

Compaq StorageWorks

Enterprise Backup Solution with Legato NetWorker

User Guide

Third Edition (November 2000)
Part Number 161764-003
Compaq Computer Corporation

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Contents

About This Guide

Purpose and Scope.....	vi
Important Safety Information.....	vi
Text Conventions	vii
Symbols in Text.....	vii
Symbols on Equipment	viii
Rack Stability	ix
Getting Help	ix
Compaq Technical Support.....	ix
Compaq Website	x
Compaq Authorized Reseller	x

Chapter 1

Features

Installation Overview	1-4
-----------------------------	-----

Chapter 2

Installing Components

StorageWorks EBS with Legato NetWorker	2-1
Compaq ProLiant Server	2-3
Third Party X86 Server	2-4
Configuring Host Bus Adapter.....	2-5
Microsoft Windows NT and Windows 2000	2-5
Compaq Tru64	2-5
SUN Solaris.....	2-6
Configuration and Setup with Legato NetWorker Software.....	2-6

Installing Components

continued

Tape Libraries	2-7
ESL9326D Library	2-8
TL895 DLT Library	2-14
TL891 MiniLibrary System	2-20
STK Tape Library System	2-29
Fibre Channel to SCSI Bridge.....	2-30
Modular Data Router	2-30
Fibre Channel Tape Controller II (FCTC II)	2-34
Fibre Channel Tape Controller (FCTC).....	2-35
Fibre Channel Switches.....	2-37
StorageWorks Fibre Channel SAN Switch 8/16/EL.....	2-37
StorageWorks Fibre Channel Storage Switch 8/16	2-38
PCI Fibre Channel Host Bus Adapter	2-39
PCI Fibre Channel Host Bus Adapter (KGPSA-BC, KGPSA-CB, and KGPSA-CA)	2-40
Third Party X86 Support.....	2-40
External RAID Storage	2-41
StorageWorks RAID Array 8000 Fibre Channel.....	2-41
StorageWorks Enterprise Storage Array 12000 Fibre Channel.....	2-42
Gigabit Interface Converters	2-43
Gigabit Interface Converter-Short Wave	2-43
Gigabit Interface Converter-Long Wave	2-44
Cables	2-44
Fibre Channel Cables.....	2-44
SCSI Cables	2-45

Chapter 3

Supported Configurations, Performance, and Tuning

Supported Configurations	3-1
Typical EBS Configurations	3-1
Maximum EBS Configuration	3-2
Clustered EBS Configuration	3-4
Feed Source, Primary Storage, and Controller Type (DLT only)	3-5
File Block Size	3-6
The File (Data) Compression Ratio	3-6
The Tape Drive Solution.....	3-6

Chapter 4

Management and Utilities

Compaq Management Tools with Legato NetWorker	4-1
Storage Utility Software Kit.....	4-1
User Diagnostics	4-2
Compaq Insight Manager.....	4-3
Tape Storage Management Console (TSMC).....	4-3
Compaq StorageWorks Command Console	4-6
Third Party Support.....	4-8

Chapter 5

Software

Solution Kit	5-1
CD-ROMs	5-1
Software.....	5-3
Evaluating the Software	5-3
Registering the Software for Permanent Use.....	5-3
45-Day Evaluation Enabler Codes	5-4
Microsoft Cluster Server.....	5-6
Legato NetWorker.....	5-6
Compaq SANworks Secure Path for Windows NT and Solaris	5-7
SANworks Command Console	5-8
SANworks Enterprise Volume Manager.....	5-9
Clustering	5-9
Compaq TruCluster Available Server.....	5-9

Chapter 6

Sizing

StorageWorks Backup Sizing Tool	6-1
---------------------------------------	-----

Appendix A

Troubleshooting

Troubleshooting EBS Components.....	A-1
Visual and Physical Inspection	A-10
Common Troubleshooting Issues.....	A-11

Index

About This Guide

Purpose and Scope

This guide provides information necessary for installing and troubleshooting the Compaq StorageWorks Enterprise Backup Solution with Legato NetWorker.



Important Safety Information

Before installing this product, read the *Important Safety Information* document provided.

Text Conventions

This document uses the following conventions to distinguish elements of text:

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase.
<i>FILENAMES</i>	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These elements appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These elements appear in uppercase.
Type	When you are instructed to <i>type</i> information, type the information without pressing the Enter key.
Enter	When you are instructed to <i>enter</i> information, type the information and then press the Enter key.

Symbols in Text

The following symbols are found in the text of this guide to indicate different types of information.



WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.



CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

IMPORTANT: Text set off in this manner presents clarifying information or specific instructions.

NOTE: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Symbols on Equipment

The following symbols are placed on equipment to indicate the presence of potentially hazardous conditions:



This symbol in conjunction with any of the following symbols indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed. Consult your documentation for specific details.



This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.



This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure.



This symbol on an RJ-45 receptacle indicates a Network Interface Connection.

WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



This symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.



These symbols on power supplies or systems indicate the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.



This symbol indicates that the component exceeds the recommended weight for one individual to handle safely.

Weight in kg **WARNING:** To reduce the risk of personal injury or damage to the
Weight in lb equipment, observe local occupational health and safety requirements and guidelines for manual material handling.

Rack Stability



WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - The stabilizing feet are attached to the rack if it is a single rack installation.
 - The racks are coupled together in multiple rack installations.
 - Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.
-

Getting Help

If you have a problem and have exhausted the information in this guide, you can get further information and other help in the following locations.

Compaq Technical Support

In North America, call the Compaq Technical Phone Support Center at 1-800-OK-COMPAQ. This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for worldwide Technical Support Centers are listed on the Compaq website. Access the Compaq website:

<http://www.compaq.com>

Be sure to have the following information available before you call Compaq:

- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

Compaq Website

The Compaq website has information on this product as well as the latest drivers and Flash ROM images. Access the Compaq website:

<http://www.compaq.com>

Compaq Authorized Reseller

For the name of your nearest Compaq authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the Compaq website for locations and telephone numbers.

Chapter 1

Features

The Compaq StorageWorks Enterprise Backup Solution (EBS) with Legato NetWorker[™] integrates data protection and archival strategies with disk storage subsystems across multiple platforms and operating systems located on the same storage area network (SAN). This solution provides for the interconnection of multiple heterogeneous servers to multiple tape backup devices using dynamic device sharing technology.

The EBS with Legato NetWorker successfully combines the functionality and management of EBS, SAN, high availability software, and scaling tools to integrate tape and disk storage subsystems in the same Fibre Channel environment.

This solution can include:

- Compaq ProLiant servers running Microsoft Windows NT and Windows 2000
- Compaq AlphaServer servers running Compaq Tru64 UNIX
- Sun UltraSPARC servers running Sun Solaris
- Dell PowerEdge servers running Windows NT and Windows 2000
- Hewlett-Packard NetServer servers running Windows NT and Windows 2000
- IBM NetFinity servers running Windows NT and Windows 2000
- Compaq TaskSmart N-Series Server

The servers can share one or more Compaq StorageWorks Digital Linear Tape (DLT) libraries interconnected through Compaq StorageWorks Fibre Channel and SAN Switches.

Online storage, such as MA8000, RAID Array 8000 (RA8000), and Enterprise Storage Array 12000 (ESA12000), can also be attached to the switch.

The Legato NetWorker application manages the tape backup and restore operations. This guide provides a general outline for the EBS with Legato NetWorker and its components. Legato NetWorker is based on the client/server architecture, and comprises four distinct components: Client, Storage Node, NetWorker server, and Smart Media server. This four-tier architecture provides the flexibility and performance required to protect and manage data on the most complex networks. It also allows tape libraries to be shared within a data zone.

These agents and options are specifically designed for the components that make up the EBS:

- Fibre Channel Host Bus Adapter (HBA)
- SAN Switches
- Fibre Channel Tape Controller/Modular Data Router
- Tape Library

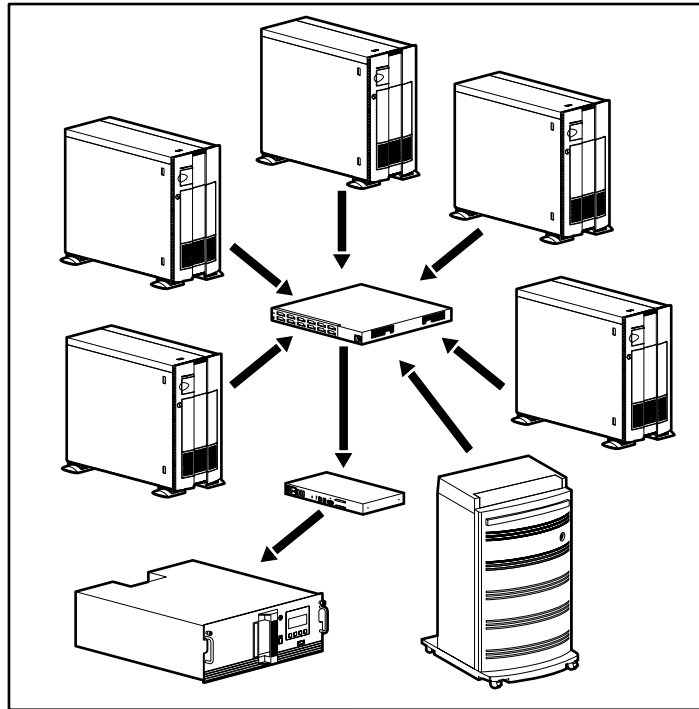


Figure 1-1 SAN with Enterprise Backup Solution

For detailed installation instructions, the applicable component installation guides are referenced with any specific requirements noted.

Before you begin configuring your system for use with Compaq StorageWorks Enterprise Backup Solution (EBS) with Legato NetWorker, read this chapter to acquaint yourself with the recommended configurations.

Installation Overview

1. Install all Solution hardware in the rack. Install these components in the sequence shown in Table 1-1 below.

Table 1-1
Solution Installation Sequence

Sequence	Components
1	Switch
2	Modular Data Router or FCTC
3	Tape Storage Library
4	Host Bus Adapter (installed in each required server)
5	Gigabit Interface Converter (GBIC)
6	Fibre Channel Cables
7	SCSI Cables

2. Install any or all Enterprise Backup Systems tape libraries and MDRs or Fibre Channel Tape controllers.

NOTE: For information on installing, configuring, and troubleshooting EBS libraries and MDRs, see Chapter 2, "Installing Components" of this guide.

3. Install the Fibre Channel Host Bus Adapters into servers. Write down the World Wide Name (WWN) of the Fibre Channel Host Bus Adapters and attach to each server. Configure Compaq Fibre Channel Host Bus Adapters.
4. Run Fibre Channel cables from all servers, storage components, and MDRs or to the SAN Switch.
5. Power on the components in the sequence shown in the table.

Table 1-2
Solution Power On Sequence

Sequence	Components	Instruction
1	Tape Library	Wait for the self-initialization to complete.
2	Modular Data Router or FCTC II	Power on the first tape controller and wait approximately 60 seconds before powering on subsequent tape controllers.
3	Fibre Channel Switch	Wait at least 30 seconds for the self-initialization to complete.
4	Legato NetWorker server	Wait for server to come online and services to start
5	Other servers	Wait for server to come online and services to start.

6. Install the operating systems for each server.

NOTE: For information on installing, configuring, and troubleshooting your operating system, see your operating system's user documentation.

7. Install the latest operating systems patches or service packs.

8. Configure all servers to access the storage.

NOTE: For information about supported components and drivers, see Chapter 2, "Installing Components."

9. Install Legato NetWorker.

Chapter 2

Installing Components

StorageWorks EBS with Legato NetWorker

The Enterprise Backup Solution (EBS) with Legato NetWorker may include the following:

- Servers
 - Compaq ProLiant Server
 - Compaq Alpha Server
 - Sun Ultra SPARC Server
 - IBM, Dell, Hewlett-Packard X86 Server
- Tape Libraries
 - ESL9326D Library
 - TL895 DLT Library
 - TL891 MiniLibrary, TL891 Expansion and Data Unit
- Tape Controllers
 - StorageWorks Modular Data Router
 - Fibre Channel Tape Controller II
 - Fibre Channel Tape Controller

- Fibre Channel Switches
 - StorageWorks SAN Switch 8/16/8-EL
 - StorageWorks FC Storage 8/16
- PCI Fibre Channel Host Adapters
 - PCI Fibre Channel Host Bus Adapter KGPSA-CA
 - PCI Fibre Channel Host Bus Adapter KGPSA-BC
 - PCI Fibre Channel Host Bus Adapter KGPSA-CB
 - PCI Fibre Channel Host Bus Adapter SWSA4-PC
- SBus Fibre Channel Host Adapters
 - SBus Fibre Channel Host Bus Adapter SWSA4-SB
 - SBus Fibre Channel Host Bus Adapter SWSA4-SC
- Gigabit Interface Converters
 - Gigabit Interface Converter-Short Wave (GBIC-SW)
 - Gigabit Interface Converter-Long Wave (GBIC-LW)

Compaq ProLiant Server

The Compaq ProLiant server combines high-availability performance and modular expandability in a platform designed for demanding environments. This server must be running Windows NT 4.0 or Windows 2000 with the minimum recommended configuration and TCP/IP communication.

Table 2-1
Operating System Requirements of EBS

Operating System	Service Pack or Patch
Windows NT 4.0	5.0 or higher
Windows 2000 Advanced Server	X.X

ProLiant Servers compatible with Enterprise Backup Solution (EBS) with Legato NetWorker are listed in the following table.

Table 2-2
EBS with Legato NetWorker Compatible Compaq
ProLiant Servers

New Names	Present or Former Names
ProLiant ML350	ProLiant 800
	ProLiant 1500
ProLiant ML370	ProLiant 1600
ProLiant DL380	ProLiant 1850
ProLiant CL380	ProLiant CL1850
	ProLiant 2500
ProLiant ML530	ProLiant 3000
	ProLiant 4500
	ProLiant 5000
ProLiant ML570	ProLiant 5500
	ProLiant 6000
ProLiant DL580	ProLiant 6400
	ProLiant 6500
	ProLiant 7000
ProLiant ML750	ProLiant 8000
ProLiant DL750	ProLiant 8500

Third Party X86 Server

Compaq supports several third party X86 servers for use within the EBS. These servers must be running Windows NT 4.0 or Windows 2000, with the minimum recommended configuration and TCP/IP communication.

The following lines of servers have been qualified for use with the EBS.

NOTE: Refer to the Host Bus Adapter Section for setup and operating instructions.

Table 2-3
EBS with Legato NetWorker Compatible Third Party X86 Servers

Dell PowerEdge Series
HP Netserver Series
IBM Netfinity Series

Configuring Host Bus Adapter

Refer to the installation documents for installing the Host Bus Adapter and its driver.

Microsoft Windows NT and Windows 2000

For servers running Windows NT or Windows 2000 the topology parameter must be set to 1 to enable switched fabric (F-Port) support. This is set up automatically with the .A7 driver.

NOTE: For more information, refer to the driver Readme file.

Compaq Tru64

Compaq AlphaServer servers must run Tru64 UNIX version 4.0F, 5.0A, 5.1 for compatibility with Compaq StorageWorks Enterprise Backup Solution with Legato NetWorker.

Compaq supports both the KGPSA-BC and KGPSA-CA host bus adapters for use with Compaq AlphaServer servers.

The following Compaq AlphaServer models are supported for use with Legato NetWorker:

- 800
- 1000A
- 1200
- 4x00
- 8x00
- DS10
- DS20
- ES40
- GS60
- GS80
- GS140
- GS 160
- GS 320

SUN Solaris

Sun Ultra SPARC servers must run Sun Solaris version 2.6, version 7 or 8 for compatibility with Compaq StorageWorks Enterprise Backup Solution with Legato NetWorker. Both the 32-bit and 64-bit models are supported.

Compaq supports the SWSA4-SB, SWSA4-SC, and SWSA4-PC host bus adapters for use with Sun Ultra SPARC servers.

For servers running Sun Solaris, the host bus adapter must be set to fabric mode when installed. This can be done by installing HSG80 platform kit or manually by editing the `fcad.conf` file.

NOTE: For more information, refer to the driver Readme file.

Configuration and Setup with Legato NetWorker Software

Contact your authorized local Compaq reseller to schedule an engineer for onsite installation and setup of Legato NetWorker.

NOTE: Legato Smart Media must be installed by a Legato engineer.

Tape Libraries

The most important components of the EBS are the tape libraries. The DLT libraries automate the tape handling process, freeing valuable administrative resources. Automated tape libraries provide continuous dedicated service (24 hours a day, 7 days a week). EBS supports a number of tape libraries to support a range of needs from small workgroup installations to enterprise data center environments.

Use the table below to verify that your tape library meets the minimum revision requirements for Enterprise Backup Solution with Legato NetWorker.

Table 2-4
Tape Library Minimum Revision Requirements

Tape Library	Model Number	GUI Firmware Version	Robot Firmware Version	Drive Firmware Version
ESL9326D	6240077		1.41p4	v80
TL895	6310080	1.23	2.31	v80
TL891			5.14	v80

ESL9326D Library

The ESL9326D is a highly reliable, automated backup and restore library that contains 326 slots and up to 16 Compaq 35/70 DLT drives and provides native capacity of 11.4 TB. The ESL9000 platform also offers high availability and scalability features not normally found in tape libraries.

Incorporating a PCI backplane into its architecture, the ESL9000 series of libraries will accept future product enhancements such as Fibre Channel cards, network administration cards, hardware RAID, or a library thin server card for direct network application support (NAS) control.

