

HP SureStore SAN Backup Solution

Installation Guide

Edition 1



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Edition 1: September 2000 (Initial Printing)

Typographical Conventions and Terms

| | |
|--------------------|---------------------------|
| Keycap: | Menu choices and screens. |
| [Soft Key]: | Soft keys to press. |
| Computer Output | Host and SCSI commands. |

WARNING

Warnings call attention to a procedure or practice that could result in personal injury if not correctly performed. Do not proceed until you fully understand and meet the required conditions.

CAUTION

Cautions call attention to an operating procedure or practice that could damage the product if not correctly performed. Do not proceed until you understand and meet these required conditions.

NOTE

Notes explain significant concepts or operating instructions.

TIP

Tips provide hints or shortcuts for a procedure.

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: Global Engineering, 1-800-854-7179
- *Gigabit Interface Converter (GBIC), Small Form Factor*, SFF-8053, Rev. 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

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Storage Area Network (SAN)

Chapter Overview

The objective of this chapter is to:

- Describe SAN topologies
- Introduce components of the storage area network architecture

Table 1-1

Abbreviations Used in this Manual

| | |
|--------|---|
| FC | Fibre Channel |
| FC-AL | Fibre Channel Arbitrated Loop |
| GB | GigaByte |
| Gb | GigaBit |
| GBIC | Gigabit Interface Converter |
| GLM | GigaBaud Link Module |
| HBA | Host Bus Adapter |
| I/O | Input Output |
| IP | Internet Protocol |
| IPL | Initial Program Load |
| SAN | Storage Area Network |
| SCSI | Small Computer Systems Interface |
| SNIA | Storage Networking Industry Association |
| SNMP | Simple Network Management Protocol |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| WWN | World Wide Name |

Storage Network Industry Association (SNIA) definition of a Storage Area Network:

“A network whose primary purpose is the transfer of data between computer systems and storage elements and among storage elements. Abbreviated SAN. A SAN consists of a communication infrastructure, which provides physical connections, and a management layer, which organizes the connections, storage elements, and computer systems so that data transfer is secure and robust.”

--SNIA *Technical Dictionary*: Storage Networking Industry Association, Copyright 2000.

Storage Area Network

Storage Area Networks (SANs) are evolving due to the maturation of newer storage interconnect technologies like Fibre Channel. A SAN is a shared storage repository that consists of three basic components:

- An interface (for example, SCSI or Fibre Channel)
- Interconnects (switches, bridges, routers, or hubs)
- A protocol (for example, IP or SCSI) that controls traffic over the access paths that connect the nodes.

These three components, plus the attached storage devices and servers, form an independent storage area network. The I/O channel operates on the backend of the server, via a host bus adapter (HBA), making file access and data transfers independent of the LAN.

Topologies

Topology describes the way nodes on a network are connected. These nodes can be servers and storage systems, as well as interconnected devices such as hubs, switches and bridges.

Types of topologies include:

- **Point-to-Point** - A dedicated Fibre Channel connection between two devices.
- **Arbitrated Loop** - A shared 100MBps Fibre Channel transport supporting up to 126 devices and one fabric attachment.
- **Switched Fabric** - One or more switches providing higher level services and switched 100MBps bandwidth per port. Maximum number of nodes = 16 million addresses +/-, maximum bandwidth = 100MBps/ x nodes.

Point-to Point is the most simple of SAN connectivity topologies that allows bi-directional communication between two nodes, such as a server and tape library. Between these two nodes is a dedicated fiber-optic connection.

Arbitrated Loop is a continuous ring configuration where each node translates or passes data to adjacent nodes. The SAN hub arbitrates requests for data to make optimum use of the available bandwidth.

Switched Fabric is a new term established to support fiber-optic SAN technology and describes extensive storage networks where numerous servers and storage devices are connected using fiber-optic switches. These switches can be cascaded and combined with loops to create interwoven networks known as fabrics. This configuration is managed by software that uses the SAN management capabilities that are built directly into the fabric scheme.

Components

Cabling

While the SAN supports a number of interfaces, Fibre Channel (FC) and FC fabrics have gained attention due to flexibility, high throughput, inherent fault-tolerant access paths, and the potential for revitalizing network-to-storage communications.

Components can be connected either by copper or fiber-optic cabling. Each cable type has definite advantages and disadvantages when used within a SAN.

- Copper is less expensive, but is less reliable and has limited distance considerations.
- Fiber-optic is more expensive, easier to use, more reliable and can be utilized in distances up to 10km.

Fibre Channel Components/Plug-In Modules

Each device connected to a fabric requires an interface or adapter board. Boards will have an integrated component or a plug-in module. Two module types are:

- **GigaBit Interface Converter (GBIC)** - a removable transceiver module for FC and Gigabit Ethernet physical-layer transport.
- **Gigabaud Link Modules (GLMs)** - a semi-permanent transceiver that incorporates serializing/deserializing functions.

Hubs

Fibre Channel hubs establish connectivity for arbitrated loops. An Arbitrated Loop (AL) allows up to 127 devices to share the same 1Gbps bandwidth. The disadvantage of AL is that only two devices will be active at any given time. The advantage of AL is that Port Bypass Capability enables hubs to deactivate bad ports.

- **Hub** - in FC, a wiring concentrator that collapses a loop topology into a physical star topology.

Topologies and Components

Components

- **Multi-Port Hub** - consists of 6 to 16 ports (copper or optical GBICs), network management software, and supports Fibre Channel Arbitrated Loop (FC-AL).

Switches

Switches are intelligent devices that are able to interconnect individual nodes, arbitrated loops, and other switch elements. Switches provide full bandwidth per port and high-speed routing of data via link-level addressing, as well as the following:

- 8 to 16 ports (possibly more)
- Copper or optical GBICs
- Fast, non-blocking, dedicated bandwidth
- Special services (time, name, etc.)
- Integrated Simple Network Management Protocol (SNMP) and Management Information Base (MIB)-compliant management for remote management
- Configuration management tools and utilization monitoring
- Automated port isolation and device failover for fault-tolerance, along with N+1 hot-swappable components
- Port Bypass Capability enables switches to deactivate bad ports

Bridges

The bridge provides connectivity between FC switched fabric or FC-AL to devices without FC ports. Bridges enable SCSI-based devices to be connected to FC SANs.

FC-to-SCSI bridges are typically used to connect SCSI tape libraries and autoloaders to the SAN. A bridge can also be used to connect servers or workstations to the SAN in “initiator” mode. The FC specification allows for a 10km maximum end-to-end distance. A bridge may also provide:

- Mapping of SCSI devices to units of a single AL-PA
- A configurable mapping table
- SNMP management
- Extenders allow FC connections greater than 10km

Storage Area Network Supported Storage Devices

Current supported storage devices include:

- HP SureStore E Tape Library 20/700
- HP SureStore E 10/180
- HP SureStore E Tape Library Model 6/140
- HP SureStore E Tape Library Models 2/20, 4/40 and 6/60

Topologies and Components

Storage Area Network Supported Storage Devices

2 Installation

Chapter Overview

This chapter covers basic installation of a HP storage area network. The components discussed are:

- Switches
- Hubs
- Storage devices
- Bridges
- Host bus adapters
- Software drivers
- A protocol that controls traffic over the access paths connecting the nodes

Order of Installation for Tape Library SAN Components

The recommended procedure to install library SAN components is as follows:

1. If connecting Fibre Channel (FC) switches to form a multi-switch fabric, install and configure the switches, and plug in the FC cables between the switches.
2. Install FC hubs that will be placed between the switches and the libraries. Install the FC cables between the hubs and switches.
3. Install and configure your HP library. If your library requires one or more external FC bridges, connect the library to the bridge(s).
4. Connect the FC bridge and/or library FC interface cards to the FC hub (if present) or to the FC switch (if present).
5. Install the FC Host Bus Adapters into each server. Connect the servers to the switch with the appropriate FC cables.
6. Install or configure the backup software to allow servers to share libraries.

Switches

CAUTION

Power to components should be **OFF** when physically installing components.

CAUTION

To prevent damage to the fiber-optic cable, DO NOT have a bend radius of less than three inches. Keep all sharp objects away from the cable and place the cable where it will not be crushed by nearby equipment.

