table in ascending SCSI Bus Number (SCSI port ID number) order.

The current mode for address mapping appears when you select **5)** from the Fibre Channel to SCSI Configuration menu.

Changes to these settings must be saved in FLASH memory using option **A** from the Configuration Menu, where they are retained across future device resets or power cycles.

- Select **5)** to view or edit the Fibre Channel to SCSI Mapping table used for Indexed addressing. This option only appears (see below) if you previously set address mapping to Indexed.

```
   Fibre Channel to SCSI Mapping Table
      Version: x.x  xxxx   Link Up

            FC_LUN    BUS TGT LUN
            0x00  ->  0   0   0
            0x01  ->  0   1   0
            0x02  ->  -   -   -
            0x03  ->  -   -   -
            0x04  ->  -   -   -
            0x05  ->  -   -   -
            0x06  ->  -   -   -
            0x07  ->  -   -   -
            0x08  ->  -   -   -
            0x09  ->  -   -   -
            0x0A  ->  -   -   -
            0x0B  ->  -   -   -
            0x0C  ->  -   -   -
            0x0D  ->  -   -   -
            0x0E  ->  -   -   -
            0x0F  ->  -   -   -

Enter LUN entry to change, F to fill, X to return, <enter> for more >
```

Existing LUN entries can be edited by specifying the LUN numbers to be changed. The LUN numbers are entered as two-digit values.

The Mapping Table can also be filled by entering an 'F' at the command prompt. The following menu will appear.

```
Fill Fibre Channel to SCSI Mapping Table
           Version X.X   XXXX

1) Flat, LUN Priority
2) Flat, Target ID Priority
3) Flat, Bus Number Priority
4) Ordered, LUN Priority
5) Ordered, Target ID Priority
6) Ordered, Bus Number Priority

X) Return to Previous Menu
```

Flat – This option sets all Fibre Channel LUN values in ascending order. Use this option when you have multiple devices using different D_IDs.

LUN priority – Fills the table according to ascending LUN order.

Target ID priority – Fills the table according to ascending SCSI Target ID (SCSI device address ID) order.

Bus Number priority – Fills the table in ascending SCSI Bus Number (SCSI port ID number) order.

Ordered – This option maps only SCSI Target IDs that are responding.

LUN priority – Fills the table according to ascending LUN order.

Target ID priority – Fills the table according to ascending SCSI Target ID (SCSI device address ID) order.

Bus Number priority – Fills the table in ascending SCSI Bus Number (SCSI port ID number) order.

Trace Settings Configuration

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

```
                  Trace Settings
                Version X.X XXXX

    Level 0 : ON        Level 1 : OFF
    Level 2 : OFF       Level 3 : OFF
    Level 4 : OFF       Level 5 : OFF
    Level 6 : OFF       Level 7 : OFF

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


Enter trace level to change >
```

Enter a level number from the Trace Settings that are shown. This toggles the current setting to either **ON** or **OFF**.

Level 0 is for Errors and Exceptions
Level 1 is for Fibre Channel Events
Level 2 is for Bridge Events
Level 3 is for SCSI Events
Levels 4-7 are reserved.

Select **U)** to update current operating trace levels. This option forces the currently displayed trace settings to become effective immediately, without requiring a reboot or power cycle.

Real-Time Clock Configuration

When this option is selected from the Perform Configuration menu, the System Clock Setup Menu appears.

```
        System Clock Setup Menu
           Version X.X XXXX


FRIDAY, Date: 06/11/00, Time: 12:43:13

1) Set clock


X) Return to previous menu
```

Select **1)** to set the clock. A series of three prompts will appear allowing setup of 24 hour time (hh:mm:ss), current date (mm/dd/yy), and the day of week (SUN, MON, TUE, WED, THU, FRI, SAT). All digits must be entered, i.e. 12:37:00.

Save Configuration

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

Restore Last Saved Configuration

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

Reset and Save Configuration to Factory Defaults

This option resets all current configuration options to the factory defaults and saves those options to FLASH memory as the current configuration.

SNMP Configuration

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

Current SNMP Configuration indicates the community names for GET and SET and indicates trap status, including the Manager IP Address for enabled traps.

```
                SNMP Configuration
                 Version X.X XXXX

Current SNMP Configuration:

Community Name for GET: public
Community Name for SET: private

Traps are disabled

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


X) Return to previous menu
```

The SNMP GET community name is checked for each GET request received by the Scalar 100 FCR-1 Module. The community name in the SNMP packet must match the community name configured here for the SNMP GET request to be successfully completed. Configure your SNMP manager to have the same GET and SET community names as the Scalar 100 FCR-1 Module.

- Select **1)** to change the Community Name for GET.
- Select **2)** to change the Community Name for SET.
- Select **3)** to toggle traps on or off.

  If SNMP Traps are disabled, no Trap events are sent.

  SNMP configuration with traps enabled:

```
                SNMP Configuration
                 Version: X.X XXXX

Current SNMP Configuration:

Community Name for GET: public
Community Name for SET: private
Manager IP Address for Traps: 1.1.1.1

Traps are enabled for events of any priority

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

X) Return to previous menu
```

- Select **4)** to change the Manager IP Address for Traps. The Trap Manager IP address is the address used for sending Trap notifications. Typically, this is the IP address of the machine using the Network Management Program and/or a MIB browser.

- Select **5)** to decrease Trap Priority.

- Select **6)** to increase Trap Priority.

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

Chapter 5

Managing the Scalar 100 FCR-1 Module

The Scalar 100 FCR-1 Module can be configured over the serial port via a terminal or terminal emulation utility or over Ethernet via a Telnet utility, Internet Web browser, or SNMP management tool. FTP and TFTP are also supported on Ethernet to upgrade firmware revisions.

Note	Menus are not case sensitive. You can enter uppercase and lowercase characters interchangeably when selecting from menus.

For information on accessing a user interface, see the *Configuration Methods* section of Chapter 3.

For information on setting up serial communications with the Scalar 100 FCR-1 Module or for how to configure specific settings of the Scalar 100 FCR-1 Module, see Chapter 4.

Management Operations

The screens shown in this chapter are available through the serial interface or the Ethernet interface when a telnet session is used. In either of these cases, the menu structure is the same. A Web Management Interface is also available, or the Scalar 100 FCR-1 Module may also be configured using an SNMP management tool.