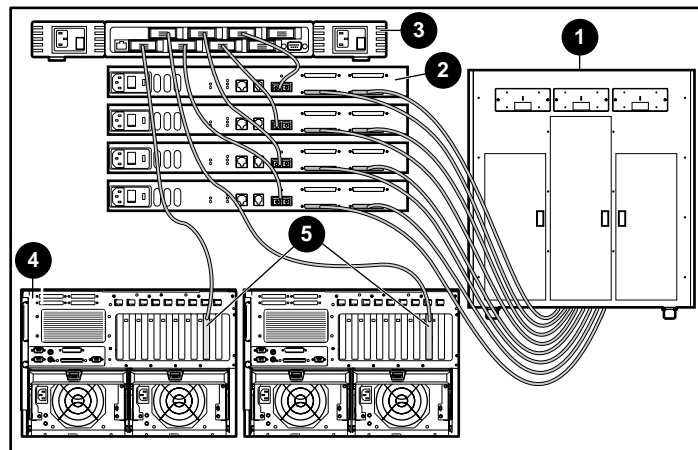


Figure 2-1. A possible ESL9326D configuration

- | | | | |
|---|---------------------|---|---------------------------------|
| ① | ESL9326D Library | ④ | Server |
| ② | Modular Data Router | ⑤ | Fibre Channel Host Bus Adapters |
| ③ | SAN Switch | | |

The ESL9326D comes standard with redundant power, 2+N hot-plug power supplies, and redundant hot-plug cooling fans for true high availability. The stand alone 11.4 TB cabinet will be scalable up to 5 modules, providing a single 57 TB tape library. Each drive bay is preconfigured to accept a hot swappable DLT drive canister for easy online drive expansion, service, and future drive upgrades.

Adding the ESL9326D to the EBS product mix provides increased performance features such as the following:

- Increased scalability
- 6 to 16 hot-swappable DLT 35/70 drives matching performance and retention needs
- Lights-out operations

Changing the SCSI ID Settings on a ESL9326D Tape Library

The first step in installing the ESL9326D tape library is changing the SCSI ID setting. Use the ESL9326D Tape Library control panel to change the SCSI ID settings. Go to “Fibre Channel Tape Controller” (FCTC), later in this chapter, for more information.

NOTE: MDR does not require specific SCSI ID settings. See MDR section for specific settings.

1. Press **Standby** to take the library off-line.
2. Press **Operator** to enter the operator screen. The Operator screen is restricted for use by individuals with operator or service access privileges.
3. When the Operator screen appears, enter a password, type the password numbers on the keypad, and press **Enter**.

NOTE: The default password is 1234.

4. When the password is confirmed, press **Configure Library**.
5. The Configure Library Menu displays a list of devices and current settings. To change the settings, press **Configure**.
6. The Configure Library Settings screen appears. Press **Select** three times or until DEVICE is highlighted.
7. Press the **Left** and **Right** arrow buttons to select the device to be changed.

NOTE: As the operator scrolls through the list of devices the SCSI ID field will simultaneously update the devices current SCSI IDs setting.

8. When the device has been highlighted, press **Select** one time to highlight the SCSI ID field.

9. Press the **(left and right)** buttons to scroll through the list of SCSI IDs.
10. When the desired setting appears, press **Change** to save the settings as part of the library configuration.
11. Repeat steps 7 through 10 to configure additional devices.

NOTE: The library must be power cycled before new SCSI ID settings will be effective.

Table 2-5
ESL9326D Tape Library SCSI ID Setting for FCTC II

Device	FCTC #1		FCTC #2		FCTC #3		FCTC #4	
	Bus 0	Bus 1	Bus 0	Bus 1	Bus 0	Bus 1	Bus 0	Bus 1
Robot	1							
Drive 0	2							
Drive 1	3							
Drive 2		2						
Drive 3		3						
Drive 4			2					
Drive 5			3					
Drive 6				2				
Drive 7				3				
Drive 8					2			
Drive 9					3			
Drive 10						2		
Drive 11						3		
Drive 12							2	
Drive 13							3	
Drive 14								2
Drive 15								3

NOTE: The default drive cable/library configuration should be used for the robot and drives, with the exception of the SCSI ID assignments.

Table 2-6
ESL9326D Tape Library SCSI ID Setting for FCTC

	FCTC #1	FCTC #2	FCTC #3	FCTC #4	FCTC #5	FCTC #6	FCTC #7	FCTC #8
Device	Bus 0	Bus 0	Bus 0	Bus 0	Bus 0	Bus 0	Bus 0	Bus 0
Robot	1							
Drive 0	2							
Drive 1	3							
Drive 2		2						
Drive 3		3						
Drive 4			2					
Drive 5			3					
Drive 6				2				
Drive 7				3				
Drive 8					2			
Drive 9					3			
Drive 10						2		
Drive 11						3		
Drive 12							2	
Drive 13							3	
Drive 14								2
Drive 15								3

NOTE: The default drive cable/library configuration should be used for the robot and drives, with the exception of the SCSI ID assignments.

Connecting the ESL9326D Tape Library



WARNING: Make sure the power to each component is off and the power cords are unplugged before making any connections.

IMPORTANT: Read the documentation included with each component for additional operating instructions before installing.

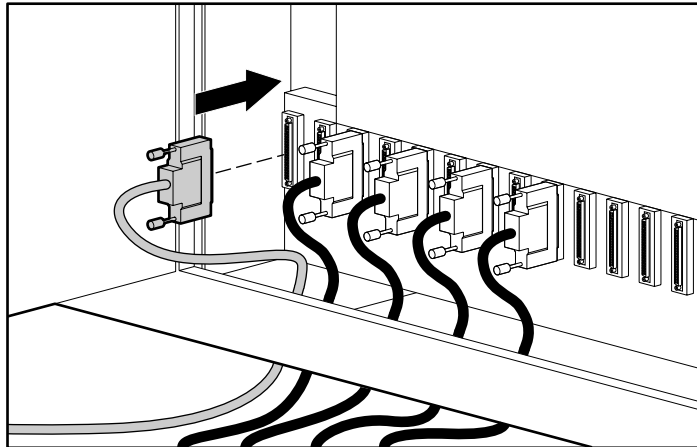


Figure 2-2. Connecting the ESL9326 Tape Library to the Modular Data Router, FCTC, or FCTC II

Connect the ESL9326D Tape Library to the FCTC using a SCSI interface cable. Before installing the ESL9326D Tape Library, check the following table for correct drive, cabling, and SCSI port connections.

Table 2-7
ESL9326D Tape Library Connections

Number of Drives	Number of SCSI Cables Required	Library SCSI Port Connectors	Ports Requiring Termination (can be terminated inside also)
2	1	A	B
3	2	A and C	B and D
4	2	A and C	B and D
5	3	A, C, and E	B, D, and F
6	3	A, C, and E	B, D, and F
7	4	A, C, E, and G	B, D, F, and H
8	4	A, C, E, and G	B, D, F, and H
9	5	A, C, E, G and I	B, D, F, H, and J
10	5	A, C, E, G and I	B, D, F, H, and J
11	6	A, C, E, G, I, and K	B, D, F, H, J, and L
12	6	A, C, E, G, I, and K	B, D, F, H, J, and L
13	7	A, C, E, G, I, K, and M	B, D, F, H, J, L, and N
14	7	A, C, E, G, I, K, and M	B, D, F, H, J, L, and N
15	8	A, C, E, G, I, K, M, and O	B, D, F, H, J, L, N, and P
16	8	A, C, E, G, I, K, M, and O	B, D, F, H, J, L, N, and P

NOTE: Follow the instructions in the *Compaq StorageWorks ESL9326D Tape Library Installation Guide* to install and configure the tape library.

TL895 DLT Library

The TL895 DLT automated tape library is a high-performance, free-standing DLT tape library targeting the departmental secondary storage market. The TL895 product is a 96-slot automated library unit, available with two to seven DLT drives. This tape library offers up to 6.7 TB at 2:1 compression of automated DLT backup and restore for mission critical data.

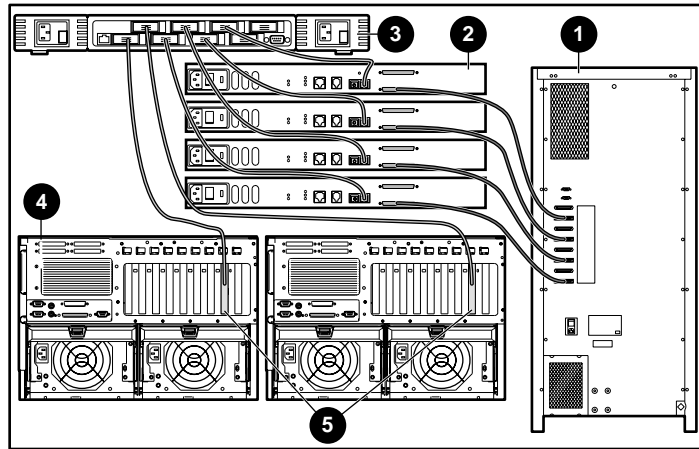


Figure 2-3. A possible TL895 configuration

- | | |
|-----------------------|-----------------------------------|
| ① TL895 DLT Library | ④ Server |
| ② Modular Data Router | ⑤ Fibre Channel Host Bus Adapters |
| ③ SAN Switch | |

IMPORTANT: Upgrade Requirements

If you own a legacy (older revision) of the TL895 library, you will need to upgrade your library so that it is compatible with the EBS. The serial numbers indicated below require upgrades of the TL895.

Series Version:	A01	B01	C01
<i>EBS</i>			
<i>Compatible</i>			
Serial Number Start	5J83400001	5J83400001	<u>2G91CBB5T001</u>
Serial Number End	5J90400005	5J90400005	<u>2G91CBB5X014</u>
Revision Method	On-site Revision	On-site Revision	Customer
	required via	required via	Configuration
	Compaq Services	Compaq Services	of Robotics
			Serial Num.

If an upgrade is required, call Compaq at 1-800-OKCOMPAQ or contact a Compaq authorized reseller to obtain an upgrade kit. The reference part number for the Compaq StorageWorks TL895 Library upgrade to EBS Compatible Kit is 128683-B21.

For additional information, go to the Compaq website at www.compaq.com. Search for the following keywords: ebs, advisory or ebs, techpubs. Or go to www.compaq.com/products/storageworks/ebs.

NOTE: This backup solution allows for one or more libraries in one solution. The number of libraries or drives needed depends upon the amount of data and backup window required.

Changing the SCSI ID Settings on a TL895 Tape Library

The first step of installing the TL895 Tape Library is changing the SCSI ID setting. Use the TL895 Tape Library control panel to change the SCSI ID settings. Go to “Fibre Channel Tape Controller” (FCTC), later in this chapter, for more information.

1. Press **Standby** to take the library off-line.
2. Press **Operator** to enter the operator screen. The Operator screen is restricted for use by individuals with operator or service access privileges.
3. When the Operator screen appears enter a password, type the password numbers on the keypad and press **Enter**.

NOTE: The default password is 1234.

4. When the password is confirmed, press **Configure Library**.
5. The Configure Library Menu displays a list of devices and current settings. To change the settings, press **Configure**.
6. The Configure Library Settings screen appears. Press **Select** three times or until **Device** is highlighted.
7. Press the **Left** and **Right** arrow buttons to select the device to be changed.

NOTE: As the operator scrolls through the list of devices the SCSI ID field will simultaneously update the devices current SCSI IDs setting.

8. When the device has been highlighted, press **Select** one time to highlight the SCSI ID field.
9. Press the **Left** and **Right** arrow buttons to scroll through the list of SCSI IDs.
10. When the desired setting appears, press **Change** to save the settings as part of the library configuration.
11. Repeat steps 7 through 10 to configure additional devices.

NOTE: The library must be power cycled before new SCSI settings will be effective.

Table 2-8
TL895 Tape Library SCSI ID Setting for FCTC II

Device	FCTC II #1		FCTC II #2	
	Bus 0	Bus 1	Bus 0	Bus 1
Robot	1			
Drive 0	2			
Drive 1	3			
Drive 2		2		
Drive 3		3		
Drive 4			2	
Drive 5			3	
Drive 6				2

Table 2-9
TL895 Tape Library SCSI ID Setting for FCTC

Device	FCTC #1	FCTC #2	FCTC #3	FCTC #4
	Bus 0	Bus 0	Bus 0	Bus 0
Robot	1			
Drive 0	2			
Drive 1	3			
Drive 2		2		
Drive 3		3		
Drive 4			2	
Drive 5			3	
Drive 6				2

NOTE: The default drive cable/library configuration should be used for the robot and drives, with the exception of the SCSI ID assignments.

Connecting the TL895 DLT Library

WARNING: Make sure the power to each component is off and the power cords are unplugged before making any connections.

IMPORTANT: Read the documentation included with each component for additional operating instructions before installing.

Connect the TL895 DLT Library to the FCTC using a SCSI interface cable. Before installing the TL895 Tape Library, check the table below for correct drive, cabling, and SCSI port connections.

Table 2-10
TL895 Tape Library Connections

Number of Drives	Number of SCSI Cables	Library SCSI Port Connectors
2	1	1
3	2	1 and 3
4	2	1 and 3
5	3	1, 3, and 5
6	3	1, 3, and 5
7	4	1, 3, 5, and 7

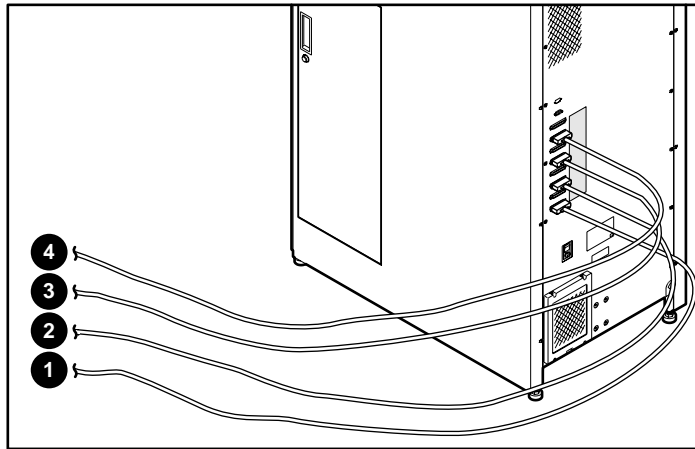


Figure 2-4. Connecting a TL895

① to ④ To the Modular Data Router, FCTC, or FCTC II

NOTE: Follow the instructions in the *Compaq TL895 Tape Library Installation Guide* to install and configure the tape library (refer to part number 330558-001).

TL891 MiniLibrary System

The MiniLibrary System is an expandable, modular tape library system combining DLT technology drives with advanced robotics. The MiniLibrary System is designed for high duty-cycle on-line and near-on-line applications, such as hierarchical storage management, high-volume backup, and archival service. The MiniLibrary System is comprised of the following:

- TL891 MiniLibrary and TL891 DLT

The TL891 MiniLibrary can support up to two DLT 35/70 drives. With 10 data cartridges, the TL891 MiniLibrary offers 700 GB of storage capacity (at 2:1 compression) in a small 4-U form factor.

- MiniLibrary Expansion Unit

The MiniLibrary Expansion Unit assumes control of all attached TL891 modules, allowing for the creation of a multi-module virtual library in a single rack-mount configuration. It also provides an additional 1.1 TB (at 2:1 compression) of capacity (16 cartridges, no drives). The Expansion Unit supports up to five additional modules in a single rack-mount configuration. With the use of a special pass-through mechanism, all tapes within this multi-module configuration are available to all DLT drives, creating a single virtual library.

This true scalability of performance and capacity allows the end user the opportunity to configure the device to meet their specific requirements, as well as offers a “pay as you grow” solution for easy capital management. The multi-unit configuration can also be disassembled at any time and each module reconfigured independently to meet changing corporate backup strategies.

- MiniLibrary Data Unit

The MiniLibrary Data Unit is a 16-cartridge rack mount module which provides for additional capacity (up to 1.1 TB at 2:1 compression) in a TL891 multi-module configuration.

TL891 MiniLibrary

The TL891 MiniLibrary can support up to two DLT 35/70 drives. With 10 data cartridges, the TL891 MiniLibrary offers 700 GB of storage capacity (at 2:1 compression) in a small 4-U form factor.

NOTE: Follow the instructions in the *Compaq StorageWorks TL891 MiniLibrary User Guide* to install and configure the tape library (refer to part number 127510-001).

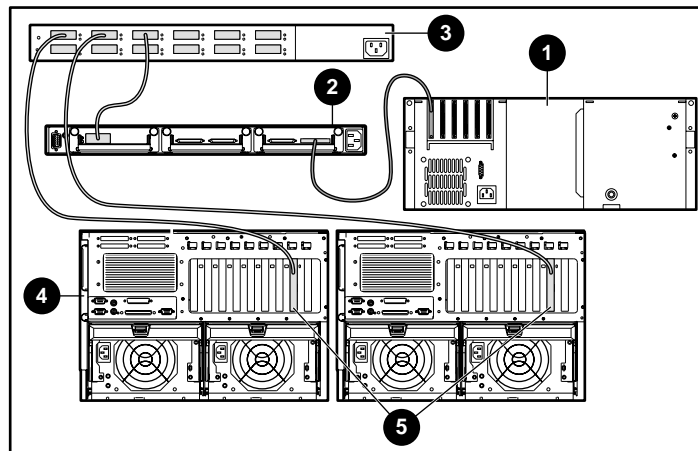


Figure 2-5. A possible TL891 MiniLibrary configuration

- | | | | |
|---|---------------------------------------|---|---------------------------------|
| 1 | TL891 MiniLibrary | 4 | Server |
| 2 | Modular Data Router, FCTC, or FCTC II | 5 | Fiber Channel Host Bus Adapters |
| 3 | SAN Switch | | |

IMPORTANT: Upgrade Requirements

To make your TL891 compatible with the Enterprise Backup Solution, locate the serial number displayed on the back of your TL891 MiniLibrary. If the serial number of your library is any 10-digit number starting with 2K, for example 2K90527078, an upgrade kit is required for your system.

If an upgrade is required, call Compaq at 1-800-OKCOMPAQ or contact a Compaq authorized reseller to obtain an upgrade kit. The reference part number for the upgrade kit is 158517-001.

For additional information, go to the Compaq website at www.compaq.com. Search for the following keywords: ebs, advisory or ebs, techpubs. Or go to www.compaq.com/products/storageworks/ebs.