Installing a Fibre Channel Switch into a SAN Environment:

1. Power-off the switch.
2. Install the switch in a physical location (rack or desk mounted).
3. While supporting and routing the cables to prevent damage (see CAUTION above), connect the correct GBIC and cables as your topology requires.
4. Once the switch is physically in place and connected, power-on the switch and attached components. For multiple switches (cascading), power-on one switch at a time and wait for the Power-on Self-Test (POST) to complete before powering-on the next switch. Always power-on the switches in the same order as the initial installation.

NOTE

Depending on the type and brand of switch you install, managing and monitoring functions may be accessed in different ways. If using the Brocade SilkWorm® 2400, refer to the *Brocade SilkWorm® 2400 Hardware Reference Manual*, Publication Number 53-0001533-01. If using the SilkWorm 2800 Switch, refer to the *Brocade SilkWorm® 2800 Hardware Reference Manual*, Publication Number 53-0001534-01.

- **The SilkWorm® 2800 Switch** (16-port, front panel configuration) is managed locally via the front panel buttons and remotely via Telnet, SNMP, or the Web interface.

- **The SilkWorm® 2400 Switch** (8-port, serial port configuration) is managed remotely via Telnet, SNMP, Web interface, or a serial connection. This switch does not have a front panel.

The Telnet, SNMP, and Web management tools require that the switch be accessible via a network connection. The switch must be configured with an IP address to allow for the network connection.

Entering an IP Address Using the SilkWorm® 2800 Front Panel:

NOTE

The switch's front panel display is normally not illuminated. Pressing the front panel buttons activates the display.

1. Select **[Configuration Menu]** using the right button.
2. Scroll down until **[Ethernet IP Address]** appears. Select this option using the right button. The switch's default IP address is 10.77.77.77. Enter a valid IP address.
3. Use the arrow keys to change the displayed value. Change from one address segment to the next using the left button.
4. When the values are correctly entered, press the right button to input the changes.
5. Select **[YES]** to confirm that the new IP address is correct and commit it to flash RAM.

NOTE

Your switch may also require a subnet mask and a gateway address before it will be completely network accessible. Consult your system administrator to determine if these settings are required. If a subnet mask and gateway address are required, repeat the steps above after selecting the appropriate options from the **Configuration Menu**.

Entering an IP Address Using the SilkWorm® 2400:

There are two ways to enter an IP address on the 2400. If the default address (10.77.77.77) allows you to connect to the switch using Telnet, see "Managing the Switch using the Telnet Option" on page 2-6.

If the default address cannot be used in your network configuration, you will need to make a serial (RS-232) connection to the switch using terminal emulation software. To do this, you will need a standard serial cable with a female 9-pin D-Sub connector for the switch connection and an appropriate connector for the host/terminal being used.

The cabling pinout is described in the table below.

Table 2-1 Serial Connection Pinout for Brocade SilkWorm™ 2400 Switch

| Pin | Signal | Description |
|-----|--------|-------------------------------------|
| 1 | - | - |
| 2 | TxDATA | Transmit data |
| 3 | RxDATA | Receive data |
| 4 | - | - |
| 5 | GND | Logic ground |
| 6 | - | - |
| 7 | CTS | Clear to send (must be driven high) |
| 8 | - | - |
| 9 | - | - |

Managing the Switch Using the Telnet Options:

1. Connect the host system and the switch using the serial cable.
2. Start the terminal emulation software on the host system.
3. Power-on the switch.

The switch will automatically connect, and you will be logged in as admin. If you are prompted for a login and password:

1. Enter [admin] and [password] respectively.
2. Enter the command [ipAddrSet]. You will be prompted to enter the Ethernet and FC IP addresses, subnet mask, and gateway address.
3. If the current value displayed is correct, select [ENTER]. The switch should now be accessible using Telnet.

4. To login to either switch using a host system that supports Telnet, enter the following at the command prompt:

```
>telnet switch name or IP address<
```

NOTE

You can only connect using the switch name if the host supports a name service.

5. Enter the login and password to complete the Telnet connection.

NOTE

Please refer to the *Brocade® Fabric OS User's Guide, Publication Number 53-0001551-01* for more information on Telnet and SNMP commands. For information regarding Web access, please see the *Brocade® Web Tools User's Guide, Publication Number 53-0001375-01*.

Configurations Not Currently Supported

- Zoning - refers to the ability of partitioning the switch into multiple logical SANs. This feature is currently not supported for SAN Backup. All hosts need to see all tape drives. Shared access to tape drives is handled by the backup application software running on each host.
- Quickloop - also known as Emulated Public Loop (EPL); a feature that allows a switch to emulate a hub and provide arbitrated loop connectivity for non-public hosts or devices.

Verification of Firmware Versions

Using one of the access methods described above (serial connect, Telnet, or web tools for the SilkWorm 2400 Switch, or the front panel, Telnet, or web tools for the SilkWorm 2800 Switch), verify the following:

- The firmware version is at least 2.1.3
- That the switch is not in Quickloop mode
- That no zoning schemes are enabled

Hubs

Hubs may be installed between the switch and the library, but are NOT supported between servers and switches or between two switches (i.e., switch spanning). (See Figures 2-1 through 2-4 on pages 2-9, 2-10, 2-11, and 2-12.)

CAUTION

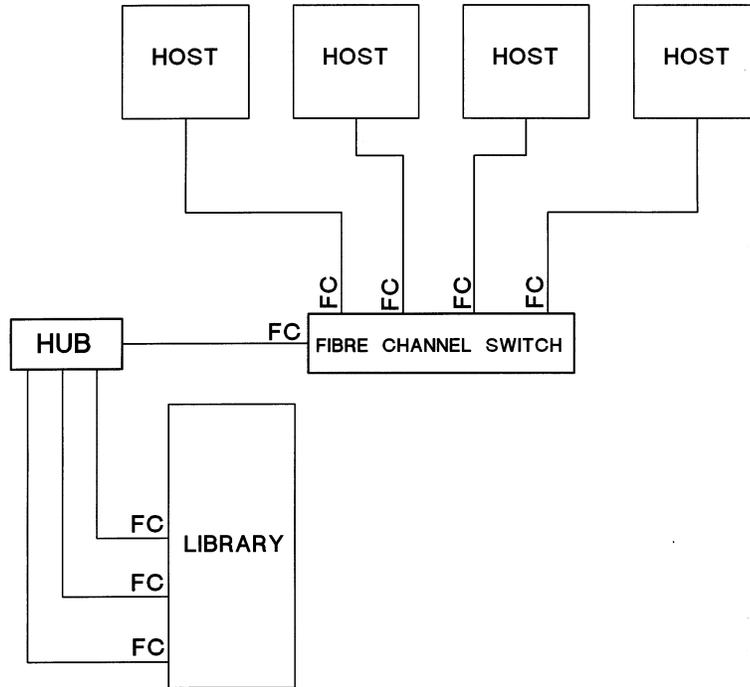
To prevent damage to the fiber-optic cable, DO NOT have a bend radius of less than three inches. Keep all sharp objects away from the cable and place the cable where it will not be crushed by nearby equipment.

FC hubs may not be used in place of switches for providing shared access to tapes and tape libraries. Loop topologies allow for one host to interrupt the backup taking place from another host to a tape device. FC switches isolate host interactions from each other, providing a more robust environment for streaming data.

Hubs may be used with switches to aggregate tape drive connections into a switch. However, they may not be used between hosts and switches. Also, multiple hubs may not be cascaded when used to aggregate tape drive connections to a switch port.