From the serial interface, access the main menu.

```
                ADIC Scalar 100 FCR-1 Module
                         x.x   xxxx

        1) Perform Configuration
        2) System Utilities
        3) Display Trace and Assertion History
        4) Reboot
        5) Download a New Revision of the Firmware


Command >
```

For information on selection **1)**, see Chapter 4.

Select **2)** to access System Utilities. This option is described in detail later in this chapter.

Select **3)** to display trace and assertion history. This option is described in detail later in this chapter.

Select **4)** to reboot the Scalar 100 FCR-1 Module. A confirmation message will appear verifying you want to do this. If you enter **N** for No, you are returned to the System Utilities menu. If you enter **Y** for Yes, the Scalar 100 FCR-1 Module will restart. This option is described in more detail later in this chapter.

Select **5)** to download a new revision of the firmware. A confirmation message will appear verifying you want to do this. If you enter **N** for No, you are returned to the System Utilities menu. If you enter **Y** for Yes, the Scalar 100 FCR-1 Module begins accepting firmware data from the serial port. This option is described in more detail later in this chapter.

System Utilities

```
        System Utility Menu
             x.x   xxxx


1) System Statistics Menu
2) Event Log
3) Enter System Diagnostics Mode

X) Return to main menu
```

- Select **1)** to display the System Statistics Menu, described later in this chapter.
- Select **2)** to display the Event Log Menu, described later in this chapter.
- Select **3)** to enter diagnostics mode. A confirmation message will appear verifying you want to do this. If you enter **N** for No, you are returned to the System Utilities menu. If you enter **Y** for Yes, the Scalar 100 FCR-1 Module enters System Diagnostics Mode. This option is described in more detail later in this chapter.

System Statistics

```
            System Status/Statistics Menu
                 x.x   xxxx


1) Display Fibre Channel Status
2) Display Attached Fibre Channel Devices
3) Display SCSI Statistics
4) Display Attached SCSI Devices
5) Display Router/Bridge Statistics

X) Return to main menu
```

- Select **1)** to display Fibre Channel status information.

```
                    Fibre Channel Status & Statistics
                                x.x    xxxx


LinkState     DOWN        ALPA          x00000000   InDevDataSeqs x00000000
OutDevDataSeq x00000000   InLnkDataSeqs x00000000   OutLnkDataSeq x00000000
InP_BSYFrames x00000000   OutP_BSYFrms  x00000000   InF_BSYFrames x00000000
InP_RJTFrames x00000000   OutP_RJTFrame x00000000   LinkDowns     x00000000
InABTSs       x00000000   OutABTSs      x00000000   LaserFaults   x000000BF
SignalLosses  x00000000   SyncLosses    x00000000   BadRxChars    x00000000
LinkFailures  x00000001   BadCRCFrames  x00000000   ProtocolErrs  x00000000
BadSCSIFrames x00000000

       A) Autorepeat
       X) Return to previous menu
```

- Select **A)** to have the status information repeatedly refreshed.

- Select **2)** to display attached Fibre Channel devices. A list of all currently recognized Fibre channel devices will be displayed.

```
      Fibre Channel Device Display
                x.x   xxxx

R) Refresh Device Display
D) Display Device Details

X) Return to previous menu
```

- Select **R)** to refresh the display with the latest status information.

- Select **D)** to display details about the Fibre Channel devices.

- Select **3)** to display SCSI statistics.

```
            SCSI Statistics
               x.x   xxxx


IOs[0]         x00000000
Discons[0]     x00000000
Aborts[0]      x00000000
BusReset[0]    x00000001

IOs[1]         x00000000
Discons[1]     x00000000
Aborts[1]      x00000000
BusReset[1]    x00000001


        A) Autorepeat
        C) Clear Counters
        X) Return to previous menu
```

IOs are the total number of data transfer events.

Discons are the number of times that devices disconnect from the bus (usually to preserve bus or system performance).

Aborts are the number of times that operations were terminated on a LUN from this initiator.

BusReset is the number of times operations were terminated for all LUNs on this bus.

- Select **A)** to have the status information repeatedly refreshed.
- Select **C)** to clear counters and stop autorepeat mode.

- Select **4)** to display attached SCSI devices. The SCSI Device Display Menu will appear.

```
              SCSI Device Display Menu
                      x.x   xxxx


1) Display Attached SCSI Devices, LUN Priority
2) Display Attached SCSI Devices, Target ID Priority
3) Display Attached SCSI Devices, Bus Number Priority

X) Return to previous menu
```

  - Select **1)** to display devices by LUN priority.
  - Select **2)** to display devices by Target ID priority.
  - Select **3)** to display devices by BUS Number priority.

- Select **5)** to display router/bridge statistics.

```
      Router/Bridge Statistics
             x.x   xxxx

Pending I/Os  x00000000

A) Autorepeat
X) Return to previous menu
```

  - Select **A)** to have the status information repeatedly refreshed.

Event Log

When this option is selected from the System Utilities menu, the Event Log Menu is displayed.

```
          Event Log Menu
            x.x   xxxx

1) Display event log
2) Clear event log

X) Return to previous menu
```

Select **1)** to display the event log.

Example of an event log entry:

```
75   06/07/99    16:23:17
Unit Restart and Initialization.
Version:X.X   Build Level:XXXX
```

Select **2)** to clear the event log of all old entries and start over with an empty list.

Diagnostics Mode

When this option is selected from the System Utilities menu, a confirmation message will appear to verify the selection. If a response of **Y** (yes) is given to the confirmation message, current Scalar 100 FCR-1 Module activities will be interrupted while the unit restarts itself and enters diagnostics mode. The power up messages will appear followed by the diagnostics menu.

```
System Diagnostics Mode
                x.x   xxxx

1) Perform Ethernet External Loopback Test
2) Perform SCSI External wrap Test
3) Perform Fibre Channel Loopback Test


X) Exit diagnostics mode and reboot
```

- Select **1)** to perform a loopback test of the Ethernet connection on the back of the Scalar 100 FCR-1 Module unit. For the test to be performed correctly, an Ethernet loopback connector must be attached to the Scalar 100 FCR-1 Module's Ethernet port before selecting this option.

- Select **2)** to perform wrap test of the SCSI ports on the exterior side of the FCR-1 Module.

- Select **3)** to perform a loopback test of the Fibre Channel connection on the back of the Scalar 100 FCR-1 Module unit. For the test to be performed correctly, a Fibre Channel loopback connector must be attached to the Scalar 100 FCR-1 Module's Fibre Channel port before selecting this option.