NOTE: This backup solution allows for one or more libraries in one solution. The number of libraries or drives needed depends upon the amount of data and backup window required.

Changing the SCSI ID Settings on a TL891 MiniLibrary

The first step of installing the TL891 MiniLibrary will be changing the SCSI ID setting. Use the TL891 MiniLibrary front control panel to change the SCSI ID settings. Proceed using the following instructions.

Use the TL891 MiniLibrary control panel to change the SCSI ID settings.

1. Power on the library and wait until the Power-On Self Test completes and the default screen appears on the display of the control panel. The display may vary depending on the number of drives in the library. The ready LED indicator will be lit green and the library status window will display the following:

DLT0: No Tape
DLT1: No Tape
Loader Idle

2. At the Default Screen, press **Enter**. The Main Menu appears and displays the following:

Load/Unload
Show Status Menu
Maintenance Menu
Configure Menu

3. Press the **Down** arrow button. Select the Configure Menu, then press **Enter**. The Configure Submenu appears as follows:

Set Data Format
Set SCSI ID
Set Library Mode
Set Element Base

4. Press the **Down** arrow button to select Set SCSI ID, then press **Enter**. The SCSI Submenu appears as follows:

Library Parity:
*Enabled
Library Bus ID:
*0

5. Press the **Down** arrow button to select Library Bus ID and press **Enter**. Press the up button until a 1 appears below the Library Bus ID. Press **Enter** to accept the SCSI ID of 1 as shown below:

Library Bus ID:

*1

6. Press the **Down** arrow button again to select DLT0 Bus ID and press **Enter**. Press the **Down** arrow button until a 2 appears below the DLT0 Bus ID, as shown below:

DLT0 Bus ID:

*2

Press **Enter** to accept the SCSI ID of 2.

7. Repeat step 6 and set DLT1 to SCSI ID 3.
8. Press the **Escape** key to activate the new SCSI ID setting.

NOTE: For about 15 seconds, the front panel will display: SCSI Param. Update.

At the end of the update, the front panel will return to the Configure Menu as shown below:

Set Data Format
Set SCSI ID
Set Library Mode
Set Element Base

9. Power off the library unit to begin the installation procedures.

Connecting the TL891 MiniLibrary



WARNING: Make sure the power to each component is off and the power cords are unplugged before making any connections.

IMPORTANT: Read the documentation included with each component for additional operating instructions before installing.

Connect the TL891 MiniLibrary to the FCTC using a SCSI interface cable. See the “Fibre Channel Tape Controller” (FCTC) section, later in this chapter, for more information.

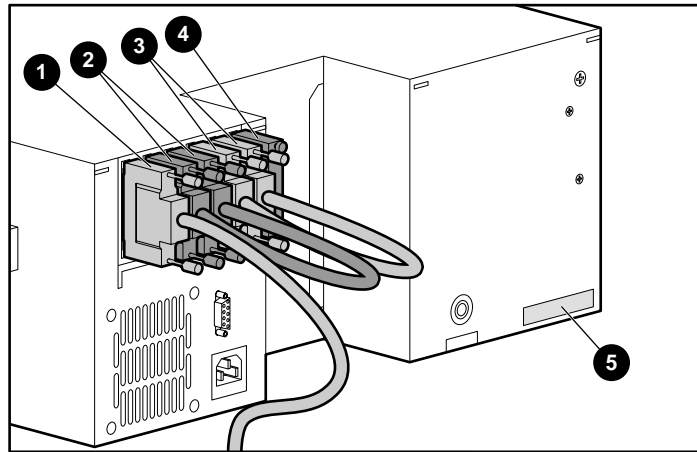


Figure 2-6. Typical daisy chain cabling and termination of the TL891 Tape Library

- | | | | |
|---|----------------------|---|-------------------------|
| ① | SCSI Interface Cable | ④ | Differential Terminator |
| ② | SCSI Jumper Cable | ⑤ | Serial Number |
| ③ | SCSI Jumper Cable | | |

TL891 Expansion or Data Unit

A TL891 Expansion Unit has 16 slots and no drives. It acts as a controller of the MiniLibrary system. The expansion unit is designed to expand the capacity and performance of your storage system. The Compaq TL891 Expansion Unit integrates the robotics of individual modules into a single coordinated library robotics system. The Expansion Unit performs and maintains an inventory of all media present in the system, using a 16-cartridge magazine with a rugged random access robotics mechanism.

NOTE: This backup solution is not limited to one library. The number of libraries or drives needed depends upon the amount of data and the backup window that is required.

Adding an Expansion Unit or Data Unit to a Stack Environment

IMPORTANT: The TL891 Expansion Unit must always be the top unit in the stack of data units and TL891 MiniLibraries. This enables the pass-through robotics mechanism to access and control all of the devices in the stack.

NOTE: The system must be rack-mounted.

NOTE: Follow the instructions in the *Compaq StorageWorks TL891 MiniLibrary System User Guide* to install and configure the tape library (refer to part number 127510-001).

All robotics mechanism controllers are driven by the TL891 Expansion Unit, thus, eliminating the need to drive each controller separately. In order for the TL891 Expansion Unit to drive each robotics mechanism, each device in the stack is attached through a Robotics Mechanism Interface Cable (RMIC).

To enable the unit to work within a stack environment, the configuration of each TL891 MiniLibrary must be reset to a slave setting. Follow these requirements to configure the unit:

- All libraries (TL891 Expansion Unit and TL891 MiniLibraries) must be in working condition.
- Each TL891 MiniLibrary used in the stack must be reset to a slave setting. As opposed to its default stand-alone master setting. To make this change, go to the front panel of the first TL891 MiniLibrary:
 1. Press the **Enter** button on the TL891 MiniLibrary.

2. Select the CONFIGURE MENU option.
3. Select the SET SPECIAL CONFIG option.
4. Select the ALTERNATE CONFIG option.
5. Press the **Enter** button.
6. Select SLAVE mode.
7. Press the **Enter** button.

Creating a Multi-Stack Unit

1. Remove the back panel from the TL891 MiniLibrary to allow the robotics mechanism device to pass through.
2. Add TL891 MiniLibraries to the stack (rack mount) and connect the serial cables to their respective slots. See “Remote Management Interface Cables” later in this section.
3. Connect a TL891 to the tape controller. There is a maximum of two drives per SCSI bus.

IMPORTANT: When creating a stack configuration, insure that your TL891 Expansion Unit firmware version is equal to or greater than any other firmware versions in the stack.

NOTE: For additional information, refer to the *Compaq StorageWorks DLT MiniLibrary Expansion Unit User Guide*.

Devices in a Stack Environment

Table 2-11
TL891 Stack Options

Device	Number supported in a Stack Environment
Tape Controller	Minimum of 1 required/Maximum of 5 *
1 SCSI Bus	1 to 2 drives + 1 TL891 master controller
2 SCSI Buses	3 to 4 drives
3 SCSI Buses	5 to 6 drives
TL891 Expansion Unit	1 required
TL891 MiniLibrary	Minimum of 1 required/Maximum of 5
Data Units	Minimum of 0 required/Maximum of 5

A maximum of 6 devices in any combination can be used, as long as the order and termination guidelines are met.

* **NOTE:** You may need to connect the maximum of 5 FCTC to enable proper drive configurations, depending on the specific FCTC used. See the documentation delivered with your specific FCTC.

Connecting a TL891 Expansion Unit or Data Unit

IMPORTANT: The TL891 Expansion Unit must always be the top unit in the stack of data units and TL891 MiniLibraries. This enables the pass-through robotic mechanism to access and control all of the devices in the stack.

The Expansion Unit or Data Unit SCSI cabling can have several different configurations depending on the specific needs of each particular system. The SCSI cable connection to the TL891 Expansion Unit should be daisy-chained to the next available TL891 MiniLibrary.

SCSI Cabling

The SCSI cabling can have several different configurations depending on the specific needs of each particular system. However, certain cabling rules must be followed for your system to function properly.

- The expansion unit must be the top device in the stack.
- The SCSI cable connection to the TL891 Expansion Unit should be daisy-chained to the next available TL891 MiniLibrary.
- A TL891 must be the last device, at the bottom of the stack.
- Data units, libraries with only storage capacity, and additional libraries can be installed in any order below the expansion unit as long as one TL891 is at the bottom.
- The TL891 MiniLibrary must be terminated at the fourth port in a one-drive library and the sixth port in a two-drive library. See the arrows in the following figure.
- The TL891 MiniLibrary must be connected with a loop back cable the fourth and fifth ports in a two-drive library. The first two ports are used for the robotics mechanism outside the stack environment.

NOTE: For additional information, refer to the Compaq StorageWorks DLT MiniLibrary Expansion Unit User Guide.

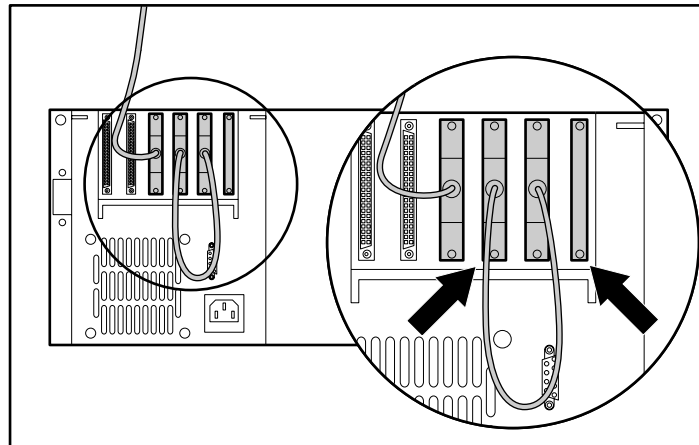


Figure 2-7. Typical connections to a two-drive TL891 MiniLibrary SCSI cables

RMIC Cables

Certain Remote Management Interface Cables (RMIC) cabling rules must be followed for your system to function properly.

- An RMIC cable must connect the robotics mechanism motor to the TL891 Expansion Unit.
- The RMIC cables must be connected from the expansion unit to each separate device used in the stack.
- The TL891 Expansion Unit acts as the master and the other devices act as the slaves.

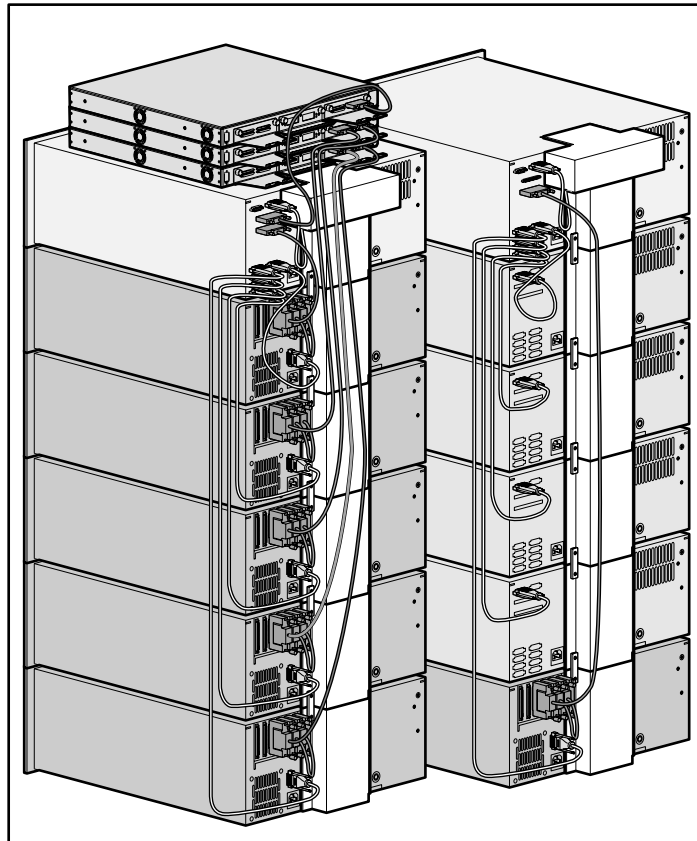


Figure 2-8. Two possible stack configurations
(Left) stack shows one TL891 Expansion Unit, five TL891 MiniLibraries, and three MDRs; (Right) stack shows one TL891 Expansion Unit, four TL891 Data Units, and one TL891 MiniLibrary

Powering on the TL891 MiniLibrary System

1. After the configuration is built, power on all TL891 MiniLibraries (slaves).
2. When each TL891 MiniLibrary is finished configuring, a message will display.

Waiting for Master
3. Power on the TL891 Expansion Unit (master).

STK Tape Library System

Compaq supports the STK 9710 and the STK 9714 libraries. For information on STK tape library systems, see your user documentation.

Fibre Channel to SCSI Bridge

- Each SCSI bus should be limited to 2 SCSI tape drives or 2 SCSI tape drives and a robot.
- The tape library SCSI IDs must be set as follows, when using the Fibre Channel Tape Controller II or Fibre Channel Tape Controller I.

Bus 0:

- SCSI ID 1 = Robot (if applicable)
- SCSI ID 2 = Tape drive
- SCSI ID 3 = Tape drive

Bus 1 (Fibre Channel Tape Controller II only):

- SCSI ID 2 = Tape drive
- SCSI ID 3 = Tape drive

IMPORTANT: All Fibre Channel Tape Controller SCSI Buses, active or inactive, must be terminated (one terminator per unused bus).

NOTE: Large LUNs must be enabled at the operating system level for Windows NT and Windows 2000 and the SCC mode on the Modular Data Router must be enabled when the MDR has more than 9 devices (tapes and robot).

The Modular Data Router and FCTCs are Fibre Channel-to-SCSI bridges that allow a differential SCSI tape device to communicate with other devices over Fibre Channel. The Modular Data Router using modular technology can support up to four SCSI channels per fibre connection. Each SCSI bus can be connected to a maximum of two tape drives. All tape controllers are rack-mountable and have a 1-U form factor. Each FCTC has a single Fibre Channel connection and a single 20 MB/s SCSI bus that can be connected to a tape drive. Each FCTC II has a single Fibre Channel connection and dual 20 MB/s SCSI buses that can be connected to a maximum of two tape drives per bus.

Modular Data Router

The Modular Data Router is a multi-purpose, highly modular storage controller that provides the capability to attach DLT tape libraries to the Fibre Channel SAN. Each Modular Data Router may have a single-port or a dual-port Fibre Channel module and up to two Dual SCSI Bus modules with Very High-Density Cable Interconnect (VHDCI) connectors or Quad SCSI for a maximum of eight tape drives per module. The Dual SCSI Bus modules are available in High Voltage Differential (HVD) and Low Voltage Differential (LVD).

NOTE: The Modular Data Router is limited to 8 SCSI tape drives with single fibre, 16 SCSI tape drives with dual fibre.

The Modular Data Router is rack-mountable and has a 1-U form factor.

NOTE: The Compaq StorageWorks Modular Data Router, FCTC II, and FCTC are interchangeable in HVD SCSI library configurations. Replacing a tape controller will necessitate a reboot of all servers in the SAN. A reboot is required to update all servers' device maps and insure consistency between the operating system and the application. See Chapter 6, "Maintenance," for more information.

Connecting the Modular Data Router



WARNING: Make sure the power to each component is off and the power cords are unplugged before making any connections.

IMPORTANT: Follow the instructions in *Compaq Modular Data Router Reference Guide* for installing and configuring the that router (part number 133834-001).

1. Connect the Fibre Channel cable.

- a. Install a GBIC module in a Fibre Channel port or the Modular Data Router.
 - b. Connect one end of the fibre cable to the GBIC in the Fibre Channel port on the Modular Data Router.
 - c. Install a GBIC module in a port in the SAN Switch 8/16 depending on the interconnect hardware you have.
 - d. Connect the other end of the fibre cable to the GBIC in the port of the interconnect hardware in the particular setup (SAN Switch 8/16).
2. Connect the SCSI cable.
 - a. Connect the VHDCI end of the SCSI cable to a connector on the Modular Data Router.
 - b. Connect the 68-pin end of the SCSI cable to the SCSI connector on the tape storage device.
 3. Connect the AC power cord to the tape controller and then to an AC power source.

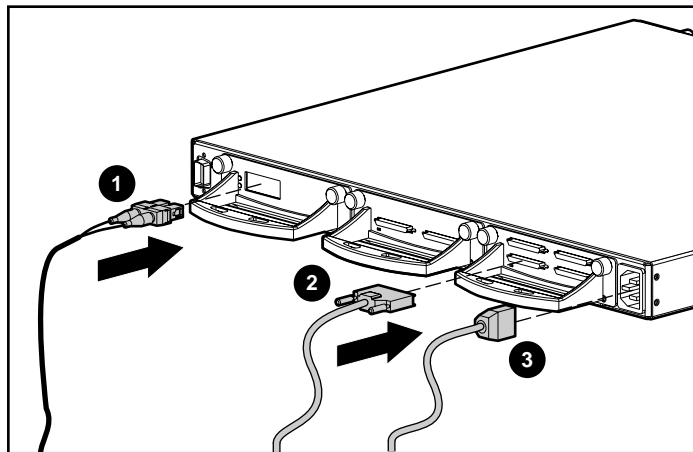


Figure 2-9. Connecting the back of the Modular Data Router

- ① Fibre Channel cable to the switch
- ② SCSI cable to the library
- ③ Power cord

Fibre Channel Host to SCSI Target Configuration

The Modular Data Router's default configuration allows it to act as a target to a Fibre Channel Initiator and to pass FCP requests to SCSI target devices. In order to map SCSI targets to Fibre Channel Hosts, Modular Data Router supports two Fibre Channel to SCSI addressing methods:

- Progressive Persistent Device Discovery Addressing

Mapping tables are saved in persistent memory and are loaded each time the Modular Data Router is power cycled. The Modular Data Router creates new entries in the address mapping tables for newly attached devices. This is the default setting of the Modular Data Router.

- Indexed Addressing

Allows editing of an address mapping table. SCSI targets are selected by mapping the appropriate values into the FCP LUN field, and comparing a Fibre Channel LUN value to a SCSI Bus:Target:LUN value. The Modular Data Router acts as a single initiator on each SCSI bus, defaulting to ID 7. All commands passed through to a SCSI bus originate from this SCSI ID.

Progressive Persistent Device Discovery (PPD) Addressing

NOTE: Progressive Persistent Device Discovery (PPD) is the recommended mode for EBS.

PPD address mapping is the default mode during the new SCSI device discovery process that is initiated upon power-up or remapping. During the Data Router's discovery process on a SCSI bus, the Index table is filled with adjacent FCP LUNs referencing each subsequent SCSI device. The host system will then detect every attached device without voids, allowing full device discovery to the host.

The Modular Data Router can perform SCSI device discovery in two ways:

- Target ID priority

This mode fills the table according to ascending SCSI Target ID order.

- Bus number priority

This mode fills the table in ascending SCSI Bus Number (SCSI port number) order. This is the Modular Data Router's default discovery mode.

Use the Application Management Console (AMC) `setFcLunPriority` command to choose which mode to use (see Appendix D, “Application Management Console in Windows HyperTerminal” in *Compaq Modular Data Router Reference Guide* (part number 133834-001).

Indexed Addressing

Indexed Addressing mode is recommended for environments where users want more flexibility in mapping Fibre Channel to SCSI addresses than provided by the default Progressive Persistent Device Discovery Addressing (PPD) Mode. The user can edit the entries in the Fibre Channel to SCSI Mapping table with indexed addressing using an in-band management tool. The user can then select a table entry by FCP LUN and specify the associated BUS:TARGET:LUN. The Modular Data Router saves all changes to the Mapping table in persistent memory and loads them at the next power cycle.

NOTE: Legato NetWorker does not require the use of indexed addressing for device persistency.

RemapFcSCSI Command After Hardware Configuration Change

When there is a change to the SCSI hardware configuration attached to the SCSI connectors on a Modular Data Router, the user must reconfigure the router by executing the `remapFcSCSI` command from the router’s Application Management Console (AMC). The AMC is accessed using HyperTerminal (or any suitable serial communications application) through the serial port on the Modular Data Router. For instructions on how to access the AMC, refer to the *Compaq StorageWorks Modular Data Router Reference Guide*.

NOTE: The MDR will support a maximum of 8 devices.

Fibre Channel Tape Controller II (FCTC II)

Connecting the FCTC II



WARNING: Make sure the power to each component is off and the power cords are unplugged before making any connections.

NOTE: Follow the instructions in the *Compaq StorageWorks Fibre Channel Tape Controller-II User Guide* for installing and configuring the tape controller (part number 153799-001).

1. Connect the Fibre Channel cable.
 - a. Connect one end of the fibre cable to the Fibre Channel port on the tape controller.
 - b. Install a GBIC-SW module in a switch port.
 - c. Connect the other end of the fibre cable to the GBIC-SW in the Fibre Channel Storage switch port.
2. Connect the SCSI cables.
 - a. Connect one end of the external Wide 68-pin SCSI cable to a SCSI connector on the tape controller.
 - b. Connect the other end of the SCSI cable to the SCSI connector on the tape storage device.
3. Attach the differential SCSI terminator cap to the unused SCSI connector on the tape controller.

IMPORTANT: It is necessary to terminate all unused ports.

4. Connect the AC power cord to the tape controller and then to an AC power source.

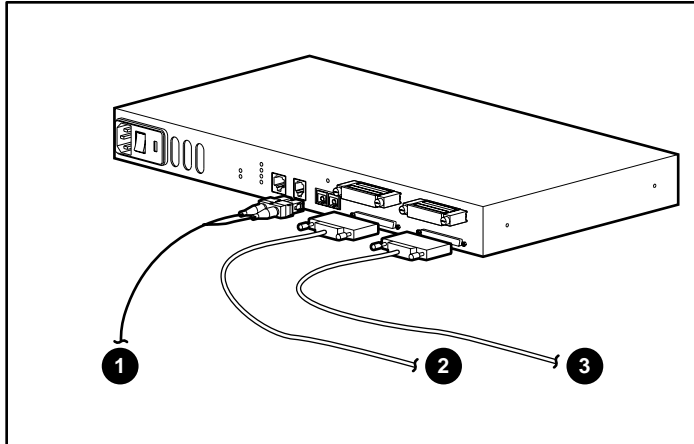


Figure 2-10. Connecting the back of the FCTC

- ① Fibre Channel Cable to the Switch
- ②-③ SCSI to the Library

Fibre Channel Tape Controller (FCTC)

Connecting the FCTC



WARNING: Make sure the power to each component is off and the power cords are unplugged before making any connections.

NOTE: Follow the instructions in the *Compaq Fibre Channel Tape Controller-II User Guide* for installing and configuring the tape controller (part number 153799-001).

1. Connect the Fibre Channel cable.
 - a. Connect one end of the fibre cable to the Fibre Channel port on the tape controller.
 - b. Install a GBIC module in a Fibre Channel Storage SAN Switch 8/16 port.
 - c. Connect the other end of the fibre cable to the GBIC in the Fibre Channel Storage port.
2. Connect the SCSI cables.
 - a. Connect one end of the external Wide 68-pin SCSI cable to a SCSI connector on the tape controller.
 - b. Connect the other end of the SCSI cable to the SCSI connector on the tape storage device.
3. Attach the differential SCSI terminator cap to the unused SCSI connector on the tape controller.

IMPORTANT: It is necessary to terminate all unused ports.

4. Connect the AC power cord to the tape controller and then to an AC power source.

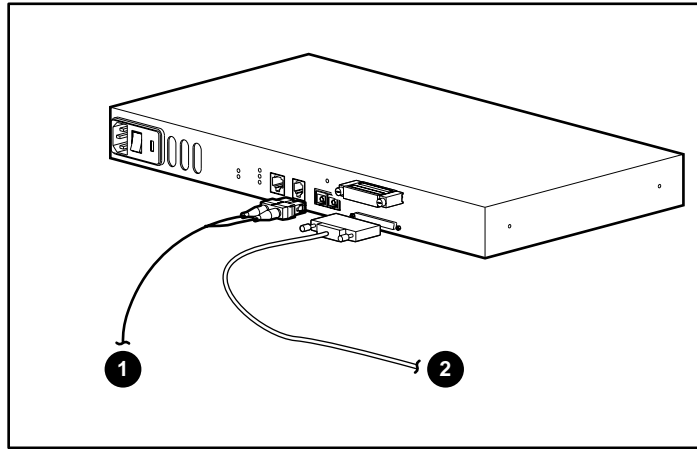


Figure 2-11. Connecting the back of the FCTC

- ① Fibre Channel cable to the SAN switch
- ② SCSI to the Library

Fibre Channel Switches

StorageWorks Fibre Channel SAN Switch 8/16/8-EL

Key components of the StorageWorks EBS with NBU Data Center solution are the StorageWorks Fibre Channel SAN Switches 8/16/8-EL. These are high performance, scalable switched fabrics, designed for creating Storage Area Networks (SANs) .

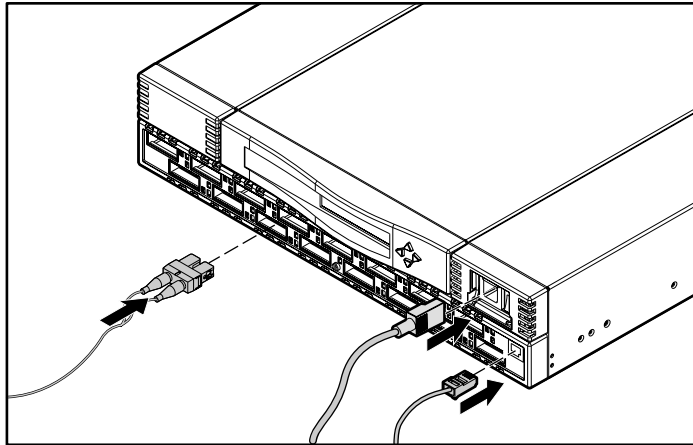


Figure 2-12. Connecting to the 16-port SAN switch

For SWCC support, the IP address of the switch should be configured as described in the installation instructions.

Chapter **3**

Supported Configurations, Performance, and Tuning

Supported Configurations

Typical EBS Configurations

The typical EBS configuration consists of multiple ProLiant and Alpha servers and an EBS tape library.

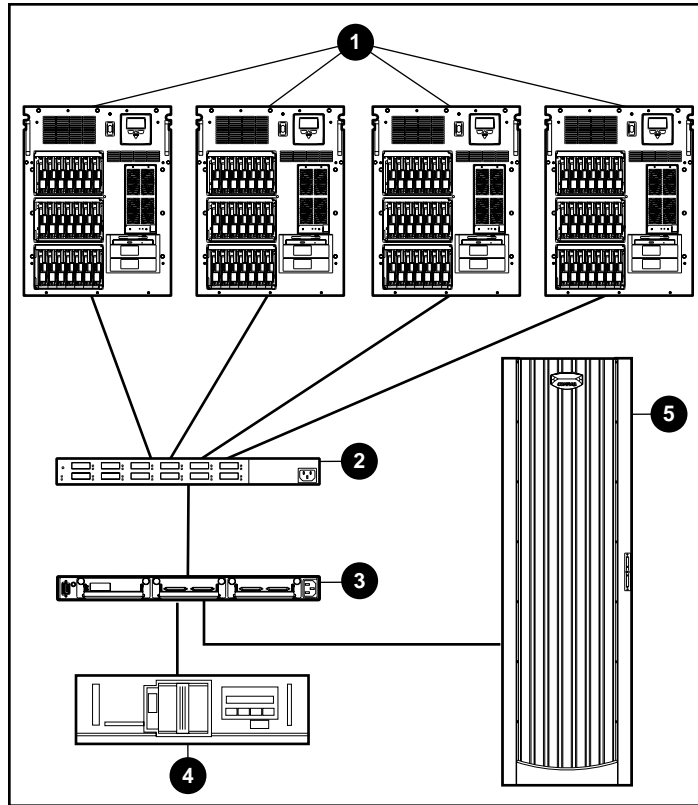


Figure 3-1. Basic configuration

- | | |
|--|---|
| ① Windows NT 4.0, Windows 2000, or Alpha Servers | ⑤ Modular Data Router, Fibre Channel Tape Controller (FCTC), or FCTC-II |
| ② SAN Switch | ④ EBS Tape Library |
| | ⑥ EMA 12000 |

Maximum EBS Configuration

This configuration supports up to 16 DLT drives and can be changed to increase backup speeds and for shorter backup windows. See the “Sizer Utility” section in Chapter 6 to determine performance of the EBS.

NOTE: Using Windows NT or 2000, the Modular Data Router will support up to 32 devices.

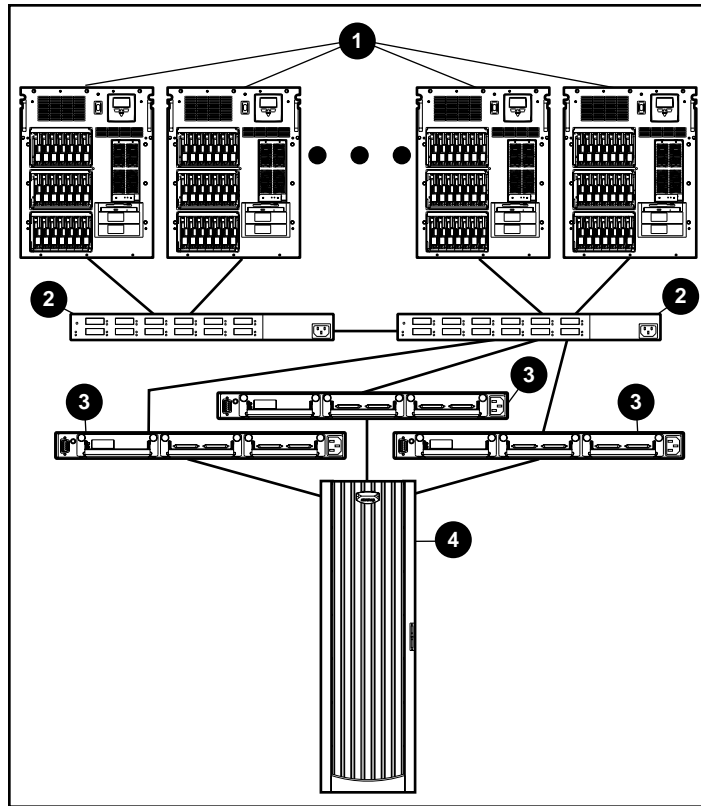


Figure 3-2. Maximum EBS configuration 16 x 16

- | | |
|---|---|
| ❶ Windows NT 4.0 or
Windows 2000 Servers | ❸ Modular Data Router, Fibre
Channel Tape Controller
(FCTC), or FCTC-II |
| ❷ SAN Switch | ❹ EMA 12000 |

Clustered EBS Configuration

The EBS with Legato NetWorker supports backup and restore of the primary and secondary node of a clustered pair of Windows NT and Windows 2000 servers. In the EBS environment, Tru64 cluster and Solaris are supported without failover. This configuration requires some special requirements of the cluster registry such as hive/files, the quorum resource, and disk signature.

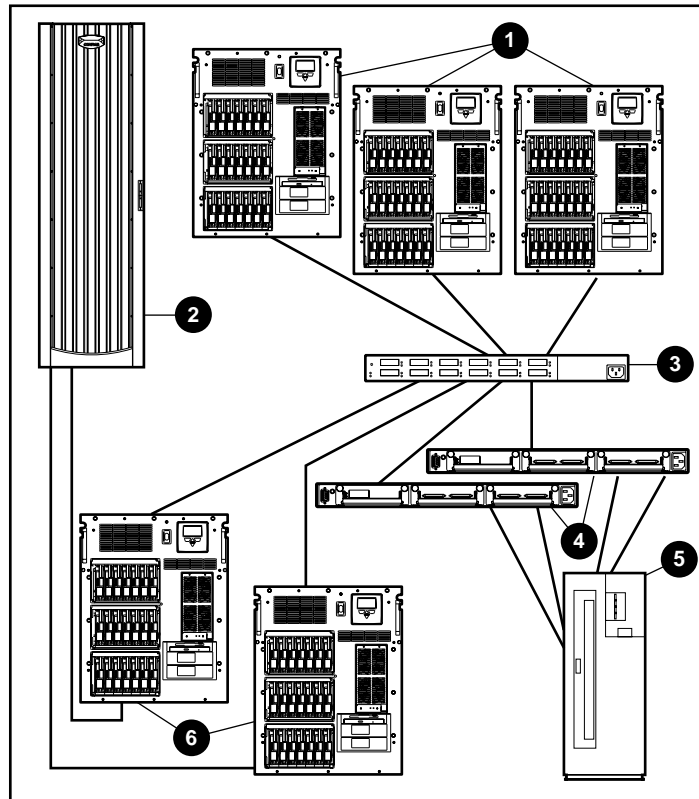


Figure 3-3. Microsoft Clustered Server EBS configuration

- | | | | |
|---|---|---|-------------------|
| ❶ | Windows NT 4.0,
Windows 2000, or Alpha
Servers | ❺ | EBS Tape Library |
| ❷ | EMA 12000 | ❻ | Clustered Servers |
| ❸ | SAN Switch | | |
| ❹ | Modular Data Router, Fibre
Channel Tape Controller
(FCTC), or FCTC-II | | |

Feed Source, Primary Storage, and Controller Type (DLT only)

The type of controller that is used has a direct effect on the speed at which the server can send data to the tape device. Compaq tests show that it is necessary to read from the primary storage device at a speed at least three times the backup rate (3:1) of each DLT drive. This allows the data to stream to the DLT drive achieving optimal performance results.

Table 3-1
Primary Storage Controller Types/Speeds

Controllers	Feed Speed (GB per hour)
Internal SCSI controller	~30
SMART-2 controllers	~100
Fibre Channel controllers	~150

The base rate for 1:1 backups is approximately 15 GB/H per drive. The base rate for 2:1 backups is approximately 26 GB/H per drive. Therefore, if the controller cannot feed data to the DLT drive at a fast enough rate, the drive performance will slow down due to idle time on the DLT drive.

File Block Size

The use of the largest block size available will provide the fastest data transfers because the loop has to be arbitrated less frequently. Currently Legato NetWorker supports up to a 64-KB transfer block size.

The File (Data) Compression Ratio

Compaq tests show that not all data can be compressed equally. The compression ratio will affect the amount of data that can be stored on each tape cartridge, as well as the speed at which the tape drives can read or write the data.

As the data compression ratio increases, tape storage capacity increases. For example: At 1:1 compression, a tape can store 35 GB of data; at 2:1 compression, it can store 70 GB of data.

Typical compression ratios are shown in the following table.

Table 3-2
Typical File Compression Ratios

Data Type	Typical Compression
CAD	3.8 : 1
Spreadsheet/Word Processing	2.5 : 1
Typical File/Print Server	2.0 : 1
Lotus Notes Databases	1.6 : 1
Microsoft Exchange/ SQL Server Databases	1.4 : 1
Oracle/SAP Databases	1.2 : 1

The Tape Drive Solution

The tape drive solutions is the fifth piece in determining backup and restore performance. Use of the Modular Data Router or Compaq Fibre Channel Tape Controller with connections to Compaq StorageWorks Libraries DLT 35/70 tape drives is a simple way to scale backup performance.

Chapter 4

Management and Utilities

Compaq Management Tools with Legato NetWorker

Storage Utility Software Kit

The Storage Utility Software (SUS) Kit is included with all EBS tape libraries. This solution requires SUS version 1.3 or greater.

NOTE: If you do not have the 1.3 revision of the Storage Utility Software Kit, please call Compaq and order the part number 165197-004.

The following CDs are included in the SUS Kit:

- Tape Drive Supplemental Driver CD
- Compaq SmartStart and Support Software version 4.80

- Tape Storage Management Console (TSMC) CD
- Compaq Management CD
 - Compaq Insight Manager
 - Compaq Management Agents for Servers
 - Compaq Management Agents for Alpha Servers
 - Compaq Management Agents for Digital Servers
 - Compaq Management Agents for Clients
 - Compaq Survey Utility
 - Compaq Systems Management Toolkit
 - Compaq Integration Tech Notes
 - Documentation
 - Compaq Power Management

User Diagnostics

User Diagnostics provide several management functions for the EBS components:

- Detailed device information

This device information allows you to view library ID, serial number, and firmware revision. Additionally, you can see the FCTC worldwide name as well as the devices that are attached.

- Firmware upgrades

User Diagnostics allow you to upgrade both the FCTC firmware and the DLT drive firmware through your Fibre Channel SAN.

- Functional tests

Functional tests, such as DLT buffer read/write, move media, and test unit ready, can be remotely administered off-line from the server or remote client.

- User Diagnostics are available at <http://www.compaq.com>.

Compaq Insight Manager

Compaq Insight Manager is a comprehensive management tool used to monitor and control the operation of servers and clients. This control includes the ability to monitor the health and status of the following:

- Fibre Channel tape controllers
- Tape libraries
- Individual tape drives
- Firmware level
- World Wide Name
- Serial numbers
- Error counts and whether maintenance is needed

Compaq Insight Manager consists of two components:

- Windows-based console application
- Server-server or client-based management data collection agents

Working in conjunction with the system hardware and firmware, Compaq Insight Management Agents monitor over 1,000 management parameters. Key subsystems are checked to make health, configuration, and performance data available to the agent software.

The agents act upon the applicable data by initiating alarms in the event of faults, and by providing updated management information, such as network interface or storage subsystem performance statistics. Compaq Insight Manager provides control over systems through monitoring and alerting capabilities for the critical systems in your distributed enterprise.

Tape Storage Management Console (TSMC)

This product is offered to both Compaq customers and trained service personnel. The diagnostics, tests and tools that make up Tape Storage Management Console (TSMC) are designed to aid in the installation and continued use of Compaq tape and tape automation products.

The TSMC will look for and report problems and failures with tape and tape automation products connected via Fibre Channel, SCSI or serial interfaces. This is primarily accomplished through the use of Standard and Custom tests that are built into TSMC. These tests emulate No Trouble Found (NTF) tests developed by Compaq engineers. Should there be a problem with a device, TSMC can identify failed components and report Field Replaceable Unit

(FRU) information to you. If you are installing a device for the first time, you can run TSMC to verify that the tape drive or tape library you purchased is properly installed and is available to your system before you attempt to load any other application software.

You can also load firmware into tape drives or tape libraries with the TSMC tool. If you are connected to the World Wide Web, TSMC will search the appropriate Compaq website for the latest available firmware needed by your device. Newer versions of TSMC are also delivered to you over the Internet.

Device Listing

TSMC provides a device listing to view the library components in your SAN. Here you will see each device, which may be SCSI or Fibre Channel. The number of SCSI devices on a Bus can range from 0 to 7 or 0 to 15 with Wide SCSI. With Fibre Channel, whereby devices can be directly attached or part of a switch network, the numbers get much larger.

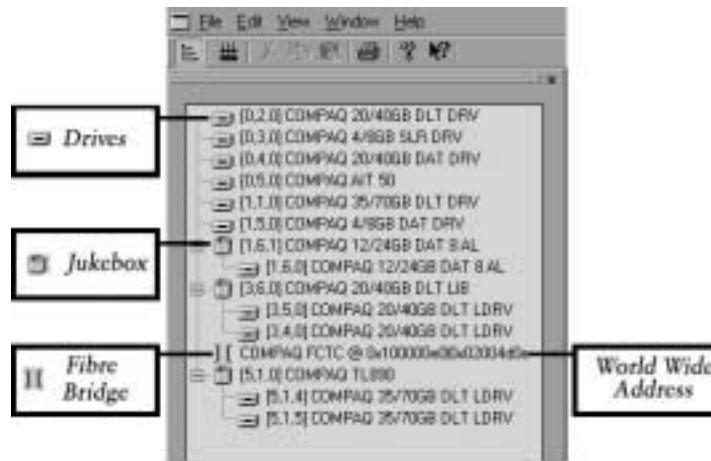


Figure 4-1. Device listing

NOTE: Drives in jukeboxes will be displayed in association with the libraries in which they reside. For several libraries, including the TL895 and ESL9326D these drives will display incorrectly if the library is in standby mode or if a drive is unavailable and the user has not reconfigured the library. To insure correct display, place the library online or reconfigure the library as needed.

Tape Automation Qualifier Screen

TSMC provides a screen that will appear for testing Libraries and Autochangers. Basic and advanced modes appear as in the following figures.

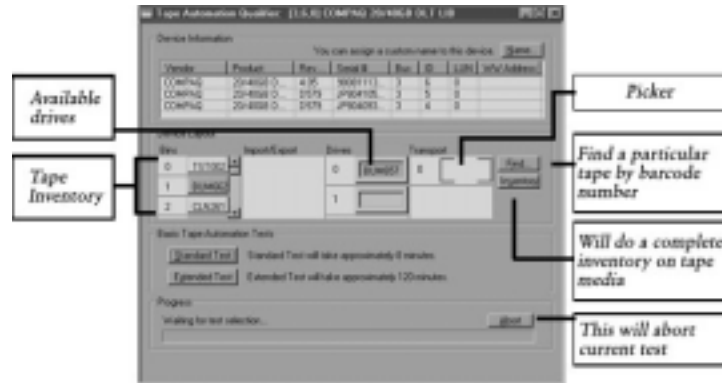


Figure 4-2. Tape Automation Qualifier (Basic Mode)

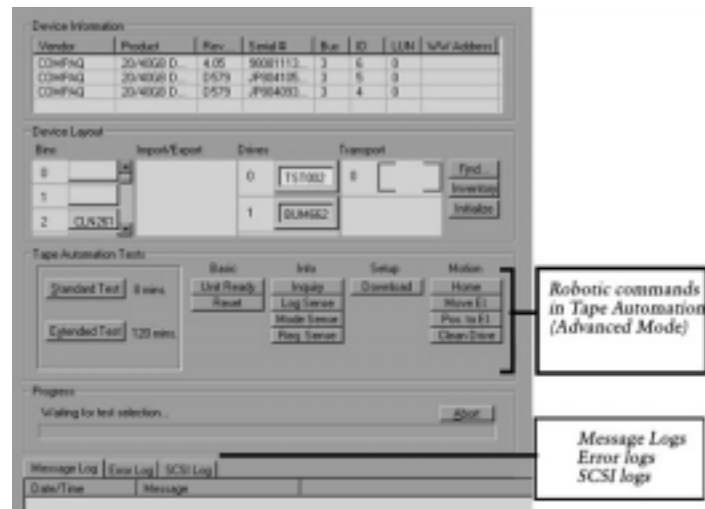


Figure 4-3. Tape Automation Qualifier (Advanced Mode)

Compaq StorageWorks Command Console

StorageWorks Command Console is a storage management software tool that allows systems administrators to configure and monitor storage graphically from a single management console.



Figure 4-4. StorageWorks Command Console initial screen

Command Console consists of two major components:

- The Client, which includes the user interface and some additional services, provides a window into your storage subsystems.
- The Agent is a host resident program that is an interface between the Client and the host's storage controller to interpret and transfer information.

The Command Console provides configuration and monitoring support for Fibre Channel fabrics consisting of switches, hubs, and Fibre Channel Tape Controllers using the Fabric Window or the Command Console Fabric Page.

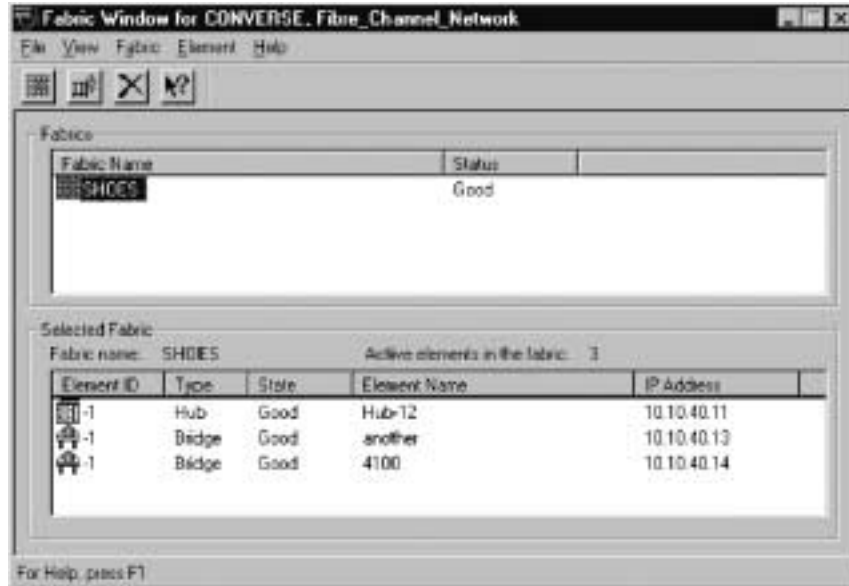


Figure 4-5. StorageWorks Command Console fabric window

The Fabric Window lets you configure Fibre Channel fabrics; add and delete switch, hub, and Fibre Channel tape controller elements to a fabric; and display status information about the fabrics via a Windows interface. In addition, you can drill down to configure and monitor a Fibre Channel Switch, hub, or tape controller in the fabric. You can configure the switch and tape controller, including its port and network requirements.

Third Party Support

Before You Begin

Before you begin installing Compaq software for use with your EBS, make sure that your non-Compaq server meets the following requirements:

- Windows NT 4.0 with Service Pack 5.0 or later, or Windows 2000
- Systems Management Server Launch Support

Microsoft Systems Management Server Launch Support is optional and is applicable only if you are performing an Enterprise rollout.

- Microsoft Internet Explorer Version 3.4 or later

If you do not have Internet Explorer, you can download a free copy of the latest version of Internet Explorer from the Microsoft website at <http://www.microsoft.com>.

- 32-MB RAM
- 35-MB disk space
- VGA monitor or better
- TCP/IP protocol
- SNMP service

Compaq Insight Manager

Compaq Insight Manager is the Compaq application for easily managing network desktops and servers. Insight Manager delivers intelligent monitoring and alerting (based on your preferences) as well as visual control of your EBS.

Compaq Insight Manager provides integration with leading management platforms including HP OpenView, IBM NetView, SunNet Manager, and Microsoft Systems Management Server.

Before you Install Compaq Insight Manager

Before you install Compaq Insight Manager, make sure that the SNMP service is installed on your server.

1. Right-click the Network Neighborhood icon on the Windows NT desktop and choose Properties.
2. Click the Services tab.

3. If SNMP Service does not appear on the Network Services list, click Add. If SNMP Service does appear on the Network Services list, proceed to the next section, “Installing Compaq Insight Manager.”
4. Choose SNMP Service from the Network Services list and click OK.
5. The Windows NT Setup window appears. Type the location of your Windows NT setup files and click OK.
6. When installation completes, the Microsoft SNMP Properties window appears. Configure SNMP by entering the Community Name and Trap Destinations on the Traps tab.

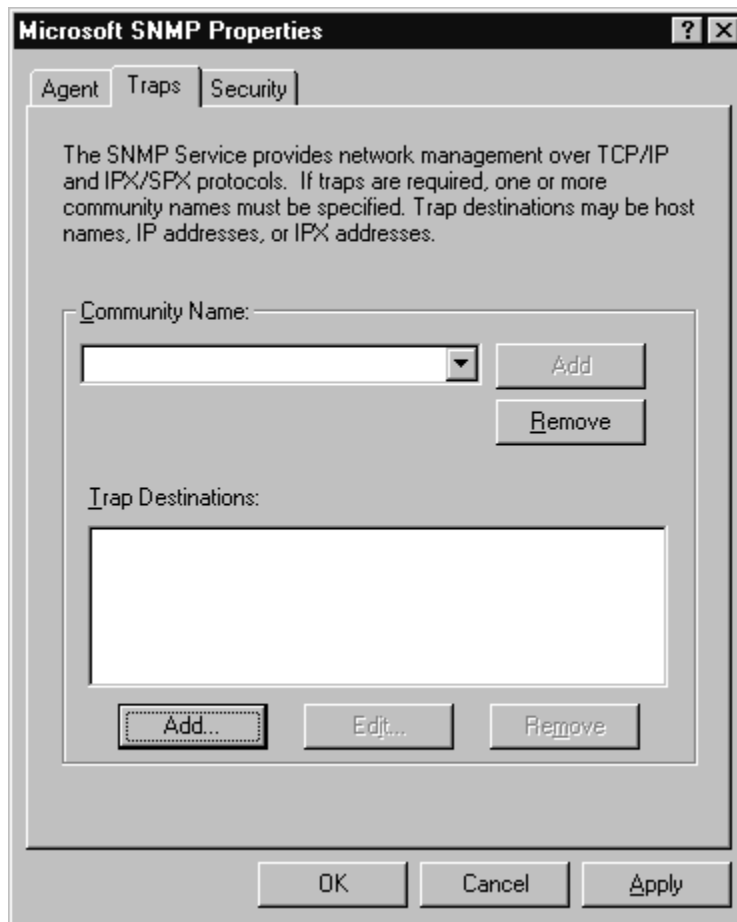


Figure 4-6. The SNMP Properties Traps tab

7. When you finish configuring SNMP Service, click OK.

8. The Network window reappears. Click Close.
9. Do not reboot. Reinstall your Windows NT Service Pack (version 5.0 or later).
10. Reboot your server.

Installing Compaq Insight Manager

Once you verify that the SNMP service is installed and configured properly, you can install Compaq Insight Manager.

1. Insert the Compaq Management CD.
2. The Compaq Management CD window appears. Click Compaq Insight Manager.
3. The Compaq Insight Manager window appears. Choose Compaq Insight Manager and click Open.
4. The Compaq Insight Manager Setup window appears. Click Next.
5. Enter the appropriate information when prompted during setup. When the Select Install Options window appears, select Compaq Insight Manager and click Next.
6. Enter the file location and click Next.

The Configuration Options window displays.

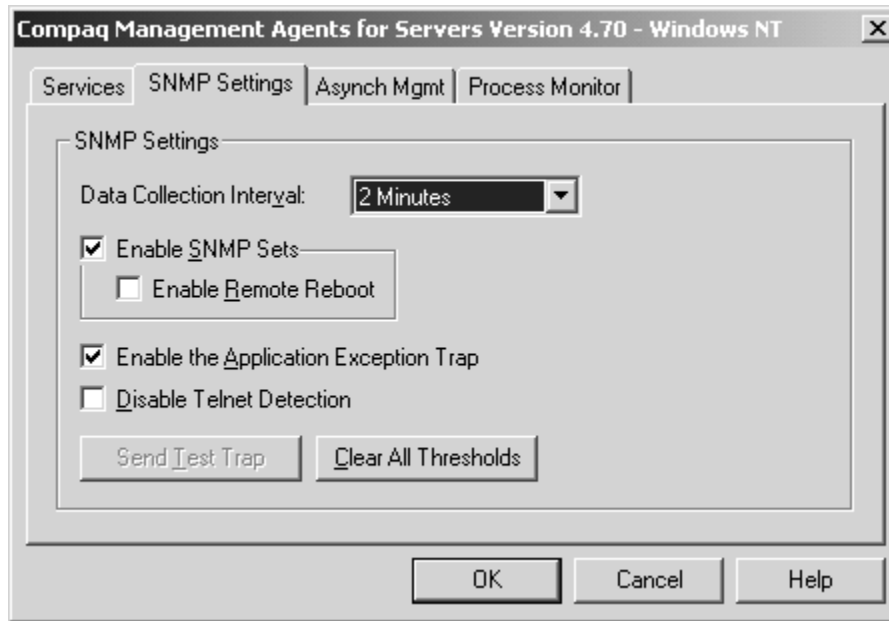


Figure 4-7. The Compaq Insight Manager Configuration Options window.

7. Configure as required and click Next.
8. Choose a Program Folder location and click Next.
9. When Setup completes, click Finish.
10. The Compaq Insight Manager window reappears. Click Close.

The Compaq Management CD window reappears.

IMPORTANT: Do not close the Compaq Management CD window or reboot your server.

Installing Compaq Insight Manager Agents

After installing Insight Manager, you must install the Insight Manager Agents for Compaq Insight Manager to function properly.

IMPORTANT: If you do not install the Compaq Insight Manager Agents by following the instructions below, Insight Manager may not function properly on your non-Compaq server.

1. Minimize the Compaq Management CD window.
2. Remove the Compaq Management CD from the CD-ROM drive.

3. Insert the Compaq SmartStart and Support Software CD. If you have enabled AutoPlay, the Diskette Builder window appears. **Do not** select I Agree, then click OK to close the Diskette Builder window.
4. Click Start and click Run.
5. In the Open box, enter
`X:\CPOSUPSWANTSSD\SETUP.EXE`
Where X is the letter of your CD-ROM drive.
6. The Compaq Server Support Setup window appears. Minimize this window.

IMPORTANT: Do not close the Compaq Server Support Setup window.

7. Remove the Compaq SmartStart and Support Software CD.
8. Reinsert the Compaq Management CD.
9. Restore the Compaq Management Agents for Servers window.
10. Choose Compaq Management Agents for Servers and click Open.
11. The Install Type window appears. Choose Custom and click Next.
12. Install only the Compaq Foundation Agents, Compaq Storage Agents, and Compaq Web Agent. All other items should display No Action, as shown in the figure below. To not install, highlight each agent and click No Action.

IMPORTANT: Only install the agents listed above. Installing agents other than those listed above may cause Compaq Insight Manager to function improperly on your non-Compaq server.

