

ASACA AM-SERIES DVD
Digital Virtual Library

FIBRE CHANNEL MANUAL

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Much of Chapter 1, Introduction to Fibre Channel, is taken from IBM Redbook SG24-5470, "Introduction to Storage Area Network," an excellent resource for those new to the topic.

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EU EMC Directive 89/336/EEC

Essential health and safety requirements relating to electromagnetic compatibility.

EN 55022 Class A

Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1

EC generic immunity requirements, Category A & B.

EN61000-4-2

EC Electrostatic discharge requirements for industrial process measurement and control equipment.

EN61000-4-3

Radiated electromagnetic field requirements for industrial process measurement and control equipment.

EN61000-4-4

Electrically fast transients for industrial process measurement and control equipment.

EN61000-4-5

Surge immunity test evaluates ability of industrial process measurement and control equipment to handle power surges.

EN61000-4-6

Conducted immunity test evaluates ability of industrial process measurement and control equipment to handle power surges.

EN6100-4-11

Voltage dips and short interruptions test evaluates ability of industrial process measurement and control equipment to handle short power interruptions.

EC Low Voltage Directive 72/33/EEC

Essential health and safety requirements relating to electrical equipment designed for use within certain limits.

EN 60 950

Safety requirements of information technology equipment including electrical machines.

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CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

CAUTION

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CAUTION

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

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

The user is required to ensure that the optical GBIC being used meets all of the above requirements.

Required 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

Preface

This manual is intended for the system administrator. It explains the configuration and use of the optional Fibre Channel router available on the Asaca AM-Series Libraries.

How This Manual Is Organized

Chapter 1—Provides an introduction to Fibre Channel networks and terminology.

Chapter 2—Explains connection of the AM-Series library to a Fibre Channel network.

Chapter 3—Explains configuration of the Fibre Channel router.

Chapter 4—Provides troubleshooting information.

Companion Documents

This manual is a companion to the following documents:

- AM-750 DVD Library Users Manual
- AM-1450 DVD Library Users Manual
- ASACA AM-Series DVD Library RAID Manual
- ASACA AM-Series DVD Library SCSI Reference Manual
- ASACA AM-Series DVD Library Serial/Telnet Interface Manual
- ASACA AM-Series DVD Library Web Interface Manual

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Chapter 1

Introduction to Fibre Channel

1.1 Fibre Channel Overview

Fibre Channel is a serial data transfer architecture for use with computers and mass storage devices. It is rapidly emerging to challenge SCSI as the interface of choice for host-to-storage applications. Advantages of Fibre Channel include:

- Connection distances up to 10 kilometers
- 100 megabytes per second data transfer rates
- Up to 126 devices on a loop
- Operating system independence
- Interconnect flexibility

The Asaca AM-Series DVD-RAM Library with optional FC Router transmits SCSI commands for both the library and its drives over a Fibre Channel interface. The Fibre Channel interface does not modify the SCSI-3 commands or data, and is used only as a transport mechanism.

1.2 SAN Technology

A SAN, or Storage Area Network, is an interconnected network of storage devices typically managed by application servers. The SAN can be viewed as an extension to the storage bus concept that enables storage devices and servers to be interconnected using elements similar to those used in Local Area Networks (LANs) and Wide Area Networks (WANs): Routers, Hubs, Switches and Gateways. A SAN can be shared between servers and/or dedicated to one server. It can be local or can be extended over geographical distances. Fibre Channel is one of the SAN interfaces.

SANs create new methods of attaching storage to servers. These new methods promise great improvements in both availability and performance. SANs are used to connect shared storage arrays to multiple servers, and are used by clustered servers for failover. A SAN differs from traditional networks because it is constructed from storage interfaces.

A SAN can be used to bypass traditional network bottlenecks. It supports direct, high speed data transfers between servers and storage devices in the following three ways:

- **Server to storage:** This is the traditional model of interaction with storage devices. The advantage is that the same storage device may be accessed serially or concurrently by multiple servers.
- **Server to server:** A SAN may be used for high-speed, high-volume communications between servers.
- **Storage to storage:** This outboard data movement capability enables data to be moved without server intervention, thereby freeing up server processor cycles for other activities like application processing. Examples include a DVD-RAM Library backing up its data to DVD-RAM Library without server intervention, or remote device mirroring across the SAN.

SANs allow applications that move data to perform better, for example, by having the data sent directly from source to target device without any server intervention. SANs also enable new network architectures where multiple hosts access multiple storage devices connected to the same network. Potential benefits of SAN use include:

- Improvements to application availability: Storage independent of applications and accessible through alternate data paths.

- Higher application performance: Storage processing off-loaded from servers and moved onto a separate network.
- Centralized and consolidated storage: Simpler management, scalability, flexibility, and availability.
- Data transfer and vaulting to remote sites: Ability to create remote copies of data for disaster protection.
- Simplified centralized management: Many users spread over a wide area can access data from disks in a single, central data center.

1.3 Fibre Channel Architecture

The industry considers Fibre Channel (FC) to be the architecture on which most SAN implementations will be built. Fibre Channel is a technology standard that allows data to be transferred from one network node to another at very high speeds. This standard is backed by a consortium of industry vendors and has been accredited by the American National Standards Institute (ANSI).

The Asaca AM-Series Library with Fibre Channel router uses FC to carry SCSI traffic. As an analogy, take Ethernet. This single networking hardware standard supports a variety of networking protocols, including TCP/IP, NetBIOS, and AppleTalk. Similarly, there can be many protocols mapped onto FC.

In the following sections, we will introduce some basic Fibre Channel concepts.

1.3.1 Physical Layers

Like other networking protocols, Fibre Channel is structured in independent layers. There are five of these layers in FC, numbered from 0 to 4, with the physical layers numbered from 0 to 2. These physical layers include:

- FC-0** Defines physical media and transmission rates. These include cables and connectors, drivers, transmitters, and receivers.
- FC-1** Defines encoding schemes. These are used to synchronize data for transmission.
- FC-2** Defines the framing protocol and flow control. This protocol is self-configuring and supports point-to-point, arbitrated loop, and switched topologies.

1.3.2 Upper Layers

Fibre Channel is a transport service that moves data quickly and reliably between nodes. The two upper layers enhance the functionality of Fibre Channel and provide common implementations for interoperability. These layers, numbered 3 and 4, are as follows:

- FC-3** Defines common services for nodes. One defined service is multicast, to deliver one transmission to multiple destinations.
- FC-4** Defines upper layer protocol mapping. Protocols such as FCP (SCSI), and IP can be mapped to the Fibre Channel transport service.