When X (exit) is selected from the System Diagnostics Mode, a confirmation message will appear to verify the selection. If a response of Y (yes) is given to the confirmation message, the

Scalar 100 FCR-1 Module will restart itself and enter normal operation mode. The power up messages will appear followed by the main menu.

Note	When existing System Diagnostics Mode, be sure to remove any diagnostics cables before restarting the unit.

Trace History

When this option is selected from the System Utilities menu, the Trace Dump Menu is displayed. Trace options are setup in the Trace Settings Configuration menu described in Chapter 4.

```
              Trace Dump Menu
                 x.x   xxxx


1) Display trace for current boot cycle
2) Display trace from previous boot cycle
3) Clear current trace buffer

X) Return to previous menu
```

Select **1)** to display trace history for the current boot cycle.

Select **2)** to display trace history from the previous boot cycle.

Select **3)** to clear the current trace buffer. If cleared, then the **Display trace from current boot cycle** option will not show any data.

Reboot

When this option is selected a confirmation message will appear to verify the selection. If a response of **Y** (yes) is given to the confirmation message, current Scalar 100 FCR-1 Module activities will be disrupted while the unit restarts itself. The last saved configuration changes will also take effect after the Scalar 100 FCR-1 Module powers on again.

Download a New Revision of the Firmware

When this option is selected, a confirmation message will appear to verify the selection. If a response of **Y** (yes) is given to the confirmation message, current Scalar 100 FCR-1 Module activities will be interrupted while the unit begins accepting the new firmware from the serial port.

Upgrade Firmware

The Scalar 100 FCR-1 Module can use FTP, TFTP or serial communications to update the firmware. In order to update the firmware via the serial connection, the Scalar 100 FCR-1 Module must be connected to a terminal or terminal emulation program supporting XMODEM transfers. The **Download Firmware** menu item does not appear when accessing the configuration menus through Telnet, SNMP, or the Web Management Interface.

Note	For quicker downloading, configure the Scalar 100 FCR-1 Module and the terminal emulator utility session connected to it (such as Hyperterminal) to run at 115200. Download time is approximately 2 minutes at 115,200.

To upgrade firmware using FTP:

1. Connect the Scalar 100 FCR-1 Module to the Ethernet network used by your computer.
2. Start your FTP program using the Scalar 100 FCR-1 Module's IP address:

   ftp <IP address>

The default IP address is 1.1.1.1. See the "Change IP Address" section of Chapter 4 for information on changing the Scalar 100 FCR-1 Module IP address.

1. Use "root" as the user name and "password" as the password.

To change the user name and password, see the "Change Security Settings" section of Chapter 4.

1. Specify binary mode:

   Bin

2. Specify the firmware's path and filename with the "put" command:

   put <*path:filename*>

The file will transfer and the Scalar 100 FCR-1 Module will reboot. The Scalar 100 FCR-1 Module will then be using the new firmware.

Note	You may want to confirm the new firmware level by checking the Scalar 100 FCR-1 Module's reboot messages through the serial interface.

To upgrade firmware using TFTP:

1. Connect the Scalar 100 FCR-1 Module to the Ethernet network used by your computer.
2. At the command line, type the following command:

   tftp –i <IP address> put <path:filename>

The file will transfer and the Scalar 100 FCR-1 Module will reboot. The Scalar 100 FCR-1 Module will then be using the new firmware.

Note	You may want to confirm the new firmware level by checking the Scalar 100 FCR-1 Module's reboot messages through the serial interface.

To upgrade firmware using the serial connection:

This method requires a terminal (or a PC running terminal emulation software) connected to the serial port at the back of the router.

1. From the "System Utilities" menu, select the **Download a New Revision of The Firmware** option to start the download procedure.

2. When you confirm you want to download, the Scalar 100 FCR-1 Module will start the download process.

3. Use the **Transfer→Send File** option in the terminal emulator utility.

4. Select the location of the firmware. Use the **Browse** button, if you need help finding it.

5. Make sure you select XMODEM as the transfer protocol.

6. Press the **Send** button.

7. The firmware will begin to download to the Scalar 100 FCR-1 Module.

When the download process is complete, the system verifies that the firmware image was successfully written to the FLASH memory and then reboots the Scalar 100 FCR-1 Module. Upon reboot, the Scalar 100 FCR-1 Module detects that there is a newly downloaded firmware image and copies that image to the boot sector of the FLASH and then boots with that image. At that point the Scalar 100 FCR-1 Module is using the new firmware.

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

Figure 5-1: Downloading firmware over serial connection

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

Please begin xmodem firmware transfer ...
________ (transmit Firmware image via XMODEM)
Performing Power-on Self Test ...
 (…)
Self test completed successfully

