QUALSTAR®

The Tape Library Experts™

TLS-4000

Installation and Operation Manual

501370 Rev. J

Important Manual/Firmware Revision Information

This manual and the operating firmware for the Tape Library System (TLS) are revised periodically as the product is improved. This manual was revised to correspond with the firmware version indicated below. Do not use this manual with prior versions of the firmware. Check with Qualstar Technical Support about use of this manual with older or newer firmware.

Manual	Corresponding Firmware
TLS-4000 Installation and Operation Manual 501370 Rev. J, Revised Nov 05, 2004	TLS Executive Firmware 700105 Version 2.23

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European Union Directive 89/336/EEC and Standard EN55022 (Electromagnetic Compatibility)

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

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1. Introduction

1.1 Who Should Read This Manual

This manual covers all of the TLS-4000 Series Tape Library's except for the TLS-412xxx models which are covered in document 501300. Except where series or model differences require separate treatment, each unit may be referred to as a TLS. For the sake of clarity and compliance with the SCSI specifications, the control interface of the TLS is defined as a "Medium-changer" and is referred to throughout this manual as the "changer".

This Installation and Operation Manual is written for the TLS installer, the system administrator and the user/operator. This manual includes instructions on installation, configuration and operation. Also included are preventive maintenance procedures and repacking instructions, in case it ever becomes necessary to transport the unit.

For information about the SCSI interface, or other information outside the scope of this manual, please refer to the appropriate documents listed below.

Subject	Document	Qualstar Document Number
Service	TLS-4000 Technical Service Manual	501380
Specifications	TLS-4000 Product Specification	500563
Fibre Channel Option	Fibre Channel Option Installation and Operation Manual	501440
Supported Tape Drives	Product Information Note	PIN-014
SCSI Connection Guide	Product Information Note	PIN-023
Approved Data Cartridges	Product Information Note	PIN-038
Barcode Label Specifications	Product Information Note	PIN-040
SCSI Command Information	TLS-4000 SCSI-2 Interface Manual	500523
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

Although Qualstar has made every effort to insure the accuracy of the information contained in this manual, no guarantee is expressed or implied that the manual is error-free. Qualstar reserves the right to make changes at any time without prior notification.

The Qualstar TLS is a sophisticated, state-of-the-art computer peripheral. It should only be serviced by a competent service technician who is experienced with the operation and maintenance of tape libraries, and only after reading and understanding this manual and the TLS-4000 Technical Service Manual.

Glossary

A glossary has been provided at the end of this manual to define specialized terms that are used in this manual.

1.2 Important Safety Information

All of the operating instructions and maintenance procedures in Qualstar manuals must be followed to prevent personal injury or damage to the equipment. In the interests of safety, there are two kinds of warnings used in Qualstar documents, as shown below.

DANGER

PERSONAL INJURY MAY RESULT IF YOU DO NOT FULLY COMPLY WITH THE HANDLING, OPERATING, OR SERVICE INSTRUCTIONS FOUND IN A DANGER PARAGRAPH.

GEFAHR

UNSACHGEMAESSE BENUTZUNG, BEDLENUNG ODER RAPARATUR AUFGRUND VON NICHTBEACHTUNG DER SICHERHEITSANWEISUNG KANN ZU VERIETZUNGEN FUEHREN.

CAUTION

EQUIPMENT DAMAGE OR LOSS OF DATA may result if you do not fully comply with the handling, operating, or service instructions found in a CAUTION paragraph.

In addition, useful information and tips may be found throughout the document in the following formats:

NOTE

SPECIAL ATTENTION to explanatory statements found in a NOTE paragraph will help you avoid mistakes and/or save time.

NOTICE

A NOTICE box contains additional important information not covered by the other three types of special text: DANGER, CAUTION, or NOTE.

1.3 Lithium Battery

Please observe the following when repairing the unit.

DANGER

U9, A DALLAS SEMICONDUCTOR CORPORATION DS1225AB OR A SGS-THOMPSON MICROELECTRONICS M48258X IC ON THE EXECUTIVE PCBA CONTAINS AN INTEGRAL LITHIUM BATTERY. AN EXPLOSION DANGER EXISTS IF THE IC IS INCORRECTLY REPLACED. REPLACE THE IC ONLY WITH THE SAME PART NUMBER, OR AN EQUIVALENT DESIGNATED BY THE MANUFACTURER. DISPOSE OF THE USED IC ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

GEFAHR

DER U9, EIN DALLAS SEMICONDUCTOR CORPORATION DS1225AB ODER EIN A SGS-THOMPSON MICROELECTRONICS M48258X IC AUF DEM EXECUTIVE BOARD ENTHAELT EINE INTEGRIERTE LITHIUM BATTERIE. WENN DIESE UNSACHGEMAESS AUSGETAUSCHT WIRD, BESTEHT EXPLOSIONS GEFAHR. DER IC DARF NUR DURCH EINEN ARTIKEL MIT DER SELBEN ARTIKELNUMMER, BZW, MIT EINEM VERGLEICHBAREN ARTIKEL LAUT HERSTELLER ANGABE ERSETZT WERDEN. DIE ENTSORGUNG DES ALTEN IC'S DARF NUR GEMAESS HERSTELLERANGABEN ERFOLGEN.

1.4 Class 1 LED Product

The TLS may contain a class 1 LED product.

CAUTION

CLASS 1
LED PRODUCT

VORSICHT

LED KLASSE 1
PRODUCT NACH IEC 825-1

2. Unpacking

This chapter contains unpacking instructions for the TLS-4000.
(Refer to Chapter 13 for instructions on repacking the TLS for shipping.)

DANGER

DEPENDING UPON THE MODEL, THE TLS WEIGHS OVER 140 POUNDS (64 kg), EXCLUDING MAGAZINES AND CARTRIDGE DRIVES. IMPROPER LIFTING TECHNIQUES CAN RESULT IN BACK INJURY AND/OR EQUIPMENT DAMAGE. GET HELP WHEN LIFTING OR MOVING THE TLS.

GEFAHR

ABHAENGIG VOM MODELL BETRAEGT DAS GEWICHT DER TLS OHNE MAGAZIN UND CASSETTENLAUFWERK ÜBER 64 kg (140 POUND). FALSCHES TRAGEN KANN ZU PERSONENVERLETZUNGEN UND/ODER ZU BESCHAEDIGUNGEN DES GERAETES FUEHREN. TRAGEN ODER BEWEGEN SIE DAS GERAET NIE OHNE MINDESTENS EINE ZWEITE HILFSPERSON.

The units are shipped in a specially designed double carton with energy absorbing corner blocks. The shipping carton contains the following items:

TLS (Tape Library System)

An accessory pack containing:
- One Power Cord
- Two Door Keys
- The Installation and Operation Manual
- Two Stabilizer Feet (except for models 4212 and 4222)
- Magazines

NOTE

The Accessory Pack is shipped separately with the following models: 4440, 4480, 4660 and 46120

NOTE

Before unpacking the unit, check the shipping container for damage, and report all shipping damage to the carrier before opening the carton.

Tape drives, cartridges and magazines are not necessarily included with the shipment.

Be sure to retain all cartons and packing material in case reshipment ever becomes necessary. Also, for units shipped with the Accessory Pack inside the Outer Carton, be sure to retain the Accessory Pack Carton. It is needed to pack the Outer Carton properly.

Refer to Figure 2-1.

With the help of an assistant, follow the instructions below.

1. Open the top of the Outer Carton.

2. Remove the Accessory Pack and the four top Corner Blocks (item 1).

3. Fold back the carton's flaps and lay it on its side (item 2).

4. Slide the Inner Carton out of the Outer Carton and remove the remaining four Corner Blocks (item 2).

5. Open the bottom flaps of the Inner Carton (the end with the box manufacturer's stamp) and remove the Foam Base Liner (item 3).

