

Exabyte Tape Library Data Protection Solutions

Apple Fibre Channel Integration Guide





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Introduction

Integrating Exabyte® Tape Libraries into Apple® XServe, XServe RAID Architecture

- This guide presents an overview of integrating Exabyte Fibre Channel Tape Library Hardware into Apple Fiber Channel Storage Area Networks. Common configurations are outlined as well as the parts required to build them.
- This guide also addresses some common challenges integrating fibre channel hardware solutions.

General Overview of parts and Accessories



The image displays various hardware components used in the integration of Exabyte tape libraries into Apple Xserve systems. On the left, there is a horizontal Xserve server. Below it are four smaller components: an Xserve FC Host Adapter, an SFP Transceiver, an LC Optical cable, and an SFP Copper cable. Further down are two Xserve RAID units, a Fabric Switch, and an Exabyte 221L tape library. On the right side of the image is a large, vertical Exabyte Magnum 8X143 tape library.

Xserve

Fibre Channel Accessories

- Xserve FC Host Adapter
- SFP Transceiver
- LC Optical cable
- SFP Copper cable

Xserve RAID

Xserve RAID

Fabric Switch

Exabyte 221L

Exabyte Magnum 8X143

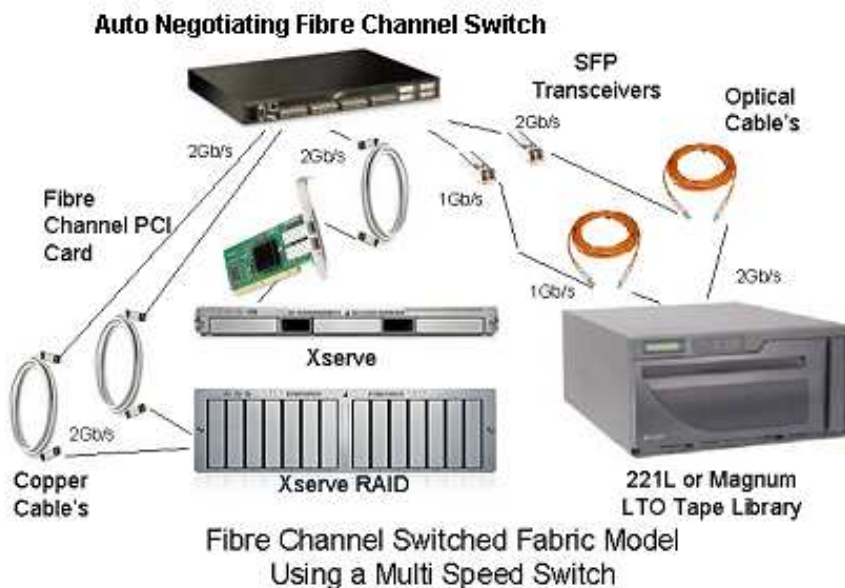
Connect an Exabyte Fibre Channel Tape Library to a Host System and a Network.

Hardware and Operating System Compatibility Requirements:

- Exabyte Fibre Channel Tape Libraries feature native Optical Fibre “LC” style connectors. One connector for the library control and one connector on each tape drive mounted in the Library.
- Exabyte tape library control connection specification is FC-2 1Gb/s, Arbitrated Loop.
- Exabyte LTO-1 Tape Drive connection specification is FC-2 1Gb/s, Arbitrated Loop.
- Exabyte LTO-2 Tape Drive connection specification is FC-2 1Gb/s or 2Gb/s, Arbitrated Loop.
- Exabyte LTO-3 Tape Drive connection specification is FC-2 1Gb/s or 2Gb/s, Arbitrated Loop.
- Users may either establish communication to a host by connecting directly with the Fibre ports on a Fibre Channel Host Adapter or connect through a Fibre Channel Switch if more than two connections are required. Port speed and topology must be set to match the device connected.
- Connecting Libraries and Tape drives to more than 2 host server ports is not supported.
- Exabyte Fibre Channel Tape Libraries are compatible with XServe and XServe RAID Systems. Mac OSX version 10.3.3 or later is required along with Apple Fibre Channel utility software.
- Only use Fibre Channel Components listed on the Apple Store or their equivalents. Verify compatible hardware by check the Apple Website: (www.apple.com).