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

 seconds left 1 : 1
Verifying firmware checksum ...
Updating firmware ...
Target Name: XXXX
Attaching network interface lnPci0... done.
Attaching network interface lo0... done.
NFS client support not included.
Initializing sioc...
SCRIPTS start @ 0x88002000 (3520)
BRIDGE:
Initialized Successfully
Build Level: XXXX
```

Web Management Interface

The Scalar 100 FCR-1 Module allows any standard Web browser to view and change the Scalar 100 FCR-1 Module's current configuration and operating status. Although the menu structure is different than the serial and SNMP interfaces, the functionality of the Web Management Interface is the same. In many cases, the Web Management Interface replaces the menu screens of the serial and SNMP interfaces with drop-down menu options.

Information is presented in HTML format in accordance with the W3C specification for HTML 3.2. Current W3C Recommendations and other technical documents can be found at http://www.w3.org/pub/WWW/TR/.

Accessing the Web Management Interface

1. Connect a 10/100baseT Ethernet cable to the back of the Scalar 100 FCR-1 Module. See Chapter 4, *Configuring the Scalar 100 FCR-1 Module*, of the User Manual for more information on configuring Ethernet access.

2. Apply power to connected Fibre Channel devices.

3. After all the devices have gone through their power up routines, boot up the Scalar 100 Library.

4. Turn on the host computer.

5. If you know the IP address for the Scalar 100 FCR-1 Module, open the host computer's web browser and enter the IP address into the Address field of the Web browser. The factory default for the IP address of the Scalar 100 FCR-1 Module is 1.1.1.1.

   If you do not know the Scalar 100 FCR-1 Module's IP address (or need to change the IP address), connect to the Scalar 100 FCR-1 Module using the RS-232 (serial) connection. Current information can be seen and changed from the Ethernet/SNMP Configuration menu. See Chapter 4, *Configuring the Scalar 100 FCR-1 Module*, of the User Manual for more information on making changes to the IP address.

Note

To access the Web Management Interface, the Scalar 100 FCR-1 Module must be assigned an IP address. The factory default setting for the IP address allows access on a local area network only. If the factory default for the IP address is already used by another device on the local network, the IP address must be changed.

For remote access from WAN or Internet locations, the IP address must be changed to a valid IP address. Valid IP addresses have the form *x.x.x.x* where each *x* is an integer in the range of 1 to 255.

6. When selecting a menu item for the first time (except the Display SCSI Devices option), a prompt requesting a user name and password appears. The defaults are "root" for user name and "password" for password. This information is required only once per session.

7. After entering the user name and password, full access is gained to the configuration menus for as long as a session lasts. A session ends when the user exits the Web browser or navigates the browser to a new web address. Log-in will be required again the next time a session is opened.

Making Changes via the Web Interface

To make changes to settings, use a standard keyboard and mouse to enter new information. Select the **Submit** button to send changes from the web browser to the Scalar 100 FCR-1 Module. Changes will not take effect until the next time the Scalar 100 FCR-1 Module reboots. The unit can be forced to reboot right away by selecting the **Reboot** option from the Diagnostics menu.

For instructions on specific settings, see Chapter 4, for descriptions of the equivalent settings available from the serial interface of the router.

Note	It is recommended not to bookmark Web interface pages with a Web browser. Because configuration information is transmitted via URLs, there is the possibility of the Scalar 100 FCR-1 Module being configured with information present at the time a page was bookmarked. For similar reasons, it is also recommended not to use navigation features of the Web browser (such as the BACK button) to navigate the Web interface. It is recommended to navigate only using the Web page links contained in the Web interface itself. Depending on the Web browser used, these links will often appear as highlighted text. By clicking on the text links, the Web interface can be safely navigated.

Chapter 6

Troubleshooting

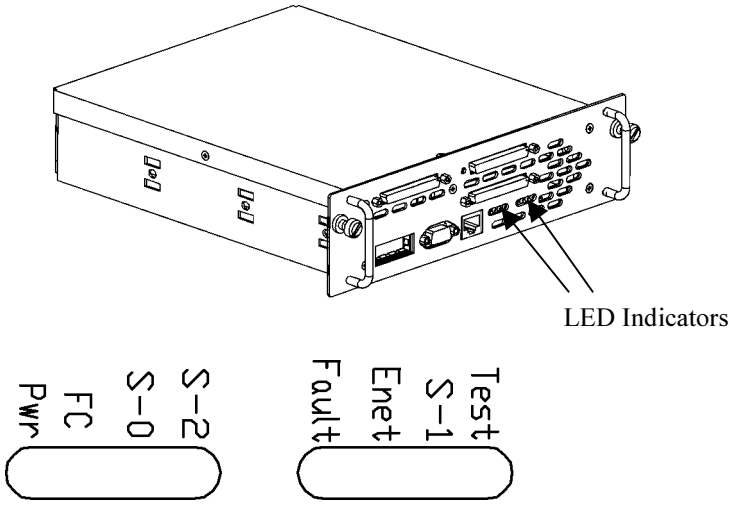
Various problems can arise when configuring and using the Scalar 100 FCR-1 Module. This section is provided to help guide the user through some of the basic methods of identifying faults in the setup and configuration of the unit.

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

Indicators

The LED indicators on the Scalar 100 FCR-1 Module are useful for diagnosing various problems.

Figure 6-1. Scalar 100 FCR-1 Module LEDs



- The *Pwr* indicator turns on when power is applied to the router. Lack of power indication suggests the unit being turned off, a problem with the power supplied to the unit, or an internal problem with the unit.

- The *Fault* indicator is lit when the Scalar 100 FCR-1 Module detects a fault condition. Faults can occur as a result of Power On Self Test (POST) failure or

operational failures. It is normal for this indicator to flash on when the unit is powered up or reset. If the fault indicator stays lit, contact ADIC support.

- The *FC* indicator shows Fibre Channel activity when lit. If this indicator fails to light at all, or stays continually lit without corresponding SCSI bus activity, it may indicate a problem with the Fibre Channel link. Verify the Fibre Channel Configuration.

- The *Enet* indicator signifies Ethernet activity when lit. If the light fails to flicker, or if it stays continuously lit, it may indicate a problem with the network connection. Verify the network connection. The port must be connected to a 10/100BaseT Ethernet network to function properly.

- The *S-0, S-1, and S-2* indicators show SCSI activity (when lit) on the bus indicated (Bus 0, 1, or 2). This should only occur briefly during power up or configuration, and relatively often when the unit is transferring data. If the SCSI indicator stays continually lit without corresponding target device activity, it may indicate a problem with the SCSI bus configuration. Verify the SCSI bus configuration.

- The *Test* indicator is reserved for special diagnostics and should only be used by an authorized service representative.

Basic Verification

Verify SCSI Bus Configuration

Problems with SCSI bus configuration are common. Basic operation of a SCSI bus can be checked by using the configuration menu to view attached SCSI devices. See Chapter 4 for more information. Other conditions to look for include:

- Termination – Problems with termination can cause intermittent or hard failure. A SCSI bus must be terminated on both ends, and only both ends. Termination issues when both narrow and wide devices are on the same bus are common.

- Bus Type – The S-E and LVD devices can be connected to the same SCSI bus, however on power up, if at least one S-E device is detected, the LVD devices must convert to S-E mode, and S-E mode will be used. Only the LVD interface is being specified for the Fast/40 and higher rates.

- Device ID – Each device on a SCSI bus must have a unique ID. Also check the configured ID's for the Scalar 100 FCR-1 Module to verify these are not in use by other devices on the same SCSI bus.

- Cabling – Check SCSI cables to verify they are functional. SCSI rules for total length, distance between devices, and stub length must be adhered to. Connections should also be checked and reseated if necessary.

- Scalar SCSI Drives – Verify that the Scalar's drives can be seen in the configuration menu of the Scalar 100 FCR-1 Module. Select "Perform Configuration" from the first menu. Then select "Fibre Channel to SCSI Mapping Configuration." You must then enter a "**1**" for LUN priority, "**2**" for Bus priority, or a "**3**" for Target, in order to view the list of the attached SCSI drives. If the Scalar 100 FCR-1 Module can not

see the drives, verify SCSI configuration and cabling.

Even if the Scalar's SCSI drives are displayed, they are not accessible unless the mapping mode is auto-assigned or the mapping table has been filled when using Indexed addressing.

Verify Fibre Channel Connection

If the Scalar 100's drives are recognized on the SCSI buses, but do not appear to the Fibre Channel host, it may be that the Fibre Channel link is not properly established. Most hubs and switches have link indicators, showing link status. When the Scalar 100 FCR-1 Module is connected and powered on, this link indicator should show a good link. If it does not, check the cabling or connections. As a means of verifying link integrity when connected to a functional host, disconnecting then reconnecting the Fibre Channel cable should cause momentary activity of this indicator as the link itself reinitializes. Also verify that the media type of the Scalar 100 FCR-1 Module and attached hub, HBA, or switch are of corresponding types. When using optical media, verify that the attached device is using non-OFC type optical devices.

Verify SCSI Devices in NT

If running NT, open the NT Control Panel, select "SCSI Adapters," and double click on the FC HBA. The SCSI devices should be listed.

If no devices are listed, verify the Scalar 100 FCR-1 Module configuration, FC HBA configuration, and cabling.

If devices are listed, verify FC HBA mapping mode or the ALPA on the Scalar 100 FCR-1 Module.

If no drives are listed, verify the Scalar 100 FCR-1 Module configuration, SCSI Controller configuration, and cabling.

Sometimes NT may need to be rebooted with all SCSI devices and the Scalar 100 FCR-1 Module left on before NT will recognize the devices.

Verify Configuration

A number of configuration changes may result in an invalid configuration. If you are in doubt about the configuration, restore the Scalar 100 FCR-1 Module to the factory default configuration and proceed to configure the unit a step at a time, verifying the functionality of the configuration as changes are made.

Verify Addressing

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

Verify Devices

It may be useful to connect the Scalar 100 to a native SCSI interface to verify that the devices are functional. SCSI target devices can be connected to a host SCSI bus to verify they are functional.

Verify Host Configuration

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

Verify HBA Device Driver Information

Check the HBA device driver **`Readme.txt`** file for configuration specifics. An HBA may require a different configuration, depending on whether it is connected to a loop or a switch. HBAs typically come with utility programs that can be used to view or change their configuration.

Serial Port Problems

If you experience trouble communicating with the serial port, verify the configuration of the host terminal or terminal emulation program. The Scalar 100 FCR-1 Module requires the baud rate to be set correctly, 8 data bits, 1 stop bit, and no parity. Flow control should be disabled, and may cause problems if set to 'hardware'. Some terminal programs may not support baud rates higher than 19200, so a lower baud rate may be required. If problems persist, you may want to check the cabling or try a different host. If a valid Ethernet IP address is configured, serial configuration settings can also be set via SNMP and telnet.

Contact ADIC

If you are unable to resolve an issue, contact ADIC Systems technical support at support@adic.com.

Include the model and serial numbers of the ADIC product you are using. This information appears on the rear of the unit next to the power entry module.

If possible, include the version of firmware you are using. The firmware version number appears on most configuration menu screens beneath the menu title.

ADIC Technical Support may ask for trace data or other configuration information. Trace data is obtained by setting the appropriate trace levels in the configuration menu, and running the failing situation. The router dumps the appropriate trace data to the serial port. A terminal or terminal emulator should be set to capture the information into a text file that can be emailed or faxed to ADIC support personnel.

ADIC Technical Assistance Center (ATAC) can be contacted at 1-800-827-3822 (US)or 00.800.9999.3822 (Western Europe and Japan).

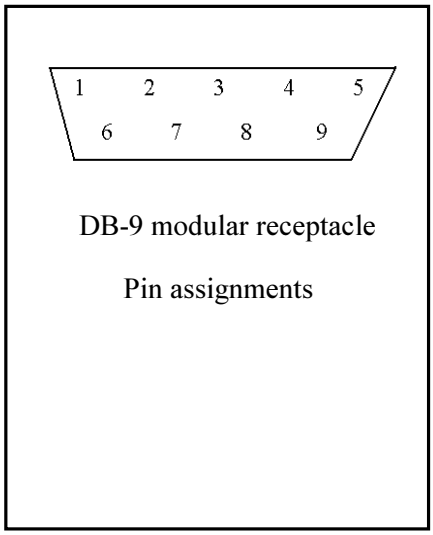
Appendix A

Pin Assignments

DB-9 Serial Pin Assignments

The pin assignments given for the DB-9 serial connection are in reference to the serial receptacle on the exterior side of the Scalar 100 FCR-1 Module. Use an RS-232 null modem cable to connect the Scalar 100 FCR-1 Module to the host system.

Figure A-1. DB-9 pin assignments

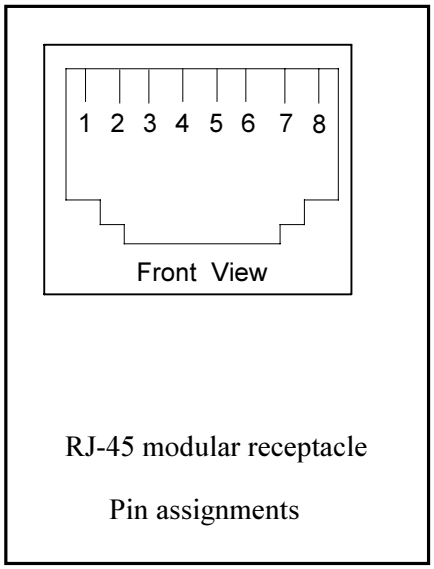


Pin No.	Function
Pin 1	No Connection
Pin 2	Receive Data to Scalar 100 FCR-1 Module
Pin 3	Transmit Data from Scalar 100 FCR-1 Module
Pin 4	No Connection
Pin 5	Ground
Pin 6	No Conection
Pin 7	RTS (Request to Send), not used
Pin 8	CTS (Clear to Send), not used
Pin 9	No Connection

RJ-45 Ethernet Pin Assignments

The pin assignments given for the RJ-45 Ethernet connection are in reference to the Ethernet receptacle on the exterior side of the Scalar 100 FCR-1 Module. The Scalar 100 FCR-1 Module Ethernet connection supports the IEEE specifications for 10BASE-T and 100BASE-TX Ethernet standards.

Figure A-2. RJ- 45 pin assignments



Pin No.	Function
Pin 1	Transmit Out +
Pin 2	Transmit Out -
Pin 3	Receive In +
Pin 4	No Connection
Pin 5	No Connection
Pin 6	Receive In -
Pin 7	No Connection
Pin 8	No Connection

Appendix B

Fibre Channel Interface and Commands

Download Command