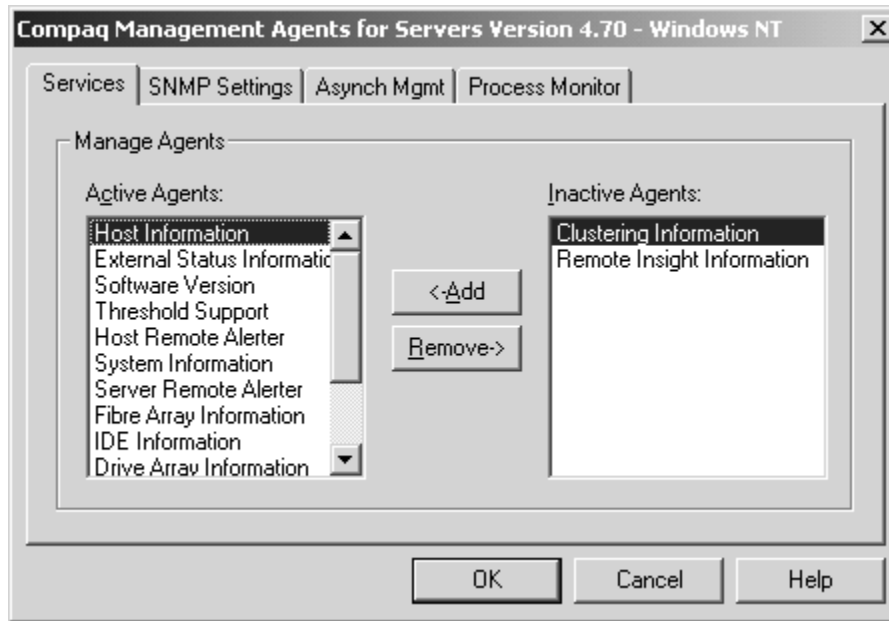


Figure 4-8. Compaq Management Agents window with appropriate items selected for installation

13. Click Next.
14. Click Finish.
15. Click OK to clear information messages.
16. The Compaq Management Agents window reappears. Click Close.
17. Remove the Compaq Management CD and reboot your server.

NOTE: The only component of Compaq Insight Manager that will function on a non-Compaq server is storage monitoring and notification.

Chapter 5

Software

Solution Kit

The solutions kit for the Compaq StorageWorks Enterprise Backup Solution with Legato NetWorker contains five CD-ROMs with the following Legato software.

CD-ROMs

Legato Support for the Compaq Enterprise Backup Solution

- Legato NetWorker Server, Client, and Storage Node software for Microsoft Windows NT (Intel[®]), Compaq Tru64 UNIX, and Sun Solaris

NetWorker Application Modules CD-ROM

- Application Modules for Windows NT
- Application Modules for UNIX

Legato Product Family

- Legato SmartMedia[®] Server and connections for Windows NT
- Legato SmartMedia[®] Server and connections for Sun Solaris

Documentation Suite

- Documentation for all Legato software is in electronic format. You can find information quickly using hyperlinks, and share documents with several users at once.
- Most of the documentation files are provided in Adobe Acrobat® (PDF) or HTML format. Acrobat Reader software for a variety of operating systems is also provided.
- GNU Ghostscript software is provided for printing PDF files from the DYNIX/ptx operating system.

Legato NetWorker® Server, Client, and Storage Node CD-ROM

Legato NetWorker Server, Client, and Storage Node software for Windows NT and Compaq Tru64 UNIX.

Legato NetWorker Client software for Windows 95/98 and UNIX operating systems including Compaq Tru64 UNIX, Solaris™ (SPARC™), HP-UX, IRIX, Compaq Tru64 UNIX, Solaris (X86), SunOS™, SCO UNIX, and UnixWare®

Software

Evaluating the Software

Evaluating Legato NetWorker Server Software Products

You do not need to enter enabler codes to evaluate any of the optional Legato NetWorker software products within the 30-day evaluation period. To use the Legato NetWorker software beyond the 30-day trial evaluation, you must purchase an enabler code for the software you want to use. See the following information for details.

Evaluating Optional Modules, Except Power Edition

1. Make sure that your Legato NetWorker Server software is enabled.
2. Enter the evaluation enabler code for the product you want to evaluate. After you enter the code, you can evaluate the product with your existing Legato NetWorker Server software for 45 days. See the “enabler codes” table for the 45-day enabler code for your NetWorker product.

IMPORTANT: You cannot enter a Power Edition evaluation enabler on your system if you have already entered a Network or WorkGroup Edition base enabler. To evaluate Power Edition in your existing NetWorker environment, you must delete your base enabler.

NOTE: The evaluation period for Hierarchical Storage Management (HSM) for Microsoft Windows NT is 30 days. This product does not have a 45-day evaluation period. Once purchased, a permanent HSM enabler will be issued.

Registering the Software for Permanent Use

To obtain permanent enabler codes, please send your request to the Legato Compaq Business Unit at the following email address:
compaanswers@legato.com.

Or call (408) 530-3296.

45-Day Evaluation Enabler Codes

Table 5-1
NetWorker 45-Day Evaluation Enabler Codes

	NetWorker Product	45-Day Evaluation Enabler Code
NetWorker for UNIX NetWorker for Windows NT server options	Unlimited Slot Jukebox Module	131eea-298758-cb9fa
	Storage Node 1	f57277-ad693a-2917ac
	Storage Node 2	75f2f7-2de9ba-a9902c
	Storage Node 3	f67378-ac6a3b-2e10af
	100 Client Connections	8c8e0e-2b00d1-4023c5
	Archive	e76c69-a87b2c-3f8fbe
	HSM (NetWorker server for Solaris only)	d75c59-9e4b1c-0fbf8e
ClientPak for Macintosh		a2a724-7f5ef0-6e0fe8
ClientPak for NetWare		db585d-862737-5a3ca1
ClientPak for PC Desktops		62e7e4-329eb1-d2d428
ClientPak for UNIX		030085-d0ff5a-2f3149
ClientPak for Windows NT		49cecb-15b598-e86513
BusinesSuite Module for DB2 AIX client		9a811c-4166df-2394e0
BusinesSuite Module for Informix UNIX and Windows NT clients		UNIX client: cc494e-872811-52f996
		Windows NT client: f06b72-bb0c35-76d3ba
BusinesSuite Module for Lotus Notes UNIX and Windows NT clients		UNIX 4.5 or higher client: 253ca7-e4d16a-af506f
		UNIX 4.2.5 client: 3fc4c1-0ebb84-c68f05
		Windows NT client: 253ca7-e4d16a-af506f

continued

Table 5-1
NetWorker 45-Day Evaluation Enabler Codes *continued*

NetWorker Product	45-Day Evaluation Enabler Code
BusinessSuite Module for Microsoft Exchange Server Windows NT client	UNIX client: 272ca9-e1d362-2e486d Windows NT client: 7f9a01-497bca-b2a5c5
BusinessSuite Module for Microsoft SQL Server Windows NT client	UNIX client: 74f1f6-3e80b7-4d7d3e Windows NT client: 203ba2-eadc6b-11516a
BusinessSuite Module for Oracle Windows NT client (1.0)	4cd7ce-09a89f-66dc16
BusinessSuite Module for Oracle UNIX and Windows NT clients	UNIX client: a4a126-6150e7-9edcee Windows NT client: e07b63-a51c25-66c3aa
BusinessSuite Module for SAP/R3 on Oracle UNIX and Windows NT clients	UNIX client: b0b532-7c4cfa-3700fa Windows NT client: 1e05a0-eeda6c-d52164
BusinessSuite Module for Sybase UNIX client	969318-5e62ce-b4b2dc
NetWorker Power Edition Before installing this enabler, read the important note preceding this table.	UNIX server: 40d9c2-09bc8a-b3d90a Windows NT server: f16073-be0d24-a640bb
NetWorker for Frameworks Module UNIX and Windows NT servers	9fa421-435be4-0681e5
GEMS Reporter, 25 connections	UNIX server connections: NBR3CWDF-XVVPKEPT-FS2SPGPC Windows NT server connections: OD2QFHGX-925VL2SC-RVT1LTWD
NetWorker Automated Recovery Manager	UNIX and NT server connections: MYSKOVMJ-XGS7DDYQ-FE1A4K79 5 Automated Recovery Modules: RG44T3SM-25BR7MOM-2HPV39EN

Microsoft Cluster Server

Microsoft Cluster Server (MSCS) EBS for Legato NetWorker incorporates the high availability of Microsoft clustering into the enterprise storage and tape backup SAN architecture. MSCS clusters are backed up and restored using the Legato NetWorker application with SmartMedia.

MSCS ensures that online data is backed up if the primary server hosting the shared-storage fails. Legato NetWorker provides protection by having a client setup for each virtual server on the cluster. SmartMedia leverages the available tape storage devices by allowing all servers in the cluster to dynamically share tape resources in the same library. It is not necessary to provide each cluster member with its own tape storage.

When server failures occur, services remain accessible to end-users and cluster backups continue with little or no operator intervention. Data generated in a cluster is protected by NetWorker's ability to effectively and efficiently perform backups and restores of shared-storage resources served up by MSCS cluster members. The high availability features offered by MSCS clustering and the Compaq Enterprise Backup Solution for Legato NetWorker further enhance the Compaq SAN and StorageWorks technology.

EBS-specific requirements

No special configuration is required for MSCS to function properly with this solution. Refer to www.compaq.com for more detailed information on Microsoft Cluster Server Enterprise Backup Solution for Legato NetWorker.

Legato NetWorker

The media management capability enables organizations to perform all aspects of media management, including library sharing. The NetWorker interface provides complete real-time and historical analysis of all backup and recovery operations.

During installation, the NetWorker Browser is configured to work with a specific NetWorker client. When a user starts an operation using the NetWorker Browser, the browser software sends the appropriate messages to its designated NetWorker client. The software on the NetWorker client then communicates with the server and handles the client side of the operation.

NetWorker client software enables server directed backup, archive, and restore operations on entire folders or individual files that reside on your NetWorker client. This software also allows you to perform user-directed backup, archive, and restore operations on your NetWorker client, without logging into the

NetWorker master server. Once you start a user-directed operation, the NetWorker process runs under the control of the NetWorker master server. You request the service and the NetWorker master server manages the rest, including storage and retrieval of data.

In NetWorker terminology, the system that requires the backup or archive is the NetWorker client. The system that manages the storage and retrieval of the backup data is called the NetWorker master server.

EBS-specific requirements

IMPORTANT: A Legato Engineer must install the Legato NetWorker application if SmartMedia is part of the installation..

The EBS with Legato NetWorker solution requires the Legato NetWorker server application and the Shared Storage Option to be installed on all media servers. One server must be designated as the master server, while the others will be designated as media servers. Please see the Legato NetWorker's documentation for details on the minimum requirements of each server.

Compaq SANworks Secure Path for Windows NT and Solaris

Compaq SANworks Secure Path is a high availability software product that provides continuous data access for the RA8000, ESA12000, MA8000, and EMA12000 storage products configured on Windows NT and Solaris platforms. Redundant hardware, advanced RAID technology, and automated failover capability enhance fault tolerance and availability.

Secure Path effectively eliminates controllers, interconnect hardware, and host bus adapters as single points of failure in the storage system.

Secure Path enables the dual HSG80 controllers in the storage subsystems to operate in the active/active Multiple-Bus failover mode. This failover mode allows each controller to be configured on its own bus and to process I/O independently under normal operation.

The Secure Path software

- detects the failure of I/O operations to complete on a failed path.
- automatically reroutes all traffic to the second path.

Controller and path failover are completed without disruption or data loss.

The Secure Path management utility provides continuous monitoring capability and identifies failed paths and failed-over storage units. To facilitate static load balancing, storage units can be moved between paths using simple drag-and-drop operations.

EBS-specific requirements

No special configuration is required for Secure Path to function properly with this solution.

Compaq SANworks Command Console

SANworks Command Console (SWCC) is a GUI that provides local and remote management of StorageWorks controllers. SWCC is used to monitor, configure, and troubleshoot storage subsystems.

SWCC can be connected to your StorageWorks controller in several ways. When connected, SWCC issues commands and interprets the responses sent by the controller. The GUIs display the logical and physical layout, as well as the status of a selected subsystem.

- SWCC consists of two major components, the Client and the Agent. The Client:
 - Includes the user interface
 - Includes additional services
 - Provides a window into your storage subsystems
- The Agent:
 - Is a host-resident program
 - Is an interface that interprets and transfers data between the Client and the host storage controller

You can download SWCC from www.compaq.com/storageworks.

EBS-specific requirements

No special configuration is required for SWCC to function properly with this solution.

Compaq SANworks Enterprise Volume Manager

Compaq SANworks Enterprise Volume Manager (EVM) is a Web-based application that automates array controller commands to create clones or snapshots of array volumes mounted on NT servers. These clones or snapshots can then be mounted as volumes on alternate NT servers on the same controller. Using EBS for Legato NetWorker, the newly created volumes can be backed up on the alternate server, reducing the performance impact on the original server. EVM can also be used to provide copies of data for operations such as data mining and warehousing, testing, and work distribution. EVM operates on the Compaq line of RAID arrays using the HSG80 array controller.

EBS-specific requirements

No special configuration is required for EVM to function properly with this solution.

Clustering

Compaq TruCluster Available Server

The Compaq TruCluster EBS with Legato NetWorker incorporates the high availability of Tru64 UNIX clustering into the enterprise storage and tape backup SAN architecture. TruClusters are backed up and restored using the Legato NetWorker application.

A TruCluster Available Server environment is an integrated organization of systems and external disk and tape devices connected to shared SCSI buses that provide highly available software and disk data and tape service to client systems.

TruCluster Available Server provides multi-host access to SCSI disks and a generic failover mechanism for disks and applications. In this environment, system administrators can set up services that make disks, tapes, and applications highly available to client systems. TruCluster Available Server provides all of the necessary fail-over software for disks and tapes on a shared SCSI bus. To fail over an application, shell scripts are created that the software executes to stop the application and restart it on another host.

The systems connected to the shared **buys bus** run the services. Each system can run every service and fail over to all of the disks on the shared bus. A

service runs on only one system at a time, and with the proper hardware configuration can automatically be restarted on another system in the event of a device or system failure.

Review the Compaq TruCluster Server Enterprise Backup Solution with Legato NetWorker Tech Note at www.compaq.com for more information.

EBS-specific requirements

No special configuration is required for TruCluster to function properly with this solution.

Chapter 6

Sizing

StorageWorks Backup Sizing Tool

To analyze the performance of the Enterprise Backup Solution (EBS), Compaq designed a test suite to emulate real-world applications. The principles of the five components in the performance section were applied to all components to optimize system performance. By carefully analyzing the interrelationships between these components, Compaq generated formulas to define backup windows and design systems for lights-out operations accurately.

To run successful hands-off, lights-out operations, systems must be sized to fit backup windows and ensure sufficient tape retention. This provides safe, unattended backups with minimal intervention. Full, Incremental, and Differential backup jobs were analyzed and the effects of tape changes and application overhead were applied to clarify the overall operations.

These exhaustive tests have resulted in a new tool, Compaq StorageWorks Backup Sizing Tool. This one-of-a-kind Compaq application quickly analyzes complex environments while predicting requirements and performance expectations. Compaq StorageWorks Backup Sizing Tool can be downloaded from www.compaq.com/storageworks/. An in-depth white paper, "Sizing the Compaq StorageWorks Enterprise Backup Solution," is available at www.compaq.com/support/techpubs/whitepaper/.

Appendix **A**

Troubleshooting

This chapter outlines troubleshooting strategies for problems that can occur during installation, implementation, and administration of the Compaq StorageWorks Enterprise Backup Solution (EBS) with Legato NetWorker. Topics covered include:

- Detailed information about symptoms, causes, and solutions
- System settings
- Troubleshooting issues

Troubleshooting EBS Components

If there is a problem with one or more of the EBS components, the source of the problem can be with the devices, the applications, the connections, and more. The following table lists possible problems, causes, and solutions to more effectively troubleshoot the Enterprise Backup Solution (EBS) with Legato NetWorker.