6. Turn the Inner Carton over, so that the open end is down and the flaps of the carton are not underneath it, then lift the Inner Carton off the unit (item 4).

7. Remove the Plastic Bag (item 5).

8. Remove the Cardboard Aft Liner (item 6).

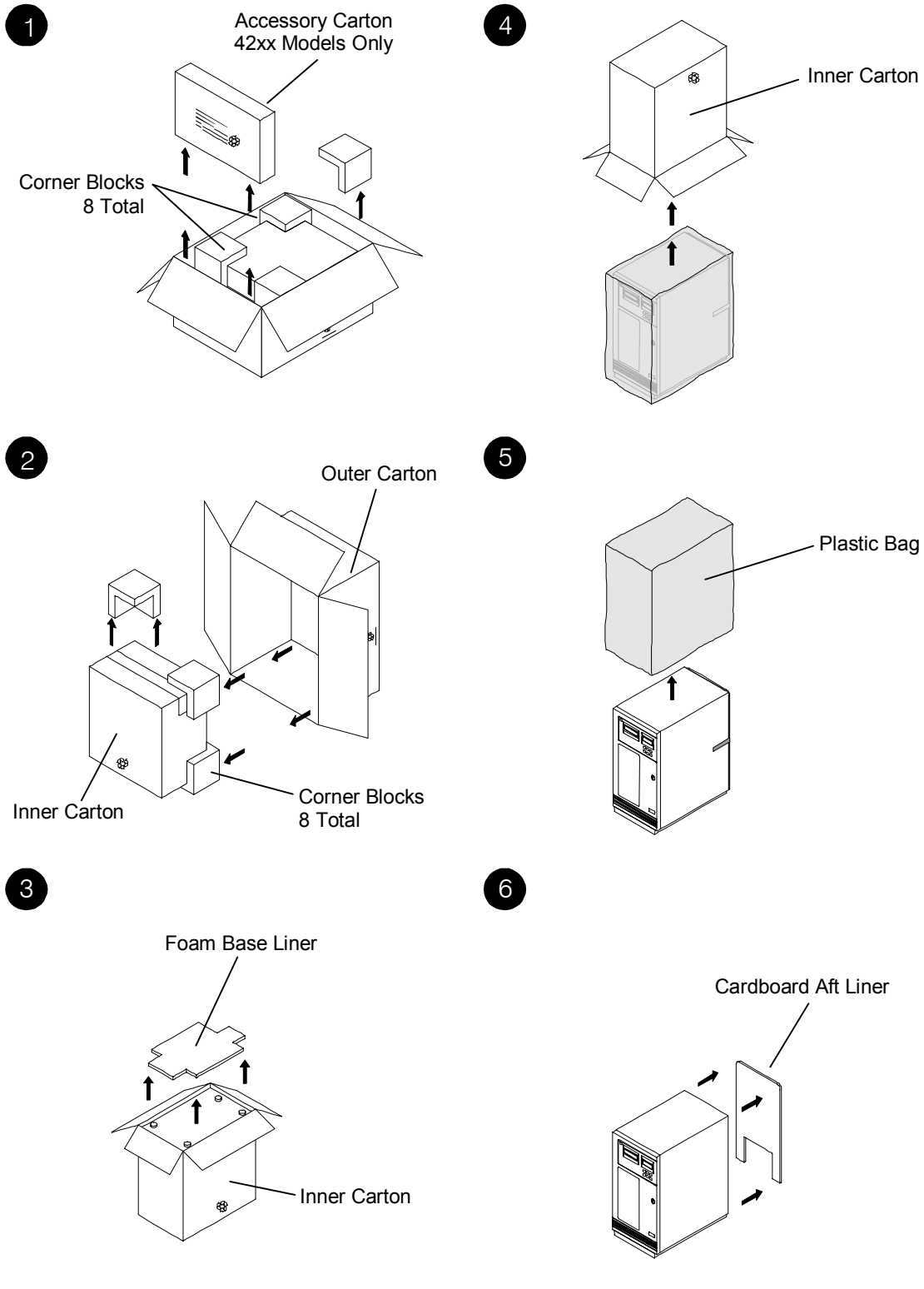


Figure 2-1 Unpacking the TLS

3. Product Description

3.1 General Description

The TLS-4000 Series libraries utilize Sony AIT-1, AIT-2, AIT-3 and AIT-4 tape drives. The models described in this manual can accommodate up to 126 data cartridges and six tape drives.

The tape drives supported by the TLS are listed in Product Information Note #014. To request a copy contact Qualstar Sales (see page *ii* of this manual). It is also available at the Qualstar Web Site at **www.qualstar.com**.

The TLS-4000 Series forms a family of reliable automated tape library's. Model-dependent features include a one- to six-drive capability and a barcode reader. The entire system, composed of tape drives and changer can be under host control via the industry-standard, Ultra SCSI interface. A Fibre Channel Interface option is also available for all models. The TLS can also function as a *Stacker,* without the need for cartridge-handling host software. Q-Link, an optional web-based remote library manager can remotely control the TLS and is available for all models. Q-Link can automatically e-mail alarm messages to the system administrator and operating firmware may be remotely updated using Q-Link.

The TLS contains a high-performance robotics system for moving cartridges, removable magazines for cartridge storage, fixed slots for storing cleaning tapes, and multiple tape drive mounting locations. An I/O port for inserting and removing cartridges under secured host system control is supported in all models. Additionally, Variable I/O port (VIOP) allows users to set the number of storage slots dedicated to importing/exporting tape cartridges. Entire magazines may also be exchanged through the VIOP. Separate, high-efficiency, power supplies are used for the tape drives and the changer. All units operate on any internationally available AC power source(s), with the TLS power cable and a SCSI interface cable(s) being the only connections required. The entire cabinet is pressurized and cooled by filtered air to ensure an optimum operating environment.

For the sake of clarity and compliance with the SCSI specifications, the SCSI device portion of the TLS is defined as a "Medium-changer" and is referred to throughout this manual as the "changer". The changer has an interactive menu system for configuration, maintenance and manual operations. Emulation of many other tape library's is very feasible.

The TLS-4000 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 this three-axis mechanism. Instead, brushless motors operate precision lead screws. Digital closed-loop servo systems and magnetic position sensors assure fast, smooth, trouble-free cartridge handling. The servos automatically calibrate themselves, thus eliminating all electrical adjustments. The TLS even informs the operator when its time to replace the air filter.