The Upgrade Firmware (WRITE_BUFFER) command is used to transfer firmware to the Scalar 100 FCR-1 Module over Fibre Channel. Multiple Upgrade Firmware commands will be required to accomplish the total transfer. All write commands except the final write will have the 3-bit Mode field set to 0x06. The last write command in the sequence will have the Mode field bits set to 0x07 to signify the end of transfer. Each WRITE_BUFFER command will return an FCP response. Upgrading the firmware is successful when the FCP response returns 0x00 (success). When the transfer process is complete and the firmware image has been successfully written to FLASH, the Scalar 100 FCR-1 Module will respond to the last transfer with 0x00, then re-boot with the upgraded firmware. If any errors occur, the Controller will return an FCP_RSP response RC value other than 0x00 and the Scalar 100 FCR-1 Module will abort the upgrade. In this case, the Scalar 100 FCR-1 Module will not re-boot and the previous version of firmware will remain intact. The host will issue a WRITE_BUFFER command as described in *Table B-1*.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (0x3B)							
1	Reserved					Mode		
2	Buffer ID							
3	(MSB)							
4	Buffer Offset							
5	(LSB)							
6	(MSB)							
7	Parameter List Length							
8	(LSB)							
9	Control							

Table B-1. Upgrade Firmware command write buffer

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

Note:

- Multiple Upgrade Firmware commands will generally be required to transfer the entire program image from the host to the Scalar 100 FCR-1 Module DRAM. When the last data block is transferred (mode = 0x07) the Scalar 100 FCR-1 Module terminates data transfer and performs a CRC checksum on data received.
- It is required that the FC initiator sends sequentially from the beginning of the firmware image to the end. No out of sequence Write Buffers are allowed.
- If the CRC test is successful, the Controller will reboot. The Scalar 100 FCR-1 Module will use the newly upgraded firmware. The previous firmware image is discarded. If the CRC test fails, the image transferred to DRAM is discarded, and the controller continues to use the previous firmware image.
- Multi-frame sequences are allowed. Transfer Length for each write must be less than or equal to 64KB (65536 bytes).
- It is required that the Parameter list length be the same as the FCP_DL field in the FCP_CMND IU.

Report LUNs Command

In SCC mode, the Scalar 100 FCR-1 Module supports the FC Report LUNs command. The Report LUNs command will return a list of Logical Unit Numbers that can receive commands. The format of the report LUNs command is as follows:

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (0xA0)							
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	(MSB)							
7	Allocation Length							
8								
9								(LSB)
10	Reserved							
11	Control Byte							

Table B-2. Report LUNs command

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)							
1	LUN list length							
2								
3								(LSB)
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
LUN list								
0-7	First LUN							
	:							
0-7	Last LUN							

Table B-3. Report LUNs parameter list

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

PRLI Data

The Scalar 100 FCR-1 Module supports the discovery mechanism as described in the standard "Private Loop SCSI Direct Attach Rev. 1.6 (section 10.3 - Target Discovery)". The Scalar 100 FCR-1 Module returns the PRLI response data as specified in *Table B-4. Scalar 100 FCR-1 Module PRLI response data*.

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

Table B-4. Scalar 100 FCR-1 Module PRLI response data

Appendix C

SCSI Interface and Commands

SCSI Inquiry Data

The Scalar 100 FCR-1 Module returns the Inquiry Data as defined in Table C-1 when it is addressed to the Scalar 100 FCR-1 Module. The Scalar 100 FCR-1 Module rejects all other commands that are addressed to the Scalar 100 FCR-1 Module.

Item	Value
Peripheral Qualifier	0x00
Peripheral Device Type	0x0C - Indicates Router/Router function
RMB	0x00
Device Type Qualifier	0x00
ISO Version	0x00
AENC	0x00
TrmIOP	0x00
Response Data Format	0x02 - SCSI-2 Inquiry Data Format
Additional Length	0x20
RelAdr	0x00
Wbus32	0x00
Wbus16	0x00
Sync	0x00
Linked	0x00
CmdQue	0x00
SftRe	0x00
Vendor ID	“ADIC”
Product ID	“Scalar 100 FCR-1 Module ”
Revision Level	“0.01”

Table C-1. Scalar 100 FCR-1 Module inquiry data

The Scalar 100 FCR-1 Module will only reply to a SCSI Inquiry when using 8-byte LUN field of 0x00's. Once the Scalar 100 FCR-1 Module has been detected, then the devices on the SCSI-2 can be detected using the SCC Logical unit addressing.

Appendix D

Addressing, Structures and Operation

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

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

Bit / Byte	7	6	5	4	3	2	1	0
N	Address Method		Address Method Specific					
N+1	Address Method Specific							

Table D-1. SCC Addressing Structure

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

Table D-2. Address Method Definitions

Bit / Byte	7	6	5	4	3	2	1	0
N	1	0	Target					
N+1	Bus				LUN			

Table D-3. SCC Logical Unit Addressing

Bit Byte	7	6	5	4	3	2	1	0
N	0	0	Bus					
N+1	Target/LUN							

Table D-4. Peripheral Device Addressing

The Scalar 100 FCR-1 Module supports the Peripheral Device Addressing Method and the Logical Unit Addressing Method, depending on the configuration.

0:0x01	21:0x2E	42:0x52	63:0x74	84:0xA6	105:0xC9
1:0x02	22:0x31	43:0x53	64:0x75	85:0xA7	106:0xCA
2:0x04	23:0x32	44:0x54	65:0x76	86:0xA9	107:0xCB
3:0x08	24:0x33	45:0x55	66:0x79	87:0xAA	108:0xCC
4:0x0F	25:0x34	46:0x56	67:0x7A	88:0xAB	109:0xCD
5:0x10	26:0x35	47:0x59	68:0x7C	89:0xAC	110:0xCE
6:0x17	27:0x36	48:0x5A	69:0x80	90:0xAD	111:0xD1
7:0x18	28:0x39	49:0x5C	70:0x81	91:0xAE	112:0xD2
8:0x1B	29:0x3A	50:0x63	71:0x82	92:0xB1	113:0xD3
9:0x1D	30:0x3C	51:0x65	72:0x84	93:0xB2	114:0xD4
10:0x1E	31:0x43	52:0x66	73:0x88	94:0xB3	115:0xD5
11:0x1F	32:0x45	53:0x67	74:0x8F	95:0xB4	116:0xD6
12:0x23	33:0x46	54:0x69	75:0x90	96:0xB5	117:0xD9
13:0x25	34:0x47	55:0x6A	76:0x97	97:0xB6	118:0xDA
14:0x26	35:0x49	56:0x6B	77:0x98	98:0xB9	119:0xDC
15:0x27	36:0x4A	57:0x6C	78:0x9B	99:0xBA	120:0xE0
16:0x29	37:0x4B	58:0x6D	79:0x9D	100:0xBC	121:0xE1
17:0x2A	38:0x4C	59:0x6E	80:0x9E	101:0xC3	122:0xE2
18:0x2B	39:0x4D	60:0x71	81:0x9F	102:0xC5	123:0xE4
19:0x2C	40:0x4E	61:0x72	82:0xA3	103:0xC6	124:0xE8
20:0x2D	41:0x51	62:0x73	83:0xA5	104:0xC7	125:0xEF

Table D-5. Arbitrated Loop Node number to ALPA lookup table

The data shown in Table D-5 comes from the Fibre Channel Configuration Menu (setting the ALPA value) on the Scalar 100 FCR-1 Module storage router. The user enters the node number (number to the left of the colon from Table D-5) and the router translates the node number into the corresponding ALPA value (number to the right of the colon in Table D-5).

Auto Assigned Addressing Option

