



# **TLS-8000**

## Product Specification

501498 Rev. C

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# 1.

# Introduction

## 1.1 Scope

This product specification describes the Qualstar TLS-8000 Series Tape Library Systems, subsequently referred to in this specification as the TLS-8000, or simply as the TLS. It also provides detailed specifications of the product and is intended for use by individuals evaluating, purchasing and/or integrating the TLS-8000 library products.

## 1.2 Supplemental Documentation

For information about the SCSI interface, or other information outside the scope of this manual, please refer to the appropriate documents listed below. The following Qualstar and ANSI documents supplement this specification:

SUBJECT	DOCUMENT	QUALSTAR DOCUMENT
Installation & Operation	TLS 5000/6000/8000 Installation and Operation Manual	<a href="#">501450</a>
Service	TLS 5000/6000/8000 Technical Service Manual	<a href="#">501090</a>
Remote Operation	Q-Link Remote Library Manager Installation Guide	<a href="#">501520</a>
Supported Tape Drives	Product Information Note	<a href="#">PIN-014</a>
Approved Data Cartridges	Product Information Note	<a href="#">PIN-038</a>
Barcode Label Specifications	Product Information Note	<a href="#">PIN-040</a>
SCSI Command Information	TLS 5000/6000/8000 SCSI-2 Interface Manual	<a href="#">501205</a>
SCSI-2	ANSI X3.131-1994	N/A
SCSI SPI-2 Specification	ANSI X3.302-1998 SCSI Parallel Interface-2 (SPI-2)	N/A
SCSI SPI-3 Specification	T10 Project 1302D SCSI Parallel Interface- (SPI-3)	N/A

**Table 1-1 Applicable Documents**

## 2.

# Product Description

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### 2.1 General Description

The TLS-8000 series is a family of reliable, automated tape library systems that use the LTO (Linear Tape Open) tape drives and data cartridges. Data capacities for the five available models range from 1.1 to over 105 terabytes. Model-dependent features include one to eight tape drives, an I/O port, 11 to 264 data cartridges and a barcode reader. The entire system, composed of tape drives and a changer, can be under host control via the industry-standard Ultra SCSI interface. A Fibre Channel interface option is available for all models. Q-Link, a web based remote library manager is also available. Models 88132 and 88264 are referred to as dual bay libraries because of their dual drive bays. All other models are single bay libraries.

Each library contains a high performance robotics system for handling data cartridges, a drive bay to accommodate the tape drives, and storage slots for data cartridges. All units operate on any internationally available AC power source. The entire cabinet is pressurized and cooled by filtered air to ensure an optimum environment.

The TLS-8000 family was designed for maximum reliability. Only the highest quality components are used in a design that is inherently robust and simple. There are no belts or pulleys to stretch or wear out in any of the motion axis'. Instead, brushless motors operate precision lead screws. Digital closed-loop servo systems and Hall-Effect position sensors assure fast, smooth, trouble-free cartridge handling. The servos automatically calibrate themselves, thus eliminating all electrical adjustments. Preventive maintenance is reduced to cleaning and replacing the air filter(s), when so prompted by the control panel display.

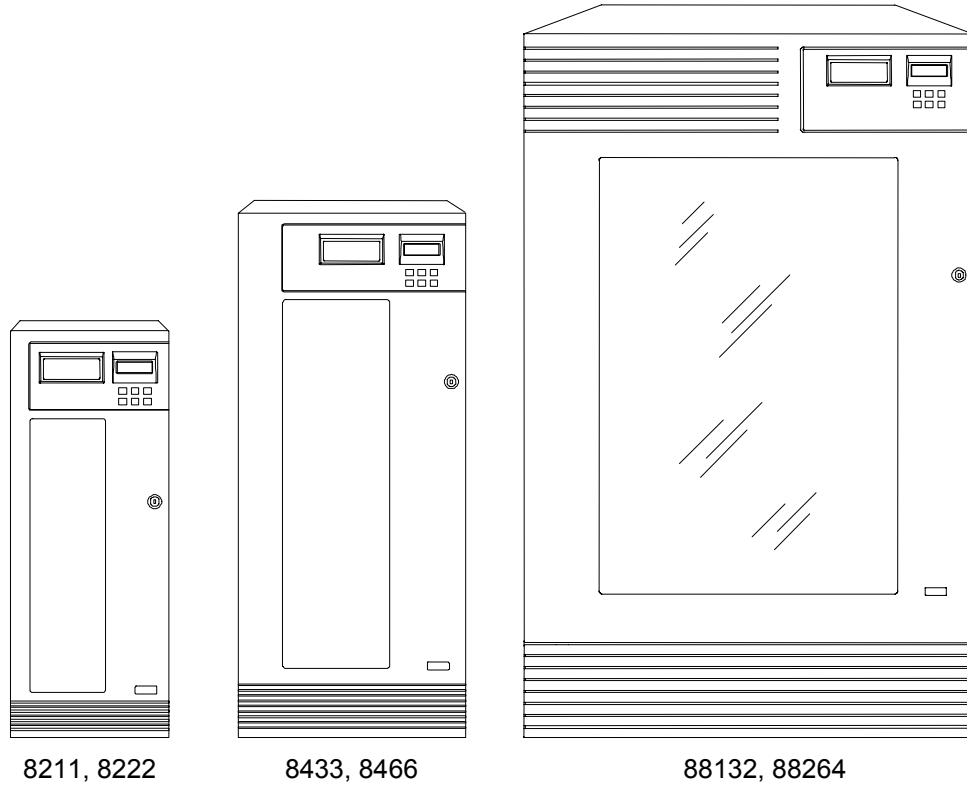
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## 2.2 Features Common to All Models

- Key-locked access door with a large window
- No mechanical or electrical adjustments required
- Barcode scanning of data cartridges supported in all models
- Automated I/O port for inserting and removing cartridges
- 1,000,000 Mean-Exchanges-Between-Failures rating
- All brushless DC motors
- Precision leadscrew driven mechanisms (no belts or pulleys)
- Q-Link Remote Library Manager
- Back-lighted 80-character display
- Menu driven control system for use in system configuration, operation and maintenance
- Pressurized, filtered, forced air cooling of library and tape drives
- Drives are individually mounted in enclosures that slide in from the rear of the TLS.  
Two SCSI connectors per drive are provided. Individual SCSI connection to each drive or a group of drives is readily accomplished.
- Simple system integration to any host computer through LVD/SE SCSI interface
- Fibre Channel Interface option
- Inventory Sentry™ feature minimizes off-line time
- Maintenance-friendly by design, self-calibrating, all-digital servo control system
- Operating firmware updatable via the SCSI interface or Q-Link
- Wide input voltage range (100 VAC to 240 VAC)
- High degree of spare parts commonality among all models
- Simultaneous Random and Multi-Sequential (Multiple Stacker) operating modes in multi-drive models
- Logical Libraries feature supports simultaneous connections to as many as four hosts
- Automated tape drive cleaning
- Non-volatile RAM stores system data when power is removed

## 2.3 Available Models

Available models and a list of their features are shown below.



FEATURE/MODEL	8211	8222	8433	8466	88132	88264
Maximum number of drives	2	2	4	4	8	8
Number of cartridges (11 cartridges per magazine)	11	22	33	66	132	264
Barcode Reader(s)	Opt.	Opt.	Std.	Std.	Std.	Std.
I/O port for automated cartridge insertion/removal	Opt.	Opt.	Std.	Std.	Std.	Std.
Carousel(s) (rotary positioning of magazines)	Opt.	1	1	1	2	2
Number of Cartridge Handlers	1	1	1	1	2	2
Fibre Channel Option	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Q-Link Remote Library Manager	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

Table 2-1 Available Models

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## 2.4 Q-Link

Q-Link is Qualstar's remote tape library monitoring and management system. Q-Link provides the key information needed to monitor and manage the TLS from anywhere in the world. Q-Link supports total remote operation of the library. Any function that can be executed locally from the operator control panel can be performed over the worldwide web via Q-Link. Q-Link utilizes an easy-to-use graphical interface accessed over a web browser, and supports up to ten individual user accounts.

The TLS Executive firmware and the Q-Link firmware can both be uploaded remotely via Q-Link. Q-Link can also automatically send e-mail messages to a predefined list of recipients whenever selected faults, alarms or alerts occur or the TLS requires maintenance.

## 2.5 Field Expansion Kits

Expansion kits are available to increase the library capacity to meet increased storage requirements after a unit has been installed. The kits consist of the appropriate hardware to allow a field engineer to upgrade a unit in less than 60 minutes. The following models may be converted by installing field expansion kits:

FROM MODEL	TO MODEL
8211	8222
8433	8466
88132	88264

Table 2-2 Field Expansion Kits

## 2.6 Field Upgrades

A barcode reader may be added to a TLS-8211 or 8222 in the field by a qualified service technician.

## 2.7 Controls and Indicators

The control panel is located at the top of the TLS and contains a four-line, 80-character display and six momentary push-button switches. An audible alarm alerts the operator to error conditions.

The multipurpose display shows the following information, depending upon the selected mode of operation:

- Model number, identification number and firmware revision
- Operational status
- SCSI command display

- SCSI command history log which stores the most recent commands and status
- Error conditions
- Extensive menu system for configuration, maintenance and operation functions
- Configuration and Control of Fibre Channel Interface

The six push-button switches are used to manually control the TLS by means of the menu system and are identified in Table 2-3.

NAME	FUNCTION
▲	Scrolls up through menu items.
▼	Scrolls down through menu items.
ENTER	Accepts the currently displayed menu choice.
EXIT	Exits the present menu and returns to the previous menu level.
✱	Used in conjunction with other keys to park the handler high or low and to open the I/O port for cartridge insertion/removal.
MENU	Always takes you to the Top Menu.

**Table 2-3 Control Panel Switches**

## 2.8 Cartridge Handling System

Figure 2-1 and Figure 2-2 show some of the major internal components of the single and dual bay TLS models.

The front door provides easy access to the cartridge bay and robotic handler(s) and can be locked with a key to prevent unauthorized access. Opening the door disables the robotic handler(s) but not the tape drives.

Cartridges are stored in eleven-cartridge magazines, which are easily removed and replaced. A positive locking system assures the magazines are securely fastened.

All models, except the 8211, utilize rotating carousels to present the desired magazines to the robotic handler. Optical sensors assure accurate carousel positioning. TLS-88xxx models use two carousels.

The robotic handler consists of a carriage that moves data cartridges up and down between the tape drives and the magazines, and a carriage-mounted loader which moves the cartridges in and out of the drives and magazines. The robotic handler is self-aligning and does not require electrical or mechanical adjustment after tape drives are added or exchanged. TLS-88xxx models use two handlers.

A leadscrew driver shuttle mechanism is found on TLS-88xxx models for moving cartridges laterally between the two handlers so that any tape cartridge may be placed in any tape drive or storage location.

A brushless DC motor turns a precision nut around a stationary lead screw to drive the carriage in the vertical axis. As the nut turns, the carriage moves up or down the

lead screw. Linear ball bearings on hardened shafts provide lateral and torsional support. Hall-effect sensors are utilized to provide commutation, position and velocity feedback for the control system. This unique design produces optimum positioning accuracy, reliability and long life.

A brushless DC motor turning a precision lead screw drives the carriage-mounted loader. Again, magnetic sensors provide position and velocity feedback, while an optical sensor provides absolute position information. A solenoid actuates the spring-loaded cartridge gripping mechanism.

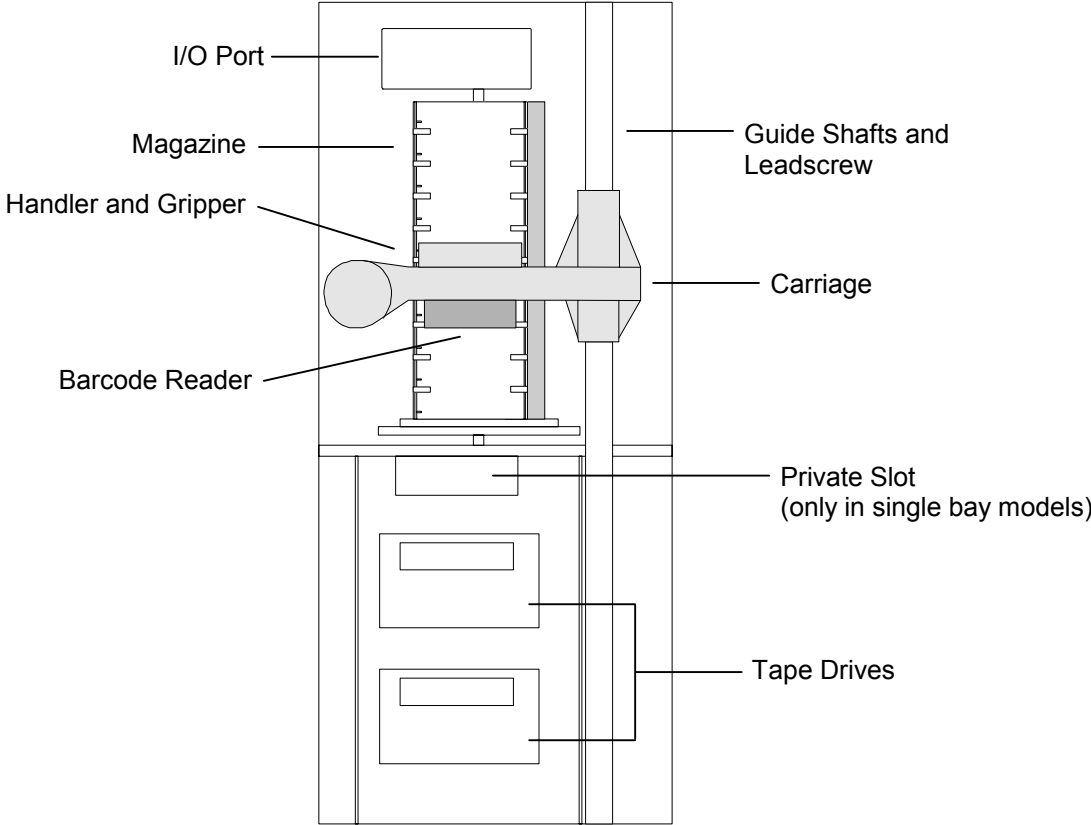


Figure 2-1 TLS Major Internal Assemblies (Single Bay Library)

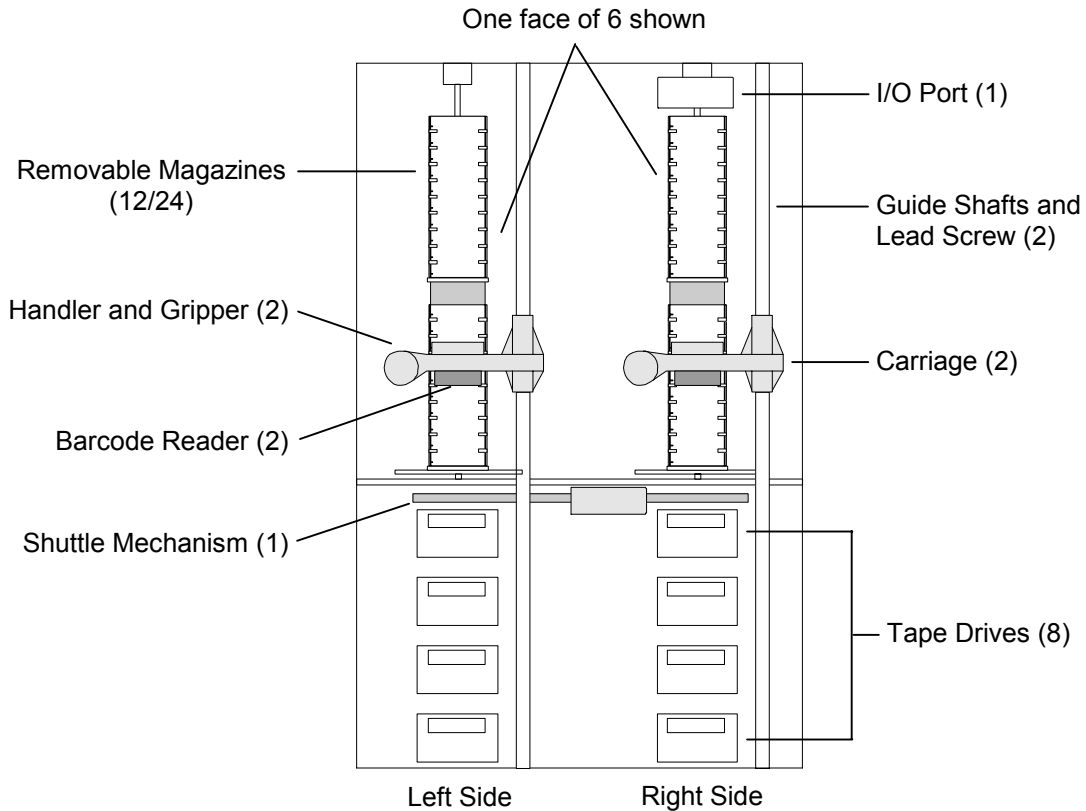


Figure 2-2 TLS Major Internal Assemblies (Dual Bay Library)

## 2.9 Cartridge Inventory Security

The Inventory Sentry™ utilizes an infrared beam which passes (vertically) in front of all cartridge storage locations and tape drives. If the door is opened to inspect the inventory and if the inventory is not disturbed, closing the door immediately returns the TLS to operational status.

If this beam is broken while the cabinet door is open, by someone moving a cartridge for example, the TLS inventory status is invalidated. When the door is closed, the TLS will automatically rescan the cartridge inventory (and barcode labels if present) and update its internal inventory database before becoming operational.

## 2.10 Cartridge Access

### 2.10.1 Data Cartridge Magazines

Bulk exchange is performed by removing an entire cartridge magazine. Magazines snap easily into and out of the library system without tools. The robotic handler is disabled when the door is opened for magazine removal or installation. A dust cover is included with each magazine for storage outside the TLS.

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## 2.10.2 I/O Port

All models have an I/O port that provides an automated means of inserting or removing cartridges, one at a time, from the library. The \* button allows the user to request access to the I/O port. The I/O port automatically retracts when a data cartridge is fully inserted.

The disposition of cartridges into or out of the I/O port is handled either automatically by the host computer or manually by using the menu system. The host system software can assume complete control of the I/O port for enhanced data security and can prevent access to the media via the control panel.

The I/O port is operated by a lead screw and is monitored by optical sensors to ensure proper data cartridge insertion by the user.

## 2.11 Barcode Reader

Barcode readers are supported in all models to scan barcode labels on data cartridges for fast media inventory and tracking. Barcode readers are able to uniquely identify each cartridge without having to read the tape within. The use of a barcode reader requires that each cartridge is identified by a barcode label.

The barcode reader consists of a charge-coupled sensor (similar to that used in a video camera) and associated electronics mounted under the robotic handler. The barcode reader can scan all data cartridges in the library, as well as cartridges introduced into the I/O port. Information from the barcode reader is stored internally in the library's non-volatile RAM, and is available to the host computer upon request.

## 2.12 Barcode Labels

Pre-printed barcode labels, which are both human- and machine-readable, are available from a number of sources including Qualstar.

Barcode labels must conform to ANSI/AIM BCI-1995, Uniform Symbology Specification Code 39. Please refer to [PIN-040](http://www.qualstar.com) at [www.qualstar.com](http://www.qualstar.com) (click on Support tab) for more information.

By default, the TLS expects a modulus 43 check character at the end of each label. The use of a check character helps assure that labels are read error-free. The TLS configuration must be changed before using barcode labels without a check character. All of the labels within the TLS must match the check character configuration: either all with or all without a check character.

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## 2.13 Cooling System

Axial-flow fans (or a centrifugal blower on 8 drive, dual bay models) draw outside air into the cabinet through a replaceable air filter or filters. The resulting inside positive pressure prevents dust and debris from entering the TLS. Each LTO tape drive is mounted in its own carrier that contains a fan that draws filtered cooling air through the tape drive and exhausts it out the rear of the library.

## 2.14 SCSI Interface

The standard SCSI control-interface to the TLS is both Low-Voltage Differential (LVD) and Single-Ended (SE) capable. This is defined by ANSI as Multi-Mode Low Voltage Differential or MLVD and is also called LVD/SE. The interface can operate in the narrow or wide modes. All available tape drives support wide LVD/SE operation.

TLS-88xxx models have two SCSI control ports which have identical capabilities – one or both may be used. All other models have a single SCSI control port.

There are two SCSI interface connectors on the rear panel for each TLS SCSI control port and each installed tape drive. The two connectors are found at the ends of a short cable which loops through the SCSI device. Adjacent devices may be bridged together utilizing optional 7-inch long SCSI Bridge Cables (Qualstar P/N: 501087-01-9). The devices may be connected individually to separate SCSI busses or grouped together as required.

The user can change the SCSI ID of the control port and all the tape drives from the control panel as described in the Installation and Operation Manual (Document No. [501450](#)). The complete SCSI-2 interface protocol is described in Qualstar's SCSI-2 Interface Manual, Document No. [501205](#).

### 2.14.1 SCSI Cable Lengths

The lengths of the individual SCSI cables internal to the TLS are described in Table 2-4. The total length of cable on any LVD/SE SCSI bus should not exceed 12-meters.

ITEM	Applicable Models	INTERNAL SCSI CABLE LENGTH
Medium-changer	84xx and 88xxx	15 inches / 0.38 meters
	82xx	10 inches / 0.25 meters
Tape Drive / Carrier Assembly	All	10 inches / 0.25 meters
Bridge Cable (between changer & drive or any two drives)	All	6.5 inches / 0.16 meters

**Table 2-4 Internal SCSI Cable Loop Length**

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### 2.14.2 SCSI Connector

The standard TLS device connector is a 68-pin female, high-density, connector (AMP P/N 786096-7 or equivalent). The mating connector should be an AMP 750752-1 or equivalent. The standard jackscrew locking hardware is utilized.

### 2.14.3 SCSI Terminators

The SCSI bus must be properly terminated at each of its ends. The host adapter board is usually terminated. The other end usually appears at the library and requires the installation of a SCSI terminator. The recommended MLVD (LVD/SE) terminator is Qualstar P/N 117-0011-9.

### 2.14.4 SCSI Termination Power

Each TLS SCSI control port can supply over 2 amps of termination power to the SCSI bus. This termination power is fed to the SCSI bus TERMPWR line through a circuit protector, a blocking diode and a jumper (TPWR), as shown in Figure 2-3. The termination power is periodically monitored and, if it is missing, the front panel will display an appropriate error message.

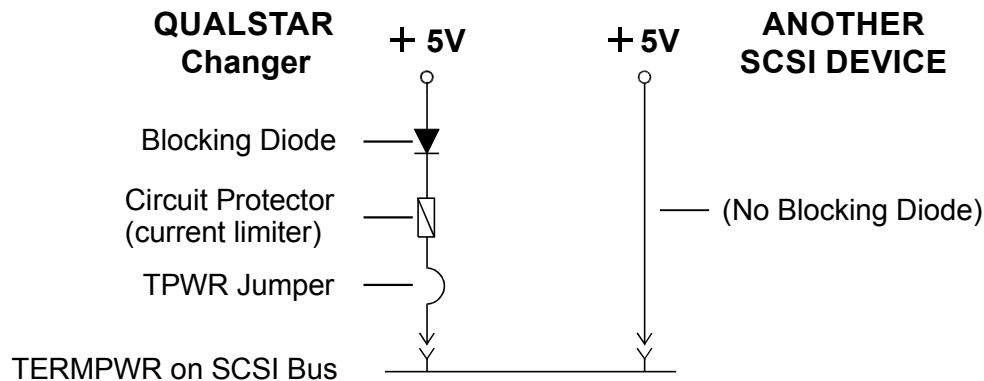


Figure 2-3 SCSI Termination Power Diagram

## 2.15 Operating Firmware

The operating firmware for the TLS is contained in flash memory. The operating firmware can be updated in the field through Q-Link, Q-Conn, the Fibre Channel or SCSI interface, or by changing the flash memory chip. The TLS-8000 Series are operationally identical to the Qualstar TLS-4000, TLS-5000 and TLS-6000 Series of tape libraries.

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## 2.16 Random and Multi-Sequential (Multiple Stacker) Operation

Each tape drive and cartridge storage location in the TLS may be configured through the menu system for Random or Sequential operation. If a tape drive is configured for the Random mode, it becomes a resource to be controlled by an application that will operate the library. If a drive is configured for the Sequential modes, it is referred to as a sequential drive and is marked unavailable in the list of resources reported. Sequential drives are instead manually controlled via the library control panel.

For Sequential or Recycle operation, a single contiguous range of cartridge locations is assigned to each sequential drive for its exclusive use. In these modes, each tape cartridge is returned to its original storage location after it is ejected from the tape drive.

For Dual-Bin operation, two separate ranges of magazine locations are assigned to each sequential drive for its exclusive use. The Input range of locations is where the changer removes cartridges to be placed in the sequential drive. The Output range is where those cartridges are returned after the drive has ejected them.

Cartridge storage locations assigned to sequential operations are marked as being unavailable in the list of resources reported to host computers. Empty slots in a Sequential, Recycle or Dual-Bin drive's storage location range will not adversely affect operation.

When a Sequential or Recycle operation is started (via the menu system), the changer moves the first cartridge, found at (or after) the initial specified storage location into the drive. When the drive ejects the cartridge, the changer automatically returns the cartridge to its original location. The changer then places the next cartridge, found within the drive's storage range into the drive. This process is repeated, until the last specified cartridge is ejected and returned to storage. This sequence may be started at any location within a Sequential drive's storage range but will always end at the last storage location. In Recycle operations, the handler will return to the starting position and repeat the cartridge movement cycle indefinitely.

When a Dual-Bin operation is interactively started (via the menu system), the changer moves the cartridge found at (or after) its Input First location into the drive. When the drive ejects the cartridge, the changer automatically places it in the first empty cartridge location in the drive's Output range. This process is repeated, until the last specified cartridge in the Input range has been ejected from the drive and placed into the Output range.

The computer communicating with the sequential drive only communicates with the drive and not the changer. This allows the use of applications lacking library-specific, cartridge-movement, operating software.

The computer communicating with the sequential drive only communicates with the drive and not the changer. This allows the use of applications lacking library-specific, cartridge-movement, operating software.

Multiple tape drives can be configured for concurrent Sequential, Recycle or Dual-Bin operation. All random drives, and all cartridge locations not assigned to sequential drives, are still available for simultaneous Random mode operations.

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This flexible design allows the user to partition the library's resources to best meet overall system needs. With a TLS-8466, for example, it is possible to have one library serve as the tape storage device for four separate systems.

## 2.17 Manual Operation

The menu system provides a means of manually moving cartridges to or from all available locations (drives, magazine slots, fixed slots, I/O port). The menu system is accessed using the keys on the front panel. If the host makes a request to the TLS during a manual operation, the TLS indicates it is busy until the manual operation is completed (usually within a few seconds).

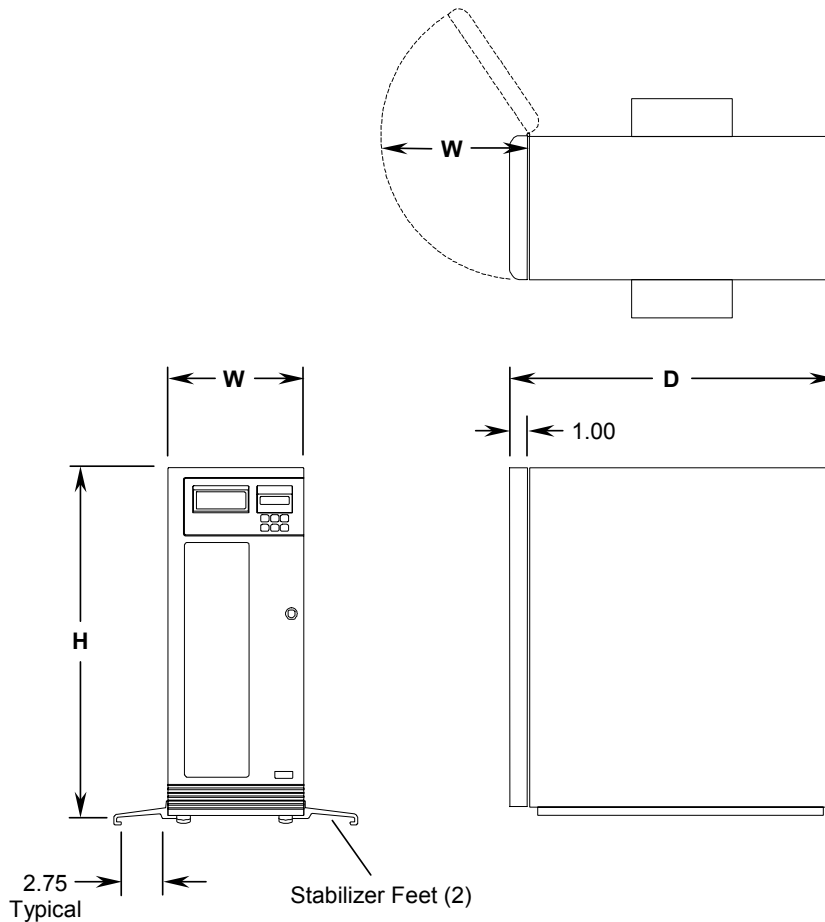
## 2.18 Logical Libraries

When shipped from the factory, all TLS-8000 libraries look like a single library with all tape drives and storage slots dedicated to random operation. This is generally the correct configuration for a single system running a library aware backup application.

However, when multiple hosts are present and each needs to run a library specific backup application, then the TLS can be sub-divided into smaller *logical libraries*. This masquerade can be done for a total of four logical libraries – thereby making a single logical library do the work of up to four smaller ones.

# 3. Physical Specifications

## 3.1 Dimensions and Weights

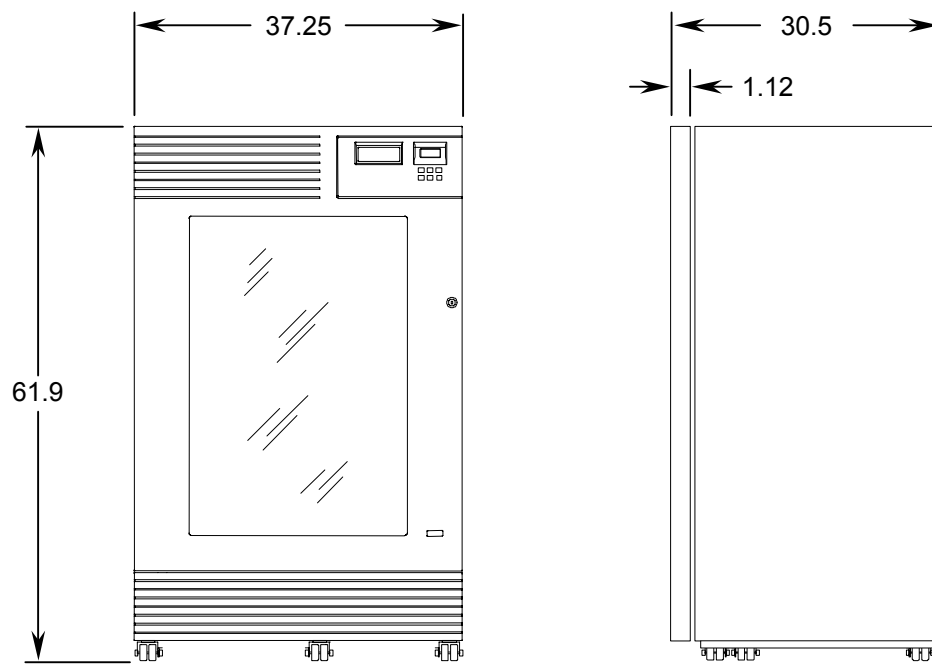
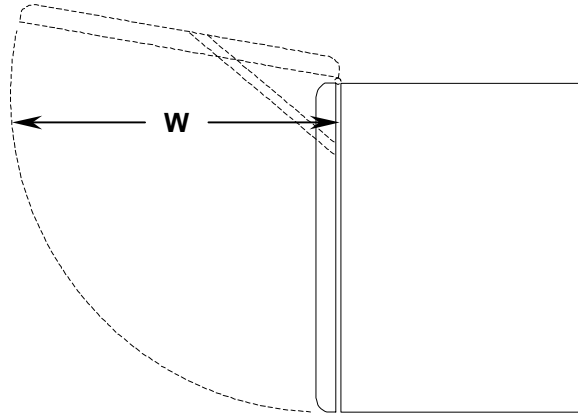


MODEL	HEIGHT (in/cm)	WIDTH (in/cm)	DEPTH (in/cm)	EMPTY ④ WEIGHT (lb/kg)	SHIPPING ① WEIGHT (lb/kg)
8211, 8222	34.7 / 88.1	13.1 / 33.3 ②	24.9 / 63.2	89 / 40.3	125 / 56.7 ③
8433, 8466	44.5 / 113.0	18.75 / 47.6 ②	30.5 / 77.5	153 / 69.4	235 / 107 ③

Table 3-1 Single Bay Dimensions and Weights

- ① Shipping weights include the TLS, empty data cartridge magazines and accessories.
- ② Stabilizer feet add 5.0 inches (12.7 cm) to the base width of all models except 88xxx.
- ③ Weight includes accessory box (shipped separately).
- ④ Empty weights exclude tape drives, magazines and data cartridges.

Dimensions shown in inches



MODEL	HEIGHT (in/cm)	WIDTH (in/cm)	DEPTH (in/cm)	EMPTY ③ WEIGHT (lb/kg)	SHIPPING ① WEIGHT (lb/kg)
<b>88132, 88264</b>	61.9 / 157.3	37.25 / 94.62	30.5 / 77.5	359 / 163	602 / 273 ②

**Table 3-2 Dual Bay Dimensions and Weights**

- ① Shipping weights include the TLS, empty data cartridge magazines and accessories.
- ② Weight includes accessory box (shipped separately).
- ③ Empty weights exclude tape drives, magazines and data cartridges.

The weight of a functional TLS-8000 is the sum of the TLS empty weight (see the table above) and required quantities of the following items. A fully loaded TLS-8222 would therefore weigh 119.3 pounds (54 kilograms) compared to an empty weight of 89 pounds (40.3 kilograms).

Other Weights	Weight (lb/kg)
LTO Tape Drive/Carrier Assembly	8.0 / 3.6
LTO Magazine	2.0 / 0.9
LTO Data Cartridge	0.5 / 0.23
SCSI Bridge (Jumper) Cable	0.3 / 0.13

**Table 3-3 Other Weights**

## 3.2 Standard Colors

The standard exterior color is beige.

Standard Color Specification: H.B. Fuller Industrial Coatings Division  
IF 2044, Parchment Texture Powder Coat

## 3.3 Custom Logo Provision

The TLS is normally shipped with a Qualstar logo on the front of the unit. If specified at time of order, the logo may be either deleted, or the customer's logo substituted.

The logo size is 1.72 in., by 0.62 in., by 0.06 in. thick, with 0.06-in. corner radii.

## 3.4 Tape Drive, Data Cartridge and Data Cartridge Magazine Compatibility

- The TLS-8000 series is designed to operate only with LTO tape drives supplied by Qualstar. Refer to Qualstar Product Information Note 014 for an up-to-date list of supported tape drives.
- The choice of media for use in the TLS is important. Only media approved by the tape drive manufacturer and Qualstar should be used in the TLS. Please refer to Qualstar Product Information Note 038 for the current list of approved media sources.
- **Data Cartridge Magazine** – Qualstar 11-cartridge magazine, P/N 501350-01-1

# 4. Electrical Specifications

## 4.1 Power Requirements and Consumption

The TLS operates with the following alternating current power sources:

Nominal Voltage Range	Nominal Line Tolerance	Maximum Operating Line Voltage	Minimum Operating Line Voltage	Line Frequency Range
100–120 VAC	+10%, -10%	254 VAC	90 VAC	48–62 Hz
200–240 VAC	+6%, -10%	254 VAC	90 VAC	48–62 Hz

No changes to the TLS are required to operate over either range.

Power consumption varies with the number of tape drives installed and the particular operation being performed. Table 4-1 is based on a full complement of tape drives installed in each model specified. The idle power figures indicate the power consumed when the robotic handler and tape drives are idle. The peak power figures indicate the peak power consumed when the robotic handler accelerates and the tape drives are active. The peak is not expected to last for more than two seconds at a time. The peak V-A (volt-amperes) figures are derived by dividing the peak power values by the TLS power factor.

MODEL	IDLE ①	PEAK ①	PEAK V-A	POWER FACTOR
<b>8211, 8222</b>	≤ 140 watts ≤ 478 BTUs/hr	≤ 270 watts ≤ 921 BTUs/hr	≤ 370 V-A	> 0.95
<b>8433, 8466</b>	≤ 245 watts ≤ 836 BTUs/hr	≤ 375 watts ≤ 1280 BTUs/hr	≤ 515 V-A	> 0.95
<b>88132, 88264</b>	≤ 470 watts ≤ 1605 BTUs/hr	≤ 590 watts ≤ 2015 BTUs/hr	≤ 848 V-A	Pending

**Table 4-1 Power Requirements**

① Power consumption figures include the *steady-state* power consumed by the maximum number of LTO tape drives possible for each model (maximum number of drives determined by second digit of model number). Subtract 45 watts for each tape drive not installed. Add 40 watts for each Fibre Channel Option installed.

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## 4.2 Power Source Disturbances

The TLS will continue to operate uninterrupted and without damage over a one-cycle line dropout. It is recommended that the TLS be powered from an Uninterruptible Power Source (UPS). The UPS should be rated to handle the peak V-A values indicated in Table 4-1.

## 4.3 Power Entry

The power switch, line fuse and line filter with I.E.C. power receptacle are mounted on the rear panel. An internal AC line filter reduces EMI conducted emissions and protects the TLS from noise on the power lines. A six-foot, seven-inch (2-meter) power cord is supplied for 120 VAC use in North America. For other destinations, a Harmonized HO5VV-F power cord is supplied.

## 4.4 Power Supplies

The TLS provides regulated DC power (+5V and +12V) for the tape drives on connectors which mate directly to the drives. There is one universal input, line switching power supply for each two tape drive mounting slots in the TLS. All supplies feature a soft-start circuit to eliminate current surges on the AC mains when power is applied. They also feature an over-voltage protection circuit that protects the robotics electronics and the tape drives in the event of a power supply failure.

The tape drive and robotic power supplies are Power Factor Corrected (PFC) to minimize harmonic distortion. All TLS-8000 models comply with the requirements of EN-61000-3-2.

# 5.

# Agency Compliance

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## 5.1 EEC Directive Compliance (European Economic Community)

The TLS meets or exceeds the requirements of the CE Mark as set forth by:

- Electromagnetic Compatibility Directive 89/336/EEC
- Low Voltage Directive 73/23/EEC

## 5.2 Emissions/Immunity Standards Compliance

The TLS meets or exceeds the standards set forth by:

- FCC Rules, Part 15, Subpart B, Class A Computing Devices
- EN55022: 1998 Class A, EN55024: 1998, EN61000-3-2 and EN61000-3-3.

## 5.3 Safety Standards Compliance

The TLS meets or exceeds the standards set forth by:

- UL1950 Third Edition (United States)
- CAN/CSA-C22.2 No. 950-95 (Canada)
- EN 60950 (1992) with Amendments 1 and 2 (CB Scheme)

# 6. Performance Specifications

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## 6.1 Data Cartridge Handling Times

Table 6-1 lists the Average Time to pick a cartridge from its storage location and place it in a drive, or pick a cartridge from a drive and return it to its storage location. Four seconds is the average time required for the shuttle mechanism to transfer a data cartridge between the carriages in dual bay, 88xxx libraries.

MODEL	AVERAGE TIME
8211	14 seconds
8222	15 seconds
8433, 8466	16 seconds
88132, 88264	18 seconds

Table 6-1 Cartridge Handling Times

## 6.2 Scan All Barcodes

In Table 6-2, the Typical Time values are the times required to scan a full complement of data cartridges, with no cartridge installed in the I/O port. This assumes all cartridges are barcoded and that no retries are needed.

MODEL	TYPICAL TIME
8211	28 seconds
8222	38 seconds
8433	49 seconds
8466	79 seconds
88132	91 seconds
88264	98 seconds

Table 6-2 Barcode Scanning Times

# 7. Environmental Specifications

## 7.1 Temperature, Humidity and Altitude

PARAMETER	OPERATING	NON-OPERATING ①
Ambient temperature	+5 °C to +32 °C (+41 °F to +90 °F)	-20 °C to +60 °C (-4 °F to +140 °F)
Temperature gradient (maximum)	1 °C/minute, 10 °C/hour (2 °F/minute, 18 °F/hour)	1 °C/minute, 20 °C/hour (2 °F/minute to +36 °F/hour)
Relative humidity (non-condensing)	20% to 80%	10% to 90%
Wet bulb temperature	26 °C (79 °F) maximum	29 °C (84 °F) maximum
Altitude	-1000 to +10,000 feet -304.8 to +3,048 meters	-1000 to +40,000 feet -304.8 to +12,192 meters

① Storage and transportation for the TLS only – tape drives and media excluded.

Table 7-1 Environmental Specifications

**NOTE**

*Rapid changes in temperature which produce condensation must never be allowed since the condensed liquid may contaminate bearing lubricants and possibly shorten the expected Mean Time Between Failures.*

## 7.2 Acoustical Noise

Overall noise level at one meter from the front of the TLS, shall not exceed:

- With all tape drives operating: ≤ 50 dBA
- All tape drives plus robotic handler operating: ≤ 65 dBA

# 8.

# Reliability Specifications

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## 8.1 Mean Exchanges Between Failures

The demonstrated Mean Exchanges Between Failures (MEBF) rating is 1,000,000 exchange cycles. The MEBF rating excludes tape drives which are rated separately by their manufacturer. An exchange cycle consists of the following actions:

1. Pick a data cartridge from a storage location.
2. Place the cartridge into a tape drive.
3. Remove a cartridge from a drive.
4. Return the cartridge to a storage location.

Qualstar Corporation does not warrant either the MEBF or the historical failure rate to be representative of any particular unit installed for customer use. Failure rates are derived from a large database of test samples. The individual failure rate will vary from unit to unit.

## 9.1 Mean Time To Repair

The Mean Time To Repair (MTTR) shall not exceed 30 minutes. The MTTR is the average time for an adequately trained and equipped technician to diagnose and correct a malfunction while following the service procedures in the Technical Service Manual. Servicing will be limited to replacing major subassemblies and printed circuit board assemblies (PCBAs). Repair time does not include system retest time.

## 9.2 Preventive Maintenance

The only routine preventive maintenance required by the TLS consists of periodically cleaning and replacing the air filter, which is located on the front panel, or on some models, on both the front and rear panels. The TLS keeps track of its power-on hours in order to periodically remind the user to replace the filter. After replacement, the user clears the maintenance reminder via the menu system. The replacement interval can be changed to match the local environmental conditions.

## 9.3 Automated Tape Drive Cleaning

A feature of the TLS allows the user to specify a storage location where a cleaning cartridge can be stored for each tape drive. Any number of cleaning cartridge locations from none, up to the number of drives may be specified, but each drive can have only one location. Cleaning cartridge locations are not restricted from the resources available to random or sequential operations.

A menu allows the user to specify a drive to be cleaned. If the drive is empty, the TLS will move the predetermined cleaning cartridge to the drive. When the drive ejects the cartridge, the TLS will return it to its original location.

If the application software supports automated tape drive cleaning, this task can be completely automated.

## 9.4 Adjustments

The TLS does not require electrical or mechanical adjustments after any field replaceable unit (FRU) or tape drive is replaced. All adjustments, alignments and calibrations are performed automatically.