To complete the hardware interface connection users must:

- Install a Fibre channel host bus adapter in a host server or computer along with their software utilities.
- Use optical SFP Transceivers in the Fibre channel host adapter or switch,
- Connect LC Optical Fibre Channel cables to the Library control and to each tape Drive in the tape library.
- Connect the Library and Tape Drives optical cables to the server fibre channel card ports or switch ports.
- Configure all port connections to their correct settings with their software other port management utilities.
- Connect the Exabyte tape library to a 10/100 Ethernet network for the library Remote Management feature.
- Connect a power cord to the tape Library. An uninterruptible power supply (UPS) is recommended.
- Power down the SAN. Then power cycle the Fibre Channel switch. Power cycle all Storage devices. Power the host server. This correctly allows the Fiber channel layer and host to initialize communications to all devices.



Common Supported Fibre Channel Configurations

Tape Library Configuration Directly Attached to the Host Server (No Switch)

Support For:

- 221L or Magnum Tape Library with a single LTO Tape Drive

Solution Topology:

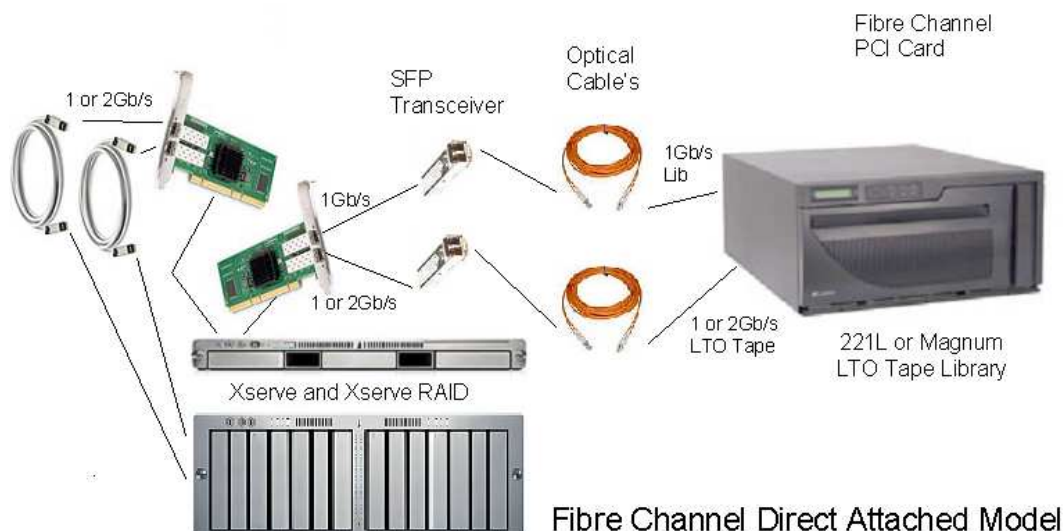
- Library and Tape Drive connect directly to the Server using an Apple Dual Port Fibre Channel Card.
- A second Apple Dual Port Fibre Channel Card may be used to support an XServe RAID.

Purpose:

- This architecture provides a solution for a Library with 1 Tape Drive requiring only 2 Fibre Channel Ports. This would be typical for a small XServe host with Xserve RAID and a tape Library altogether requiring 4 F/C ports, 2 for the RAID and 2 for the Tape Library.

Checklist:

- Install one dual port Fibre Channel Adapters in the server for the library and tape drive.
- Install Optical SFP Transceivers in both ports of the Fibre Channel Adapter for the library and tape drive.
- The Xserve RAID is connected with copper SFP cables.
- Set the Server Fibre Channel Adapters to the correct Port Settings. Use the Fibre Channel Adapter Utility, and verify the settings with the ioreg terminal command. (Refer to the troubleshooting checklist)
- Tape, Port 0 Set to the speed of the tape drive to be used, 1Gb/s or 2Gb/s and topology set to NL_Port (Arbitrated Loop).
 - Library, Port 1 Set to 1Gb/s and NL_Port (Arbitrated Loop) Topology.
- Connect the Tape Drive to Port 0 of the Server Fibre Channel Adapter.
 - An LC to LC Optical Cable is required.
- Connect the Library Control to Port 1 of the Server Fibre Channel Adapter.
 - An LC to LC Optical Cable is required.
- Power sequencing of all the Fibre Channel components.
 - Power all the storage devices on the SAN including all RAID and Tape Libraries.
 - Power the host and allow the operating system to complete loading.