The Auto Assigned option is similar to the Indexed addressing, but with the distinction that the table used is created through SCSI device discovery on power up or reset, and not otherwise retained. As the unit performs device discovery on the SCSI bus, the Index table FCP LUN values are filled with adjacent FCP LUNs referencing each subsequent Scalar 100 drive. The host system will then detect every attached SCSI device without voids, allowing full device discovery to the host. Configuration options provide for the SCSI discovery to be performed in order of bus, target, or LUN as desired for the specific environment. This is the preferred method of addressing for the Scalar 100 FCR-1 Module.

Indexed Addressing Option

Indexed Addressing allows for host bus adapter (HBA) drivers that only use Peripheral Device addressing to access the Scalar 100 drives attached to the Scalar 100 FCR-1 Module. This is done by use of a table, which is indexed by sequential LUN values, indicating selected BUS:TARGET:LUN devices. It is not possible in this mode to address the Scalar 100 FCR-1 Module as a controller unit directly. The table has the structure as shown in Table D-6.

The maximum size of the table is equal to the number of buses times the number of targets per bus, less one initiator ID per bus, times the number of LUNs per target.

The index table can be manually edited. Configuration tools allow for the table to be filled in order of increasing bus, target, or LUN, as may be desired for the specific requirements needed. A method is also provided to perform SCSI device discovery, and fill the table in the order that the Scalar 100 drives are discovered on the SCSI busses.

FCP LUN Value	SCSI BUS:TARGET:LUN
0	0:0:0
1	0:1:0
2	0:2:0
3	0:3:0
4	0:4:0
5	0:5:0
6	0:6:0
	(0:7:0 occupied by Initiator ID)
7	0:8:0
(...)	(...)
13	0:14:0
14	0:15:0
15	1:0:0
16	1:1:0
17	1:2:0
(...)	(...)

Table D-6. Example of Indexed Addressing Table

SCC Addressing Option

When a Scalar 100 FCR-1 Module device is configured to use SCC addressing, the unit is capable of responding as a controller device to the FCP Initiator, or routing the FCP request to a specified BUS:TARGET:LUN. When a request using the Peripheral Device Addressing Method is received (An FCP command with the LUN field with bits 7 and 6 of byte 0 are set to 0), the unit routes the request to the internal processor, which acts on the command directly. When a request using the Logical Unit Addressing Method is received (bits 7 and 6 set to 10b), the request is routed to the BUS:TARGET:LUN as specified in the defined field.

Host systems using SCC addressing will typically do initial device discovery using the Peripheral Device Addressing method. On issuing an INQUIRY command to the Scalar 100 FCR-1 Module, the host will receive the Scalar 100 FCR-1 Module Inquiry data, indicating the device type as a controller device (Inquiry data indicates device type is 0xC). The host will then know,

on this basis, that subsequent commands to Scalar 100 FCR-1 Module attached devices will use the Logical Unit Addressing method.

The host can perform discovery by either walking through the BUS:TARGET:LUN values as would a standard SCSI driver, or by issuing a REPORT LUNS command. This command is sent to the Scalar 100 FCR-1 Module (using the Peripheral Device Addressing Method), and the Scalar 100 FCR-1 Module returns a table indicating attached devices. The host can then perform actions on these Scalar 100 FCR-1 Module attached devices directly without having to perform discovery by issuing commands through all possible combinations.

Appendix E

Reference Standards

- *Fibre Channel Physical and Signaling Interface (FC-PH),* ANSI X3T9.3/Project 755D/Rev. 4.3, Contact: Global Engineering, 1-800-854-7179
- Fibre Channel Protocol for SCSI (FCP) Rev 12
- Fibre Channel Private Loop Direct Attach (FC-PLDA)
- *Fibre Channel Arbitrated Loop (FC-AL),* ANSI X3T11/Project 960D/Rev. 4.54, Contact: Globe Engineering, 1-800-854-7179
- *Gigabit Interface Converter (GBIC)*, Small Form Factor. SFF-8053, Revision 5.X
- *Common FC-PH Feature Sets Profiles*, Fibre Channel Systems Initiative, FCSI-101-Rev. 3.1
- *SCSI Profile,* Fibre Channel System Initiative, FCSI-201-Rev. 2.2
- *FCSI IP Profile*, Fibre Channel System Initiative, FCSI-202-Rev. 2.1

Glossary

Adapter

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

Address

See SCSI Addressing.

Addressing Mode

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

AL_PA

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

Arbitrated Loop

See Fibre Channel - Arbitrated Loop. (ANSI specification FC_AL ver 4.5)

Area

The second byte of the N_Port Identifier.

Auto-Assigned Mapping

A menu item. The auto-addressing option creates a mapping table using devices discovered upon powering up or resetting the Scalar 100 FCR-1 Module, that is not otherwise retained by the Scalar 100 FCR-1 Module.

Baud

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

Bus

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

Channel

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

Clusters

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

Device

See FC Device or SCSI Device.

Differential

An electrical signal configuration using a pair of lines for data transfer. The advantage of differential compared to single-ended configuration is a relative high tolerance for common-mode noise and crosstalk when used with twisted pair cables. In layman's terms, this means longer distance.

Domain

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

Exchange

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

Fabric

AN FC term that includes FC Arbitrated Loop, Switched Fabric, and Point-to-Point.

Fault LED

During power up and self test, the Scalar 100 FCR-1 Module Fault LED comes on. After self test, if this LED remains on or comes on, the Scalar 100 FCR-1 Module has a problem with one of its components. During normal operation, this LED should be off.

FC

See Fibre Channel.

FC-AL

See Fibre Channel - Arbitrated Loop.

FC Adapter

A printed circuit assembly that translates data between the FC host processor's internal bus and the FC link. This is also known as an HBA, or Host Bus Adapter.

FC Device

A device that uses Fibre Channel communications.

FC Port

An opening at the back of the Scalar 100 FCR-1 Module that provides a fiber optic connection between the FC adapter and the FC host.

FC-SCSI Hardware Path ID

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

Format: Bus_Converter/Adapter_Address.Protocol_Type.Area.Port.Bus.Target.LUN

Example: 8/4.8.0.0.2.4.0

Fiber

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

Fibre

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

Fibre Channel (FC)

