

Compaq StorageWorks

ESL9000 Series Tape Library

Reference Guide

Second Edition (June 2001)

Part Number: 243491-002

Compaq Computer Corporation

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Compaq StorageWorks ESL9000 Series Tape Library Reference Guide
Second Edition (June 2001)
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About This Guide

This guide is designed to be used as step-by-step instructions for installation and as a reference for operation, troubleshooting, and future upgrades.

Related Documents

Document Title	Part Number
Compaq StorageWorks™ ESL9000 Series Tape Library Diagnostic Software Guide	243493-002
Compaq StorageWorks™ ESL9000 Series Tape Library Pre-Installation Site Survey	243494-002
Compaq StorageWorks™ ESL9000 Series Tape Library Unpacking and Relocating Guide	243490-002
Compaq StorageWorks™ ESL9000 Series Pass-Through Mechanism (PTM) Installation Guide	243492-002

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 upper case. NOTE: UNIX commands are case sensitive and will not 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 enter information, type the information and then press the Enter key.

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings:



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

These icons may be located on equipment in areas where hazardous conditions may exist.



Any surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

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



Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection (NIC).

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



Any surface or area of the equipment marked with these symbols 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.



Power supplies or systems marked with these symbols indicate the equipment is supplied by multiple sources of power.

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



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

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

Cabinet 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 cabinet rests on the leveling jacks.
 - The stabilizing feet are attached to the cabinet if it is a single cabinet installations.
 - The cabinets are coupled together in multiple cabinet installations.
 - Only one component is extended at a time. A cabinet 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-OKCOMPAQ. For continuous quality improvement, calls may be monitored or recorded. This service is available 24 hours a day, 7 days a week.

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for world wide Technical Support Centers are listed on the Compaq website. Visit the Compaq website at 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. You can visit the Compaq website at 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, you can visit the Compaq website for locations and telephone numbers.

Chapter 1

Library Description

This chapter describes the *Compaq StorageWorks™ ESL9000 Series Tape Library* and its components. Sections include:

- Library models
- Features and benefits
- Library components:
 - Cabinet
 - Control panel
 - Intelligrip™ Cartridge Handling Mechanism (CHM)/Gripper
 - Tape drives
 - Load port

Library Models

The Compaq StorageWorks ESL9000 Series Tape Library is an automated storage and retrieval library. It contains up to 8 tape drives and 198 cartridges for the ESL9198 Series and up to 16 tape drives and 326 cartridges for the ESL9326 Series.

When fully populated with DLT tape drives and cartridges, the ESL9198 has a maximum storage capacity of over 7.9 TB (7,920 GB), based on 198 cartridges at 40 GB each. The ESL9326, when fully populated with DLT tape drives tape cartridges, has a native capacity of 13.04 TB (13,040 GB), based on 326 cartridges at 40 GB each. If compression is enabled, the maximum storage capacity of the library is increased to over 15.8 TB (15,840 GB) for the ESL9198 and 26.08 TB (26,080 GB @ 2:1 compression) for the ESL9326.

When fully populated with SDLT tape drives and cartridges, the ESL9198 has a maximum storage capacity of over 21.8 TB (21,800 GB), based on 198 cartridges at 110 GB each. The ESL9326, when fully populated with SDLT tape drives tape cartridges, has a native capacity of 35.9 TB (35,860 GB), based on 326 cartridges at 110 GB each. If compression is enabled, the maximum storage capacity of the library is increased to over 43.6 TB (43,600 GB) for the ESL9198 and 71.8 TB (71,720 GB @ 2:1 compression) for the ESL9326.

The following ESL9000 Series library models support a wide range of storage and performance requirements (see Table 1-1 and Table 1-2). Model numbers are created by combining the number of drives and the number of storage bins in the library.

Table 1-1 Library Model Numbers for ESL9198 Series

Model Number	Model Name	Displayed Name	Product ID	Number of Drives	Storage Bins	Drive Type
6318280 (def)	ESL9198DLX	ESL9198	ESL9000 SERIES	8	198	DLT8000
6318281	ESL9198DLX	ESL9198	P2000 6318281	8	198	DLT8000
6318285 (def)	ESL9198SL	ESL9198	ESL9000 SERIES	8	198	SDLT
6318286	ESL9198SL	ESL9198	P2000 6318286	8	198	SDLT

Table 1-2 Library Model Numbers for ESL9326 Series

Model Number	Model Name	Displayed Name	Product ID	Number of Drives	Storage Bins	Drive Type
6310080 (def)	ESL9326D	ESL9326	ESL9000 SERIES	16	326	DLT7000
6310081	ESL9326D	ESL9326	ESL9000 SERIES	16	170	DLT7000
6310082	ESL9326D	ESL9326	P3000 6310082	16	326	DLT7000
6310085 (def)	ESL9326DX	ESL9326	ESL9000 SERIES	16	326	DLT8000 (HVD)

Table 1-3 Model Numbers for ESL9326 Series Libraries with Mixed Media Capability

Model Number	Model Name	Displayed Name	Product ID	Number of Drives	Storage Bins	Drive Type
6313080 (def)	ESL9326SL	ESL9326	ESL9000 SERIES	16	326	SDLT
6313081	ESL9326SL	ESL9326	ESL9000 SERIES	16	170	SDLT
6313082	ESL9326SL	ESL9326	P3000 6313082	16	326	SDLT

NOTE: Model 6310083 is required for older ESL9326 libraries not having the mixed media gripper (not LTO capable) but will be upgraded to SDLT.

Features and Benefits

The library provides the following features and benefits:

- High-capacity, high-performance data storage and retrieval.
- Expandable library configurations:
 - Up to five ESL9000 Series libraries can be joined together into one multi-unit library system. Tape cartridges can be shared between libraries using Pass Through Mechanisms (PTMs).
- Access to future expansion and technology upgrades through Prism™ architecture:
 - Prism architecture employs standard PCI bus technology to provide greater upgrade flexibility at reduced costs.
 - This technology ensures compatibility with future on-board technologies such as tape drive controllers, high-speed host and network interfaces, as well as server and tape RAID.
- Reliable, versatile 120-240 volt AC auto-switching power supplies.
- Hot-pluggable, redundant DC power supplies ensure library operations against power supply failure.
- Advanced cooling system to prevent failures from overheating.
- On-line cartridge exchanges: load port with two removable 6-cartridge magazines for easy insertion of cartridges without interrupting library operations.
- Easy serviceability and manageability:
 - Hot-pluggable drives, DC power supplies, and fans enable field service engineers to make repairs without taking the library off-line.
 - Easy access and replacement of critical components.
 - A control panel provides a wide range of configuration and service-related functions.

Library Components

The library consists of the following major components:

- Cabinet
- Control panel
- Intelligrip CHM/Gripper
- DLT tape drives
- SDLT tape drives
- Load port
- Optional PTM

Cabinet

The cabinet houses all library components including:

- Cartridge handling mechanism
- Storage bins
- Control electronics
- Power supply and distribution equipment
- Fans
- Tape drives

You can access these components through the front and back doors of the library cabinet.

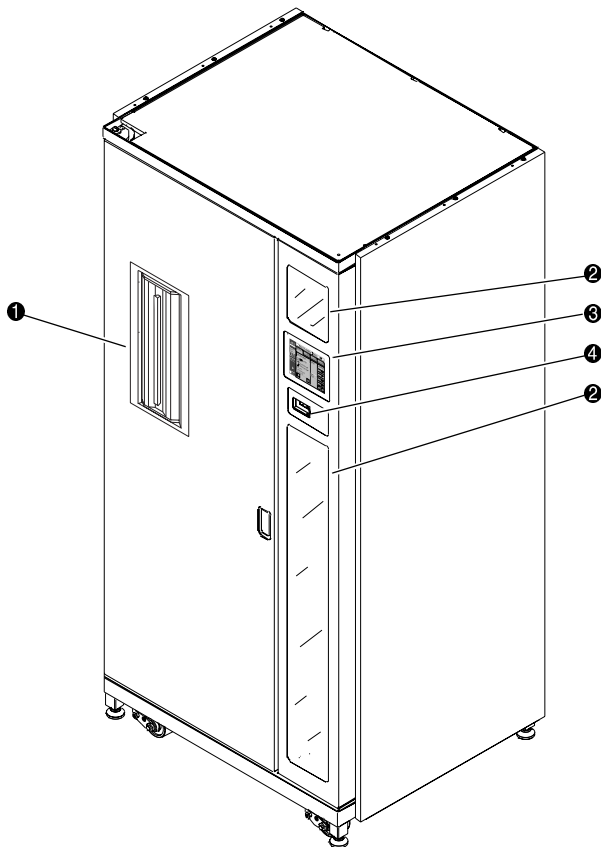
Cabinet (Front)

The front of the library cabinet provides access to the following (see Figure 1-1 and Figure 1-2):

- The front door(s) provide easy access to the CHM and the storage array.
- The viewing windows makes it possible to visually monitor library operations.
- A control panel on the right side of the cabinet lets you monitor and control library operations.
- A load port with two 6-cartridge removable load pack magazines provides easy insertion of additional tape cartridges while the library is in operation.

1-6 Compaq StorageWorks ESL9000 Series Tape Library Reference Guide

- The power switch for the library is located behind a sliding panel on the front door for the ESL9198 and on the right front door on the ESL9326.

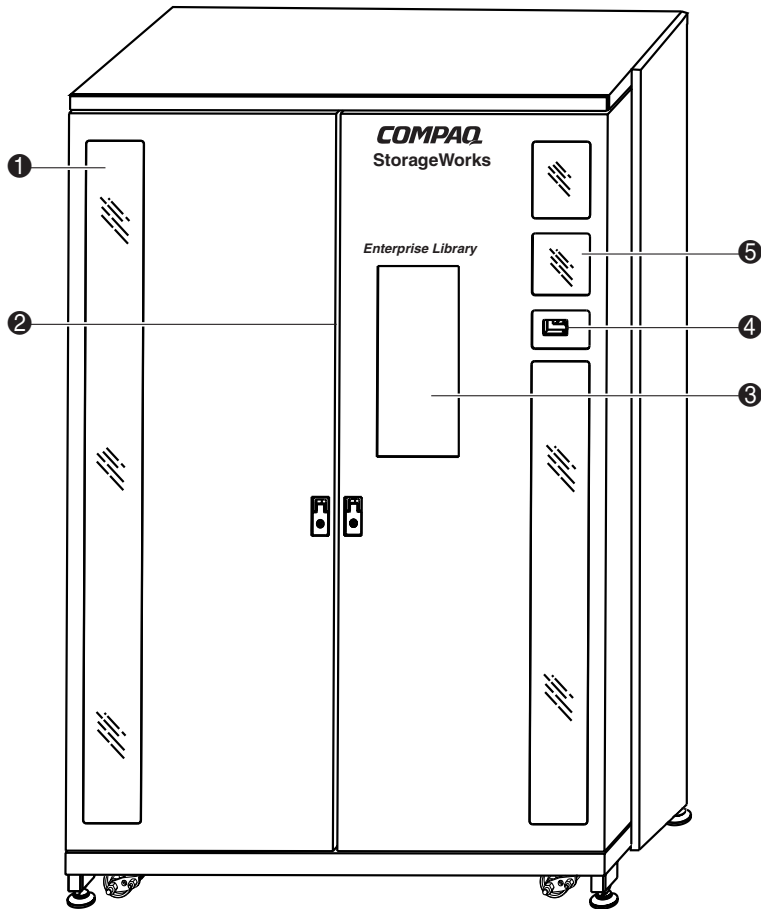


❶ Load port with two
6-cartridge magazines

❷ Viewing windows
❸ Control panel touch screen

❹ Power switch

Figure 1-1. Cabinet ESL9198 (front panel)



1 Viewing window

2 Dual doors

3 Load port with two
6-cartridges magazines

4 Power switch

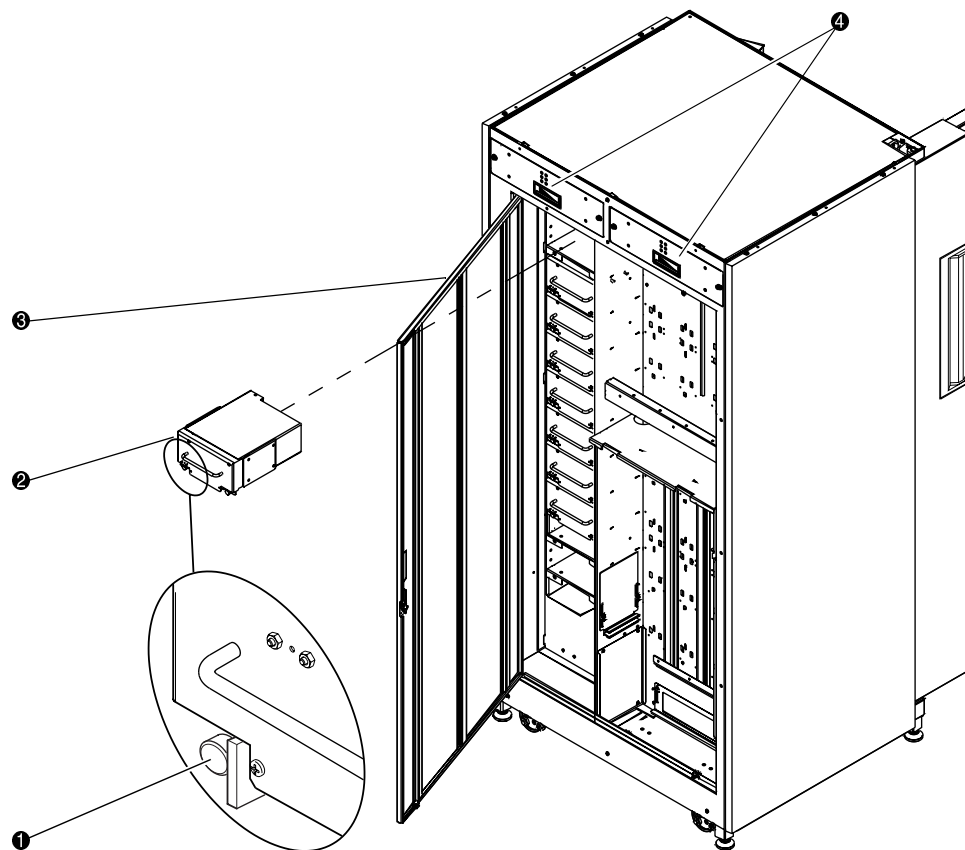
5 Touch screen control panel

Figure 1-2. Cabinet ESL9326 (front panel)

Cabinet (Rear)

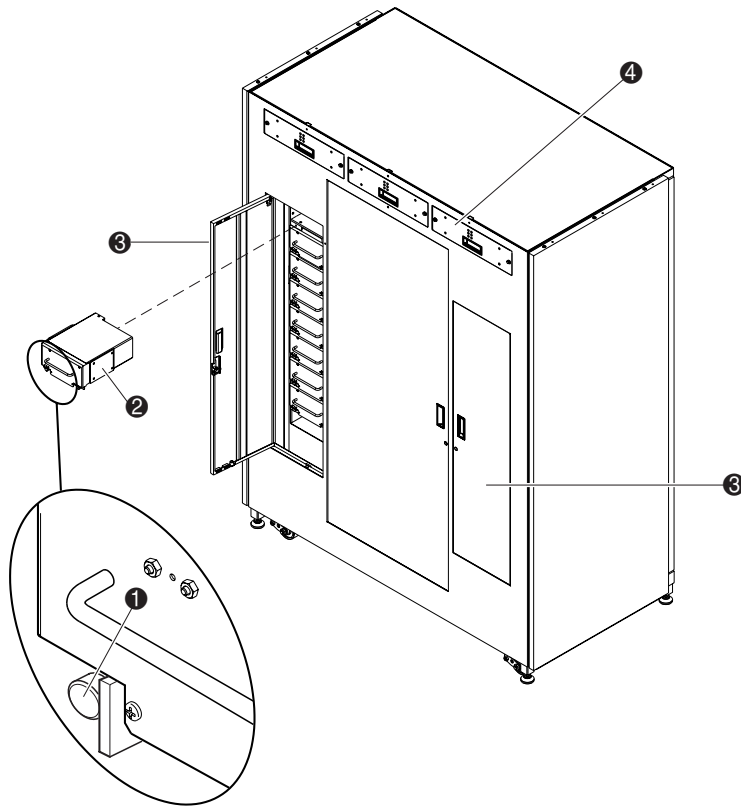
The rear of the cabinet (see Figure 1-3 and Figure 1-4) provides easy accessibility to:

- Cooling fans
- Power, control, and data interfaces
- Tape drives



- 1 Quick release thumbscrew on each bottom corner
- 2 Hot-pluggable drives in removable canisters
- 3 Easy-access rear panel
- 4 Hot-pluggable removable fans

Figure 1-3. Cabinet ESL9198 (rear panel)



- ❶ Quick release thumbscrew on each bottom corner
- ❷ Hot-pluggable drives in removable canisters
- ❸ Easy-access rear panel
- ❹ Hot-pluggable removable fans

Figure 1-4. Cabinet ESL9326 (rear panel)

Storage Bins (ESL9198)

The ESL9198 stores tape cartridges in the following locations:

- Up to 106 storage bins on the back wall. Some are removed if a PTM is installed.
- 92 storage bins on the inside of the front door.
- One load port consisting of two 6-cartridge magazines.
- Up to 8 tape drives.

Figure 1-5 shows the storage bin, load port bin, and tape drive numbering conventions. These conventions are used by the library control panel and the diagnostic software program.

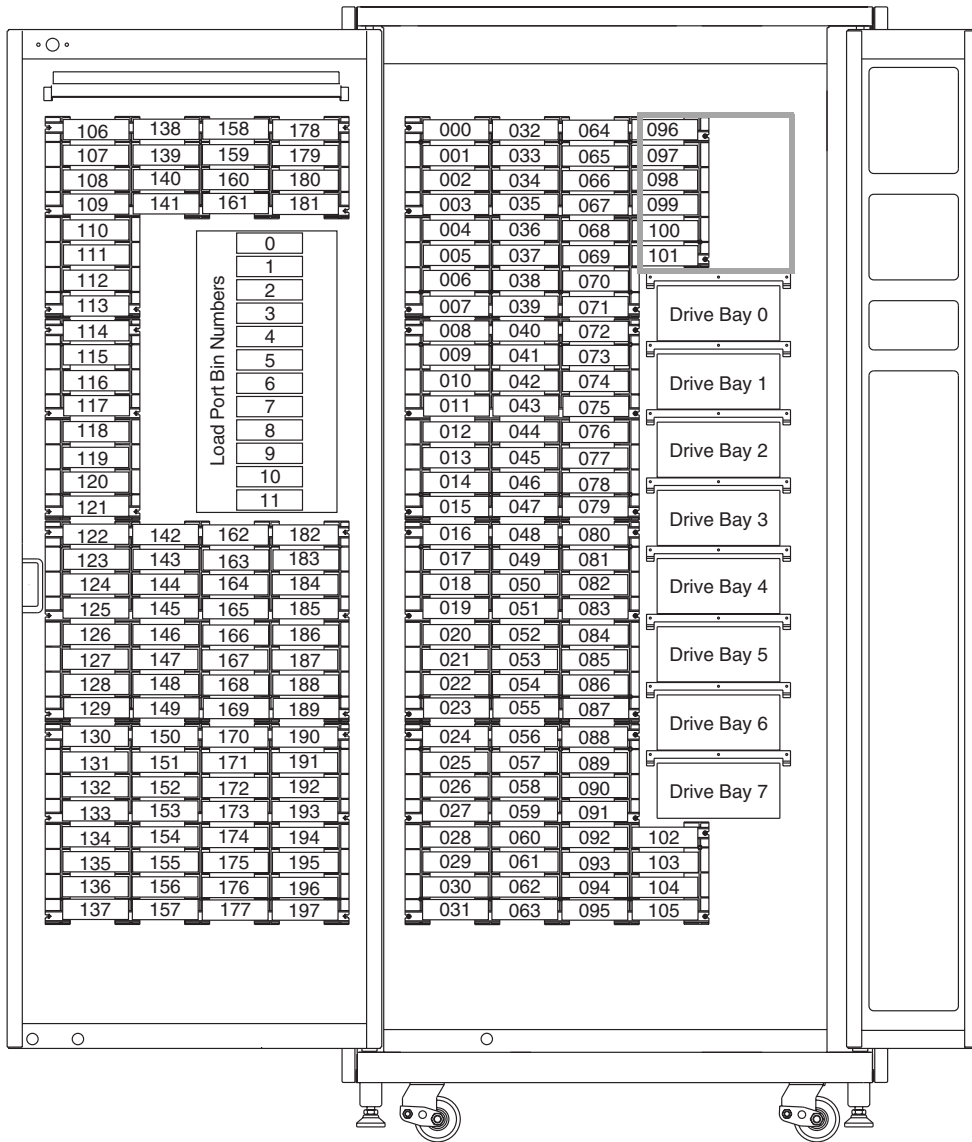


Figure 1-5. Storage bin numbering conventions (ESL9198)

Storage Bins (ESL9326)

The ESL9326 stores tape cartridges in the following locations:

- 170 storage bins on the back wall
- 96 storage bins on the inside of the left door
- 60 storage bins on the inside of the right door
- One load port consisting of two 6-cartridge magazines.
- Up to 16 tape drives.

Figure 1-6 shows the storage bin, load port bin, and tape drive numbering conventions. The tape library touch screen control panel and the diagnostic software program use these conventions

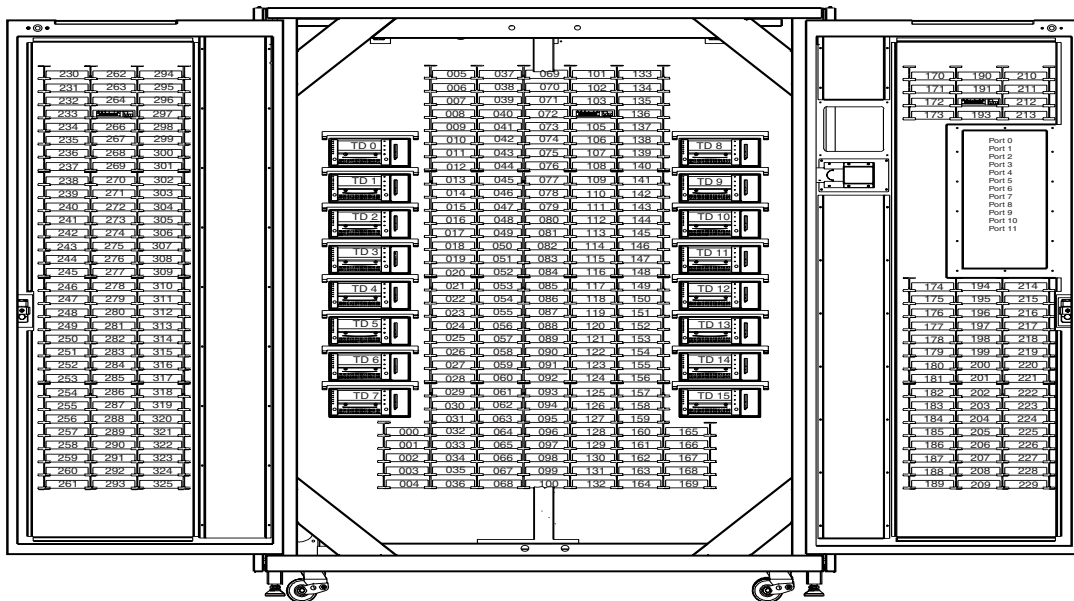


Figure 1-6. Storage bin numbering conventions (ESL9326)

Control Panel

The control panel features a menu system for determining library status, configuring the library, and performing certain diagnostic functions (see Figure 1-7).



- ❶ Vertical taskbar
- ❷ Horizontal taskbar
- ❸ Main display area

Figure 1-7. Control panel initial screen (ESL9198 shown)

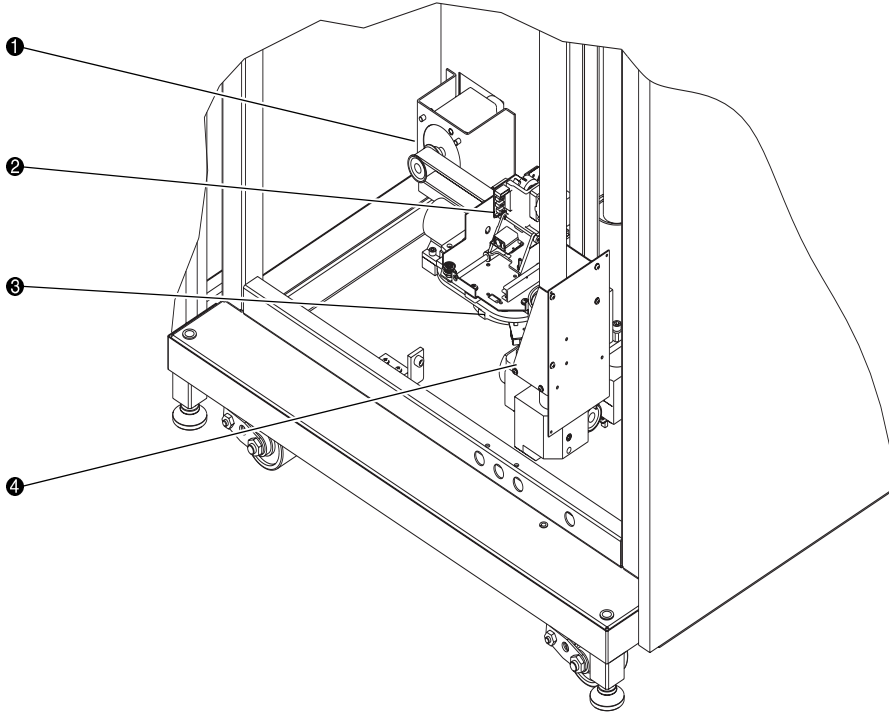
The horizontal taskbar ❷ provides left and right arrow buttons to scroll through the tabs for overview, tapes, operator, service and multi-unit options.

The vertical taskbar ❶ provides various library controls such as system state display, standby, **Load Port** button, security level indicator, and **Stop** button. The **Stop** button immediately removes power from library robotics.

For further information about the library control panel, see ““Using the Control Panel”” in Chapter 3”.

IntelliGrip CHM

Figure 1-8 shows the library IntelliGrip CHM.



- ❶ Horizontal drive motor
- ❷ Gripper assembly
- ❸ Extension axis assembly
- ❹ Vertical carriage assembly

Figure 1-8. Advanced robotics system

The IntelliGrip CHM vertical and horizontal actuators move the gripper into position to pick and place tape cartridges. The rotary actuator rotates the gripper 180 degrees, allowing the gripper to pass cartridges between the front storage bins and the back storage bins or tape drives. The extension actuator extends the gripper forward to make contact with the desired cartridge and then retracts the gripper to remove the cartridge from a bin or drive.

The gripper includes a Class II laser bar code scanner that reads standard six to eight character, 3 of 9 bar code labels. The scanner is used to maintain an inventory of the tape cartridges within the library. An inventory occurs automatically each time the library is turned on or after the bulk load door has been closed. An inventory can also be initiated from the host computer.

Although the library does not require tape cartridges to have bar code labels, properly labeled tape cartridges and full storage bins speed up the inventory process.

DLT Tape Drives

The ESL9198 holds up to 8 Digital Linear Tape (DLT) tape drives. The ESL9326 holds up to 16 DLT tape drives (see Figure 1-9). A DLT is an advanced half-inch tape device capable of storing up to 40 GB of non-compressed data per cartridge (see Table 1-4). Refer to the *Compaq DLT 8000 Drive Reference Guide* for more information about its features and capabilities.

NOTE:

- ESL9198: When fewer than 8 DLT tape drives are installed, the tape drives must occupy consecutive drive bays, beginning with drive bay 0.
- ESL9326: When fewer than 16 DLT tape drives are installed, the tape drives must occupy consecutive drive bays, beginning with drive bay 0.

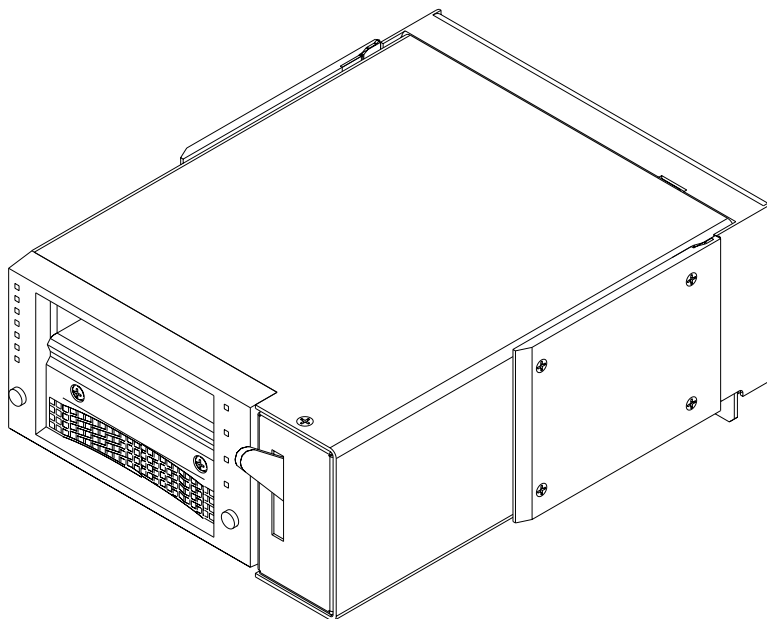


Figure 1-9. DLT tape drive

Table 1-4 DLT Tape Drive Capacity and Data Transfer Rate

Drive Model	Data Capacity (C-1V Media)	Sustained Data Transfer Rate
TZ89	35 GB (native)	5 Mb/sec (18Gb/hr)
DLT8000	40 GB (native)	6 Mb/sec (21.6Gb/hr)

DLT Tape Cartridges

The library supports DLT Tape III, DLT Tape IIIXT, and DLT Tape IV cartridges.



CAUTION: Do not use DLT Tape I or DLT Tape II cartridges with this library.

SDLT Tape Drives

The Compaq SDLT 110/220 tape drive is a high-capacity, high-performance streaming tape drive that uses Laser Guided Magnetic Recording (LGMR) technology to maximize the amount of data that can be stored on a tape. An SDLT tape drive is capable of storing up to 110 GB of non-compressed data per cartridge (see Table 1-5). Refer to the *Compaq SDLT 110/220 Drive Reference Guide* for more information about its features and capabilities.

The ESL9198 holds up to 8 SDLT tape drives. The ESL9326 holds up to 16 SDLT tape drives (see Figure 1-10).

NOTE:

- ESL9198: When fewer than 8 SDLT tape drives are installed, the tape drives must occupy consecutive drive bays, beginning with drive bay 0.
- ESL9326: When fewer than 16 SDLT tape drives are installed, the tape drives must occupy consecutive drive bays, beginning with drive bay 0.

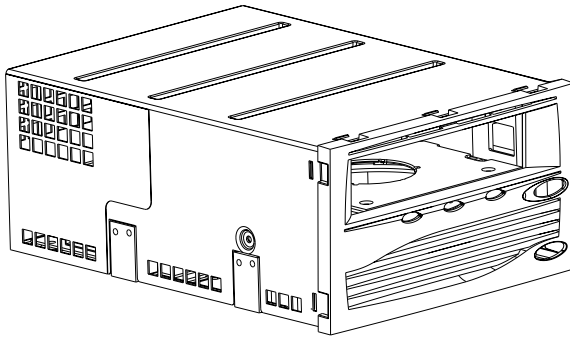


Figure 1-10. SDLT tape drive

Table 1-5 SDLT Tape Drive Capacity and Data Transfer Rate

Drive Model	Data Capacity	Sustained Data Transfer Rate
SDLT 110/220	110 GB (native)	11 Mb/sec (39.6 Gb/hr)
SDLT 110/220	220 GB (compressed)	22 Mb/sec (79.2 Gb/hr)

SDLT Tape Cartridges

The library supports DLT Tape IV cartridges (read only) and SDLT cartridges (read/write).



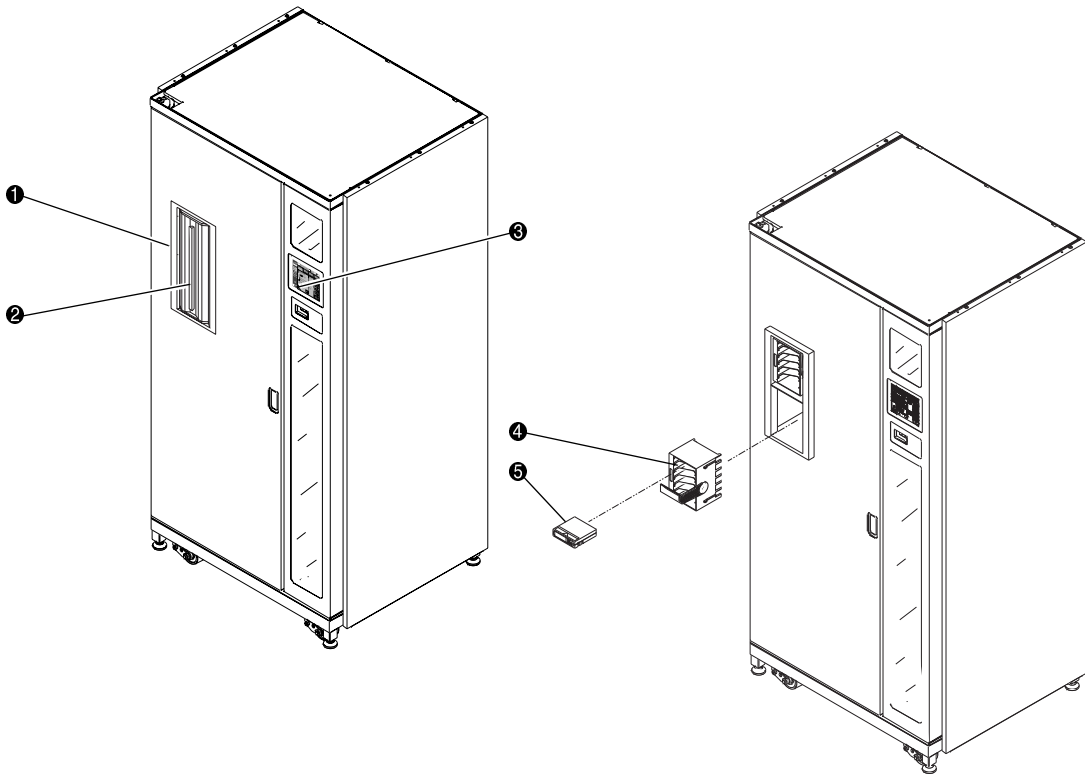
CAUTION: Do not use DLT Tape I, DLT Tape II, DLT Tape III or DLT Tape IIIXT, cartridges with SDLT.

Load Port

The load port (see Figure 1-11) is a mechanical device in the front panel of the library that lets you insert up to 12 tape cartridges into the library (or to export up to 12 tape cartridges) without interrupting library operations. It holds two 6-cartridge magazines.

Operating the Load Port

After pressing the **Load Port** button on the control panel, pull the load port's handle toward you. It will move outward about 1 inch (2.54 cm) and enable the load port to be rotated 180 degrees so that the magazines can be loaded or unloaded. After loading the magazines, rotate the load port back 180 degrees and push the load port handle to lock the load port in position.



- ❶ Load port
- ❷ Load port handle
- ❸ Load port button (control panel)
- ❹ 6-cartridge magazine
- ❺ Tape cartridge

Figure 1-11. Load port (ESL9198 shown)

Optional PTM

An optional PTM enables the transfer of a single tape cartridge between two Compaq StorageWorks ESL9000 Series Tape Libraries. The PTM can be used to connect up to five tape libraries increasing the storage capacity of the entire tape library system.

Refer to the *Compaq StorageWorks Pass-Through Mechanism (PTM) Installation Guide* for information about attaching libraries as well as installing, cabling, and calibrating the PTM.

Chapter 2

Preparing the Library for Operation

This chapter explains how to prepare the Compaq StorageWorks ESL9000 Series Tape Library for operation. Sections in this chapter include:

- SCSI cable configurations
- Multi-unit library system configuration
- Inserting tape cartridges into DLT tape drives
- Inserting and removing a tape cartridge from an SDLT tape drive
- Placing tape cartridges in fixed storage bins
- Inserting tape cartridges using the load port
- Removing and replacing the load pack
- Closing the library doors and access panels
- Turning the library on and off

SCSI Cable Configurations

This section describes the supported SCSI cable configurations for the ESL9000 Series libraries.

Connecting SCSI Cables (ESL9198)

Looking from the rear of the ESL9198 library, connect the SCSI cables and jumpers as shown in Figure 2-1.

NOTE: 9198 Series libraries are equipped with internal SCSI cables and terminators in place for a two drive per SCSI bus configuration. Additional SCSI jumper cables and terminators are supplied in the library Accessory Kit to allow up to four drives per SCSI bus.

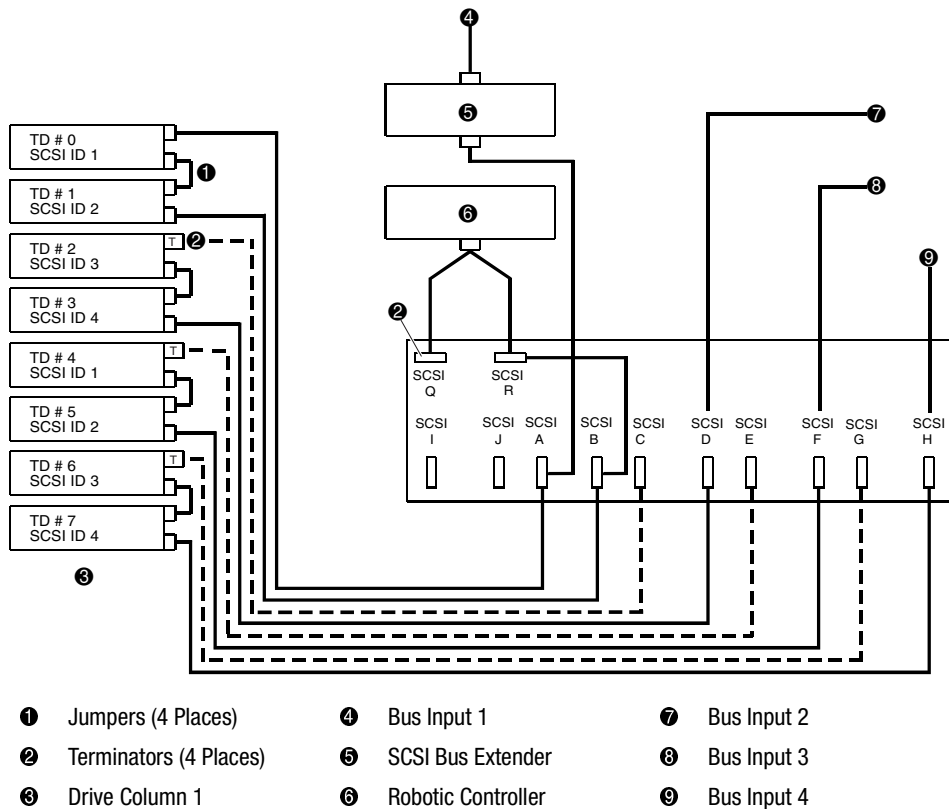


Figure 2-1. Cabling configuration, 8-drive library, ESL9198 (viewed from back)

SCSI Bus Termination (ESL9198)

Table 2-1 lists the recommended SCSI bus termination for the ESL9198 library.

SCSI Port Identifier	SCSI Bus Number	Function	Device Connection
A	1	SCSI extender (device side)	Drive 0
B	1	Jumper to R	Drive 1
C	2	Not Used	Drive 2
D	2	Bus 2 SCSI Input	Drive 3
E	3	Not Used	Drive 4
F	3	Bus 3 SCSI Input	Drive 5
G	4	Not Used	Drive 6
H	4	Bus 4 SCSI Input	Drive 7
R	1	Jumper to B	Robot
Q	1	Terminator	Robot
SCSI Extender in	1	Bus 1 SCSI Input	

NOTE: Bus 1 is terminated at connector Q on the SCSI bulkhead
 Bus 2 is terminated at drive 2 on the drive tray PWA
 Bus 3 is terminated at drive 4 on the drive tray PWA
 Bus 4 is terminated at drive 6 on the drive tray PWA

SCSI Breakouts (ESL9198)

Figure 2-2 shows the SCSI breakouts as viewed from the rear of the ESL9198 library.

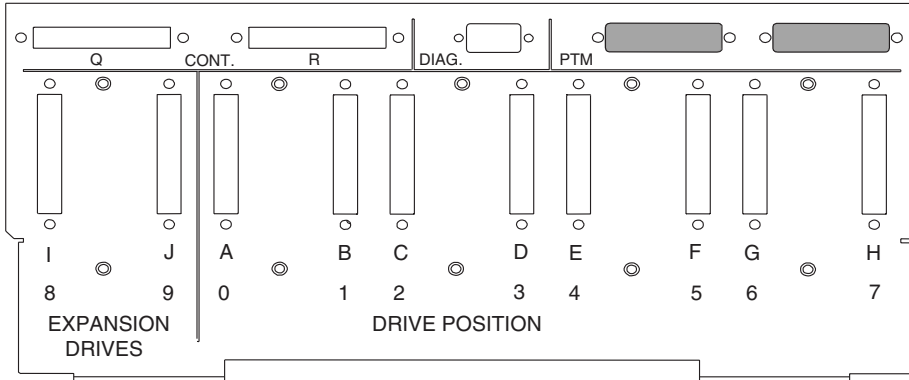


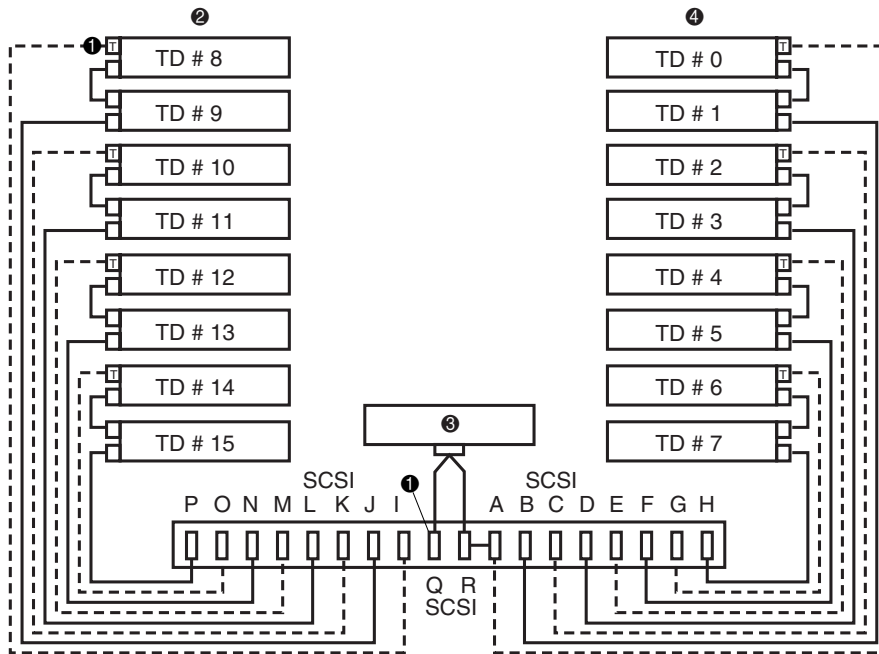
Figure 2-2. SCSI Breakouts (ESL9198)

Connecting SCSI Cables (ESL9326D and ESL9326DX)

Looking from the rear of the library, connect the SCSI cables and jumpers as shown in Figure 2-3. The recommended cabling configurations are for a 16-drive library.

NOTE: ESL9326 Series libraries are equipped with internal SCSI cables and terminators in place for a two drive per SCSI bus configuration. Additional SCSI jumper cables and terminators are supplied in the library Accessory Kit to allow up to four drives per SCSI bus.

The ESL9326D library is HVD only



- ① Terminators (9 Places)
- ② Drive Column 1
- ③ Robotic Controller
- ④ Drive Column 0

Figure 2-3. Cabling configuration, 16-drive library (ESL9326D/DX)

SCSI Bus Termination (ESL9326D/DX)

Table 2-2 lists the recommended SCSI bus termination for the ESL9326D/DX library.

Table 2-2 SCSI Bus Termination (ESL9326D/DX)			
SCSI Port	SCSI Bus Number	Function	Device Connection
Q	1	Terminator	Robot
R	1	Jumper to A	Robot
A	1	Jumper to R	Drive 0
B	1	Bus 1 SCSI Input	Drive 1
C	2	Not used	Drive 2
D	2	Bus 2 SCSI Input	Drive 3
E	3	Not used	Drive 4
F	3	Bus 3 SCSI Input	Drive 5
G	4	Not used	Drive 6
H	4	Bus 4 SCSI Input	Drive 7
I	5	Not used	Drive 8
J	5	Bus 5 SCSI Input	Drive 9
K	6	Not used	Drive 10
L	6	Bus SCSI Input	Drive 11
M	7	Not used	Drive 12
N	7	Bus 7 SCSI Input	Drive 13
O	8	Not used	Drive 14
P	8	Bus 8 SCSI Input	Drive 15

NOTE: Bus 1 is terminated at connector Q on the SCSI bulkhead
 Bus 2 is terminated at drive 2 on the drive tray PWA
 Bus 3 is terminated at drive 4 on the drive tray PWA
 Bus 4 is terminated at drive 6 on the drive tray PWA
 Bus 5 is terminated at drive 8 on the drive tray PWA
 Bus 6 is terminated at drive 10 on the drive tray PWA
 Bus 7 is terminated at drive 12 on the drive tray PWA
 Bus 8 is terminated at drive 14 on the drive tray PWA

Connecting SCSI Cables (ESL9326DLX and ESL9326SL)

Looking from the rear of the library, connect the SCSI cables and jumpers as shown in Figure 2-4. The recommended cabling configurations are for a 16-drive library.

NOTE: ESL9326 Series libraries are equipped with internal SCSI cables and terminators in place for a two drive per SCSI bus configuration. Additional SCSI jumper cables and terminators are supplied in the library Accessory Kit to allow up to four drives per SCSI bus.

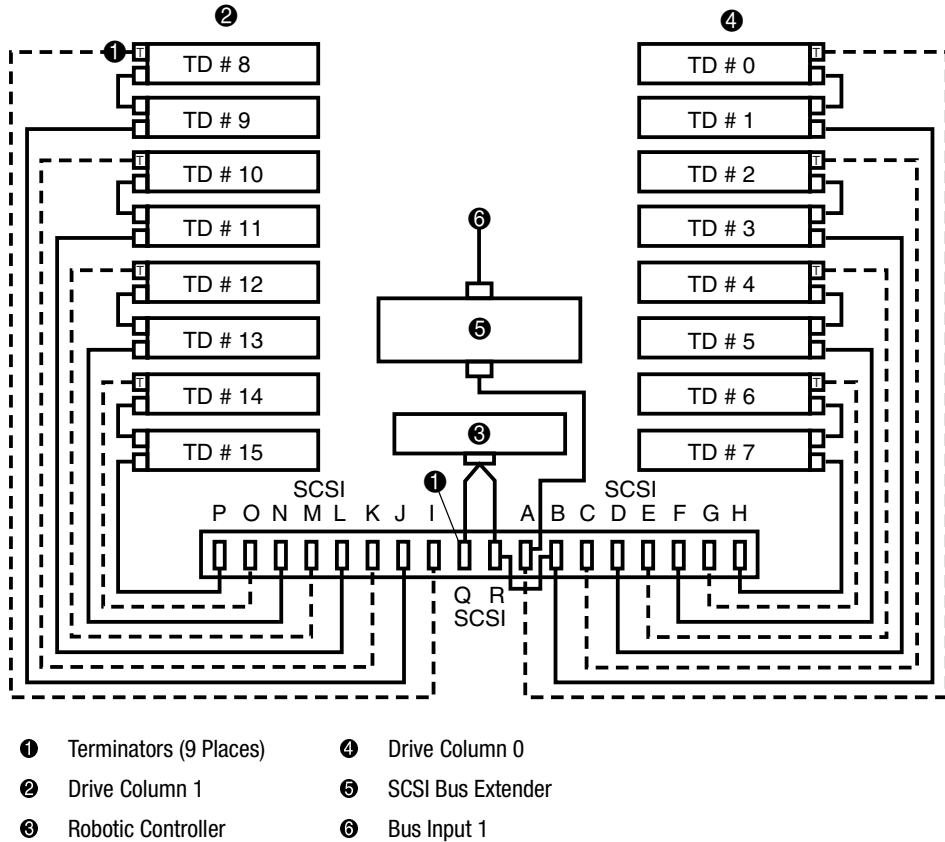


Figure 2-4. Cabling configuration, 16-drive library (ESL9326DLX/SL)

SCSI Bus Termination (ESL9326DLX/SL)

Table 2-3 lists the recommended SCSI bus termination for the ESL9326 library.

Table 2-3 SCSI Bus Termination (ESL9326DLX/SL)			
SCSI Port	SCSI Bus Number	Function	Device Connection
Q	1	Terminator	Robot
R	1	Jumper to B	Robot
A	1	SCSI Extender (device side) Bus 1 SCSI Input	Drive 0
B	1	Jumper to R	Drive 1
C	2	Not used	Drive 2
D	2	Bus 2 SCSI Input	Drive 3
E	3	Not used	Drive 4
F	3	Bus 3 SCSI Input	Drive 5
G	4	Not used	Drive 6
H	4	Bus 4 SCSI Input	Drive 7
I	5	Not used	Drive 8
J	5	Bus 5 SCSI Input	Drive 9
K	6	Not used	Drive 10
L	6	Bus 6 SCSI Input	Drive 11
M	7	Not used	Drive 12
N	7	Bus 7 SCSI Input	Drive 13
O	8	Not used	Drive 14
P	8	Bus 8 SCSI Input	Drive 15

NOTE: Bus 1 is terminated at connector Q on the SCSI bulkhead
 Bus 2 is terminated at drive 2 on the drive tray PWA
 Bus 3 is terminated at drive 4 on the drive tray PWA
 Bus 4 is terminated at drive 6 on the drive tray PWA
 Bus 5 is terminated at drive 8 on the drive tray PWA
 Bus 6 is terminated at drive 10 on the drive tray PWA
 Bus 7 is terminated at drive 12 on the drive tray PWA
 Bus 8 is terminated at drive 14 on the drive tray PWA

SCSI Breakouts (ESL9326)

Figure 2-5 shows the SCSI breakouts as viewed from the rear of the ESL9326 library.

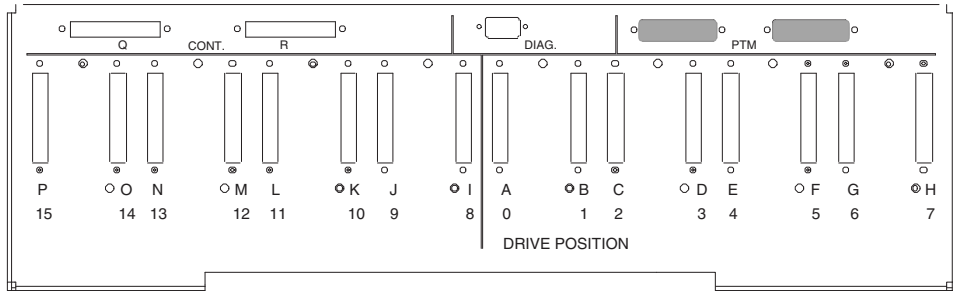


Figure 2-5. SCSI breakouts (ESL9326)

Default SCSI IDs

Table 2-4 lists the default SCSI IDs for the ESL9000 Series Tape Library.

NOTE: The ESL9198 holds a maximum of 8 tape drives, with tape drive 7 being the highest numbered tape drive.

Table 2-4 Default SCSI IDs—ESL9198/9326

Drive #	Default SCSI ID
Tape Library	0
Drive 0	1
Drive 1	2
Drive 2	3
Drive 3	4
Drive 4	1
Drive 5	2
Drive 6	3
Drive 7	4
ESL9326 Only	
Drive 8	1
Drive 9	2
Drive 10	3
Drive 11	4
Drive 12	1
Drive 13	2
Drive 14	3
Drive 15	4

Multi-Unit Library System Configuration

A Multi-Unit Single LUN (MUSL) configuration establishes a library set of two or more cabinets as a single library system (see Figure 2-6). As a result, all cabinets share the same Logical Unit Number (LUN). Addresses for each element type, gripper, storage bins, and so on) are consecutive from the first library to the last. Note that a single MOVE MEDIUM command can be used to move a cartridge between any two elements in a multi-unit library system.

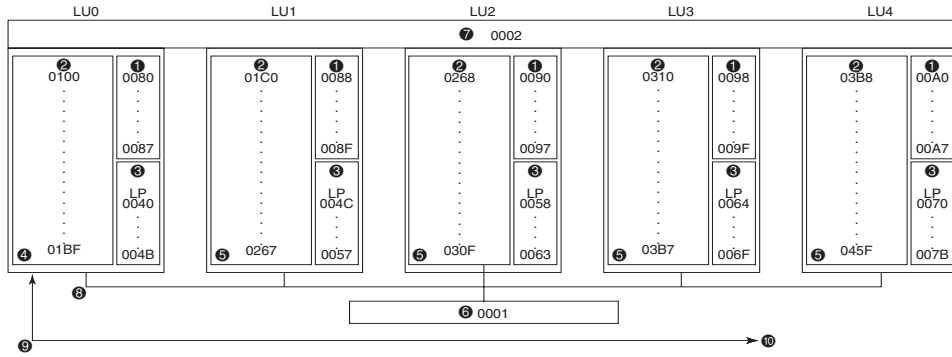
NOTE: Element addresses are hexadecimal and are provided for reference only. Although the addresses are accurate at the time of printing this guide, they are subject to change. It is recommended that the Mode Sense Data listed in Appendix A be used to determine the address of the entire multi-unit library system configuration.

The physical and logical setup of a multi-unit library system requires that the Pass-Through Mechanism (PTM) is aligned and that the multi-unit controller ports are cabled correctly. The LUN setup must reflect the library's physical position in the set.

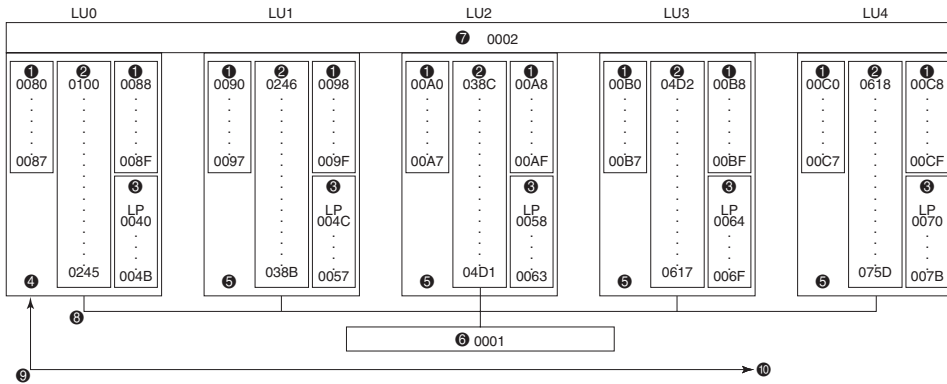
Refer to the *Compaq StorageWorks Pass-Through Mechanism (PTM) Installation Guide* for information about attaching libraries as well as installing, cabling, configuring and calibrating the PTM.

NOTE: It is not necessary for the first library in the set to be the master library. The master library can be located anywhere in the library set.

2-12 Compaq StorageWorks ESL9000 Series Tape Library Reference Guide



ESL9198



ESL9326

- ① Tape drives
- ② Storage bins
- ③ Load port
- ④ Master tape library (LU0)
- ⑤ Slave tape libraries (LU1 through LU4)
- ⑥ Gripper
- ⑦ PTM
- ⑧ QSPI interconnect cable
- ⑨ SCSI bus
- ⑩ To/from host computer

Figure 2-6. ESL9000 series multi-unit library system configuration

Inserting Tape Cartridges into DLT Tape Drives

To insert tape cartridges into DLT tape drives, make sure you:

- Insert a bar code label on each tape cartridge
- Set the write-protect switch as desired
- Place tape cartridges in the fixed storage bins



CAUTION: Handle tape cartridges with care. Do not drop or bang them, or place them near sources of electromagnetic interference. Rough handling can displace the tape leader, making the cartridge unusable and potentially hazardous to the tape drives.

Labeling Tape Cartridges

Attaching a bar code label to each tape cartridge enables the library to identify the cartridge quickly, thereby speeding up inventory time.

Place the label in the slide-in slot (❶ Figure 2-7) on the front of the tape cartridge.

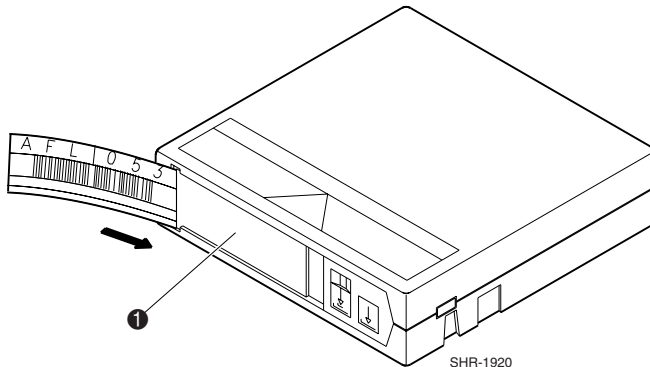


Figure 2-7. Inserting a bar code label

NOTE: Only use bar code labels that have been designed for Compaq tape cartridges. Do not adhere labels to a tape cartridge anywhere except the slide-in slot.

Use 7-character barcode labels (ABC123S) with SDLT media only. The “S” identifies the tape as SDLT media.

Setting the Write-Protect Switch

Each tape cartridge has a write-protect switch (Figure 2-8). This switch determines whether new data can be written to the tape cartridge (write-enabled) or whether data on the tape cartridge is protected from being erased or overwritten (write-protected).

To write-protect the tape cartridge, move the switch to the left (❷ Figure 2-8). To write-enable the tape cartridge, leave the switch in default position (to the right).

An orange indicator appears above the switch when the tape cartridge is write-protected (❶ Figure 2-8).

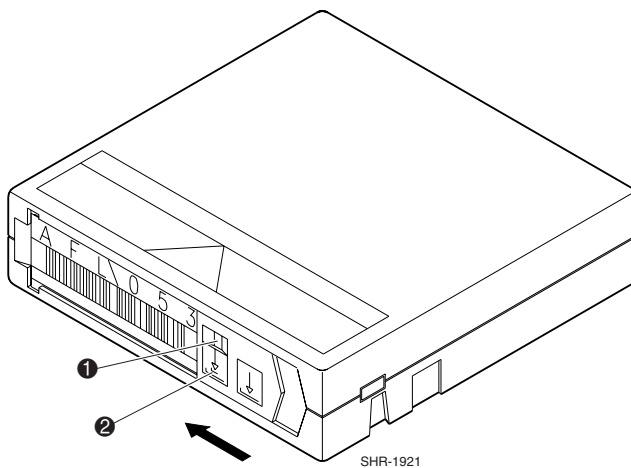


Figure 2-8. Write-protecting tape cartridges

Manually Ejecting a Tape Cartridge (DLT Tape Drives)

NOTE: It is recommended to unload and move tape cartridges through the robotics (from the host, control panel, or diagnostics). There might be times when it is desirable to manually unload tape cartridges.

After closing the doors, a POST and inventory is performed. This takes approximately nine minutes.

To manually eject a tape cartridge from one of the DLT tape drives:

1. Unlock and open the appropriate library front door:
 - a. Press the **Standby** button on the control panel. This places the library off-line.
 - b. Verify that the display state display reads System Off-line and that the robotics has

stopped moving. The off-line state does not take effect until current commands are completed.

- c. Make sure you are properly grounded and free from electrostatic discharge.
 - d. Using the key from the Accessory Kit, unlock the front door.
 - e. Lift the door handle straight up and then turn the handle counterclockwise to unlatch the door.
 - f. Gently pull on the door handle to open the door.
2. Press the **Unload** button on the tape drive (❶ Figure 2-9). When you press the **Unload** button, the tape cartridge rewinds. This might take between 10 to 120 seconds. When the rewind process completes, the Operate Handle indicator comes on.

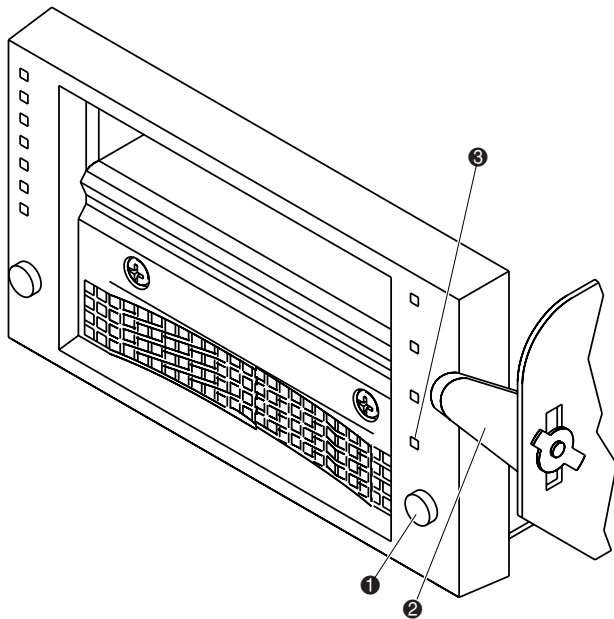


Figure 2-9. DLT tape drive front bezel

3. When the Operate Handle indicator (❸ Figure 2-9) comes on, with one hand, place your thumb approximately one-half inch from the tape and then slowly raise the insert/release handle (❷ Figure 2-9) to eject the tape cartridge.
4. Pause for five seconds, then grasp the tape cartridge and slowly pull it half way out of the drive.

NOTE: If the tape cartridge leader failed to detach from the take-up leader, push the tape cartridge all the way back into the tape drive, press down on the insert/release handle, and return to step 3. Otherwise, continue to step 5.

5. Pull the tape cartridge completely out of the tape drive.
6. Close and lock the library door.

Inserting and Removing a Tape Cartridge from an SDLT Tape Drive

Figure 2-10 shows how to insert a tape cartridge into an SDLT tape drive

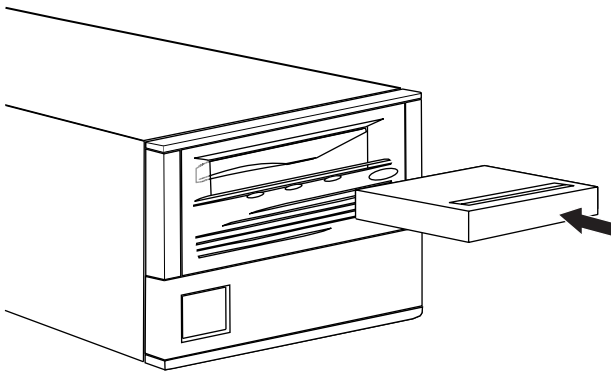


Figure 2-10. Loading a tape cartridge

After a tape cartridge is inserted, the tape cartridge initialization process begins and the green indicator flashes. When the tape cartridge is at the Beginning Of Tape (BOT) marker, the green indicator lights. The tape cartridge is now ready for use. Refer to the *Compaq SDLT Drive Reference Guide* for more information on front panel indicator lights.



CAUTION: If reusing a pre-recorded tape cartridge and writing from BOT, all pre-recorded data is lost.

To remove a tape cartridge, press the **Eject** button or issues an EJECT command using your software application.

Write-Protecting a Tape Cartridge (SDLT Tape Drives)

Tape cartridges have a write-protect switch to prevent accidental erasure of data. Before inserting a tape cartridge into an SDLT tape drive, position the write-protect switch on the front of the tape cartridge (see Figure 2-11). By moving the switch to the left ❶, the tape cartridge is write-protected. By moving the switch to the right ❷, the tape cartridge is write-enabled.

Moving the tape cartridge write-protect switch to the left while the tape cartridge is in the SDLT tape drive, causes the red indicator to immediately light. If the tape drive is writing data to the tape cartridge, write-protect does not begin until the current write command completes.

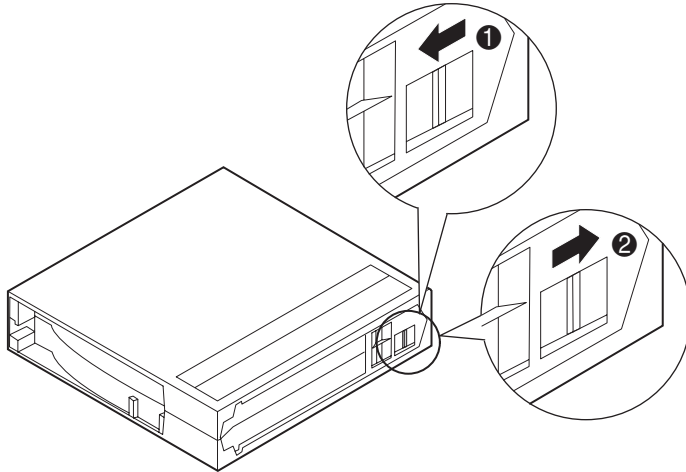


Figure 2-11. Tape cartridge write-protect switch

Placing Tape Cartridges in Fixed Storage Bins

Place a tape cartridge in each fixed storage bin (❶ Figure 2-12) along the back wall of the library and on the inside the front door. Be sure all cartridges are properly oriented and seated in the bins.

Each cartridge should slide into place with very little force. If a cartridge does not slide into place easily, check the cartridge for correct orientation and structural integrity.

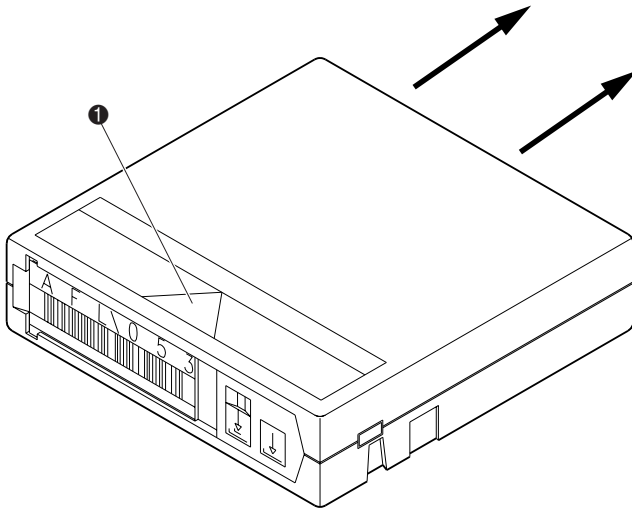


Figure 2-12. Installing tape cartridges



CAUTION: Handle tape cartridges with care. Do not drop or mishandle tape cartridges. Rough handling can displace the tape leader, making the tape cartridge unusable and potentially hazardous to the tape drives.

Inserting Tape Cartridges Using the Load Port

This section explains how to insert tape cartridges using the load port mechanism.



CAUTION: Do not use DLT Tape I, DLT Tape II or SDLT cartridges in D, DX or DLX libraries.

Do not use DLT Tape I, II, III, or IIIXT cartridges in S or SL libraries.



CAUTION: Opening or closing the load port door presents mechanical hazards. Do not insert hands or fingers into the load port opening at any time.

NOTE: To move cartridges to the load port for removal, see “Moving Cartridges” in Chapter 4.

To insert a tape cartridge:

1. Prepare the tape cartridges to be inserted by affixing a bar code label and write-protecting or write-enabling each tape cartridge as desired (see Figure 2-7, Figure 2-8, and Figure 2-11).
2. Press the **Load Port** button on the control panel. The library unlocks the load port.
3. Use the finger grip on the load port door to open the door completely.
4. With the load port door open, place the tape cartridge in an available load port magazine slot. Figure 2-12 shows the proper orientation for inserting a tape cartridge into a fixed storage bin.
5. Manually close the load port door.

If Auto Load is enabled, the library automatically moves the cartridges to the available storage bins.

Tape Cartridge and Load Pack Installation and Removal

This section describes how to install and remove a tape cartridge and a load pack. To install a tape cartridge:

1. Insert a tape cartridge into a load pack (❶ Figure 2-13).
2. Push the tape cartridge in until you hear it snap into place (❷ Figure 2-13).

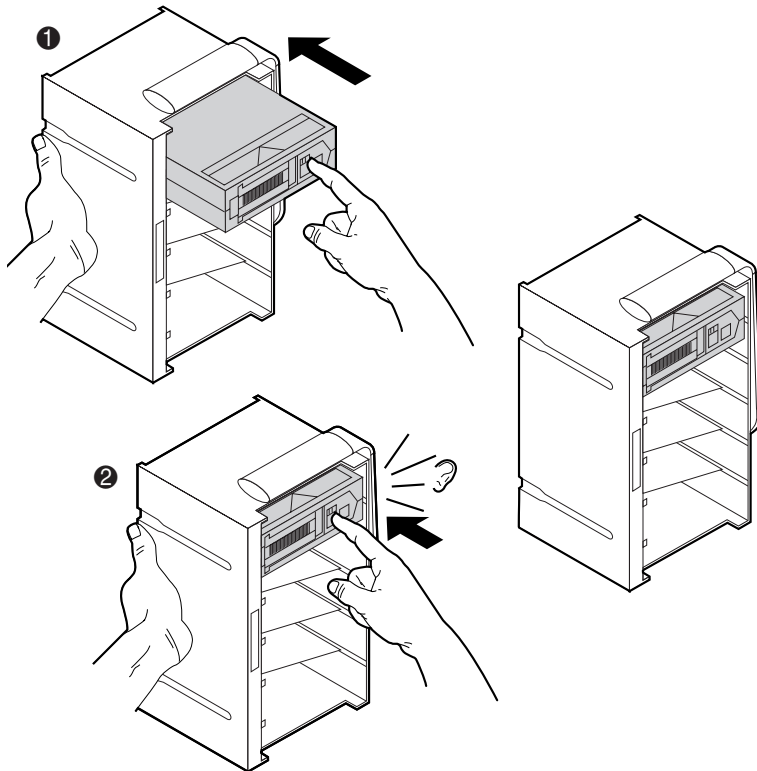


Figure 2-13. Installing a tape cartridge

To remove a tape cartridge:

1. Push the tape cartridge in until you hear a snap (❶ Figure 2-14).
2. Eject the tape cartridge (❷ Figure 2-14).
3. Remove the tape cartridge (❸ Figure 2-14).

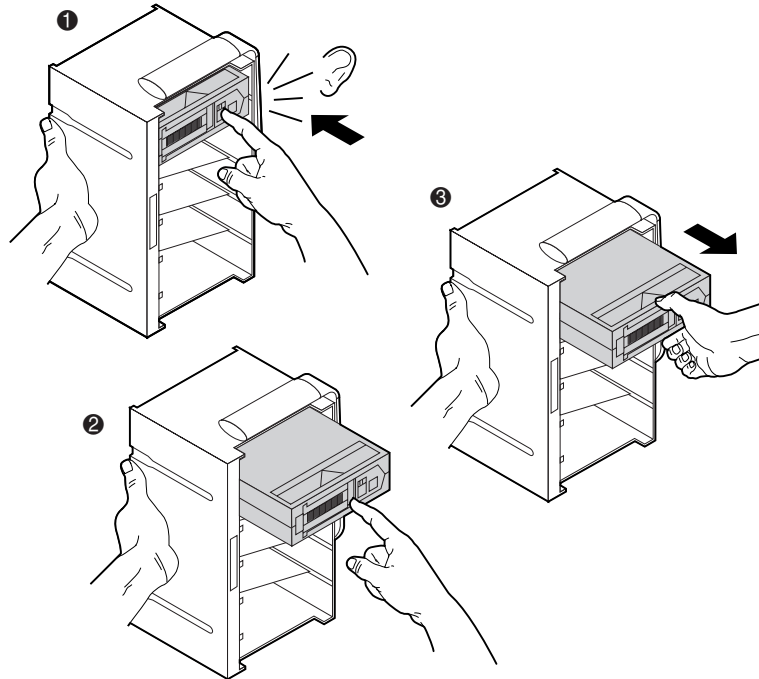


Figure 2-14. Removing a tape cartridge

To install a load pack:

1. Insert the load pack into the library (❶ Figure 2-15).
2. Push the load pack in until you hear it snap into place (❷ Figure 2-15).

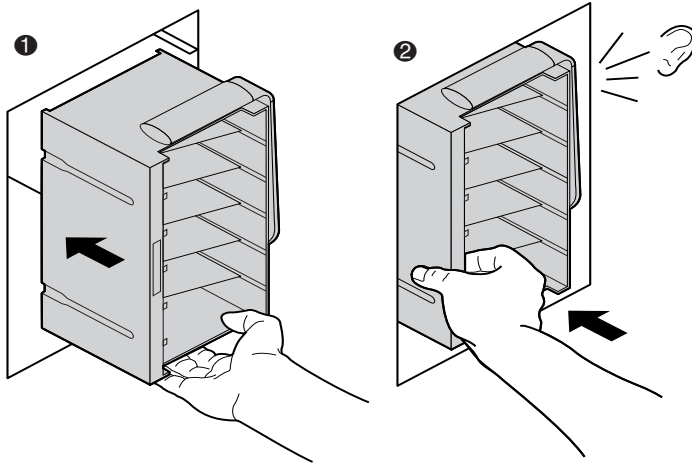


Figure 2-15. Installing a load pack

To remove a load pack:

1. Release the handle on the load pack (❶ Figure 2-16).
2. While holding the handle release, pull the load pack handle down (❷ Figure 2-16).
3. While holding the handle release, remove the load pack (❸ Figure 2-16).

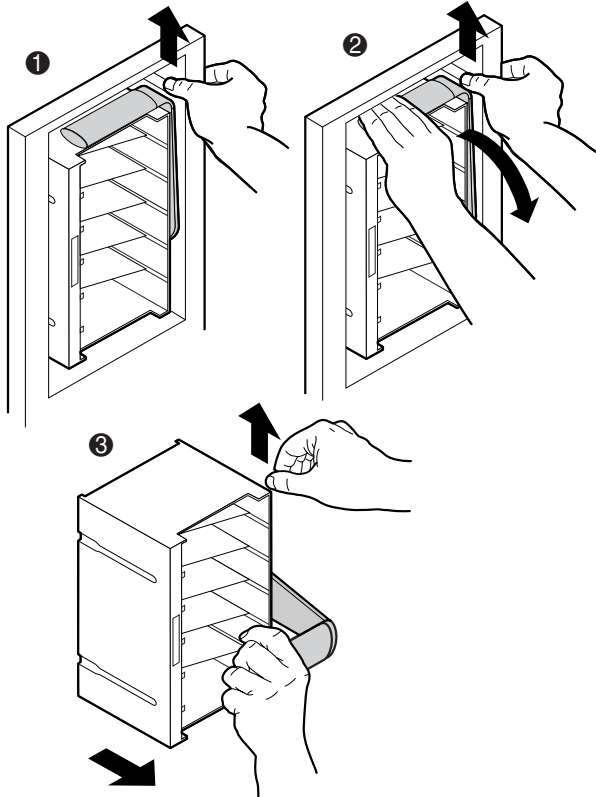


Figure 2-16. Removing a load pack

Closing the Library Doors and Access Panels

The library has one or two front doors and one or three rear access panels. To close and lock any front door and rear access panel:

1. Turn the door latch to secure the door to the library frame.
2. Lower the latch over the door lock.
3. Using the key from the Accessory Kit, lock the latch in place.
4. Close and lock any rear access panel using a 5/32 hex wrench.

NOTE: Rear access panels must be closed during normal operation for proper cooling and proper operation of the bar code scanner.

Turning the Library On and Off

This section explains how to:

- Turn the library on
- Place the library on-line and off-line
- Turn the library off
- Test the installation

Turning the Library On

To turn the library on:

1. Verify that:
 - a. All doors and access panels are closed.
 - b. All back panel cable connections are firmly in place.

NOTE: If there are two AC power distribution assemblies, there will be two main circuit breakers.

2. Turn on CB1 on the AC distribution assembly located in the base of the cabinet behind the rear access panel. If two AC distribution assemblies are present, turn on CB1 on both assemblies.
3. Turn on the power switch located below the control panel.

4. After several seconds, the control panel becomes active and the Home screen appears. The POST routine and inventory routine also runs. These routines can take up to nine minutes to complete.

Placing the Library On-line or Off-line

With library turned on, press the **Standby** button on the control panel. Pressing the **Standby** button toggles the library between on-line and off-line states.

Turning the Library Off

To turn the library off:

1. Place the library off-line by pressing the **Standby** button. The library robotics completes any current commands and then stops.
2. Verify that the control panel display shows “System Off-line.”
3. Verify that the CHM is empty by checking the Overview screen on the control panel. (see Chapter 3). If there is a tape cartridge in the transport-gripper, perform a MOVE command to place the cartridge in an available storage bin.
4. Turn off the power switch located below the control panel.
5. ESL9198: Turn off CB1 on the AC power distribution assembly (or both assemblies if two are present).
6. ESL9326: Turn off both circuit breakers on the AC power distribution assembly.

NOTE: Wait 10 seconds before turning on the power switch again.

Testing the Installation

After installing the library, perform the following operations to set up and test the library:

- CALIBRATE LIBRARY
- Inventory Library
- Issue SCSI commands from each of the host computers

For more information about the CALIBRATE LIBRARY command, see Chapter 3. For more information about issuing SCSI commands from the host computer, refer to the host computer operating system/application software documentation.

Chapter 3

Operating the Control Panel

This chapter provides an overview of the control panel and describes the following basic library operating procedures:

- Using the control panel
- Obtaining library status
- Changing the control panel security level

Using the Control Panel

The control panel is activated by touching the screen, and is located at the front of the library. The menus displayed on the control panel let you obtain information about the library, execute library commands, and test library functions (see Figure 3-1).

The control panel functions are grouped into the following four screens (see Table 3-1):

- *Overview screen*—displays current tape drive, CHM, and load port content and activities
- *Tapes screen*—displays tape drive, storage bin, load port, and gripper inventories
- *Operator screen*—contains library configuration and control functions (password protected)
- *Service screen*—contains reporting functions, system tests, and service commands (password protected)
- *Multi-Unit*—contains multi-unit configuration and calibration commands

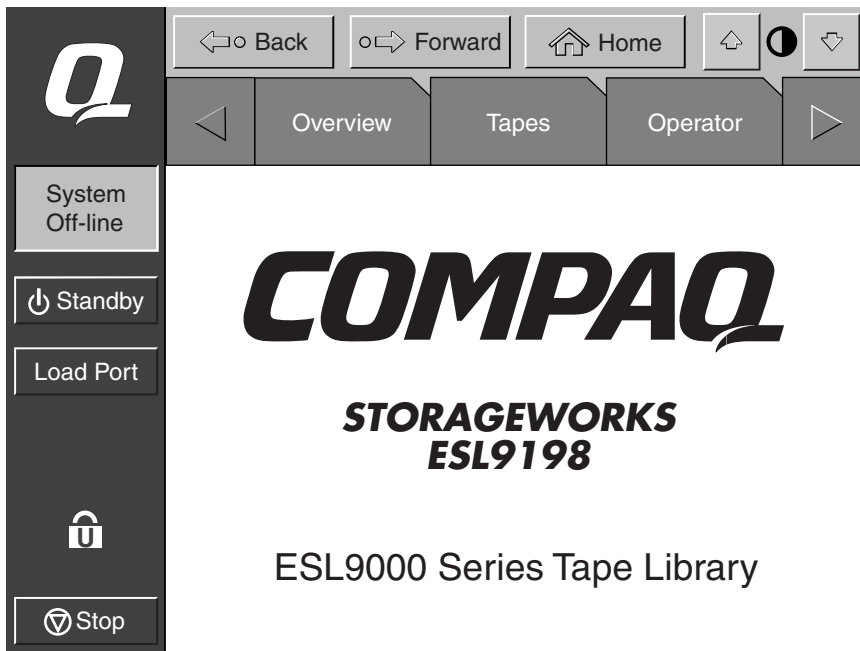


Figure 3-1. Control panel initial screen (ESL9198SL shown)

Table 3-1 Control Panel Functions

Overview Screen	Tapes Screen	Operator Screen¹	Service Screen¹	Multi-Unit Screen¹
Status display	Inventory display	Configure	Reports	Configure/Calibrate
<ul style="list-style-type: none"> ■ Tape drives ■ Activity ■ Load port 	<ul style="list-style-type: none"> ■ Tape drives ■ Storage bins ■ Load port ■ Transport (CHM) 	<ul style="list-style-type: none"> ■ Configure library ■ Configure options ■ Move cartridges ■ Inventory tapes ■ Calibrate library ■ Unload drive ■ Unload imp/exp 	<ul style="list-style-type: none"> ■ Statistics ■ Actuator ■ SysTest results ■ Auto clean ■ SysTest tape library ■ Operate axes ■ Miscellaneous (ESL9326 only) ■ Initialize nonvol stats ■ Initialize nonvol config ■ Change password ■ System monitor 	<ul style="list-style-type: none"> ■ Configure Multi-Unit ■ Calibrate all PTMs

¹ The Operator, Service and Multi-Unit screens are password protected.

Table 3-2 Control Panel Features Not Specific to Operator Tab


Component	Name	Function
Horizontal bar	Back button	Moves you backwards screen-by-screen through previous menu selections.
	Forward button	Moves you forward screen-by-screen through previous menu selections.
	Home button	Returns you to the initial control panel screen.
	Contrast button	Lets you adjust the contrast of the control panel screen.
Vertical bar		Displays Compaq service information, and Robotic Firmware level.
	Status window	Displays the current state of the library and important messages relating to library operation.
	Standby button	Switches the library between on-line and off-line.
	Load Port button	<ul style="list-style-type: none"> ■ In the closed position, unlocks the load port so you can open it. ■ In the open position, unlocks the load port so you can push it all the way to the left to close and lock it.
	Security level indicator (lock icon)	Shows the security level in use at the control panel. Compaq 9000 series library control panels have five levels of security.
	Stop button	<ul style="list-style-type: none"> ■ When pressed once, halts all library activity by cutting off power to the library robotics. ■ When pressed a second time, restores power to the library robotics.
	Display area	Overview screen
Tapes screen		Displays tape drive, storage bin, load port, gripper inventories, and PTM.
Operator screen		Contains library configuration and control functions. To use this screen, you must have either operator or service-level access privileges.

Table 3-2 Control Panel Features Not Specific to Operator Tab (Continued)

Component	Name	Function
	Service screen	Contains reporting functions, system tests, and service commands. To use this screen, you must have service-level access privileges.
	Multi-unit screen	Lets you set the library unit, library unit number, number tape libraries, and Calibrate PTM.

Basic Operation

Touching the screen activates the control panel. Once activated, the four control panel screens are available for use.

Opening a Screen

To open one of the five main screens, touch the desired tab at the top of the control panel. The Overview and Tapes screens are accessible by anyone. The Operator, Service, and Multi-Unit screens require a password.

Once the desired screen appears on the control panel, you can view information or press buttons to execute commands and open other screens.

Navigating from Screen to Screen

Three buttons let you move backward and forward through screens you have already opened (see Figure 3-1).

- *Back button*—moves backward screen by screen through previous selections
- *Forward button*—moves forward screen by screen through previous selections
- *Home button*—returns to the home (initial) screen

Exiting a Screen

To exit any screen, press the **Back** or **Home** button.

While the command is executing, the control panel displays a Command In Progress dialog box with an **Abort** button. Pressing **Abort** cancels the command and stops the ongoing operation.

After pressing **Abort**, it is still necessary to press the **Back** button to exit the screen associated with the aborted command.

Library Controls

Library controls are located along the top and left side of the control panel in the horizontal and vertical bars (see Figure 3-2).

These controls function as follows:

- *Contrast buttons*—adjust the contrast of the control panel.
- *Compaq logo*—displays a Compaq information screen and the library firmware level.
- *System state display*—shows the current state of the library (system on-line, system off-line, system stopped, door open, and so on).
- *Standby button*—toggles the library between on-line and off-line states.
- *Load Port button*—releases and locks the load port door. If the load port is locked in the closed position, pressing this button releases the load port and then locks the door. If the load port is locked in the open position, pressing this button unlocks the load port, letting you rotate the load port to the closed position where it automatically locks.
- *Lock icon*—shows the current security level at the touch screen GUI. Five security levels are available: service (S), operator (O), user (U), import only (I), and locked (L). Table 3-3 lists the attributes of each security level.
- *Stop button*—halts library activity immediately by cutting power to the library robotics. Pressing the **Stop** button a second time restores power to the library robotics.

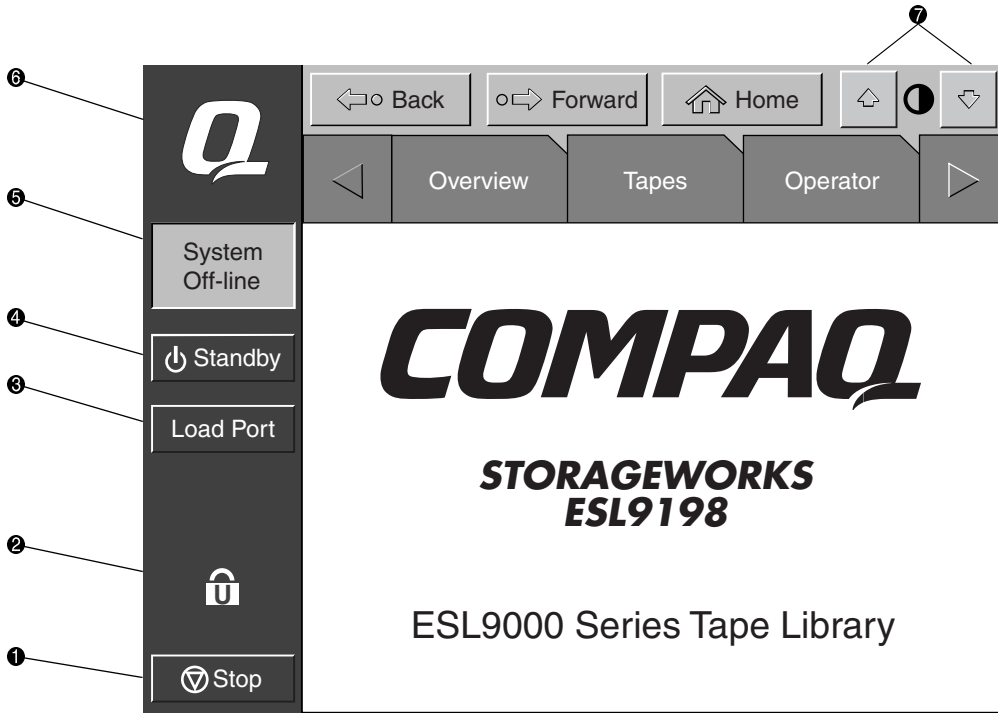


Figure 3-2. Library controls (ESL9198SL shown)

- ❶ Stop button
- ❷ Lock icon
- ❸ Load port button
- ❹ Standby button
- ❺ System state display
- ❻ Compaq logo
- ❼ Contrast buttons

Table 3-3 Security Levels, Highest to Lowest

Level	Password Protected	Overview Screen Access	Tapes Screen Access	Operator Screen Access	Service Screen Access	Load Port Access	Stop and Standby Access
Service	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operator	Yes	Yes	Yes	Yes	No	Yes	Yes
User	Yes	Yes	Yes	No	No	Yes	Yes
Multi-unit	Yes	No	No	No	No	No	No
Import only	Yes	Yes	Yes	No	No	Yes	No
Locked	No	Yes	Yes	NO	No	No	No

NOTE: The default passwords are: Operator “1234”, Service “5678”, User “2222”, and Import only “1111”

For more information on password and security levels see “Changing the Control Panel Security Levels” described later in this chapter.

Obtaining Library Status

The Overview and Tapes screens on the control panel provide library status. The Overview screen displays a “snapshot” of the tape drive, robot activity, and load port inventory (see Figure 3-3). The Tapes screen displays the inventory of all elements in the library (see Figure 3-4).

To display the Overview or Tapes screen, press the appropriate option on the control panel. Note that these functions operate in On-line or Off-line mode.

Overview Screen

The Overview screen provides the following information:

- Drive status
- Activity
- Load port content and status

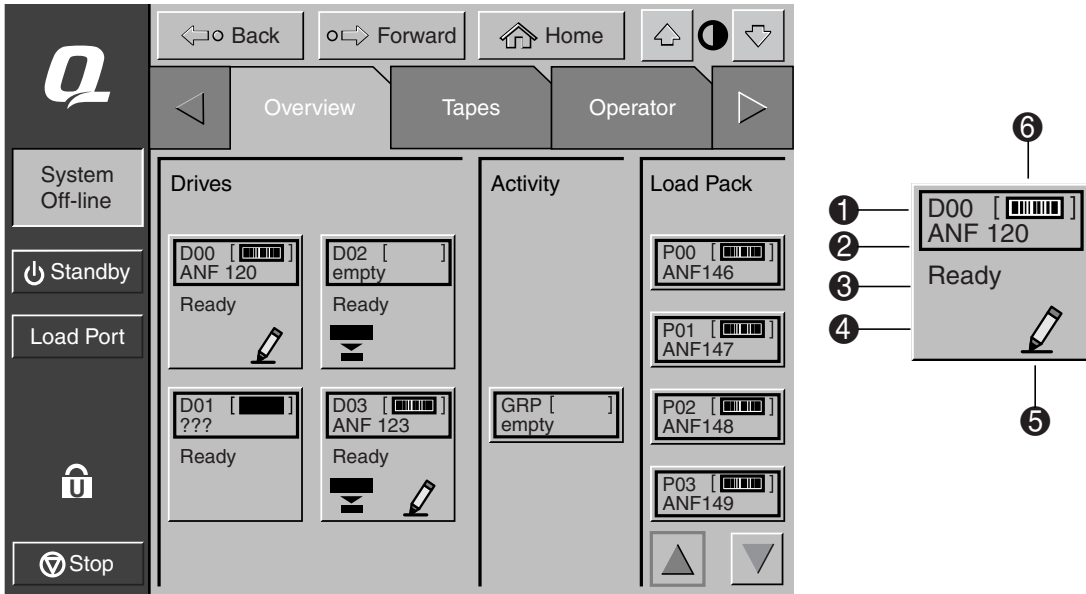


Figure 3-3. Overview screen

- ❶ Element number
- ❷ Bar code number
- ❸ Element status
- ❹ Compressed enabled
- ❺ Write enabled
- ❻ Cartridge present

Drive Status

The Drives area reports whether or not:

- A tape drive has a cartridge
- The cartridge is write-enabled or write-protected
- Compression is enabled

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It also provides status for:

- Bar code labels
- Drive states
- Drive types
- Media types
- Drive serial numbers
- SCSI IDs

It also displays the bar code number of the cartridge.

For a more detailed view of drive status, press the screen anywhere in the Drives area to display the Tape Drive Status box (see Figure 3-4). Use the arrow buttons at the bottom of the box to scroll to the desired drive.

To return to the Overview screen, press the screen anywhere in the Tape Drive Status box (see Figure 3-4).

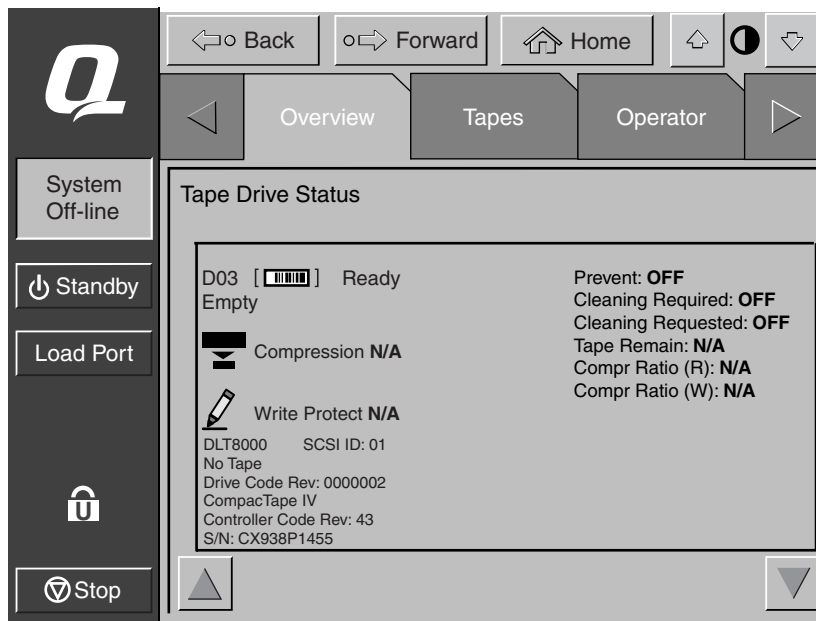


Figure 3-4. Tape Drive Status box (DLT8000 shown)

Activity Status

The Activity area shows the source element, the transport medium, and the destination element involved in the activity; the current location of the tape cartridge; and the progress of the activity.

Load Port Status

The Load Port area identifies tape cartridges currently stored in either magazine in the load port. Use the Arrow button to view contents not currently displayed.

Tapes Screen

The Tapes screen identifies the tape cartridges residing in the following elements (see Figure 3-5):

- Tape drives
- Storage (fixed storage bins)
- Transport (CHM/gripper), and PTM
- Load port

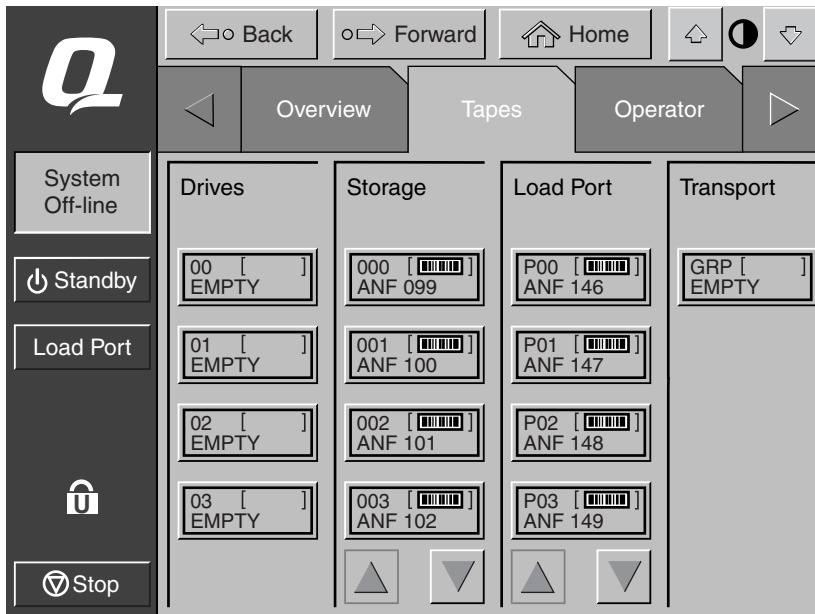


Figure 3-5. Tapes screen

Viewing Storage and Load Port Elements


The Drives, Storage, and Load Port categories might contain too many elements to display at once. To scroll through these elements, use the Arrow buttons at the bottom of each category.

You can also expand the Drives, Storage, or Load Port list to fill the screen by touching the desired category anywhere above the scrolling arrows. To return to the start of the Tapes screen, press the **Back** button.

Changing the Control Panel Security Levels

Compaq 9000 series library control panels have five levels of security:

- *Operator (O)*—provides access to the Operator set of screens and all functions on the system bar.
- *Service (S)*—provides access to both the Operator and Service set of screens and all functions on the system bar.
- *User (U)*—provides access to screens that are not password-protected (Overview and Tapes screens) and all functions on the status bar.
- *Import Only (I)*—provides access to Overview and Tapes screens and the **Load Port** button on the system bar (no **Stop** or **Standby**).
- *Locked (L)*—provides access to Overview and Tapes screens only.

The security level indicator (lock icon ) at the lower left corner of the control panel indicates the current security level (O, S, U, I, or L).

Securing the Control Panel

When the User security level is set, access is restricted to the Operator and Service screens. Since these screens control library configuration, testing, and initializing functions, the User security level is the appropriate default condition for routine library operation.

For more information about changing to a higher security level to access the Operator or Service screens, see “Opening the Operator Screen” in Chapter 4 or “Opening the Service Screen” in Chapter 5.

Changing Security Levels

To change security levels:

1. Press the **Lock** icon. The Password screen appears (see Figure 3-6).

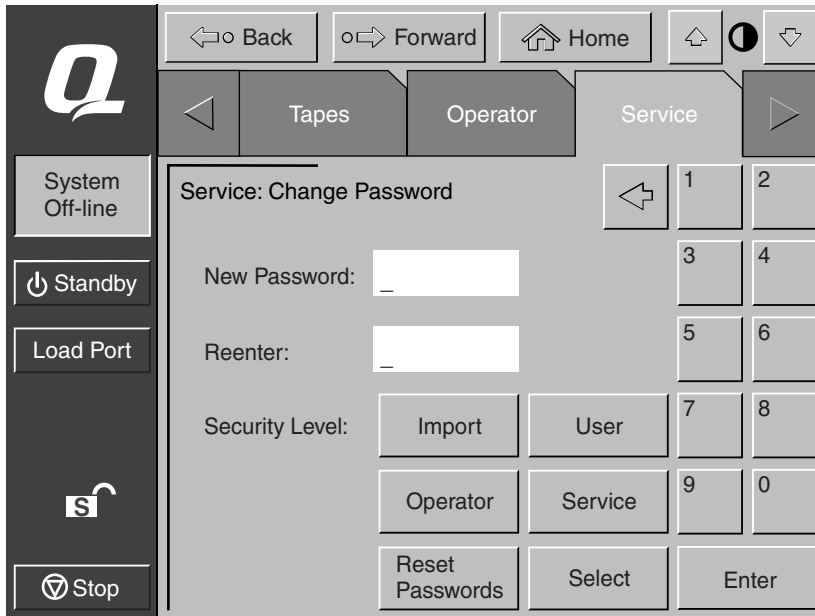


Figure 3-6. Password screen

2. Press the security level button for the desired level of security (**Operator**, **Service**, **User**, **Import Only**, or **Locked**).
3. Enter a password if necessary. A password is required to enter a higher security level than the current level.
4. Press the **Select** button. A screen appears indicating that the new security level has been set successfully.
5. Press OK. The lock icon displays the new security level (O, S, U, I, or L).

NOTE: This procedure is especially useful to change from the Operator or Service levels to the User level after executing an Operator or Service level command.

If the control panel is accessed from the Operator (O) or Service (S) level, and no activity has occurred for 15 minutes, the control panel will return to the initial screen (Figure 3-1).

Chapter 4

Operator Commands

This chapter describes the commands found on the Operator screen of the library control panel. The Operator screen commands initiate the following actions:

- Opening the Operator screen
- Configuring the library
- Configuring library options
- Calibrating the library
- Performing an inventory
- Moving cartridges
- Unloading a drive
- Unloading the load port

NOTE: The library must be off-line to perform any of the functions listed above.

Opening the Operator Screen

To open the Operator screen:

1. Press the **Operator** tab. The control panel displays the password screen (see Figure 4-1).
2. Enter the correct operator or service password to gain access to the Operator screen (see Figure 4-2). The default operator password is 1234.

NOTE: To change passwords, see “Changing Passwords” in Chapter 5.

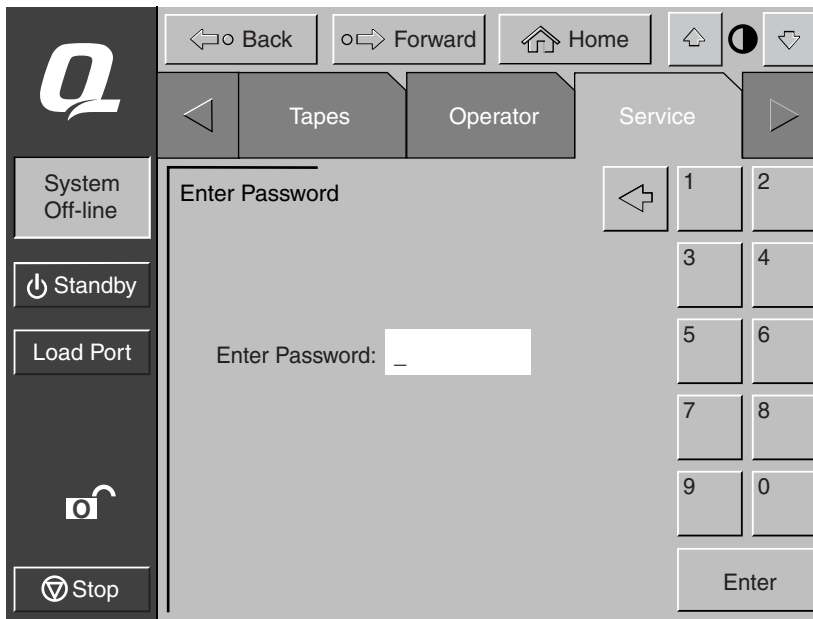


Figure 4-1. Password screen

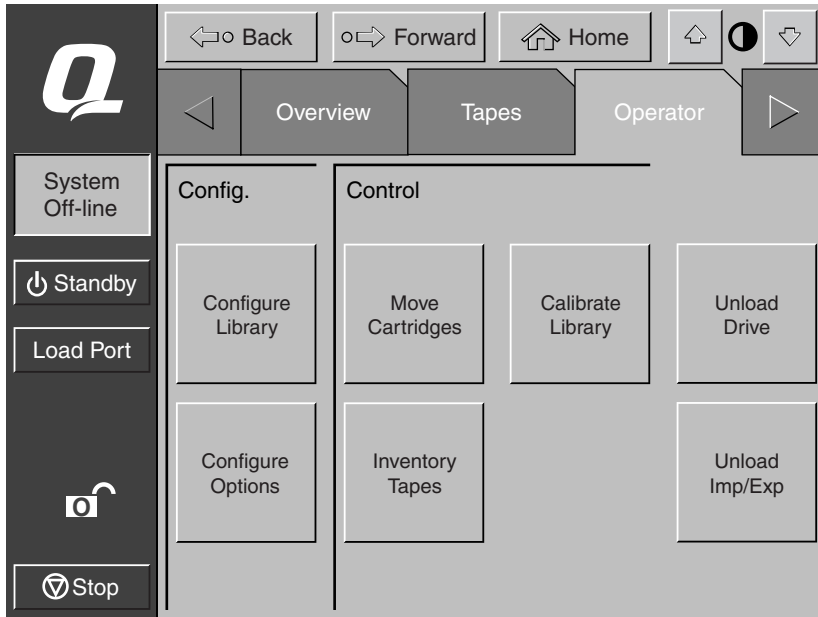


Figure 4-2. Operator screen

Configuring the Library

The CONFIGURE LIBRARY command lets you assign the following:

- Library model number (see Table 1-1 or Table 1-2)
- Number of storage bins
- Number of drives
- Library SCSI ID
- Tape drive SCSI ID
- PTM configuration

To configure any of these attributes:

1. In the Operator screen, press the **Configure Library** button. The control panel displays the Configure: Library screen (see Figure 4-3).

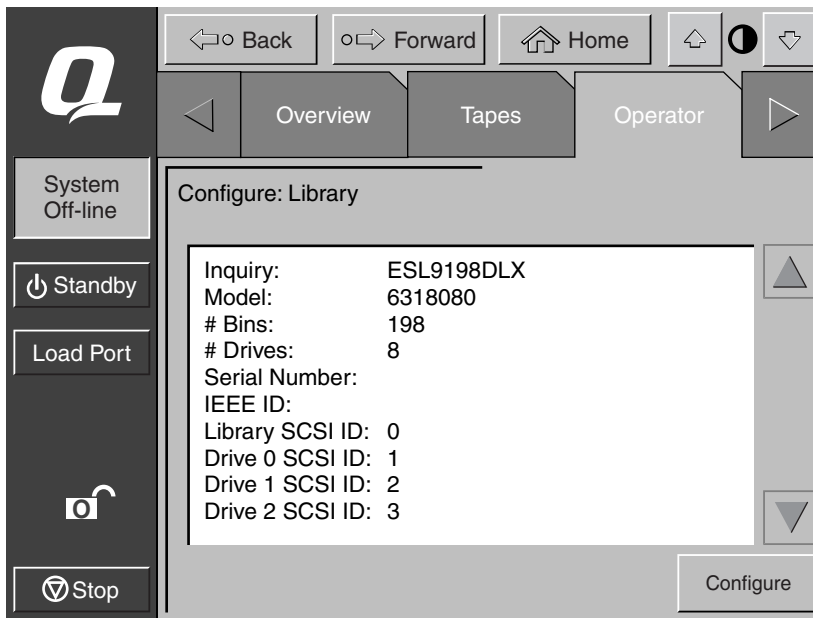


Figure 4-3. Configure: Library screen (ESL9198 shown)

2. Press the **Configure** button. The control panel displays the Configure: Library Settings screen (see Figure 4-4). Ensure that the library is off-line.

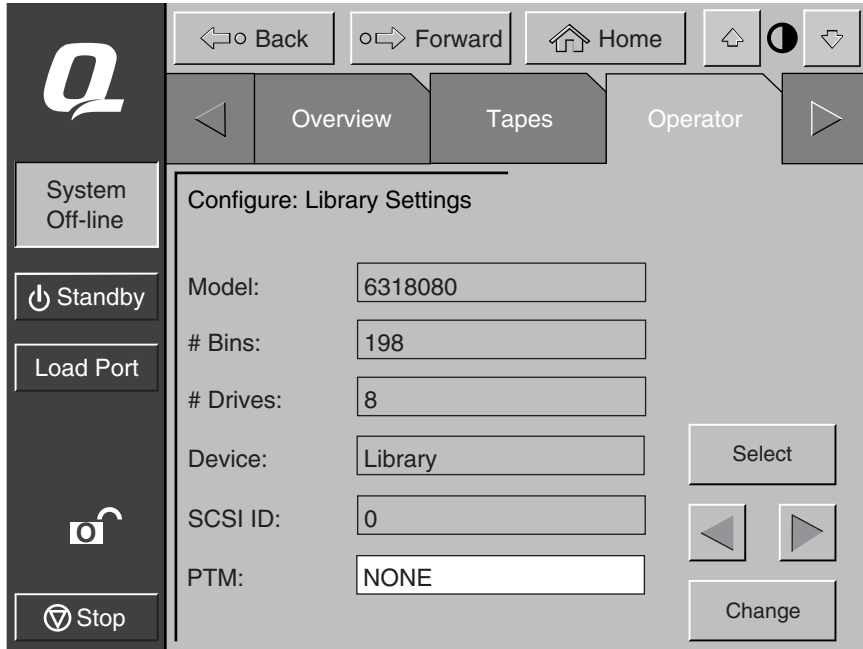


Figure 4-4. Configure: Library Settings screen (ESL9198 shown)

3. Press the **Select** button until you highlight the setting you want to change.
4. Using the arrow buttons, scroll through the available values for the setting.
5. Press the **Change** button to accept the new value.
6. Repeat steps 3 through 5 to make other changes.
7. Press the **Back** button to return to the Configure: Library screen.

The options you selected are now part of the library configuration.

SCSI ID Assignment Guidelines

When selecting SCSI ID numbers, each SCSI device on the same bus must have a unique number from 0 to 15. SCSI devices include the library robotics, the host computer, the library tape drives, internal and external hard disk drives, and so on.

If you set up the library with multiple SCSI buses, you can assign the same number to two or more devices, provided each device is on a different SCSI bus.

NOTE: Power must be cycled for the new SCSI ID number to become effective.

PTM Configuration

To configure the PTM, set the PTM option to either None, Right, Left, or Both (see Figure 4-4). This automatically adjusts the number of bins in the library

Configuring Library Options

The CONFIGURE OPTIONS command lets you set the following:

- *Power-On State*—determines whether the library is on-line or in standby mode when powered up (default is On-Line).
- *Auto Clean*—allows the library to perform drive cleaning tasks automatically as needed (default is Disabled). Not suggested for SDLT.
- *Retries*—causes the library to retry a failed command automatically before issuing an error message (default is Enabled).
- *Bar Code Labels*—turns bar code scanning on or off during inventory. This option should be disabled when the library contains cartridges that are not labeled (default is Enabled).
- *Auto Inventory*—causes the library to perform an inventory whenever the library is powered up (default is Enabled).
- *Auto Load*—causes the library to automatically move cartridges in the load port to empty storage bins as soon as the load port door closes (default is Disabled).
- *Temp. Detection*—enables or disables the over-temperature detection warning and shutdown features of the library (default is Enabled).
- *Power-On Security*—determines the library security level when powered up (default is User).
- *Auto Drive Unload*—causes the drive to unload a tape when a MOVE MEDIUM command is received (default in Enabled).
- *Barcode Retries*—lets you set a number of attempts to read a bar code label before giving up (default is 8).

Configuring a Library Option

To configure a library option:

1. On the Operator screen, press the **Configure Options** button. The control panel displays the Configure: Options screen (see Figure 4-5).
2. Press the button for the desired option.
3. Using the arrow buttons, scroll through available values for the selected option.
4. When the New Value box displays the desired value, press the **Execute** button to apply the new value. The Current Value box displays the new value.
5. Repeat steps 2 through 4 to change other configuration options.
6. When you have finished making changes to library options, press the **Back** button until you return to the initial Operator screen.

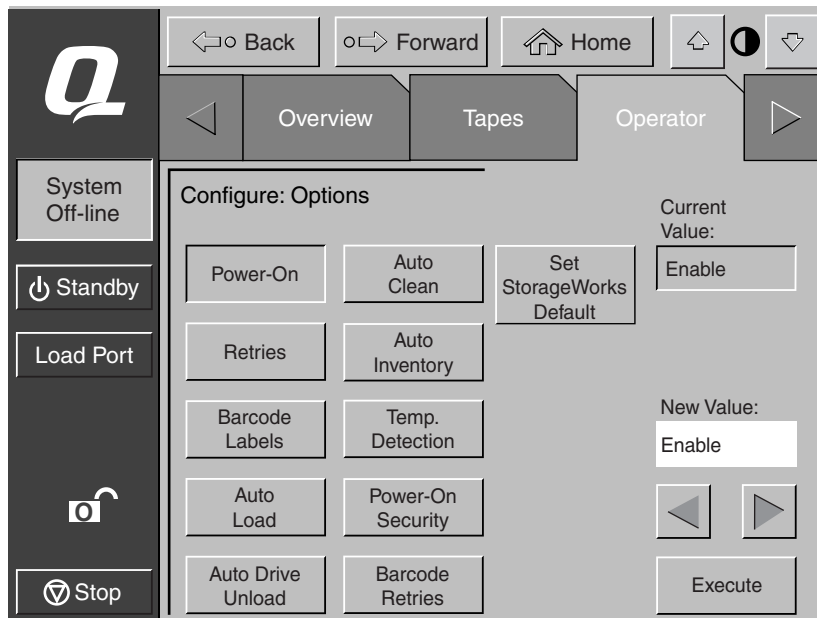


Figure 4-5. Configure: Options screen

To return the library to the default values press the **Set StorageWorks Default** button.

Calibrating the Library

The CALIBRATE LIBRARY command lets you calibrate the storage bins, the tape drives, the load port, or the entire library. Calibrate the library during initial installation and after any maintenance procedure.

To calibrate library elements:

1. On the Operator page, press the **Calibrate Library** button. The control panel displays the Calibrate Library screen (see Figure 4-6).
2. Press the button with the desired calibration option.

NOTE: Pressing the **Calibrate All** button causes the drives, bins, and the load port to be calibrated. This operation takes approximately 20 minutes.

The control panel displays a “Command In Progress” screen while the calibration process is in progress. Calibrate All takes approximately 20 minutes.

3. When the calibration process completes, repeat step 2 to perform another calibration, if desired.

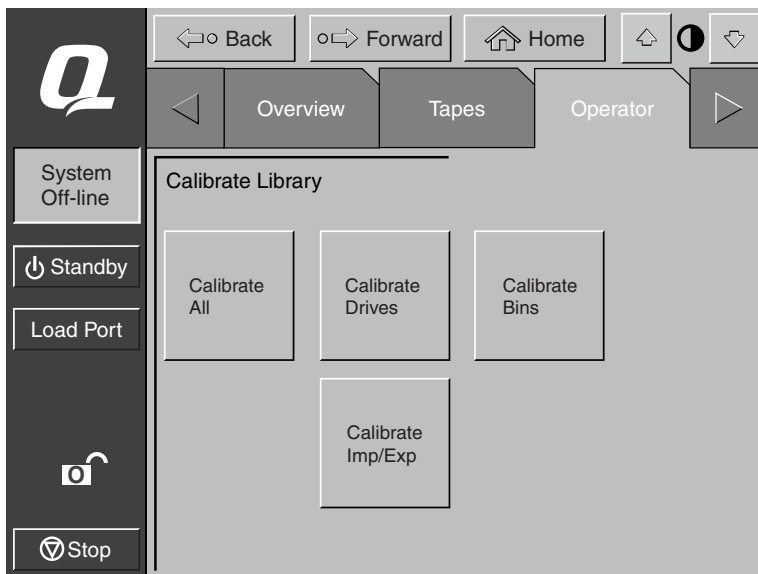


Figure 4-6. Calibrate Library screen

Performing an Inventory

The INVENTORY TAPES command reads the bar code labels of the cartridges in the tape drives, fixed storage bins, and the load port bins. All elements that contain cartridges without labels are marked as full with no label.

To perform an inventory:

1. Press the **Inventory Tapes** button in the Operator screen. The control panel displays a “Command In Progress” screen.
2. Press the **Abort** button to stop continuous running of the inventory process, otherwise, the process will continue until all storage elements have been inventoried.

NOTE: The inventory process is also stopped if an error is detected or if the rear door is open. In this case, the control panel displays an error message.

Moving Cartridges

The MOVE CARTRIDGE command lets you move any tape cartridge in the library to the destination you specify. This destination can be a storage bin, a tape drive, the load port, the gripper, or the PTM.

NOTE: To move a cartridge from a tape drive if auto-drive unload is disabled, issue an UNLOAD DRIVE command. See “Unloading a Drive” described later in this chapter.

To move a cartridge:

1. On the Operator screen, press the **Move Cartridge** button. The control panel displays the Control: Move Cartridge screen, with the Source input field active (see Figure 4-7).

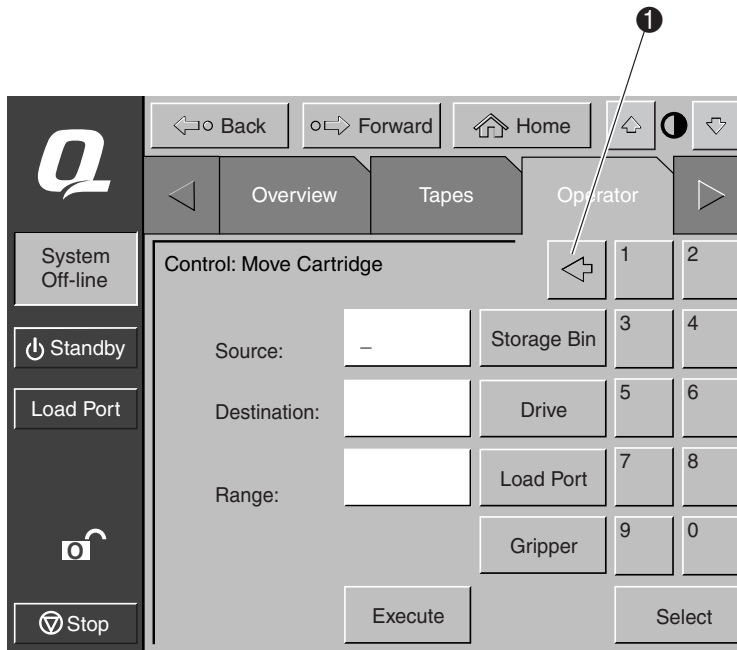


Figure 4-7. Control: Move Cartridge screen

NOTE: Use the **Backspace** button to erase a partial entry character-by-character (1 Figure 4-7).

2. Identify the source element of the cartridge:
 - a. Press the appropriate source element button (**Storage Bin, Tape Drive, Load Port, Gripper, or PTM**). When you press an element type, the Range box (below the Destination box) displays the range of addresses.
 - b. Using the keypad, enter the address of the source element and then press the **Select** button. The Source information is displayed in the Source box and the Destination box becomes active.
3. Identify the destination for the cartridge:
 - a. Press the appropriate destination element button (**Storage Bin, Tape Drive, Load Port, Gripper, or PTM**).
 - b. Using the keypad, enter the address of the destination element and then press the **Execute** button. The Destination box displays the destination information and the move is initiated.

The control panel displays a Command In Progress dialog box with an **Abort** button.

The MOVE CARTRIDGE command continues until completed unless you press the Abort button to stop the operation.

Unloading a Drive

The UNLOAD DRIVE command prepares a tape cartridge to be removed from a drive by rewinding and ejecting the cartridge. After unloading the drive, remove the tape cartridge using the MOVE CARTRIDGE command.

To unload a drive:

1. On the Operator screen, press the **Unload Drive** button. The control panel displays the Control: Unload Drive screen (see Figure 4-8).

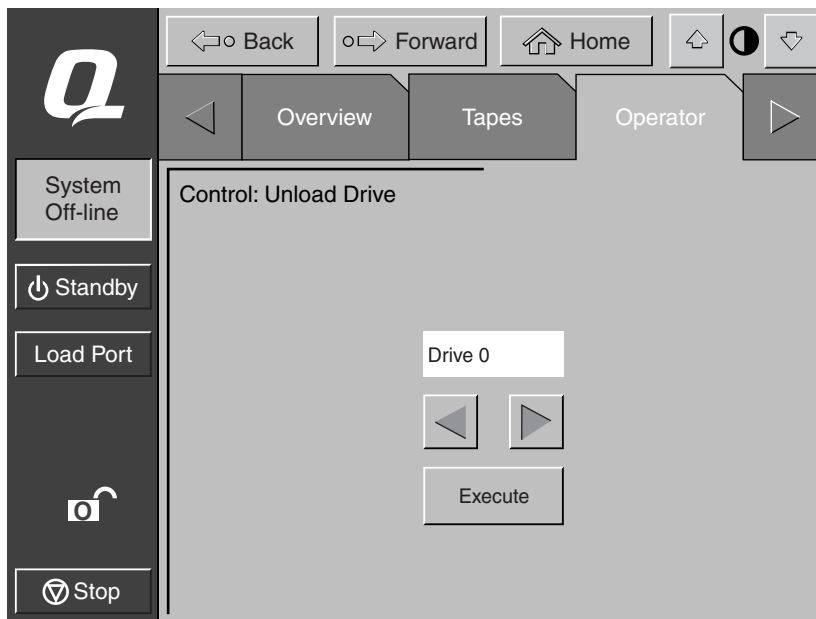


Figure 4-8. Control: Unload Drive screen

2. Use the arrow buttons to highlight the desired drive and then press **Execute**.

The control panel displays a Command In Progress dialog box.

The UNLOAD DRIVE command continues until completed unless you press the **Abort** button to stop the operation.

Unloading the Load Port

The UNLOAD IMP/EXP command moves a tape cartridge from the load port to an available storage bin. This option must be invoked after inserting a tape into the load port whenever the library Auto Load feature is disabled. See “Configuring Library Options” described earlier in this chapter.

NOTE: You can also use the MOVE CARTRIDGE command to unload the load port. The MOVE CARTRIDGE command is especially useful if the destination of the move is important. For more information about the MOVE CARTRIDGE command, see “Moving Cartridges” described earlier in this chapter.

To unload the load port:

1. On the Operator screen, press the **Unload Imp/Exp** button. The control panel displays a Command In Progress dialog box.
2. If it becomes necessary to stop the UNLOAD command, press the **Abort** button.

Chapter 5

Service Commands

This chapter describes the commands found on the Service screen of the library control panel. The Service screen commands initiate the following actions:

- Opening the Service screen
- Generating reports
- Testing the library
- Initializing nonvolatile information
- Changing passwords

Opening the Service Screen

To open the Service screen:

1. Press the Service tab. The control panel displays the password screen (see Figure 5-1).
2. Enter the correct service password to gain access to the Service screen (see Figure 5-2). The default service password is 5678.

NOTE: To change passwords, see “Changing Passwords” described later in this chapter.

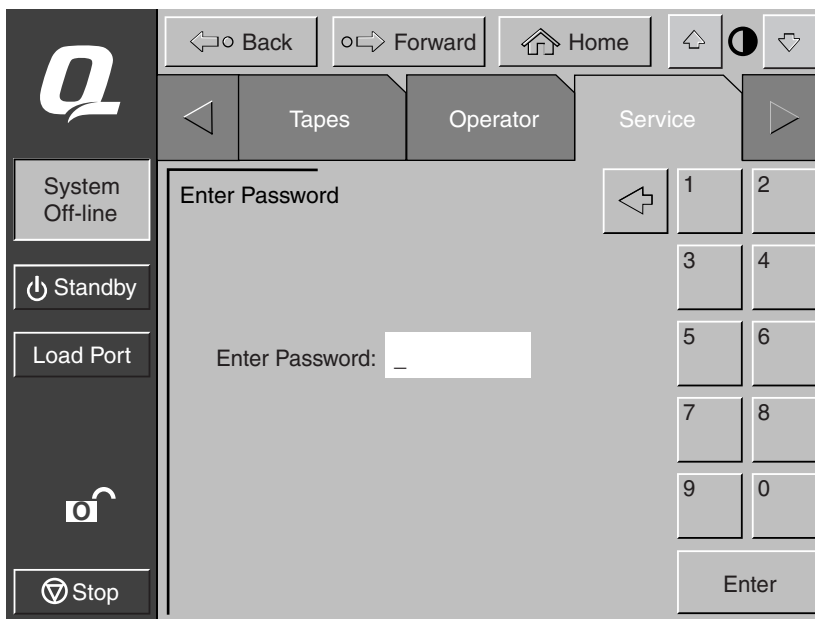


Figure 5-1. Enter Password screen

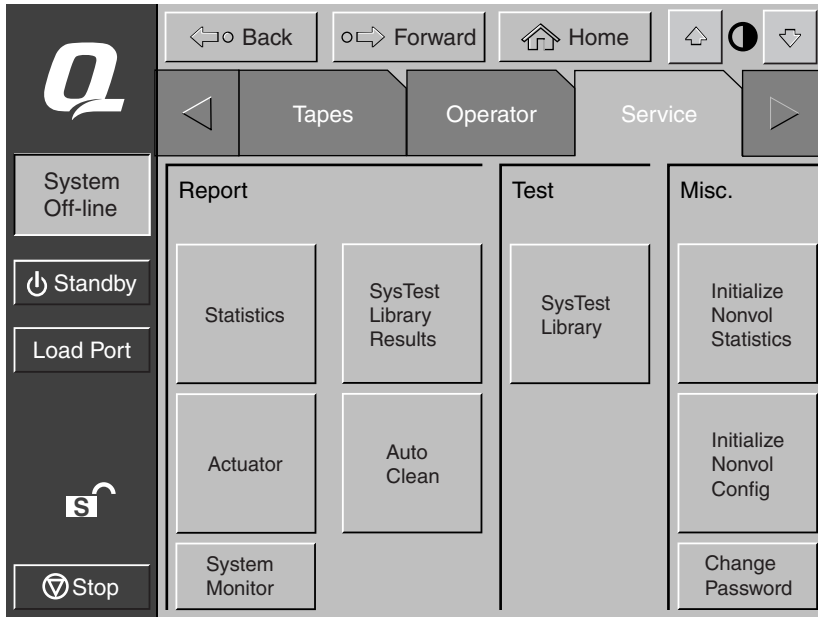


Figure 5-2. Service screen

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Figure 5-3 and Figure 5-4 show an overview of the Service screen.

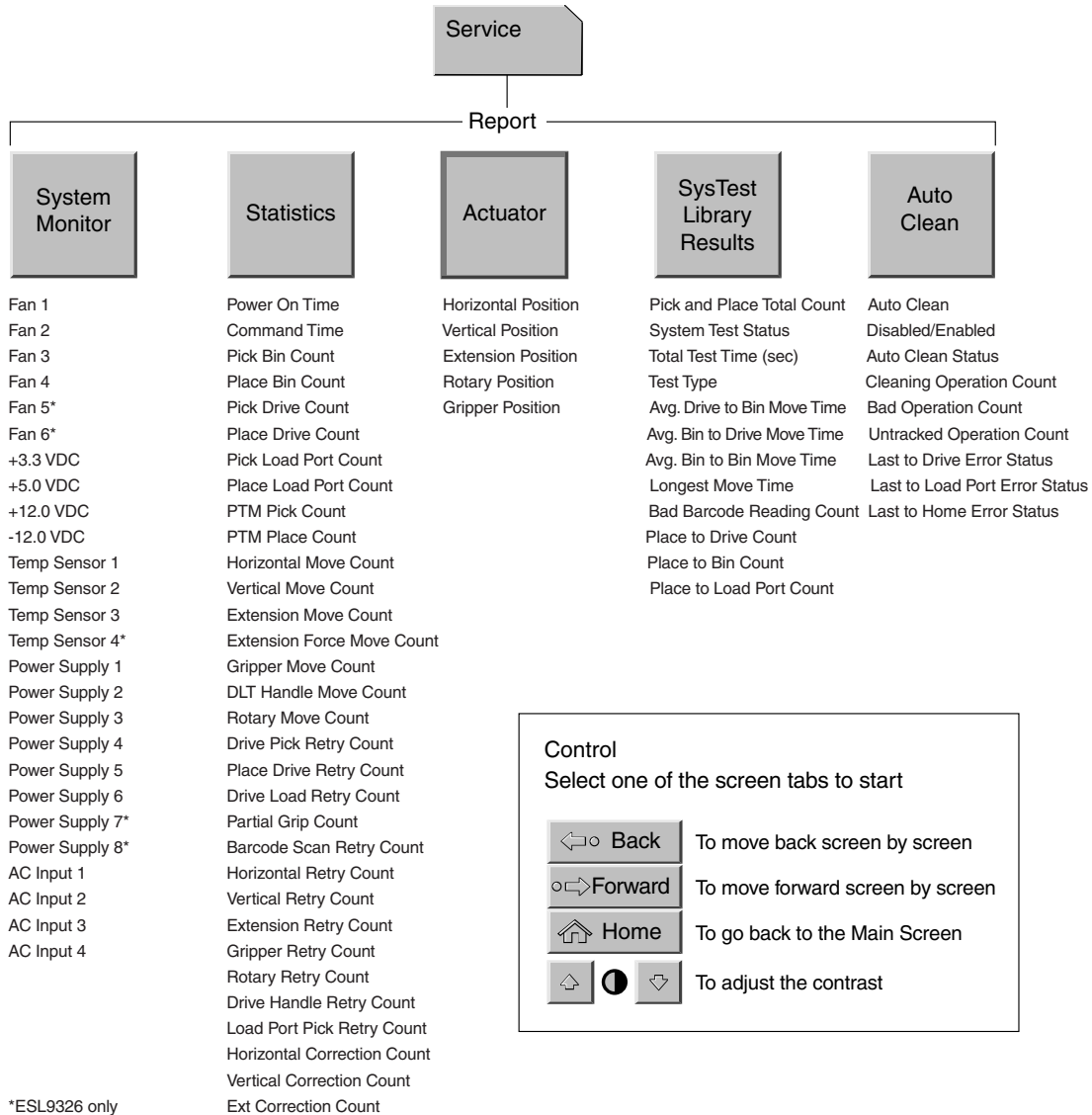
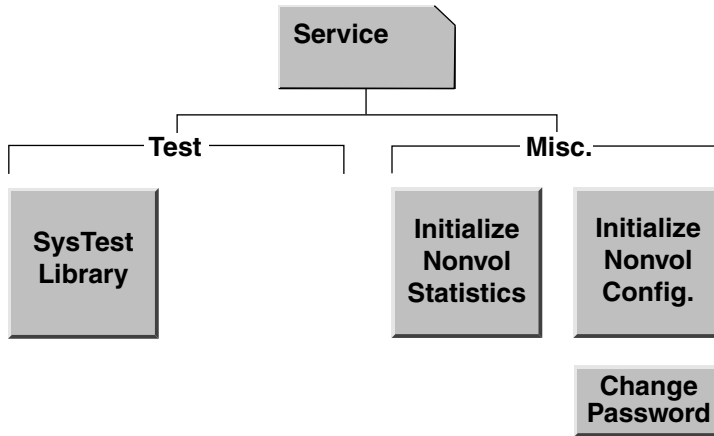


Figure 5-3. Control panel service screen (1 of 2)



Control
Select one of the screen tabs to start





 Back	To move back screen by screen
 Forward	To move forward screen by screen
 Home	To go back to the Main Screen
	To adjust the contrast

Figure 5-4. Control panel service screen (2 of 2)

Generating Reports

The Service screen lets you generate on-screen reports about the following:

- Library operation statistics
- Actuator positions and status
- System test results
- Auto clean status and tracking information

Generating Service Reports

Press the appropriate button on the Service screen. Within a few seconds, the control panel will display the requested report.

Statistics Report

Figure 5-5 shows a sample statistics report.

Press the **Update** button to update the report (otherwise the report will update periodically).

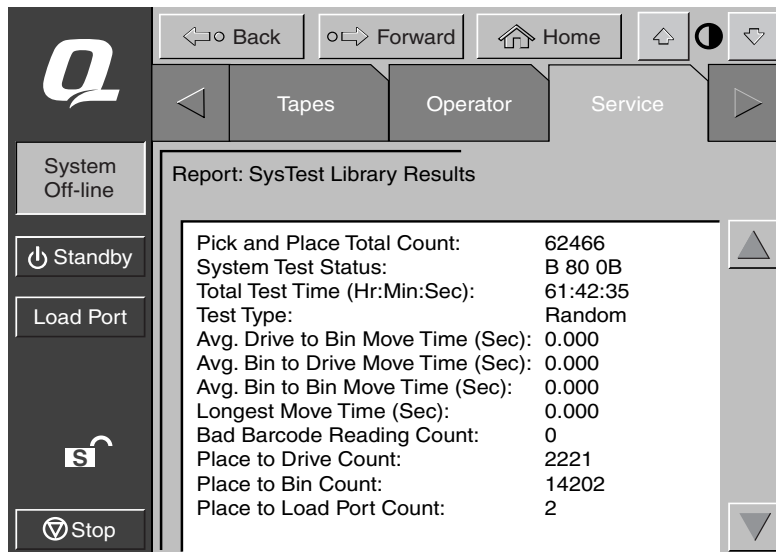


Figure 5-5. Report: Statistics screen

Actuator Report

Figure 5-6 shows a sample actuator status report.

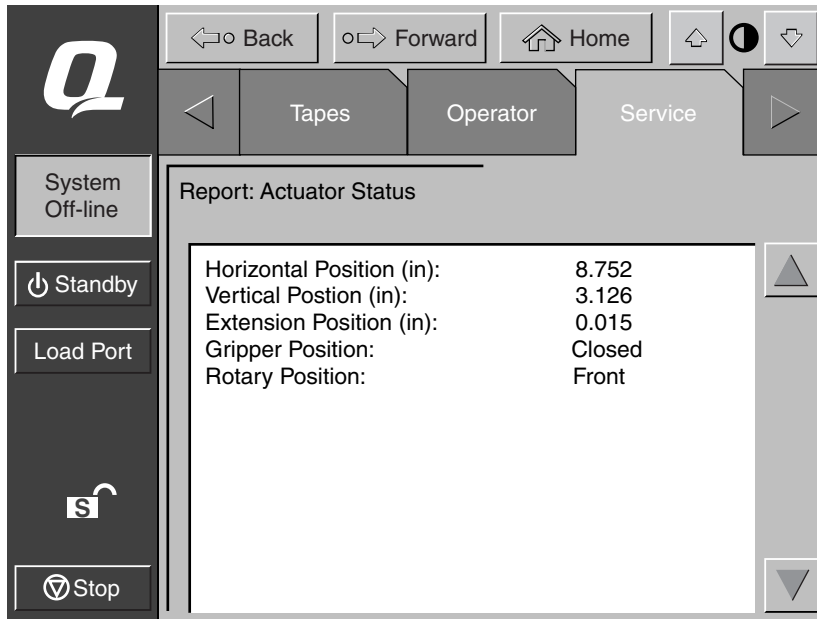


Figure 5-6. Report: Actuator Status screen

SysTest Report

Figure 5-7 shows a sample system test report.

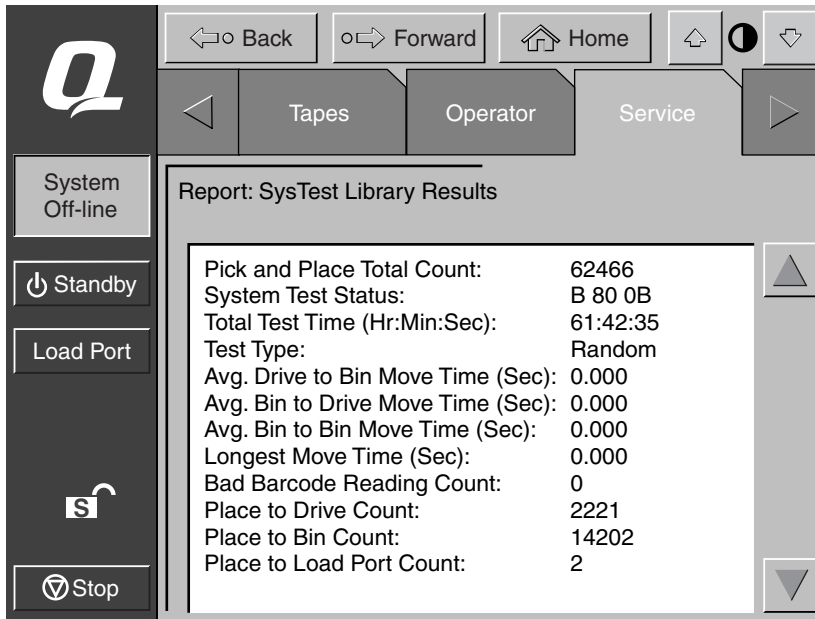


Figure 5-7. Report: SysTest Library Results screen

Auto Clean Report

Figure 5-8 shows a sample of the auto clean report.

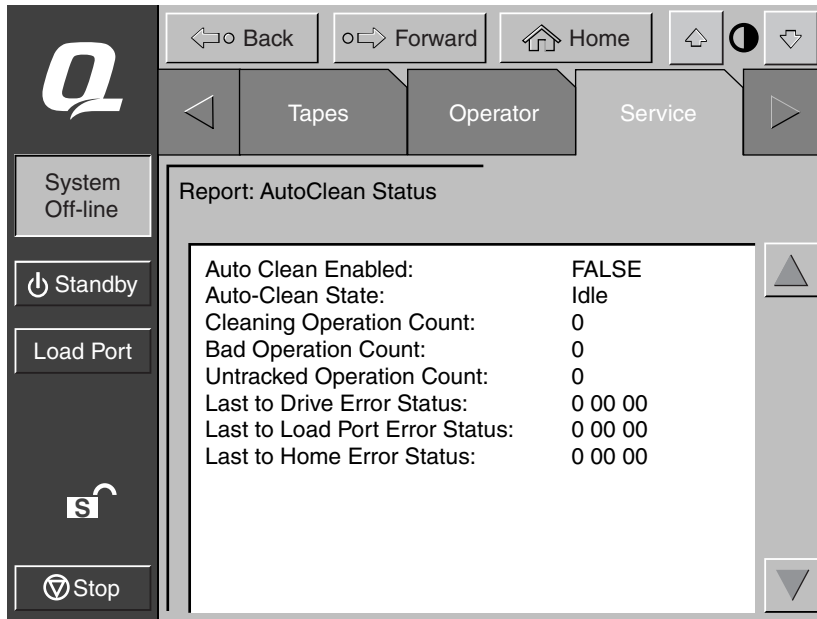


Figure 5-8. Report: Autoclean Status screen

When you have finished reviewing the report, press the **Back** button to return to the Service screen.

Testing the Library

The Service screen provides the following testing command:

SYS TEST LIBRARY—This command lets you test library operation by swapping tape cartridges between storage bins, drives, and load port.

NOTE: Do not perform this test if the cartridge position within the library is important. Cartridges are not returned to their original positions during this test.

Performing a System Test

To perform a system test:

1. On the Service screen, press the **SysTest Library** button. The control panel displays the Test: SysTest Library screen (see Figure 5-9).



Figure 5-9. Test: SysTest Library screen

2. Select one of the following system test options:
 - a. Swap Bins - test storage bins only
 - b. Swap Drives - test drives only
 - c. Swap Bins and Drives - test bins and drives
3. Select all desired test options as follows:
 - a. Random - swap cartridges at random
 - b. Barcode - read barcode as cartridges are swapped
 - c. Continuous - repeat test until aborted

NOTE: The **Continuous** button must be deselected to enter # of Runs.

4. When you have selected the type of test and all test options, press the **Execute** button. The control panel displays the Command In Progress dialog box. The system test continues until completed unless you press the **Abort** button. If you pressed the **Continuous** button in step 3, you must press the **Abort** button to stop the test.

Initializing Nonvolatile Information

The Service screen contains two commands involving information stored in nonvolatile memory:

- **INITIALIZE NONVOLATILE MEMORY CONFIGURATION**—returns the library configuration to its factory-default condition, eliminating any changes made using the **Configure Library** and **Configure Options** commands in the Service screen and invalidates the calibration data.
- **INITIALIZE NONVOLATILE MEMORY STATISTICS**—purges nonvolatile memory of all statistical information about library operation. This information is used to generate the statistical report described in “Generating Service Reports” earlier in this chapter.

Executing Either Command

To execute either command:

1. On the Service screen, press the button that corresponds to the command you want to execute. The control panel displays a dialog box prompting you to Continue or Cancel the command.
2. Press Continue. A “Command in Progress” dialog screen is displayed.

NOTE: If it becomes necessary to abort the command, press **Abort**.

Changing Passwords

This command lets you change a password. Valid passwords consist of four to eight numeric characters entered using the keypad in the Change Password screen.

To change a password:

1. On the Service screen, press the **Change Password** button. The control panel displays the Service: Change Password screen (see Figure 5-10).



Figure 5-10. Service: Change Password screen

2. Press the security level button that corresponds to the password you want to change.
3. Using the keypad, enter a new password and press the **Select** button. Asterisks representing password characters appear in the New Password text box.
4. Re-enter the password and press the **Select** button. Asterisks representing the password appear in the Reenter text box.

If you Lose a Password

If you lose the Operator, Import Only, or User password, you can replace the password by:

1. Opening the Service screen and following the steps to change the password.
2. Pressing the **Reset Passwords** button on the Change Password screen. This resets all passwords to their default values.

The default values are:

- Operator “1234”
- Multi Unit “1234”
- Service “5678”
- User “2222”
- Import Only “1111”

If you lose the Service password (and cannot access the Change Password screen), contact your Compaq service representative for assistance.

Chapter 6

Maintenance and Troubleshooting

This chapter provides troubleshooting and maintenance information for the Compaq StorageWorks ESL9000 Series Tape Library. Sections in this chapter include:

- Common problems and solutions
- DLT tape drive cleaning:
 - Cleaning the DLT tape drive heads
 - Preserving DLT tape cartridges
- SDLT tape cartridge handling and storage

Common Problems and Solutions

This section describes problems you might encounter during the setup and operation of the Compaq StorageWorks ESL9000 Series Tape Library. Corrective information is provided to help you resolve the problems.

Several of these problems produce error messages on the control panel called *sense data values*. Sense data value messages consist of a number and a description of the error. For a complete list of sense data values, see Appendix A, “Characteristics and Specifications.”

The troubleshooting information in this section contains the following topics:

- Start-up problems
- Control panel problems
- Robotics problems
- Operating problems
- Tape drive problems

Start-Up Problems

Table 6-1 lists corrective actions for problems that occur during start-up.

Table 6-1 Start-Up Problems	
Problem	Corrective Action
The library does not power on.	Make sure the power cord is connected to a grounded electrical outlet, the power distribution assembly (left rear corner of cabinet) circuit breaker is on, and the power switch behind the slide panel just below the control panel is on.
The library or tape drives do not respond on the SCSI bus.	Make sure each SCSI device on the same SCSI bus has a unique address and the last device is properly terminated.
During initialization, the library reports "Not Ready."	Determine the failure type by checking any previous error codes returned to the host computer. Correct the cause of the error.
One or more tape drives fail to spin up during start-up.	Check all SCSI cabling and termination behind the center rear access door. If necessary, contact your Compaq service representative about replacing the drives.
The library starts up in standby mode.	Press the Standby button to verify that the library switches to on-line mode. You can use the control panel to select either on-line or standby mode at power up.

Control Panel Problems

Table 6-2 lists corrective actions for control panel problems.

Table 6-2 Control Panel Problems	
Problem	Corrective Action
The control panel is blank.	Confirm that power is on, then contact your Compaq service representative.
The control panel does not respond to touch.	Contact your Compaq service representative.
An error message appears.	Write down the details of the error message, including the SK, ASC, and ASCQ numeric values. Press OK to clear the message. See Appendix A, "Characteristics and Specifications," for instructions about resolving the error.

Robotics Problems

Table 6-3 lists corrective actions for robotics problems.

Table 6-3 Robotics Problems	
Problem	Corrective Action
The robot does not move at power up.	<p>Make sure that all internal packing materials (foam pads and tie wraps) have been removed.</p> <p>Check the Stop and Standby buttons; make sure the library is on-line and the Stop button is disabled.</p>
The gripper partially grips a tape cartridge.	Issue a MOVE CARTRIDGE command to move the cartridge from the gripper to an empty storage bin.
The barcode reader on the gripper fails.	<p>Verify that nothing obstructs the reader.</p> <p>Restart the library. If the problem continues, contact your Compaq service representative.</p>
The robot times out or fails during an operation.	<p>Check that the tape cartridge involved in the operation is properly positioned in the bin or drive and ready to be picked.</p> <p>Check that the robot is not obstructed in any way.</p> <p>Retry the operation. If it still fails, contact your Compaq service representative.</p>
The robot drops a cartridge.	<p>Open the front door.</p> <p>Retrieve the cartridge, orient it properly, and place the cartridge in an empty storage bin. (Do not try to place the cartridge in the gripper.)</p> <p>Perform an inventory following the instructions in Chapter 4, "Operator Commands."</p> <p>If a cartridge is manually placed in an empty bin, make sure you run an inventory so the library records the position of the manually placed cartridge.</p>
A cartridge is in the gripper at start-up, when a MOVE command is requested, or after a PLACE command is executed.	<p>Open the front door.</p> <p>Manually remove the cartridge from the gripper and place it in an empty bin.</p> <p>Perform an inventory following the instructions in Chapter 4, "Operator Commands."</p> <p>If a cartridge is manually placed in an empty bin, make sure you run an inventory so the library records the position of the manually placed cartridge.</p>

Table 6-3 Robotics Problems

Problem	Corrective Action
The gripper does not have a cartridge after completing a pick command.	Make sure there is a cartridge in the source location. Retry the command. If the pick operation fails again, contact your Compaq service representative.

Operating Problems

Table 6-4 lists corrective actions for problems that occur during library operation.

Table 6-4 Operating Problems

Problem	Corrective Action
The host computer cannot communicate with the library.	This might be a SCSI bus time-out or a premature disconnect problem. Check cable connections, cable length, SCSI addresses, and termination. Restart the host and the library. If the host and library still are not communicating, contact your Compaq service representative.
A cable or terminator is disconnected from the SCSI bulkhead.	Reconnect the cable or terminator according to the guidelines found in Chapter 2, "SCSI Cable Configurations."
A tape cartridge (medium) is reported not present.	This indicates that the gripper could not sense a tape cartridge in a particular storage bin even though the inventory reports that it is present. Check to see if the designated cartridge is present. If it is, make sure it is properly seated. (For a tape drive, make sure the cartridge is completely unloaded.) Then retry the command. If the error persists, contact your Compaq service representative.
A MOVE command failed.	Check the source and destination bins. The source bin should hold the cartridge to be moved; the destination bin should be empty. Make sure the gripper is empty and all actuators are free of obstruction. Also, make sure the library is on-line and the Stop button is released. Retry the command.
A flash memory error is reported.	Contact your Compaq service representative.

Table 6-4 Operating Problems

Problem	Corrective Action
A maximum temperature exceeded warning appears.	<p>Make sure the three fan units are operational; the Normal LEDs should be lit. Also check temperatures and fan speed using the control panel System Monitor functions.</p> <p>Ensure that there are no obstructions to the air flow at the fan inlet or exhaust. Also make sure that the rear doors are closed.</p> <p>Turn off the library and allow it to cool down. Lower the room temperature, if possible, and increase ventilation around the library.</p> <p>(If the operating temperature is too high, the library will automatically shut down until the temperature drops.)</p>

DLT Tape Drive Problems

Table 6-5 lists corrective actions for DLT tape drive problems.

Table 6-5 DLT Tape Drive Problems

Problem	Corrective Action
The library is unable to communicate with a drive.	This is indicated by a Drive Communication Time-out error. Contact your Compaq service representative.
The tape drive does not eject a cartridge.	<p>Reset the tape drive using the Diagnostic Software's Align/ Calibrate menu and retry the UNLOAD command.</p> <p>Refer to the <i>Compaq StorageWorks ESL9000 Series Tape Library Maintenance and Service Guide</i> for further instructions.</p> <p>If the tape still does not unload, stop the library, open the front door, and manually unload and eject the cartridge. See Chapter 3 "Basic Library Operations" for further instructions.</p>
A drive handle error occurs.	Contact your Compaq service representative.

SDLT Tape Drive Problems

Table 6-6 lists corrective actions for SDLT tape drive problems.

Table 6-6 DLT Tape Drive Problems	
Problem	Corrective Action
The library does not recognize the SDLT tape drive.	<p>Make sure all SCSI cabling is properly connected.</p> <p>Make sure the SCSI ID is correct.</p> <p>If the problem persists, contact your Compaq service representative.</p>
The SDLT tape drive does not power up.	<p>With the SDLT tape drive powered off, check all power connections.</p> <p>Make sure the correct number of drives is specified in the library's configuration.</p> <p>If the problem persists, contact your Compaq service representative.</p>
The amber LED is on.	<p>Try to unload the tape cartridge and then reinitialize the tape drive by turning the drive power off and then back on. The green LED should flash. If reinitializing is successful, the LEDs light steadily again and then go off.</p> <p>If the problem persists, contact your Compaq service representative.</p>
Fatal or nonfatal errors occur. The cause cannot be determined.	<p>Make sure all SCSI cabling is properly connected.</p> <p>Make sure the SCSI ID is correct.</p> <p>If the problem persists, contact your Compaq service representative.</p>

DLT Tape Drive Interface LED Problems (ESL9198DLX, ESL9198SL, ESL9326SL)

Table 6-7 lists the corrective actions for tape drive interface LED problems. Refer to Figure 1-9 for LED locations.

Table 6-7 DLT Tape Drive Interface LED Problems (ESL9198DLX)			
Red Led	Green Led	Condition	Action Required
ON	ON	Reserved condition.	Contact your Compaq service representative.
ON	Flashing	Reserved condition.	Contact your Compaq service representative.
ON	OFF	Drive power fail.	Toggle the hot-plug tape drive switch to clear the condition. If this is unsuccessful, contact your Compaq service representative.
OFF	ON	GOOD	None required
OFF	FLASHING	SCSI bus incompatible components.	This indicates a LVD/HVD incompatibility. Make sure all components are LVD.
OFF	OFF	No power to tape drive interface.	Make sure the hot-plug tape drive switch is on. Reset the tape drive. Make sure the library is powered on and the correct number of tape drives are configured.
FLASHING	ON	Drive unhealthy	Make sure the drive leader is in place and then reseal the tape drive. If problem persists, contact your Compaq service representative.
FLASHING	FLASHING	Drive inserted, in the process of becoming ready.	This is normal after the library or tape drive power is turned on for a short period of time. If the problem persists, contact your Compaq service representative.
FLASHING	OFF	Microbridge incompatibility.	Contact your Compaq service representative.

DLT Tape Drive Cleaning

Follow these guidelines for instructions on using the cleaning cartridge to clean the DLT tape drive heads (see Table 6-8).

- Under normal conditions, the cleaning cartridge is effective for about 20 cleanings. If the cleaning cartridge has been overused, the Use Cleaning Tape LED will remain lit after you load the cleaning cartridge and no cleaning action will take place. When this happens, use another cleaning tape.
- DLT tapes do not usually need regular cleaning, as their design allows for minimal head contamination. The action of loading and using any tape tends to clean the heads of the tape drive.
- Use the cleaning tape no more than once every two weeks (or after 50 hours of continuous tape use).
- When the Use Cleaning Tape LED lights, take note of the tape in use at the time. This tape may be causing head contamination. Try another tape before using the cleaning tape to see whether the Use Cleaning Tape LED stays on.
- Use the cleaning tape more than once if a tape has severely contaminated the drive heads. If the problem persists after two cleanings, contact your Compaq service representative.

IMPORTANT: SDLT drives do not require cleaning. Do not use a cleaning tape in an SDLT drive.

Table 6-8 DLT Tape Cartridge Cleaning Guidelines

Problem	Cause	Solution
The Use Cleaning Tape LED lights.	The drive heads need cleaning or the tape is defective.	Use the cleaning cartridge. The cleaning operation begins automatically as soon as the cartridge insert/release handle is closed. When cleaning completes, the tape automatically unloads and the Operate Handle LED lights.
A particular cartridge causes the Use Cleaning Tape LED to turn on frequently.	The data cartridge may be defective.	Back up this data to another cartridge, then discard the old cartridge. A damaged cartridge may cause unnecessary use of the cleaning cartridge.
The Use Cleaning Tape LED turns on after you clean the drive heads and reload your data cartridge.	Your data cartridge may be the problem.	Try a different cartridge.
The Use Cleaning Tape LED is still on after approximately five minutes and the Tape In Use LED is lit.	Cleaning has not been done and the cleaning cartridge has expired.	Replace the cleaning cartridge with a new one.

Cleaning the DLT Tape Drive Heads

The DLT tape drive heads physically read and write data to and from the tape cartridge. Under normal conditions, the heads require cleaning only when the Use Cleaning Tape LED indicates that it is required.

IMPORTANT: Never attempt to clean the heads in a manner other than described in the following procedure. Doing so can void the product warranty.

To clean the heads:

1. Apply power to the tape drive and wait for the green Operate Handle LED to light.
2. Raise the cartridge insert/release handle and insert the cleaning cartridge into the drive, then lower the handle.
3. The drive automatically executes the head-cleaning operation, which takes anywhere from one to five minutes depending on the number of times the tape has been used. When the cleaning cartridge completes this task, the green Operate Handle LED lights.
4. Remove the cleaning cartridge.
5. Mark the frequency-of-use label on the cleaning cartridge, placing a check mark in the next available square on the card each time you use the cleaning cartridge.



CAUTION: Remove the cleaning cartridge as soon as possible following completion of the cleaning operation. Leaving a cleaning cartridge in the drive can result in redundant cleaning operations each time power to the tape drive is turned off and on, resulting in unnecessary wear on the tape drive's read/write heads.

Preserving DLT Tape Cartridges

To preserve the life of DLT tape cartridges, follow these guidelines for proper care and handling:

- Do not drop or bang the tape cartridge. This can displace the tape leader, making the cartridge unusable and possibly hazardous to the tape drive.
- Store cartridges in a dust-free environment with a temperature of between 50°F to 104°F (10°C and 40°C) and a relative humidity of between 20% and 80%. For longer life, store the cartridges in their plastic containers at room temperature (72°F ±7°F or 22°C ±4°C) in a relative humidity of 40% ±20%.
- Keep cartridges out of direct sunlight and away from any type of heat source and electromagnetic interference. If a cartridge is exposed to extremes of heat or cold, stabilize the cartridge at room temperature for the same amount of time it was exposed (up to 24 hours).
- Follow guidelines provided by the tape cartridge manufacturer.

SDLT Tape Cartridge Handling and Storage

For longer life of recorded or unrecorded tape cartridges:

- Store tape cartridges in a clean environment.
- Use tape cartridges in temperatures between 50°F to 104°F (10°C and 40°C).
- If a tape cartridge has been exposed to extreme heat or cold, stabilize the tape cartridge at room temperature for the same amount of time it was exposed for up to 24 hours.
- Do not place tape cartridges near electromagnetic interference sources, such as terminals, motors, and video or X-ray equipment. Doing so may cause data on the tape cartridge to be altered.
- Store tape cartridges in a dust-free environment where the relative humidity is between 20 percent and 80 percent. For longer tape cartridge life, store the tape cartridge at 40 percent to 60 percent relative humidity.

If a tape cartridge is dropped or damage is suspected, gently shake the tape cartridge:

- If it rattles, it is damaged. Restore the data on the tape cartridge by some means other than by using the SDLT 110/220 tape drive, and discard the damaged tape cartridge.
- If it doesn't rattle, check the tape leader inside the cartridge. To do this, open the door on the rear of the tape cartridge by releasing the door lock. The tape leader should be visible at the top-left of the tape cartridge.

Refer to the *Compaq SDLT 110/220 Drive Reference Guide* for more information.

Appendix **A**

Characteristics and Specifications

This appendix lists characteristics and specifications of the Compaq StorageWorks ESL9000 Series Tape Library. These characteristics and specifications are categorized as follows:

- Physical characteristics
- Performance characteristics
- Environmental specifications

NOTE: For tape drive specifications see the appropriate tape drive product manual.

Physical Characteristics

Table A-1 lists dimensions and other physical characteristics of the library.

Table A-1 Physical Characteristics		
Description	Specifications ESL9198	Specifications ESL9326
Width	36 in (91.4 cm)	57 in (145 cm)
Depth	29 in (74 cm)	29 in (74 cm)
Footprint	7.25 sq ft (0.673 sq m)	29 in x 57 in (74 cm x 145 cm)
Height	75 in (191 cm)	75 in (191 cm)
Weight	985 lb (447 kg)	1300 lb (589 kg)
	8 drive configuration without cartridges Crated: 1220 pounds (553 kg)	16 drive configuration without cartridges Crated: 1650 pounds (748 kg)
Maximum tape drives	Up to 8	Up to 16
Maximum tape cartridges	0 through 198	0 through 326
Drive type	DLT 8000 (ESL9198DLX) SDLT 110/220 (ESL9198SL)	TZ89N-AV (ESL9326D) DLT8000 (ESL9326DX) SDLT 110/220 (ESL9326SL)
SCSI bus type	Low Voltage Differential	Low Voltage Differential
Host to library interface software	SCSI-2 medium changer command set	SCSI-2 medium changer command set
Power cord	2 standard, US, IEC 320 C19 male connector rated at 125 VAC (NEMA 5-20P connector included)	
Host to tape drive interface software	SCSI-2	SCSI-2
Library diagnostics	RS-232C service port for connecting to a field service computer.	RS-232C service port for connecting to a field service computer.

Performance Characteristics

Table A-2 lists the performance characteristics of the library.

Table A-2 Performance Characteristics	
Description	Specification
Average swap time	22 seconds, consisting of two MOVE MEDIUM commands
Inventory	Less than 6 minutes, fully loaded with labeled cartridges
MTBF	250,000 power-on hours
MSBF	1 million load/unload cycles
MTTR	Less than 30 minutes

Environmental Specifications

Table A-3 lists the power-environmental and mechanical-environmental specifications of the library.

Table A-3 Environmental Specifications		
Description	Specification	
Electrical inputs	Voltage	90 VAC to 264 VAC
	Frequency	47 Hz to 63 Hz
	Power consumption	VA max 1600 W, 1200W (ESL9198)
	Electrical connection to power	IEC 320 C19 male connector inside rear door
Operating temperature	Dry bulb	59 to 90 F (15 to 32 C)
	Wet bulb	77 F (25 C) max
	Thermal transition	18 F (11 C) per hour
Shipping and storage temperature	Dry bulb	-40 to 151 F (-40 to 66 C)
	Wet bulb	115 F (46 C) max
	Thermal transition	54 F (30 C) per hour
Relative humidity	Operating	20% to 80% non-condensing
	Shipping and storage	5% to 95% non-condensing
Altitude	Operating	Sea level to 10,000 ft (3,048 m)
	Shipping and storage	Sea level to 12,000 ft (3,657 m)

Table A-3 Environmental Specifications (Continued)

Description	Specification	
Heat dissipation	Operating	5500 BTU/hr (1400 KCal/hr or 1600 W) for ESL9326 4125 BTU/hr (1050 KCal or 1200 W) for ESL9198
Direct Electrostatic Discharge (ESD)	Contact discharge	@ 2.0, 4.0, 6.0, 8.0 kV to all external metal panels and doors
	Air discharge	@ 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 15.0 kV to the front control panel display
RF radiated emissions (per CISPR 22: 1993 + A1: 1995 + A2: 1996)	30 MHz to 230 MHz @ 40 dBuV/m (quasi-peak limit)	
	230 MHz to 1000 MHz @ 47 dBuV/m (quasi-peak limit)	
RF conductive emissions (per CISPR 22: 1993 + A1: 1995 + A2: 1996)	0.15 MHz to 0.50 MHz @ 66 dBuV/m (quasi-peak limit)	
	0.50 MHz to 30 MHz @ 60 dBuV/m (quasi-peak limit)	
Harmonic current emissions (per EN 61000-3-2: 1995)	Class A	
Voltage fluctuations and flicker (per EN 61000-3-3: 1994)	Conforms to EN standard	
Direct ESD (per EN 61000-4-2: 1995)	Contact discharge	@ +/- 2.0, 4.0 kV to conductive surfaces
	Air discharge	@ 2.0, 4.0, 8.0 kV to non-conductive surfaces
Radiated fields (per EN 61000-4-3: 1995)	80% AM modulation	1 kHz from 80 MHz to 1000 MHz
Radiated fields (per ENV50204: 1996)	Pulse modulation	200 MHz from 895 MHz to 905 MHz
Electric fast transients (per EN 61000-4-4: 1994)	Data cables	+/- 0.5 kV
	Power cables	+/- 0.5, 1.0, kV
Power line surge (per EN 61000-4-5: 1994)	Common mode coupling	+/- 0.5, 1.0, 1.5, 2.0 kV
	Differential mode coupling	+/- 0.5, 1.0, kV
Conductive fields	Data cables and power lines	80% AM modulation, 1 kHz from 0.15 MHz to 80 MHz

Table A-3 Environmental Specifications (Continued)

Description	Specification	
Power frequency magnetic field (per EN 61000-4-8: 1993)	3 A/m @ 50 Hz	
Voltage dips and interruptions (per EN 61000-4-11: 1994)	30% power line reduction, 60% power line reduction, 100% power line reduction	
Acoustical noise (sound power level)	Operating	8.10 Bel
	Idle	7.63 Bel
Acoustical noise (pressure @ bystander)	Operating	63 dB

CHM/Gripper Assembly

The gripper assembly includes a Class II laser bar code scanner that reads standard six to eight character, 3 of 9 bar code labels. The scanner is used to maintain an inventory of the tape cartridges within the library. For example, an inventory occurs automatically whenever the library is turned on or after the bulk load door has been closed. An inventory can also be initiated manually from the host computer.

Sense Data Values

Table A-4 lists message information that can be sent from the library to a host computer. The table is sorted by the data in the Additional Sense Code (ASC) column and lists the following information:

- Sense key
- ASC
- Additional Sense Code Qualifier (ASCQ)
- Message name, description, and (potential) recovery action
- Valid interfaces
 - SCSI (host computer)
 - DIAG (diagnostic port/computer)
 - Both = SCSI and DIAG port

The message name and description might contain abbreviations as follows:

- Logical Unit (LU)
- Required (REQ'D)
- Device (DEV)
- Diagnostics (DIAG)
- Nonvolatile RAM (NVRAM)
- Analog-to-Digital (A/D)

Table A-4 Sense Data Values (Hexadecimal)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
0	00	00	NO ADDITIONAL SENSE INFORMATION No recovery necessary.	Both
B	00	00	SCSI ABORT Command aborted because host sent SCSI Abort Message.	SCSI
2	04	00	LU IS NOT READY, CAUSE NOT REPORTABLE Check library power. Retry command.	Both
2	04	01	LOGICAL UNIT IN PROCESS OF BECOMING READY Wait for library to complete initialization.	Both
2	04	02	LOGICAL UNIT INIT REQUIRED Element status or calibration unknown. Perform INITIALIZE ELEMENT STATUS command (SCSI) or INITIALIZE INVENTORY command (DIAG)	Both
2	04	03	LU IS NOT READY, MANUAL INTERVENTION REQ'D Initialization failed. Determine failure type by checking any previous error code returned to host. Correct the cause of the failure and toggle Standby button.	Both
0B	08	00	LOGICAL UNIT COMMUNICATION FAILURE Check cables. Ensure library is turned on. Retry command.	SCSI

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
0B	08	01	LIBRARY COMMUNICATION TIME-OUT ER_LU_COM_TO QSPI communications not responding. Retry command.	Both
5	1A	00	PARAMETER LIST LENGTH ERROR Invalid parameter list length field specified by command.	SCSI
5	20	00	INVALID COMMAND OPERATION CODE Verify the host command format.	SCSI
5	21	01	INVALID ELEMENT ADDRESS Check Mode Sense data for correct element addresses.	SCSI
5	24	00	INVALID FIELD IN COMMAND DATA BLOCK Ensure all reserve fields are set to zero.	SCSI
5	25	00	LOGICAL UNIT IS NOT SUPPORTED Verify the logical unit field specified in the command contains a legitimate logical unit number. Check cabling to logical unit.	SCSI
5	26	00	INVALID FIELD IN PARAMETER LIST Verify Mode Select page fields. Verify that fields comply with the command format described in this guide.	SCSI
5	26	02	PARAMETER VALUE INVALID Verify Mode Select page fields. Verify that fields comply with the command format described in this guide. This response will also be returned for commands issued to the diagnostic interface of the library if an invalid parameter is sent.	Both
6	28	01	IMPORT OR EXPORT ELEMENT ACCESSED Load port door has been closed.	Both
6	29	00	POWER-ON, OR BUS DEVICE RESET OCCURRED Informational message. If power on occurs, the host user should assume the inventory might have been corrupted, and should ask the library for that information again.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
6	29	01	POWER-ON OCCURRED Informational message	Both
6	29	02	SCSI BUS RESET OCCURRED Informational message	Both
6	29	03	BUS DEVICE RESET OCCURRED Informational message	Both
6	29	04	INTERNAL DEVICE RESET OCCURRED Informational message	Both
6	2A	01	MODE PARAMETERS CHANGED Mode parameters might have changed due to another host issuing a MODE SELECT command.	Both
0B	30	00	INCOMPATIBLE MEDIA An attempt was made to move media to a destination element that is incapable of receiving it.	Both
-none- OR 5	30	03	CLEANING CARTRIDGE INSTALLED Indicates that the element contains a cleaning cartridge that is not used-up. This is returned with the element status data, which has no sense key. A cleaning cartridge cannot be removed from a drive because it is being used in a cleaning operation. A cartridge cannot be placed into the drive because the drive is being cleaned. A cartridge cannot be placed into an empty storage element because it is reserved for a cleaning cartridge that is currently in use in a drive cleaning operation.	SCSI Both
5	39	00	SAVING PARAMETERS NOT SUPPORTED Verify Save Parameter field in the MODE SENSE command complies with the command format described in this guide.	SCSI

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	3A	00	MEDIUM NOT PRESENT The inventory indicated that a cartridge was in this bin but no cartridge was sensed by the gripper when it attempted to pick it. Retry the command. Check for proper seating of the cartridge. It might also indicate that the tape is not ready to be picked from the drive because the tape is not fully unloaded. Retry the command. If the problem persists, check the function of the tape drive handle assembly. Manually unload the tape.	Both
5	3B	0D	MEDIUM DESTINATION ELEMENT FULL Destination element address already contains a cartridge. Issue a READ ELEMENT STATUS command and retry MOVE command. If the problem recurs, issue an INITIALIZE ELEMENT STATUS command followed by a READ ELEMENT STATUS command and retry MOVE MEDIUM command.	Both
5	3B	0E	MEDIUM SOURCE ELEMENT EMPTY Source element address does not contain a cartridge. Issue a READ ELEMENT STATUS command and retry MOVE command. If the problem recurs, issue an INITIALIZE ELEMENT STATUS command followed by a READ ELEMENT STATUS command and retry the MOVE MEDIUM command.	Both
B	43	00	SCSI MESSAGE ERROR Detected message error in message processing on the SCSI bus.	SCSI
B	45	00	SELECT OR RE-SELECT FAILURE Library timed out trying to reselect host. Make sure host is running.	SCSI
B	47	00	SCSI PARITY ERROR SCSI Parity Error detected. Check cable connections and cable length.	SCSI

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
B	48	00	INITIATOR DETECTED ERROR Initiator Detected Error Message was received from the host.	SCSI
5	4E	00	OVERLAPPED COMMANDS ATTEMPTED Due to a second command being sent from the same host before a previous command has completed, the previous command has been aborted. This can also occur when executing off-line commands via the control panel and DIAG port simultaneously.	Both
5	53	02	MEDIUM REMOVAL PREVENTED PREVENT MEDIUM REMOVAL command was executed and command was received to export cartridge. Execute ALLOW MEDIUM REMOVAL command and retry MOVE MEDIUM command.	SCSI
6	54	00	SCSI TO HOST SYSTEM INTERFACE FAILURE Possible SCSI bus time-out or premature disconnect. Check cable connections and cable length.	Both
2	5A	01	OPERATOR MEDIUM REMOVAL REQUEST Indicates that the element contains a cleaning cartridge that is used-up and the library is unable to export the cleaning cartridge. Manually unload the tape. The load port door is open, so import/export elements can not be accessed.	Both
2	80	00	DOOR IS OPENED INVENTORY MAY HAVE BEEN CORRUPTED Close door and retry command. If the library is on-line, it executes its initialization procedure.	Both
6	80	00	DOOR WAS OPENED INVENTORY MAY HAVE BEEN CORRUPTED Close door and retry command.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
-none-	80	01	DRIVE REQUIRES CLEANING Tape drive indicates that drive needs cleaning. Clean the tape drive. This is returned with element status data, which has no sense key.	SCSI
5	80	01	TRANSFER FULL - COMMAND CAN NOT BE EXECUTED Gripper has cartridge in it. Move cartridge to empty storage element using MOVE MEDIUM command. Retry command.	Both
B	80	01	TRANSFER FULL - AT END OF PLACE Gripper has cartridge in it at end of a place operation (Move Medium with a target other than the Transfer). Move cartridge to empty storage element using MOVE MEDIUM command. Retry command.	Both
B	80	06	TRANSFER EMPTY - COMMAND ABORTED Gripper does not contain cartridge at end of pick portion of MOVE MEDIUM command.	Both
2	80	07	SYSTEM IS STOPPED (BUTTON IS CURRENTLY PUSHED) The Stop button on the control panel was pressed. Press the Stop button.	Both
6	80	07	SYSTEM STOP BUTTON WAS PRESSED (MAY CURRENTLY BE PRESSED) The Stop button on the control panel was pressed. Press the Stop button. Retry command.	Both
6	80	08	LOGICAL UNIT TURNED ON-LINE The library is ready to communicate with the host computer. Press the Standby button on the control panel to take the library off-line.	DIAG
2	80	09	LOGICAL UNIT IS TURNED OFF-LINE The library is ready to communicate with the diagnostic PC. Press the Standby button on the control panel to place the library on-line.	SCSI
6	80	09	LOGICAL UNIT STANDBY BUTTON WAS PRESSED Retry command.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	80	0A	NVRAM CHECKSUM FAILURE Nonvolatile RAM contents are corrupted. Use the diagnostic software to initialize nonvolatile RAM and calibrate library.	Both
B	80	0B	COMMAND ABORTED BY USER Informational message. No action is necessary.	Both
B	80	0D	CARTRIDGE IS ONLY PARTIALLY GRIPPED (ONLY SEEN IN THE FRONT SENSOR). Issue a MOVE MEDIUM command to move the cartridge from the transfer element to an empty storage element.	Both
6	80	0E	DATA TRANSFER CHANGED A drive has been inserted into the library. Use Read Element Status to determine status of drives.	Both
4	80	0F	LOW POWER ERROR Check power connections.	Both
B	80	10	LOAD RETRY FAILED Library was unable to successfully load the drive, even after retries. Check drive alignment. If the problem continues, drive might need servicing.	Both
4	80	11	MOTOR POWER FAILURE Indicates motor power turned off for a reason not otherwise reported. Toggle of the Stop button should clear.	Both
5	80	22	ELEMENT CONTENTS UNKNOWN The contents of an element address are unknown. Issue a READ ELEMENT STATUS command for the element address. If contents are still unknown issue an INITIALIZE ELEMENT STATUS command.	Both
4	80	23	BAR CODE DECODER COMMUNICATION FAILURE Unable to initialize decoder. Verify that the decoder is powered on. Cycle power and/or check cable connections.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	81	00	GRIPPER AXIS INTERNAL FAIL Gripper axis code internal failure. Contact your Compaq service representative.	Both
B	81	01	GRIPPER TIMEOUT Gripper did not reach desired position. Issue a REZERO UNIT command.	Both
B	81	04	GRIPPER OPEN FAILURE Gripper did not reach open position. Issue a REZERO UNIT command.	Both
B	81	05	GRIPPER CLOSE FAILURE Gripper did not reach close position. Issue a REZERO UNIT command.	Both
B	81	51	UNABLE TO PICK CARTRIDGE Cartridge was sensed in front gripper sensor, but was unable to seat cartridge in the rear gripper sensor. Check that gripper sensors are working and/or that tape was ejected far enough.	Both
4	81	54	GRIPPER TPU REGISTER FAILURE Replace robotic controller board.	Both
4	81	55	GRIPPER TPU RAM FAILURE Replace robotic controller board.	Both
4	82	00	ROTARY AXIS INTERNAL FAIL Rotary axis code internal failure. Contact your Compaq service representative.	Both
4	82	01	ROTARY TIMEOUT The rotary axis did not reach the desired position within the time limit. Retry the command. If the failure recurs, issue a SELF-TEST command.	Both
B	82	04	ROTARY FRONT FAILED The rotary move to the front position failed. Retry the command. If the failure recurs, issue a SELF-TEST command.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
B	82	05	ROTARY BACK FAILURE The rotary move to the back position failed. Retry the command. If the failure recurs, issue a SELF-TEST command.	Both
4	82	08	ROTARY HOME NOT FOUND The home flag was not found. Issue REZERO UNIT to retry command. If the failure recurs, issue a SELF-TEST command.	Both
4	82	10	ROTARY INVALID START The rotary axis has not been homed yet. Issue a REZERO UNIT command.	Both
5	82	11	ROTARY INVALID COMMAND Rotary axis was commanded to a position out of its legal range. This is an internal code failure.	Both
4	82	20	ROTARY TEST FAILURE The rotary motor or sensor failed. Check the motor/sensor connections. Make sure that the flags extend into the sensor without contact. Check that the extension axis operates properly, since it must be safely positioned before the rotary axis moves. If the failure recurs, contact your Compaq service representative.	Both
4	82	23	ROTARY POSITION OVERFLOW The position step counter overflowed. Issue a REZERO UNIT command.	Both
4	83	00	EXTENSION INTERNAL FAILURE Extension axis code internal failure. Contact your Compaq service representative.	Both
B	83	01	EXTENSION TIMEOUT Extension axis did not reach desired position. Retry command. If the failure recurs, use the diagnostic software to run extension self-test.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	83	02	EXTENSION CURRENT FEEDBACK FAILURE The extension axis is obstructed. Determine the cause of the obstruction. Calibrate the library. Lubricate the rail.	Both
4	83	03	EXTENSION MECHANICAL POSITION ERROR The extension axis was unable to move to commanded position. Retry command. If the failure recurs, run extension self-test.	Both
4	83	08	EXTENSION HOME NOT FOUND The extension axis did not reach the home position. Issue REZERO UNIT to retry the command. If the failure recurs, then issue the SELF-TEST command.	Both
B	83	10	EXTENSION INVALID ACTUATOR START POSITION Extension axis position is unknown. Issue a REZERO UNIT command.	Both
5	83	11	EXTENSION INVALID COMMAND Extension axis was commanded to a position out of the libraries mechanical limits.	Both
4	83	20	EXTENSION TEST FAILURE The value of the extension encoder did not change during the self-test. Check the motor/encoder connector.	Both
4	83	22	EXTENSION ENCODER FAILURE The value of the extension encoder did not change during the self-test. Check the motor/encoder connector.	Both
4	83	40	EXTENSION FORCE NOT REACHED During calibration or pushing in a drive, the extension never reached its intended force. If the failure recurs, run extension self-test.	Both
4	83	41	EXTENSION FORCE OBJECT MISSING During calibration or pushing in a drive, the extension never made contact with any object.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	83	50	EXTENSION SENSOR FAIL The CIG sensor was occluded unexpectedly during calibration, inventory or pick/place. Retry the command. If the failure recurs, contact your Compaq service representative.	Both
4	84	00	VERTICAL INTERNAL FAILURE Vertical axis code internal failure. Contact your Compaq service representative.	Both
B	84	01	VERTICAL TIMEOUT Vertical axis did not reach desired position within the time limits. Retry command. If the failure recurs, run vertical self-test.	Both
4	84	03	VERTICAL MECHANICAL POSITION ERROR Vertical axis did not reach desired position. Retry command. If the failure recurs, run vertical self-test.	Both
4	84	08	VERTICAL HOME NOT FOUND Vertical axis did not reach the home position. Issue REZERO UNIT and retry command. If the failure recurs, run vertical self-test.	Both
B	84	10	VERTICAL INVALID ACTUATOR START POSITION Position of vertical axis is unknown. Issue a REZERO UNIT command.	Both
5	84	11	VERTICAL INVALID COMMAND Vertical axis commanded to position out of library mechanical limits. Issue a REZERO UNIT command. If the problem persists, calibrate the library.	Both
4	84	20	VERTICAL TEST FAILURE The value of the vertical encoder did not change during the self-test. Check the motor/encoder connector.	Both
4	84	22	VERTICAL ENCODER FAILURE The value of the vertical encoder did not change during the self-test. Check the motor/encoder connector.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	84	23	VERTICAL POSITION OVERFLOW The position step counter overflowed. Issue a REZERO UNIT command.	Both
4	84	30	VERTICAL MAPPING FAILURE Scanner was unable to detect vertical target during calibration.	Both
4	85	00	HORIZONTAL INTERNAL FAILURE Horizontal axis code internal failure. Contact your Compaq service representative.	Both
B	85	01	HORIZONTAL TIMEOUT Horizontal axis did not reach desired position within the time limits. Retry command. If the failure recurs, use the diagnostic software to run horizontal self-test.	Both
4	85	03	HORIZONTAL MECHANICAL POSITION ERROR Horizontal axis did not reach desired position. Retry command. If the failure recurs, use the diagnostic software to run horizontal self-test.	Both
4	85	08	HORIZONTAL HOME NOT FOUND Horizontal axis did not reach the home position. Issue REZERO UNIT and retry command. If the failure recurs, run horizontal self-test.	Both
B	85	10	HORIZONTAL INVALID ACTUATOR START POSITION Position of horizontal axis is unknown. Issue a REZERO UNIT command.	Both
5	85	11	HORIZONTAL INVALID COMMAND Horizontal axis commanded to position out of library mechanical limits. Issue a REZERO UNIT command. If the problem persists, calibrate the library.	Both
4	85	20	HORIZONTAL TEST FAILURE The value of the horizontal encoder did not change during the self-test. Check the motor/encoder connector.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	85	22	HORIZONTAL ENCODER FAILURE The value of the horizontal encoder did not change during the self-test. Check the motor/encoder connector.	Both
4	85	23	HORIZONTAL POSITION OVERFLOW The position step counter overflowed. Issue a REZERO UNIT command.	Both
4	85	30	HORIZONTAL MAPPING FAILURE Scanner was unable to detect horizontal target during calibration.	Both
6	88	00	WARNING SAFE TEMPERATURE EXCEEDED This is only a warning that the temperature in the library exceeds the normal operational temperature 96.8°F (36°C).	Both
4	88	01	MAXIMUM TEMPERATURE EXCEEDED Library turns off and remains off until the temperature returns to an acceptable level 59 to 90°F (15 to 32°C).	Both
5	8A	02	UNCALIBRATED POSITION Library requires calibration.	Both
4	8B	00	PASSTHRU INTERNAL FAILURE Pass-through axis code internal failure. Contact your Compaq service representative.	Both
B	8B	01	PASSTHRU TIMEOUT Pass-through axis did not reach desired position. Retry command. If the failure recurs, use the diagnostic software to run extension self-test.	Both
4	8B	02	PASSTHRU CURRENT FEEDBACK FAILURE The pass-through axis is obstructed. Determine the cause of the obstruction. Calibrate the library. Lubricate the rail.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	8B	03	PASSTHRU MECHANICAL POSITION ERROR The pass-through axis was unable to move to commanded position. Retry command. If the failure recurs, run extension self-test.	Both
4	8B	08	PASSTHRU HOME NOT FOUND The pass-through axis did not reach the home position. Issue REZERO UNIT to retry the command. If the failure recurs, then issue the SELF-TEST command.	Both
B	8B	10	PASSTHRU INVALID ACTUATOR START POSITION Pass-through axis position is unknown. Issue a REZERO UNIT command.	Both
5	8B	11	PASSTHRU INVALID COMMAND Pass-through axis was commanded to a position out of the libraries mechanical limits.	Both
4	8B	20	PASSTHRU TEST FAILURE The value of the pass-through encoder did not change during the self-test. Check the motor/encoder connector.	Both
4	8B	22	PASSTHRU ENCODER FAILURE The value of the pass-through encoder did not change during the self-test. Check the motor/encoder connector.	Both
4	8B	51	PTM ELECTRONICS NOT PRESENT The library backplane needs to be upgraded to VPN 6310520-04 to support the PTM	Both
B	8B	60	PTM FULL The PTM contains a cartridge. Issue a command to retrieve the cartridge from the PTM and place it in either a bin or a tape drive.	Both
B	8C	01	LOAD PORT TIMEOUT The load port door was unlocked, but did not leave its current position before time-out (30 seconds). This might be due to the door being stuck, or in the case of a close operation, the operator not moving the door.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	8C	06	LOAD PORT DOOR OPEN Load port door unlocked but failed to open	Both
B	8C	09	LOAD PACK DETENT FAILURE The load pack bin detention spring is unable to hold or release the cartridge. This is detected during a place if the tape does not stay seated in the pack or during a pick if the tape does not eject from the pack.	Both
B	8D	01	DRIVE HANDLE TIMEOUT Drive handle did not reach commanded position within time limits. Retry the command. If the failure recurs, issue a SELF-TEST command.	Both
4	8D	24	HANDLE HARDWARE Stepper was unable to reach destination (open or close). Retry command. If the failure recurs, run drive handle Self-test.	Both
4	8E	01	FLASH MEMORY UNABLE TO IDENTIFY Flash is soldered onto the board. Contact your Compaq service representative.	DIAG
4	8E	02	FLASH MEMORY UNABLE TO ERASE Flash is soldered onto the board. Contact your Compaq service representative.	DIAG
4	8E	03	FLASH MEMORY UNABLE TO PROGRAM Flash is soldered onto the board. Contact your Compaq service representative.	DIAG
B	8F	00	LIBRARY UNIT COMMAND TIMED OUT Verify that communications to the library still exists by issuing another command	SCSI
5	F0	01	RESERVATION CONFLICT Internal firmware error. Report this occurrence and previous command (if known) to your Compaq service representative.	Both

Table A-4 Sense Data Values (Hexadecimal) (Continued)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	F1	00	COMMAND UNSPECIFIED Internal firmware error. Report this occurrence and previous command (if known) to your Compaq service representative.	Both
5	F1	01	COMMAND HEAP OVERFLOW Internal firmware error. Report this occurrence and previous command (if known) to your Compaq service representative.	Both
5	F1	02	UNRECOGNIZED COMMAND Internal firmware error. Report this occurrence and previous command (if known) to your Compaq service representative.	Both
5	F1	03	COMMAND REGISTER ERROR Internal firmware error. Report this occurrence and previous command (if known) to your Compaq service representative.	Both
5	F3	00	COMMUNICATION INTERNAL FAILURE Internal drive communication port code or hardware failure.	Both
4	F3	02	DRIVE COMMUNICATION TIMEOUT The library is unable to communicate with a drive.	Both
4	F3	11	DRIVE HANDLE NOT OK The tape drive is reporting that the handle cannot open. (This might indicate that a cartridge is present that has not been unloaded.)	Both

Appendix B

Regulatory Notices

This appendix displays regulations for the Class II laser bar code scanner used by the gripper assembly in the Compaq *StorageWorks ESL9000 Series Tape Library*. These regulations are defined by the following figures:

- Label product conformation
- Laser light warning labels
- Exposure warning label

Laser Regulation Labels

Product Conformation Label

The product conformation label is on the rear panel of the library (see Figure B-1).

A rectangular label with a black border containing the text "PRODUCT CONFORMS TO USA DHHSS 21CFR SUBCHAPTER "J" in all caps.

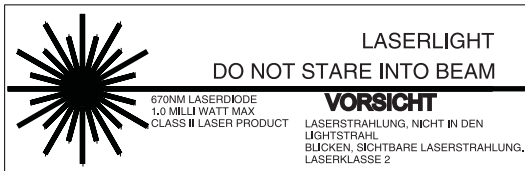
PRODUCT CONFORMS TO USA DHHSS 21CFR SUBCHAPTER "J"

SHR-1958

Figure B-1. Product conformation label

Laser Warning Label

The laser light warning label is near the laser (see Figure B-2).



SHR-1852

Figure B-2. Laser light warning label

Exposure Warning Label

The exposure warning label is on the laser (Figure B-3).



SHR-1853

Figure B-3. Exposure warning label

Appendix C

Regulatory Compliance Notice

Federal Communications Commission Notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (that is, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

The rating label on the device shows which class (A or B) the equipment falls into. Class B devices have a FCC logo or FCC ID on the label. Class A devices do not have a FCC logo or ID on the label. Once the class of the device is determined, refer to the following corresponding statement.

Class A Equipment



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



WARNING: Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.



WARNING: Cet appareil est un appareil de Classe A. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.

Declaration of Conformity for Products Marked with FCC Logo, United States Only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. For questions regarding this declaration, contact:

Compaq Computer Corporation
P. O. Box 629
Marlboro, Massachusetts 01752

To identify this product, refer to the Series number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Compaq Computer Corporation may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

European Union Notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (in brackets are the equivalent international standards):

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

Australian Notice

This customer equipment is to be installed and maintained by service personnel, as defined by AS/NZS 3260 Clause 1.2.14.3. Service Personnel. Incorrect connection of connected equipment to a General Purpose Outlet could result in a hazardous situation. Safety requirements are not fulfilled unless the equipment is connected to a wall socket outlet with protective earth contact.

Appendix D

Power Cord Requirements

The power cord set meets the requirements for use in the country where you purchased your equipment. Power cord sets for use in other countries must meet the requirements of the country where you use the server. For more information on power cord set requirements, contact your authorized Compaq dealer.

General Requirements

The requirements listed below are applicable to all countries:

- The length of the power cord must be at least 6.0 feet (1.8 m) and a maximum of 12 feet (3.7 m).
- The power cord set must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord will be used.
- The power cord set must have a minimum current capacity and nominal voltage rating of 20 A at 125 VAC, or 10 A at 250 VAC as required by each country's power system.
- The appliance coupler must meet the mechanical configuration of an EN60320/IEC 320 Standard Sheet C13 Connector for mating with the appliance outlet on the server.

Country-Specific Requirements

Table D-1 Power Cord Set Requirements - By Country

Country	Accredited Agency	Applicable Note Numbers
Australia	EANSW	1
Austria	OVE	1
Belgium	CEBC	1
Canada	CSA	2
Denmark	DEMKO	1
Finland	SETI	1
France	UTE	1
Germany	VDE	1
Italy	IMQ	1
Japan	JIS	3
Norway	NEMKO	1
Sweden	SEMKO	1
Switzerland	SEV	1
United Kingdom	BSI	1
United States	UL	2

NOTE:

- 1) Flexible cord must be <HAR> Type HO5VV-F, 3-conductor, 1.0 mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.
- 2) Flexible cord must be Type SVT or equivalent, No. 18 AWG, 3-conductor. Wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V).
- 3) Appliance coupler, flexible cord, and wall plug must bear a “T” mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 1.0 mm² conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

Appendix E

Tape Drive Upgrade

This appendix provides instructions for adding a Compaq tape drive to a Compaq StorageWorks ESL9000 Series Tape Library.

Required Tools

The following tools are required:

- Flat-blade screwdriver
- Hex key (5/32-inch) to open door

Accessories

The following accessories are required for non-default SCSI bus configuration:

- Terminator (1)
- SCSI jumper cable (1)

Installing a Tape Drive

This section explains how to install a Compaq tape drive in a drive bay. You need one of the following Tape Drive Upgrade Kits to complete the installation. Contact your Compaq sales representative for more information.

- DLT8000 tape drive (LVD): 221248-B21
- SDLT 110/220 tape drive (LVD): 234617-B21
- DLT8000 tape drive (HVD): 161267-B21
- SDLT 110/220 tape drive (HVD): 234616-B23

NOTE: The library is in the powered-on state during installation, however, the library robotics is unavailable for host-initiated operations during portions of this upgrade procedure.

Tape drives must be installed in sequential order from the lowest number to the highest (no gaps are allowed).

To install a tape drive (see Figure E-1 and Figure E-2):

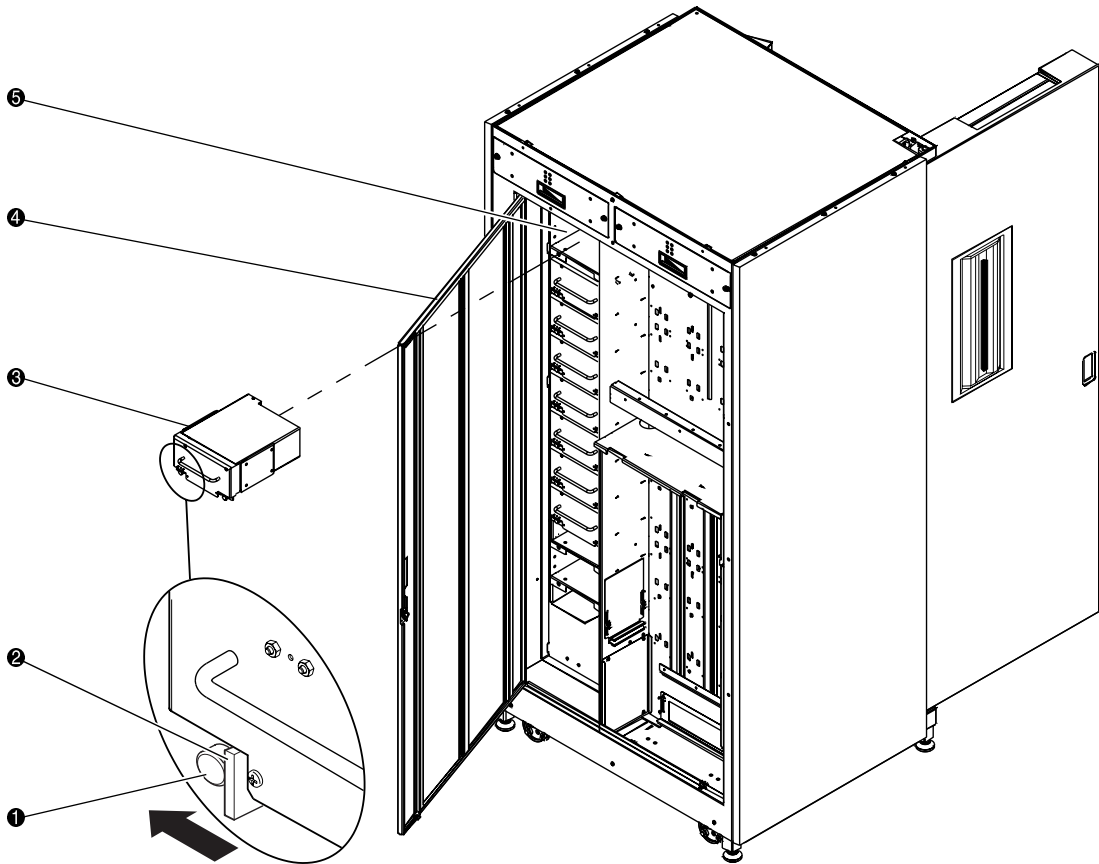
See the sections “Storage Bins (ESL9198)” and “Storage Bins (ESL9326)” in Chapter 1 for the tape drive numbering scheme used by the ESL9000 Series Tape Library.

1. Open the easy access rear panel ④.
2. Insert the tape drive ⑥ into the drive bay ⑤.
3. Secure the tape drive in the drive bay by tightening the two captive screws ①. These quick-release screws are located at the lower left and lower right corners of the tape drive.
4. Move the hot-plug sensor lever ② to the left.
5. Connect the appropriate SCSI cables. See the section “SCSI Cable Configurations” in Chapter 2 for more information.
6. Configure the library for any new tape drive. See the section “Configuring the Library” in Chapter 4, for more information.

NOTE: The drive position is automatically calibrated once the lever is lowered and the drive has been configured. During this time, the library robotics is unavailable to perform normal operation. If a library time-out or error message is returned as a result of issuing a robotic command from the library, re-issue the command after the tape drive Calibration completes. See “Configuring the Library” in Chapter 4 for more information.

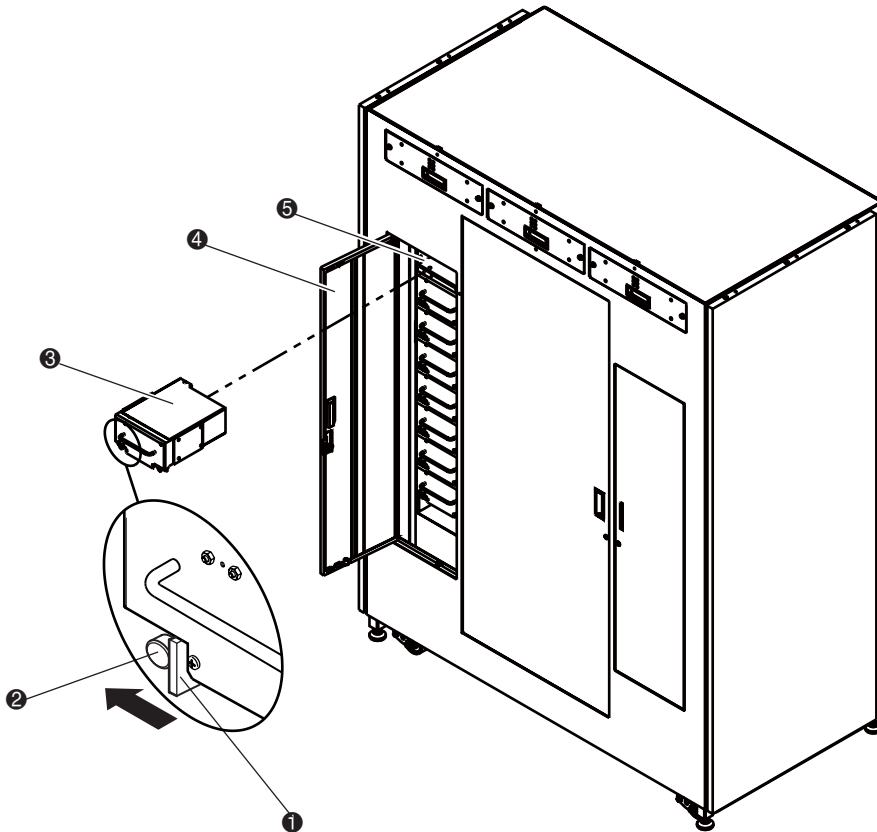
The tape drive remains in the powered-off state until Configure completes.

The library comes pre-cabled from the factory for a two-drive-per-SCSI-bus configuration.



- ❶ Quick-release thumbscrew on each bottom corner
- ❷ Hot-plug sensor lever
- ❸ Tape drive
- ❹ Easy-access rear panel
- ❺ Drive bay

Figure E-1. Installing a tape drive (ESL9198)



- ❶ Hot-plug sensor lever
- ❷ Quick-release thumbscrew on each bottom corner
- ❸ Tape drive
- ❹ Easy-access rear panel
- ❺ Drive bay

Figure E-2. Installing a tape drive (ESL9326)

Glossary

This glossary defines terms used in this guide or related to this product. It is not a comprehensive glossary of computer terms.

abort

To cancel or terminate a program, command, or procedure while in progress.

Abort button

A button appearing on control panel Command In Progress screens, for use in canceling or terminating a command or operation in progress.

actuator

One of the components that make up library robotics. Actuators consist of the gripper, extension axis, vertical axis, and horizontal axis.

array

A physical or logical structure with multiple rows and columns that a system or program treats as a single unit.

arrow buttons

Buttons found in various control panel screens used to scroll through lists.

Autoclean

A user-defined mode in which the library automatically performs drive cleaning tasks as needed.

Autoload

A user-defined mode in which the library automatically moves cartridges in the load port to empty storage bins as soon as the load port door is closed.

automated tape library

An enclosed data storage system consisting of storage elements, data transfer elements, DLT cartridges, and a robotic gripping mechanism used to identify, handle, and move the cartridges from one element to another.

Back button

A control panel button that allows a backward movement through previously selected screens.

Backspace button

A button with a left-pointing arrow icon, found in control panel screens with the keypad, that allows the elimination of a partial numeric entry character-by-character.

bar code

A printed pattern of vertical bars of varying widths used for computerized inventory control.

bar code label

A tape cartridge identification label that includes a bar code.

bar code scanner

A device mounted on the extension axis that reads the cartridge bar code labels.

bit

The basic unit of information in a binary numbering system (*binary digit*). A bit is represented by either 1 or 0. Eight bits make up each byte.

bus

An interface designed to send and receive data.

byte

The basic unit of computer memory, large enough to hold one character. A byte is composed of eight bits.

calibration

A process used by the library robotics to determine the exact position of storage, data transfer, and import/export elements.

cartridge

A case containing a supply reel with magnetic tape used as media for reading and writing computer data.

CHM

Cartridge Handling Mechanism (see gripper).

command

A user-initiated signal given to a computer program that initiates, terminates, or otherwise controls the execution of a specific operation. In a menu-driven system such as the library control panel, choose commands by pressing on-screen buttons.

compression

The process of encoding data to take up less storage space on magnetic tape. Compression can be carried out by the host computer (software compression) or by the drive (hardware compression).

Contrast buttons

Control panel buttons in the upper right corner of the display that adjust the contrast of the control panel screen.

control panel

The panel on the front of the library that contains the library status displays.

data transfer element

The SCSI designation for a disk or tape drive.

digital linear tape

A 0.5-inch, high-grade, metal-particle magnetic tape medium housed in a 4.1 x 4.1 x 1-inch cartridge. DLT technology is the intellectual property of Quantum Corporation.

DLT

See digital linear tape.

drive access door

The door on the right side of the library used to access tape drives for replacement or cabling.

element

A SCSI designation for any device or bin in the library that can hold a DLT cartridge. SCSI elements include storage bins, tape drives, load port bins, and the gripper.

error message

A message appearing on the host computer or library control panel screen showing that the program was unable to carry out the desired operation.

execute

To carry out the instructions in a computer program.

exercise

A user-initiated, continuous operation in which the library robotics randomly moves tape cartridges from one library element to another. The exercise operation runs continuously until aborted.

extension axis

Mounted on the vertical axis, an assembly that consists of the gripper and the horizontal axis upon which the gripper assembly is mounted.

FCC Class A

A standard established by the U.S. Federal Communications Commission governing electromagnetic emissions in a commercial environment.

fixed storage array

The matrix of all storage elements in the library.

Forward button

A control panel button that allows a forward movement through previously selected screens.

GB

See gigabyte.

gigabyte

A unit of measure for computer memory consisting of approximately 1 billion bytes (1,073,741,824) or 1,000 megabytes.

graphical user interface

A user interface made up of bit-mapped graphics resembling buttons and switches, designed to make it simpler to obtain information and choose and execute commands.

gripper

An electromechanical assembly mounted on the extension axis that includes a sensor for reading bar codes and a gripping mechanism for handling DLT cartridges. Also referred to as CHM.

GUI

See graphical user interface.

Home button

A control panel button that allows a return to the initial control panel screen.

horizontal carriage

The rails, belt, and mechanisms that cause the extension axis to move from the left of the library to the right.

host computer

The computer that issues SCSI commands to control the library robotics.

import/export element

The SCSI designation for a load port bin.

interface

A hardware or software protocol, contained in the electronics of the tape controller and tape drive, that manages the exchange of data between the drive and computer.

inventory

An operation in which the library determines the identity and location of all tape cartridges and SCSI elements.

LCD

Liquid crystal display.

load port

The small revolving door on the front panel of the library for loading and unloading tape cartridges.

Load Port button

A button on the control panel that opens or unlocks the load port, depending on the load port's current state.

lock icon

Another name for the security level indicator on the control panel.

media

The material or device used to store information in a storage subsystem. The magnetic tape used in cartridges is an example of high-grade media.

nonvolatile RAM

Battery-powered RAM used to store library configuration information even when the library is turned off.

NVRAM

See nonvolatile RAM.

offline

A state in which the library is not ready for communications with a host. The library must be placed in offline mode before opening library doors, removing library cosmetic panels, or performing certain library commands such as configure library.

online

A state in which the library is ready for communications with a host.

Operate Axes Test

A system test initiated from the Service screen in the control panel that allows the testing of each tape library axis in various ways.

password

A sequence of characters used to gain access to protected portions of the computer system. The control panel has an operator password and a service password consisting of 4 to 8 numeric characters.

pick

The process of removing a cartridge from a source element in preparation for placing it in a destination element.

place

The process of placing a cartridge in a destination element after it has been picked from a source element.

PTM

Pass Through Mechanism. A mechanism by which tapes can be passed between two or more tape libraries.

RAM

Random access memory. An integrated circuit memory chip that lets information be stored and retrieved by a microprocessor or controller while the computer is running.

rear panel

The rear cosmetic panel of the tape library that contains the AC power switch, AC power receptacle and connectors for attaching external cabling to the tape library.

retry

The process of automatically attempting a failed command before issuing an error message.

SCSI

Small computer system interface. An American National Standards Institute (ANSI) communications standard for attaching peripheral equipment to computers.


SCSI device

A computer or computer peripheral connected to a SCSI bus. SCSI devices include the library robotics, host computers, library tape drives, and hard drives.

SCSI ID number

A unique address (0 to 15) assigned to each device on a SCSI bus.

security level indicator

A small “lock” icon() on the control panel that shows the current security level setting. Five security levels are available: service (S), operator (O), user (U), import only (I), and locked (L).

Standby button

A control panel button that switches the library between on-line and off-line states.

Stop button

A control panel button that halts all library activity by cutting power to library robotics. Pressing the Stop button a second time restores power to library robotics.

storage array door

The door used to access the gripper and the fixed storage array.

storage bin

Any of the small, rectangular containers that make up the fixed storage array, designed to hold a single DLT cartridge.

storage element

The SCSI designation for a storage bin.

SysTest library

A system test initiated from the Service screen in the control panel that tests all library components by swapping tape cartridges.

tape drive

The mechanism that reads data from, and writes data to, a tape cartridge.

tape library system

A storage and retrieval system that uses a robotic mechanism to automatically load and unload tape cartridges into one or more tape drives.

UL

Underwriters Laboratories.

Unload button

A button on the tape drive that prepares a tape cartridge for removal from the drive. When this button is pressed, the drive rewinds the tape back into the cartridge.

Unload Drive button

A control panel button in the Operator screen that allows the unloading of a tape drive.

Unload Imp/Exp button

A control panel button in the Operator screen that allows the unloading of the load port when the Auto Load feature is disabled.

vertical carriage

The rails, belts, and other mechanisms that cause the extension axis to move from the top of the library to the bottom.

write-enable

To set a tape cartridge so that data can be written to it.

write-protect

To set a tape cartridge so that data cannot be written to it or erased from it.

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