Tape Library in a mixed Configuration (Direct Attach / Switched Fabric)

Support for:

- Exabyte 221L LTO with up to 2 Tape Drives (Up to 3 Fibre Channel Optical Ports Required)
- Exabyte Magnum LTO (Up to 9 Fibre Channel Ports Required)
- **Multi Port Single Speed Fibre Channel Switches.**

Solution Topology:

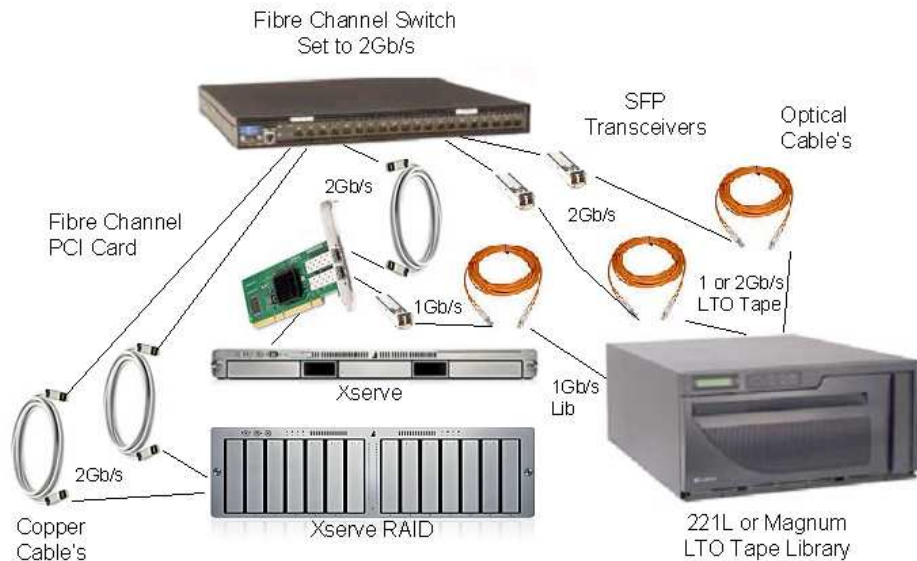
- The Fibre Channel Switch connects to the Host Server Fibre Channel Adapter.
- The Xserve RAID and Library Tape drives connect to the Fibre Channel Switch.
- The Library Control connects to the Host Server Fibre Channel Adapter.
 - Library Control may connect to the Fibre Channel Switch if the Speed is set to 1Gb/s.
- Library Tape Drives connect to the Fibre Channel Switch.

Purpose:

This architecture provides a solution for a requirement of more than two Fibre Channel Ports. The Switch increases the number of devices that can connect to the Host. For Multi Drive Tape Libraries and RIAD together.

Checklist:

- A Dual Port Fibre Channel Adapter is installed in the Host Server.
- Set the Host Server Fibre Channel Adapter to the correct Port Settings. Use the Fibre Channel Adapter Utility, and verify the settings with the ioreg terminal command.
 - Port 0, Set the speed to Auto and topology to NL_Port (Arbitrated Loop).
 - Port 1, Set the speed to 1Gb/s and topology to NL_Port (Arbitrated Loop).
- Connect Port 0 of the Host Server Fibre Channel Card and the Xserve RAID to the Fibre Channel Switch.
 - An SFP to SFP copper cable is acceptable
 - Alternately, Qty 2 SFP Transceivers and an LC-LC cable may be used. (Optical)
- Connect the Tape Library Control to Port 1 of the Host Server Fibre Channel Card.
 - An SFP Transceiver must be installed in the F/C Card.
 - An LC to LC Optical Cable is required.
- Connect each Tape Drive to the Fibre Channel Switch, any port.
 - SFP Transceivers must be installed in the F/C Switch.
 - An LC to LC Optical Cable is required for each Tape Drive.
- Power sequencing of all the Fibre Channel components.
 - Power the Fibre Channel switch first.
 - Power all the storage devices on the SAN including all RAID and Tape Libraries.
 - Power the host and allow the operating system to complete loading.