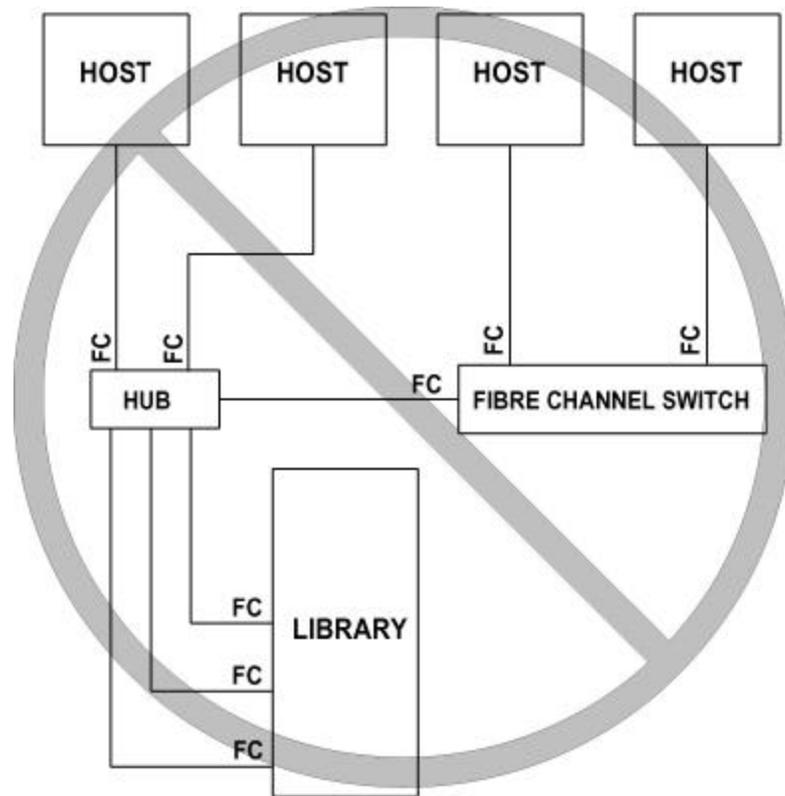
When aggregating tape drives, no more than 10 DLT 8000 drives would be configured per hub. This assures there is not a performance bottleneck between the tape drives and switch.

Figure 2-1 **Valid/Supported Hub Configuration**



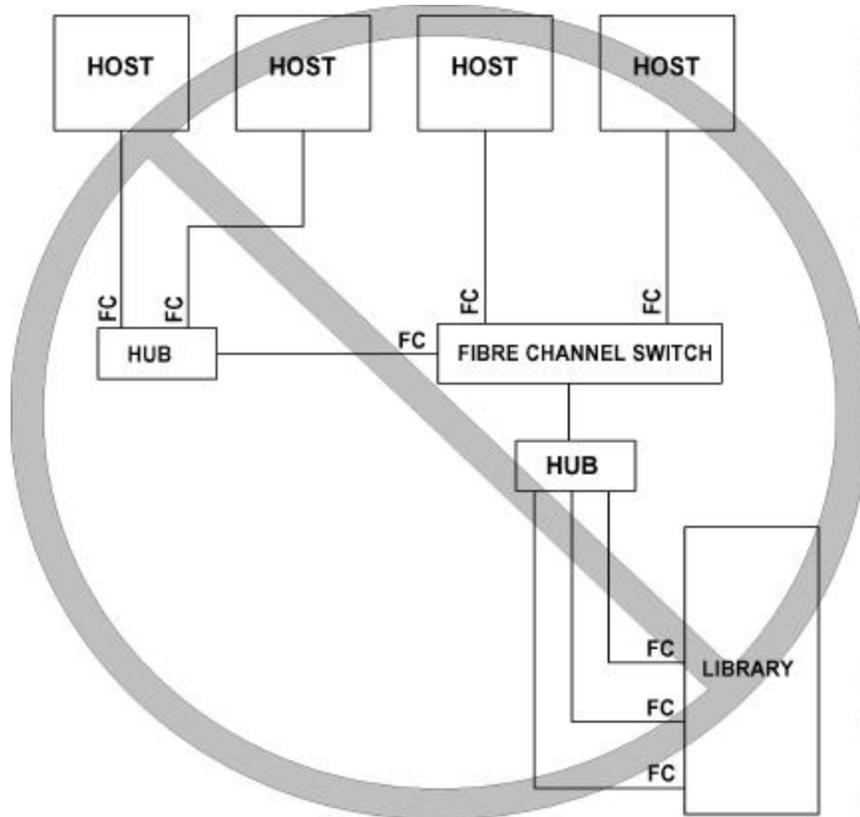
An invalid/unsupported configuration places the hub between the host(s) and the Fibre Channel switch (see Figure 2-2).

Figure 2-2 Invalid/Unsupported Configuration



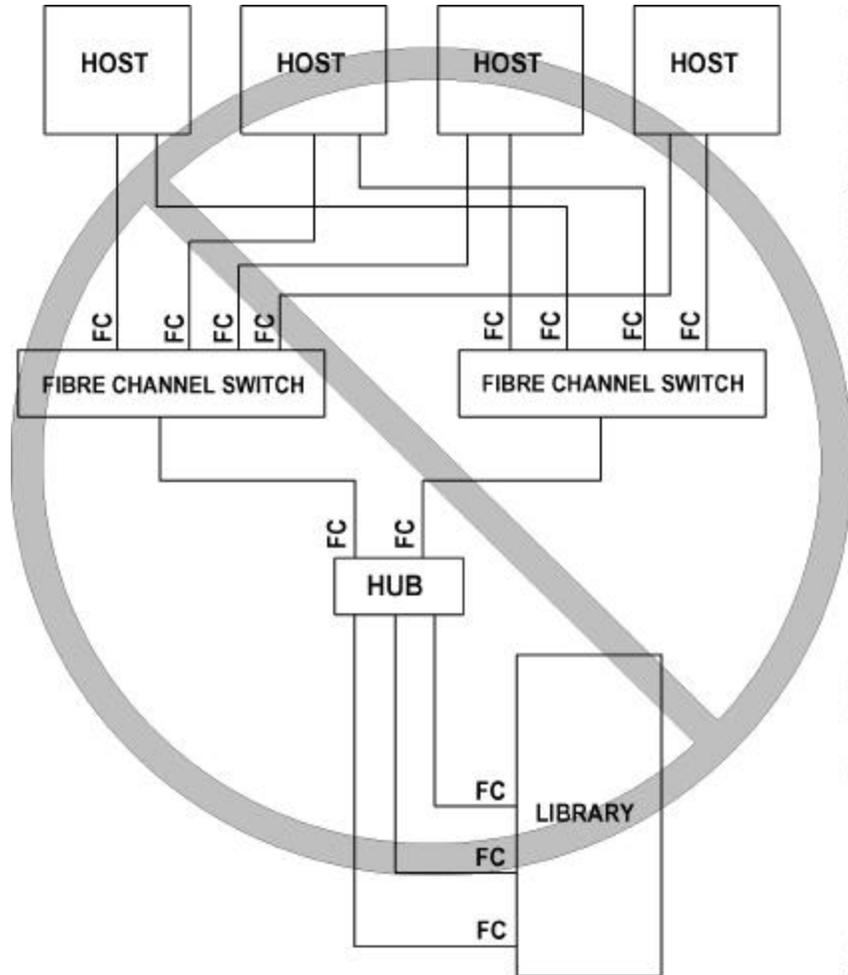
A second invalid/unsupported configuration also places the hub between the host(s) and the Fibre Channel switch (see Figure 2-3).

Figure 2-3 Invalid/Unsupported Hub Configuration



A third invalid/unsupported configuration uses a hub to aggregate tape drive connections into more than one switch (see Figure 2-4).

Figure 2-4 Invalid/Unsupported Hub Configuration



Tape Libraries

HP SureStore E Tape Library Models 2/20, 4/40, 6/60 and 6/140

The HP SureStore E Tape Library Models 2/20, 4/40, 6/60 and 6/140 have the ability to connect to a SAN via internal FC interface cards. These cards serve the same function as an external FC bridge, but require no additional rack space and can be managed and configured via the library's front panel or the Web-based Library Administrator.

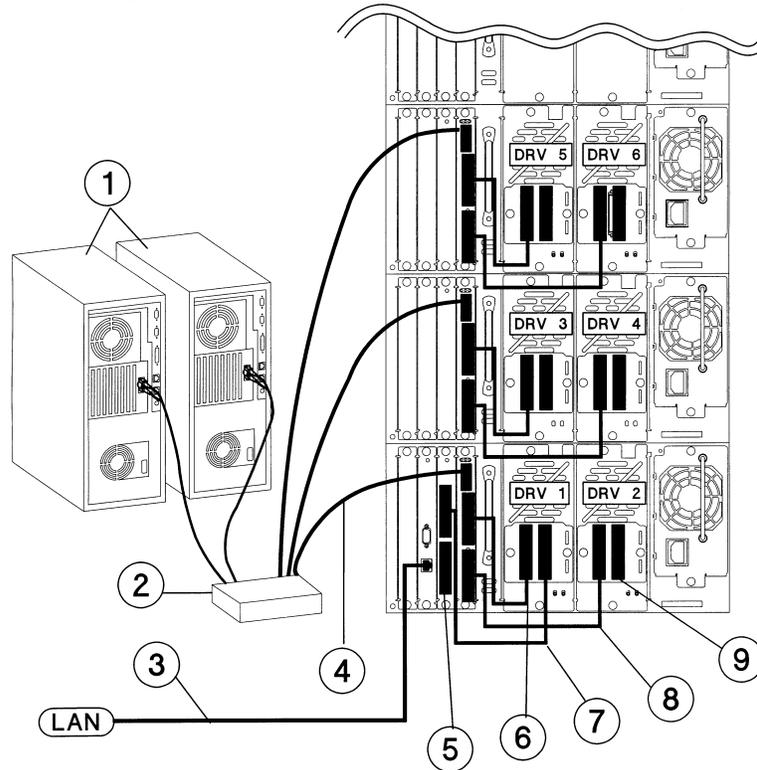
To install an HP library, you will need to connect the library to the SAN, configure the FC interface card, and set the library's time/date and IP address.