Table A-1
Troubleshooting EBS Components

Application	Description	Cause	Solution
NetWorker	NetWorker creates a 4mm tape device by default. (This does not occur in NetWorker 6.0).	When installing Legato NetWorker Version 5.5.2 (build 165 or below) a 4mm tape device is created by default on any Compaq server.	Remove the tape device from the device list in the Graphical User Interface (GUI) and rerun the jconfig command.
NetWorker	NetWorker will not cancel label or inventory processes.	The user is unable to cancel a tape labeling or a tape inventory process, once such a process is initiated. Since the default number of tapes to label or inventory is all tapes, users with larger numbers of tapes in their configurations may tie up their NetWorker servers needlessly.	None - only label or inventory those tapes that are required.
NetWorker	NetWorker may label tapes with duplicate barcode labels (will only be seen under Volumes tab in NW GUI).	Under certain conditions, the media database in Legato NetWorker may retain the old barcode labels of the tapes. This can happen, for instance, after completely uninstalling and reinstalling NetWorker, and the media database was not removed properly. Under these conditions, when trying to label new tapes, an error is displayed that a certain volume label already exists. This problem is also in the Legato database with an ID of 2026610.	In the Volume View of the Legato NetWorker Administration GUI on the Legato NetWorker Server, select the volume that has the problem, and select to remove the volume. When given the option, delete both the file and media index entries. Then re-label the problem tape.

continued

Table A-1
Troubleshooting EBS Components *continued*

Application	Description	Cause	Solution
NetWorker	Software is not scalable for more than 8 Storage Nodes.	In certain conditions, when all Storage Nodes and the NetWorker Server are issuing backup jobs, the nsrmmmd processes on the Storage Nodes may crash. These processes are automatically restarted, but may crash later again. This can occupy a large percentage of the server's resources, and may slow down or even stop the server completely.	<p>To reduce the likelihood of the nsrmmmd processes crashing, set the following options in the server setup under the Media Management option:</p> <ul style="list-style-type: none"> ■ nsrmmmd control timeout - 30 ■ nsrmmmd restart interval - 2 ■ nsrmmmd polling interval - 60 <p>Note that the above settings may not completely eliminate the nsrmmmd.</p>
NetWorker/ SmartMedia	LCPs will display a status of disconnected because SCSI access path is incorrect.	The SCSI access path to the library is determined during LCP configuration and saved to a config file which is referenced each time the LCP is started. If other target devices are added, removed, rebooted, etc. and the LCP server is reset, more than likely the SCSI access path to the library will change. Therefore the LCP will not start. (Alpha servers will present themselves as targets to NT servers).	<p>Do not place any other targets on a lower port than the library.</p> <p>Boot up all NT servers prior to any other OS servers.</p>

continued

Table A-1
Troubleshooting EBS Components *continued*

Application	Description	Cause	Solution
NetWorker/ SmartMedia	Auto-mount fails due to method of importing cartridges from SmartMedia into NetWorker. Methods Available: #nsrjb -a -T [Volume] [Volume] #nsrjb -a -T +[# of cartridges] #nsrjb -CHv	Importing cartridges/volumes into NetWorker from SmartMedia, using a method other than this one specified, will cause the auto-mounting of media for scheduled jobs to fail.	Use the following UNIX method for importing cartridges into NetWorker from SmartMedia: # nsrjb -a -T [Volume name] [Volumes name] or use the add.sh script (If SmartMedia has to be reinstalled, after doing so, delete the NetWorker jukebox and recreate it using jb_config).
NetWorker	NetWorker setup crashes.	When installing Legato NetWorker 5.5.2 build 165, NetWorker gives you an error when Windows NT 4.0 displays windows leading up to the setup.exe file window.	Close all windows up to the setup.exe window. Only have the setup.exe window open.
NetWorker	OS sees all devices but NetWorker does not.	"Inquire" with no parameter will only see devices in sequential LUN order. (If LUN 0 is skipped under a target, it will see no devices behind that target).	Run "inquire -l" (the "-l (lower-case L)" parameter will force the inquire command to search all LUNs).
NetWorker/ Library	NetWorker will display duplicate barcode labels on operations screen.		Make sure tape drives are cabled correctly (according to manufacturers guidelines).

continued

Table A-1
Troubleshooting EBS Components *continued*

Application	Description	Cause	Solution
NetWorker/MS CS	NetWorker reports successful backup but resource group files are not fully backed up.	If a resource is relocated during backup, the job will report successful, but will stop the backup of that resource at the time of relocation.	1) Don't relocate resources during a backup. 2) Disable any automatic resource relocation scripts during backups.
NetWorker	NetWorker server is non-responsive to the admin GUI. (This is more likely to surface in a Microsoft cluster.)	When a storage node is shutdown within 20 minutes of the start of the backup job - and it is no 1 in the storage node affinity list, the GUI will be non-responsive for at least twenty minutes.	When you see this condition on a specific server, do not do anything! (The processes are running properly and simply waiting the duration of the timeout period.)
SmartMedia 1.4	Server hangs indefinitely during DCP configuration due to the inquire of SCSI LUNs on the SAN.	SmartMedia will search the entire SAN (all HBAs) for available LUNs; if too numerous, the server will crash.	Add more memory to SmartMedia server.
SmartMedia 1.4	In Solaris 2.7 and NT - the <code>ov_mount</code> cmd fails, and the tape is left in the drive unmounted.	According to the DCP output, the <code>test_unit_ready</code> cmd, times out too quickly, and even though the DCP does later receive the <code>unit_ready</code> signal, the operation errors out.	Patch issued by Legato: LGTPA21879

continued

Table A-1
Troubleshooting EBS Components *continued*

Application	Description	Cause	Solution
SmartMedia 1.4/NT	OS sees devices, SmartMedia does not. When configuring DCPs and/or LCPs, error message received "scsinfo file empty". When configuring DCPs and/or LCPs, error message received "ntsupport is empty".	By default, SmartMedia does not search all LUNs, so if a LUN is skipped, no devices behind it are seen (if 0 is skipped, no other devices will be seen).	In system environment, set SEARCH_ALL_LUNS to 1.
SmartMedia 1.4/NT	Can only configure one DCP at a time; configuring the second DCP will generate the error "300 second timeout, scsinfo file empty".	When SEARCH_ALL_LUNS is enabled, the ntsupport program will take up to five minutes to complete; if a second instance is started within that period, more than likely it will not complete.	After completing the first DCP config, verify that the ntsupport program completes before attempting to configure a second DCP.
NT	Unable to see any SCSI devices that should be available through the LP7/8k HBA.	Previous drivers (before the A- 7 driver) are pre-configured for arbitrated loop from the factory.	Be sure to use the latest driver for HBA or make the following registry entry: "Topology=1" to the end of the data string "DriverParameter" located in: HKEY_LOCAL_MACHIN E\SYSTEM\CurrentCont rolSet\Services\lp6nds 35\Parameters\Device. Then reboot the server.

continued

Table A-1
Troubleshooting EBS Components *continued*

Application	Description	Cause	Solution
NT	Tape devices displayed in wrong order as viewed in the SCSI Adapters applet.	FCTC to switch port configuration is incorrect per solution installation.	Insure that the bridge controlling the robot and first 4 tape drives is plugged in to a lower switch port number than the bridge controlling the last three drives.
NT	Unable to see devices after changing HBA from AL to fabric and switch port light is flashing.	FC switch port in bad state.	Reseat/replace GBIC in switch; reset switch port through http: connection; as a last resort, reset entire switch.
Tru64	Not able to use all drives in the TL895.	OS limitation. Tru64 v4.0f does not recognize target IDs above 7.	Reset SCSI IDs in the TL895 library.
Tru64/FCTC	ASE Tape Service does not failover. NetWorker Tape Service will go into an "Unassigned" status when attempting to failover. (This condition occurs due to a limitation on all current fibre-to-SCSI bridges).	The required ASE Tape Service for NetWorker Server will fail to relocate to an alternate node in the event of the primary node's failure.	(1) The Tape Service must be restarted. (2) Manually relocate the Tape Service.

continued

Table A-1
Troubleshooting EBS Components *continued*

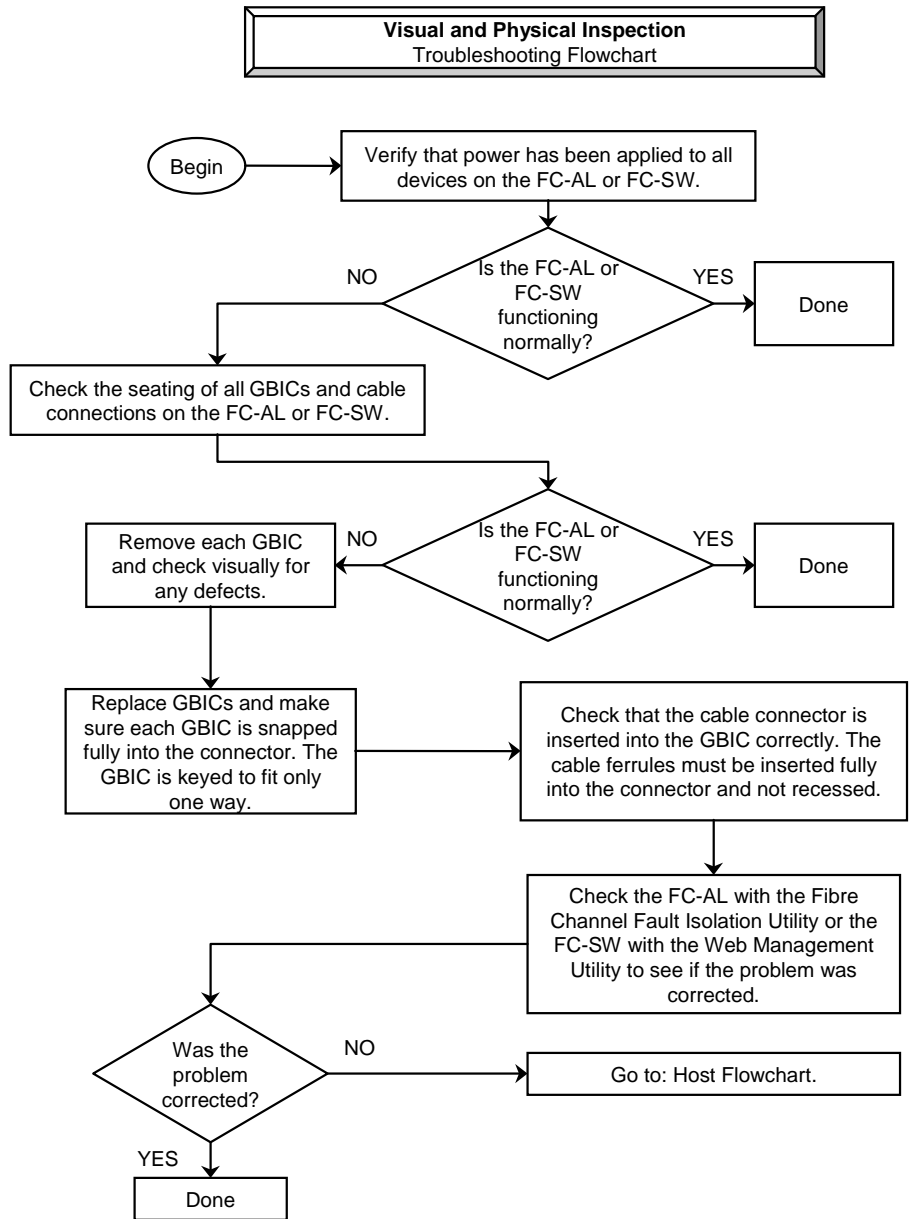
Application	Description	Cause	Solution
Tru64	No device files exist for TL895 tape devices.	OS limitation. Tru64 v4.0f does not automatically create device files for devices with a SCSI ID greater than 7.	Follow the instructions in the Emulex driver information file /etc/emx.info to bind the tape controller WWNs to SCSI Ids from 0 to 7.
Tru64 and Solaris	TL895 tape device files are not in sequential order as ordered from top to bottom in the tape library.	WWN/SCSI ID bindings are incorrect. The tape controller with the robotic arm should have the smallest SCSI ID.	Redo the WWN/SCSI ID bindings in the appropriate order per the driver instructions, remove existing devices (/dev/rmt*h and /dev/nrmt*h for Tru64, /dev/rmi/* and the files they are soft linked to for Solaris), and reboot the server (use the -r option when booting Solaris).
Solaris	TL895 tape device files are not consistent across reboots.	JNI driver limitation. WWNs bind to the first available SCSI ID in the order the devices are encountered.	Follow the instructions in the fca man page to bind tape controller WWNs to specific SCSI Ids.
Solaris	Secure Path 2.1 will not failover to a certain controller and my host and HSG controller are both set up to spec.	It is possible for everything to be set up properly and not respond accordingly if the Compaq FC switches do not have the right firmware on them.	Read the Solaris Secure Path 2.1 Installation Guide. It specifies f/w 1.6d for the Compaq FC Storage Switch. F/w for the SAN switch needs to be 2.0.3a

continued

Table A-1
Troubleshooting EBS Components *continued*

Application	Description	Cause	Solution
Solaris	Disrupting data path may cause panic/core dump on Solaris.	Resetting the bridge while Solaris is up.	Shutdown Solaris, reset bridge, then bring Solaris back up.
SAN Switch 8/16	Unable to run rshd f/w update utility - Returns the following: *** [0] ERROR: Cannot determine port number for the rshd daemon. [0] Winsock error: Error number = 11004	rshd utility does not function properly in dual NIC environment.	Perform switch f/w update from server with single NIC.

Visual and Physical Inspection



Common Troubleshooting Issues

The following table lists common issues and their resolution in order to more effectively troubleshoot the Enterprise Backup Solution (EBS) with Legato NetWorker.

Table A-2
Common Troubleshooting Issues

Issue	Resolution
NetWorker creates a 4mm tape device by default on servers in EBS environments.	To resolve this issue, remove the tape device from the device list in the Graphical User Interface (GUI) and rerun the <code>jbconfig</code> command.
EBS/Legato - NetWorker will not cancel label or inventory processes.	Label or inventory those tapes that are required.
EBS/Legato-Disrupting data path may cause panic/core dump on Solaris.	<p>If there is a need to disrupt the data path, or if it is disrupted accidentally, Compaq recommends the following best practices:</p> <ol style="list-style-type: none"> 1. Before rebooting or power cycling the Fibre Channel Tape Controller, ensure that Legato NetWorker has completed all current activity (backups, restores, or other jobs). 2. If cables are pulled, you may re-establish the connection, but monitor Legato to see if it continues tasks. If so then no action is required. If Legato NetWorker has timed-out operations and disabled the device, then ensure that all other jobs that NetWorker is performing are allowed to finish before attempting to re-enable the device.

continued

Table A-2
Common Troubleshooting Issues *continued*

Issue	Resolution
EBS/Legato - NetWorker may label tapes with duplicate barcode labels.	In the Volume View of the Legato NetWorker Administration GUI on the Legato NetWorker Server, select the volume that has the problem, and select to remove the volume. When given the option, delete both the file and media index entries. Then re-label the problem tape.
EBS/Legato - Software is not scalable for more than 8 Storage Nodes.	<p>To reduce the likelihood of the nsrmmd processes crashing, set the following options in the server setup under the Media Management option:</p> <ul style="list-style-type: none"> ■ nsrmmd control timeout - 30 ■ nsrmmd restart interval - 2 ■ nsrmmd polling interval - 60 <p>Note that the above settings may not completely eliminate the nsrmmd processes crashing; they will, however, reduce their likelihood of doing so.</p>
EBS/Legato, there is no Storage Node option available in the NT GUI.	Setup storage node by selecting the "client" option in NetWorker's setup GUI.

continued

Table A-2
Common Troubleshooting Issues *continued*

Issue	Resolution
EBS/Legato - NetWorker will not install with NT path windows open.	Close all windows up to the setup.exe window. Only have the setup.exe window open.
EBS/Legato - NT crashes when running jbconfig in a Securepath environment.	<p>The user has two options:</p> <ul style="list-style-type: none"> ■ Install Legato Networker and run the jbconfig command first, before installing the SecurePath environment ■ Disconnect the RAID array hardware used in the SecurePath environment from the Storage Area Network, reboot the server and then run the jbconfig command. After completing the command, reconnect the RAID array hardware. The server will need to be rebooted again.
EBS - Legato NetWorker NT GUI will not let user setup autochanger.	The user must run the jbconfig command from the command line to setup the library. The library cannot be setup via the GUI.
EBS - Reservation release of Tape Device on Sun Solaris 2.6 Server where backup application may sometimes return an erroneous busy status.	Apply Sun Solaris patch number 105847-06.
In Legato - Library portal operation is unsuccessful with Legato SmartMedia.	Uninstall the SCSI CAM Optical Disk Driver.

continued

Table A-2
Common Troubleshooting Issues *continued*

Issue	Resolution
<p>BS/Legato - ASE Tape Service does not failover.</p>	<p>(1) The Tape Service must be restarted.</p> <p>a) Kill or suspend any other active backup or restore jobs that are running on the same tape libraries that are used by the cluster. Power down all FCTCs or FCTC-IIs connected to the tape libraries used by the cluster. Power up all FCTCs or FCTC-IIs connected to the tape libraries used by the cluster. Restart the tape service on the new member by running the ASE asemgr utility.</p> <p>Note: To make selections from the asemgr utility menus, type the key or keys to the left of the desired menu option and press Enter.</p> <p>b) Select Managing ASE Services from the ASE main menu. Select Set a service off line from the Managing ASE Services menu. Select [Tape Service] from the Set a service off line menu. A message stating that the Tape Service is successfully offline will be displayed.</p> <p>c) Select Set a service on line from the Managing ASE Services menu. Select [Tape Service] from the Set a service on line menu. Answer yes to the Override the Automatic Service Placement (ASP) Policy message. Select a member to run the service. Exit out of the utility.</p> <p>(2) Manual Relocation of the Tape Service</p> <p>a) Ensure no backup or restore jobs are being run on the tape drives used by the cluster. Relocate the ASE tape service on the primary node running the ASE asemgr utility.</p> <p>Note: To make selections from the asemgr utility menus, type the key or keys to the left of the desired menu option and press Enter.</p> <p>c) Select Managing ASE Services from the ASE Main Menu. Select Relocate a Service from the Managing ASE Services menu. Select the tape service to be relocated. Select the member to run the tape service previously selected.</p>

Index

A

- adapter, Fiber Channel host
 - bus 2-40
- adding
 - data unit, TL891 2-24
 - expansion unit, TL891 2-24
- addressing
 - indexed 2-32, 2-33
 - progressive persistent device discovery 2-32
- agents 4-13
- AIX 5-2
- Application Management Console (AMC) 2-33
- attaching, RMIC to TL891
 - expansion unit 2-24
- automated
 - backup and restore library 2-7
 - library unit 2-13
 - tape libraries 2-6

B

- backup
 - high-volume, TL891 2-19
 - sizing tool 6-1
 - solution 1-1
- backup formula
 - file compression ratio 3-5
- base rates, optimal 3-5

- base unit, TL891 2-19
- bus number priority 2-32
- BUS:TARGET:LUN 2-33
- BusinessSuite 5-4

C

- cable
 - configuration, RMIC 2-28
 - Fibre Channel 2-44
 - SCSI 2-45
 - SCSI interface 2-11, 2-17, 2-23
- CD-ROM
 - Documentation Suite 5-2
 - Legato NetWorker 5-1
 - Legato NetWorker Server, Client, and Storage Node 5-2
 - NetWorker Application Modules 5-1
- changing
 - SCSI ID setting,
 - ESL9326D 2-8
 - SCSI ID setting, TL891 2-21
 - SCSI ID setting, TL895 2-14
- CIM
 - description 4-8
 - installing 4-8, 4-11
 - integration 4-8