Fibre Channel Direct Attached / Switched Fabric SAN

Tape Library Configuration in a Switched Fabric SAN

Support for:

- Exabyte 221L LTO with up to 2 Tape Drives (Up to 3 Fibre Channel Optical Ports Required)
- Exabyte Magnum LTO (Up to 9 Fibre Channel Ports Required)
- **Auto Sensing by Port Multi Speed** Fibre Channel Switches.

Solution Topology SAN:

- The Fibre Channel Switch connects to the Host Server Fibre Channel Adapter.
- The Library and Tape drives and RAID storage devices connect to the Fibre Channel Switch.

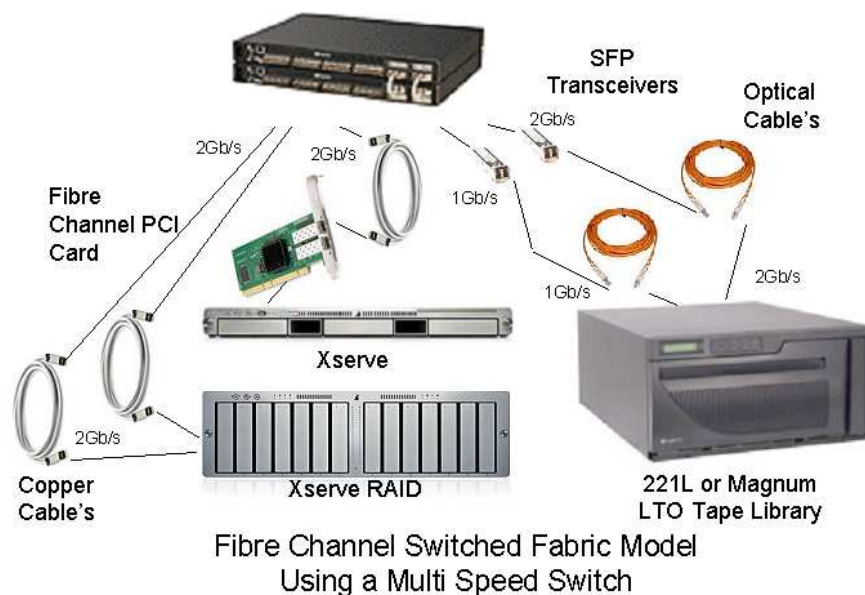
Purpose:

This architecture provides a solution for a requirement of more than two Fibre Channel Ports. The Fibre Channel Switch increases the number of devices that can connect to the Host. For Multi Drive Tape Libraries and RAID together on a single switch.

Checklist:

- A Dual Port Fibre Channel Adapter is installed in the Host Server.
- Set the Host Server Fibre Channel Adapter to the correct Port Settings. Use the Fibre Channel Adapter Utility, and verify the settings with the ioreg terminal command.
 - Port 0, Set the speed to Auto Sense and topology Auto Sense.
 - Port 1, Set the speed to 1Gb/s and topology to NL_Port (Arbitrated Loop).
- Connect the Fibre Channel Switch to Port 0 on the Host Server Fibre Channel Card.
 - SFP to SFP copper cable is acceptable
 - Alternately, Qty 2 SFP Transceivers and an LC-LC cable may be used. (Optical)
- Connect the Tape Library Control to the Fibre Channel Switch any port.
 - SFP Transceivers must be installed in the Fibre Channel Switch.
 - An LC to LC Optical Cable is required.
- Connect each Tape Drive to the Fibre Channel Switch, any port.
 - SFP Transceivers must be installed in the F/C Switch.
 - An LC to LC Optical Cable is required for each Tape Drive.
- Power sequencing of all the Fibre Channel components.
 - Power the Fibre Channel switch first.
 - Power all the storage devices on the SAN including all RAID and Tape Libraries.
 - Power the host and allow the operating system to complete loading.

Auto Negotiating Fiber Channel Switch



Troubleshooting Checklist

Power

- o All tape libraries and other devices should be powered on before the host.
- o The Fiber Channel Switch should be powered on first, if included with the topology, followed by the Tape Library, then by the Host.