1.3.3 Topologies

Fibre Channel interconnects nodes using three physical topologies, which often appear in different variations. These topologies are:

Point-to-Point: The point-to-point topology consists of a single connection between two nodes. All the bandwidth is dedicated for these two nodes. This most basic configuration, and would be used, for example, if you had only one library and one host. (See Figure 1.3.3 A)

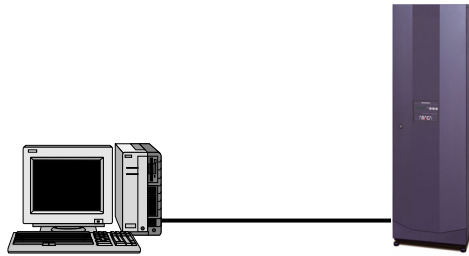


Figure 1.3.3 A—Point-to-Point Fibre Channel Topology

Loop: In the loop topology, the bandwidth is shared between all the nodes connected to the loop. The loop can be wired node-to-node; however, if a node fails or is not powered on, the loop is out of operation. This is overcome by using a hub. A hub opens the loop when a new node is connected and closes it when a node disconnects. (See Figure 1.3.3 B)

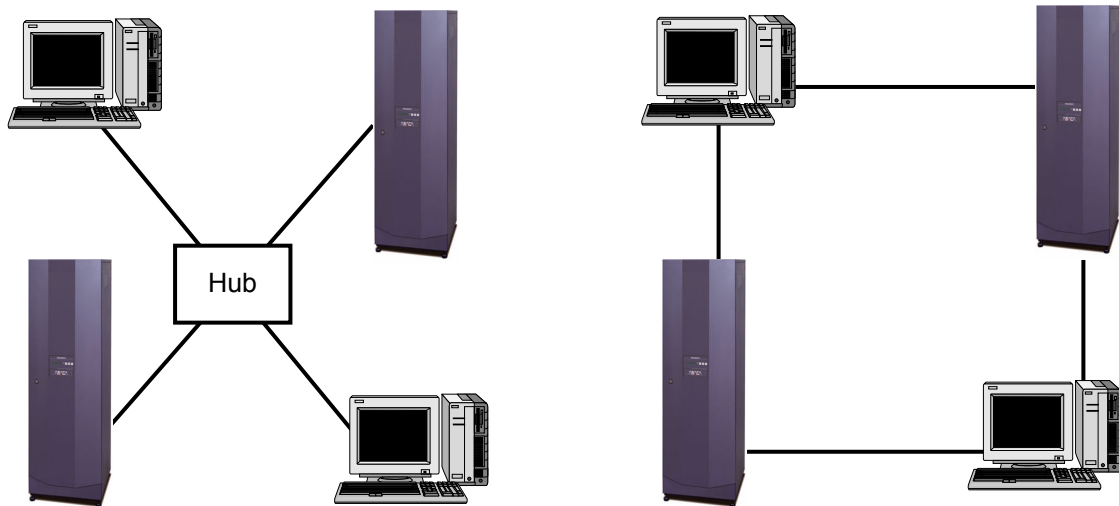


Figure 1.3.3 B—Fibre Channel Loop Topology with and without Hub

Switched: A switch allows multiple concurrent connections between nodes. There are two types of switches: circuit switches and frame switches. Circuit switches establish a dedicated connection between two nodes, whereas frame switches route frames between nodes and establish connections only when needed. A switch can handle all protocols, as it does not look at Fibre Channel layer FC-4. (See Figure 1.3.3 C)

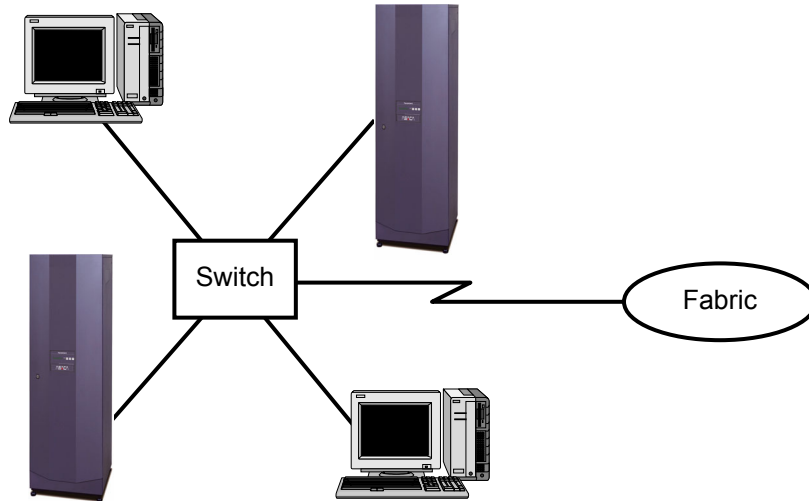


Figure 1.3.3 C—Fibre Channel Switched Topology

1.4 SAN Interconnects

The first element to be considered in any SAN implementation is the connectivity of storage and server components using technologies such as Fibre Channel. Many of the components listed below have been used for traditional LAN and WAN implementations, and are used in SANs, like in traditional networks, to connect components in many network configurations.

1.4.1 Cables and Connectors

As with parallel SCSI and traditional networking, different types of cabling are available for use in a Fibre Channel configuration. Two types of cables are currently available: copper and fiber-optical. Copper cables are used for short distances (up to 30 meters) and can be identified by their DBm, HSSDC, or HSSDC2 connector. Fiber cables come in two distinct types: Multi-Mode Fiber (MMF) for short distances (up to 2 km) and Single-Mode Fiber (SMF) for longer distances (up to 10 km), and are available with either SC or LC connectors. In addition, adapters have been developed that allow the interconnection of fiber-optic devices with copper-based devices. Figure 1.4.1 shows the five different connector types used with Fibre Channel cabling. From left to right: DBm, HSSDC, HSSDC2, SC, and LC.



Figure 1.4.1—Fibre Channel Connectors

1.4.2 Gigabit Link Models

Gigabit Link Models (GLM) are basic Fibre Channel transceiver units that integrate the key functions necessary for installation of a Fibre Channel media interface on most systems.

1.4.3 Gigabit Interface Converters

Gigabit Interface Converters (GBIC) are typically used with hubs and switches, and allow both copper and fiber optics to connect to the same hub or switch. This works well in an environment where the components to be attached may include both fiber optics and copper, depending on cost and distance requirements.

1.4.4 Media Interface Adapters

Media Interface Adapters (MIA) are used to convert optical interface connections to copper and vice versa. Typically, MIAs are attached to host bus adapters, but can also be used with switches and hubs. When a hub or switch only supports copper or optical connections, MIAs can be used to convert the signal to the appropriate media type (copper or optical).

1.4.5 Adapters

Adapters are devices that connect to a server and interface to the storage device or storage device network and control the electrical protocol for communications.

1.4.6 Extenders

Extenders are used to boost signal strength to extend cable runs beyond their normal maximum length.

1.4.7 Multiplexors

Multiplexors provide for more effective utilization of high-speed bandwidth resources by interleaving data from multiple sources onto a single link. Multiplexors are becoming increasingly efficient in terms of data compression, error correction, transmission speed, and multi-drop capabilities.

1.4.8 Hubs

Fibre Channel hubs are used to connect up to 126 nodes into a logical loop. All connected nodes share the bandwidth of this one logical loop, most commonly using the Fibre Channel Arbitrated Loop (FC-AL) protocol. Each port on a hub contains a Port Bypass Circuit (PBC) to automatically open and close the loop to support hot-plugging. Multiple hubs and links can be implemented to provide alternate path failover capability for high-availability server environments. Intelligent hubs are also available that provide features such as dynamic loop configuration and some of the benefits of switches.

