

Spectra Logic

Spectra® 2K Library User Guide



P.N. 90870782 Revision E

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Spectra 2K Library User Guide

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Warnings and Cautions

AC Power

Warning: Risk of electrical shock. To remove AC power from the library, unplug the power cord from the power inlet. There are no user serviceable parts within the library.

High Voltage

Warning: The Spectra 2K library contains high-voltage components that can cause injury or death. Only qualified electricians should replace or install high-voltage components.

Robotics

Warning: Serious injury can result if hair, clothing or appendages are caught in the library's robotics. Keep hair, clothing and appendages clear of moving parts. Do not override any of the safety features built into the library.

Tapes

Caution: Use only the data cartridges approved for use with the drives in this library. Improper data cartridges can cause damage to the drives, library and cartridges.

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1 Introduction

About TreeFrog® Architecture

The Spectra 2K library uses TreeFrog architecture for robotic tape libraries developed by Spectra Logic. TreeFrog architecture can be configured with 15 or 30 cartridge slots and one or two tape drives. In addition, TreeFrog architecture supports SCSI-2 interfaces—both low-voltage differential/single-ended (LVD/SE) and differential. The cornerstones of TreeFrog architecture are the integrated robotic picker and the uni-body robotic chassis.

About This Guide

This guide is intended to be read by the owners of the Spectra 2K library. It covers the installation and operation of the library, as well as troubleshooting information. For the latest up-to-date information please go to www.spectralogic.com, and view the latest *Spectra 2K Library User Guide*. Also available are these related publications:

Related Publications

- *Spectra 2K Library Release Notes* provides last-minute information about the Spectra 2K library.
- *Spectra 2K Library Developer Guide* provides SCSI reference material and other references useful to application developers.

Getting Started

If your library is already installed and configured, begin with Chapter 4 *Using the Library*. To install and configure the library from the beginning, read all of the chapters of this guide in sequence.

Conventions Used

This guide uses special conventions to highlight notes, cautions, and warnings. These conventions are explained below:

Note: Read **Notes** for additional information or suggestions about the topic or procedure being discussed.

Caution: Read **Cautions** to learn ways to avoid damaging the library, tape drives or other equipment.

Warning: Read **Warnings** to learn ways to avoid personal injury.

How to Contact Spectra Logic Corporation

United States Office

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Boulder CO 80301
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Fax (303) 939-8844

European Office

Mailing Address Spectra Logic Europe Limited
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Monument Business Park
Warpsgrove Lane
Chalgrove Oxon
UK-OX44 7RW

Phone +44 (0) 870 112 2150

Fax +44 (0) 870 112 2175

2 Installing the Library

To install the library, complete the steps outlined in these sections:

- Unpacking the Library
- Attaching to the Host Computer
- Attaching More than One SCSI Device
- Powering On the Library and Host Computer
- Inserting Media
- Installing the Data Cartridge Magazine(s)
- Using Horizontal and Rack Mounted Libraries

Unpacking the Library

Save the original packing material. If the need arises, return the library with the original packaging materials.

Note: Failure to return the library in its original packaging risks voiding the library's warranty.

To unpack the library, first note how the library is packed into its box (Figure 2-1), then proceed to the step-by-step instructions that follow.

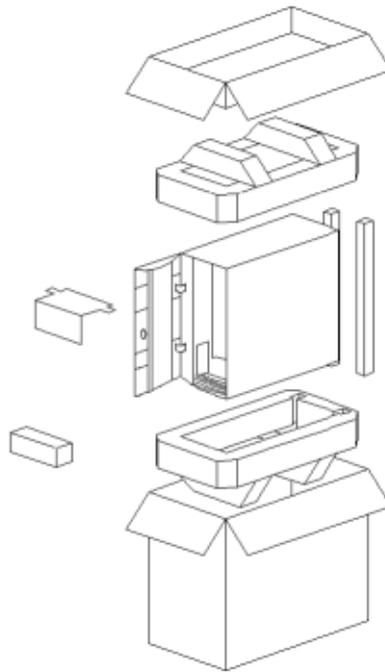


Figure 2-1 *Unpacking the library.*

1. Remove the cardboard tray from the top of the box. This tray contains the accessories for the library (see *Library Accessories* on page 13).
2. Remove the top piece of foam protecting the library.
3. Lift the library out of the box.

Warning: Take care when lifting the library. It weighs approximately 30 pounds.

4. Remove the plastic overwrap, taking care not to scratch the paint on the library's exterior.
5. With the library still sitting up on its end, use the library door key to open the library door.
6. Remove the plastic and foam protecting the robotic picker (Figure 2-2 and Figure 2-3).

Caution: Take care when removing these pieces not to damage the door sensor cable (the white cable that runs along the right side of the library).



Figure 2-2 Remove the plastic that protects the robotic picker from moving while shipping.



Figure 2-3 Remove the foam that protects the robotic picker from moving while shipping.

Note: Remember to save all packaging materials in the event that you need to ship the library at a later date.

Library Accessories

The library comes with the following accessories:

- One 120-volt AC power cord
(in packages shipped within the United States and Canada)
- One or two data cartridge magazine(s)
- Two keys for the library's front door
- One small screwdriver, for configuring settings on the back of the library
- One *Quick Install Guide*
- One CD-ROM with library documentation.

Attaching to the Host Computer

Follow this procedure to connect the library as the only unit on a SCSI bus. To attach more than one SCSI device, read *Attaching More than One SCSI Device* on page 18, as well as the documentation for the other device(s) on the bus.

About the SCSI IDs and the SCSI Bus

The library communicates with the host computer through a system of cables and connectors called the Small Computer System Interface (SCSI). The library uses an extremely fast version of SCSI called Ultra Wide SCSI, which can connect up to 16 devices in a series. Each SCSI device requires a unique SCSI ID. The library contains either two or three SCSI devices:

- Library robotics
- Drive 1
- Drive 2 (optional)

The library requires one SCSI ID for the library robotics and one SCSI ID per drive for a maximum of three possible SCSI IDs. The factory SCSI ID settings work correctly for most SCSI bus configurations.

Note: Don't change the default settings for the library's SCSI IDs unless necessary; see *Attaching More than One SCSI Device* on page 18.

LVD/SE or Differential SCSI Interface

The library is available with either an LVD/SE or differential SCSI interface. You will need to purchase the appropriate terminator for that interface—the LVD/SE library requires an active, multimode LVD/SE terminator, and the differential unit requires a differential terminator.

If you are not sure about the interface for your library, you can determine it in one of two ways:

1. Locate the SCSI interface label between the two SCSI connectors on the back panel of the library (Figure 2-4).

2. The library interface can be identified by its part number sticker, also located on the back panel of the library (Figure 2-4).
 - An LVD/SE library has a **W** in the position directly following the second hyphen of the part number: **9087####-#-W#**
 - The differential library has a **D** in the position directly following the second hyphen: **9087####-#-D#**

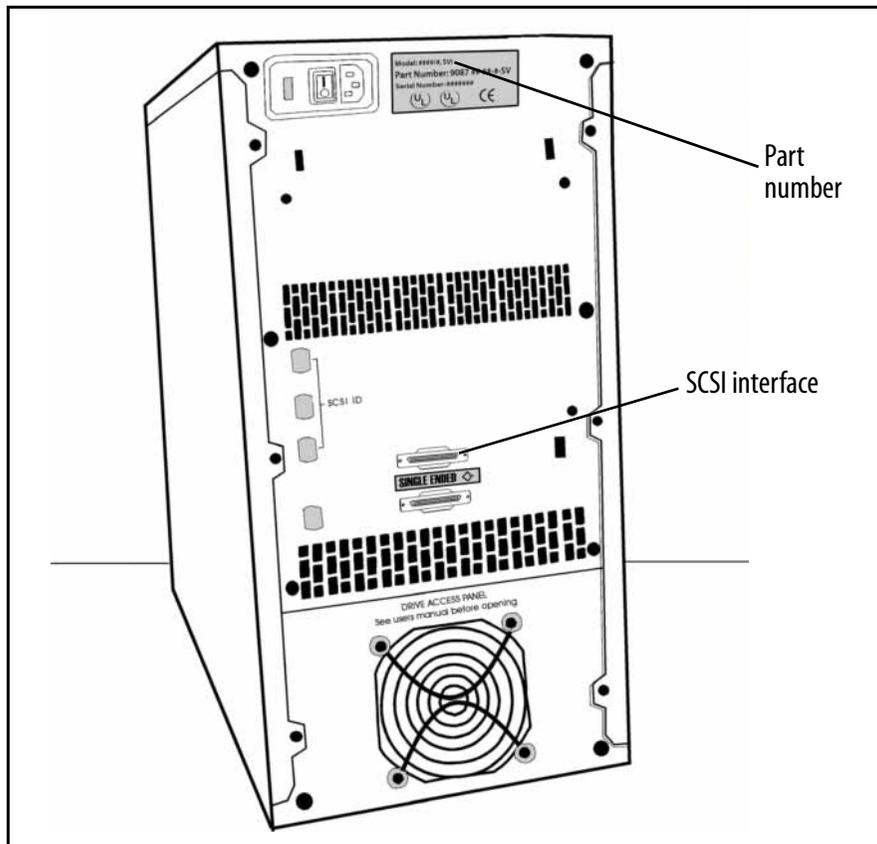


Figure 2-4 The part number sticker indicates the type of SCSI interface.

LVD/SE SCSI Bus

The LVD/SE library operates in either single-ended or low-voltage-differential SCSI mode, depending on the type of bus that is attached.

Note: The entire bus (including host bus adapter, devices, and termination) must be LVD to operate in LVD mode. Attaching any single-ended SCSI device to an LVD bus renders the entire bus (and all attached devices) subject to the maximum specification requirements for single-ended SCSI (including maximum cable lengths).

The LVD/SE terminator should function in either mode. To check the mode in which your library is operating, look at the library terminator and the terminator's light-emitting diode (LED). The top of the terminator lists the color of the LED for each mode.

SCSI specifications for LVD and single-ended modes are shown in this table:

SCSI Specifications	LVD Mode	Single-Ended Mode
SCSI Bus Width	16 bits	16 bits
Maximum Bus Speed	80 MB/sec	40 MB/sec
Maximum Bus Cable Lengths	12 meters ^a	1.5 meters ^a

^a Maximum cable length requirements include the internal cabling for each device. The library contains 60 centimeters (24 inches) of cabling inside the library.

Attaching the SCSI Cable

Note: The library requires a minimum of two SCSI IDs on the SCSI bus.

To attach the library to the host computer:

1. Turn off the computer and library.
2. Determine the correct specifications for the SCSI cable as described in *SCSI Cable Requirements* on page 79.
3. Attach the SCSI cable to the connector on the back of the library.
4. Attach the other end of the SCSI cable to the host computer.

- Determine the correct specifications for the SCSI terminator as described in *SCSI Terminator Requirements* on page 81. Attach a SCSI terminator to the free SCSI connector on the library, as shown in Figure 2-5.

Caution: The SCSI bus must be terminated at both ends or unexpected errors may result. Make sure that the SCSI adapter in the host computer has the appropriate termination enabled.

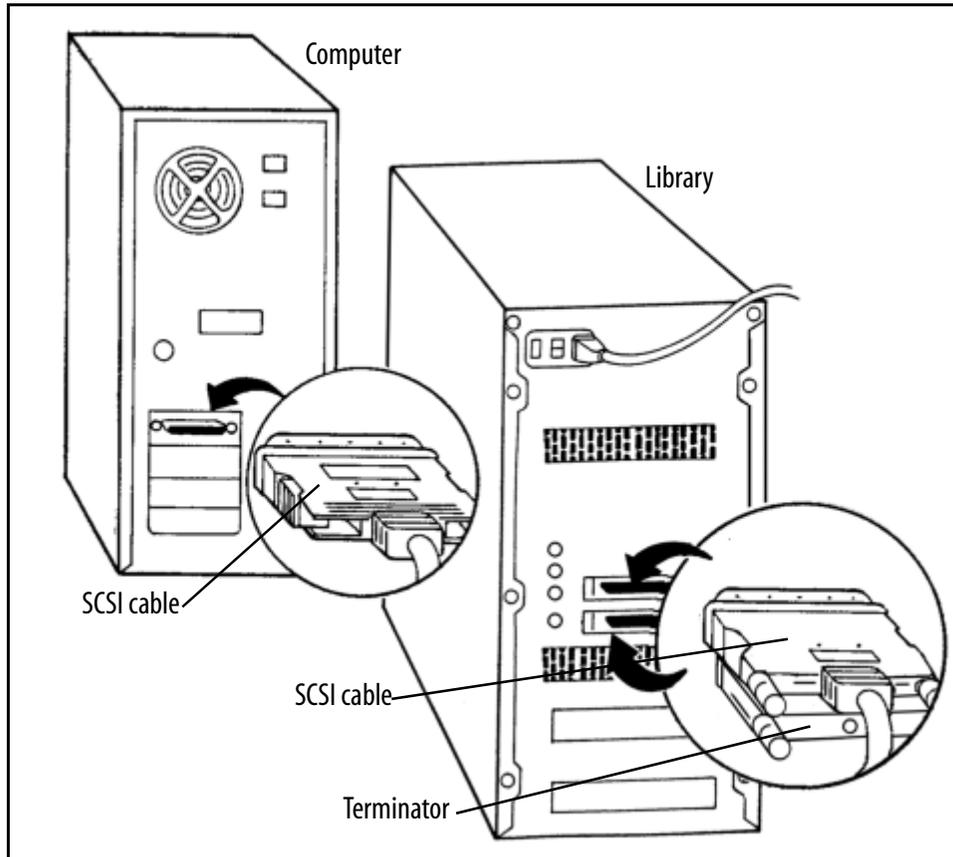


Figure 2-5 Connect the library to the host computer with the SCSI cable. Connect a SCSI terminator to the library (as necessary).

- To attach additional devices to the SCSI bus, continue with *Attaching More than One SCSI Device* and complete any further procedures as necessary.

The SCSI card BIOS should display the following information:

SCSI ID: 1	Sony SDX-300C or Sony SDX-500C or Sony SDX-700C
SCSI ID: 2	Sony SDX-300C or Sony SDX-500C or Sony SDX-700C (if Drive 2 is installed)
SCSI ID: 3	Spectra 215

Attaching More than One SCSI Device

To attach more than one device to the same SCSI bus, review the following sections:

- *Verifying the SCSI Bus Requirements*, below.
- *Changing SCSI IDs as Necessary* on page 19.

Verifying the SCSI Bus Requirements

To attach more than one device to a SCSI bus, confirm that the following requirements have been met:

- Make sure that the total length of the SCSI bus is as short as possible to minimize the potential for communication errors, such as cross-talk.
- Make sure that the total length of the SCSI bus, including cabling inside the library and all other devices, does not exceed the maximum length specified in *Appendix B. SCSI Cable and Terminator Requirements*.
- The SCSI IDs of all devices must be unique; no two devices can share the same SCSI ID. To change the SCSI IDs for the library and drives, review *Changing SCSI IDs as Necessary* on page 19.

Note: An incorrectly configured SCSI bus causes most problems experienced while installing the library. Eliminate SCSI bus problems early by taking the time to configure the bus correctly the first time.

Changing SCSI IDs as Necessary

Note: Do not change the default SCSI ID settings for the library or the drives unless they are set to the same value(s) already in use by other devices on the same SCSI bus or unless required by your software.

To change the SCSI IDs:

1. After you have confirmed the need to modify the SCSI IDs of the library and/or the drives, power off the library, the host computer, and any other device on the SCSI bus.
2. Locate the SCSI ID switches on the back panel of the library (see *Rear Panel Components* on page 34).
3. Determine the correct settings for the SCSI ID switches. Each tape drive and the library require a unique SCSI ID number.
4. Using the small screwdriver included with the library, set the SCSI IDs of the drives and the library to the correct values.
5. Verify that the SCSI IDs do not match the ID of any other device on the SCSI bus *including the SCSI ID for the host computer's controller card* (usually 7).
6. Verify the unique settings of every device on the SCSI bus.

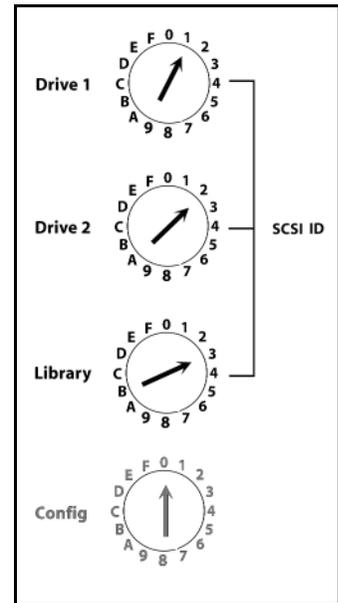


Figure 2-6 Use a small screwdriver to set the switch to the correct SCSI ID (default setting shown). Do not turn the library configuration (Config) switch.

Caution: Incorrectly set SCSI IDs will cause malfunctions.

See Chapter 3 *Configuring the Library* for further explanation of the use of the configuration switch.

Powering On the Library and Host Computer

After correctly connecting the library to the host computer, perform the steps described in the following sections.

Powering On the Library

Power on the library before powering on the host computer and take note of the library's initialization routine:

- The picker moves along the length of the library, checking the data cartridge magazine (DCM) and tape drive(s) for data cartridges.
- The picker records the cartridge locations in the library firmware.
- The bar code reader records bar code information in the library firmware.
- The picker parks at the bottom of the library in front of Drive 1; its LED displays a green light.

If you experience problems, see *Troubleshooting the Library* on page 61.

Powering On the Host Computer

The host computer initializes the library and establishes connectivity between the SCSI devices at power up. The default settings for the SCSI IDs and device identification settings are:

SCSI ID: 1	Sony SDX-300C or Sony SDX-500C or Sony SDX-700C
SCSI ID: 2	Sony SDX-300C or Sony SDX-500C or Sony SDX-700C (If Drive 2 is installed)
SCSI ID: 3	Spectra 215

Note: Most UNIX operating systems create device driver files for the library as soon as the library and drives have been detected. Refer to your operating system documentation for information about the naming and location of device files.

For information about common problems communicating over the SCSI bus, see *Troubleshooting SCSI Problems* on page 63.

To change the SCSI IDs, see *Changing SCSI IDs as Necessary* on page 19.

Inserting Media

The simplest way to insert media into your library is to load the DCM(s) with tapes before installing the DCM(s) in the library. To do this, insert tapes one at a time into the individual slots in the DCM, with the clear plastic window of the cartridges facing away from the drives.

Note: For additional information regarding inserting media into the DCM, see Figure 4-5 on page 37.

Installing the Data Cartridge Magazine(s)

A library may be configured to hold 15 cartridges (one DCM) or to hold 30 cartridges (two DCMs). To install your first or only DCM, proceed as follows:

1. Use the library door key to open the library door.
2. Remove the DCM from its protective packaging.

Position the DCM so that the holes on the side of the DCM line up with the pegs inside the library (Figure 2-7).

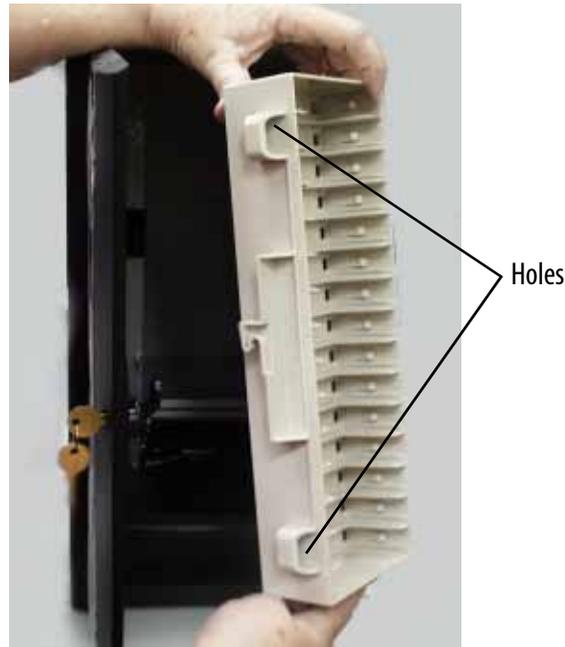


Figure 2-7 Properly align the DCM for insertion in the library.

Note: For additional information regarding the correct positioning of the DCM, see Figure 4-5 on page 37.

3. Holding the DCM in one hand, push it firmly into its place behind the robotic picker. You will hear it snap into place when it fits correctly.
4. Close and lock the library door.

To Install the Second (Optional) DCM:

1. Remove the DCM from its protective packaging.
2. Connect power to the library and turn it on; the library will initialize.
You will see the picker move and then stop to rest at the bottom of the library. You will then see the rotation of the DCM, so that the first DCM installed now faces the back of the library.
3. After the rotation completes, use the library door key to open the library door and stop the initialization process.
4. Position the second DCM upright, as you did the first, and firmly press it into its place. You will hear it snap into place when it fits correctly.

5. Close and lock the library door.

Reading and Writing Data to Tape

Before performing store and restore operations with the library, use your backup software to test library/host communications. Refer to your backup software documentation for instructions on specific testing procedures.

If you experience difficulty with any one of the procedures above, you may need to change the library's configuration as discussed in the next chapter.

Using Horizontal and Rack Mounted Libraries

Every Spectra 2K library can be operated in either a vertical or horizontal position.

In vertical position, the drives should be located on the bottom of the unit.

With the library in the horizontal position, the key lock is at the top and the hinges of the door are at the bottom.

Operating the library in the horizontal position requires a Horizontal Conversion Kit. To operate the library in a rack mount configuration requires a Horizontal Rack Mount Kit. See *Purchasing Additional Library Accessories* on page 64 for information about ordering these kits from Spectra Logic.

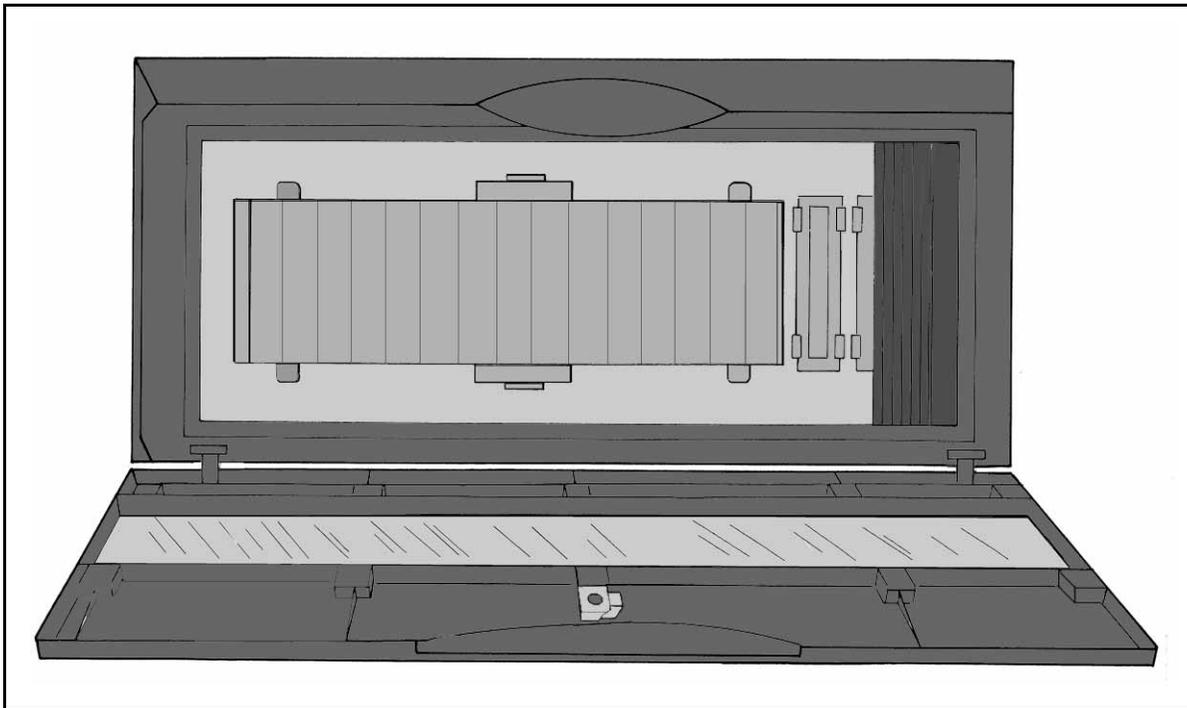


Figure 2-8 *Positioned correctly, the horizontal (or rack mounted) library door opens downward.*

3 Configuring the Library

The Spectra 2K library is compatible with most operating systems. This chapter discusses:

- Changing the Library's Configuration
- Custom Configurations

Changing the Library's Configuration

The library is configured through the configuration switch located on the back panel.

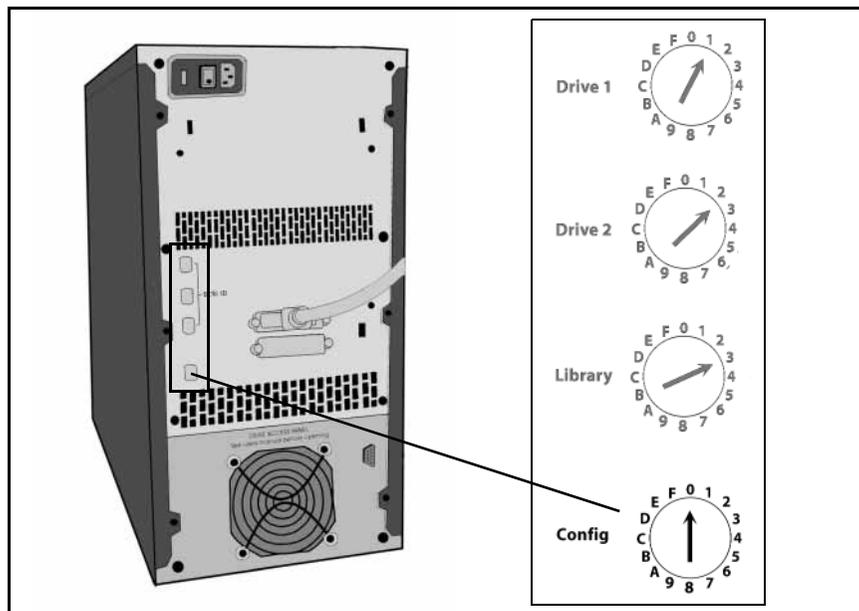


Figure 3-1 The rear panel of the library with a larger view of the configuration switch.

About the Configuration Switch

The configuration switch determines:

- Emulation mode for the robotics
- Emulation mode for the AIT tape drives

The default position of the configuration switch (0) identifies the library and tape drives with the following information:

- Library Inquiry (or Name): Spectra 215
- Drive Manufacturer: Sony
- Drive Model: SDX-300C or SDX-500C or SDX-700C
- Drive DIP Switch: 0

These values, returned by the SCSI **INQUIRY** command, inform the host computer how to communicate with the library and tape drives. Some operating systems require custom configurations in order to communicate with the library. Customizing the library's configuration is the subject of the remaining sections in this chapter.

For the latest information about operating system specific installation procedures, see your operating system documentation, or see the *Server Preparation Document for Spectra Logic Libraries*, an on-line document located on the Spectra Logic Web site at www.spectralogic.com/support/support_docs.cfm

Note: All configuration settings are controlled through the configuration switch on the back panel of the library. The Configuration Switch Settings table on page 28 summarizes the available configuration switch settings.

Determine Your Configuration

The Spectra 2K library will run successfully with the attached server or host computer running most operating systems, and secondary configuration switch changes are usually not required.

If the computer attached to the library is running one of the following, secondary configuration switch changes *are* required.

Operating System	Computer Description	Switch Value
HPUX 9.x, HPUX 10.x, HPUX 11.x	HP 9000 Model 700/800 with GSC controller (HSC Bus)	A
HPUX 9.x, HPUX 10.x, HPUX 11.x	HP 9000 Model 800 with 28696A SCSI Controller (HP-PB Bus)	D

For more information about preparing your server for the Spectra 2K library, see the *Server Preparation Document for Spectra Logic Libraries*, an on-line document located on the Spectra Logic Web site at: www.spectralogic.com/support/support_docs.cfm

Custom Configurations

The library has two types of SCSI devices: the robotic tape picker and the AIT tape drive(s). The configuration switch configures these devices to emulate, other devices. Because one switch changes the behavior of both the robot and the drives, the configuration switch may need to be set twice:

- Set the configuration switch once to change the library robotics emulation.
- Set the configuration switch a second time to change the AIT drive emulation.

Note: The most recent configuration always overrides previous configurations. Values listed as no change retain the previous setting.

Before setting the emulation mode for the library robotics or tape drives, find the setting you want to use in the table below.

Emulation Mode	Switch Setting	Response to the Inquiry Command			Drive DIP Switch Setting ^a
		Library Inquiry	Drive Manufacturer	Drive Model	
Default—random access	0	Spectra 215	Sony	SDX-300C SDX-500C SDX-700C	0
Tape stacker mode—Drive 1 only, no random access robotics commands	1	No change ^b	No change ^b	No change ^b	No change ^b
Spectra 10000 library emulation	2	Spectra 10000	No change ^b	No change ^b	No change ^b
Exabyte EXB 210 library emulation	3	Exabyte EXB-210	Exabyte	EXB-8900	No change ^b
HP 9000 Model 700/800 (GSC Controller) emulation	A	No change ^b	Hewlett Packard	C-1533A	13
Quantum DLT-7000 drive emulation	B	No change ^b	Quantum	DLT-7000	No change ^b
Custom (AIT-2 only)	C	No change ^b	Sony	SDX-300C	No change ^b
StorageTek 9490 drive emulation	D	No change ^b	STK	9490	No change ^b
Spectra 4000 library emulation	E	Spectra 4000	No change	No change	No change ^b
User-defined emulation	F	Use the serial cable to change these settings			

a. The Drive DIP Switch (default 0) determines the drive emulation and is set electronically by the configuration switch.

b. Values listed "No change" retain the last setting; it may be necessary to set the configuration switch a second time.

Changing Configurations

To change the emulation mode for the library robotics or tape drives:

1. Power off the library.
2. With a small screwdriver, set the configuration switch to the value that corresponds with the desired emulation mode.
3. With the library door closed, power on the library.

As the library changes its configuration, the robotic tape picker pauses in front of the data cartridge magazine and the LED blinks amber and green. When complete, the picker parks in front of the drive(s).

4. Check the new configuration by using your backup software, or by checking that the host computer reflects the SCSI ID inquiry string changes.

The SCSI card BIOS should display the following information:

```
SCSI ID: <ID #>          <DRIVE MODEL>
SCSI ID: <ID #>          <DRIVE MODEL>
SCSI ID: <ID #>          <LIBRARY INQUIRY>
```

Make sure that the ID numbers, drive models, and library setting appear as you wanted them set.

5. Repeat Step 1 through Step 4 for other emulations as necessary.

Changing Configurations More than Once

The configuration switch default position of **0** overrides all previous configuration switch settings and verifies that no previous changes to the configuration of the library, drives, or drive switch positions remain, reducing the chance of mishap.

Before beginning a series of configuration changes:

1. Power off the library.
2. Set the configuration switch to the default position of **0**.
3. Power on the library with the door closed.

After using this process to ensure that no previous switch settings remain, you can follow Step 1 through Step 4 under *Changing Configurations* for new emulations.

4 Using the Library

Once the library is already installed and configured, review this chapter to begin using the library. This chapter includes:

- Getting to Know the Library
- Attaching Bar Code Labels
- Using AIT Data Cartridges
- Using the Data Cartridge Magazine
- Getting Information from the Picker's LED
- Using the 30-Cartridge Library

Getting to Know the Library

The various components of the library include:

- Front panel components
- Internal components
- Rear panel components

Front Panel Components

The front panel components of the library include:

Door Provides access to the data cartridge magazine, tape drives and robotic tape picker.

Window Allows full visibility of the data cartridge magazine, tape drives and robotic tape picker.

Keys Lock and unlock the library.

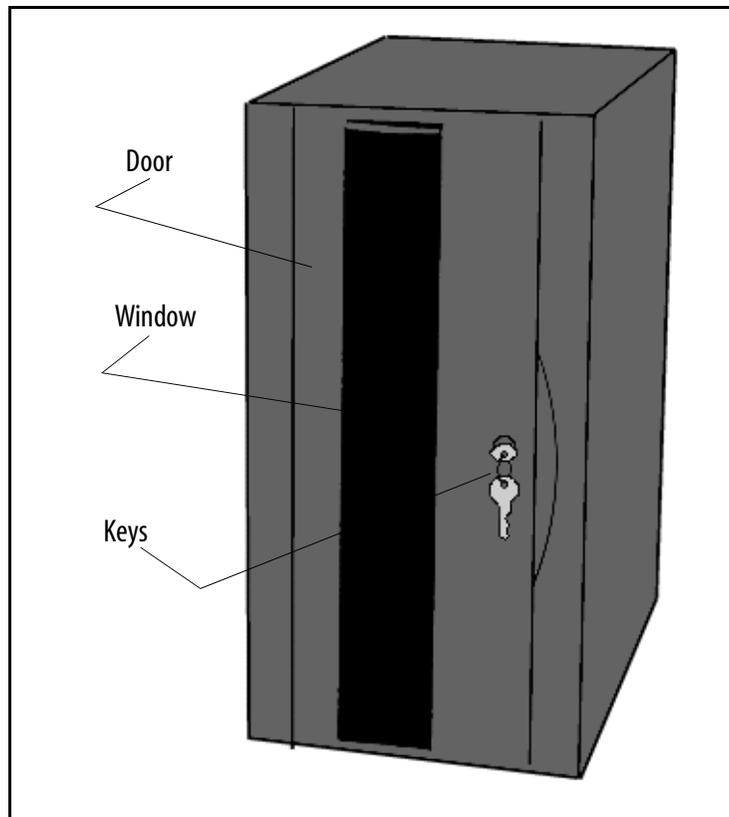


Figure 4-1 *The library's front panel components.*

Note: To prevent the door from accidentally opening, and to make sure that the library operates without interruption, keep the door locked when not in maintenance.

Internal Components

To open the door, turn the key in the lock. The internal components accessible through the front door include:

- Data cartridge magazine(s) (DCM(s))
- AIT tape drive(s)
- Robotic tape picker

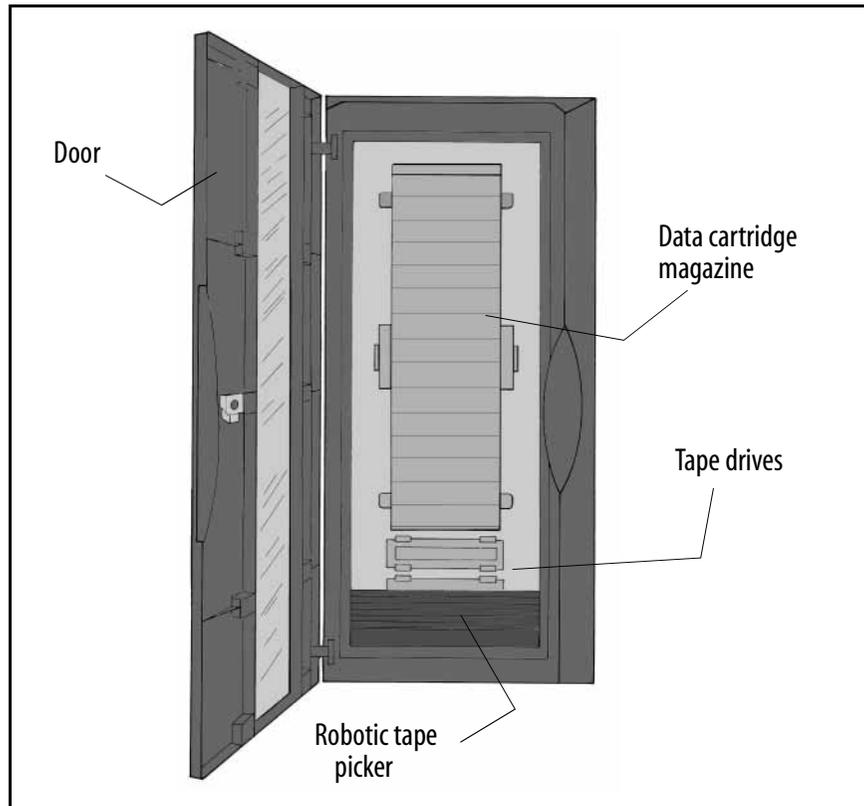


Figure 4-2 *The library's internal components.*

Note: Using the internal components is described in detail later in this chapter.

Rear Panel Components

The rear panel components of the library are used to install, configure, and repair the library; they include:

- Power entry module (includes fuse, power switch, and power cable connector)
- SCSI connectors (shown terminated in diagram below)
- Male DB-9 serial port connector (SSCL interface)
- Drive access panel and fan
- Library configuration switch
- SCSI ID switches

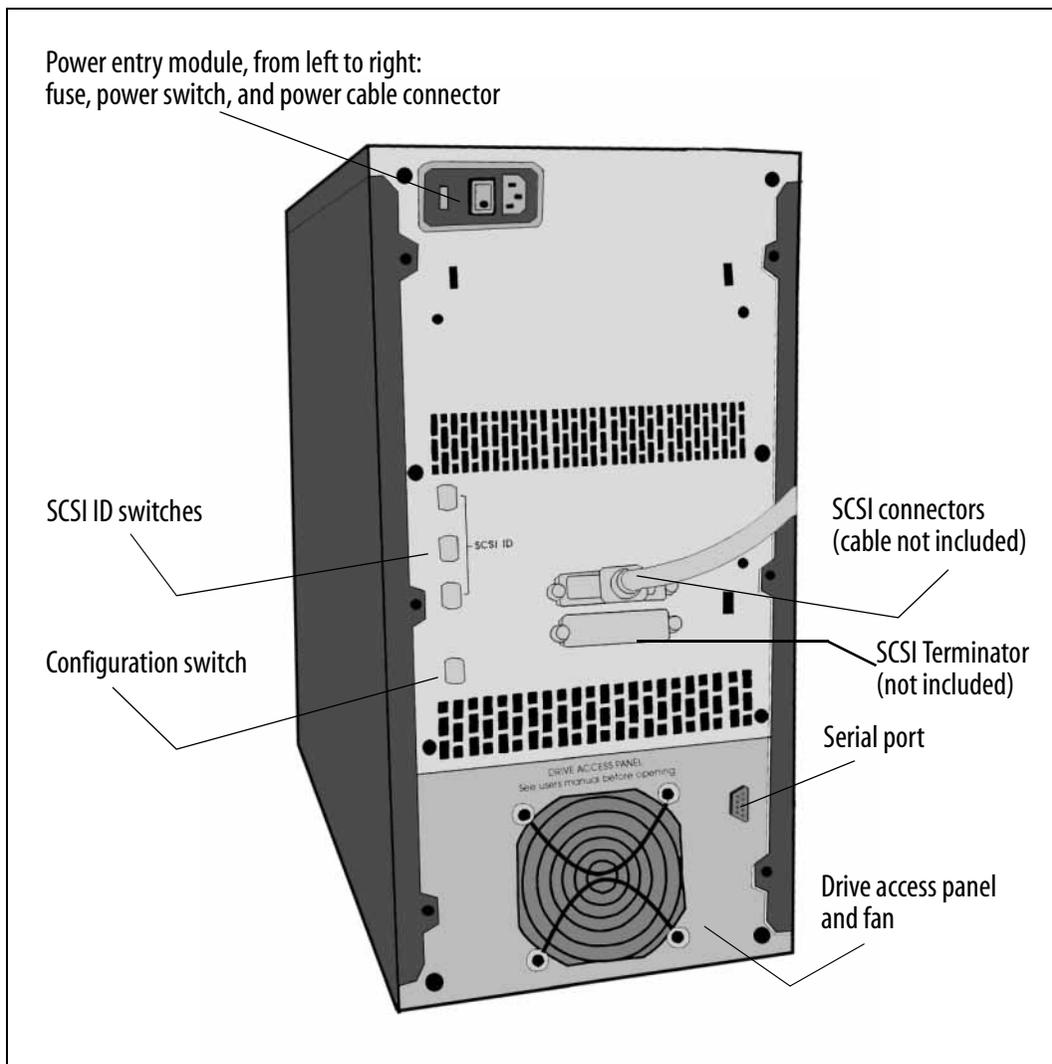


Figure 4-3 The rear panel of the library.

About AIT Bar Code Labels

Review the following information before attaching bar code labels to AIT data cartridges.

Note: Spectra Logic bar code labels are pre-approved for use with the Spectra 2K library; keep this information for future reference.

Label Quality Use labels designed for AIT data cartridges. Avoid poor quality labels having poor contrast and resolution.

Bar Code Type Use only bar codes with standard 3-in-9 encoding (Standard 39 Code).

Number of Characters Use labels with eight or fewer characters (including zeros).

Checksums Bar code labels are available with or without checksum characters; the Spectra 2K library accepts only bar code labels with a checksum character.

Attaching Bar Code Labels

Bar code labels allow the library to track data cartridges within the library.

To attach a bar code label to an AIT data cartridge:

1. Review *About AIT Bar Code Labels* on page 35, for bar code label requirements.
2. Attach the Spectra Logic approved bar code label to the cartridge.
 - Make sure that the label is within the indented box with the numbers closest to the top of the cartridge (the side with the clear plastic window).
 - Make sure the edge of the label is parallel to the edge of the cartridge as shown in Figure 4-4.



Figure 4-4 Example of a bar code label attached to a data cartridge.

Using AIT Data Cartridges

AIT is the only tape to incorporate the unique Memory-In-Cassette (MIC) feature. A memory chip built into the tape cartridge holds the tape's entire data structure, history, and other user-definable information read directly by the AIT drive. The MIC feature reduces file access time and expedites the operation of the drive.

Inserting and Removing Data Cartridges

The relationship of the data cartridges and the DCM is shown in Figure 4-5. When inserting and removing AIT data cartridges, the cartridges should be handled as follows:

- The cartridge is inserted in the DCM with the cartridge window facing the top of the magazine. Correctly installed, the data cartridge snaps into the tape slot.
- The cartridge is removed when grasped and pulled straight out of the DCM.

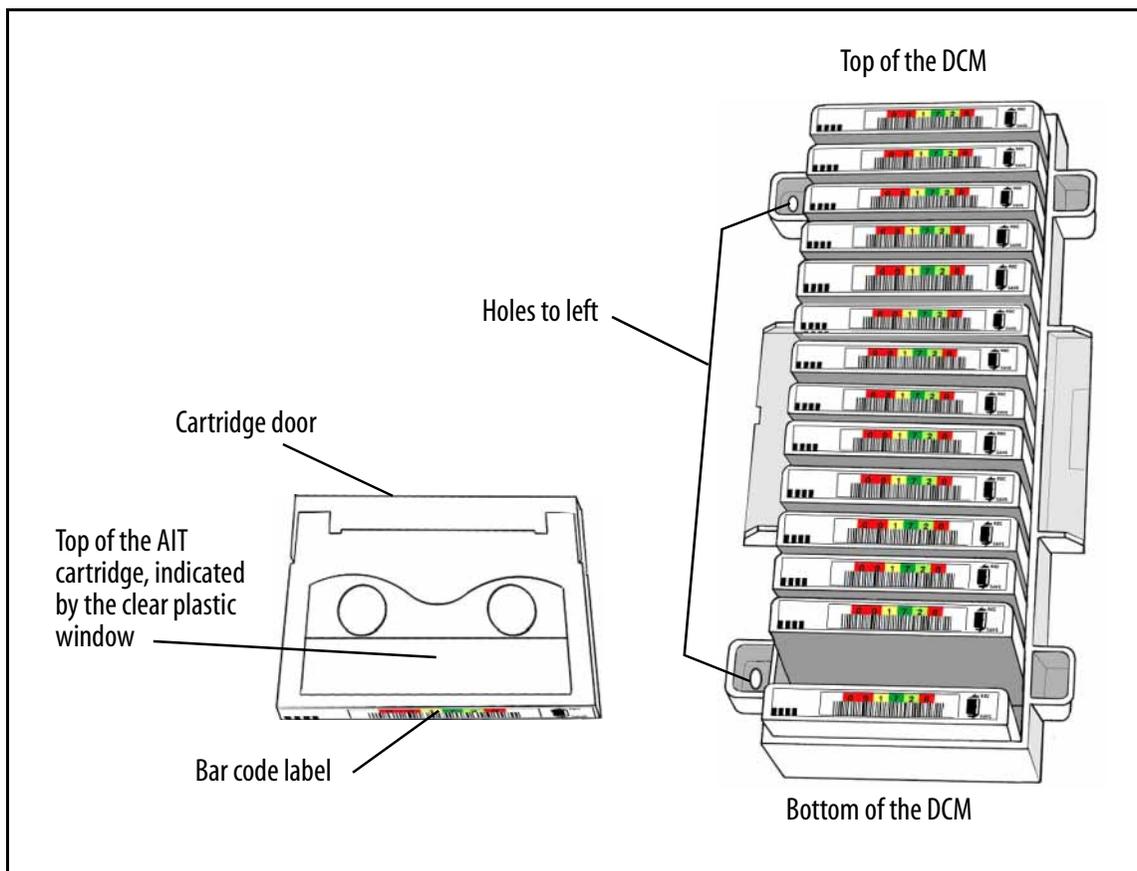


Figure 4-5 An AIT cartridge, left, and a DCM containing multiple AIT cartridges.

Write-Protecting and Recording

The write-protect tab on the AIT cartridge prevents accidental data erasure. To use the write-protect tab on the AIT data cartridge:

- With your fingernail, move the tab on the edge of the data cartridge to the SAFE position. With the tab in this position, the tape can be read, but it cannot be written to, and data on the tape is safe from accidental deletion.
- Move the tab to the REC position to record data. With the tab in this position, the tape can be written to, and the data already on tape can be erased and written over.

Note: There is a slight difference in the configuration of the write-protect tab between the AIT-1 cartridge and the AIT-2 and AIT-3 cartridges: the tab is vertical on AIT-1, and it is horizontal on AIT-2 and AIT-3. The example in Figure 4-4 on page 36 shows the AIT-2 and AIT-3 cartridge style.

Inserting a Tape Cartridge into a Drive

The robotic tape picker moves tapes between tape storage slots and the tape drives. If, for any reason, you need to manually install the data cartridge directly in the tape drive (for example, to load a firmware tape), follow this procedure.

To insert a data cartridge directly into a tape drive:

1. Open and close the library door. Shortly before the picker completes its calibration routine, it pauses in front of the DCM and the LED shines green.
2. Open the door of the library while the picker is parked in front of the DCM.
3. Carefully insert the tape cartridge in the drive with the window facing the top of the drive.

To remove a data cartridge from the drive without using the library robotics:

1. Power on the library.
2. Open the door of the library with the picker in front of the DCM.
3. Press Eject on the front of the drive, and the tape ejects.

Caution: Do not attempt to remove an AIT data cartridge from the tape drive without pressing Eject, or you risk damaging the cartridge and/or the drive. For a diagram showing the location of the drive Eject button, see Figure 5-1 on page 43.

Using the Data Cartridge Magazine

Once you have finished installing data cartridges in the DCM, insert the full magazine in the library. Align the DCM holes with the library's posts and press firmly to latch the retaining clips on each side of the DCM. Remove the magazine by firmly grasping near the top of the magazine with one hand and pulling it straight out through the door.

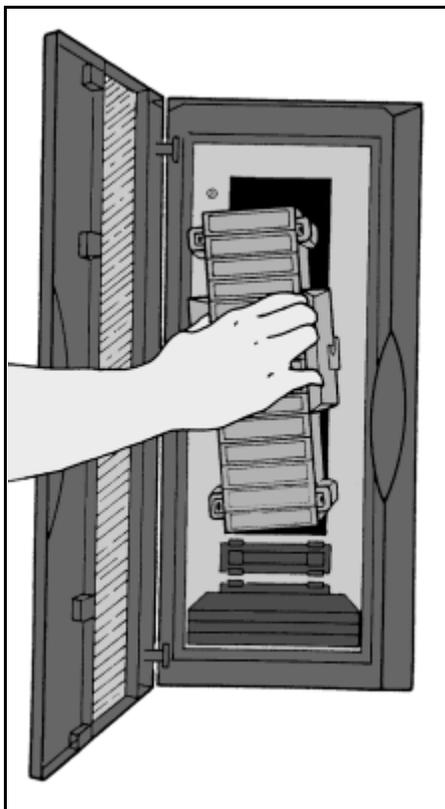


Figure 4-6 *Inserting the DCM in the library.*

Storing Cartridges Outside the Library

Follow these guidelines to store data cartridges outside the library with the DCM:

- Attach the clear plastic lid to the front of the DCM to shield the data cartridges from dust and other debris while in storage.
- Follow the tape storage suggestions described in *Caring for Data Cartridges* on page 56.
- Before inserting cartridges in the library, store the cartridges for 24 hours in the same room as the library; this prevents problems such as tape seizure caused by cold or cool tapes.

Getting Information from the Picker's LED

The robotic picker's light-emitting diode (LED), visible through the window of the library, shines either green or amber. The colored light indicates the status of the picker. The following table describes the LED operational modes and the information conveyed by these operating modes.

Mode	Information
Green	The picker is idle and the library is ready for use; this is the normal operating mode.
Green and Blinking	The picker is active and functioning properly.
Amber	The library is not ready for use. Verify that the door is shut and that the library SCSI connection is terminated and is within specifications; see <i>Appendix B. SCSI Cable and Terminator Requirements</i> .
Amber and Blinking	Failure. For example; to indicate a jam condition. Locate the source of the jam to return the picker to its normal state.
Blinking Amber and Green	The library configuration switch has been changed since the last power-up and the library is changing its configuration (as explained in <i>Chapter 3. Configuring the Library</i>).

Using the 30-Cartridge Library

The front door provides access to one 15-cartridge DCM at a time.

To access the second DCM:

1. Open and close the library door.
During the library's initialization procedure, the magazine carousel turns 180 degrees, reversing the positions of the magazines.
2. As soon as the carousel turns, open the door of the library with the second magazine in front.
3. Close the door of the library and the process repeats itself.

In all other respects, the use of the 30-cartridge library is identical to the use of the 15-cartridge library.

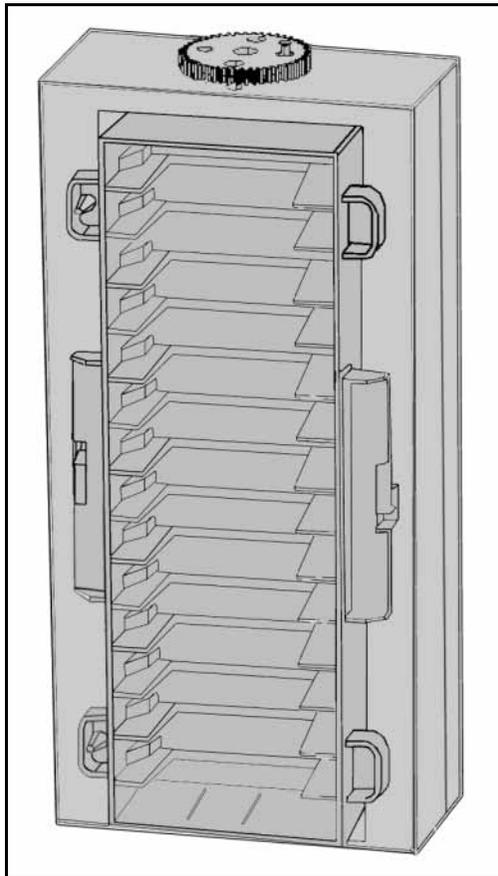


Figure 4-7 *The 30-cartridge magazine carousel.*

5 Using the AIT Tape Drives

The Sony AIT tape drive is a high-performance, low-maintenance tape drive. Using the AIT tape drives requires:

- Getting to Know the AIT Tape Drive
- Getting Information From the Drive LEDs
- Maintaining the AIT Tape Drive

Getting to Know the AIT Tape Drive

The AIT tape drive has an internal, variable-speed fan that cools the baseplate and other drive components without introducing airborne dust into the tape path. The fan, visible from the outside of the library, is also a critical part of the drive-cooling mechanism.

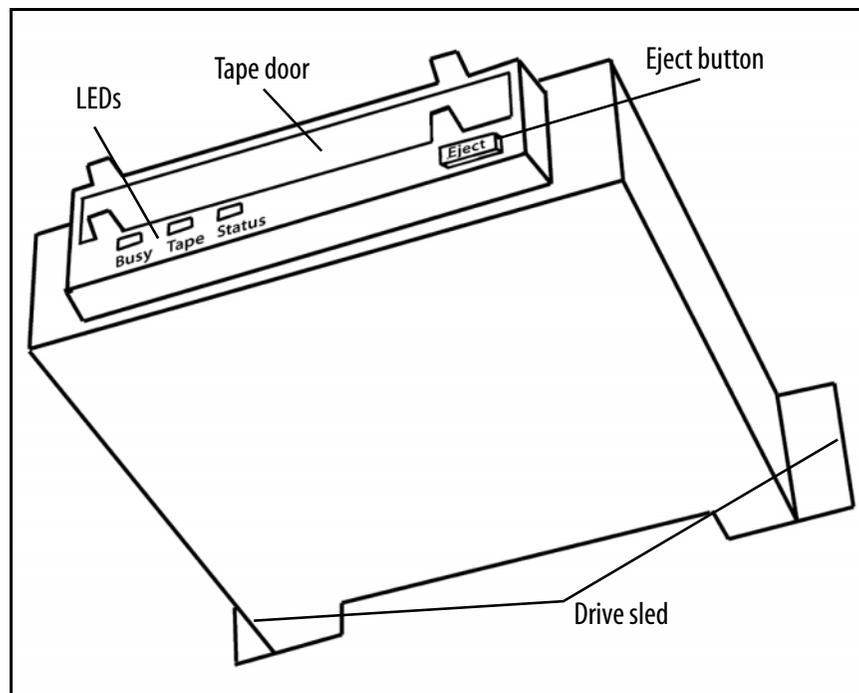


Figure 5-1 An AIT drive in a drive sled.

For further information about AIT tapes and tape drives, see *Sony AIT Tape Specifications* on page 74.

Built-In Cleaning Feature

The Sony AIT drive uses a built-in head cleaner designed to last for the life of the drive. This built-in cleaner works well, but it should not be relied upon as the *only* drive-cleaning mechanism, particularly in environments where more excessive drive head contamination may occur. Spectra Logic recommends that drives be cleaned after every 100 hours of use in normal data center environments. If excessive read or write errors occur while the drives are being cleaned with that frequency, Spectra Logic recommends cutting the cleaning time to every 50 hours of drive use.

Caution: Drive cleaning should be performed using only approved Sony SDX-TCL cleaning cartridges. For ordering information, see *Purchasing Additional Library Accessories* on page 64.

For more information about cleaning your drives, see *Tape Drive Head Cleaning* on page 46.

Getting Information From the Drive LEDs

The AIT tape drive has three light emitting diodes (LED) on the front of the drive:

Busy Indicates drive read and write activity.

Tape Indicates tape load and unload activity and error rate information.

Status Indicates the status of the tape drive, including whether the tape inside is write-protected, if it is a cleaning tape, or if the drive failed a self-test.

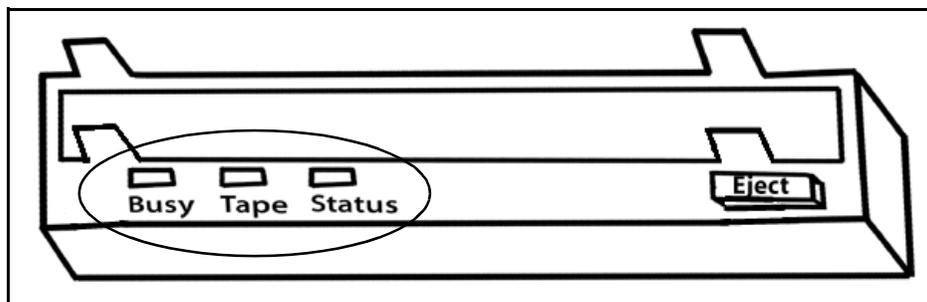


Figure 5-2 The AIT tape drive LEDs.

The following table summarizes the information carried by the blinking methods of the different drive LEDs:

Type of Blink	LED Type		
	Busy	Tape	Status
Off ^a	Not Busy	Unloaded	N/A
On ^b	SCSI Active	Loaded	Write protected
Fast Blink ^c	Drive active	Loading/Unloading	Cleaning tape at EOM
Slow Blink ^d	N/A	Error Rate Warning: data may be written incorrectly	Cleaning request
Single Pulse ^e	Waiting for reset	Waiting for eject	N/A
Double Pulse ^f	N/A	N/A	Self-test failure: power cycle the library to reset

a. Off: no color in the LED

b. On: green* and not blinking

c. Fast blink: blinks green* for 1/4 second and off for 1/4 second

d. Slow blink: blinks green* for 3-1/2 seconds and off for 1/2 second

e. One pulse: blinks green* for 1/4 second and off for 1 second

f. Two pulse: blinks green* for 1/4 second twice in a row then off for 1 second

* A green light on AIT-1 and AIT-2 drives is equivalent to a blue light on AIT-3 drives.

If the drive's Tape LED indicates possible errors with the data on that tape, the errors may be caused by old media or physical damage to the media. Resolve the problem by copying the data to another tape and discarding the old tape.

Maintaining the AIT Tape Drive

The AIT tape drive is an extremely reliable media storage subsystem; performing a few simple maintenance procedures will keep the drives reading and writing reliably for many years.

- For best performance with AIT tape drives, perform a read/write confidence test with your backup software regularly. For information about performing this operation, see the documentation for your backup software.
- As explained in *Getting to Know the AIT Tape Drive* on page 43, the drive cleans itself when necessary. If further cleaning is necessary, as indicated by the drive LED light and/or by the read/write confidence test, use only Sony SDX-TCL cleaning cartridges. For ordering information, see *Purchasing Additional Library Accessories* on page 64.

Tape Drive Head Cleaning

Head cleaning with a Sony SDX-TCL cleaning cartridge should be performed in the following situations:

- Every 100 hours of drive use (or less) in the following situations:
 - When the tape library has been installed in areas having high amounts of airborne particulates.
 - When the drive fails to write or read data correctly.
 - When the drive fails to eject a data cartridge.

Note: Dirty drive heads are not the only cause for read or write failures. Damaged media can also cause this type of failure.

Most installations require scheduled cleaning using SDX-TCL cleaning cartridges. Scheduled cleaning is definitely required in installations having high amounts of airborne particulates. Most software applications have features that allow scheduled automatic head cleaning of tape libraries.

Manual Drive Head Cleaning Operation

To clean your AIT tape drives, follow these steps:

Note: Use only Sony SDX-TCL cleaning cartridges.

1. Power on the library.
2. Open and close the library door.
Before the picker completes its calibration routine, it pauses in front of the DCM and the LED shines green.
3. Open the door of the library while the picker is parked in front of the DCM.
4. Carefully insert the cleaning tape into the drive with the window facing the top of the drive.

The cleaning tape performs automatic cleaning and ejects the cartridge when complete.

Caution: Do not use the cleaning cartridge for more than the number of specified cleaning cycles indicated on the cartridge label. Mark the cleaning cartridge each time you use it or use backup software to track cleaning cartridge usage.

6 Library Stacker Mode

If you are familiar with the operations of a tape stacker, you should have no problems operating the library in stacker mode. The following information covers the basics of the stacker mode for both the 15-cartridge and 30-cartridge libraries.

Stacker Mode Overview

In tape stacker mode, the library:

- Treats the DCM(s) as a single storage unit
- Reads and writes data using only Drive 1
- First selects cartridges at one end of the DCM and works towards the other end, requiring careful arrangement of cartridges in the DCM
- Performs different operations as controlled by opening the door for less than two seconds

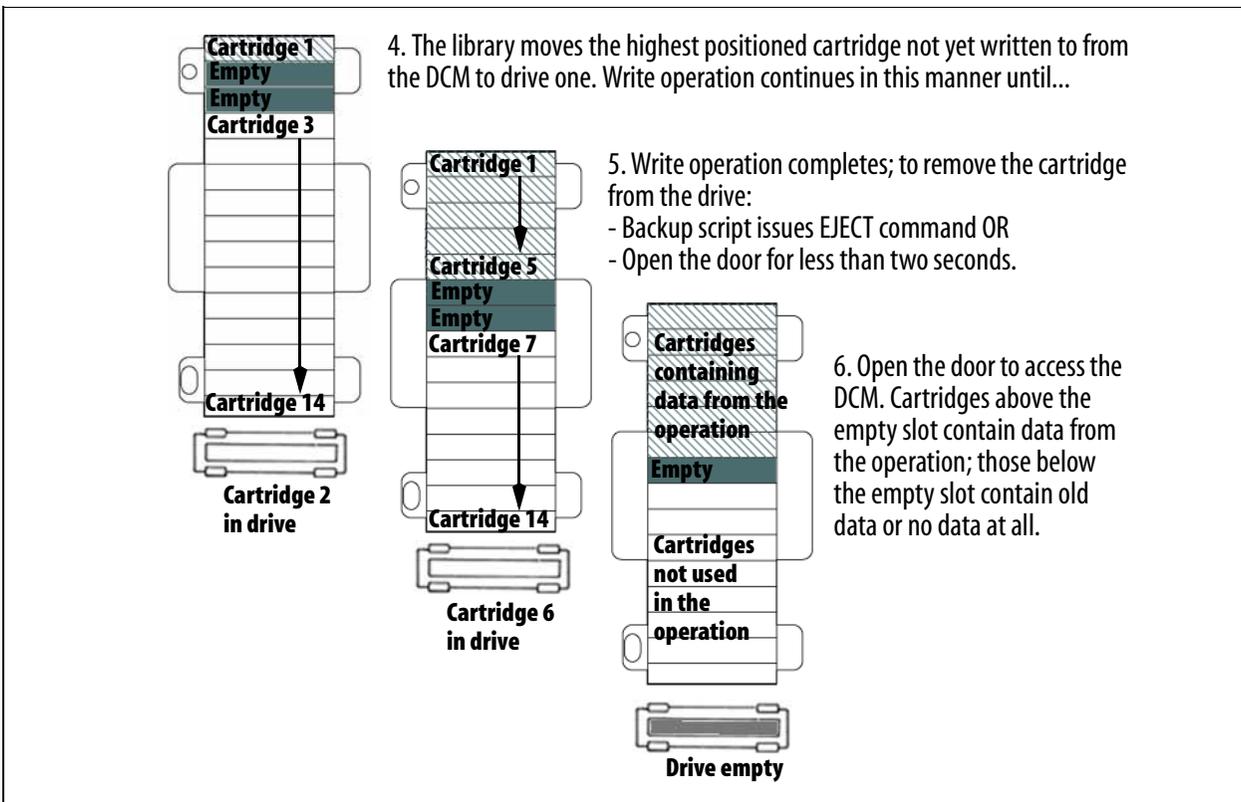
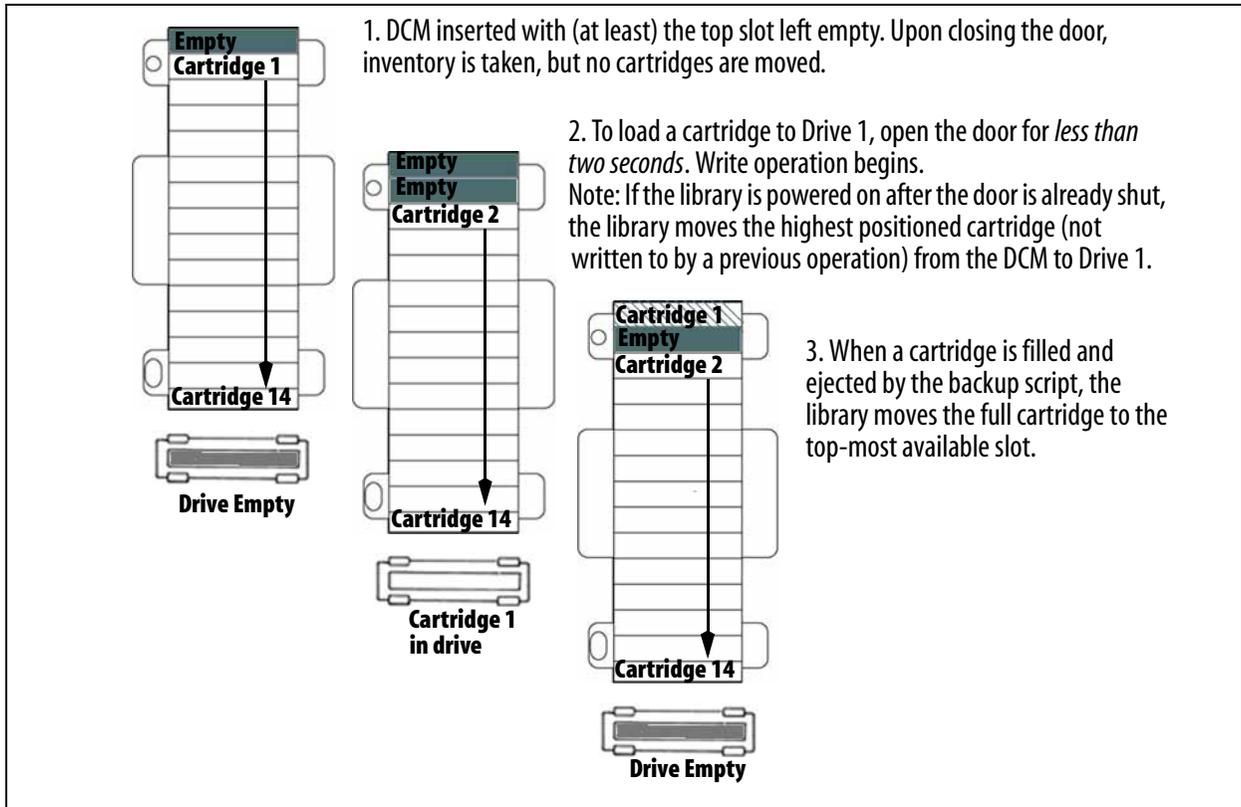
Using Drive 1 Only

Only Drive 1 is used in stacker mode. In a library with two tape drives, Drive 2 is powered on and idle, but unrecognized by the library and host computer. Furthermore, a drive must always be installed in the location for Drive 1; stacker mode never recognizes the location for Drive 2.

Thinking Like One Big Data Cartridge

The library stacker treats the DCM as if it were a single storage unit. It performs cartridge operations beginning with the cartridge in the first slot of the DCM. When the library stacker is through with a cartridge, it moves the cartridge to the next *available* slot in the DCM. The library stacker then grabs the cartridge in the next slot, moves it to the drive, and continues in this way until the command is complete.

See the diagrams on page 50 for a detailed view of the stacker mode process.



Arranging Cartridges in the DCM

Because the library only distinguishes between individual cartridges by their order in the DCM, arrange the cartridges in the DCM following these guidelines:

Empty Top Slot Leave the top slot empty. When the library stacker completes operations with a cartridge, it moves the used cartridge to the highest available slot and removes the cartridge in the next lower slot. By leaving the top slot empty, you assure that a space remains between the cartridges used and cartridges not used by the stacker, thus making it easier to tell the difference when you want to remove the DCM.

Cartridge Order Install the cartridges in the order you want them to be used. The cartridge at the top of the DCM is the first cartridge loaded. Make sure that the write protect tab on all cartridges is set to REC before attempting a write operation.

Do Not Overload Do not overload the DCM with cartridges. After a store completes, you don't want to mistake cartridges that contain data for cartridges that are empty. Use a maximum of 14 cartridges in a 15-cartridge library or 29 cartridges in a 30-cartridge library.

Do Not Underload Do not under-load the DCM with cartridges. Most stacker scripts return an error when the media runs out of room and require that the entire operation (or series of operations) be repeated.

Do Not Use for Cartridge Storage Do not store cartridges in the library stacker. All cartridges within the stacker (not write-protected) are fair game for stacker read or write operations.

Label Cartridges When storing data cartridges, label the cartridges carefully. Include the date, data type, and script name. Additional DCMs may be useful for organized storage. See *Purchasing Additional Library Accessories* on page 64 for ordering information.

Controlling the Library Stacker

The operation of the door determines the operating mode for the library as described by the following table.

When You Do This...	The Library Running in Stacker Mode Does This.
Shut the door	Scans the cartridges in the DCM, but until the door is opened for less than two seconds, the library will not load a cartridge in the drive.
Open the door <i>less than two seconds</i>	Moves the cartridge in the slot with the lowest slot number (highest slot of the DCM) into Drive one; ends the current operation and moves the tape from the drive to the highest empty slot in the DCM.
Open the door <i>more than two seconds</i>	Resets stacker mode; the library forgets the number and location of previous data cartridges. You can replace the DCM with the door open.

Caution: To avoid errors, do *not* open the door during read/write operations.

Using the Library in Stacker Mode

Tape stacker mode allows you to create your own backup and restore scripts and run them with the library. For information on writing scripts, see your UNIX man pages and/or operating system documentation.

To read or write data with the library stacker:

1. Configure the library for stacker mode as described in *Custom Configurations* on page 27.
2. Power on the library stacker and host computer.
3. Load the cartridges in the DCM as described in *Thinking Like One Big Data Cartridge* on page 49.
 - The cartridge nearest the top of the magazine is the first cartridge loaded in the drive.
 - Leave empty the very top slot in the data cartridge magazine so that you can distinguish between cartridges used in the operation and cartridges not used.

4. Shut the door, open it for *less than two seconds*, then close it. The library loads the first cartridge into Drive 1.
5. Issue a command over the SCSI bus. The library stacker mode cycles through cartridges as they are filled with data until the command completes or the stacker runs out of unused data cartridges.

Note: To differentiate between tapes containing data and unused tapes, always insert the DCM in the library with the top slot empty. This way, once the store completes, an empty slot separates the tapes with data from the tapes not used (see the diagrams on page 50).

7 Maintenance, Troubleshooting, and Repairs

This chapter reviews maintenance, troubleshooting, and repairs; this includes:

- Maintaining the Library
- Troubleshooting the Library
- Shipping Information
- Purchasing Additional Library Accessories
- Shipping Information
- Spectra Logic Repair Policies

Maintaining the Library

Maintaining the library requires:

- Caring for Data Cartridges
- Caring for the Library
- Replacing the Fuses

Caring for Data Cartridges

Although AIT cartridges are ruggedly built, they must be handled with care to preserve the data that they contain. The following are guidelines for storing and using AIT cartridges:

- Do not open the tape access door of the cartridge or touch the magnetic tape; one fingerprint can prevent a drive from reading the tape. Handle only the plastic tape cartridge.
- Keep the cartridge away from sources of electromagnetic fields such as telephones, dictation equipment, mechanical or printing calculators, motors, stereo speakers, and bulk erasers. Do not lay cartridges on a computer monitor or on the base unit of a computer.
- Keep the cartridge away from direct sunlight and heat sources, such as radiators and warm air ducts.
- Keep the cartridge free of moisture. Do not wet or submerge a cartridge in liquid.
- Do not expose the cartridge to temperature extremes. Allow the cartridge to reach room temperature slowly.

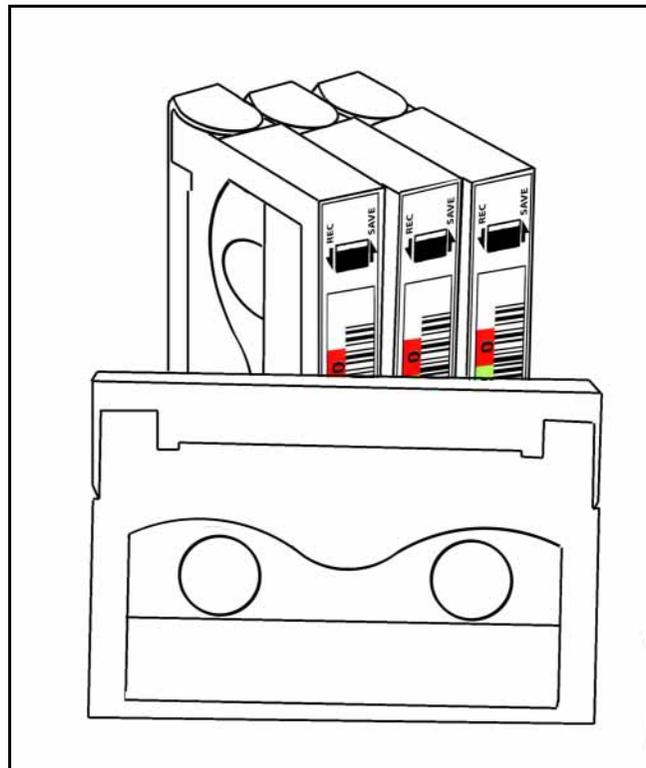


Figure 7-1 AIT data cartridges.

Handling of Tape Cartridges

Proper handling of tape cartridges is essential to insuring data integrity.

- Tape cartridges must be kept in a clean, dust-free environment. Store tape cartridges in a sealed container (the individual tape case or the 15-slot cartridge packs with the dust cover installed) when they are not loaded in the library. The Spectra Logic Pack Rack™ cartridge storage system is recommended for storing DCMs.
- Avoid abusive handling or dropping of tape cartridges. If a cartridge is inadvertently dropped, inspect it for damage. The dust cover on the cartridge must be properly seated or it could cause a jam condition in the tape drive.
- Cartridges should be used under the following conditions:
 - Temperature: 41°F to 113°F (5°C to 45°C)
 - Relative Humidity: 20 percent to 80 percent (non-condensing)
 - Maximum Wet Bulb Temperature: 77°F (25°C)

Note: Extreme changes in temperature and humidity should be avoided whenever possible.

- Condition of the cartridge. Before use, the cartridge should be conditioned by exposure to the operating environment for a time at least equal to the period during which it has been out of the operating environment (up to a maximum of 24 hours).

Caring for the Library

For a lifetime of reliable performance from your library, disconnect the power to the library and perform an annual inspection of the internal components.

- Use compressed air to clean out the slots in the DCM(s).
- Use compressed air to clean out the inventory sensors on the robotic tape picker (Figure 7-2).
- Use a soft cloth to clean the bar code scanner window on the robotic tape picker (Figure 7-2).
- With power to the library disconnected, open the rear access panel and use compressed air to clean out the area behind the drives.

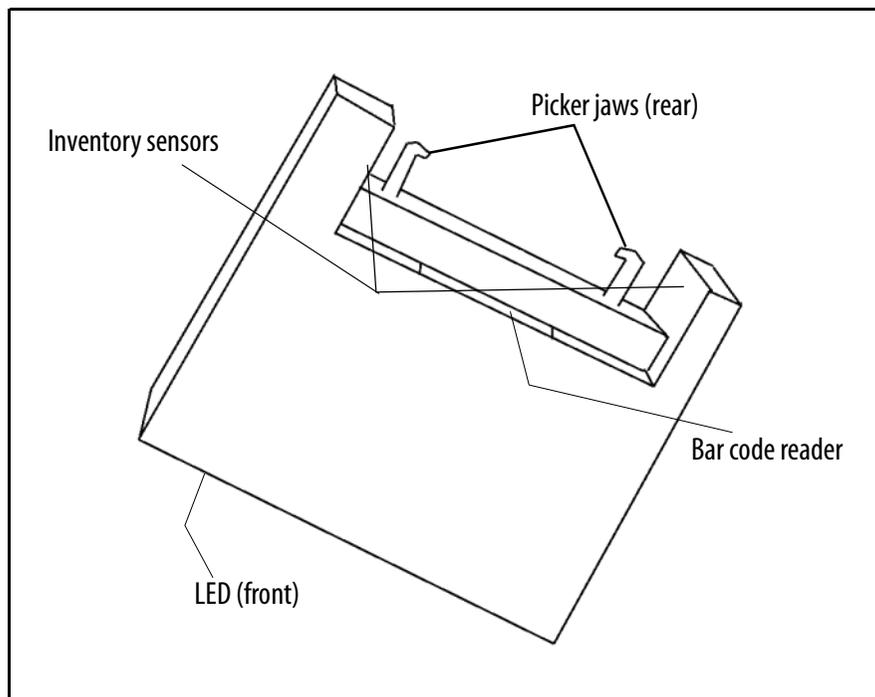


Figure 7-2 *Robotic tape picker (shown removed for clarity).*

Replacing the Fuses

The fuses used in the library are 1/4 x 1-1/4 inches (3AG) or 5 x 20 mm, 250-volt, 2A slow fuses. For purchasing information, see *Purchasing Additional Library Accessories* on page 64.

To check or replace the fuses, follow these steps:

1. Shut down your system and disconnect the AC power cable from the library.
2. On the back of the library, open the fuse compartment by prying under the short tab with a small screwdriver (Figure 7-3).
3. Remove the fuse holder underneath.
4. Remove the two fuses and replace them with new fuses.
5. Insert the fuse holder back into its original location and close the fuse door.

The door may take a little force to shut; it will snap when completely closed.

6. Attach the AC power to the library.
7. Power on the library.
8. Power on the computer.

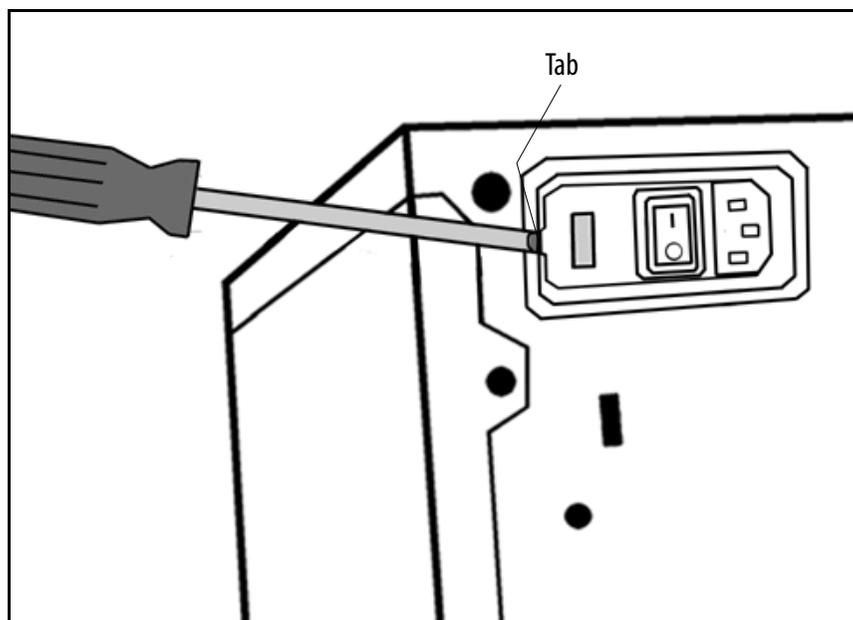


Figure 7-3 Use a screwdriver to pry open the fuse drawer door.

Updating Library Robotics Firmware

Note: To complete this procedure, you must have a Spectra Logic firmware upgrade tape available from Spectra Logic Technical Support.

To load the library firmware:

1. Power down the host computer.
2. Disconnect the SCSI cable from the library; this will prevent conflicts between the host bus adapter and the library SCSI ID setting.
3. Open and close the library door.

Before the picker completes its initialization routine, it pauses in front of the DCM and the LED shines green.

4. Open the door of the library while the picker is parked in front of the DCM.
5. Carefully insert the firmware upgrade tape into Drive 1 with the tape's clear plastic window facing the top of the drive.

Note: In a two-drive library, Drive 1 is the drive closest to the DCM.

6. Turn off the power to your library.
7. Move the library to a position that provides easy access to both the front and rear of the library.

Note: You may close the library door while moving the library, if necessary. However, you must re-open the door before the upgrade. The library door must remain open during the entire upgrade procedure.

8. Locate the configuration switches on the rear of the library.
9. Write down the current settings of the library configuration switch and the library SCSI ID switch.
10. Use a small screwdriver to turn the library configuration switch (Config) to **4** and the library SCSI ID switch (Library) to **7**.
11. Make sure that the library door is open.

12. Turn on the power to the library.

The picker parks at the bottom of the library, and its LED turns amber for the duration of the firmware upgrade (usually less than five minutes).

13. When the drive ejects the tape, the upgrade is complete; remove the firmware tape from the drive.

Note: If the tape fails to eject at the end of the procedure, do the following:

- i. With the picker parked in front of the DCM, open the library door.
 - ii. Press **EJECT** on the front of the drive, and the tape will eject.
-

Caution: Do not attempt to remove a cartridge from the tape drive without pressing **EJECT**, or you risk damaging the cartridge and/or the drive.

14. Turn off power to the library.

15. Use a small screwdriver to return the library SCSI ID switch (Library) and the library configuration switch (Config) to their original settings.

16. Return the library to its normal operating location.

17. Reconnect the SCSI cable to the back of the library.

18. Power up the library and the host computer.

Troubleshooting the Library

The following procedures, described in the following pages, solve many common problems:

- Troubleshooting Library Initialization
- Troubleshooting the Robotic Tape Picker
- Troubleshooting SCSI Problems
- Troubleshooting the Bar Code Reader

Also, you can reference the Spectra Logic Technical Support Knowledge Base on the Web at www.spectralogic.com/support/kbase/index.cfm.

Troubleshooting Library Initialization

To troubleshoot problems with library initialization:

1. Check that the power cable is securely inserted in the library and the wall outlet.
2. Make sure that the foam piece that secures the picker during transit has been removed (for a diagram of its location, see Figure 2-2 on page 13).
3. Make sure that the door is completely closed and that the key is turned to the locked position.
4. Make sure that a tape or other object is not blocking the motion of the picker; check the picker jaws, the drives, and the DCM.
5. Make sure that the SCSI terminator is properly connected.
6. Make sure that the library configuration switch is set correctly. (Settings 4 and 5 can cause errors.)
7. Make sure that all devices on the SCSI bus are set to a unique SCSI ID number.
8. If the LED on the picker does not light, or if the fan is not running, check that the fuse has not blown. If you suspect a blown fuse, follow the procedure in *Replacing the Fuses* on page 59.

Note: On SE/LVD libraries, the fan will not run unless a tape is in the drive.

Troubleshooting the Robotic Tape Picker

As a general rule, any problem you experience with the tape picker can most likely be solved by power cycling the library.

To troubleshoot problems with the tape picker:

1. Make sure that the door is completely closed. You should see a green LED through the library window when the library is ready. When you close the door, the library performs a short calibration routine before it becomes ready to use.
2. Make sure that nothing is blocking the tape path. Check that you removed the protective foam piece shipped with the library to protect the picker. For a diagram of its location, Figure 2-2 on page 13.
3. There may be a tape stuck in the picker. This happens when power to the library has been shut off while the picker is holding a tape. Turn on the library, and the picker replaces the data cartridge in a tape slot in the magazine.
4. Check that all tapes are correctly installed in the tape slots. A tape that is loose in a tape slot may block the picker's path.

Troubleshooting SCSI Problems

To troubleshoot problems with a SCSI device:

1. Make sure that each SCSI device in your SCSI chain has a unique SCSI ID. If two or more devices have the same ID, the computer may stop when you try to use the library robotics, or it may fail to recognize other SCSI devices.
2. Check that the SCSI host adapter card is firmly seated in the card slot in your server computer.
3. Make sure that the SCSI bus is terminated at both ends.
4. Make sure that the terminator is correct for the type of SCSI bus you are using.
 - Differential configurations require differential SCSI terminators.
 - Single-ended terminators can be passive or active, but must be the same at both ends of the SCSI bus.
 - LVD configurations require LVD terminators.
5. Check for bent pins on the cable connectors. Make sure that all cable connectors are firmly seated and screwed in, if possible.
6. Make sure that the chain of SCSI devices is compatible.
 - SCSI-3 devices may not function on SCSI-2 cables.
 - SCSI-2 devices may not function on SCSI-3 cables.
7. Recalculate the length of the SCSI bus including the cables inside the library and server computer. The maximum length specified in *Appendix B. SCSI Cable and Terminator Requirements* includes the cables inside the library.

Troubleshooting the Bar Code Reader

To troubleshoot problems with the bar code reader:

1. Make sure that the backup software's bar code feature is enabled.
2. Make sure that bar code labels are compliant with the standards listed in *About AIT Bar Code Labels* on page 35.
3. Make sure that all bar code labels are installed parallel to the cartridge edge (Figure 7-4).

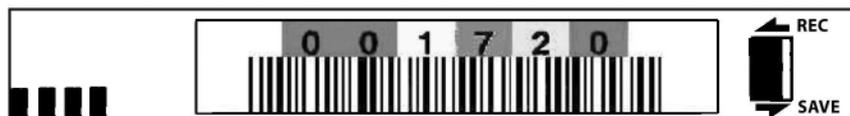


Figure 7-4 Sample AIT bar code label applied to a data cartridge.

4. If none of these steps resolve the problem, call Spectra Logic Technical Support.

Purchasing Additional Library Accessories

Spectra 2K library accessories, including bar code labels numbered sequentially from 000000 to 000720, are available directly from Spectra Logic.

Note: For media, see our Web site: www.spectralogic.com/media.

To order approved Spectra Logic accessories:

1. Call (800) 833-1132 or (303) 449-6400.
2. Ask for a sales representative.
3. Use the correct part number when ordering:

Accessory	Part Number
AIT Data Cartridge Magazine and Cover	90870652
AIT Cleaning Cartridge	4569
180 AIT Bar Code Labels	92844100
Replacement Fuse	4735
Replacement Key Set	90870224
Drive Installation Kit ^a :	
LVD/SE Spectra 2K Library, AIT-1 Drive	90870622
LVD/SE Spectra 2K Library, AIT-2 Drive	90870696
Differential Spectra 2K Library, AIT-2 Drive	90870697
Horizontal (Non-Rack Mount) Conversion Kit	Call Spectra Logic Sales
Horizontal Rack Mount Kit ^a	
For Standard 19" Equipment Rack	
For Enclosed Flush-Mount Rack	Call Spectra Logic Sales

- a. This can be upgraded in the field by an authorized service technician. Ask your Spectra Logic sales representative for the authorized service technician closest to you.

Note: Upgrading to AIT-3 drives requires swapping the entire library. If you are interested in upgrading to AIT-3 technology, call your Spectra Logic sales representative for details.

Purchasing Bar Code Labels

You can purchase bar code labels from Spectra Logic.

- You can purchase bar code labels within the range of 000000-0000179 directly from Spectra Logic. Use part number 92844100 to place your order.
- Pre-bar-coded Certified AIT Media is available directly from Spectra Logic. All bar code numbers on Certified AIT Media are unique and sequenced.

Bar Code Type Use only bar codes with Standard 3-in-9 encoding (Standard 39 Code).

Number of Characters Use labels with nine or fewer characters (including zeros, but not including the Checksum character, if used). For optimal performance, always use labels with the same number of characters. The library firmware adapts to a standard number of characters during power up and retries any label with fewer characters.

Checksums Bar code labels are available with or without a checksum character. The Spectra 2K library only supports bar code labels with a checksum character.

Installation Install all bar code labels parallel to the edge of the cartridge.

Vendors While many vendors are available for standard 8 mm bar code labels, AIT labels are slightly smaller, so caution should be exercised when acquiring labels. Use only bar code labels that are specifically designed for AIT tape cartridges.

Shipping Information

To ship the library for any reason, reverse the procedure in *Unpacking the Library* on page 11, making sure to use the original packaging materials.

The following table lists the size and weight of the library for shipping purposes.

	Vertical Spectra 2K Library	Horizontal Spectra 2K Library	30-Cartridge Spectra 2K Library
Height	16.9"	8.6"	Same
Width	8.6"	16.9"	Same
Depth	16.5"	16.5"	Same
Weight	28 pounds ^a	28 pounds ^a	32 pounds ^a
a. Library weight is calculated for a unit containing one drive, zero data cartridges, and one bar code reader.			

Caution: Never ship a library with the cartridge packs installed.
Remember to remove *both* cartridge packs from a 30-cartridge library before shipping.

Spectra Logic Repair Policies

Spectra Logic offers a standard three-year return-to-factory warranty on all Spectra 2K libraries. As of January 10, 2003, Spectra Logic is also offering a free upgrade to QuickSwap when users register their libraries on the Spectra Logic Web site within 60 days from the date on which the library was shipped to them (U.S. and Canada only).

The details of the standard warranty are found under *Limited Warranty*, below. The details of the QuickSwap service are found under *QuickSwap Service* on page 70.

Notices

Under any Warranty and Additional Service Option, if Spectra Logic forwards to Customer a library or part to replace a malfunctioning library or part, Customer will return the malfunctioning unit or part to Spectra Logic (using the RMA # provided) within five days of receipt of the replacement library/part. If Customer does not return the malfunctioning library/part within five days (fob destination), Customer will pay for the unit/part at the then-applicable list price and upon receipt of invoice from Spectra Logic.

If Customer does not pay as provided herein and such non-payment continues for 10 days after written notice, Spectra Logic may unilaterally void the warranty and pursue all available remedies.

Limited Warranty

Spectra Logic warrants the tape library to be in good working order for a period of three full years from the date of shipment from Spectra Logic or an authorized Spectra Logic dealer. Should this product fail to be in good working order at any time during this three-year period, Spectra Logic will, at its option, repair or replace this product at no additional charge except as follows:

Suspect parts sent to Spectra Logic will be repaired or replaced. Exchanged parts will be either reconditioned or new at the option of Spectra Logic. This limited warranty does not include:

- Service to repair damage resulting from accident
- Disaster, misuse, and abuse
- Non-Spectra Logic modification of the product including, but not limited to, product expansion through plug-in additions except as provided by Spectra Logic
- Removal of serial number tags
- Physical damage caused by inadequate packaging
- Tape head cleaning performed on drives provided by Spectra Logic with a non-certified cleaning cartridge
- Drives purchased from vendors other than Spectra Logic

If any of the above conditions exist, Spectra Logic reserves the right to repair the unit at the current fixed price of repair.

Warranty service can be acquired during the three-year period by shipping the product to Spectra Logic with an invoice and Return Materials Authorization (RMA) number.

Note: No return can be accepted without an RMA number from Spectra Logic Technical Support. Returns must be shipped prepaid in their original packing containers; damage incurred in transit is not covered by Spectra Logic's warranty.

Spectra Logic makes no other warranties, expressed or implied, and specifically disclaims any warranty of merchantability or fitness for a particular purpose or use. If this product is not in good working condition as warranted above, your sole remedy shall be replacement or repair as provided above. In no event will Spectra Logic be liable to you for any damages, including any lost profits, lost savings, or other incidental or consequential damages arising out of the use of or inability to use such product, even if Spectra Logic has been advised of the possibility of such damages, or for any claim by any other party.

Warranty Shipping

The library must be returned in the original carton and packed with the original packing material. Failure to do so will void the warranty. See the label on the inside lid of the shipping container for instructions on packing the library.

The purchaser is responsible for paying the shipping and insurance charges for warranty goods to Spectra Logic. Spectra Logic will pay for shipping the repaired item back to the purchaser.

International warranty repairs must be accompanied by a commercial invoice, a packing slip, and a carrier waybill. The following must be written on the invoice:

GOODS OF U.S. ORIGIN, RETURN FOR WARRANTY REPAIR, VALUE FOR CUSTOMS USE ONLY.

Import duties assessed on incoming shipments will be prorated to the customer's account if proper documentation does not accompany the shipment.

Warranty Turnaround Time

A standard repair turnaround time is two weeks from receipt of the product. Spectra Logic shall reserve the right to replace the unit if it cannot be repaired within the two week time frame. A 48-hour turnaround is available for an additional charge.

Out-of-Warranty Repairs

Contact Technical Support for the current fixed library repair price. The repair is warranted for ninety days from the date the unit is shipped to a customer.

Out-of-Warranty Shipping

All non-warranty units will be shipped back to the purchaser as determined by the purchaser. Shipping charges to and from Spectra Logic are the responsibility of the purchaser. International customers with non-warranty units are responsible for customs and duties charges coming into the United States as well as charges on returned products into their own countries.

Out-of-Warranty Turnaround Time

The non-warranty turnaround time is two weeks from receipt of the unit. An expedited turnaround time of 48 hours is available for an additional fee. Spectra Logic reserves the right to either repair or replace the unit.

QuickSwap Service

The QuickSwap program covers the Spectra 2K library for the original return-to-factory period (three years from the date of shipment) at no cost to the customer. The program includes:

- Access to a Spectra Logic Technical Support representative any business day (not including evenings, weekends, or holidays) from 8:00 a.m. to 5:00 p.m. Mountain Time (MT).
- Upon verification that the product has malfunctioned, the replacement part or unit will be shipped to the customer.
- The replacement arrives within five to seven business days. The replacement can be expedited from the Spectra Logic manufacturing line for an additional charge. Contact your sales or service representative for more information.
- The customer returns the defective part or unit within 10 days of receipt of the replacement.

This program begins January 10, 2003. It covers the product for the original return-to-factory period (three years from the date of shipment) at no cost to the customer.

Advanced Service Options

There are three advanced technical support services available on a contractual basis.

- Advanced Replacement Service
- Next Business Day On-Site Service
- Four-Hour On-Site Service

Please contact Technical Support for more information and the contract pricing for these options.

Contacting Spectra Logic

Information

Web Site <http://www.spectralogic.com>

Technical Assistance

Technical Support Phone United States: (800) 227-4637 or (303) 449-6444 extension 3175
Europe: +44 (0) 870 112 2185

Technical Support E-Mail support@spectralogic.com

Knowledge Base <http://www.spectralogic.com/support/kbase/index.cfm>

Supplies and Accessories Sales

United States Sales Phone: (800) 833-1132 or (303) 449-6400
Fax: (303) 939-8844
E-mail: sales@spectralogic.com

European Sales Phone: +44 (0) 870 112 2150
Fax: +44 (0) 870 112 2175
E-mail: eurosales@spectralogic.com

Ordering Media media@spectralogic.com

RMA Number for Equipment Service and Returns

Technical Support Phone United States: (800) 227-4637 or (303) 449-6444 extension 3175
Europe: +44 (0) 870 112 2185

Technical Support E-Mail support@spectralogic.com

Appendix A. Specifications

This appendix contains the following information:

- Library Storage Capacity
- Sony AIT Tape Specifications
- Sony AIT Tape Drive Specifications
- Library Power Requirements
- Library Operating Environment Limits
- Safety Agency Standards

Library Storage Capacity

As shown in the table below, the library's data storage capacity depends on the AIT cartridge model, data compression, and the library's slot configuration.

	AIT-1		AIT-2		AIT-3	
Library Slot Configuration	15	30	15	30	15	30
Maximum Data Cartridge Capacity	15	30	15	30	15	30
Tape Length	230 meters		230 meters		230 meters	
Native Capacity per Cartridge	35 GB		50 GB		100 GB	
Maximum Native Capacity	525 GB	1050 GB	750 GB	1500 GB	1500 GB	3000 GB
Compression Ratio ^a	2.6:1		2.6:1		2.6:1	
Maximum Compressed Capacity ^a	1365 GB	2730 GB	1950 GB	3900 GB	3900 GB	7800 GB

a. The compression ratio is an approximation. Actual results will vary depending upon the type and amount of data.

Note: All specifications are subject to change without notice.

Sony AIT Tape Specifications

Sony is the only manufacturer of AIT tape cartridges. The table below lists the capacities of the different types of AIT tape cartridges.

Note: All specifications are subject to change without notice.

Tape Type	Spectra Logic P.N.	Length	Capacity
AIT-1 SDX-25C	4655	170 meters	25 GB native 65 GB with ALDC
AIT-1-XL SDX-35C	5114	230 meters	35 GB native 91 GB with ALDC
AIT-2 SDX2-50C	5122	230 meters	50 GB native 130 GB with ALDC
AIT-3 SDX3-100c	5877	230 meters	100 GB native 260 GB with ALDC
AIT-3 SDX3-100w	6648	230 meters	100 GB native 260 GB with ALDC

Sony AIT Tape Drive Specifications

The following table summarizes the specifications for Sony AIT drives.

Parameter	Specification
Ambient operating temperature ^a	+41°F to +104°F (+5°C to +40°C)
Storage temperature	-40°F to +158°F (-40°C to +70°C)
Operating humidity	20% to 80% non-condensing
MTBF	AIT-1 = 200,000 hours @ 100% duty cycle AIT-2 = 300,000 hours @ 100% duty cycle AIT-3 = 400,000 hours @ 100% duty cycle
Average file access time	AIT-1 = less than 55 seconds AIT-2 = less than 27 seconds AIT-3 = less than 27 seconds
Uncorrectable error rate	Less than 1×10^{-17} bits
Sustained transfer rate ^{b, c}	AIT-1 = 3 MB/sec native AIT-2 = 6 MB/sec native AIT-3 = 12 MB/sec native
Burst transfer rate ^d	AIT-1 = 40 MB/sec Synchronous maximum AIT-2 = 80 MB/sec Synchronous maximum AIT-3 = 160 MB/sec Synchronous maximum

- a. The upper limit applies to the drives themselves. The temperature limits for the Spectra 2K library are given in *Library Operating Environment Limits* on page 77. Be sure there is adequate air flow around the library at all times.
- b. This is a per drive value. Total sustained transfer rate for the library depends on the number of drives installed in the library.
- c. The sustained transfer rate per drive can increase by an average of 2.6 times the specified value with compression. Compression throughput and capacity depends on the type of data.
- d. The actual burst data transfer rate is limited by the performance of the SCSI host bus adapter, the SCSI bus interface controller, and the buffer control hardware of the drive.

Library Power Requirements

Power requirements for the library are summarized in the table below:

Source	Requirements
Input Voltage	100-240 volts-AC; 2 A maximum
Input Power	90 Watts minimum, 120 Watts maximum
Input Frequency	50/60 Hz

Fuses

The library includes two 1/4-inch x 1-1/4-inch or 5 mm x 20 mm (3AG), 250-volt AC, 2A slow fuses. For complete instructions on replacing fuses, see *Replacing the Fuses* on page 59.

Caution: For continued fire protection, replace fuses only with the specified type and rated fuses.

Power Cable

The power cable included with the library is a standard, three-conductor, 18 AWG power cord, safe for 120-volt use in the United States and Canada. The cable has a molded NEMA 5-15P male connector to plug in the wall and a molded IEC type CEE-22 female connector to plug into the library.

Note: To use the library outside of the United States or Canada, the power cord must meet the specifications for that country.

220-Volt AC Power Cord for Use in North America

The criteria for a U.S. and Canadian 220-volt AC power cord for the library are as follows:

- Power cord must have a molded NEMA 6-15P attachment plug on one end.
- Power cord must have a molded IEC type CEE-22 female connector to connect to the library.
- Cordage must be SJT type, three-conductor, 18 AWG minimum.
- Power cord must comply with local electrical code.

220-Volt AC Power Cord for International Use

The criteria for an international 220-volt AC power cord are as follows:

- Power cord must have an attachment plug of the proper type, rating, and safety approval for the intended country.
- Power cord must have an IEC type CEE-22 female connector on one end to connect the library.
- Cord must be a flexible, HAR (harmonized) type H05VV-F, three-conductor, cord with minimum conductor size of 0.03 square inches (1.0 square millimeters).

Library Operating Environment Limits

Place the library and media in a reasonably controlled environment that does not exceed the environment limits listed in the table below:

Condition	Minimum	Maximum
Operating Temperature (Ambient Outside Library)	2° C 35.6° F	30° C 86° F
Storage Temperature	-40° C -°104 F	65° C 149° F
Relative Humidity (non-condensing)	20%	80%
Maximum Wet Bulb Temperature	N/A	26° C
Altitude	0 m Sea level	3,000 m 9,842 ft

Safety Agency Standards

The following lists the safety standards with which the library and its components (including the drives) comply:

- UL 1950: 3rd Edition, Information Technology Equipment Including Electrical Business Equipment
- CSA-C22.2 No. 950-M95, Safety of Information Technology Equipment Including Electrical Business Equipment
- EN60950/IEC950: Safety of Information Technology Equipment Including Electrical Business Equipment

Appendix B. SCSI Cable and Terminator Requirements

To operate correctly, the library must meet certain requirements as explained by the following sections:

- SCSI Cable Requirements
- SCSI Terminator Requirements

SCSI Cable Requirements

The following table lists the recommended specifications for a SCSI cable (not included).

Cable Feature	Requirement
Standard Construction	68 conductors (34 twisted pairs with drain wire and shield)
Primary Conductors	Insulated per UL Style 1589 Gauge: #28 AWG minimum stranded (7/34) annealed, tinned copper Insulation: Polypropylene (80° C) 0.010 inch nominal
Shielding	80% minimum tinned copper braid over aluminum/mylar foil
Outer Jacket	Insulated per UL Style 2919, polyvinyl chloride (PVC) (80° C)
Voltage Rating	30 VAC
Impedance	100 Ohms \pm 10% @ 1.5 MHz
Grounding	Case to case grounding
Connector	68-contact AMP Amplimate 0.050 male, shielded, SCSI-3 connector

The maximum length of the SCSI cable (including the internal and the external cable) depends on the SCSI configuration:

- Single-ended SCSI maximum allowable bus length is 1.5 meters (4.5 feet) including the 60 centimeters (24 inches) of cabling inside the library.
- Differential SCSI maximum allowable bus length is 20 meters (60 feet) including the 60 centimeters (24 inches) of cabling inside the library.
- LVD SCSI maximum allowable bus length is 12 meters (39 feet) including the 60 centimeters (24 inches) of cabling inside the library.

Note: The entire bus (including host bus adapter, devices, and terminator) must be LVD to operate in LVD mode. Attaching any single-ended SCSI device to an LVD bus renders the entire bus, including all devices, subject to the limits for the maximum specification requirements for single-ended SCSI.

For maximum performance with a single-ended SCSI interface, Spectra Logic recommends that you attach the Spectra 2K library as the only device on the SCSI bus.

Follow these steps to determine if your SCSI configuration complies with the maximum cable length specifications:

1. Measure the length of the SCSI cables between each device on the SCSI bus.
2. Add these lengths together.
3. To that sum, add 60 centimeters (24 inches) for the cabling inside each library.

For single-ended libraries, this total must not exceed 1.5 meters in length.

LVD configurations must not exceed 12 meters in length.

Differential configurations must not exceed 20 meters in length.

SCSI Terminator Requirements

If the library is the last device on the SCSI bus, a terminator must be attached to the empty SCSI connector on the back of the library.

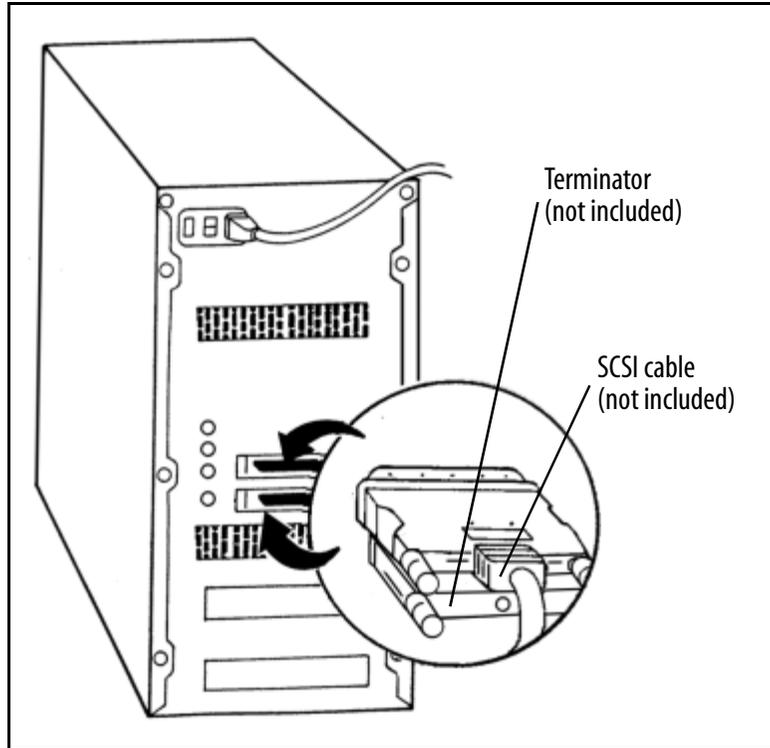


Figure 7-1 Close-up shows a SCSI cable attached to the top connector and a SCSI terminator attached to the bottom connector.

The SCSI terminator must match the SCSI bus configuration, whether differential, LVD, or single-ended. Terminators are not included with the library. Termination can be active or passive on a single-ended SCSI bus, but must be the same at both ends.

Note: For best performance, do not terminate the library internally.

Appendix C. Regulatory Notices

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

Taiwan

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

EU Declaration of Conformity

We

Spectra Logic Corporation
1700 North 55th Street
Boulder, Colorado 80301
USA

declare under sole responsibility that

Spectra Logic's Spectra 2K automated tape library

to which this declaration relates, meets the essential health and safety requirements and is in conformity with the EU Directives listed below using the relevant section of the following EU standards and other normative documents:

EU Low Voltage Directive 73/23/EEC	Essential health and safety requirements relating to electrical equipment designed for use within certain voltage limits.
EN 55022 (CISPR 22) Class B	Limits and methods of measurements of radio interference characteristics of information technology equipment.
EN 60950 (IEC 60950)	Safety requirements of information technology equipment including electrical machines.
EN 61000-4-2 (1995)	Electrostatic discharge requirements for industrial process measurement and control equipment.
EN 61000-4-3 (1996), ENV 50204 (1995)	Radiated electromagnetic field requirements for industrial process measurement and control equipment.
EN 61000-4-4 (1995)	Electrically fast transients for industrial process measurement and control equipment.
EN 61000-4-5 (1995)	Electrical surge immunity for industrial process measurement and control equipment.
EN 61000-4-6 (1996)	Conducted radio frequency immunity for industrial process measurement and control equipment.
EN 61000-4-8 (1993)	Power frequency magnetic field immunity for industrial process measurement and control equipment.
EN 61000-4-11 (1994)	Immunity to voltage dips, interruptions and variations for industrial process measurement and control equipment.
EU EMC Directive 89/336/EEC	Essential health and safety requirements relating to electromagnetic compatibility.

The Spectra 2K automated tape library complies with all safety relevant provisions referring to:

- Protection against electrical hazards.
- Protection against hazards such as:
 - Mechanical Hazards
 - Fire Hazards
 - Noise
 - Vibration

The CE marking has been affixed on the device according to Article 10 of the EU Directive 89/336/EEC and 73/23/EEC.

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