Device Discovery

- o Ensure All Host Adapter and Switch Link Light Status is correct for the connection. Refer to the HBA or Switch hardware guide for specifics.
- o If a device discovery in System Profiler or software is not successful after a restart of the server than unplug and re-plug the missing device cable.
- o Users can verify all link characteristics with the “ioreg” console command.
ioreg -w 0 -c AppleLSIFusionFC | grep "Controller Characteristics"
- o Users can Monitor Fibre Channel Activity with the “tail” terminal command.
tail -f /var/log/systems.log

For All Topologies

- o Always use HBA Port 0 for Tape drives in direct attached setups.
- o Always use HBA port 0 for connecting the switch serving the Library and Tape Drives.
- o In direct attached configurations always setup the HBA ports to match speed and set loop topology for tape libraries.

Setup Recommendations

- o Verify Apple HBA link settings with the ioreg controller characteristics terminal command.
- o Always use Port 0 for a single tape drive in a direct attached setup.
- o Connect Switches to the host using Port 0, set to 1 or 2 Gb/s loop or auto.
- o Verify all link characteristics with the “ioreg” console command:
> ioreg -w 0 -c AppleLSIFusionFC | grep "Controller Characteristics"
>
>
>
> excerpt of the output that may be useful. use '/' within less to
> search for key patterns.
>
> | | | | | "Controller Characteristics" = {"Port
> Number"=0,"Port Speed"="Automatic (2 Gigabit)","Port World Wide
> Name"=<100000062b06c27c>,"Product Name"="LSI7202P","Vendor
> Name"="LSILogic","Address Identifier"=<000a01>,"Fibre Channel Cabling
> Type"="Fiber Optic","Product Revision Level"="Firmware 0.0.0, Fcode
> 1.00.29","Slot"="SLOT-C","Node World Wide
> Name"=<200000062b06c27c>,"Port Topology"="Automatic (N_Port)","Port
> Status"="Link Established"}
> | | | | | "Controller Characteristics" = {"Port
> Number"=1,"Port Speed"="Automatic","Port World Wide
> Name"=<100000062b06c27d>,"Product Name"="LSI7202P","Vendor
> Name"="LSILogic","Product Revision Level"="Firmware 0.0.0, Fcode
> 1.00.29","Slot"="SLOT-C","Node World Wide
> Name"=<200000062b06c27d>,"Port Topology"="Automatic","Port Status"="No
> Link Established"}

Device, Part Number, Settings Reference

General Listing of Parts

- Required to integrate a Fibre Channel Exabyte Tape Library Solution
- Qualified Equivalents May be Substituted
- Check the Apple Website. www.apple.com