1.4.9 Bridges

Bridges facilitate communication between LAN/SAN segments and/or networks with dissimilar protocols.

1.4.10 Gateways

A Gateway is a network station used to interconnect two or more dissimilar networks or devices, and may or may not perform protocol conversion. These boxes are typically used to provide access to WAN from a LAN. With gateways, SANs can be extended across a WAN.

1.4.11 Switches

Switches are among the highest-performing devices available for interconnecting large numbers of devices, increasing bandwidth, reducing congestion, and providing aggregate throughput. Fibre Channel protocol was designed specifically by the computer industry to remove the barriers of performance with legacy channels and networks. When a Fibre Channel switch is implemented in a SAN, the network is referred to as a fabric, or switched fabric. Each device connected to a port on the switch can access any other device connected to any other port on the switch, enabling an on-demand connection to every connected device. Various FC switch offerings support both switched fabric and/or loop connections. As the number of devices increases, multiple switches can be cascaded for expanded access. As switches allow any-to-any connections, the switch and management software can restrict which other ports a specific port can connect to, a method called port zoning.

1.4.12 Routers

Storage routing is a new technology based on the old concept of routing as it is understood by the data communications industry. Storage routers differ from network routers in that the data being routed uses storage protocols like FCP (SCSI) instead of messaging protocols such as TCP/IP. The data path used to transfer storage data may be the same as that used for messaging traffic, but the content of the data itself contains embedded storage protocol information. This is similar to the concept of tunneling protocols used in the broader market, where data is transferred over differing transmission media and addressing schemes. As a combination of communications and storage channel capabilities, Fibre Channel represents the first opportunity to apply communication techniques, such as routing, to storage traffic. For example, a storage router could encapsulate SCSI information in TCP/IP packets for transmission over an intervening Ethernet network.

This Chapter provides the information necessary to connect the Asaca AM-Series Library with Fibre Channel router to a Fibre Channel network.

2.1 Physical Connections

You can connect the router directly to an FC HBA (Host Bus Adapter) or to an FC switch or hub. You must use proper FC components (for example, GBICs, MIAs, and FC cable, either optical or copper).

You will need to purchase a GBIC through your distributor. The GBIC connector is available in seven different versions:

- Copper
 - DB-9
 - HSSDC
 - HSSDC2
- Optical
 - Short wave
 - SC
 - LC
 - Long wave
 - SC
 - LC

To connect to the Fibre Channel port:

Be sure the router is turned off.

1. Insert the GBIC into the Fibre Channel port.

The GBIC is keyed and can only go in one way. However, be sure that the GBIC locks into place.

2. Connect one end of the Fibre Channel cable to the GBIC and the other end to a server's HBA, an arbitrated loop hub, or a fabric switch.

The cable used to connect from the GBIC to an HBA, hub, or switch depends on the connection and topology of the Fibre Channel network.

You will also need to connect some external SCSI cabling. The cabling consists of two 0.5 meter SCSI cables which are connected as follows:

1. Connect one 0.5 meter SCSI cable from syscon library connector to the connector labeled SCSI to syscon.
2. Connect the second 0.5 meter cable from syscon library to the connector labeled SCSI from syscon.

Note that the two syscon library connectors are identical and that the connections to the SCSI to syscon and SCSI from syscon connectors are interchangeable.

A power interconnect cable from the AC input accessory connector to the fibre channel power supply must also be installed. Figure 2.1 shows all the fibre channel external cabling that must be installed prior to using the library and the fibre channel module.



Figure 2.1—External Cabling

2.2 Status LEDs

The LED status lights are located on the lower rear panel of the ASACA AM-Series Library. (These indicator lights are shown in Figures 2.2 A and 2.2 B, and are explained in Figure 2.2 C.) As you can see in Figure 2.2 A, The LEDs are located on the GBIC interface module. In a configuration with one Fibre Channel router, only the top set of indicator lights will be used. If a second Fibre Channel router is installed, the bottom set of indicator lights will also be used.

Note: If all indicator LEDs are on solid for a router module, the router module is not installed (as is the case in one-router configurations) and is bypassed by the internal system hub.

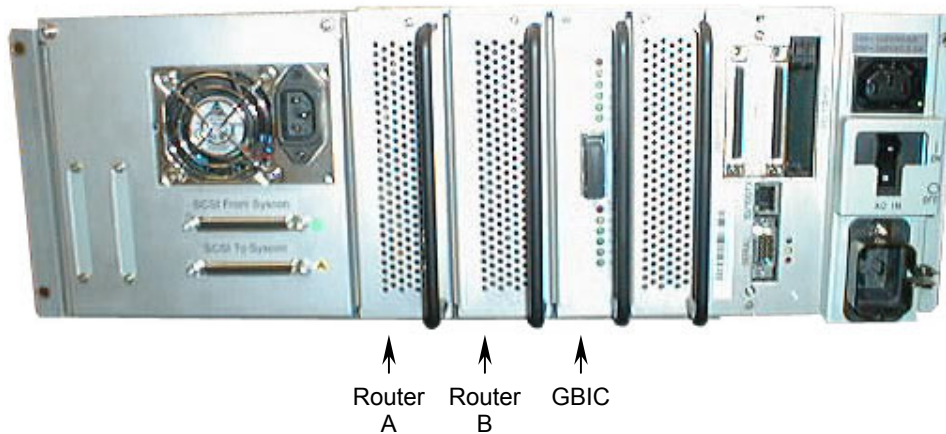


Figure 2.2 A—Back Panel

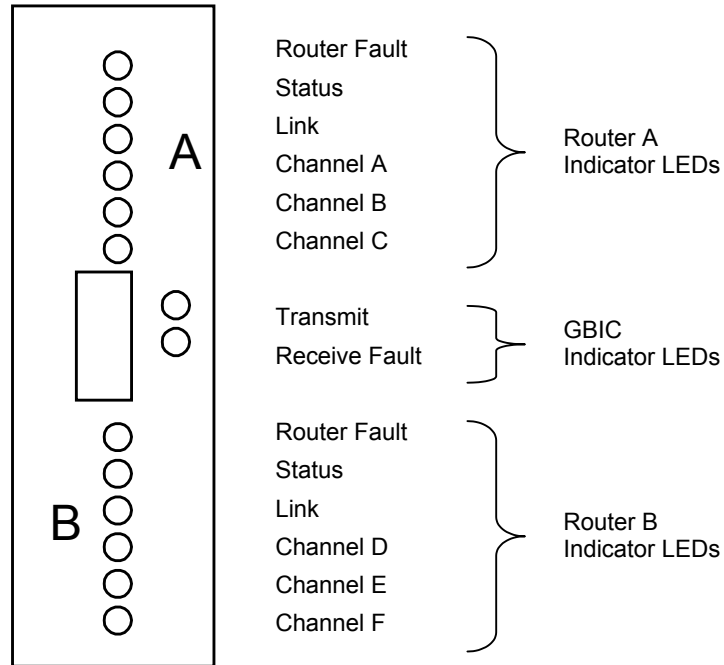


Figure 2.2 B—Status LEDs Single GBIC Module

Led Label	Description	Color	Function
Router Fault	Router Fault	Red	Solid on when router is powered-up and fails any internal diagnostic or detects a critical error, or if router is not installed or connected properly.
Status	Router Status	Yellow	Solid on when router is powered-up and passes all internal diagnostics. Flashing when router either detects a warning/degraded mode or fails to boot.
Link OK	Host FC activity	Green	Solid on when FC link is connected. Solid off when FC link is disconnected.
CH	SCSI channel activity	Green	Solid on when bus is active or busy.
TX	GBIC Transmit Fault	Red	Solid on when FC router cannot send.
RX	GBIC Receive Fault	Red	Solid on when FC router cannot Receive.