Logically, the Fibre Channel is a bidirectional, full-duplex, point-to-point, serial data channel structured for high performance data communication. Physically, the Fibre Channel is an interconnection of multiple communication ports, called N_Ports, interconnected by a switching network, called a fabric, a point-to-point link, or an arbitrated loop. Fibre Channel is a generalized transport mechanism that has no protocol of its own or native input/output command set, but can transport any existing Upper Level Protocols (ULPs) such as SCSI and IP.

Fibre Channel - Arbitrated Loop (FC-AL)

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

Fibre Channel Protocol for SCSI (FCP)

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

Frame

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

FTP

File Transfer Protocol

GigaBit Interface Connector (GBIC)

A physical component that manages the functions of the FC-0 layer, which is the physical characteristic of the media and interface, including drivers, transceivers, connectors, and cables. Mounts on a FC adapter card and connects the Scalar 100 FCR-1 Module to a FC host.

Hardware Path

See FC-SCSI Hardware Path ID.

Host Bus Adapter (HBA)

See FC Adapter.

HVD

High Voltage Differential. Differential SCSI scheme that has been in use for years. The terminators run on 5 Volts DC.

ID

Numerical identifier

Indexed Addressing

A menu name. It allows for generic Fibre Channel host bus adapters to access SCSI devices attached to the Scalar 100 FCR-1 Module using a table which is indexed by sequential LUN values.

Initiator

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

IP

Internet Protocol

Link

For Fibre Channel, it is a connection between two nodes, each having at least one N_Port (or the other end could be an F-Port), interconnected by a pair of optical or copper links, one inbound and one outbound.

Longwave

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

Loop Address

A FC term indicating the unique ID of a node in Fibre Channel loop topology, sometimes referred to as a Loop ID. Also a status type in the FC Status Menu, showing the FC Loop Address of the Scalar 100 FCR-1 Module.

Loop Port (L_Port)

A FC port that supports loops.

LUN

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

LVD

Low Voltage Differential (See SCSI-3 specifications). LVD uses less power than the current differential drive (HVD), is less expensive and will allow the higher speeds of Ultra-2 SCSI. LVD requires 3.3 Volts DC instead of 5 Volts DC for HVD.

Management Information Base (MIB)

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

Mapping Table

A table which is indexed by sequential LUN values, indicating selected BUS:TARGET:LUN devices. It is used by the Scalar 100 FCR-1 Module to perform Fibre Channel-to-SCSI operations by default.

Mb

Megabit.

MB

Megabyte. (There are 8 bits in a byte.)

MIB

See Management Information Base.

Motherboard

The main PCA of the Scalar 100 FCR-1 Module that provides a physical and logical connection between Fibre Channel and SCSI devices.

Multiplexer

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

N_Port

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

N_Port Identifier

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

Node Name

A field value under the FC Status Menu. The unique FC identifier, a 64-bit value, the factory assigns to the Scalar 100 FCR-1 Module.

Offline

Taking the Scalar 100 FCR-1 Module offline indicates that all SCSI and FC adapters in the Scalar 100 FCR-1 Module are offline.

Taking a SCSI adapter offline means ending inputs/outputs and suspending all transactions going from the Scalar 100 FCR-1 Module to the specified SCSI devices. The SCSI adapter is no longer active or available for access.

Taking a FC adapter offline means ending inputs/outputs and suspending all transactions going from the Scalar 100 FCR-1 Module to the specified FC device.

Online

For the Scalar 100 FCR-1 Module, online indicates that at least one adapter in the Scalar 100 FCR-1 Module is active and available for access.

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

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

Originator

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

Point-to-Point

One of three existing FC topologies, in which two ports are directly connected by a link with no fabric, loop, or switching elements present. The FCR-1 Module uses FC-AL to support Point-to-Point configurations.

Port Name

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

POST

See Power On Self Test.

Power On Self Test (POST)

A group of tests run when the Scalar 100 FCR-1 Module is powered on.

Processor

Contains the arithmetic and logic, control, and internal memory units that control the Scalar 100 FCR-1 Module.

Reset SCSI

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

Responder

The logical function in an N_Port responsible for supporting the exchange initiated by the originator in another N_Port. A FC responder is comparable to a SCSI target. The Scalar 100 FCR-1 Module is often the responder.

Router

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

SAN

Storage Area Network

SCC Addressing

A menu name. SCSI-3 Controller Commands (SCC) addressing is used to address SCSI devices attached to the Scalar 100 FCR-1 Module using the SCC logical unit addressing method. In SCC addressing mode, the Scalar 100 FCR-1 Module will respond to FCP commands as in a SCC controller device.

SCSI

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

SCSI Adapter

A 16-bit fast/wide differential or 8-bit narrow single-ended physical connection between the Scalar 100 FCR-1 Module and the SCSI devices. Each SCSI adapter supports up to sixteen (for fast/wide) or eight (for narrow) SCSI devices, including itself.

SCSI Addressing

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

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

SCSI Bus

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

SCSI Device

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

SCSI Port

An opening at the back of the Scalar 100 FCR-1 Module providing connection between the SCSI adapter and the SCSI bus.

SCSI Status

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

Shortwave

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

SNMP

Simple Network Management Protocol.

Speed

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

TCP

Transmission Control Protocol

Target

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

Terminator Block/Termination

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

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

TFTP

Trivial File Transfer Protocol

Topology

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

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

Trap

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

View Node Name

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

View Port Name

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

World Wide Name (WWN)

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

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