Part Description	Part Number	Comments / Device Settings
Exabyte 221L LTO-1 Ultrium Tape Library Includes 1 LTO1 Ultrium Tape Drive Tolis BRU Server Basic	T7273LL/A	<ul style="list-style-type: none"> • Library Default F/C Settings • Direct to host, connect Tape Drive to F/C HBA Port 0 • Direct to host, connect Library to F/C HBA Port 1
Exabyte 221L LTO-1 Add On drive	T7274LL/A	<ul style="list-style-type: none"> • Optional 2nd LTO-1 Add-on Drive
Exabyte 221L LTO-2 Ultrium Tape Library Includes 1 LTO2 Ultrium Tape Drive Tolis BRU Server Basic	T7273LL/A	<ul style="list-style-type: none"> • Library Default F/C Settings • Direct to host, connect Tape Drive to F/C HBA Port 0 • Direct to host, connect Library to F/C HBA Port 1
Exabyte 221L LTO-2 Add On drive	T8765LL/A	<ul style="list-style-type: none"> • Optional 2nd LTO-2 Add-on Drive
Exabyte 221L LTO-3 Ultrium Tape Library Includes 1 LTO2 Ultrium Tape Drive Tolis BRU Server Basic	TD317LL/A	<ul style="list-style-type: none"> • Library Default F/C Settings • Direct to host, connect Tape Drive to F/C HBA Port 0 • Direct to host, connect Library to F/C HBA Port 1
Exabyte 221L LTO-3 Add On drive	TD318LL/A	<ul style="list-style-type: none"> • Optional 2nd LTO-2 Add-on Drive
Exabyte 110/221L Rack Mount Kit (Optional)	T9421LL/A	<ul style="list-style-type: none"> • Rack Support for 1 221L Library • Optional Accessory
Exabyte Magnum LTO2 Ultrium Tape Library Includes 1 LTO2 Ultrium Tape Drive Tolis BRU Server Basic	T9422LL/A	<ul style="list-style-type: none"> • May add up to 7 Add-On Drives • Library Default F/C Settings • Direct to host, connect Tape Drive to F/C HBA Port 0 • Direct to host, connect Library to F/C HBA Port 1
Exabyte Magnum LTO-2 Add On drive	T9423LL/A	<ul style="list-style-type: none"> • Optional LTO-2 Add-on Drive
Exabyte Magnum Rack Mount Kit (Optional)	T9438LL/A	<ul style="list-style-type: none"> • Rack Support for 1 Magnum Library • Optional Accessory
Apple Dual Port Fibre Channel PCI-X Card (Or Equivalent)	M9274G/B	LTO1 Tape Drives Connected <ul style="list-style-type: none"> • Port 0, Set to 1Gb/s FC-AL for Tape Drive • Port 1, set to 1Gb/s FC-AL for Library LTO2 Tape Drives Connected <ul style="list-style-type: none"> • Port 0, Set to 2Gb/s FC-AL for Tape Drive • Port 1, set to 1Gb/s FC-AL for Library
Fibre Channel Storage Switch	Various options:	<ul style="list-style-type: none"> • Refer to the Apple Store for more detail.
Optical SFP Transceiver Module 850nm/Multi-Mode - LC, 1&2Gb/s dual rate (Finisar FTRJ8519P1xNL Or Equivalent)	T7127LL/A	<ul style="list-style-type: none"> • Qty 1 Required for the Library Control • Qty 1 Required for Each Tape Drive
Apple Copper Fibre Channel Cable, SFP to SFP, 2.9 M	M9378G/A	<ul style="list-style-type: none"> • For Host Connection to a F/C Switch
Fibre Optic Cable - LC to LC, 2Gb/s, 5M	T7713LL/A	<ul style="list-style-type: none"> • Optional Length Cable • Only 2 Cables Required for this configuration
Fibre Optic Cable - LC to LC, 2Gb/s, 10M	T7711LL/A	<ul style="list-style-type: none"> • Optional Length Cable • Only 2 Cables Required for this configuration

Part Description	Part Number	Comments / Device Settings
Fibre Optic Cable - LC to LC, 2Gb/s, 25M	T6228LL/A	<ul style="list-style-type: none"> Optional Length Cable Only 2 Cables Required for this configuration
Fibre Optic Cable - LC to LC, 2Gb/s, 50M	T6227LL/A	<ul style="list-style-type: none"> Optional Length Cable Only 2 Cables Required for this configuration

Quick Reference Information

Quick Configuration Guide for Fibre Channel Tape Libraries

Model	Library & Tape Drive Optical Connection Ports Req'd	Direct Attached to Server Option	PCI Card Part No.	Dual Port PCI Card Quantity	Switch Option	Switch Part No.	Optical SFP Transceiver Part No.	Optical SFP Transceiver Required	Optical Cables	Optical Cable Quantity
221L LTO-1, 1 Drive	2	Optional	M9274G/B	1	Optional	Various	T7127LL/A	2	Various	2
221L LTO-1, 2 Drive	3	No			Required			3		
221L LTO-2, 1 Drive	2	Optional			Optional			2		
221L LTO-2, 2 Drive	3	No			Required			3		
221L LTO-3, 1 Drive	2	Optional			Optional			2		
221L LTO-3, 2 Drive	3	No			Required			3		
Magnum 8x143 LTO-2, 1 Drive	2	Optional			Optional			2		
Magnum 8x143 LTO-2, 2 Drive	3	No			Required			3		
Magnum 8x143 LTO-2, 3 Drive	4	No						4		
Magnum 8x143 LTO-2, 4 Drive	5	No						5		
Magnum 8x143 LTO-2, 5 Drive	6	No						6		
Magnum 8x143 LTO-2, 6 Drive	7	No						7		
Magnum 8x143 LTO-2, 7 Drive	8	No						8		
Magnum 8x143 LTO-2, 8 Drive	9	No						9		

Refer to the Apple Website for "Various" choices

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Notes: