Tape Series Mid-Range Libraries

T200, T380, AND T680

Site Preparation Guide

SPECTRALOGIC.COM

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Part Number

91010004 Revision F

Revision History

Revision	Date	Description
A	January 2008	Initial release
B	March 2008	Added T200 library
C	November 2008	Added the T680 library
D	December 2011	Corrected errors. Updated formatting and organization.
E	March 2015	Updated trademarks.
F	September 2022	Added new drive types

Note: To make sure you have the most current version of this guide check the Spectra Logic Technical Support portal at support.spectralogic.com/documentations/user-guides/

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Warnings and Cautions

Warning

Risk of electrical shock. Hazardous moving parts. Use caution when removing the library's front or side panels. Spectra Logic recommends turning off the power to the library before removing the front or side panels.

Warnung: Gefahr eines elektrischen Schlages. Gefährliche bewegliche Teile. Seien Sie vorsichtig, wenn Sie die Library der Vorder-oder Seitenwänden. Spectra Logic empfiehlt Drehen Sie das Gerät in die Library, bevor Sie den Front-oder seitlichen Platten.

Warning

Risk of electrical shock. To prevent the possibility of electrical shock, install cord locks on the AC power cords and a permanent grounding wire between the chassis and earth ground.

Warnung: Gefahr eines elektrischen Schlages. Um zu verhindern, dass die Möglichkeit eines elektrischen Schlages, der Installation von Kabel-Sperren auf den AC Netzkabel und eine ständige Erdung Draht zwischen den Chassis und Masse.

Warning

The T200 library weighs approximately 230 lb (104 kg), the T380 library weighs approximately 305 lb (138 kg), and the T680 weighs approximately 765 lb (347 kg) without controllers, drives, and media installed. Use extreme caution when moving it.

Warnung: Die Library T200 wiegt ca. 104 kg, die Library T380 wiegt ca. 138 kg, und die Library T680 wiegt ca. 347 kg ohne Controller, Laufwerke und Medien installiert werden. Verwenden Sie extreme Vorsicht walten lassen, wenn sie abwandern.

Warning

The T200/T380 library is very heavy. Always use four people, two on each side, when lifting or moving the library.

Warnung: Die T200/T380 Library ist sehr schwer. Benutzen Sie immer vier Personen, zwei auf jeder Seite, beim Heben oder Fortbewegen der Library.

Warning

The T200 and T380 must be installed in a standard 19-inch (48 cm), four-post rack to prevent tipping. The rack must be located on a level, hard-surfaced floor such as cement or tile. A two-post rack will not support the weight of the library.

Warnung: Die T200 und T380 sind in einem Standard-48 cm, Vier-Pfosten-Rack zu verhindern Kippen installiert werden. Ein Zwei-Pfosten-Rack wird nicht mit dem Gewicht der Library.

Caution If the library is loaded with media packs (RXT media packs or media in TeraPacks), Spectra recommends that the library not be moved. If you must move the library, contact Spectra Logic Technical Support for recommendations before proceeding.

Caution Use only the media approved by Spectra Logic for use in the drives installed in your library. Improper media will result in damage to the drives, library, and media.

Caution The library and components should be kept in their shipping boxes while moving them to the installation location. If space for moving the boxes is not available, contact Spectra Logic Professional Services for guidance.

Caution Be cautious when moving the library and component shipping boxes. Use a pallet jack to move the boxes on a level surface. Use a stair crawler or other special equipment that can handle the weight of the boxes to traverse stairways.

Caution When the library is moved from a cold environment to a warm environment, it should not be used for at least 24 hours. This adjustment period prevents condensation damage.

Caution If you tilt the library, Spectra Logic is not responsible for any damage caused to the library or its components, or for any damage caused to your site.

Caution The library is designed to be used on parallel power only. If the power sources for the dual AC inputs are not parallel, damage to the library could result.

Contacting Spectra Logic

To Obtain General Information

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Contents

About This Guide

This guide describes site preparation for the installation of the Spectra® T200, T380, and T680 libraries (referred to as the library, except where noted). It includes precautions for safety and handling, as well as facility requirements for the library's environment, cabling, and placement. This guide also provides the library specifications and a checklist that you can use to help ensure that your site is prepared before your library arrives.

Most of the figures in this document show the Spectra T380 library. The relative locations of the components and the procedures are the same for the other libraries unless otherwise indicated. The differences are indicated by library type; for example:

- **Spectra T200 or T380**—items indicated with this text refer to either of these libraries.
- **Spectra T680**—items indicated with this text refer to only this library.

Intended Audience

This guide is intended for data center personnel who are responsible for ensuring that the data center is properly prepared for the installation of the library. The information in this guide assumes a familiarity with SCSI, Fibre Channel, and SAS communication protocols as well as with network connectivity protocols such as Fibre Channel and Ethernet. It also assumes a knowledge of technical tasks such as configuring operating systems and installing drivers.

Related Publications

For additional information about the library and its tape drives, refer to the publications listed in this section.

Spectra T200, T380, and T680 Libraries

This guide and the following documents related to the Spectra T200, T380, and T680 libraries are available as PDF files on the Spectra Logic website at: https://support.spectralogic.com/documentation.

- The *Spectra T200, T380, or T680 Library User Guide* describes how to configure, use, maintain, and troubleshoot the library. It also provides specifications for the library.
- The *Spectra T200, T380, or T680 Library Quick Reference Guide* provides a quick reference for the user interface and instructions for performing day-to-day library operations such as powering on and off, and preparing, importing, and exporting media.
- The *Spectra T200, T380, or T680 Library BlueScale Toolbar Option Map* provides a quick reference for locating the options and commands available through the BlueScale user interface.
- The *Spectra T200, T380, or T680 Library Site Preparation Guide* provides information about preparing your site for the installation of the library.
- The *Spectra T200 & T380 Rackmount Kit Installation Guide* provides information about installing the T200 or T380 library in a standard 19-inch, four-post rack.
- The *Spectra BlueScale Vision Camera User Guide* provides detailed information about installing and using the white BlueScale Vision Camera and software.
- The *Vivotek FD8361 Fixed Dome Network Camera User's Manual* provides detailed information about installing and using the black BlueScale Vision Camera and software.
- The *Spectra Encryption User Guide* provides detailed information about using BlueScale Encryption Standard and Professional Edition and the Spectra TKLM Encryption key management system. It also provides useful information about encryption best practices and recycling encrypted media.
- The *Spectra Tape Libraries SCSI Developer's Guide* provides detailed information about the SCSI and Fibre Channel commands used in the library.
- The *Spectra Tape Libraries XML Command Reference* provides detailed information about using the XML interface with the T200, T380, and T680 libraries.
- The *Spectra Tape Libraries Warnings* document provides all of the warnings found in Spectra tape libraries documentation, in English and 27 other languages.

The following document is available after logging into your Support portal account at: https://support.spectralogic.com.

- The *Spectra T200, T380, and T680 Library Release Notes and Documentation Updates* provides the most up-to-date information about the library, drives, and media.

LTO Ultrium Tape Drives

The following documents provide information that is applicable to all IBM LTO tape drives.

- *IBM Tape Device Drivers Installation and User's Guide*

  Note: This guide also provides information about using the IBM Tape Diagnostic Tool (ITDT) to troubleshoot drive problems.

- *IBM TotalStorage LTO Ultrium Tape Drive: SCSI Reference* (LTO-1 through LTO-4)
- *IBM TotalStorage LTO Ultrium Tape Drive: SCSI Reference* (LTO-5 and later generations)

For drive-specific information, search for the product name (for example, LTO 5) on the documentation page on the IBM website. You can also search the IBM Support Portal at:
http://www-947.ibm.com/support/entry/portal/Documentation.

TS11*xx* Technology Drives

The following documents provide information that is applicable to TS11*xx* technology drives.

- IBM System Storage Tape Drive 3592 SCSI Reference
- IBM Tape Device Drivers Installation and User's Guide

  Note: This guide also provides information about using the IBM Tape Diagnostic Tool (ITDT) to troubleshoot drive problems.

Spectra SKLM Server

For additional information that can assist you during the installation and configuration of your server, see the following website:

- IBM Security Key Lifecycle Manager welcome page

Discontinued Components

The following components are no longer available for purchase. If your library includes these components, refer to the documentation that accompanied your library when you received it for information about using these components when you configure partitions.

- QIPs (both F-QIPs and E-QIPs) have been replaced by a Fibre Channel Robotics Interface Module (RIM) and are no longer available for purchase.

  The RIM does not provide drive connectivity. If your library includes SCSI drives, you can continue to use them as long as you have a QIP or BEM to provide connectivity for the drives.

- SCSI-based drives, including SDLT, SAIT and RXT drives, as well as LTO-2 through LTO-6 drives, are no longer available for purchase.
- The Bus Expansion Module (BEM), which is used to provide direct SCSI bus connectivity for SCSI drives in the library, is no longer available for purchase.

Typographical Conventions

This document uses the following conventions to highlight important information:

Note: Read notes for additional information or suggestions about the current topic.

Important Read text marked by the "Important" icon for information that will help you complete a procedure or avoid extra steps.

Caution Read text marked by the "Caution" icon for information you must know to avoid damaging the library, the tape drives, or losing data.

Warning Read text marked by the "Warning" icon for information you must know to avoid personal injury.

Warnung: Lesen Sie markierten Text durch die "Warnung"-Symbol für die Informationen, die Sie kennen müssen, um Personenschäden zu vermeiden.

CHAPTER 1

Library Overview

The Spectra T200, T380, and T680 libraries are highly scalable, modular libraries that provide unattended data storage, archiving, backup, and retrieval for environments ranging from mid-sized PC workgroups to multi-server networks. The unique TranScale™ modular design makes it possible to increase the storage capacity or number of drives in the library to meet an organization's evolving storage and performance needs.

This chapter provides an overview of the library features and components. With the exception of the maximum number of drives, the total storage capacity, and the number of interface modules that each supports, the T200, T380, and T680 libraries are functionally and operationally identical. The differences between the libraries are noted where appropriate.

LIBRARY FEATURES

The Spectra T200, T380, and T680 libraries all use the same components and BlueScale® user interface. The libraries include the following features:

BlueScale Software Features

The BlueScale software provides control over every aspect of the library's operation.

Auto Configuration Save The Auto Configuration Save feature automatically generates a weekly backup file and stores the file on the memory card in the LCM. The backup file contains the library configuration and the MLM and DLM databases, as well as the encryption configuration and keys.

Auto Drive Clean Auto Drive Clean lets you configure a dedicated partition to be used for cleaning cartridges. The cleaning partition can be shared by multiple data partitions using the same drive technology and is used by the library to automatically clean drives whenever necessary.

Controller Failover In libraries using robotic interface modules, Controller Failover configures two identical controllers in the library as a failover pair. The primary controller provides the robotic control path in the partition while the secondary is designated as the spare. In the event that the secondary controller detects a problem with the primary controller, it automatically takes over all robotics control operations to provide uninterrupted operation.

Encryption and Key Management BlueScale Encryption key management is tightly integrated into the BlueScale environment. Encryption can be performed either through encryption-capable LTO-4 through LTO-9 drives, or an encryption-enabled Fibre Channel QIP, if installed. Encryption key management is provided through the library's BlueScale software.

EnergyAudit™ Reports BlueScale EnergyAudit lets you display and record actual power consumption, giving you greater control of your data center and budget.

Global Spare The Global Spare feature provides a way to remotely replace a failed drive in the library. You simply configure an installed drive as a designated spare for other drives in the library. This drive can then be substituted for a failed drive in any partition that is configured to use the Global Spare drive.

Hardware Health Monitoring BlueScale Hardware Health Monitoring (HHM) tracks maintenance thresholds for key library components and notifies you when maintenance tasks are required to keep your library in optimum operating condition. With a Preventive Maintenance contract with Spectra Logic, these automated notices can be sent to Spectra Logic Technical Support so you can work with them to proactively schedule maintenance service at a convenient time.

Media Lifecycle Management BlueScale Media Lifecycle Management (MLM) helps you manage your tape media by giving you tools to proactively detect potential media errors well before they happen. When used in combination with Spectra Logic Certified Media, MLM lets you manage, track, and report all facets of tape usage from creation to retirement — all consolidated within the same application you use to manage your library.

Shared Library Services (SLS) Virtualization The library uses Shared Library Services (SLS) virtualization technology to partition the library into a maximum of eight virtual libraries. With SLS, one library can support multiple media types and provide dedicated library services to multiple user groups.

Soft Power Control The Soft Power option disables the front panel power button and instead enables a "soft power" button on the General Status screen of the BlueScale user interface. Enabling the Soft Power option prevents unauthorized users from powering the library off using the front panel power switch.

User Interface The BlueScale user interface lets you set configuration options, view library and drive information and metrics, manage cartridges, and monitor library operations. You can access the user interface using the library's front panel touch screen, a direct connection to the library control module (LCM), or through a standard web browser connected to the remote library controller (RLC).

XML Command Interface The XML command interface provides a set of commands for use in customer-generated programs used for viewing the library's status, inventory, and configuration information, and performing BlueScale package updates and other operations without using the BlueScale user interface.

Hardware Features

Barcode Reader A barcode reader mounted on the library's transporter reads the barcode labels on TeraPack™ magazines and cartridges. The barcode label information is used by the library to maintain an inventory of the media currently stored inside the library.

BlueScale Vision™ Camera The web-based BlueScale Vision camera lets you visually monitor the interior of the library.

Drives The libraries accommodate high-performance, high-capacity LTO and TS11*xx* technology drives mounted in custom drive sleds that provide the connectivity to the library. The drives are installed in modular drive bay assemblies, each containing up to four drives. Drives are hot-swappable to provide uninterrupted operation.

Robotic Interface Module The library can use the optional robotic interface module (RIM) to provide the bridge between the external interface from the host and the internal interface used by the library. The RIM is a dual-channel Fibre Channel controller, which is used to provide a control path to the transporter through a single Fibre Channel arbitrated loop or fabric. The RIM does not provide connectivity for SCSI drives, nor does it provide any encryption capability. RIMs are hot-swappable to provide uninterrupted operation.

Note: When the library does not use a RIM, one of the direct-attached drives in each partition provides the control path for motion commands from the host to the library's transporter.

TeraPack Media Storage All of the cartridges in the library are stored in TeraPack magazines. Each magazine occupies a storage chamber. The maximum media storage capacity of the library depends on the number and type of data cartridges and tape drives installed.

TeraPack Access Port (TAP) The TAP is the entry/exit port for the library. The TAP accommodates one TeraPack magazine containing one or more cartridges. The T200 and T380 each have a single TAP; the T680 has two TAPs, located one above the other.

Library Components

The following sections provide an overview of the library components. Depending on the options you ordered, some of the components shown may not be included in your library. For descriptions of the library components and media, read the Library Overview chapter in the *Spectra T200, T380, and T680 Library User Guide*.

Note: The T680 library is pre-installed in an enclosed rack that includes lockable front and back doors. The T200 and T380 must be installed in a rack before use. For clarity, the illustrations in this chapter and throughout this guide show the library without the rack.

Front Panel Components

Figure 1 shows the library front and side panel components.

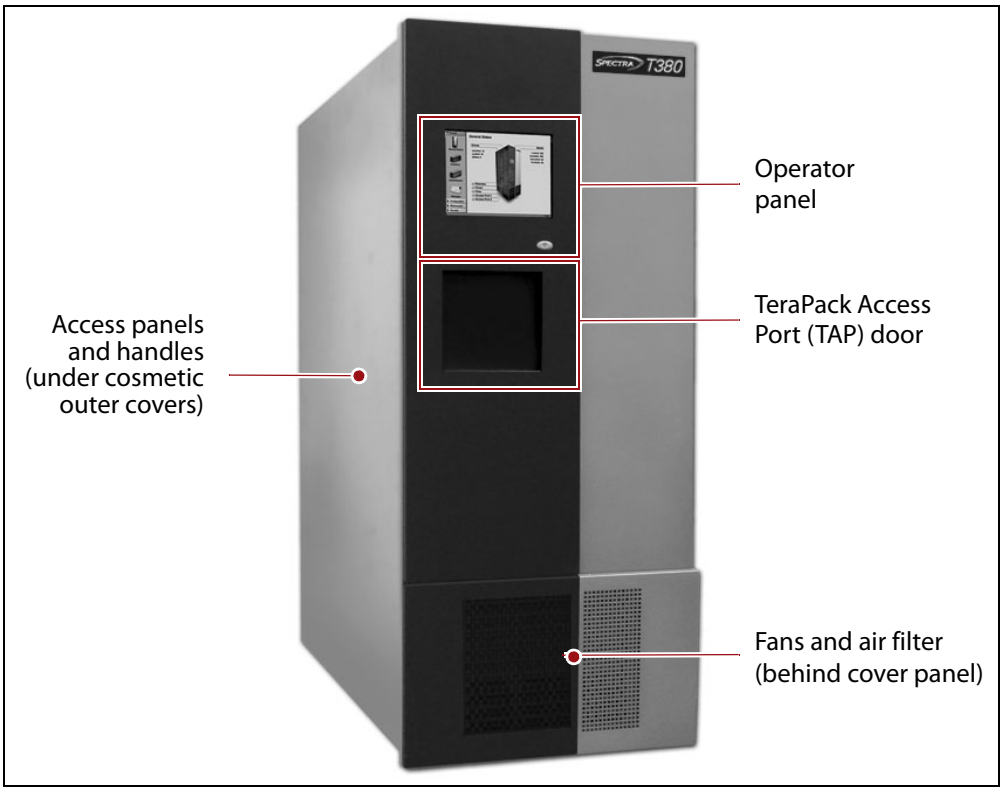


Figure 1 Front panel components (T380 shown).

Note: Most service procedures for the interior components require access to the front of the library by removing the library's front panel and all the magazines stored in the front chambers. Some procedures require access to the right-hand side of the library.

- If the rack used for the T200 or T380 library does not provide side access, the library must be removed from its rack in order to remove the access panels.
- The side panels on the T680 rack can be removed to expose the access panels.

Rear Panel Components

Figure 2 shows the rear panel components of the library.

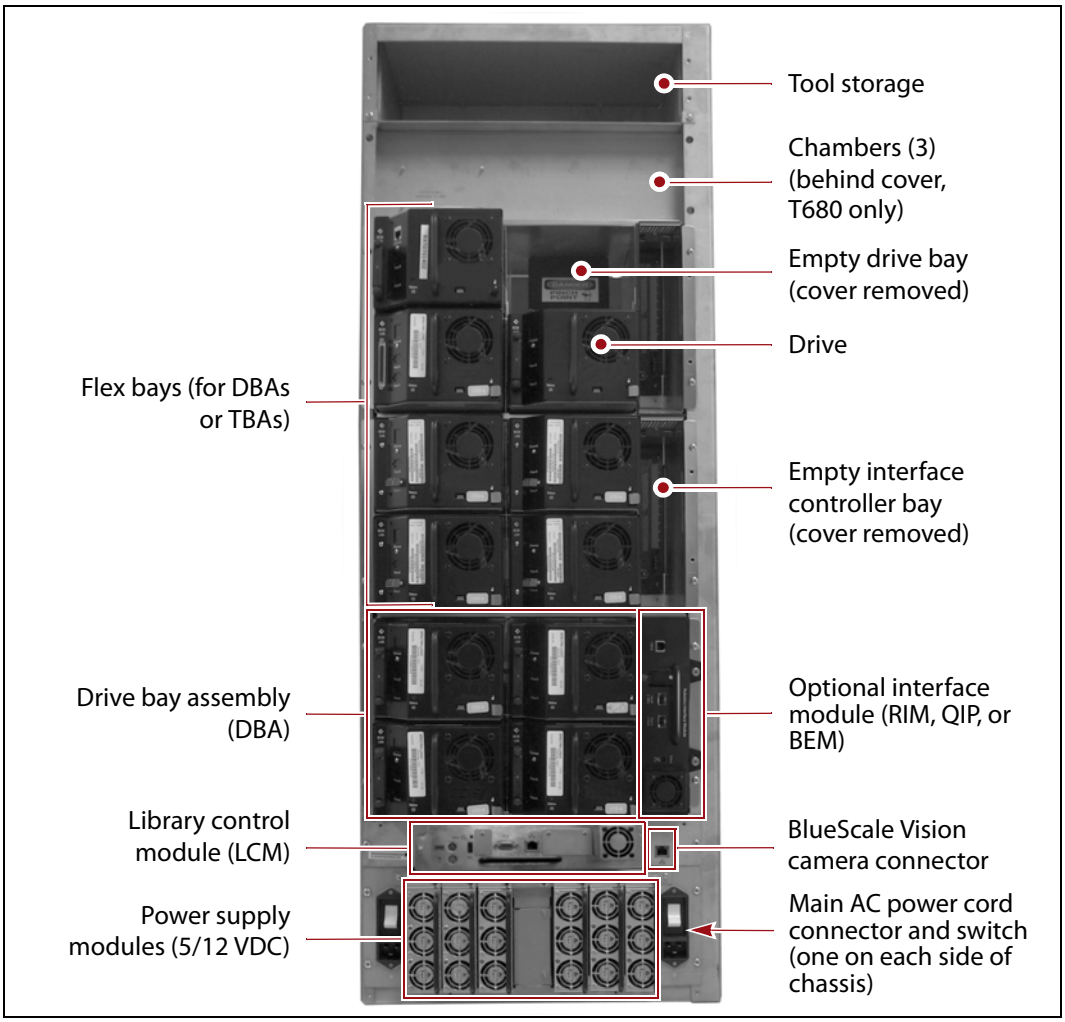


Figure 2 Library rear components (T380 with the 2N redundant power supply option shown).

Note: During normal operation, the following additional components are present on the rear panel:

- For the T200 and T380, a DBA cover is installed over the drives.
- Doors on the T680 rack enclose the back of the library.
- Cord locks are installed to prevent the AC power cords from being disconnected.
- A permanent grounding wire is connected to the chassis.
- Any bays that do not contain components have covers installed to maintain proper air circulation through the library.

CHAPTER 2

Site Requirements

This chapter describes the site requirements for the library. Make sure that the location where the library will be used meets these requirements before the field engineer arrives to install the library.

PHYSICAL REQUIREMENTS

The following physical requirements apply to the location where the library will be operated. Meeting these requirements sets the necessary parameters for successfully operating the library, as well as ensuring adequate clearances for accessing the library components.

Flooring

Flooring Material The floor where the library is to be installed must be level, and must be a hard surface such as cement or tile—do not install the library on carpeting. Carpeting increases the risk of static discharge when operating the library.

Library Weight The flooring must be capable of supporting the full weight of the installed library when it is fully loaded with media. The following table shows the maximum weight of the installed library when fully loaded with media, power supply modules, interface modules, and the maximum number of tape drives.

Library	Weight
T200	428 pounds (194 kg)[a]
T380	627 pounds (284 kg)[a]
T680	1211 pounds (549 kg)[b]

a. This weight does not include the weight of the rack mounting hardware.
b. Including the weight of the integrated rack.

The actual weight varies depending on the number of drives, interface modules, power supplies, and TeraPack magazines, as well as cartridges, installed in the library.

See Chapter 4 – Library Specifications, beginning on page 30 for detailed information about the library weight and dimensions.

Power Requirements

The library includes dual AC power inputs. The standard configuration uses only one of these inputs. The 2N redundant power supply option, which must be purchased separately, uses both inputs. When using the redundant power configuration, connect each input to a separate branch circuit, which allows for failover in the event of a power failure in one of the circuits. The failover feature requires the 2N power redundancy option.

The building branch circuit feeding the library requires a circuit breaker rated at 15 Amps. See Power Specifications on page 33 for detailed requirements.

Note: Adequate electrical cabling *must* be completed *before* the arrival of the field engineer on site for the library installation.

CABLING REQUIREMENTS

All cabling required for the library must be completed and tested before installation begins.

Cable Routing

The following table summarizes the cable routing guidelines.

Note: Cable routing can be customized as required.

Library	Connection Type
Spectra T200 and T380	Cables can be routed to and from the top and/or bottom of the library through cutouts in the DBA cover on the back of the library. The DBA cover can be removed while connecting the cables to the drives and interface modules.
Spectra T680	Cables can be routed through the top and/or bottom of the library rack. Access the back of the library and open the rack door.

Contact Spectra Logic Professional Services for more information (see Contacting Spectra Logic on page 6).

Ethernet Network Connections

Spectra Logic recommends providing the following Ethernet network connectivity for the library:

Connection Type	Description
Direct internet access	A direct internet connection is recommended so that you can access the library's BlueScale software remotely and download BlueScale updates directly to the library.
Email access	Access to an email gateway is required to use the library's automated monitoring and technical support features.
BlueScale Vision camera access	The camera requires a separate Ethernet connection. Using a shielded cable is required in order to comply with EMC requirements.

Fibre Channel Connections

The Fibre Channel interface in the robotic interface module and direct-attach tape drives support the Fibre Channel Protocol (FCP). Connecting RIMs and direct-attach Fibre Channel tape drives to the host network requires multimode optical cables with dual LC connectors.

For detailed information on connectivity for drives and interface controllers, see Interface Specifications on page 40.

Environmental Requirements

The site where the library is operated must meet the environmental requirements described in Environmental Specifications on page 38 to ensure successful operation of the library. In addition, consider the following:

Requirement	Description
Air Flow	Air flow through the library is from front to back. Make sure that cold and hot (airflow in and airflow out) aisle hardware is positioned appropriately for the library installation location.
Air Quality	The library contains an air filter that keeps the inside of the library free from particulates that might contaminate its components. Regular inspection and replacement of the air filter is necessary to keep the library functioning at optimal levels. Spectra Logic recommends that the filter be inspected at least once every three months and replaced as frequently as necessary. Spare filters are available from Spectra Logic (see Contacting Spectra Logic on page 6).
Fire Protection	Spectra Logic recommends that the library be installed close to your data center's fire suppression equipment, if present.

CHAPTER 3

Installation Preparation

Before the library arrives, make the proper arrangements to ensure the safe handling and movement of the library and components from the delivery site (for example, a shipping dock or receiving area) to the location where the library will be installed.

In preparation for your installation, locate the accessory box included with the library. This box contains the activation keys for the library options you purchased and additional information that you should read before the library is installed. Make sure that you do not lose any of the activation keys.

The following sections outline the requirements for storing and moving the library and its components. Make sure that you review these requirements carefully. This information is provided to ensure that the site of the installation meets the necessary requirements before the Spectra Logic field representative arrives.

You can print out the Site Preparation Checklist on page 61 and check off each item as you complete it.

RECEIVING THE LIBRARY

The library is shipped in multiple boxes: one for the library chassis and others for the library components such as drives, RIMs (if purchased), power supplies, TeraPack magazines, and media. The boxes are shipped on pallets.

Before the library arrives, make sure that your storage area can accommodate the pallet and boxes used to ship the library and its components. The following table provides the approximate dimensions and weights of the pallet and boxes.

Parameter		Specification [a]
Library box	▪ **Height** ▪ T200 and T380 ▪ T680 ▪ **Width** ▪ T200 and T380 ▪ T680 ▪ **Depth** ▪ T200 and T380 ▪ T680	 65 in. (165 cm) 93 in. (236 cm) 48 in. (122 cm) 41 in. (104 cm) 46 in. (117 cm) 57 in. (145 cm)
Weight	▪ **Library (base chassis)** [b] ▪ T200 ▪ T380 ▪ T680 ▪ **Box and pallet** ▪ T200 and T380 [c] ▪ T680 [d]	 230 lb (104 kg) 305 lb (138 kg) 765 lb (347 kg) **Approx.** 165 lb (75 kg) **Approx.** 110 lb (50 kg)
Components box [e]	The weight of the components box depends on how many TeraPack magazines, power supplies, interface modules, and media you ordered with the library.	

a. Specifications are subject to change at any time without notice.
b. The base chassis does not contain drives, media, interface modules, or power supply modules.
c. Includes the weight of the accessory box (approximately 50 lb (23 kg)). The accessory box contains the rackmounting kit, the DBA cover, a tool kit, and documentation kit.
d. Includes the weight of the accessory box (approximately 10 lb (4.5 kg)). The accessory box contains a toolkit and documentation kit.
e. The size and weight depend on the number and type of components in the box. To calculate the approximate weight of all the components, add 15 lb (7 kg) for each drive, 5 lb (2.2 kg) for each TeraPack magazine full of media, 5 lb (2.2 kg) for each RIM, and 4 lb (1.8 kg) for each power supply.

UNPACKING AND MOVING THE LIBRARY

Before moving the library to its installation location, be sure that there is enough space at that location to remove the library from its packaging and unpack the boxes containing the additional components. Allow the following clearances on each side and the top of the library crates for maneuvering while unpacking the library:

- **Spectra T200 or T380**—Allow 4 feet (1.2 meters) on each side and the top of the boxes.
- **Spectra T680**—Allow 10 to 15 feet (3 meters to 4.6 meters) on the ramp side of the pallet to unload the library, and 4 feet (1.2 meters) on each side and the top to remove the packaging.

The following requirements are necessary to protect the library and component boxes when moving them from storage to their operating location.

Warning

The T200 library weighs approximately 230 lb (104 kg), the T380 library weighs approximately 305 lb (138 kg), and the T680 weighs approximately 765 lb (347 kg) without controllers, drives, and media installed. Use extreme caution when moving it.

Warnung: Die Library T200 wiegt ca. 104 kg, die Library T380 wiegt ca. 138 kg, und die Library T680 wiegt ca. 347 kg ohne Controller, Laufwerke und Medien installiert werden. Verwenden Sie extreme Vorsicht walten lassen, wenn sie abwandern.

Warning

The T200/T380 library is very heavy. Always use four people, two on each side, when lifting or moving the library.

Warnung: Die T200/T380 Library ist sehr schwer. Benutzen Sie immer vier Personen, zwei auf jeder Seite, beim Heben oder Fortbewegen der Library.

Caution

The library and components should be kept in their shipping boxes while moving them to the installation location. If space for moving or unpacking the boxes is not available, contact Spectra Logic Professional Services for guidance.

Caution

Be cautious when moving the library and component shipping boxes. Use a pallet jack to move the boxes on a level surface. Use a stair crawler or other special equipment that can handle the weight of the boxes to traverse stairways. Such equipment must be able to transport at least 1000 lb (454 kg).

Clearance

Before moving the library and components to where they will be installed, make sure that you have access to necessary doorways, stairways, hallways, and elevators, as well as adequate clearance to move through them.

- Doorways (including thresholds) must be wider than 48 inches (122 cm) and taller than:
  - **T200/T380**—90 inches (229 cm)
  - **T680**—93 inches (236 cm)
- Stairwells must be wider than 48 inches (122 cm) and taller than:
  - **T200/T380**—90 inches (229 cm)
  - **T680**—93 inches (236 cm)
- Stairway and hallway corners should be wider than 67 inches (170 cm)
- Elevators and elevator doors should be wider than 48 inches (122 cm) and taller than:
  - **T200/T380**—90 inches (229 cm)
  - **T680**—93 inches (236 cm)
- Elevators should be able to transport at least:
  - **T200/T380**—500 pounds (227 kg)
  - **T680**—1000 pounds (454 kg)

  Note: It may be necessary to remove the top cover of the T680 rack to ensure that it fits through a standard 80-inch elevator door.

Tilting

Avoid tilting the library as it is moved to prevent internal components moving out of their normal positions.

Caution If you tilt the library, Spectra Logic is not responsible for any damage caused to the library or its components, or for any damage caused to your site.

PREPARATION FOR THE INSTALLATION

Important Your Spectra library will be installed for you by a certified Spectra Logic field representative. Do not attempt to install the library yourself.

Review the requirements in Chapter 2 – Site Requirements, beginning on page 18, as well as the following sections to ensure that the site where the library will be installed meets the necessary requirements *before* the Spectra Logic field engineer arrives.

SERVICE ACCESS REQUIREMENTS

A minimum of 24 inches (61 cm) of access clearance is required at the front and back of the library. For ease of access, Spectra Logic recommends a working area of *at least* 36 inches (91 cm) of access clearance. Because the library is most easily serviceable from the right side, an additional 36 inches (91 cm) of access clearance on the right side of the library is highly recommended. Allowing 36 inches (91 centimeters) of work space on *both* the right and left sides of the library provides the best service access.

Spectra T200 and T380 Figure 3 shows the recommended access clearance for these libraries. An additional clearance of at least 70 inches (178 cm) in front is required when installing or removing the library from the rack.

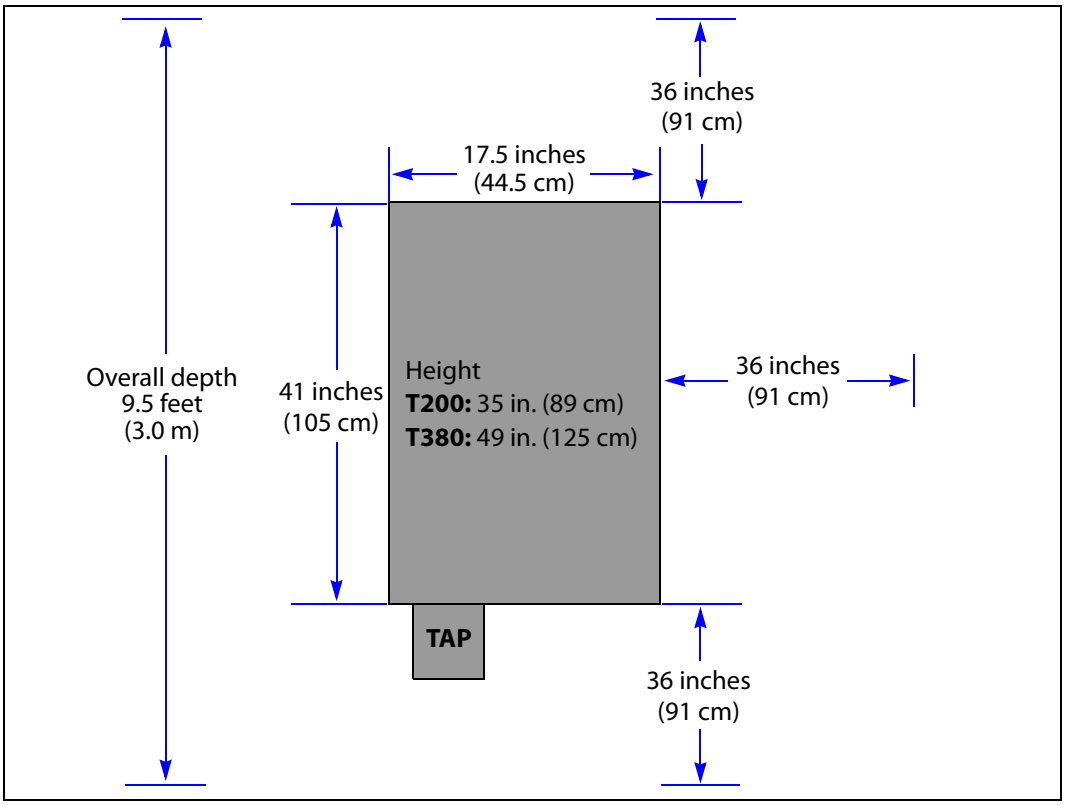


Figure 3 A top view of recommended service access dimensions for the T200 and T380 libraries.

Spectra T680 Figure 4 shows the recommended access clearance for the T680 Library.

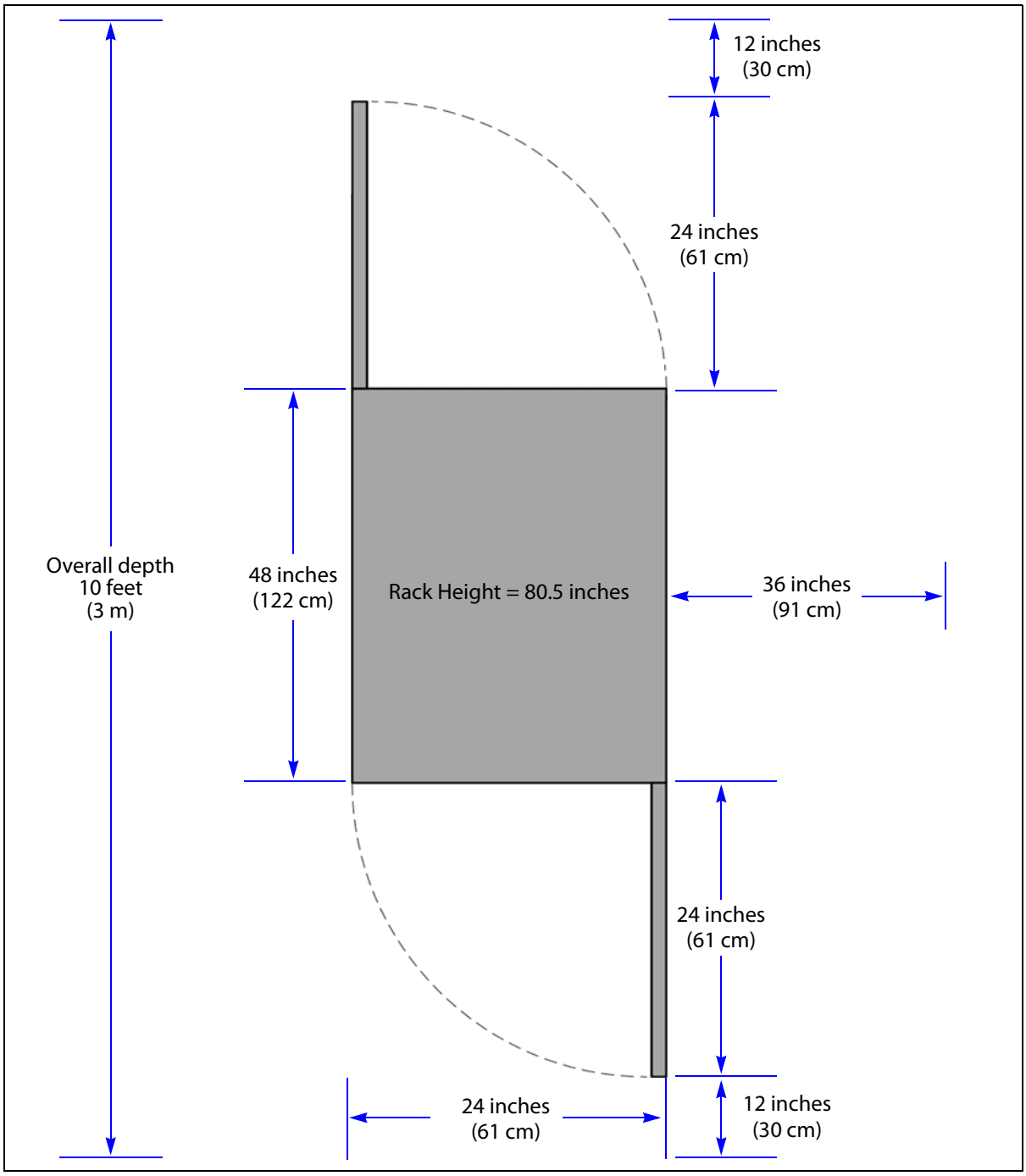


Figure 4 A top view of recommended service access dimensions for the T680 library.

Placement with Existing Equipment

It may be necessary to install the library next to previously installed equipment in your data center. Servicing the library's interior components is most easily accomplished from the right side (when viewed from the front). For this reason, Spectra Logic recommends placing the library so that its right side is accessible. See Service Access Requirements on page 25 for the minimum recommended clearances around the library.

Special servicing arrangements can be made to suit your equipment configuration. If you have any questions or concerns regarding the placement of your library in your data center, contact Spectra Logic Professional Services. See Contacting Spectra Logic on page 6.

Rack Installation

Spectra T200 or T380

The T200 and T380 libraries MUST be installed in a rack. Both libraries are designed to fit in a standard 19-inch, four-post rack. Using a rack that is at least 43 inches (110 cm) deep is recommended. An additional 3 inches (7.6 cm) at the back of the rack may be required to allow for cable clearance. A rack that allows access to the library's side panels simplifies maintenance and service procedures.

Warning

The T200 and T380 must be installed in a standard 19-inch (48 cm), four-post rack to prevent tipping. The rack must be located on a level, hard-surfaced floor such as cement or tile. A two-post rack will not support the weight of the library.

Warnung: Die T200 und T380 sind in einem Standard-48 cm, Vier-Pfosten-Rack zu verhindern Kippen installiert werden. Ein Zwei-Pfosten-Rack wird nicht mit dem Gewicht der Library.

The following table shows the height and rack space requirements for the two libraries.

Library	Height	Rack Space
T200	35 inches (89 cm)	20U
T380	49 inches (125 cm)	28U

Notes:
- The library may be too deep for some enclosed racks.
- An enclosed 19-inch, four-post rack can be purchased from Spectra Logic when you purchase your library. The rack has two doors and removable side panels to provide access to the sides of the library.

Make sure that the rack is assembled and placed near the AC power outlets and network connections.

Spectra T680

The T680 ships from the factory in its own rack. Allow a minimum of an additional 24 inches (61 cm) of clearance at both the front and back of the rack to open the rack doors.

Chassis Grounding

To ensure proper grounding of the library chassis, one of the following conditions must be met:

- Cord locks must be installed on the AC power cords at the library. The supply end of each AC power cord and the AC power source outlets must have locking connectors.

  – or –

- If your site does not have locking connectors on the AC power source outlets, you must attach a permanent grounding wire connected from earth ground to one of the AC switch plates on the back of the library.

Warning Risk of electrical shock. To prevent the possibility of electrical shock, install cord locks on the AC power cords and a permanent grounding wire between the chassis and earth ground.

Warnung: Gefahr eines elektrischen Schlages. Um zu verhindern, dass die Möglichkeit eines elektrischen Schlages, der Installation von Kabel-Sperren auf den AC Netzkabel und eine ständige Erdung Draht zwischen den Chassis und Masse.

UPDATING, SERVICING, OR MOVING THE LIBRARY

Contact Spectra Logic Technical Support before making any changes to your library hardware or performing any service operations.

Installing Additional Drives

Installing an additional drive into a partially filled DBA causes the library to reassign element addresses. To avoid errors, reconfigure your backup software after adding a new drive (refer to your software documentation for instructions).

Servicing the Library

In the event that it is necessary to replace a component, make sure that you have instructions for performing the procedure *and* you either:

- Have been instructed to do so by Spectra Logic Technical Support,

  —or—

- Have a support contract such as Assisted Self-Maintenance (ASM).

Moving the Library

The library hardware is configured to ensure proper thermal control, air flow, and dust filtering. After the library is installed, do not move the library. Do not remove the doors from the back of the library or any library components (except the TeraPack magazines).

Important Moving the library without assistance from a Spectra Certified Field Engineer will void your service contract. Contact Spectra Logic Technical Support for assistance if you need to relocate your library (see Contacting Spectra Logic on page 6).

CHAPTER 4

Library Specifications

This chapter provides the specifications for the library that you will need when preparing for installation. The specifications in this chapter are subject to change without notice.

LIBRARY SPECIFICATIONS

The following sections provide detailed specifications for the library including data storage capacity, library size and weight, space requirements, power specifications, environmental specifications, and shock and vibration specifications.

Data Storage Capacity

The T200, T380, and T680 libraries provide flexible storage capacity that expands from a minimum of one media pack up to the maximum storage capacity of the library, as shown in the following table. The information in the table assumes that only one type of drive and media is installed in the library. When using mixed drives and media the library's capacity depends on the number of drives and slots installed and the type of drives and media used.

Media Type	Maximum Slots			Native Capacity (TB)		
	T200	T380	T680	T200	T380	T680
LTO-4	200	380	670	160	304	536
LTO-5				300	570	1005
LTO-6				500	950	1675
LTO-7				1200	2280	4020
LTO-7 Type M				1800	3420	6030
LTO-8				2400	4560	8040
LTO-9				3600	6840	12060
TS1140 technology	NA	261	NA	NA	1044	NA
TS1150 technology					2610	
TS1155 technology					3915	
TS1160 technology					5220	

The actual amount of media that can be installed depends on the number of drives installed, as shown in the following tables.

Number of DBAs	Maximum Number of Drives	Maximum LTO Cartridge Storage Capacity		
		Spectra T200	Spectra T380	Spectra T680
1	4	200	380	670
2	8	140	320	600
3	12	Not applicable	260	550

Number of DBAs	Number of Drives Installed	Maximum TS11*xx* Technology Spectra T380 Cartridge Storage Capacity
1	1 to 4 drives	261
3	9 to 12 drives	153

Size and Weight

The following table shows the size and weight specifications for the library and other components.

Note: To calculate the approximate weight of a loaded library, add the weight for each drive, controller, and power supply, plus the weight of each TeraPack magazine full of cartridges to the weight of the library itself.

Parameter	Specification [a]		
	T200	**T380**	**T680** [b]
Height	35 in. (89 cm)	49 in. (125 cm)	80.5 in. (204.5 cm)
Width ▪ Chassis ▪ Front panel	 17.5 in. (44.4 cm) 19.0 in. (48.3 cm)	 17.5 in. (44.4 cm) 19.0 in. (48.3 cm)	 24 in. (61 cm)
Depth (with drive cover)	41 in. (104 cm)	41 in. (104 cm)	48 in. (122 cm)
Weight ▪ Base chassis ▪ Maximum [c]	 230 lb (104 kg) 428 lb (194 kg)	 305 lb (138 kg) 627 lb (284 kg)	 765 lb (347 kg) 1211 lb (549 kg)
Each Tape Drive (with drive sled)	▪ LTO-2 through LTO-4: 11.5 lb (5.2 kg) ▪ LTO-5 and LTO-6: 11.6 lb (5.3 kg) ▪ LTO-7 FH: 11.2 (5.1 kg), HH: 9.5 lb (4.3 kg) ▪ LTO-8: FH: 11.0 (5.0 kg), HH: 9.6 lb (4.4 kg) ▪ LTO-9: FH: 11.1 (5.0 kg) ▪ TS11xx technology: 17.5 lb (8 kg)		
Each TeraPack magazine	▪ with ten LTO cartridges: 5.1 lb (2.3 kg) ▪ with nine TS11*xx* technology cartridges: 5.6 lb (2.5 kg)		
Each controller	5 lb (2.3 kg)		
Each power supply	4 lb (1.8 kg)		

a. All dimensions and weights are approximate and are rounded up to the nearest tenth.

b. The T680 is shipped and installed in a rack; the sizes shown are for the library rack.

c. The maximum weight assumes the maximum number of drives and media installed. The maximum weight does not include the weigh of the rackmounting hardware for the T200 and T380 libraries.

Service Access Requirements

A minimum of 24 inches (61 cm) of clearance is required on the right hand side of the library to provide service access. In addition, leave a minimum of 24 inches (61 cm) at the front and back of the library for service and operator access. Providing 36 inches (91 cm) of clearance on all sides of the library is highly recommended.

Shipping and Storage Size and Weight

The following table provides the approximate dimensions and weights of the pallet and boxes used to ship the library.

Parameter	Specification [a]
Library Crate	
▪ Height	
▪ T200 and T380	65 in. (165 cm)
▪ T680	87 in. (221 cm)
▪ Width	
▪ T200 and T380	48 in. (122 cm)
▪ T680	29 in. (74 cm)
▪ Depth	
▪ T200 and T380	46 in. (117 cm)
▪ T680	57 in. (145 cm)
Weight	
▪ Library (base chassis) [b]	
▪ T200	230 lb (104 kg)
▪ T380	305 lb (138 kg)
▪ T680	765 lb (347 kg)
▪ Box and pallet	
▪ T200 and T380 [c]	**Approx.** 165 lb (75 kg)
▪ T680 [d]	**Approx.** 875 lb (397 kg)
▪ Components Boxes [e]	**Approx.** 100 to 300 lb (45 to 136 kg)

a. All dimensions are rounded to the nearest tenth; weights are rounded to the nearest unit.
b. The base chassis does not contain drives, media, QIPs, RIMs, or power supply modules.
c. Includes the weight of the accessory box (approximately 50 lb (23 kg)), which contains some or all of the following items: the rack mounting kit, the protective back cover, a tool kit, and product documentation.
d. Includes the weight of the accessory box (approximately 10 lb (4.5 kg)). The accessory box contains a toolkit and documentation kit.
e. The size and weight depends on the number and type of components in the box. To calculate the approximate weight of all the components, add 12 lb (5.4 kg) for each drive, 5 lb (1.8 kg) for each TeraPack magazine full of media, 5 lb (1.8 kg) for each QIP, and 4 lb (1.5 kg) for each power supply.

Power Specifications

This section describes the power specifications for the library.

Power Consumption and Cooling Requirements

The power and cooling requirements for the library depend on the number and type of drives installed. The following table provides the maximum power consumption and heat load for the base library and for each additional component added to the base library. Use this information to calculate the total maximum power consumption and heat load values, which can be used to build a power budget for the library.

All values are measured at the AC input and include power supply efficiency. The values are averages of observed hardware. In general, the lighter the load on the power supplies, the less efficient they are. The power supply efficiency in turn affects the power draw of all components.

Component	Power Consumption (watts)	Heat Load, Continuous (BTU/hour)
Base library [a]	115	392
Power supply	33	113
RIM	12	41
G3 QIP	17	58
LTO-4, Fibre Channel	▪ **Read/write:** 36 ▪ **Idle:** 17.5 [b]	**Read/write:** 123
LTO-4, SCSI	▪ **Read/write:** 31 ▪ **Idle:** 16 [b]	**Read/write:** 106
LTO-5, Fibre Channel	▪ **Read/write:** 37 ▪ **Idle:** 19 [b]	**Read/write:** 126
LTO-6, Fibre Channel	▪ **Read/write:** 28 ▪ **Idle:** 8 [b]	**Read/write:** 95
LTO-7 Fibre Channel Full-Height	▪ **Read/write:** 31 ▪ **Idle:** 20 [b]	**Read/write:** 106
LTO-7 Fibre Channel or SAS Half-Height	▪ **Read/write:** 31 ▪ **Idle:** 20 [b]	**Read/write:** 106
LTO-8 Fibre Channel Full-Height	▪ **Read/write:** 40 ▪ **Idle:** 15 [b]	**Read/write:** 136
LTO-8 Fibre Channel or SAS Half-Height	▪ **Read/write:** 43 ▪ **Idle:** 14 [b]	**Read/write:** 164
LTO-9 Fibre Channel Full-Height	▪ **Read/write:** 35	**Read/write:** 119
LTO-9 Fibre Channel or SAS Half-Height	▪ **Read/write:** 35	**Read/write:** 119
TS1140 technology	▪ **Read/write:** 53 ▪ **Idle:** 30 [b]	**Read/write:** 181
TS1150 technology	▪ **Read/write:** 55 ▪ **Idle:** 38 [b]	**Read/write:** 188
TS1155 technology	▪ **Read/write:** 60 ▪ **Idle:** 19 [b]	**Read/write:** 205
TS1160 technology	▪ **Read/write:** 67 ▪ **Idle:** 35 [b]	**Read/write:** 229

a. Base library with one power supply installed; no drives or controllers (RIM or QIP) installed.
b. No cartridge loaded.

Input Power Requirements

The input power requirements for the library depend on the type and number of drives installed in the library, as described in the following table. Each input must be protected by a circuit breaker rated for 15 amps.For redundant AC power configurations, connect each input to a separate branch circuit, which allows for failover in the event of a power failure in one of the circuits. The two AC inputs must be on the same phase, and the voltages must be the same within a few volts. If these requirements are not satisfied, there may be problems switching between the two AC power sources.

Caution

The library is designed to be used on parallel power only. If the power sources for the dual AC inputs are not parallel, damage to the library could result.

Note: The T200 library supports a maximum of eight drives; both the T380 library and the T680 library support a maximum of twelve drives each.

Number and Type of Drives	Electrical Rating	Current Rating (Maximum) [a]
1 – 12 tape drives	100–130 VAC, 50/60 Hz [b] 200–240 VAC, 50/60 Hz [c]	12 amps per cord 8 amps per cord

a. Each branch circuit must be protected by a 15 amp circuit breaker.

b. If the male connector does not have a twist lock, an additional grounding wire from the chassis to earth ground is required.

c. Requires a 220–240 VAC AC power cord with a twist-lock male connector. See Power Cord Specifications for detailed information about power cord requirements.

Power Cord Specifications

The power cords included with the library are considered part of the library and are not intended for use with any other equipment. See Supply-End Connector Types on page 37 for the different types of cords available from Spectra Logic.

Warning

Risk of electrical shock. If you operate the library without locks on both ends of the AC power cords, a permanent grounding wire must be installed between the power supply bay and Earth ground.

Notes:

- Install the included cord locks to prevent the power cords from being inadvertently disconnected from the AC input connectors. If the male connector does not have a twist lock, an additional grounding wire from the chassis to earth ground is required. For instructions on installing cord locks and the grounding wire, see the *Spectra T200, T380, and T680 Library User Guide*.
- The supply-end connector is considered the disconnect for the unit. Make sure that the socket-outlet for the AC connections is in an accessible location near the library.
- To use the library outside of North America, the power cord must meet the specifications for that country, as described in the following sections. If the male connector does not have a twist lock, an additional grounding wire from the chassis to earth ground is required.

100–130 VAC Power Cord for Use in North America The criteria for a 100-volt to 130-volt AC power cord in North America are as follows:

Parameter	Specification
Power cordage	Three-conductor, 14 AWG
Power input connectors	▪ **Male:** NEMA 5-15P ▪ **Female:** IEC 60320-C19

North America and Korea 200–240 VAC Power Cord The criteria for a 200-volt to 240-volt AC power cord in North America and Korea are as follows:

Parameter	Specification
Power cordage	SJT type, three-conductor, 14 AWG minimum
Power input connectors	▪ **Male:** Connector must be of the proper type, rating, and safety approval (see Supply-End Connector Types on page 37). ▪ **Female:** IEC 60320 C13

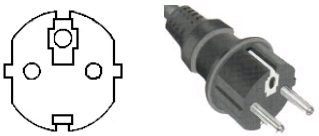
International 200–240 VAC Power Cord The criteria for an international 200-volt to 240-volt AC power cord are as follows:

Parameter	Specification
Power cordage	Flexible, HAR (harmonized) type H05VV-F, three conductor, cord with minimum conductor size of 1.7 square millimeters (0.0026350 square inches).
Power input connectors	▪ **Male:** Connector must be of the proper type, rating, and safety approval for the intended country (see Supply-End Connector Types on page 37). ▪ **Female:** IEC 60320 C13

Supply-End Connector Types

The type of connector on the supply end of the cord depends on the country. The following table shows the Spectra Logic part numbers for power cords with the supply-end connector types used in each country.

Part Number	Country of Use	Plug Style	Appearance
8147 [a]	North America	NEMA 5-15P	
8297	North America	IEC-60320 C14	
5500	North America, Korea	NEMA L6-20P	
7029	North America, Korea	NEMA L6-30P	
6805 [a]	United Kingdom	BS 1363A	

Part Number	Country of Use	Plug Style	Appearance
6807	Japan	NEMA L6-20P	
6808 [a]	Continental Europe	CEE(7)VII	
8665	United Kingdom, Continental Europe	IEC 60309	

a. For non-locking supply-end plugs, an additional grounding wire from the chassis to earth ground is required.

Environmental Specifications

This section describes environmental specifications for the library. Do not place the library on a carpeted floor or anywhere else that poses risk for static discharge that could damage the library and its drives.

Warning

The library must be installed in the rack that is delivered with the library, or if none is included, in a standard 19-inch (48-cm), four-post rack. A two-post rack cannot support the weight of the library. Ensure your floor has adequate structural integrity, and follow the rack manufacturer's instructions when installing and securing the rack.

The library is equipped with internal fans that operate as much as is necessary for the number of DBAs installed. The fans keep the library's internal temperature within specifications as long as the data center environment is within specifications.

Caution

When the library is moved from a cold environment to a warm environment, it should not be powered on for at least 24 hours. This adjustment period prevents condensation damage.

The following tables list the general environmental specifications for the library.

Operating Environmental Specification	
Humidity	20% to 80% (non-condensing)
Humidity gradient	Less than 10% per hour
Ambient temperature [a]	**LTO:** 50° F to 90° F (10° C to 32° C) **TS11*xx* Technology:** 61° F to 90° F (16° C to 32° C)
Maximum temperature change rate [b]	18° F per hour (10° C per hour), non-condensing
Maximum wet bulb temperature	77° F (25° C)
Altitude	Sea level to 10,000 feet (3,048 meters)

a. The maximum ambient temperature must not exceed 86º F (30º C) when G2 F-QIPs are installed in the library.
b. The temperature and humidity must be allowed to stabilize in the specified ambient environment for 24 hours.

Storing[a] and Shipping (Non-Operating) Environment Specification	
Humidity	10% to 95% (non-condensing)
Temperature	–40° F to 149° F (–40° C to 65° C)
Altitude	Sea level to 40,000 feet (12,192 meters)

a. The library is in its original packaging. The packaging is designed to protect the library from condensation caused by extreme temperature variations of 27° F (15° C) or more. When the library is moved from a cold storage environment to a warm operating environment, it must be acclimated in its packaging for at least 24 hours before opening to prevent serious condensation damage from occurring.

Shock and Vibration Specifications

The library will operate normally after experiencing shock loads as specified in the following table. The operating shock levels indicate how much shock the library can withstand while the enclosed drives are reading and writing data. The non-operating and storage shock levels indicate how much shock the library can withstand when it is not operating. After experiencing this amount of shock, the library will operate normally.

Specification	Operating	Storing and Shipping (Non-Operating Environment) [a]
Shock	2 g pk ½ sine wave for 10 msec (3 axes, 2 shocks per axis, minimum)	2 g pk ½ sine wave for 10 msec (3 axes, 2 shocks per axis, minimum)
Vibration (Swept Sine)	5 Hz – 500 Hz – 5 Hz 5 – 22 Hz, 0.01-inch DA displacement 22 – 500 Hz, 0.25G pk @ ½ octave (minimum three axes)	5 Hz – 500 Hz – 5 Hz 5 – 31 Hz, 0.02-inch DA displacement 31 – 500 Hz, 1G pk @ ½ octave (minimum three axes)
Vibration (Random)	0.5 Grms, 0 – 3000 Hz (single axis)	1 – 200 Hz @ 1.156 Grms. (Bottom face only for 60 minutes.)

a. Specifications are for the library in its original packaging.

INTERFACE SPECIFICATIONS

This section provides information about the interfaces used to connect the library and tape drives to the host systems. It also provides information about the Ethernet interface used to access the library's BlueScale web interface.

The Robotics Interface Module (RIM) supports a Fibre Channel host interface. The RIM does not provide connectivity for SCSI drives. Direct-attached tape drives have a native Fibre Channel interface; direct-attached SCSI drives are not supported.

Important The option to connect SCSI drives through an F-QIP is no longer available for purchase with new libraries. The library continues to support partitions configured to use QIP-attached SCSI drives.

Component Interface Connectors

Component	Physical Interface
SAS Connector	Each SAS drive sled has a single, unshielded, single-port SFF-8088 serial connector that provides the Serial Attached SCSI (SAS) connectivity for the drive
Drive, Fibre Channel	Two dual port multimode optical LC connectors [a]
Drive, SCSI	Requires an F-QIP to provide Fibre Channel connectivity. Direct-attached to a SCSI bus is not supported. [b]
RIM, Fibre Channel	Two dual port optical SFPs with LC connectors
QIP, Fibre Channel (F-QIP) [c]	Two dual port optical SFPs with LC connectors

a. Only one port at a time can be used to connect the drive to a Fibre Channel network. If desired, the two ports can be used to create a failover configuration.

b. The drive sled has one Ultra-3 SCSI "LVD" 68-pin Micro D female connector with a wide Ultra320 SCSI Active SCSI terminator installed.

c. QIPs are no longer available for purchase and are only supported as legacy devices.

Network Interface Cable Requirements

The type of cables required to connect the library and its drives to the network depend on the type of interface being used.

Interface Type	Cable Requirements
Fibre Channel (RIMs, F-QIPs, and direct-attached drives)	The Fibre Channel interface in the F-QIPs, RIMs, and direct-attached Fibre Channel tape drives support the Fibre Channel Protocol (FCP). Connecting these components to the host network requires multimode optical cables with dual LC connectors. Depending on the wavelength, the cables must comply with the following specifications in the Fibre Channel standard (FC-PI-2): ▪ **50 micron**—400-M5-SN-I classification ▪ **62.5 micron**—400-M6-SN-I classification (not supported for LTO-6 or TS11*xx* technology drives)
Ethernet	The Ethernet port on the LCM provides the connection to an Ethernet network for accessing the library using a standard web browser on a remote computer. ▪ The Spectra PC has a 10/100BaseT connection. ▪ The Spectra LS has a 10/100/1000BaseT connection. A separate Ethernet port provides connectivity for the BlueScale Vision camera. Each Ethernet port is a pin-through-hole RJ-45 shielded connector. To comply with EMC requirements, use shielded Category 5 or 5e data-grade cables for all Ethernet connections.
Serial Attached SCSI (SAS)	SAS tape drives support the point-to-point Serial Attached SCSI protocol. Connecting these drives to the host network requires a SFF-8088 SAS cable rated for 6 Gb/second that does not exceed 13 feet (4 m)

Universal Serial Bus (USB) Support

Spectra Logic supports using the USB ports on the library operator panel and the LCM for the following:

- Keyboards
- Pointer devices (for example, a computer mouse)
- External Drives (HD, CD, DVD, and Flash) with a USB interface

Spectra Logic does not support using the USB ports for the following:

- Cameras
- Multimedia devices (for example, MP3 players)

Important The library only recognizes FAT-formatted, not NTFS-formatted, USB devices.

NDMP Support

Spectra Logic tape libraries are compatible with local, remote, and three-way NDMP (Network Data Management Protocol) topologies, where the tape library is connected to the NDMP data mover host over Fibre Channel.

Tape Drive and Media Specifications

This section provides the basic specifications for the tape drives and media supported by the library.

Notes:

- SCSI drives have been discontinued and are no longer available for purchase. If your library includes these drives, refer to the documentation that accompanied your library when you received it for specification information.
- The specifications in this section are provided for convenience only. Refer to the tape drive documentation for the most current specifications (see LTO Ultrium Tape Drives on page 10 and TS11xx Technology Drives on page 10).
- The specifications in this section are subject to change without notice.

LTO Tape Drive Specifications

This section provides specifications for the LTO drives supported by the library. See Tape Media Specifications on page 52 for information about the media used in the library.

Note: LTO drives and media are also referred to as Ultrium or LTO Ultrium drives and media.

LTO-9 Drive

When connecting to a Fibre Channel network, LTO-9 Fibre Channel drives will attempt to connect at 8 Gb/second, but will auto-negotiate down to 4 Gb/second, or 2 Gb/second, depending on the requirements of the port to which the drive is connected.

LTO-9 SAS drives attempt to connect at 12 Gb/second, but auto-negotiate down to 6 Gb/second or 3 Gb/second, depending on the requirements of the port to which the drive is connected.

Parameter	Specification
Maximum sustained transfer rate [a, b]	400 MB/second, native 900 MB/second, compressed SAS 700 MB/second, compressed Fibre
Speed matching range	177 MB/second to 400 MB/second
Average space record time	TBD
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate, calculated	1×10^{-20} bits
Power consumption	Read/write: 34 watts typical Idle: TBD

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value. Total sustained transfer rate for the library depends on the number of drives installed in the library.

LTO-8 Drive

When connecting to a Fibre Channel network, LTO-8 Fibre Channel drives will attempt to connect at 8 Gb/second, but will auto-negotiate down to 4 Gb/second, or 2 Gb/second, depending on the requirements of the port to which the drive is connected.

LTO-8 SAS drives attempt to connect at 6 Gb/second, but auto-negotiate down to 3 Gb/second or 1.5 Gb/second, depending on the requirements of the port to which the drive is connected.

Parameter	Specification
Maximum sustained transfer rate [a, b]	360 MB/second, native 700 MB/second, compressed
Speed matching range	112 MB/second to 360 MB/second
Average space record time	59 seconds
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate, calculated	1×10^{-19} bits
Power consumption	Full-height: ▪ **Read/write:** 40 W **Idle:** 15 W Half-height: ▪ **Read/write:** 43 W **Idle:** 14 W

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value. Total sustained transfer rate for the library depends on the number of drives installed in the library.

LTO-7 Drive

When connecting to a Fibre Channel network, LTO-7 Fibre Channel drives attempt to connect at 8 Gb/second, but will auto-negotiate down to 4 Gb/second, or 2 Gb/second, depending on the requirements of the port to which the drive is connected.

LTO-7 SAS drives attempt to connect at 6 Gb/second, but auto-negotiate down to 3 Gb/second or 1.5 Gb/second, depending on the requirements of the port to which the drive is connected.

Parameter	Specification
Maximum sustained transfer rate [a, b]	300 MB/second, native 700 MB/second, compressed
Speed matching range	100 MB/second to 300 MB/second
Average space record time	56 seconds
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate, calculated	1×10^{-19} bits
Power consumption Full-Height or Half-Height	▪ Full-height: **Read/write:** 31 W **Idle:** 20 W ▪ Half-height: **Read/write:** 36 W **Idle:** 20 W

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value. Total sustained transfer rate for the library depends on the number of drives installed in the library.

LTO-6 Drive

When connecting to a Fibre Channel network, LTO-6 Fibre Channel drives will attempt to connect at 8 Gb/second, but will auto-negotiate down to 4 Gb/second, 2 Gb/second, or 1 Gb/second, depending on the requirements of the port to which the drive is connected.

Note: LTO-6 drives are no longer available for purchase

Parameter	Specification
Maximum sustained transfer rate [a, b]	160 MB/second, native [c] 400 MB/second, compressed
Speed matching range	40 MB/second to 160 MB/second
Average space record time	77 seconds
Encryption capability	AES 256-bit
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-17} bits
Power consumption	**Read/write:** 28 watts typical **Idle:** 8 watts

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
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. A 1.5 Gb interface speed will not stream an LTO-6 drive at 160 MB/second.

LTO-5 Drive

When connecting to a Fibre Channel network, LTO-5 Fibre Channel drives will attempt to connect at 8 Gb/second, but will auto-negotiate down to 4 Gb/second, 2 Gb/second, or 1 Gb/second, depending on the requirements of the port to which the drive is connected.

Note: LTO-5 drives are no longer available for purchase

Parameter	Specification
Maximum sustained transfer rate [a, b]	140 MB/second, native [c] 280 MB/second, compressed
Speed matching range	30 MB/second to 140 MB/second
Average space record time	75 seconds
Encryption capability	AES 256-bit
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-17} bits
Power consumption [b]	**Read/write:** 27 watts typical **Idle:** 7.5 watts

a. Assuming a 2:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value.
c. A 1 Gb interface speed will not stream an LTO-5 drive at 140 MB/second.

LTO-4 Drive

When connecting to a Fibre Channel network, LTO-4 Fibre Channel drives will attempt to connect at 4 Gb/second, but will auto-negotiate down to 2 Gb/second or 1 Gb/second, depending on the requirements of the port to which the drive is connected.

Note: LTO-4 drives are no longer available for purchase

Parameter	Specification
Sustained transfer rate [a, b]	120 MB/second native [c] 240 MB/second compressed
Average space record time	70 seconds
Encryption capability	AES 256-bit
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-17} bits
Power consumption - Fibre Channel [b]	Read/write: 29.5 watts typical Idle: 12.5 watts
Power consumption - SCSI [b]	**Read/write:** 26.5 watts typical **Idle:** 9.5 watts

a. Assuming a 2:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value.
c. A 1 Gb interface speed will not stream an LTO-4 drive at 120 MB/second.

LTO-3 Drives

Note: LTO-3 drives are no longer available for purchase.

Parameter	Specification
Sustained transfer rate [a, b]	80 MB/second native 160 MB/second compressed
Average file access time	54 seconds
Encryption capability	No
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-17} bits
Power consumption [b]	28 watts typical

a. Compression throughput depends on the type of data.
b. This is a per-drive value.

LTO-2 Drives

Note: LTO-2 drives are no longer available for purchase.

Parameter	Specification
Sustained transfer rate [a, b]	35 MB/second native 70 MB/second compressed
Average file access time	65 seconds
Encryption capability	No
WORM capability	No
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-17} bits
Power consumption [b]	29 watts typical

a. Compression throughput depends on the type of data.
b. This is a per-drive value.

TS11*xx* Technology Tape Drive Specifications

This section provides specifications for the TS11*xx* technology drives.

Note: The specifications in this section are provided for convenience only. Refer to the tape drive documentation for the most current specifications (see TS11xx Technology Drives on page 10).

TS1160 Technology Drive

Parameter	Specification
Maximum sustained transfer rate with JE media[a, b]	400 MB/second, native 900 MB/second, compressed
Speed matching range	JE: 112 MB/second to 365 MB/second JD: 112 MB/second to 365 MB/second JC (TS1150 technology format): 99 MB/second to 303 MB/second JC (TS1140 technology format): 62 MB/second to 252 MB/second
Average file access time	45 seconds
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	250,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-20} bits
Power consumption	Read/write: 67 watts maximum Idle: 35 watts

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value.

TS1155 Technology Drive

Parameter	Specification
Maximum sustained transfer rate [a, b]	360 MB/second, native 700 MB/second, compressed
Speed matching range	JD: 112 MB/second to 365 MB/second JC (TS1150 technology format): 99 MB/second to 303 MB/second JC (TS1140 technology format): 90 MB/second to 252 MB/second
Average file access time	55 seconds
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	237,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-20} bits
Power consumption	Read/write: 60 watts maximum Idle: 19 watts

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value.

TS1150 Technology Drive

Parameter	Specification
Maximum sustained transfer rate [a, b]	360 MB/second, native 700 MB/second, compressed
Speed matching range	JD: 112 MB/second to 365 MB/second JC (Gen 5 format): 99 MB/second to 303 MB/second JC (Gen 4 format): 90 MB/second to 252 MB/second
Average file access time	55 seconds
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	237,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-20} bits
Power consumption	Read/write: 46 watts maximum Idle: 22.3 watts

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value.

TS1140 Technology Drive

Parameter	Specification
Maximum sustained transfer rate [a, b]	250 MB/second, native 650 MB/second, compressed
Speed matching range	76 MB/second to 251 MB/second
Average file access time	54 seconds
Encryption capability	AES 256-GCM
WORM capability	Yes
MTBF	237,000 hours at 100% duty cycle
Uncorrected error rate	1×10^{-20} bits
Power consumption	Read/write: 51 watts maximum Idle: 24 watts

a. Assuming a 2.5:1 compression ratio. Compression throughput depends on the type of data.
b. This is a per-drive value.

Encryption Highlights

Key AES-256 data encryption with a secret 256-bit encryption key is used to encrypt and decrypt data. The key is not retrievable from the encryption core and is automatically erased during the unload process; software is required to extract the key, keep it secure, and provide management tools to track, store, use, and delete keys as appropriate.

Notes:
- The encryption performed by encryption-enabled LTO-4 or later generation drives is not compatible with the encryption performed by an encryption-enabled F-QIP.
- Spectra TKLM key management is not compatible with BlueScale Encryption key management, because they cannot share encryption keys. Data encrypted using Spectra TKLM key management cannot be decrypted using BlueScale Encryption key management, and vice versa.

For more information about encryption, see the *Spectra Encryption User Guide*.

Tape Media Specifications

This section provides specifications for the tape media supported by the library. See the *Spectra T200, T380, and T680 Library User Guide* for information about ordering media for your library.

Environmental Requirements

The following table lists the specifications for storage temperature and other environmental requirements for tape media. Do not allow the temperature and humidity in the storage environment to fluctuate.

Specification	Operating [a]	Operational Storage	Archival Storage	Shipping [b]
Temperature	**LTO:** 50° F to 113° F (10° C to 45° C) **TS11*xx* technology:** 61° F to 90° F (16° C to 32° C)	61° F to 90° F (16° C to 32° C)	61° F to 77° F (16° C to 25° C)	–9° F to 120° F (–23° C to 49° C)
Relative humidity	10% to 80%	20% to 80%	20% to 50%	5% to 80%
Wet bulb temperature	79° F (26° C)	79° F (26° C)	79° F (26° C)	79° F (26° C)

a. The upper limit applies to the media, not the library. Be sure there is adequate air flow around the library at all times.

b. When media is moved from a cold shipping/storage environment to a warm operating environment, it must be acclimated in its packaging for at least 24 hours before opening to prevent condensation damage from occurring.

LTO Media Specifications

The following table shows the capacities of the different generations of LTO Ultrium data cartridges.

LTO Media Generation	Native Capacity (Compressed Capacity)
LTO-2	200 GB (400 GB [a])
LTO-3 and LTO-3 WORM	400 GB (800 GB [a])
LTO-4 and LTO-4 WORM	800 GB (1.6 TB [a])
LTO-5 and LTO-5 WORM	1.5 TB (3 TB [a])
LTO-6 and LTO-6 WORM	2.5 TB (6.25 TB [b])
LTO-7 and LTO-7 WORM	6 TB (15 TB [b])
LTO-7 Type M	9 TB (22.5 TB [b])
LTO-8 and LTO-8 WORM	12 TB (30 TB [b])
LTO-9 and LTO-9 WORM	18 TB (45 TB [b])

a. Assuming a 2:1 compression ratio. The compressed capacity depends on the type of data.

b. Assuming a 2.5:1 compression ratio. The compressed capacity depends on the type of data.

LTO Read/Write Compatibility

The following table shows the media read/write compatibility for each LTO drive generation supported by the library.

Drive Gen	LTO-4 Media	LTO-5 Media	LTO-6 Media	LTO-7 Media	M8 Media	LTO-8 Media	LTO-9 Media
LTO-4	**Read/ write**	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
LTO-5	**Read/ write**	**Read/ write**	Not supported	Not supported	Not supported	Not supported	Not supported
LTO-6	*Read only*	**Read/ write**	**Read/ write**	Not supported	Not supported	Not supported	Not supported
LTO-7	Not supported	*Read only*	**Read/ write**	**Read/ write**	Not supported	Not supported	Not supported
LTO-8	Not supported	Not supported	Not supported	**Read/ write**	**Read/ write**	**Read/ write**	Not supported
LTO-9	Not supported	Not supported	Not supported	Not supported	Not supported	**Read/ write**	**Read/ write**

TS11*xx* Technology Media Specifications

The following table shows the capacities of the TS11*xx* technology data cartridges.

Media type	Native Capacity (Compressed Capacity [a])
JC / JY (WORM)	(TS1140 technology format): 4 TB (10 TB) (TS1150 technology format): 7 TB (17.5 TB)
JD / JZ (WORM)	(TS1150 technology format): 10 TB (25 TB) (TS1155/60 technology format): 15 TB (37.5 TB)
JE / JV (WORM)	(TS1160 technology format): 20 TB (50 TB)

a. Assuming a 2.5:1 compression ratio. The compressed capacity depends on the type of data.

TS11*xx* Technology Read/Write Compatibility

The following table shows the media read/write compatibility for each TS11*xx* technology drive generation supported by the library.

Drive Generation	JC Media	JD Media	JE Media
TS1140	**Read/write**	Not supported	Not supported
TS1150	**Read/write**	**Read/write**	Not supported
TS1155	**Read/write**	**Read/write**	Not supported
TS1160	*Read only*	**Read/write**	**Read/write**

WORM Media

Certain records retention and data security applications require a Write Once, Read Many (WORM) method for storing data on tape. LTO-3 and later generation drives and TS11*xx* technology drives enable WORM support when a WORM tape cartridge is loaded into the drive.

WORM Media Requirements Because standard read/write media are incompatible with the WORM feature, a specially formatted WORM tape cartridge is required. Each WORM cartridge has a unique, worldwide cartridge identifier (WWCID), which comprises the unique CM chip serial number and the unique tape media serial number.

Data Security on WORM Media Certain built-in security measures help ensure that the data written on a WORM cartridge does not become compromised, for example:

- The format of a WORM tape cartridge is unlike that of standard read/write media. This unique format prevents a drive that lacks WORM-capable firmware from writing on a WORM tape cartridge.
- When the drive senses a WORM cartridge, the firmware prohibits the changing or altering of user data already written on the tape. The firmware keeps track of the last appendable point on the tape.

Cleaning Cartridges

Cleaning cartridges are valid for 50 uses. Do not rewind and reuse the material in a cleaning cartridge. Reusing the material may redistribute contaminants previously removed from the tape path. If all of the cleaning material has been used, discard the cartridge and use a new cleaning cartridge.

Barcode Label Specifications

Symbology The barcode labeling scheme used on Spectra Logic certified media uses the barcode symbology of USS-39. You can obtain a complete description and definition of this symbology from the *Automatic Identification Manufacturers (AIM)* specification, the *Uniform Symbol Specification (USS-39)*, and the *ANSI MH10.8M-1993 ANSI Barcode* specification.

Application and Orientation The barcode label must be applied to the cartridge so that it fits within the label recess on the edge of the cartridge without curling up on the sides or ends. The label must be oriented so that the barcode characters are along the edge closest to the hub side of the cartridge.

Printed Characters The label can have human-readable alphanumeric characters printed along the top or bottom edge of the label provided there is no conflict or interference with the automation code. This text must include the barcode data, but can also include additional text. The format and colors of the human readable characters is up to the customer and label vendor. For location restrictions, see Detailed Specifications for LTO Cartridge Barcodes on page 58 and Detailed Specifications for TS11xx Technology Cartridge Barcodes on page 59.

Note: When using barcode labels with alphanumeric characters along the bottom edge, the label must be positioned so that barcode is at least 13.72 mm below the top edge of the cartridge to ensure that the barcode reader can read the label.

Barcode Data The library supports barcode data strings consisting of from 1 to 16 characters, including an optional checksum character. Quiet zones precede and follow the start and stop characters.

The barcode data string on standard Spectra Logic barcode labels consists of a start character, eight alphanumeric characters, a checksum character, and the stop character. Quiet zones precede and follow the start and stop characters.

- The first six (6) characters following the start character can be any combination of upper case A-Z or 0-9 (for example, ABC123) to identify the cartridge Volume Serial Number. The use of "CLN" and "DG{space}" at the beginning of the volume identifier is reserved.
  - The volume identifier "CLN*vnn*" is reserved for cleaning cartridges. When a drive requires cleaning, it requests a specific type of cleaning cartridge.
    - The "*v*" field is an alphanumeric field to identify cleaning cartridge applications, "U" for Universal Cleaning Cartridges or a drive unique identifier.
    - The "*nn*" alphanumeric field is used to track individual cleaning cartridge activity (that is, usage and life).
  - The volume identifier "`DG{space}vnn`" is reserved for diagnostic and service cartridges.
- The last two (2) characters are the media identifier and indicate the cartridge Media Type (for example, "L" for LTO and "4" for an LTO-4 cartridge or JC for a TS11*xx* technology cartridge). In IBM LTO tape drives, the value of the media identifier on cleaning cartridges is ignored, although a valid value must be present.
- The barcode string can be printed in either direction on the label and must begin and end with a valid start/stop character (`*`).
- The label must be printed so that barcode data is positioned along the edge of the label that will be closest to the hub side of the cartridge.

The *AIM Uniform Symbol USS-39* specification provides detailed information about the format of the start character, the series of characters that make up the barcode data, the optional checksum character, and the stop character.

Detailed Specifications for LTO Cartridge Barcodes

Figure 5 shows the dimensional specifications for LTO labels with the alphanumeric characters above the barcode.

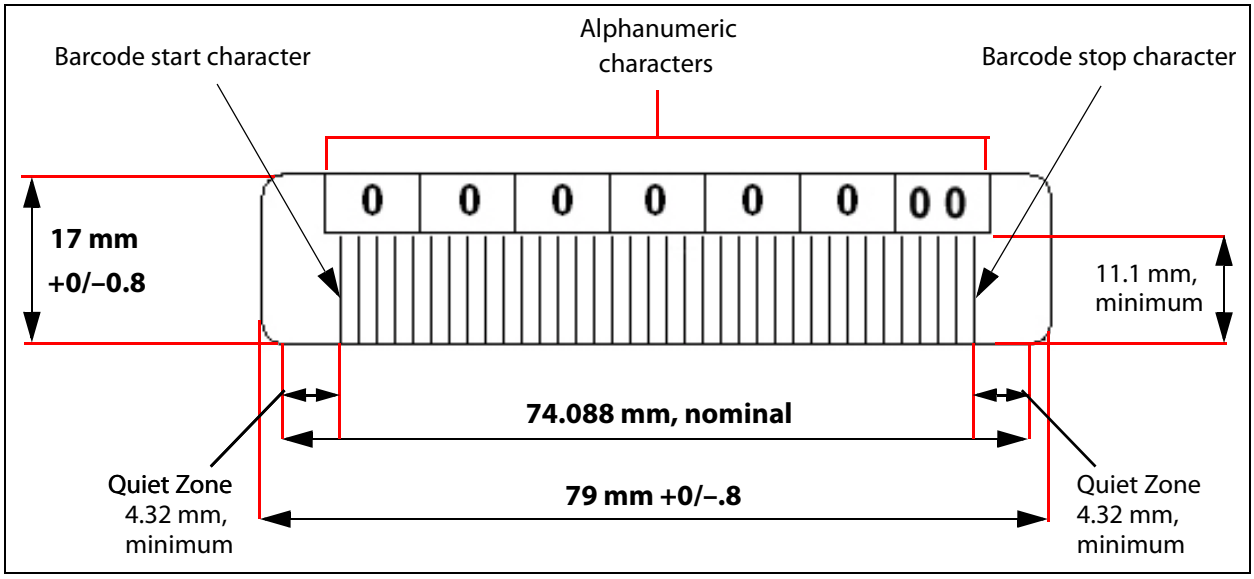


Figure 5 Barcode specifications for half-inch media; alphanumeric characters on top.

Note: When using barcode labels with alphanumeric characters along the bottom edge, the label must be positioned so that barcode is at least 13.72 mm below the top edge of the cartridge to ensure that the barcode reader can read the label.

LTO Barcode Element Specifications

- Minimum symbol height is 11.1 mm, measured to the inside of the label's edge.
- The wide-to-narrow ratio is 2.75.
- The narrow element width is 0.432 mm +0.03 mm or –0.076 mm.
- The nominal width of the wide spaces and bars is 1.188 mm.
- The inter-character gap is 0.432 mm +0.03/–0.076 mm.
- The minimum quiet zone at the beginning and end of a printed barcode string is 4.32 mm (10 times the narrow element width).
- The total nominal barcode string length (including quiet zones) is 74.088 mm.
- The edge of the barcode is the edge of the printed area associated with the bar. The edge roughness is the transition encountered as a horizontal line is moved vertically from all black to all white. The edge roughness maximum is 0.038 mm.
- Variation between all bars, white and black, must be less than ±0.0381 mm.

LTO Physical Label Specifications

- Label stock must fit within the label recess on the face of the cartridge without curling up on the sides or ends (79 mm X 17 mm +0/–0.8).
- Minimum length sufficient for the quiet zones, start-stop, and data characters (nominal 74.088 mm).
- Minimum width no less than 1.5 mm narrower than the cartridge label recess width. Corners are cut with a 1.5 mm radius.
- Maximum label thickness, including the RFID tag, if present, together with any associated layers and adhesives cannot exceed 0.40 mm.
- The label and adhesive must have an environmental performance to match or exceed the environmental specifications of the cartridge to which it is applied.

Detailed Specifications for TS11*xx* Technology Cartridge Barcodes

Figure 6 shows the dimensional specifications for TS11*xx* technology labels with the alphanumeric characters above the barcode.

Important The barcode label must only have one barcode on it. If multiple barcodes are present, the library's barcode scanner cannot determine which one to process when scanning the cartridge.

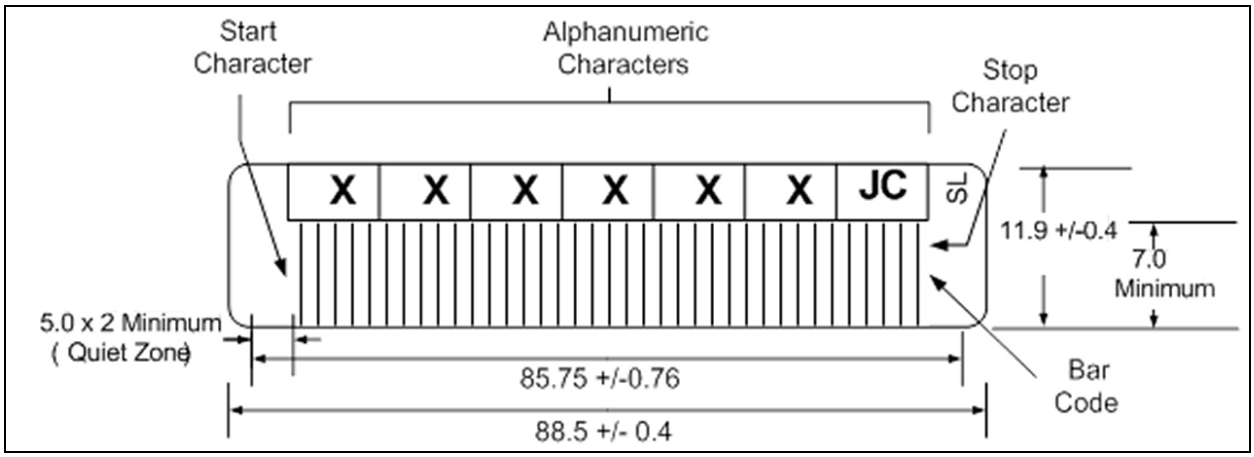


Figure 6 Barcode specifications for TS11*xx* technology media; alphanumeric characters on top. All measurements are in millimeters.

Note: When using barcode labels with alphanumeric characters along the bottom edge, the label must be positioned so that barcode is at least 13.72 mm below the top edge of the cartridge to ensure that the barcode reader can read the label.

TS11*xx* Technology Barcode Element Specifications

- Minimum symbol height is 7.1 mm, measured to the inside of the label's edge.
- The wide-to-narrow ratio is 2.75.
- The narrow element width is 0.500 mm + 0.03/- 0.07 mm.
- The nominal width of the wide spaces and bars is 1.375 mm.
- The inter-character gap is 0.500 mm + 0.03/- 0.07 mm.
- The minimum quiet zone at the beginning and end of a printed barcode string is 5.0 mm (10 times the narrow element width).
- The total nominal barcode string length (including quiet zones) is 85.75 mm.
- The edge of the barcode is the edge of the printed area attached to the bar. The edge roughness is the transition encountered as a horizontal line is moved vertically from all black to all white. The edge roughness maximum is 0.04 mm.
- Variation between all bars, white and black, must be less than ±0.04 mm.

TS11*xx* Technology Physical Label Specifications

- Label stock must fit within the label recess on the face of the cartridge without curling up on the sides or ends (88.5 mm X 11.9 mm +0/–0.4).
- Minimum length sufficient for the quiet zones, start-stop, and data characters (nominal 85.75 mm).
- Minimum width no less than 1.5 mm narrower than the cartridge label recess width. Corners are cut with a 1.5 mm radius.
- Maximum label thickness, including the RFID tag, if present, together with any associated layers and adhesives cannot exceed 0.75 mm.
- The label and adhesive must have an environmental performance to match or exceed the environmental specifications of the cartridge to which it is applied.

CHAPTER 5

Site Preparation Checklist

Use the following checklist as you prepare for the arrival and installation of your library.

Prepare for Library Delivery

Refer to Receiving the Library on page 22 for detailed information.

- ❑ The receiving/storage area can handle the size and weight of the crated library chassis as well as the crate containing the library components.

Prepare to Move and Unpack the Library

Refer to Unpacking and Moving the Library on page 23 for detailed information.

- ❑ Doorways, stairwells, hallways, and elevators accommodate the size of the crated library.
- ❑ Elevators can handle the weight of the crated library.
- ❑ Transportation equipment (forklift, pallet jack, and/or stair crawler) is available.
- ❑ Transportation equipment can handle the weight of the crated library.
- ❑ Space is available in the data center to accommodate the size of the crate and crate ramp, as well as the crate of library components, with extra space for maneuvering.

Prepare the Data Center

Refer to Site Requirements on page 18 for information related to the following preparations.

- ❑ Electrical and peripheral equipment cabling is completed and organized.
- ❑ Electrical circuits and outlets meet the library's specifications.
- ❑ Fire suppression equipment is in place.

- ❑ Flooring is a hard, level surface (for example, cement or tile, not carpeting) and capable of supporting the weight of the library.
- ❑ Space is available for the library's height, width, and depth.
  - ❑ Space is available for the library's TAP to open.
  - ❑ Space is available for service access on the right side and rear of the library.
- ❑ Mounting rack for the T200 or T380 is assembled and positioned within easy reach of power and network connections.
- ❑ Temperature and humidity are within the library's specifications.
- ❑ Vibration and shock will not exceed the library's specifications.
- ❑ Ethernet and Fibre Channel cabling is completed for the library and its drives.

Notes