Connecting and Powering-On the Library:

1. Ensure that the library is disconnected from the host, and the library is powered-off.
2. On each level of the library, connect a SCSI jumper cable from bus 1 on each FC card to the left connector on the left drive module (see Figure 2-5 on page 2-14).
3. On each level of the library, connect a SCSI jumper cable from bus 2 on each FC card to the left connector on the right drive module (see Figure 2-5 on page 2-14).
4. Connect a SCSI jumper cable from the top connector on the library controller card to the right connector on the left drive module (drive module 1) to daisy chain the library controller to the drive.
5. Terminate the bottom connector on the library controller card and connect the appropriate SCSI terminator to the remaining connectors on the drive modules. Ensure that the interface type of terminator matches your library and tape drives.
6. Connect a FC cable from each GBIC on the FC cards to a host, hub, or switch.
7. Power-on each component one at a time, waiting for each to complete the POST, before going to the next.
8. Power-on the library.

NOTE Make sure version 1.14 or later is installed before proceeding. Refer to Appendix A, Firmware Version Table.

Figure 2-5 Example of Connections as Shown on the 6/140



| | | | |
|---|---------------------------------------|---|--|
| 1 | Host | 6 | SCSI cable from bus 1 on the Fibre Channel card to drive 1 |
| 2 | Switch | 7 | SCSI cable from the library controller card to drive 1 |
| 3 | Remote management card LAN connection | 8 | SCSI cable from bus 2 on the Fibre Channel card to drive 2 |
| 4 | Fibre Channel cable | 9 | Appropriate SCSI terminator |
| 5 | Appropriate SCSI terminator | | |

Configuring the Library for Arbitrated Loop (AL) Environments:

CAUTION

Do Not use soft addressing on HP-UX™.

1. From the library front panel, select the **Fibre Channel** menu.
2. Select the level where the FC card you want to configure is located using the **[+]** or **[-]** keys.
3. Select **[OK]**.
4. A message displays the addressing assignment method and AL_PA (Arbitrated Loop Physical Address). Select the addressing type (hard or soft).
 - The default addressing is hard addressing (Recommended) with auto-select enabled. Hard addressing allows you to set and maintain a fixed address, but may result in address conflicts.
 - Soft addressing looks for an unused address on every power cycle, so the address might change. Since AL_PAs can change with soft addressing, some backup software applications may have difficulty locating the library in this mode. Check the backup software documentation to ensure soft addressing is supported before selecting this mode.
5. If you select hard addressing, select the **[AL_PA]** (fixed address) or choose **[auto-select]**. Auto-select is an option under hard addressing that picks an available address and then uses it as a hard address from then on.
6. Select **[OK]** when complete to save the changes. A message confirms your changes. You can also select **[Quit]** to exit the **Fibre Channel Configuration** menu and not save the changes.

Setting the Date and Time (Necessary during initial installation or after powering-off):

1. Select the **[Set Date & Time]** menu.
2. Use the **[+]** or **[-]** key to select the year, month, and day. Use the right arrow to scroll to the next entry.
3. Set the hour and minutes (00:00:00) using the **[+]** or **[-]** keys. Use the right arrow key to scroll to the next entry. The seconds are automatically set at 00.

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4. Use the **[+]** or **[-]** keys to select the time zone. UTC stands for Coordinated Universal Time.
5. Select **[OK]** when complete to save the changes. A message confirms your changes. You can also select **[Quit]** to exit and not save the changes.

Setting the Library's IP Address via the Remote Management Card (RMC):

NOTE

Contact your network administrator to obtain the IP address, subnet mask, and gateway address.

1. Install a RJ-45 connector into the network port of the RMC.
2. On the library's back panel, verify that the link LED on the RMC is green.
3. From the front panel, enter the IP address, subnet mask, and gateway address: **[Main Menu > Administration > Change Configuration > Network Access]**.
 - a. Enter the **[Network Access]** menu.
 - b. Enter the **[IP Address]**.

Use the **[+]** key to change the number

Use the **[->]** key to move to the next number.

Use the **[Down]** key to move to the next address.
 - c. Enter the **[Subnet Mask]** using the same procedure.
 - d. Verify the gateway address. The IP and subnet mask narrows the valid options for the gateway address.
4. Select **[OK]** when complete to save the changes, or press **[Quit]** to exit the menu and not save the changes.

A message will display to confirm the changes you have entered or alert you if the changes have not been saved.

5. Enter the designated IP address into the Web browser to launch the Web-Based Library Administrator pages.

Example:

IP address = 15.28.33.12

Device name = library1

http://library1 or http://15.28.33.12

Instructions and help screens describing this Web-based management are available online on the Web-Based Library Administration pages under online help.

HP SureStore E Tape Library Models 10/180 and 20/700

NOTE

Please read through this section thoroughly before beginning the configuration process.

NOTE

Current SAN support for these libraries requires using either the HP SureStore E Bridge FC 4/1 HV or the HP SureStore E SCSI Bridge FC 4/2.

CAUTION

It is recommended that you **DO NOT** enable Auto Clean as it may interfere with the operation of backup software.

This section describes how to configure the library and tape drives for operation. Configuration requires you to:

- Enable Auto Clean, **if desired**, (Model 20/700 only) by installing cleaning cartridges (see “Enabling Auto Clean”).
- Power-on or reset the library (either of which initializes the library).
- Enter the required configuration information.
- Place the library online.
- Send a host or client command to load library audit information into the host or client memory.

Installation
Tape Libraries

During an initialization or IPL (Initial Program Load), the library automatically verifies and loads some configuration values, such as drive locations, Auto Clean status, capacity, and drive types. Before the library is fully operational, you must enter the remaining configuration values. You can enter the values through the operator panel.

NOTE

You may need to consult with your system administrator for additional information.

Enabling Auto Clean

CAUTION

It is recommended that you **DO NOT** enable Auto Clean as it may interfere with the operation of backup software.

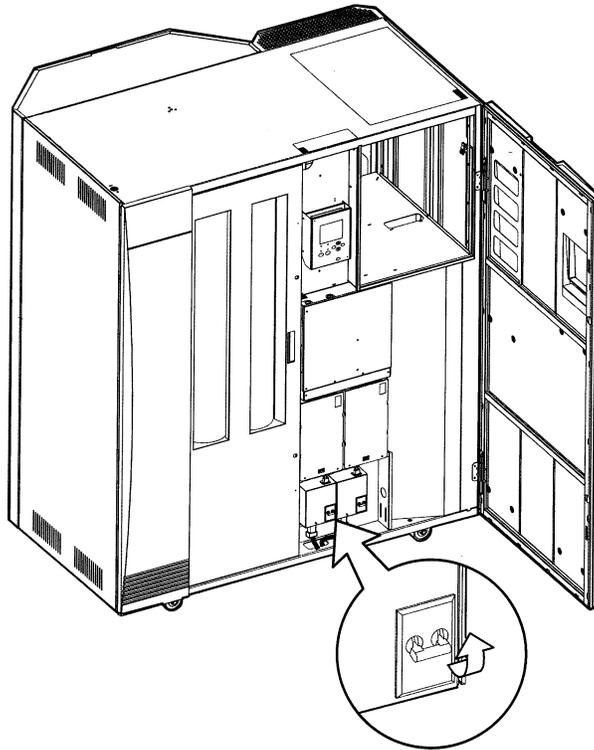
Enabling the Auto Clean feature allows the library to initiate drive cleaning without operator intervention. The Auto Clean feature is automatically enabled if you load even one cleaning cartridge into the reserved cell area and then power-on or reset the library.