3.2 Models

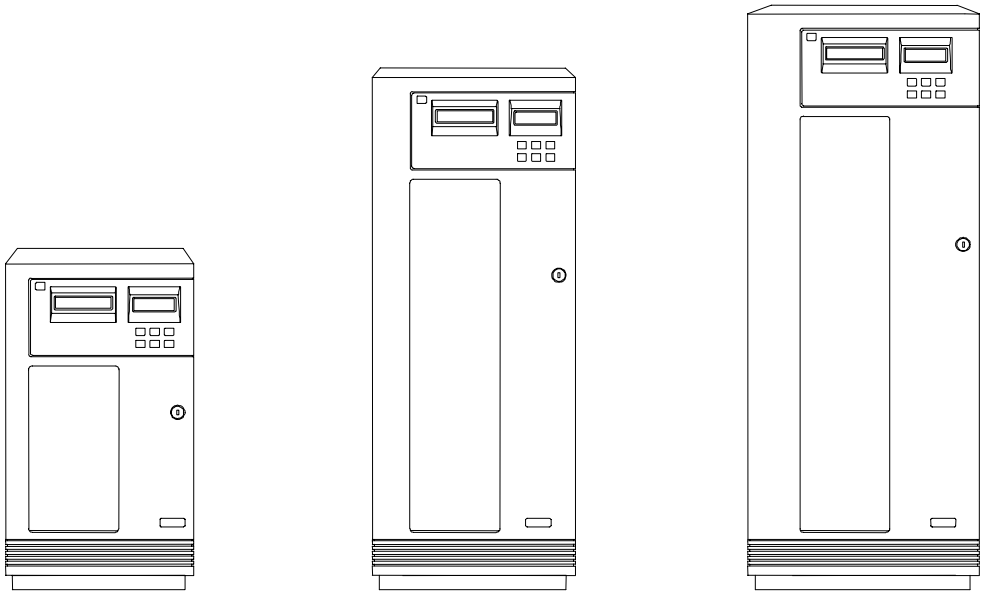


Figure 3-1 TLS-4000 Libraries

TLS-4000 Feature/Model	4212*	4222*	4440	4480	4660	46120
Maximum number of tape drives	2	2	4	4	6	6
Media capacity in cartridges (10 cartridges per magazine)	10	20	40	80	60	120
Additional fixed cartridge locations	4①	4②	2	4	3	6
Barcode Reader	Opt.	Opt.	Std.	Std.	Std.	Std.
I/O port for automated cartridge insertion/removal	Opt.①	Opt.②	Std.	Std.	Std.	Std.
Carousel (rotary positioning of magazines)	No	Yes	Yes	Yes	Yes	Yes
Magazine configuration (# high x # wide)	1x1	1x2	2x2	2x4	2x3	2x6
Fibre Channel Option	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Q-Link Remote Library Manager	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

*The 4212 and 4222 models support only 3.5-inch tape drives
One fixed slot is lost when the optional I/O port is installed
Two fixed slots are lost when the optional I/O port is installed

Table 3-1 TLS-4000 Features and Options

3.3 Model Identification

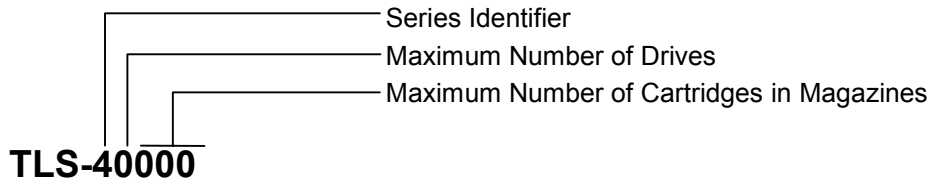


Figure 3-2 Model Number Identification Scheme

This manual applies to all models. The installation and operation of the various models is virtually identical. Differences among the models are noted where required.

Depending upon the particular model, the TLS system may have the following features:

- An HVD SCSI interface to the Medium-changer is optional on all models
- Barcode reader (standard on models 4440, 4480 and 46xxx)
- I/O Ports are optional on smaller models

3.4 Major Assemblies

3.4.1 Cabinet

The cabinet consists of an aluminum framework, which is covered on the sides and top by aluminum panels. These panels are easily removed to allow access for upgrades and field service. The entire front of the cabinet is actually a cast aluminum door with a large window and a key-operated lock for security purposes. The Control Panel and I/O port are found at the top of the door. The door has an interlock switch that prevents or halts robotic movement when the door is opened.

3.4.1.1 Control Panel

The Control Panel has six control keys, a four-line, 80-character display, and an automated I/O port. The operator uses the Control Panel and the display to communicate with the changer, to perform configuration and operation functions and to observe the unit's status messages.

The I/O port to the left of the display allows the insertion and removal of cartridges, one at a time, in a controlled manner without unlocking and opening the door.

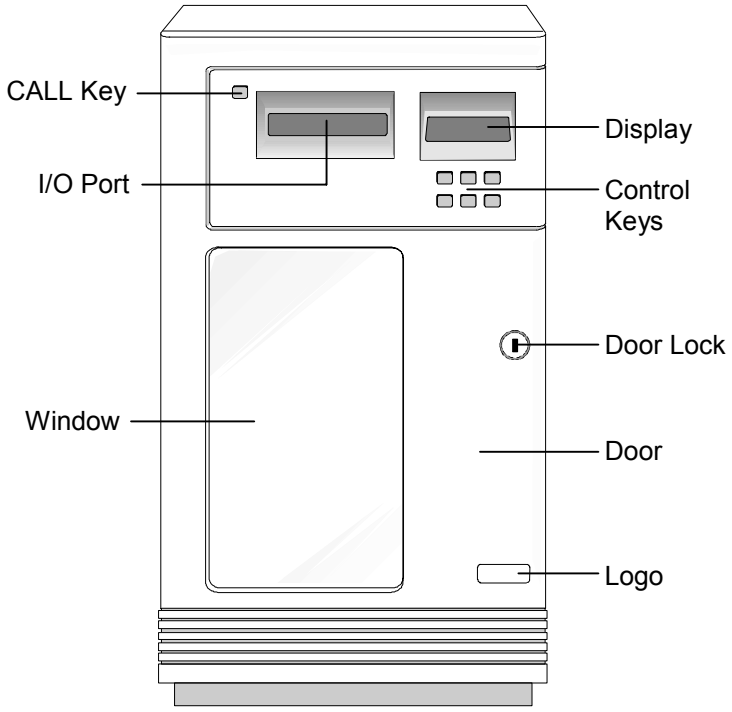


Figure 3-3 TLS-4000 Front View

3.4.1.2 Rear Panel

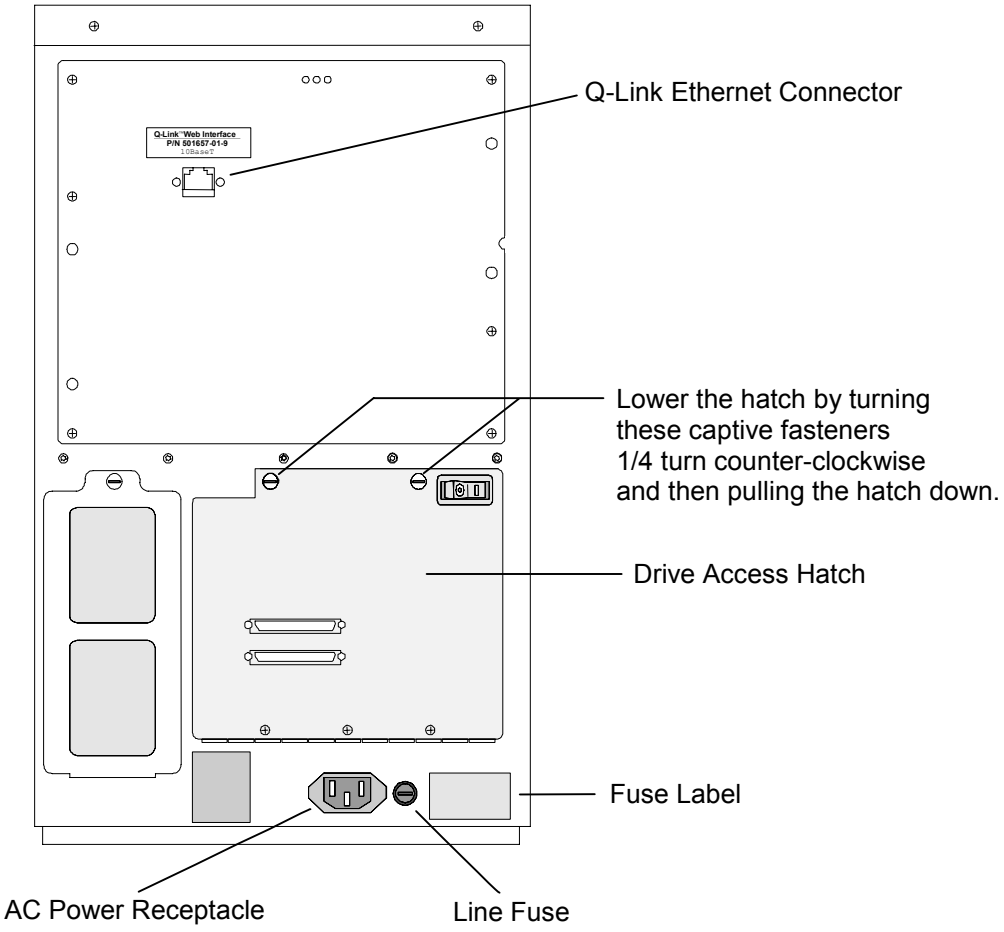


Figure 3-4 TLS-4212 Rear View

The AC power receptacle, line fuse, AC power switch and SCSI connectors are mounted on the TLS rear panel. TLS systems operate over a range 100–120 VAC or 200–240 VAC, 50 or 60 Hz. No changes to the TLS are required to operate over this range.