Figure 2.2 C—Status LEDs

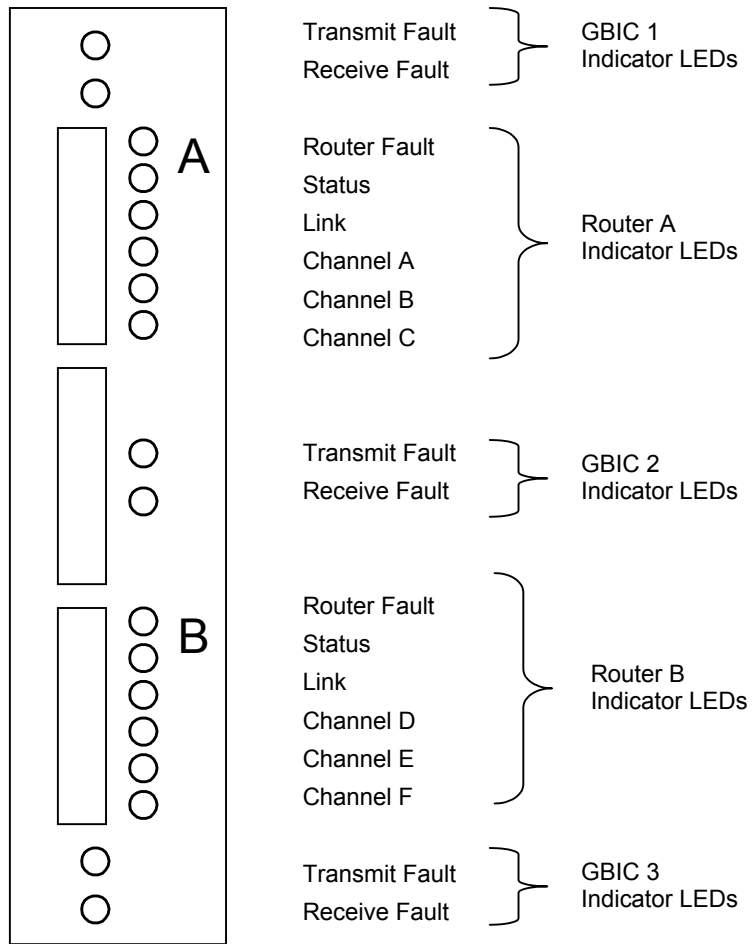


Figure 2.2 D—Status LED's Triple GBIC Module

Chapter 3 Configuring the Router

This chapter provides the information necessary to get an ASACA AM-Series Library with Fibre Channel router up and running quickly. Before configuring the router, make sure that the following have been completed: (See the AM-750 or 1450 Users Manual for help with these steps.)

- Library has been unpacked and installed.
- DVD media has been prepared and installed.
- Library has been connected to the host computers.
- Library has been turned on.
- TCP/IP settings have been configured.

3.1 Configuring the Fibre Channel Router

The Fibre Channel Router installed in the library is configured and managed using a terminal application, either through a Java applet in the library's web configuration system or through a serial or telnet connection to the library.

3.1.1 Configuring the FC Router through the Web Interface

To access the Fibre Channel configuration through the web interface, follow these steps:

1. Connect to the web interface of the library, using either the IP address or the host name you have assigned to the machine.
2. In the "Administrators" section of the menu on the left hand side is a button marked "Add-On Interface Configuration." Click on it. (See Figure 3.1.1)

The Add-On Interface Configuration page will appear. This page contains links for each of the options available on the Asaca AM-Series Libraries, not all of which may be active depending on the options you have installed in your library.

3. Click on the link marked "Fibre Channel Configuration."

A new window will open with a Java applet. This applet emulates a telnet session with the Asaca TeraCart, providing access to this terminal-based configuration program.

Depending on the configuration of your library, there may be either one or two Fibre Channel routers installed.

4. To configure FC router A, type "fiberA" at the prompt and press Enter.
To configure FC router B, type "fiberB" at the prompt and press Enter.
5. You are now in a direct connection with the Fibre Channel router. If the screen is blank, or to refresh the screen, press Ctrl-R.

For information on using the router administration software, skip ahead to Section 3.2.

When you are finished configuring the Fibre Channel router, be sure to terminate the connection between the library and the router as follows:

1. Press Ctrl-A to display a menu of connection options.
2. Select "Quit with hang-up" by pressing "Q" and Enter.

3. You have now terminated the connection and may safely close the Java terminal window.



Figure 3.1.1—Add-On Configuration Page

3.1.2 Configuring the FC Router through the Serial/Telnet Interface

Refer to the Serial/Telnet Interface Manual for instructions on creating a serial or telnet connection with the library. Once you have a connection:

- To configure router A type “/home/chap/fiberA”
- To configure router B type “/home/chap/fiberB”

When you are finished configuring the Fibre Channel router, be sure to terminate the connection between the library and the router as follows:

1. Press Ctrl-A to display a menu of connection options.
2. Select “Quit with hang-up” by pressing “Q” and Enter.
3. You have now terminated the connection and may safely close the Java terminal window.

3.2 Router Administrator Software

Using the Router Administrator, you can:

- Change the router configuration settings
- Reboot the router
- Display information about the router
- Display information about the devices attached to the router
- Change address mapping information for the devices

3.3 Navigating the Router Administrator Software

You can navigate within the Router Administrator software using your keyboard. Figure 3.3 A below describes the primary navigation and selection methods:

To	Do This
Select a menu item	Press ↑ or ↓ and press Enter or Press the letter that is a different color (or highlighted) in a menu item (hot key) and press Enter.
Return to the previous menu or screen without saving your changes	Press Esc or ←.
Scroll through the available choices for a setting	Press ↑ and ↓.

Figure 3.3 A—Router Administrator Navigation

Note: After a few seconds of inactivity, the Router Administrator software times out and returns to the System Menu.

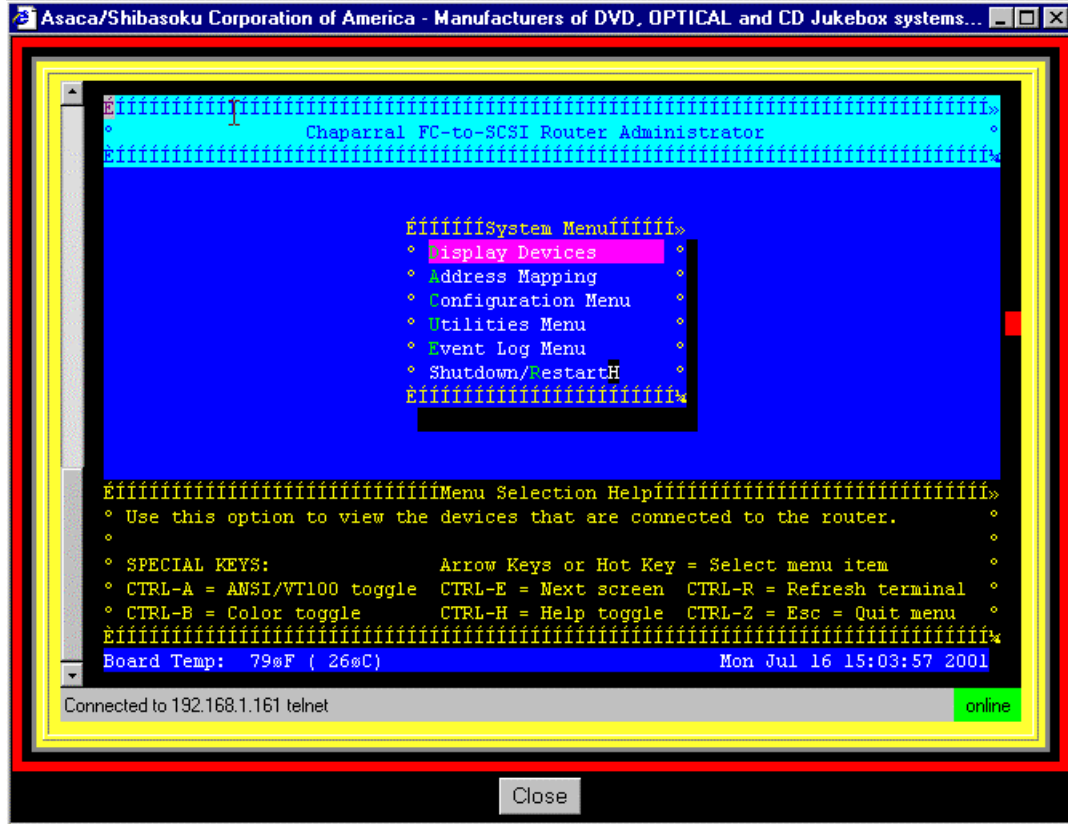


Figure 3.3 B—Router Administrator System Menu

3.3.1 Changing the Screen Display

While using the Router Administrator software, you can change the screen display using a combination of keystrokes, as shown on the System Menu. Figure 3.3.1 lists the keystrokes required to change various screen displays.

Key Combination	Function
Ctrl-A	Toggles between ANSI and VT100 character sets
Ctrl-B	Toggles between black-and-white and color screen
Ctrl-E	Toggles between the event log, hardware information, and configuration information screens
Ctrl-H	Displays Help screen
Ctrl-R	Refreshes screen
Ctrl-Z	Quits current menu

Figure 3.3.1—Changing Screen Displays

3.4 Changing Router Configuration

You can use the Router Administrator software to change a variety of router configuration settings. You can::

- Select the topology
- Change the router's loop ID
- Change the router's LUN
- Change the router's SCSI ID (initiator ID) for each channel
- Set the router's date and time
- Change the SCSI bus scan delay
- Enable and disable the internal alarm
- Restore the router default settings

3.4.1 Selecting the Topology

You should be sure that the router's topology setting is correct for your configuration. You can set the topology to:

- **Loop**—Use this option for all configurations except when the router is connected to a switched fabric.
- **Point-to-Point**—Use this option only when you connect the router to a switched fabric.

To select the topology:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Host Configuration and press Enter.
The Host Configuration screen displays.
3. Select the Topology that matches your configuration and press Enter:
 - **Loop**—use this option for all configurations except when the router is connected to a switch F-port.
 - **Point-to-Point**—use this option only when you connect the router to a switch F-port.If you selected Loop, the Loop ID screen displays.
4. If the Loop ID screen displays, select the option or number you want to use and press Enter.
For more information about these settings, see Section 3.4.2, Changing the Router's Loop ID.
The Router LUN screen displays.
5. Select the option or number you want to use and press Enter.
For more information about these settings, see Section 3.4.3, Changing the Router's FC LUN.
The system confirms that you want to make the changes.
6. Select Yes and press Enter to make the changes.
The system confirms that the changes are made.
7. Press Enter to return to the Host Configuration Menu.
8. Reboot the router.

Note: If you change the topology, Loop ID, or router LUN, you must reboot the router for the change to take effect. See Section 3.5, Rebooting the Router.

3.4.2 Changing the Router's Loop ID

If the router is installed on a FC loop, you can change the router's Loop ID to meet your needs. You have two options for setting the Loop ID:

- **Soft**—Use this setting if you do not care if the router's Loop ID changes when you power down and power up. This setting lets the FC loop initialization process determine the Loop ID.
- **Any number between 0 and 125**—Select a specific number if you want the Loop ID to stay the same after you power down and power up. The Router Administrator software cannot tell you which Loop IDs are available. To be sure that you have successfully assigned the Loop ID you want, check the Loop ID after you reboot the router. If the router cannot get the specified Loop ID during the loop initialization process, it will try to get a soft address.

To Change the Loop ID:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Host Configuration and press Enter.
The Host Configuration screen displays.
3. Select the topology you want and press Enter, or press Enter if the correct topology is already selected.
The current setting is marked with an * next to it.
The Loop ID screen displays if Loop Topology was selected.
4. Select the option or number you want to use and press Enter.

To	Do This
Let the FC loop initialization process determine the Loop ID each time the router powers up	Select SOFT and press Enter. This is the default setting.
Keep the same Loop ID for the router at all times	Select the Loop ID you want to use and press Enter. This can be any number from 0 to 125.

The Router LUN screen displays. The text inside the angle brackets < > shows the current Router LUN.

5. Press Enter.
If you want to change the router LUN, you can do so.
The system confirms that you want to make the change.
6. Select Yes and press Enter to make the changes.
The system confirms that the changes are made.
7. Press Enter to return to the Configuration Menu.
8. Reboot the router.
Note: If you change the topology, Loop ID, or router LUN, you must reboot the router for the change to take effect. See Section 3.5, Rebooting the Router.
9. If you entered a specific Loop ID, repeat steps 1 through 3 to see if the current setting is what you entered.
10. If the Loop ID is not what you want, repeat steps 4 through 8.

3.4.3 Changing the Router's FC LUN

◆ **Attention:** *Do not change this setting unless directed by the Asaca Support Team.*

You can change the router's FC LUN to meet your needs. You can have three options for setting the FC LUN:

- **Soft**—Use this setting if you do not care if the router's FC LUN changes when new devices are added to the back end. This setting assigns the last available FC LUN to the router.
- **Any number between 00 and 63**—Select a specific number if you want the router's FC LUN to stay the same when you add new devices and after you power down and power up.
- **None**—Use this setting if you do NOT want the router to display as a device on the host.

To change the LUN:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Host Configuration and press Enter.
The Host Configuration screen displays.
3. Select the topology you want and press Enter, or press Enter if the correct topology is already selected.
The current setting is marked with an * next to it. For information about the topology selection, see Section 3.4.1, Selecting the Topology.

If you selected Loop, the Loop ID screen displays. To display the Router LUN screen, press Enter. If you want to change the Loop ID, you can do so. See Section 3.4.2, Changing the Router's Loop ID.

If you selected Point-to-Point, the Router LUN screen displays.

The text inside the parentheses () shows the current Router LUN setting.
4. Select the option or number you want to use and press Enter.
The system confirms that you want to make the change.
5. Select Yes and press Enter to make the changes.
The system confirms that the changes are made.
6. Press Enter to return to the Configuration Menu.
7. Reboot the router.
Note: If you change the topology, Loop ID, or router LUN, you must reboot the router for the change to take effect. See Section 3.5, Rebooting the Router.
8. If you entered a specific LUN, repeat steps 1 through 3 to see if the current router LUN (inside the <>) is what you entered.
9. If the LUN is not what you want, repeat steps 4 through 7.

3.4.4 Changing the SCSI ID Assigned to Each Router Channel

◆ **Attention:** *Do not change this setting unless directed by the Asaca Support Team.*

The router assigns each of its SCSI channels one of the SCSI IDs (initiator IDs), leaving 15 SCSI IDs available for devices. You can change the SCSI ID assigned to each channel. The Default is 7.

To change the SCSI ID assigned to a router channel:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Channel Configuration and press Enter.
The Channel Configuration screen displays.
3. Select the channel whose SCSI ID you want to change and press Enter.
4. Select the SCSI ID (Initiator ID) you want to use for this channel and press Enter.
The system confirms that you want to make the change.
5. Select Yes and press Enter to make the changes.
The system confirms that the changes are made.
6. Press Enter to return to the Configuration Menu.

3.4.5 Setting the Router's Date and Time

You can set the router's date and time.

To set the router's date:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Set Date/Time and press Enter.
The Set Date/Time screen displays.
3. Select Set Date and press Enter.
The Set Date screen displays.
4. Enter the date you want and press Enter.
Enter the date in the following format: MM/DD/YYYY.
The System confirms that you want to make the change.
5. Select Yes and press Enter to make the changes.
The system confirms that the changes are made.
6. Press Enter to return to the Configuration Menu.

To set the router's time:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Set Date/Time and press Enter.
The Set Date/Time screen displays.
3. Select Set Time and press Enter.
The Set Time screen displays.
4. Enter the time you want and press Enter.
Enter the time in the following format: HH:MM:SS
The system confirms that you want to make the change.
5. Select Yes and press Enter to make the changes.

The system confirms that the changes are made.

6. Press Enter to return to the Configuration Menu.

Note: The router's date and time is independent of the library's date and time.

3.4.6 Changing the Scan Delay.

◆ **Attention:** *Do not change this setting unless directed by the Asaca Support Team.*

You can control how long the router waits before scanning its channels for devices. You may want to change this setting if you have devices that take longer to come ready than the router.

To change the scan delay:

1. From the System Menu, select Configuration Menu and press Enter.

The Configuration Menu screen displays.

2. Select Scan Configuration and press Enter.

The Scan Configuration screen displays.

3. Select the number of seconds you want the router to wait and press Enter.

You can select any number between 0 and 255.

The System confirms that you want to make the changes.

4. Select Yes and press Enter to make the changes.

The system confirms that the changes have been made.

5. Press Enter to return to the Configuration Menu.

3.4.7 Enabling and Disabling the Alarm

◆ **Attention:** *Do not change this setting unless directed by the Asaca Support Team.*

You can enable or disable the audible alarm that sounds when the router becomes too hot or detects low or high voltage. The alarm sounds a warning first. If the problem is not resolved, the alarm sounds a shutdown alarm. The router will then no longer transmit data until the problem is resolved.

The alarm conditions make the ST (status) light blink and also trigger an event message that displays in the Router Administrator software window and in the event log.

Figure 3.4.7 shows the temperature and voltage thresholds for each alarm and what to do to resolve the problem.

Alarm threshold	What to do when the alarm sounds
CPU temperature Warning—5°C and 65°C Shutdown—0°C and 70°C	Check the Router Administrator software to confirm what the alarm means. Check that the fan is running and is not obstructed. You can feel if the fan is running by placing your hand on the rear panel of the router near the power switch. Check the ambient temperature and lower it, if needed. Ambient temperature should be less than 45°C.
On-board temperature Warning—5°C and 45°C Shutdown—0°C and 50°C	Same as above for the CPU temperature.

Alarm threshold	What to do when the alarm sounds
VCC voltage Warning—5V -3.5% and +6.5% Shutdown—5V -6.5% and +10%	Check the Router Administrator software to confirm what the alarm means. If it is a warning alarm, let the router continue to operate. If it is a shutdown alarm, turn off the power to the router and send it for service.
12V voltage Warning—12V -8% and +8% Shutdown—12V -10% and +10%	Same as above for the VCC voltage.

Figure 3.4.7—Alarm Thresholds

To enable or disable the alarm:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Alarm and press Enter.
The Alarm screen displays. The current setting is marked with an * next to it.
3. Select the option you want and press Enter.
The system confirms that the changes are made.
4. Press Enter to return to the Configuration Menu.

3.4.8 Restoring the Default Settings

◆ **Attention:** *Do not restore default settings unless directed by the Asaca Support Team.*

You can restore all of the router’s default ROM settings. You may want to do this if the router is not working properly and you cannot determine why. This lets you then change the settings that are critical to your configuration, specifically the topology.

Note: The default settings are not the same as the shipped configuration for an Asaca AM-Series Library.

To restore the default settings:

1. From the System Menu, select Configuration Menu and press Enter.
The Configuration Menu screen displays.
2. Select Restore Defaults and press Enter.
The Restore Defaults screen displays. The selected option is marked with an * next to it.
3. Select Yes and press Enter to make the change.
The system confirms that the changes are made.
4. Press Enter to return to the Configuration Menu.

3.5 Rebooting the Router

You must reboot the router after you change the topology, Loop ID, or router LUN. You should also reboot the router when you connect new devices.

To reboot the router:

1. From the System Menu, select Shutdown/Restart and press Enter.

The system confirms that you want to shut down.

2. Select Yes and press Enter.

The system confirms that it has been shut down.

3. Press Enter to reboot.

The system performs its self-test. When you see the Router Administrator initial screen, the router is ready.

3.6 Changing and Displaying Device Information

You can change and display information about the devices connected to the router using the Router Administrator. You can:

- Change the mapping mode (Auto or Fixed)
- Change device addresses.
- Set up LUN Zoning
- Display the devices attached to the router.
- Display the FC-to-SCSI address map.

3.6.1 Changing the Mapping Mode (Auto or Fixed)

You can change how the router maps the addresses of the devices on the SCSI channels to FC LUNs. You have two options for the mapping mode, which affects all three SCSI channels on the FC Router:

- **Auto**—Lets the router assign an FC LUN to each device each time you power up the router. The router maps sequentially as it scans the channels and discovers devices (devices are discovered by channel, lowest SCSI ID and LUN first). Devices are mapped to FC LUNs, starting from LUN 0 to LUN 63 (64 LUNs are supported).
- **Fixed**—Locks the current mapping for each device. This reserves the devices' same FC LUN over power cycles (SCSI channel:target:LUN combination), even when you power down and power up the router. The router retains the mapping, if the devices are added, moved, or removed. The Fixed mode is recommended for environments where device scanning may change and a Fixed mapping for the application to the target devices is required. Devices added after selecting Fixed will be automatically mapped to an available FC LUN.

For example, if one drive is replaced with another that has the same SCSI channel:target:LUN combination, the second drive will map to the same FC LUN that the first drive did.

Note: It is highly recommended that fixed mapping mode be used. This mode is the default configuration for Asaca AM-Series Libraries.

To change the mapping mode:

1. From the System Menu, select Address Mapping and press Enter.

The Address Mapping screen displays.

2. Select Mapping Mode press Enter.

The Mapping Mode screen displays. The current setting is marked with an * next to it

3. Select the option you want and press Enter:

- **Auto**—lets the router assign the FC LUN to each device anytime you power up the router.
- **Fixed**—tells the router to keep the same FC LUN as currently assigned for each device. This reserves the same FC LUN for each device, even when you power down and power up the router. The router retains the FC LUN, even if the device is no longer connected.

The system confirms that the changes are made.

4. Press Enter to return to the Address Mapping screen.

3.6.2 Changing Device Addresses (FC LUNs)

You can change the FC LUN for any device connected to the router. You can only change the FC LUNs when the address mapping mode is set to Fixed. As long as you stay in Fixed mode, all FC LUNs you change will be retained even if the device or router is powered off and back on or if the device is removed and reconnected.

You can set the FC LUN for devices to any number between 00 and 63 by selecting the FC LUN that you want the device to map to. You cannot select the same FC LUN as the router's LUN.

When in Fixed mode, the router will discover any new devices or existing devices that were removed and reconnected to a different location. These newly discovered devices will be in Auto mode and will be assigned an FC LUN by the router. You can change these FC LUNs by following the steps below.

If you assign an FC LUN that is already in use, the FC LUNs for the two devices are swapped. For example, if device A has LUN 01 and device B has LUN 03, and you assign 03 to device A, the LUN for Device B becomes 01.

To change the device FC LUNs:

1. Set the address mode to Fixed
See Section 3.6.1, Changing the Mapping Mode (Auto or Fixed).
2. From the System Menu, select Address Mapping and press Enter.
The Address Mapping screen displays.
3. Select Display Address Map press Enter.
The Display Address Map screen displays.
4. Select the device whose LUN you want to change and press Enter.
The Change Address Map screen displays. The text inside the angle brackets <> shows the current FC LUN
5. Select the FC LUN number you want to use for this device and press Enter.
You can select any number between 00 and 63.
The system confirms that you want to make the changes.
6. Select Yes and press Enter to make the changes.
The system confirms that the changes are made.
7. Press Enter to return to the Address Mapping screen.

3.6.3 Displaying the Devices Connected to the Router

You can display a list of the SCSI devices connected to the router. Currently, the list only includes the first 15 devices on each channel.

The list includes the following information for each device:

- SCSI channel number
- SCSI ID
- LUN
- Device type number (from the SCSI inquiry data)

- Bytes 8 through 31 of the standard SCSI inquiry data, which normally includes:
 - Vendor ID
 - Product ID

To display the devices connected to the router:

1. From the System Menu, select Display Devices and press Enter.
The Display Devices screen displays.
2. Press Esc to return to the System Menu.

3.6.4 Displaying the FC-to-SCSI Address Map

You can display the FC-to-SCSI address map for all of the SCSI devices connected to the router. The address map includes the following information for each device:

- FC LUN
- Device ID (Channel number: SCSI ID: LUN)
- Bytes 8 through 35 of the standard SCSI inquiry data, which normally includes:
 - Vendor ID
 - Product ID
- Mapping mode

The address map lists devices in ascending order based on the FC LUN, including the router itself if it has a FC LUN assigned to it.

To display the address map:

1. From the System Menu, select Address Mapping and press Enter.
The Address Mapping screen displays.
2. Select Display Address Map press enter.
The Display Address Map screen displays.
3. Press Esc to return to the Address Mapping screen.

3.7 Displaying Router Information

You can display important information about the router using the Router Administrator, including:

- Event log
- Hardware and configuration information
- Router's LUN

3.7.1 Displaying the Event Log

The router's event log contains important information about the status of the router. Below is a list of the events included in the log.

- Restore defaults
- Config changed
- Cntlr params set
- Router shutdown
- Power up

- Firmware update
- Temperature warning
- Temperature failure (this leads to a shutdown of router which is logged as a shutdown)
- Voltage warning
- Voltage failure (this leads to a shutdown of router which is logged as a shutdown)

You should check the log regularly. The event log stores the most recent 400 events. Events are numbered from 001 to 999. The numbering wraps back to 001 after reaching 999.

Note: If you are having a problem with the router, check the event log before calling technical support. Event messages may let you resolve the problem without calling.

You can view the event log two ways:

- One event at a time, most recent event first.
- Full page of events at a time.

You can also capture the text to a file.

To display one event at a time:

1. From the System Menu, select Event Log Menu and press Enter.
The Event Log Menu screen displays.
2. Select View Event Log and press Enter.
The Event Log screen displays the last event that occurred.
3. Press ↑ to see the previous event.
You can continue to view earlier events by pressing ↑.
4. Press Esc to return to the Event Log Menu.

To display a full page of events:

1. From anywhere in the Router Administrator software, press Ctrl-E
2. The first screen of events from the event log displays.
3. Press D to page down or U to page up in the log.
4. Press Esc to return to the menu from which you came.

3.7.2 Displaying Hardware and Configuration Information

You can display the router's hardware and configuration information. This is where you can see what version of the firmware you have.

You can display the hardware and configuration information two ways:

- Hardware information only
- Hardware and configuration information.

Figure 3.7.2 lists the configuration information that is available.

Group	Field	What Displays	Field	What Displays
Host	Topology	Loop or Point-to-Point based on the topology set in the Router Administrator software. If set to Loop, the router detects if it is attached to a public loop (router is attached to the FL-port of a switch) or a private loop.		
	Node WWN	FC World Wide Name for node.		
	Port WWN	FC World Wide Name for port.		
	FC Addr	24-bit FC address or None if the FC link is not active.	AL_PA, if the topology is LOOP.	Currently assigned value or None if the FC link is not active.
	Loop ID, if the topology is LOOP.	SOFT or a specific number as set in the Router Administrator software.	Current	Currently assigned value if the topology if LOOP, or Inactive if the FC link is not active.
	Router LUN	SOFT, NONE, or specific number as set in the Router Administrator software.	Current	Currently assigned value or Inactive if the Router LUN is set to NONE.
CHAN 0	Initiator ID	SCSI ID of router on Channel 0 as set in the Router Administrator software.	Ultra/U2	Hardware runs as Ultra2.
	Termination	Hardware setting: ON or OFF	Term Power	Hardware supplies termination power.
CHAN 1	Initiator ID	SCSI ID of router on Channel 0 as set in the Router Administrator software.	Ultra/U2	Hardware runs as Ultra2.
	Termination	Hardware setting: ON or OFF	Term Power	Hardware supplies termination power.
CHAN 2	Initiator ID	SCSI ID of router on Channel 0 as set in the Router Administrator software.	Ultra/U2	Hardware runs as Ultra2.
	Termination	Hardware setting: ON or OFF	Term Power	Hardware supplies termination power.
Router	Alarm	Enabled or Disabled as set in the router administrator		
CAPI	Version	Version of the Configuration Application Programming Interface.		
FC LIB	Version	Version of the FC library.		

Figure 3.7.2—Configuration Information

To display hardware information only:

1. From the system Menu, select Utilities Menu and press Enter.
The Utilities Menu screen displays.
2. Select Hardware Information and press Enter.
The Hardware Information screen displays.
3. Press Esc to return to the Configuration Menu.

To display hardware and configuration information:

1. From anywhere in the Router Administrator software, press Ctrl-E.
The first screen of events from the event log displays.
2. Press Ctrl-E again.
The Hardware Information screen displays
3. Press Ctrl-E again.
The Configuration Information screen displays.
4. Press Esc to return to where you started form.

3.7.3 Displaying the Router’s FC LUN

You can display the router’s FC LUN and the FC LUNs of each device connected to the router.

To display the router’s LUN:

1. From the System Menu, select Address Mapping and press Enter.
The Address Mapping screen displays.
2. Select Display Address Map and press Enter.
The Display Address Map screen displays listing the router and all devices in the order of their assigned FC LUN.
3. Press d to page down or u to page up in the list.
4. Press Esc to return to the Address Mapping screen.

3.8 Router Default Settings

Figure 3.8 A below lists the router configuration settings. If these settings meet your needs, you can use your router now. If they do not, you can change the settings.

Note: These settings are set at the Asaca factory and are specific to the Asaca AM-Series Library, and are not the default settings on the FC Router.

Setting	Default	For more information, see
Mapping Mode	FIXED	3.7.1 Changing the Mapping Mode
Topology	LOOP	3.5.1 Selecting the Topology
Router’s Loop ID	6	3.5.2 Changing the Router’s Loop ID
Router’s LUN	SOFT	3.5.3 Changing the Router’s LUN
Router’s initiator ID (SCSI ID)	7	3.5.4 Changing the SCSI ID
Scan Delay	0 Seconds	3.5.6 Changing the Scan Delay
Alarm	ENABLED	3.5.7 Enabling and Disabling the Alarm

Figure 3.8 A—Default Settings

SCSI Bus / ID	Router A/B	Logical Drive	LUN # Mapped	AL ID
A/0	A	1	0	Low Loop ID
A/1	A	2	1	Low Loop ID
A/2	A	3	3	Low Loop ID
A/3	A	4	3	Low Loop ID
B/0	A	5	4	Low Loop ID
B/1	A	6	5	Low Loop ID
B/2	A	7	6	Low Loop ID

SCSI Bus / ID	Router A/B	Logical Drive	LUN # Mapped	AL ID
B/3	A	8	7	Low Loop ID
C/0	A	9	8	Low Loop ID
C/1	A	10	9	Low Loop ID
C/2	A	11	10	Low Loop ID
C/3	A	12	11	Low Loop ID
	A	FC Router	12	Low Loop ID
D/0	B	13	0	High Loop ID
D/3	B	14	1	High Loop ID
D/2	B	15	2	High Loop ID
D/1	B	16	3	High Loop ID
E/0	B	17	4	High Loop ID
E/1	B	18	5	High Loop ID
E/2	B	19	6	High Loop ID
E/3	B	20	7	High Loop ID
F/0	B	21	8	High Loop ID
F/1	B	22	9	High Loop ID
F/2	B	23	10	High Loop ID
F/3	B	24	11	High Loop ID
F/6	B	Library	12	High Loop ID
	B	FC Router	13	High Loop ID

Figure 3.8 B—Default Mapping Settings for AM-Series Library with 24 Drives and 2 Routers

Note: Arbitrated loop IDs are defined at the time of install and are site specific.

SCSI Bus / ID	Router A/B	Logical Drive	LUN # Mapped	AL ID
A/0	A	1	0	*
A/1	A	2	1	*
A/2	A	3	2	*
A/3	A	4	3	*
B/0	A	5	4	*
B/3	A	6	5	*
B/2	A	7	6	*
B/1	A	8	7	*
C/0	A	9	8	*
C/1	A	10	9	*
C/2	A	11	10	*
C/3	A	12	11	*
C/6	A	Library	12	*
	A	FC Router	13	*

(* = Defined at Install)

Figure 3.8 C—Default Mapping Settings for AM-Series Library with 12 Drives and 1 Router

SCSI Bus / ID	Router A/B	Logical Drive	LUN # Mapped	AL ID
A/0	A	1	0	*
A/1	A	2	1	*
A/2	A	3	2	*
B/0	A	4	3	*
B/1	A	5	4	*
B/2	A	6	5	*
C/6	A	Library	6	*
	A	FC Router	7	*

(* = Defined at Install)

Figure 3.8 D—Default Mapping Settings for AM-Series Library with 6 Drives and 1 Router

SCSI Bus / ID	Router A/B	Logical Drive	LUN # Mapped	AL ID
A/0	A	1	0	*
A/1	A	2	1	*
A/2	A	3	2	*
C/6	A	Library	3	*
	A	Router	4	*

(* = Defined at Install)

Figure 3.8 E—Default Mapping Settings for AM-Series Library with 3 Drives and 1 Router

For other configurations, see configuration guide contained in the library ship kit or contact Asaca Support.

Chapter 4 Troubleshooting

This chapter describes problems you may encounter during setup and operation of an Asaca AM-Series DVD Library with the Fibre Channel router, as well as suggested solutions to those problems.

I cannot access the AM-Series Library web server.

Verify that the IP address, subnet mask, and default gateway are set properly. You can do this by accessing the front panel controls on the Asaca AM-Series Library (See the AM-750 or 1450 Users Manual).

Verify that the Asaca AM-Series Library is connected to the network. Attempt to 'ping' the library. If the ping fails there is a network routing or network connectivity problem. Consult your system administrator.

I can access the AM-Series Library web server from computers on the same subnet, but not from computers on other subnets.

There is no default gateway set, or the default gateway setting is incorrect. Update the default gateway setting. You can do this using either the Web-based configuration utility (See the Web Interface Manual) or by accessing the front panel controls (See the AM-750 or 1450 Users Manual).

The Transmit Fault LED is on.

The Transmit Fault LED can be on if no GBIC is installed or if the GBIC is not operating properly in the library. Power down the library and install a GBIC (see Section 2.1, Physical Connections, for instructions). If a GBIC is present and installed correctly and the Transmit Fault LED is still on, contact your service center.

The Receive Fault LED is on.

The Receive Fault can be on if no Fibre Channel cable is connected to the library or if no other device is connected to the other end of the cable or the cable is damaged. Ensure the cable is secured to both ends, both devices are powered on and in a ready state, if the Receive Fault LED is still on, contact your service center.

All of the LEDs for one of the FC Routers are on.

If all of the LEDs for either the 'A' Router or 'B' Router are on, the router is not installed. This is normal for libraries with less than 12 drives and is not an error condition. If you are certain that the indicated router is, in fact, installed, contact your service center to ensure that it is installed correctly.