Powering-on the Library

powering-on the library supplies power to the library electronics and to the drive column. It also initiates an initial program load (IPL).

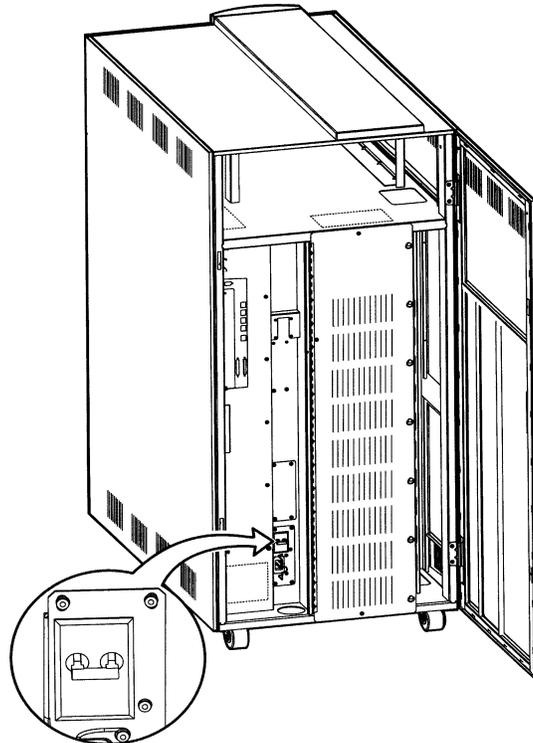
To power-on the **20/700** library, lift the switch (circuit breaker) behind the right front door of the library (see Figure 2-6).

Figure 2-6 **Powering-on the 20/700 Library**



To power-on the **10/180** library, lift the switch or switches behind the rear door (see Figure 2-7).

Figure 2-7 **Powering-on the 10/180 Library**



NOTE

Verify the correct firmware is installed by referring to Appendix A, Firmware Version Table.

Initializing the Library

Powering-on the library causes it to perform an initialization or IPL. During IPL, the library initializes the robotic components, audits any cartridges in the storage and reserved cells, and automatically verifies some configuration values, such as drive locations and drive types.

A **Re-IPL** (reset) is necessary when:

- You are directed to do so by your system administrator or a Customer Engineer.
- You have to change the library configuration (for example, when you have to change the library's SCSI ID).

To re-IPL the library after it is already powered-on, make sure that all the drives are powered-on, and press the **[RESET]** button on the operator panel.

SCSI IDs

You cannot place the library online until you have configured SCSI IDs for the library and for each of the installed drives. SCSI IDs, also called SCSI addresses, allow each piece of equipment on the SCSI bus to have a unique electronic label. By using this label, the client system can direct instructions to a specific piece of equipment.

NOTE

You must reset the library before the new library SCSI ID will take effect. Before pressing the library's **[RESET]** button, make sure that all drives are powered-on.

Library SCSI ID

You must enter the library's SCSI ID through the library configuration screen on the operator's panel.

Drive SCSI ID

NOTE

Configuring a tape drive might involve more than setting the drive's SCSI ID and bus status. For more information about 9840 drive configuration options and instructions, refer to the *9840 Tape Drive Installation Guide*, Part Number A5598-96001. For more information about DLT drive configurations, see the *DLT Drive Installation Guide*, Part Number A5599-90001.

You must set each drive's SCSI ID through the drive configuration screen on the operator's panel. For specific instructions, see "Drive Entries" on page 2-25.

Operator Panel Entry

Entering configuration data through the operator panel will prepare the tape library for basic operation.

Library Entries

Four entries complete the configuration choices for the library:

- Library SCSI ID
- Drive Fast Load Enable/Disable
- Date
- Time

NOTE

The sequence assumes that you will make all entries at one time. Each item is saved as it is changed, except for the library's SCSI ID. To save a revised library SCSI ID, you must reset the library by pressing the **[RESET]** button.

Setting the Library SCSI ID

You can set the library SCSI ID from the **Library Configuration** menu. To set this value:

1. From the online status screen, press the **[MENU]** button. The **Main** menu will display.
2. Press the down arrow button until the cursor underscores **CONFIGURATION**.
3. Press the **[SELECT]** button. The **Main Configuration** menu will appear.
4. The cursor will line up with **LIBRARY CONFIG**. Press the **[SELECT]** button. The **Library Configuration** menu will appear.
5. The cursor will line up with **SCSI ID**.
6. Press the **[SELECT]** button. The **Set Library SCSI ID** menu will appear.
7. Use the arrow keys to change the ID.
8. When the ID is correct, press the **[SELECT]** button to save the changes. You may press the **[MENU]** button to abort.

9. If the library SCSI ID is the only configuration value you wish to set at this time, press the **[RESET]** button. If you wish to set other configuration values before you reset the library, continue with the next section, “Enabling/Disabling Fast Load.”

Enabling/Disabling Fast Load

Verify that the Fast Load feature is turned **OFF**.

NOTE

Some client software does not support the Fast Load feature. Consult with your system administrator before enabling this feature.

The Fast Load feature adjusts the robot’s timing during cartridge mount operations. With the Fast Load feature enabled, the robot will load a tape into a drive and then immediately perform its next task, not waiting for the tape drive to complete its mounting cycle. With the Fast Load feature disabled, the robot will wait at the drive location until the tape is fully mounted before beginning its next task.

You can enable/disable the Fast Load feature from the **Library Configuration** menu. To set this value:

1. At the **Library Configuration** menu, press the arrow button until the cursor underscores **FAST LOAD**.
2. Press the **[SELECT]** button. An editing screen appears.
3. Use the arrow keys to select **[OFF]**.
4. When the screen displays your desired settings, press the **[SELECT]** button to save the changes. To abort, press the **[MENU]** button from the left-most field.
5. If you have already changed the library’s SCSI ID and are planning to exit the **Main Configuration** menu at this time, you must press the **[RESET]** button. If you wish to set other configuration values, continue with the next section, “Setting the Date.”

Setting the Date

The library saves the current data and time in non-volatile memory.

You can set the date from the library configuration screen. To set this value:

1. At the **Library Configuration** menu, press an arrow button until the cursor underscores **DATE**.
2. Press the **[SELECT]** button. An editing screen appears.
3. On the editing screen:
 - Use the arrow keys to select a value for each portion (field) of the date.
 - Use the **[SELECT]** button to move right to the next field.
 - Use the **[MENU]** button to move left to the previous field.
4. When the screen displays your desired setting, press the **[SELECT]** button from the right-most field to save the changes. To abort, press the **[MENU]** button from the left-most field.
5. If you have already changed the library's SCSI ID and are planning to exit the **Main Configuration** menu at this time, you must press the **[RESET]** button. If you wish to set other configuration values, continue with the next section, "Setting the Time."

Setting the Time

You can set the time from the library configuration screen. To set this value:

1. At the **Library Configuration** menu, press the arrow button until the cursor underscores **TIME**.
2. Press the **[SELECT]** button. An editing screen appears.
3. On the editing screen:
 - Use the arrow keys to select a value for each portion (field) of the time.
 - Use the **[SELECT]** button to move right to the next field.
 - Use the **[MENU]** button to move left to the previous field.

4. When the screen displays your desired setting, press the **[SELECT]** button from the right-most field to save the changes. To abort, press the **[MENU]** button from the left-most field.
5. If you have already changed the library's SCSI ID and are planning to exit the **Main Configuration** menu at this time, you must press the **[RESET]** button. If you wish to set other configuration values, continue with the next section, "Drive Entries."

Drive Entries

Information in this section refers to the 9840, DLT 7000 and DLT 8000 drives.

NOTE

For you to be able to configure a 9840 drive's SCSI ID and bus status from the library's operator panel, the drive must have firmware version 1.24 or later.

To check the drive's firmware version, select **[DRIVE INFO]** from the main menu. Configuring a tape drive might involve more than setting the drive's SCSI ID and bus status.

For more information about 9840 drive configuration options and instructions, refer to the *9840 Tape Drive Installation Guide*, Part Number A5598-96001..

Two entries at the library operator panel complete the configuration choices for each drive installed in the library.