- client
 - server architecture 1-2
 - storage node and server 1-2
- ClientPak 5-4
- clustered pair 3-4
- command console
 - components 4-6
 - defined 4-6
 - fabric window, illustrated 4-7
 - initial screen, illustrated 4-6
- communication, TC/IP 2-2
- Compaq
 - Insight Manager 4-3
 - solutions kit 5-1
 - Tru64 UNIX 5-1, 5-2
- Compaq authorized reseller x
- Compaq Insight Manager 4-8. *See* CIM
- Compaq Management CD 4-11
- Compaq website x
- compaqanswers@legato.com 5-3
- components
 - ESL9326D tape library 2-1
 - listed 2-1
- components, of backup architecture 1-2
- configuration
 - clustered EBS 3-4
 - illustrated 3-4
 - ESL9326D, illustrated 2-7
 - maximum Windows NT 4.0 and/or Windows 2000 server, illustrated 3-3
 - maximum Windows NT or Windows 2000 server 3-2
 - Modular Data Router's default 2-32
 - possible TL891 MiniLibrary, illustrated 2-20
 - RAID Array 4100 hardware 1-4
 - SCSI cabling, TL891 2-26
 - stack environment, TL891 2-26
 - TL891 minilibrary data unit. 2-19
 - TL891 minilibrary expansion unit. 2-19
 - TL895 tape library 2-17
 - illustrated 2-13
 - typical Windows NT 4.0 or Windows 2000, illustrated 3-2
 - typical Windows NT or Windows 2000 3-1
- connecting
 - ESL9326D tape library 2-12
 - Modular Data Router, illustrated 2-31
 - robotics motor to TL891 expansion unit 2-27
 - TL891 data unit 2-26
 - TL895 tape library 2-17
- connection
 - ESL9326D tape library 2-11
 - ESL9326D to FCTC 2-11
 - FCTC, SCSI to library, illustrated 2-34, 2-36
 - Fibre Channel tape controller 2-35
 - Fibre Channel tape controller-II 2-33
 - Modular Data Router 2-30
 - TL891 minilibrary, illustrated, 2-27
 - TL891 to FCTC 2-23
 - TL891, illustrated 2-23
 - TL895 DLT library 2-17
 - TL895 tape library 2-17
 - TL895 to FCTC 2-17
 - TL895 to the FCTCs, illustrated 2-18
- control panel, TL891 2-21
- controllers
 - tape
 - Fibre Channel Tape Controller 2-1
 - Fibre Channel Tape Controller II 2-1
 - Modular Data Router 2-1

D

- daisy chaining TL891,
 - illustrated 2-23
- daisy-chain SCSI cable
 - connection 2-26
- data unit, TL891 2-1, 2-24
- default
 - configuration, TL891 2-24
 - drive cable, TL895 2-16
 - screen, TL891 2-21
- default drive cable/library
 - configuration 2-9, 2-10
- Dell PowerEdge 2-4
- device listing 4-4
- devices
 - stack environment,
 - TL891 2-25
 - TL891 base unit 2-19
 - TL891 minilibrary data
 - unit 2-19
 - TL891 minilibrary expansion
 - unit 2-19
- direct network application support
 - (NAS) 2-7
- disk signature 3-4
- disk space
 - requirements 4-8
- display
 - requirements 4-8
- DLT
 - drive canister 2-7
 - drive requirements 2-29
 - drives 2-13
 - libraries 2-6
 - library, TL891 2-1
- DLT MiniLibrary 2-26
- Documentation Suite CD-ROM 5-2
- drive 2-16
 - per bus 2-30
- drive cable/library
 - configuration 2-9, 2-10

E

- EBS
 - operating system
 - requirements 2-2
- electric shock icon viii
- electric shock symbol viii
- email address 5-3
- EMX_INFO* 2-40
- enabler codes 5-3
- Enterprise Backup Solution 1-1
- Enterprise Storage Array
 - 12000 1-2
- environment
 - 24 x 7 2-2
 - stack 2-24
- ESL9000 platform 2-7
- ESL9326D tape library
 - connecting 2-11
 - SCSI ID setting for
 - FCTC 2-10
 - SCSI ID setting for FCTC
 - II 2-9
- evaluating
 - Legato Networker server
 - software products 5-3
 - optional modules 5-3
 - software 5-3
- exclamation point icon viii
- expansion unit 2-19, 2-26
- expansion unit, TL891 2-1, 2-24
- expansion, online drive 2-7

F

- fabric
 - design 2-37, 2-38
 - support 2-4, 2-40
- FCP LUN 2-33
- feed source
 - formulas 3-5
 - speed base rates 3-5
- fibre
 - Modular Data Router,
 - connecting 2-30

- Fibre Channel 1-1
 - cables 1-4
 - host bus adapter 2-39
 - Host Controller 1-4
 - host to SCSI target
 - configuration 2-32
 - Switch 1-4
 - tape controller 1-5, 2-35
 - tape controller II 1-4, 2-33
- Fibre Channel fabrics 4-7
- Fibre Channel initiator 2-32
- Fibre Channel LUN value 2-32
- Fibre Channel switch 8/16 2-37, 2-38
- Fibre Channel switches 2-2
- Fibre Channel Tape Controller 2-1
- Fibre Channel Tape Controller II 2-1
- Fibre Channel to SCSI addressing methods 2-32
- Field Replaceable Unit (FRU) 4-4
- file block size
 - data transfer 3-5
- file compression ratio
 - backup formula 3-5
- formula, file compression ratio, backup 3-5
- Foundation Agents 4-13
- F-Port 2-4, 2-40

G

- GBIC 1-4
 - illustrated 2-43
 - longwave 2-44
 - shortwave 2-43
- GBIC-LW, installing 2-44
- GBIC-SW, installing 2-43
- GEMS Reporter 5-5
- Gigabit Interface Converter 1-4
- gigabit interface converters *See*
 - GBIC 2-43

H

- hard drive

- requirements 4-8
- hardware RAID 2-7
- hazard symbol viii
- hazardous conditions symbols on equipment viii
- hazardous energy circuits
 - symbol viii
- HBA
 - EBS component 2-2
 - installing 2-39
- help
 - additional sources ix
 - Compaq authorized resellers, telephone numbers x
 - Compaq website x
 - technical support telephone numbers ix
- heterogeneous connection of servers 1-1
- Hierarchical Storage Management 5-3
- high speed connection 2-40
- hive/files 3-4
- Host Bus Adaptor *See* HBA
- hot-swappable, DLT drive canister 2-7
- HP Netserver 2-4
- HP-UX 5-2
- HSM enabler 5-3
- <http://www.compaq.com> x
- <http://www.microsoft.com> 4-8
- Hypertem 2-33

I

- IBM Netfinity 2-4
- icons on equipment viii
- Important Safety Information* document vi, ix
- indexed addressing 2-32, 2-33
- Insight Manager *See* CIM
- Insight Manager, Compaq 4-3
- installation
 - RAID Array 4100
 - hardware 1-4
 - installation sequence 1-4

installing
 CIM 4-8, 4-11
 CIM agents 4-12
 Compaq Insight
 Manager 4-11
 Compaq software 4-8
 components 2-1
 ESL9326D tape library 2-8
 GBIC-LW 2-44
 GBIC-SW 2-43
 HBA 2-39
 PCI Fibre Channel host bus
 adapter, third party server
 using Novell
 NetWare 2-41
 requirements 4-8
 Internet Explorer 4-8
 internet protocol address 2-37,
 2-38
 IP address 2-37, 2-38
 IRIX 5-2

J

jukeboxes 4-4

K

KGPSA-BC 2-40

L

labels on equipment viii
 Legato
 Compaq Business Unit 5-3
 NetWorker 1-2
 NetWorker server 5-7
 software 2-5, 5-1
 storage nodes 5-7
 libraries
 configuration, TL895 2-16
 tape 1-2
 tape, listed 2-1
 virtual, TL891 minilibrary
 expansion unit 2-19
 lights out operations 6-1

longwave GBIC 2-44
 LUN value, Fibre Channel 2-32

M

manage data 1-2
 management
 hierarchical storage,
 TL891 2-19
 tool, Compaq Insight
 Manager 4-3
 management agents
 alerting capabilities 4-3
 monitored subsystems 4-3
 map SCSI targets 2-32
 master 2-28
 master setting, changing to slave,
 TL891 2-24
 mechanism
 pass-through, TL891 2-19
 robotic, TL891 2-24
 memory
 requirements 4-8
 Microsoft
 Internet Explorer 4-8
 Systems Management Server
 Launch Support 4-8
 web site 4-8
 Windows NT 4-8
 Microsoft Windows 2000 2-3
 Microsoft Windows 95/98 5-2
 MiniLibrary 2-26
 MiniLibrary data unit 2-19
 minilibrary system
 TL891 2-19
 TL891 data unit 2-24
 TL891 expansion unit 2-24
 Modular Data Router 2-1, 2-30
 connecting, illustrated 2-31
 default configuration 2-32
 GBIC module
 installation 2-31
 modular storage controller 2-30
 module
 GBIC-LW, installing 2-44
 GBIC-SW, installing 2-43

- monitor
 - requirements 4-8
- multi-module configuration 2-19
- multi-stack unit
 - connecting, TL891 2-25
 - creating, TL891 2-25
- multi-vendor support 2-40

N

- N hot-plug power supplies 2-7
- network application support (NAS) 2-7
- Network server 1-5
- NetWorker 5-4, 5-5, 5-7
 - Application Modules
 - CD-ROM 5-1
 - client software 5-2
 - Server, Client, and Storage Node CD-ROM 5-2
- No Trouble Found (NTF) tests 4-3
- Novell NetWare 2-41

O

- online drive expansion 2-7
- operating systems 5-2
- operations, lights-out 6-1
- option kits
 - multi-mode Fibre Channel cable 2-44
- options
 - stacking, TL891 2-26

P

- pass-through mechanism 2-19
 - TL891 minilibrary data unit 2-19
 - TL891 minilibrary expansion unit 2-19
- PCI backplane 2-7
- PCI Fibre Channel host bus adapter 2-39, 2-40
- PCI Fibre Channel Host Bus Adapter

- using NovellNetWare 2-41
- permanent enabler codes 5-3
- permanent HSM enabler 5-3
- power on sequence 1-5
- powering
 - TL891 minilibrary system 2-28
- priority
 - bus number 2-32
 - target ID 2-32
- procedures
 - installing TL891 MiniLibrary 2-22
- progressive persistent device
 - discovery addressing 2-32, 2-33
- ProLiant
 - Legato NetWorker-compatible servers 2-3
 - server 2-2, 2-40

Q

- quorum resource 3-4

R

- RA4000/RA4100 Based SAN Solution
 - installation steps 1-4
- rackmount 2-24
- RAID Array 4100 hardware
 - configuring 1-4
 - installing 1-4
- RAID Array 8000 1-2
- redundant hot-plug cooling fans 2-7
- registry, cluster 3-4
- remote management interface cables 2-27
- requirements
 - disk space 4-8
 - display 4-8
 - DLT drives 2-29
 - hard drive 4-8
 - installation 4-8

- list of servers 2-3
- memory 4-8
- monitor 4-8
- operating system for EBS 2-2
- tape library minimum
 - revision 2-6
- RJ-45 receptacle symbol viii
- RMIC cabling rules 2-27
- RMIC, attaching 2-24
- robot, and drives configuration,
 - TL895 2-16
- robotic mechanism interface cable
 - See RMIC 2-24

S

- safety information vi, ix
- SAN 2-37
- SAN switch 2-2
- SAN switch 8/16 1-5, 2-38
- SCO UNIX 5-2
- screwdriver icon viii
- SCSI
 - bus 2-30
 - cables 1-4, 2-45
 - cabling configurations,
 - TL891 2-26
 - differential interface 2-45
 - IDs, changing, ESL9326D 2-8
 - IDs, changing, TL891 2-21
 - IDs, changing, TL895 2-14
 - interface cable 2-11, 2-17,
 - 2-23
- SCSI cable connection to the
 - TL891 expansion unit 2-26
- SCSI ID setting
 - for FCTC II with ESL9326D
 - tape library 2-9
 - for FCTC II with TL895 tape
 - library 2-16
 - for FCTC with ESL9326D tape
 - library 2-10
 - for FCTC with TL895 tape
 - library 2-16
- SCSI IDs, tape libraries 2-29
- SCSI targets, map 2-32

- secondary storage 2-13
- self-initialization 1-5
- serial
 - cable, TL891 2-25
 - number to upgrade TL891
 - minilibrary. 2-20
- server 1-2
 - list 2-3
 - ProLiant 2-2
 - third party X86 2-1
- service pack 2-2
- services
 - SNMP 4-8, 4-9
- setting
 - default configuration,
 - TL891 2-24
 - SCSI IDs
 - ESL9326D 2-8
 - TL891 2-21
 - TL895 2-14
- shortwave GBIC 2-43
- sizing tool 6-1
- slave setting
 - changing to, TL891 2-24
 - stack environment,
 - TL891 2-24
- slaves 2-28
- SNMP service 4-8, 4-9
- software 5-1, 5-2
 - Compaq, installing 4-8
 - storage utility 4-1
- Solaris 5-2
- SPARC 5-2
- stack
 - configurations,
 - illustrated 2-28
 - environment
 - TL891 devices 2-25
 - options
 - TL891y 2-26
- storage
 - subsystems 2-37, 2-38
- Storage Agents 4-13
- storage area network (SAN) 2-38
- storage controller 2-30

- StorageWorks
 - Command Console 2-37, 2-38
- Sun Solaris 1-2
- SunOS 5-2
- support pack 2-2
- SWCC 2-37, 2-38
- switch
 - SAN 2-2
 - SAN 16 2-2
 - SAN 8 2-2
 - SAN EL 2-2
- switch fabric design 2-37, 2-38
- symbols in text vii
- symbols on equipment viii
- Systems Management Server
 - Launch Support 4-8

T

- table
 - common troubleshooting
 - issues A-11
 - EBS components,
 - troubleshooting A-2
 - ESL9326D tape library
 - connections 2-12
 - ESL9326D tape library SCSI
 - ID settings for FCTC
 - II 2-9
 - operating system
 - requirements 2-2
 - primary storage controller
 - types/speeds 3-5
 - ProLiant Servers 2-3
 - tape library minimum revision
 - requirements 2-6
 - tape library SCSI ID setting for
 - FCTC 2-10
 - TL891 stack options 2-26
 - TL895 tape library
 - connections 2-17
 - TL895 tape library SCSI ID
 - settings for FCTC 2-16
 - TL895 tape library SCSI ID
 - settings for FCTC II 2-16

- typical file compression
 - ratios 3-6
- tape
 - controllers
 - Fibre Channel Tape
 - Controller 2-1
 - Fibre Channel Tape Controller
 - II 2-1
 - Modular Data Router 2-1
 - controllers, listed 2-1
 - libraries, ESL9326D 2-1
 - libraries, listed 2-1
 - library
 - ESL9326D 2-7
 - SCSI IDs 2-29
 - tape automation 4-3
 - Tape Automation Qualifier 4-5
 - tape cartridges in library 1-5
 - tape drive solution 3-6
 - tape library 1-5
 - tape storage library 1-4
 - Tape Storage Management Console
 - (TSMC) 4-3
 - target ID priority 2-32
 - TC/IP communication 2-2, 2-3
 - TCP/IP 4-8
 - technical support x
 - telephone numbers x
 - telephone symbol viii
 - text conventions vii
 - third party X86 server 2-3, 2-40
 - three-tier architecture 1-2
 - TL891
 - attaching RMIC 2-24
 - base unit
 - drives supported 2-19
 - height 2-19
 - storage capacity 2-19
 - components 2-19
 - data unit 2-1, 2-24
 - data unit, adding 2-24
 - expansion unit 2-1, 2-24
 - expansion unit, adding 2-24
 - master setting 2-24
 - minilibrary
 - control panel 2-21

- MiniLibrary 2-1
- minilibrary data unit
 - configuration 2-19
 - modules supported 2-19
 - storage capacity 2-19
- minilibrary expansion unit
 - configuration 2-19
 - modules supported 2-19
 - storage capacity 2-19
- minilibrary system,
 - powering 2-28
- slave setting 2-24
- upgrade requirements 2-20
- TL891 MiniLibrary 2-20, 2-26
- TL895 tape library 2-1
 - connecting 2-17
 - SCSI ID setting for
 - FCTC 2-16
 - SCSI ID setting for FCTC
 - II 2-16
 - upgrade requirements 2-14
- tools
 - command console 4-6
 - Compaq management, for
 - Backup Exec 4-1
 - Compaq StorageWorks Backup
 - Sizing 6-1
- topology parameter 2-4, 2-40
- troubleshooting
 - changing defaults A-11
 - common A-11
 - disrupting data paths A-11
 - duplicate barcode labels A-12
 - EBS components A-2
 - erroneous busy status A-13
 - failover problems A-14
 - jbconfig command A-13
 - label/inventory process
 - problems A-11
 - no storage node option in NT
 - GUI A-12
 - NT GUI autochanger A-13
 - NT installation
 - problems A-13
 - software scaling A-12
 - strategies A-1

- unsuccessful library portal
 - operation A-13
- visual and physical inspection
 - chart A-10

U

- unit
 - base, TL891 2-19
 - minilibrary data, TL891 2-19
 - minilibrary expansion,
 - TL891 2-19
 - multi-stack, creating,
 - TL891 2-25
- UnixWare 5-2
- upgrade
 - kit, TL891 minilibrary. 2-20
- user diagnostics
 - device information 4-2
 - firmware upgrades 4-2
 - functional tests 4-2

V

- very high-density cable
 - interconnect 2-30
- VHDCI connectors 2-30
- virtual libraries, TL891 minilibrary
 - expansion unit. 2-19
- virtual library 2-19

W

- warnings
 - electric shock viii
 - heavy weight ix
 - hot surfaces viii
 - multiple sources of power ix
 - network interface
 - connection viii
 - rack stability ix
 - RJ-45 receptacle viii
- Web Agent 4-13
- Windows
 - NT 5-1, 5-2
- Windows NT 4-8

www.compaq.com x
www.microsoft.com 4-8

X
X86 server 2-1