- SCSI ID
- Bus status (on or off bus)

NOTE

"On Bus" means that the drive *is* on the same SCSI bus as the library. "Off Bus" means that the drive *is not* on the same SCSI bus as the library.

You can set the drive SCSI IDs and bus status choices from the **Drive Configuration** menu. You can enter both values for each drive at the same time:

1. At the **Main Configuration** menu, press an arrow key until the cursor underscores **DRIVE CONFIG**.

Installation
Tape Libraries

2. Press the **[SELECT]** button. The screen will list all installed drives, and the cursor will align with the first drive on the list. The format of the drive information appears in the following example:

```
— 00 DLT8000 ID: _____  
      ON BUS: ON
```

The first two digits are the drive's logical number, that is, the number that the library has assigned to the drive. The library sets this number during its automatic configuration sequence (at power-on or reset). It is an internal number only and is shown only for information. The uppermost drive within the column is designated as "0," the next is "1," and so forth.

Next in the example is the drive type (DLT8000 in this example). To the right of the drive type is the ID or SCSI address. On the next line is the drive's bus status.

NOTE

Due to the size of the 9840 drive, the operator panel will display dashed lines (---) between a 9840 drive and another drive; this is due to the empty (not connected) power and tape transport interface (TTI) connector displaced by the physical size of the 9840.

3. Use the arrow keys to scroll to the drive you wish to change and press the **[SELECT]** button. The **Set Drive SCSI ID** menu will appear.

NOTE

The operator panel displays only 16 lines per screen. If the library contains more than eight drives, you must use the down arrow button to scroll to drives.

4. Use the arrow keys to change the ID.
5. When the ID is correct, press **[SELECT]** to save your changes. A message screen will appear to indicate that the library is saving the new ID and then the **Drive Configuration** menu will reappear.
6. Press the **[arrow down]** key to get the drive's second line of information (which is the drive's bus status field).
7. Press the **[SELECT]** button. The **Set Drive SCSI Bus** menu will appear.
8. Use the arrow keys to change the bus status to **[ON]** or **[OFF]**.

9. When your choice is highlighted, press the **[SELECT]** button to save the changes. To abort, press the **[MENU]** button. The Drive Configuration screen will reappear.
10. Continue with these steps until all drives are configured.
11. If you have already changed the library's SCSI ID and are planning to exit the **Main Configuration** menu at this time, you must press the **[RESET]** button. If you wish to set other configuration values, continue with the next section, "Placing the Library Online."

Placing the Library Online

Before you place the library into operation, you must first:

1. Enter the system command to place all drives online.
2. When all drives are online, enter the command to place the library online.
3. Enter the command to upload the library audit data to the client system memory.

Sending Library Audit Data to Client

During an IPL, the library audits the location and VOLSER of all cartridges in the storage and reserve cells. The library also performs an audit when you:

- Power-on the tape library.
- Open and close the front library door.
- Reset the tape library.
- Make a request at the customer server console to audit the tape library.

After the library is configured, you must follow every audit with a client command that loads the library audit data into client memory. For instructions on how to send this command, refer to your software and system publications.

Fibre Channel Bridges

HP SureStore E SCSI Bridge FC 4/2

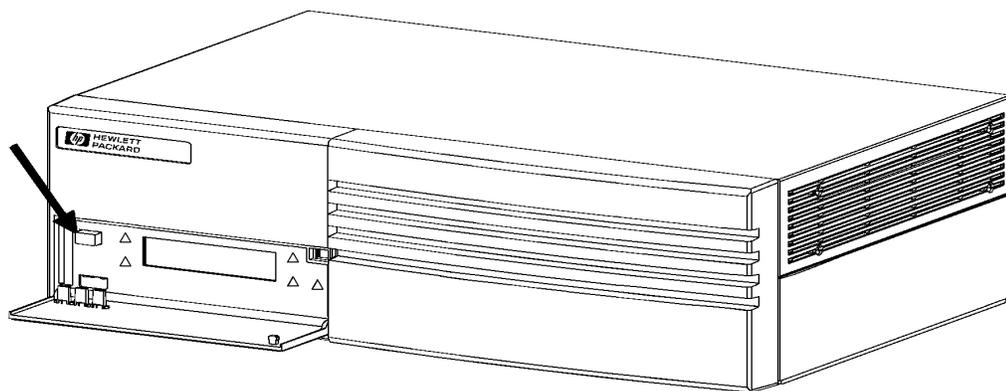
The HP SureStore E SCSI Bridge FC 4/2 is a user-expandable device that offers one or two short-wave optical Fibre Channel (FC) ports and one to four Fast-Wide Differential SCSI ports. The bridge allows you to connect your SCSI tape library into a FC SAN. For tape SAN configurations, only one of the Bridge's FC ports should be used.

Typical installations will have the bridge connected to either a single host or a switched fabric. For a single host, the unit can be directly attached to the FC host bus adapter (HBA) in a Point-to-Point fashion; in FC switch fabric environments, the bridge is plugged into the switch.

Connecting the HP SureStore E SCSI Bridge FC 4/2 to the FC SAN:

1. Plug in the bridge power cord.
2. Open the door on the front panel and turn the power on (see Figure 2-8). After approximately one minute, the bridge will complete the self-test and display system status.

Figure 2-8 **Bridge FC 4/2 Front View**



NOTE

If errors are displayed, or for additional information regarding installation and troubleshooting, refer to the *HP SureStore E SCSI Bridge FC 4/2 Service and User Manual*, Part Number A3308-96011.

3. Use the front panel's **FC Admin** menu to set the loop address of each FC port in the bridge to a unique number.
4. Power-off the bridge and your library.
5. Connect the library to the SCSI ports of the bridge.
6. Power-on the library, and then the bridge.
7. When the bridge has completed the self-test, connect the bridge to the host computer or FC switch with the proper cables.

HP SureStore E Bridge FC 4/1 HV

The HP SureStore E Bridge FC 4/1 HV is a storage router that translates the FC protocol (FCP) to and from the SCSI protocol so that FC and SCSI devices can communicate with each other. It attaches to a FC host and transfers the command, data, and status information to SCSI targets. Packets are transferred transparently by the bridge from host to targets and from targets back to the host.

The bridge provides interconnection between up to four SCSI buses and a FC Arbitrated Loop (FC_AL) or switched fabric. It takes advantage of FC's ability to encapsulate SCSI protocol packets to allow a host with a FC adapter to access SCSI or FC peripheral devices transparently over a FC connection.

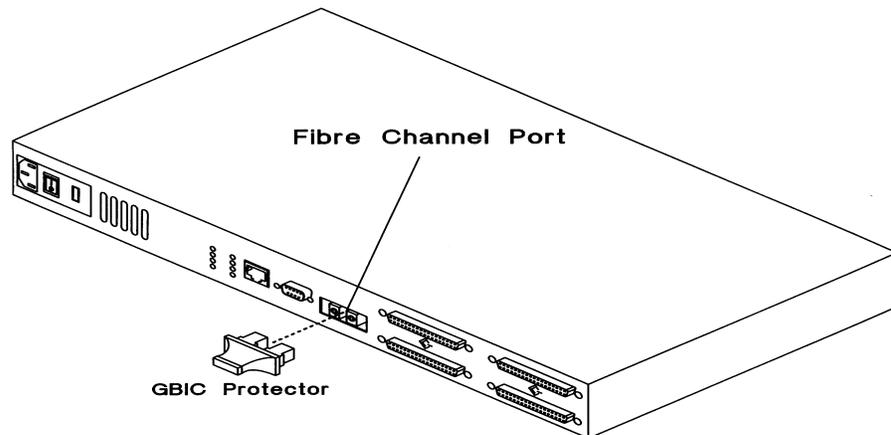
Through the bridge, any host on the FC loop can access the tape drive or library controller on each SCSI bus.

Typical installations will have the bridge connected to a single host or a switched fabric. For a single host, the unit can be directly attached to the FC host bus adapter in a Point-to-Point fashion, or the bridge can be plugged into a FC hub to which the single host is also connected. In FC switched fabric environments, the bridge may be plugged into the switch or into an intermediate FC hub.

Connecting the HP SureStore E Bridge FC 4/1 HV to the FC SAN:

1. Locate the FC port on the back of the bridge.
2. Remove the GBIC protector and push the metal latch down to lock it into place (see Figure 2-9).

Figure 2-9 GBIC Protector



3. With the bridge powered-off, connect it to your FC environment using the appropriate cabling. The FC optical connectors on the bridge's GBIC are keyed. Be sure to insert the cable connectors in the proper orientation.

Connecting the HP SureStore E Bridge FC 4/1 HV to a SCSI Bus:

1. Power-off your SCSI devices.
2. Connect a SCSI cable to one of the SCSI connectors on the back of the bridge.
3. Connect this cable to one of the SCSI connectors on your library.
4. Make sure the bus is terminated correctly. By default, the bridge is automatically terminated, but be sure that the device at the other end of the bus (your library) is also terminated.
5. Power-on your SCSI library.
6. After all the SCSI devices have completed the self-tests, power-on the bridge.

If you connect the bridge to your Intranet via the RJ-45 connector, you can configure and manage the device using Telnet, SNMP, or the built-in Web interface. FTP and TFTP are supported for firmware upgrades. In addition to these options, you can make a direct serial connection (RS-232) to the bridge as well.

Use the supplied cable and the following serial port connection settings to initiate a connection between your host (running terminal emulation software) and the bridge.

- 8 data bits
- No parity
- One stop bit
- Flow Control: None or XON/XOFF
- Autobaud (9600, 19200, 38400, 57600, or 115200)

1. Connect to the bridge while it is powered-off.
2. Power-on and wait until the self-tests and firmware initialization process completes (may take up to 90 seconds).
3. Press [ENTER] slowly, seven or eight times and the bridge will automatically detect the baud rate and connect.

NOTE

For additional information see the *HP SureStore E Bridge FC 4/1 HV Installation and Operations Guide*, Part Number A4688-90000.

Host Bus Adapters (HBAs)

An HBA involves both hardware and software installation and requires that you be familiar with installing PCI cards, connecting cables and Gigabit Interface Converters (GBICs), and installing software drivers.

Before you start the hardware installation, be sure the GBIC and the Fibre Channel (FC) cable are compatible with the storage disk subsystem interconnect system. GBICs are available for both shortwave and longwave fiber-optic cables and active copper cable. GBICs are “hot-pluggable,” which means that they can be plugged into and removed from the adapter card while the power is on.

CAUTION

The HBA is **NOT** hot-pluggable. Do not remove or insert the adapter card while power is applied. If you connect or remove a GBIC while power is applied, be sure that the adapter card is securely attached to its PCI slot to prevent damage to the card and the server’s logic board.

Software Drivers: Windows NT[®]

To begin the HP D8602A/B HBA installation, install the Windows NT[™] software drivers:

1. Start Windows NT[™] and log into an account with administrative privileges.
2. The HBA driver can be obtained from the Web, CD or diskette. If using a CD or diskette, insert the media into the appropriate drive.
3. From the **Start** menu, select **[Settings]**, then **[Control Panel]**.
4. From the **Control Panel** window, open **[SCSI Adapters]**.
5. Select **[Drivers]**, and then select **[Add]**.
6. Select **[Have Disk]** and enter the path to the driver files.
7. From the drive path (**example: A:\WinNT**), select the correct driver for your adapter.
8. Click **[OK]**.

NOTE

If you are attaching this server to a FC hub, proceed to step 9; otherwise, set the [InitAsNport] parameter in the Windows NT™ registry as described in “How to Enable/Disable N_Port Support.”

9. When the driver installation is complete, eject the HBA driver disk, then shut down your system in preparation for installing the adapter card.

HBA Hardware

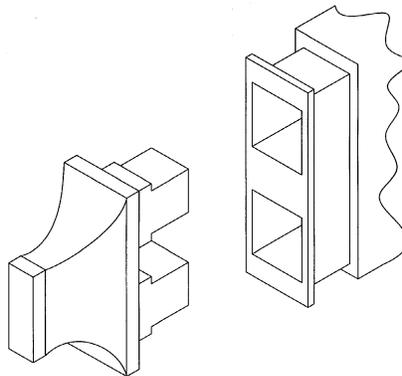
Installing the adapter card into a PCI slot:

1. Power-off your host computer.
2. Remove the chassis cover from the host computer.
3. Locate an empty PCI expansion slot in your system, and remove the expansion slot cover. (Save the slot cover screw.)
4. Insert the adapter card into the slot until it is firmly seated, and replace the slot cover screw.
5. Replace the computer chassis cover.

Once the adapter card is installed, install the GBIC and connect the cable by following these steps.

Figure 2-10

Example of a GBIC Protector



CAUTION

To prevent damage to the fiber-optic cable, DO NOT have a bend radius of less than three inches. Keep all sharp objects away from the cable and place the cable where it will not be crushed by nearby equipment.

1. Select a GBIC that is compatible with your system and cabling type.
2. Remove the GBIC protector (if present) (see Figure 2-10).
3. Install the GBIC into the receptacle on the adapter card.
4. Insert the cable end connectors into the GBIC.
5. Once you have completed the hardware installation, restart the computer and check the status lights on the adapter card to confirm that it is connected properly.
6. When you have finished installing your tape library and components such as switches and hubs, reboot each of the servers, one at a time, in order for the operating system to recognize your Fibre attached storage devices.

How to Enable/Disable N_Port Support

To Enable N_Port Support

CAUTION

Use extreme care when making changes to the Windows NT™ registry. Improper changes can cause the system to become unbootable. It is strongly recommended to backup your existing registry before making changes. For information regarding the registry, review the help topics in `>regedit.exe<`.

By default, the driver has N_Port support disabled. To set driver parameters in the Window NT™ registry:

1. Select the **[Start]** button from Windows NT™ 4.0.
2. Type `[regedt32]` and select **[ENTER]**.
3. Open the registry at the following location:

```
>\HKEY_LOCAL_MACHINE\System\CurrentControlSet\  
Services\HHBA5100\Parameters\Device\DriverParameter<
```

If the `\Parameters\Device\DriverParameter` key already exists, double-click on **[DriverParameter]** and append the text `[InitAsNport=1]` to the key's value, then exit the registry editor. If the keys do not exist, you need to create them by proceeding to step 4.

4. Using the **Edit pull-down** menu, select **[Add Key]**.
5. Type `[Parameters]` as the name of this key, and then select **[ENTER]**.
6. Select the **[Parameters Key]**.
7. Using the **Edit pull-down** menu, select **[Add Key]**.
8. Type **[Device]** as the name of this key, and select **[ENTER]**. The driver settings apply to all HHBA51xx adapters that HHBA5100.SYS supports.
9. Select the **[Device Key]**.
10. Using the **Edit pull-down** menu, select **[Add Value]**.

11. Type `[DriverParameter]` as the name of this key, and then select **[ENTER]**. Make sure the data type is `[REG_SZ]`.
12. When the **String Editor** text box appears, enter the driver parameter in the text box. For example, enter `[InitAsNport=1]` to enable N_Port support. In this example, driver parameter should be the `REG_SZ [InitAsNport=1]`.

To Disable N_Port Support

CAUTION

Use extreme care when making changes to the Windows NT™ registry. Improper changes can cause the system to become unbootable. It is strongly recommended to backup your existing registry before making changes. For information regarding the registry, review the help topics in `>regedit.exe<`.

To set driver parameters in the Windows NT™ registry:

1. Select the **[Start]** button from Windows NT 4.0.
2. Type `[regedt32]` and select **[ENTER]**.
3. Open the registry at the following location:
`>\HKEY_LOCAL_MACHINE\System\CurrentControlSet\
Services\HHBA5100\Parameters\Device\DriverParameter<`
4. When the **String Editor** text box appears, change the string from `[InitAsNport=1]` to `[InitAsNport=0]`.

HP-UX[®] Fibre Channel Software Drivers

Installing on HP-UX[®] Version 11.0

If the FC host bus adapter (HBA) is installed in the system **before** the operating system software is loaded, the FC drivers are automatically loaded with the operating system. If this is the case, perform the following steps:

NOTE

If you are installing the A5158A adapter, skip steps 1 through 4.

1. Run **SAM** (System Administration Manager).
2. Under Kernel Configuration, select [**Configurable Parameters**].
3. Set [**num_tachyon_adapters**] to the number of FC HBAs installed in the system.
4. Under the **Actions** menu, select [**Process New Kernel**].

If the FC HBA is installed in the system **after** the operating system software is loaded, perform the following steps:

NOTE

If you are installing the A5158A adapter, skip step 3.

1. Run **SAM** (System Administration Manager).
2. Under Kernel Configuration, select [**Drivers**].
3. Under the **List** menu, select [**Configurable Parameters**] and set [**num_tachyon_adapters**] to the number of FC HBAs installed in the system.

Setting the [**num_tachyon_adapters**] parameter is not necessary for the A5158A adapter.

4. Install the following FC Mass Storage drivers:

fcT1_fcp

fcT1_cntl

fcT1

fcp

fcpmux (if an FC-SCSI Mux is being installed)

td (if a Tachyon TL (A5158A) adapter is being installed)

5. Under the **Actions** menu, select **[Process New Kernel]**.

Installing on HP-UX[®] Version 10.20

Follow the steps below to load HP FC Mass Storage/9000 software using the HP-UX[™] swinstall program.

1. Log in as root.
2. Insert the software medium into the appropriate drive.
3. If the software medium is a CD-ROM, mount the CD-ROM using the command:

```
>mount dev/dsk/<cd_rom_dev_file>/tmp_mnt<
```

4. Run the swinstall program. Enter the command:

```
>usr/sbin/swinstall<
```

This opens the **Software Selection** window and **Specify Source** window.

5. Change the **Source Host Name** if necessary. Enter the mount point of the drive in the **Source Depot** path field and select the **[OK]** button to return to the Software Selection window. Select the **[Help]** button to get more information.

The Software Selection window will contain a list of available software to install.

6. Highlight the correct version of FC/9000 software for your system type.

Select part number **[J3630BA]** for the FC Mass Storage software.

7. Select **[Mark for Install]** from the **Actions** menu to choose the product to be installed.

8. Select **[Install]** from the **Actions** menu to begin product installation and open the **Install Analysis** window.
9. Click the **[OK]** button in the **Install Analysis** window to confirm that you want to install the software. Swinstall displays the **Install** window.

Swinstall loads the fileset, runs the control scripts for the filesets, and builds the kernel.

View the **Install** window to read processing data while the software is being installed. When the status field indicates **[Ready]**, the **Confirmation** window opens.
10. Click **[OK]**. A second **Confirmation** window opens.
11. Click **[OK]**. The **Install** window opens.
12. Click **[Done]**. The **Note** window opens.
13. Click **[OK]** on the **Note** window to reboot. The user interface disappears and the system reboots.
14. Once the system comes back up, log in as **[root]** and check the following files to view any error or warning messages that may have occurred during the installation:
 15. `/var/adm/sw/swagent.log`
 16. `/var/adm/sw/swinstall.log`

Modifying the HP-UX[®] Tape Driver

NOTE

By default, the HP-UX[™] SCSI tape driver (stape driver) is configured so that SCSI reserve and release commands are issued automatically with each tape driver command. This behavior needs to be modified for use in SAN environments.

To modify the tape driver, perform the following steps:

1. Login as **[root]**.
2. Run **SAM** (System Administration Manager).
3. Under Kernel Configuration, select **[Configurable Parameters]**.
4. Select **[st_ats_enabled]** from the list of configurable parameters.
5. Under the **Actions** menu, select **[Modify Configurable Parameter...]**
6. Set **Formula/Value** to **[0]**.
7. Click **[OK]**.
8. Under the **Actions** menu, select **[Process New Kernel]**.

Backup Software

For software support, refer to the manual included with your backup software.

Installation
Backup Software

A **Firmware Version Table**

Current Firmware Versions

TableA-1 Current Firmware Versions

| Device | Minimum Level |
|--|---|
| 2/10, 4/40, 6/60, 6/140 | Firmware 1.14 |
| DLT 8000 in above | Firmware v20 |
| Brocade 2400/2800 Switch | Firmware v2.1.3 |
| SureStore E FC Bridge 4/2 | Firmware v4010 |
| SureStore E FC Bridge 4/1 HV | Firmware v3.02 2004h |
| D8602A HBA | Driver 2.06 |
| 10/180 or 20/700 | Firmware v2.00 |
| DLT 7000 in above | Firmware v95 |
| DLT 8000 in above | Firmware v15 |
| HP 9840 in above | Firmware v125 |
| A5158A HBA in switch configuration | HP-UX 11.0 w/dependency patch PHKL_21381 |
| A5158A HBA in direct connect configuration | HP-UX 11.0 w/DART 48 |
| Other HP 9000 FC HBAs in direct connect configurations | HP-UX 11.0 w/IPR 9909 HP-UX 10.20 w/IPR 9912 |

Glossary

A

AL_PA Arbitrated Loop Physical Address, an 8-bit value used to identify a participating device in an arbitrated loop.

arbitrated loop topology Fibre Channel topology that provides a low-cost solution to attach multiple communicating ports in a loop without switches.

asynchronous SCSI signals are transmitted one at a time down the SCSI communication path.

B

bandwidth Transmission capacity of a link or a system

C

cleaning tape A tape that is used only for cleaning a drive.

D

differential SCSI A type of SCSI cable that can go a maximum of 25 meters.

drive, tape drive The device that the library uses to record data onto tapes.

F

fabric Switched interconnect

methodology that supports high-speed data routing in Fibre Channel networks.

FC Fibre Channel

FC-AL An acronym for Fibre Channel Arbitrated Loop topology.

FC-SW An acronym for Fibre Channel Switched Topology. The highest performance Fibre Channel fabric, providing a choice of multiple path routings between pairs of F-ports.

Fibre Bridge Bi-directional connectivity for data transfers between Fibre and SCSI.

Fibre Channel A switched protocol that allows concurrent communication among workstations, supercomputers, mainframes, data storage devices, and other peripherals. Fibre Channel is capable of transmitting at rates exceeding one gigabit per second in both directions simultaneously.

G

GBIC An acronym for the Gigabit Interface Converter, a removable transceiver module for Fibre Channel and Gigabit Ethernet physical-layer transport.

Gb Gigabit 1,062,500,000 bits per second.

GB GigaByte

GLM An acronym for the Gigabaud Link Module; a semipermanent transceiver that incorporates serializing/deserializing functions.

H

HBA Host Bus Adapter; an interface between a server/workstation bus and the Fibre Channel network.

hub A wiring concentrator that collapses a loop topology into a physical star topology.

HVDS High Voltage Differential SCSI

I

initiator Within a Fibre Channel network, typically a server or a workstation that initiates transactions to disk/tape targets.

IP Internet Protocol

IPL Initial Program Load

ISP Internet Service Provider

M

MIB Management Information Base; an SNMP structure for device mnagement.

multicast Refers to delivering a single transmission to multiple destination N_ports.

N

narrow SCSI 50-pin SCSI connector; can be single-ended or differential in implementation.

non-OFC An acronym for Non Open-Ended Fibre Control. This approach does not drop the laser power when a cable link is dropped. Non-OFC uses a lower power laser than an OFC system.

node A Fibre Channel entity that supports one or more ports.

N_Port A Fibre channel port in a point-to-point or fabric connection.

O

OFC An acronym for Open-Ended Fibre Control. When a cable link is dropped, the laser drops to eliminate the potential for eye damage.

originator A Fibre Channel term that refers to the initiating device.

P

port The hardware entity within a node that performs data communications over the fibre channel link.

protocol A data transmission convention encompassing timing, control formatting, and data representation.

R

RAID Redundant Array of Inexpensive Disks

receiver A terminal device that includes a detector and signal processing.

S

SCSI Small Computer Standard Interface

single-ended SCSI A type of cable that is limited to short distances because of the way the electronic signals move down the length of the cable.

SNMP Simple Network Management Protocol; a network management protocol designed to run over TCP/IP routed networks.

switch A device that provides a (n by n) interconnect to allow a port to have full communication bandwidth with any other port

while other communications are occurring.

SW Optical FC Cable A short wave optical Fibre Channel cable.

synchronous Simultaneous transmission of multiple transmissions down the SCSI path.

T

target Typically a disk array or a tape subsystem on a Fibre Channel network.

Telnet A virtual terminal emulation facility over TCP/IP.

terminator An electronic device that connects to the end of the SCSI bus to stabilize bus signals.

topology The logical and/or physical arrangement of stations on a network.

TCP/IP Transmission Control Protocol/Internet Protocol

W

wide SCSI A 68 pin connector that can be single-ended or differential in implementation.

World Wide Name A registered, unique 64-bit identifier assigned to nodes and ports.

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