3.4.2 TLS Components

This section defines some of the components that make up the TLS.

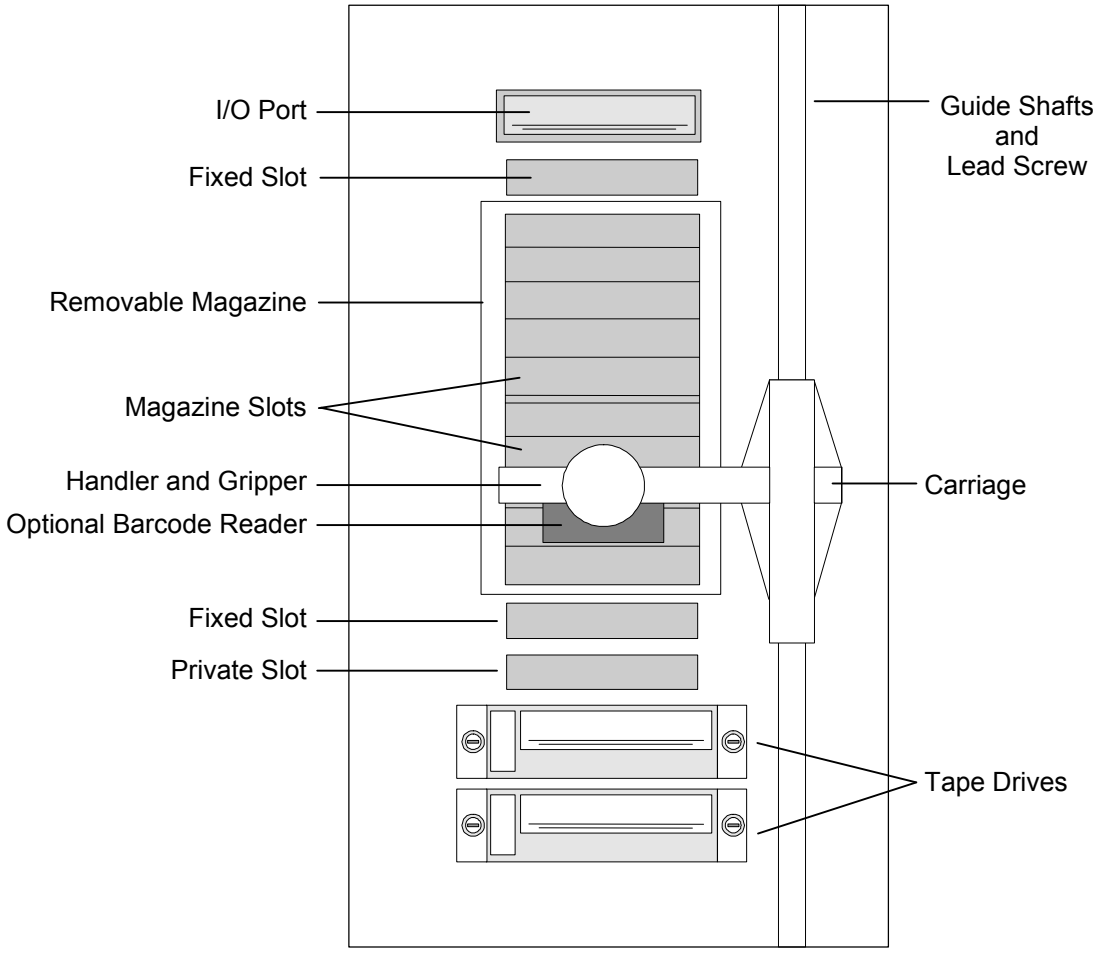


Figure 3-5 TLS Major Internal Assemblies

3.4.2.1 Magazines

A magazine is a plastic container, which can hold up to ten tape cartridges. A magazine and its cartridges can be removed from the TLS and stored as a unit with a dust cover. Magazines attach onto and detach from their mounts without the use of tools (see Figure 3-6).

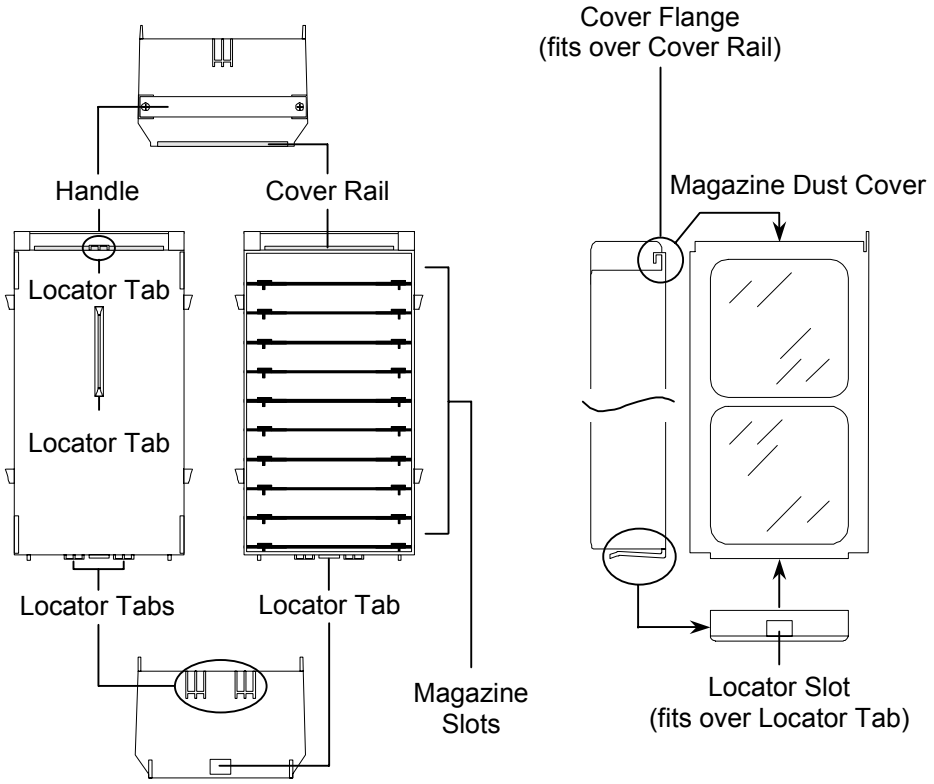


Figure 3-6 8mm Magazine: Qualstar P/N 501110-02-7

3.4.2.2 Magazine Mounts

The TLS contains one or more magazine mounts (also referred to as receivers). See Figure 3-7. Upgrade kits are available for some models that allow doubling the number of magazine mounts.

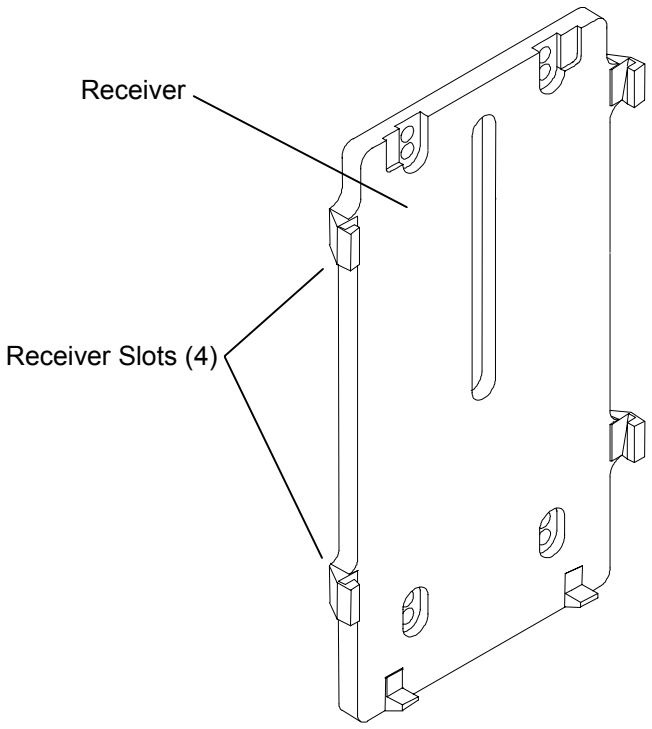


Figure 3-7 Qualstar Magazine Mount

3.4.2.3 Stories

Some models contain magazine mounts that are stacked one above the other. These models are referred to as two-story models. In a two-story model, Story A is on the bottom and Story B is on the top.

3.4.2.4 Carousel and Carousel Faces

Models may have a rotating platform called a carousel. Depending upon the model, a carousel can have two, three, four or six sides, called faces. The control system turns the carousel so that the face to be accessed faces the carriage. An algorithm in the control system decides which way to turn the carousel for the minimum access time.

3.4.2.5 Fixed Slot

In addition to the magazine slots, some models contain storage locations that cannot be removed. These extra storage locations are called fixed slots. Fixed slots can be used to store either cleaning cartridges or data cartridges.

3.4.2.6 Private Slot

Some models have a private slot, which may be used only by the changer for temporary storage. The private slot is located just above the drive bay and cannot be accessed by the interface.

3.4.2.7 Inventory Sentry

The Inventory Sentry projects an infrared beam in front of all accessible cartridge locations and tape drives. Opening the cabinet door and then moving a cartridge by hand interrupts this invisible beam. Depending upon the changer's configuration, the interruption of the Inventory Sentry Beam could cause the changer to rescan the entire cartridge inventory upon re-closing the door.

3.4.3 I/O Port

An I/O port is used to move cartridges into and out of the TLS without opening the (possibly locked) cabinet door. Pressing the CALL switch extends and retracts the I/O port slot. When the I/O port slot is extended, its door opens automatically, allowing single cartridge insertion or removal. Fully inserting a cartridge into the I/O port slot will cause it to automatically retract.

3.4.4 Variable VIOP

All models support the Variable I/O port (VIOP) feature that allows users to set the number of storage slots dedicated to import/export function. The slots are assigned in one-slot increments from zero up to all available slots in a single magazine (10 for TLS-4000 libraries). If the selected number of VIOP slots equals the number in a magazine, then the entire magazine may be removed as an I/O unit. The VIOP is accessed by opening the TLS door and should always be closed after you have finished accessing the VIOP.

3.4.5 Drive Bay

The drive bay is located at the bottom of the TLS and contains provisions for mounting two to six tape drives, depending upon the model. The 4212 and 4222 models can only accommodate 3.5-inch drives. All other TLS-4000 models can accommodate both 3.5-inch and 5.25-inch tape drives.

A tape drive may be installed in any drive location, but it is best if tape drives are installed starting at the top drive location (T1) and continuing down to the bottom drive location (Tx).

NOTE

Some software packages will not work properly unless the tape drives are installed starting at the top drive location and continuing down to the bottom drive location.

Installing a tape drive consists of attaching the mounting hardware to it, placing the drive in an open drive location, and then attaching the power, control and SCSI

connectors to the rear of the drive. The changer must then be configured via the menu system to establish the operating parameters for each installed tape drive.

3.4.6 Carriage, Handler and Gripper

The carriage, handler and gripper are the components of the changer that physically move cartridges from one location to another. See Figure 3-8.

The carriage moves tape cartridges vertically within the TLS in order to move tape cartridges. Its brushless DC motor turns a precision nut around an equally precise leadscrew to move the carriage up and down. When stopped, a small force is applied by the motor to counteract the effects of gravity. The carriage contains the handler, the gripper and the optional barcode reader.

The handler travels horizontally to insert and remove cartridges from tape drives and storage locations. Like the carriage (of which it is a part of), it uses a brushless DC motor to turn a precision leadscrew through an equally precise nut to move the gripper in and out.

The gripper grabs and holds onto the tape cartridge while it is being transported by the handler and carriage. The gripper is operated by a spring and DC solenoid.

The changer uses digital closed-loop servo systems and both optical and magnetic sensors to control the carriage and handler motors. Hall-Effect sensors are used for position information, and optical sensors are used to detect limits. The servos are self-calibrating and require no adjustments.

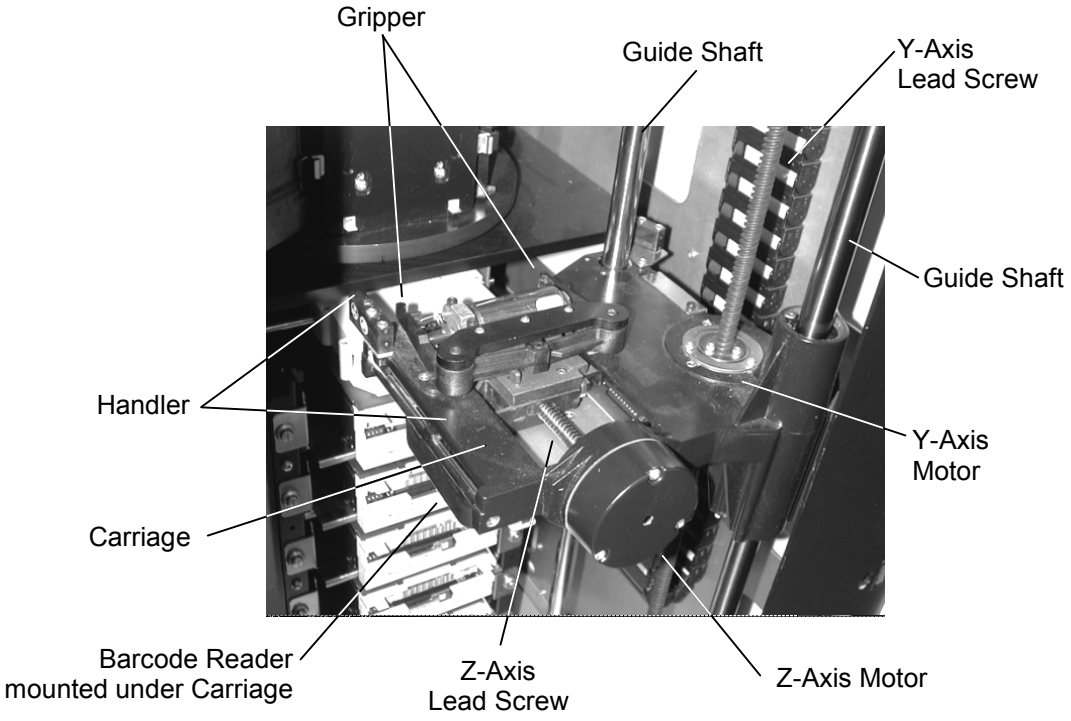


Figure 3-8 Robotic Components

3.4.7 Barcode Reader

A barcode reader is standard on models 4440 through 46120 and optional on other models. 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. Preprinted barcode labels, which are both human- and machine-readable, are available from a number of sources. Including Qualstar.

The barcode reader consists of a charge-coupled sensor (similar to that used in a video camera) and associated electronics. It is mounted under the carriage. The barcode reader can scan all cartridges in the TLS (except those loaded inside tape drives), as well as cartridges introduced into the I/O port. The changer must move cartridges in some upper slots, including the I/O port, to a temporary location before their barcode labels can be read. Barcode data is stored internally in the changer's non-volatile RAM (the internal inventory database) and is available to the host computer upon request.

NOTE

The changer automatically moves a cartridge in the I/O port slot, or an upper Fixed slot, to a temporary location where its barcode label can be scanned. The changer then returns the cartridge to its original location.

3.4.8 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 at 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.

3.5 The TLS from a SCSI Standpoint

3.5.1 SCSI Devices

The TLS-4xxx contains a SCSI interface to its changer that is referred to in SCSI specifications as a Medium-changer (MC) device. It also can contain up to six tape drives that are referred to as SCSI Sequential-access devices.

NOTE

It is important to understand that although all SCSI devices are housed in the same cabinet, they are independent. The changer moves cartridges from one location to another, and the tape drives transfer data to and from the cartridges. The changer does not communicate with the tape drives over the SCSI bus.

The changer does have a serial communication channel to each AIT tape drive. This channel is used to obtain information about the status of the drive. No commands are sent to the drive over this serial channel.

Although the MC is usually connected to a single host computer, it is capable of working with multiple SCSI initiators (hosts) on the same SCSI bus. If multiple hosts are connected to the MC and two or more of them request the same cartridge, only the first one will succeed. The others will receive error messages.

3.5.2 Element Mapping

TLS resources are referred to as Locations. Each location is identified by its designator. There are several Location types: Magazine Slots & Fixed Slots, Tape Drive, I/O port and Handler. The Private Slot is not an available resource. A Location is a place where a tape cartridge can reside.

SCSI resources are referred to as Elements. Each Element is identified by its address. The four types of SCSI Elements are: Storage, Data Transfer, Import/Export and Medium Transport.

The mapping of Location Types to Element Types is shown in Table 3-2.

TLS Location Type	SCSI Element Type	Default Starting SCSI Address
Magazine/Fixed Slots	Storage	000
Tape Drives	Data Transfer	63000
I/O Port	Import/Export	64000
Handler	Medium Transport	65000
Private Slot	(not accessible)	N/A

Table 3-2 Location Type to Element Type Mapping

3.5.3 Location Designators

There are six types of Locations (physical cartridge locations) and they are referenced in the TLS menus by Location Designators. Each of these designators describe a singular physical location and that relationship never changes. Locations are often referred to as slots throughout this manual. In the menu system, location designators are all five digits. If a particular digit is not necessary to identify a location it is replaced by a decimal point or dot. Each Location Designator contains one or more of the following components:

Space	Space is represented by a lower-case "p" when describing the *physical* space. Characters a–d indicate logical libraries a-d element address space.
Faces	A face is the vertical surface that holds one or two magazines. Non-carousel models have a single face. Carousel models have two, three, four, or six faces.
Stories	Faces come in two varieties: single-story or two-story. A single-story or the bottom story on all other models, is called **Story A**. The upper story is always called **Story B**.
Magazine Slots	The magazines have 10 slots. Two-digit numbers from 01 to 10 designate these slots. Slot 01 is at the bottom of the magazine and Slot 10 is at the top. The magazine slot designators are of the form Face\Story\Slot, e.g. 1B05.
Fixed Slots	Fixed slots are non-removable slots, which may contain cleaning or data cartridges. There are one or more fixed slots in each model. They are designated as **F**, **F1…F*n* or 1F…*n*F** depending on the model.
Private Slot	The private slot is designated by the letter **P**.
I/O Port	The I/O port slot is designated by the letter **I**.
Handler Slot	The handler slot is designated by the letter **H**. (**Note:** This location is called the handler, but it is actually the physical space between the gripper's arms where a cartridge may be located.)
Drives	Tape drive locations, assigned from top to bottom, are designated T1 through T6.

The Location Designators for the TLS-4xxx models are shown in Figure 3-9 through Figure 3-14. Please note that location designators in the menus are all five digits. Periods have been placed in some locations to facilitate logical control.

3.5.4 Element Addresses

From the SCSI interface, cartridge locations are identified by their Element Address. Unlike the permanent and absolute Location designators, each SCSI element address is initially assigned by the TLS, but may be changed by the system installer or host system. Element addresses are 16-bit unsigned integers (0–65535). All elements of the same type (e.g. Storage) are numbered consecutively. Element addresses are only assigned to locations within a Logical Library (see Chapter 7).

3.5.5 Default Element Addresses

Element Addresses are initially assigned by the TLS in sequential order to each type of location. During address assignments, all locations within a sequence are always considered present, even if they are not physically present, e.g. a magazine is not mounted or a tape drive is not installed. The mapping will be reset to the following default values with the Configuration\SET TO DEFAULTS command.

Element Type	Physical Location	Default Element Addresses					
Model:		4212	4222	4440	4480	4660	46120
Storage: Magazine Slots	A01 A10	0-9					
	B01 B10						
	1A01 1A10		0-9	0-9	0-9	0-9	0-9
	1B01 1B10				10-19	10-19	10-19
	2A01 2A10		10-19		20-29		20-29
	2B01 2B10				30-39		30-39
	3A01 3A10			20-29	40-49	20-29	40-49
	3B01 3B10			30-39	50-59	30-39	50-59
	4A01 4A10				60-69		60-69
	4B01 4B10				70-79		70-79
	5A01 5A10					40-49	80-89
	5B01 5B10					50-59	90-99
	6A01 6A10						100-109
	6B01 6B10						110-119
Storage: Fixed Slots	1F		20	40	80	60	120
	2F		21		81		121
	3F			41	82	61	122
	4F				83		123
	5F					62	124
	6F						125
	F1	10	22				
	F2	11	23				
	F3	12					
	F4	13					
Data Transfer	T1	63000	63000	63000	63000	63000	63000
	T2	63001	63001	63001	63001	63001	63001
	T3			63002	63002	63002	63002
	T4			63003	63003	63003	63003
	T5					63004	63004
	T6					63005	63005
Import/Export	I			64000	64000	64000	64000
Medium Transport	H	65000	65000	65000	65000	65000	65000

Table 3-3 Default SCSI Element Addresses – All Models

3.5.6 Inventory Database

The changer maintains an Inventory Database that contains data associated with each location. The database contains such information as cartridge presence, barcode label characters and cartridge source element address (the address where the cartridge came from - its source). The database also contains information about the validity of this data. If the validity data is true, then its associated data is correct. If the validity data is false, then its associated data may not be correct, but usually contains the last-known data. Additional definitions for the database are included in the TLS-4000 SCSI-2 Interface Manual (Qualstar document number 500523).

3.5.7 Inventory Validation

When the inventory database is invalidated, the changer scans all locations before it does anything else, and stores the cartridge location information in its internal inventory database. If a barcode reader is installed (optional on some models), and barcode labels are affixed to the cartridges, barcode information is also stored as part of the inventory information. Then, whenever the changer moves a cartridge, it updates its inventory database to reflect the change. Barcode labels cannot be read for cartridges that are inside drives.

Inventory invalidation is controlled by the factors listed below. Please refer to Chapter 8 (The Configuration Menu) and Chapter 9 (The Operation Menu) of this manual for details about these items.

- The `INVALIDATE` command in the `Operation\Element Status` menu.
- The `Configuration\Advanced\Changer\Inventory\Invalidate` setting.
- Configuration changes that modify the available locations.

Only cartridge moves made by the changer cause the unit's inventory database to be updated. Moving, adding, or removing a cartridge by hand, under default configuration settings, causes an inventory violation that invalidates the unit's inventory database. Therefore, after an inventory violation:

- The changer re-scans all locations before it does anything else, to update its internal inventory database.
- The host initially has no way of knowing what changes were made to the inventory, so the changer sends the host a `CHECK CONDITION` at its next opportunity.

NOTE

If the Control Panel is used to move a cartridge by means of either the `Operation\Move Cartridge`, or the `Operation\Exchange Carts.` commands, the changer's internal inventory database is updated, but the host is not informed about the move. In addition, no `CHECK CONDITION` is sent to the host.

3.6 Q-Link Remote Library Manager

Q-Link is an optional feature consisting of hardware and additional firmware providing remote web accessed management capability to all TLS series tape libraries. It allows a user/supervisor to observe, configure, control and possibly trouble-shoot any TLS library remotely over the Internet or a LAN using Microsoft's Internet Explorer V6.0 or Netscape V6.2 browsers. Q-Link communicates to the outside world via a standard 10BaseT interface. It derives its power from, and communicates with the TLS via a serial communications channel already provided on the TLS' executive printed circuit board.

Q-Link provides the following features:

- Display Inventory and General Status
- Configure the TLS including Drives, SCSI and Logical Libraries
- Dump diagnostic logs
- Upload new TLS firmware
- Upload new Q-Link firmware
- Move inventory
- Clean or unload tape drives

Additionally, Q-Link can be configured to e-mail event or fault messages to a list of support staff when a name server and SMTP server are available.

3.7 Random and Multi-Sequential (Multiple Stacker) Operation

Each tape drive and cartridge storage location in the TLS may be configured through the changer's menu system or through the SCSI interface for random or sequential operation. If a tape drive is configured for the Random mode, it becomes a resource under the control of host computers. If a drive and cartridge storage locations are configured for the Sequential modes, the drive is referred to as a sequential drive and its slot is not included in the list of resources reported to host computers. Sequential drives are instead manually controlled via the 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 not included 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 location 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 location 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 location 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 host computer communicating with a sequential drive only communicates with the drive and not the changer. This allows the use of applications lacking library-specific, cartridge-movement, operating software.

All 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.

This flexible design allows the user to partition the library's resources to best meet overall system needs. With a TLS-46120, for example, it is possible to have one library serve as the tape storage device for six separate systems.

3.8 Manual Operation

The menu system provides a means of manually invoking cartridge movements to or from all available locations: handler, tape drives, magazine slots, fixed slots, the private slot and the I/O port. The menu system is accessed using the control keys or via the Q-Link or Q-Conn interfaces. If the host makes a request to the changer during a manual operation, the changer indicates it is busy, until the manual operation is completed (usually within a few seconds).

3.9 Cartridge Location Designator Diagrams

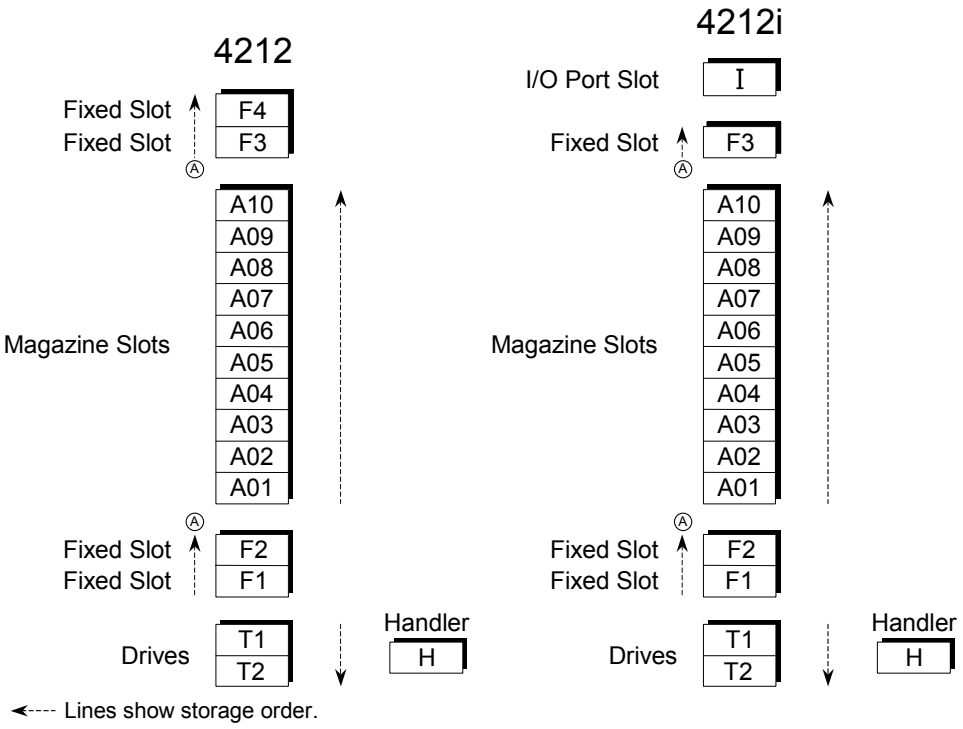


Figure 3-9 4212 Cartridge Locations Designators

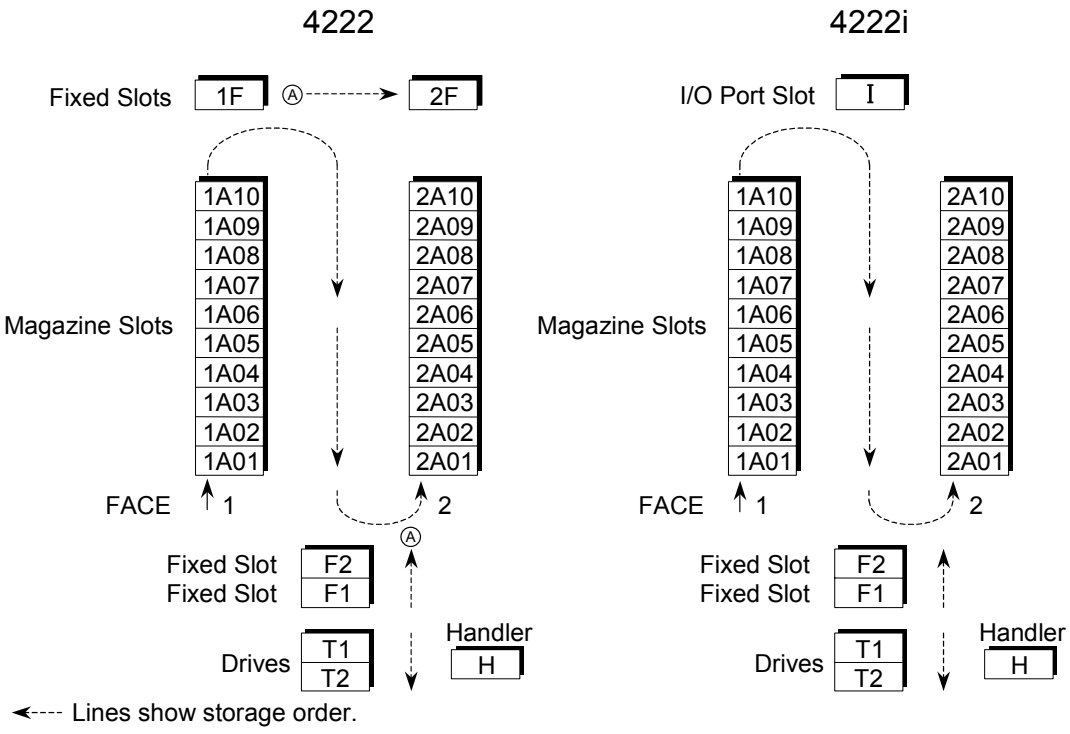


Figure 3-10 4222 Cartridge Location Designators

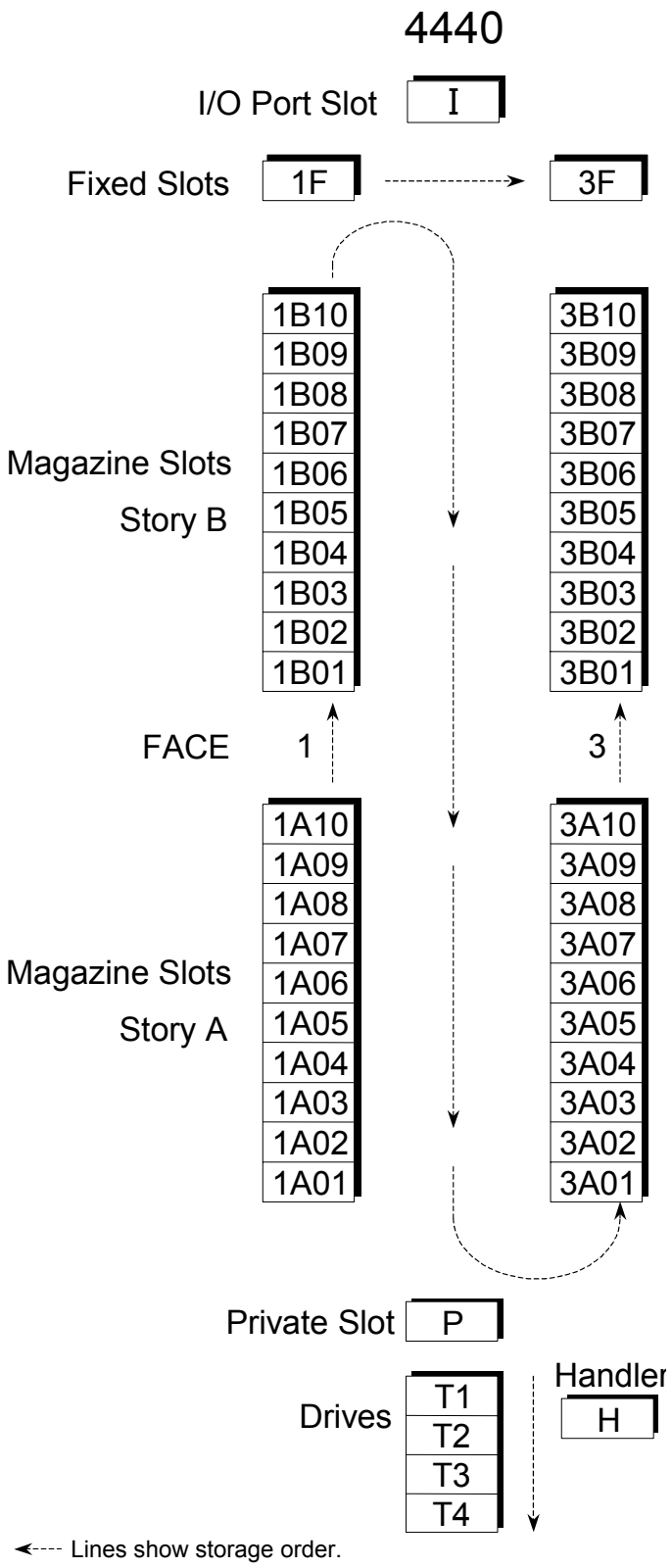


Figure 3-11 4440 Cartridge Location Designators

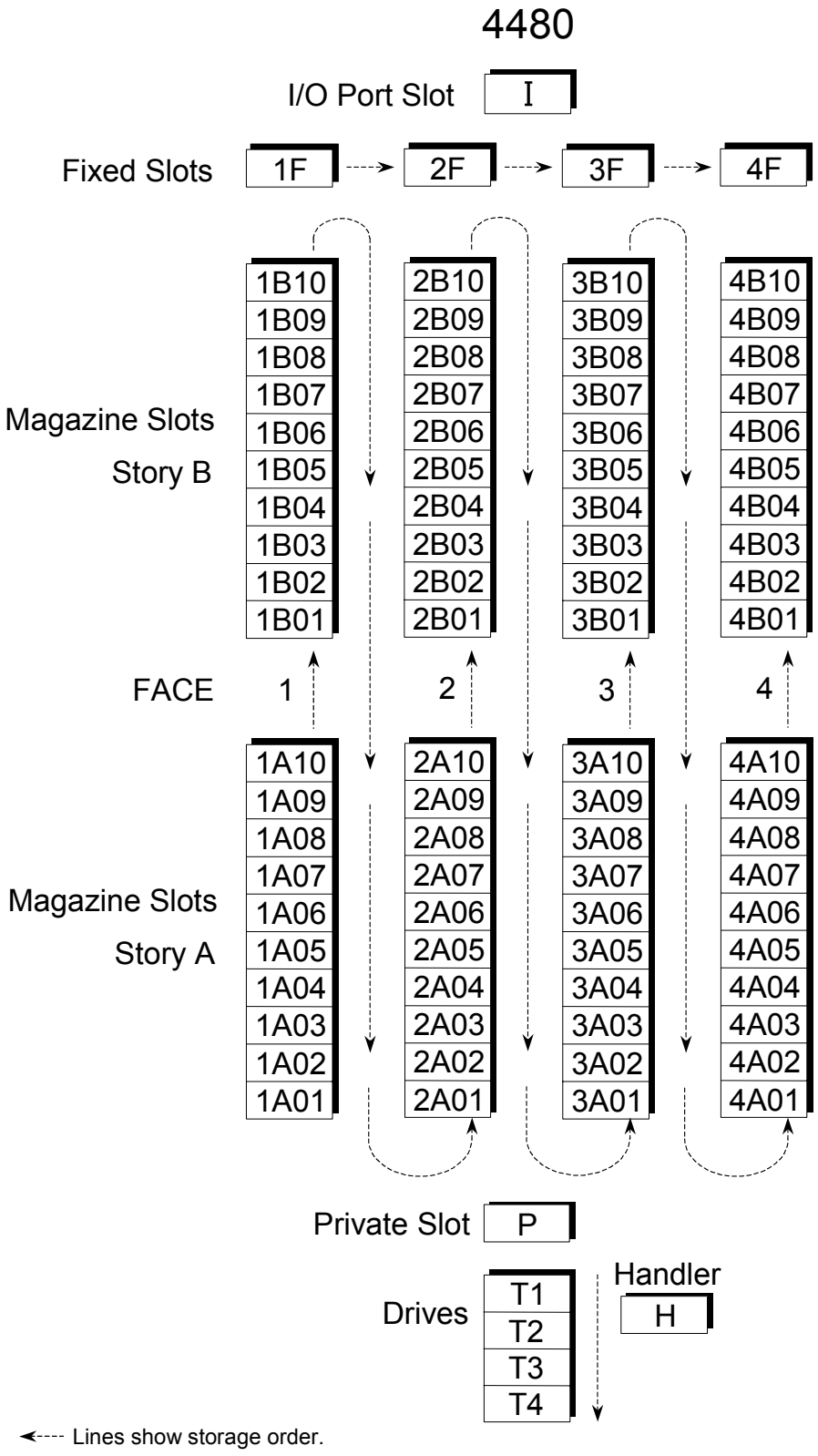


Figure 3-12 4480 Cartridge Location Designators

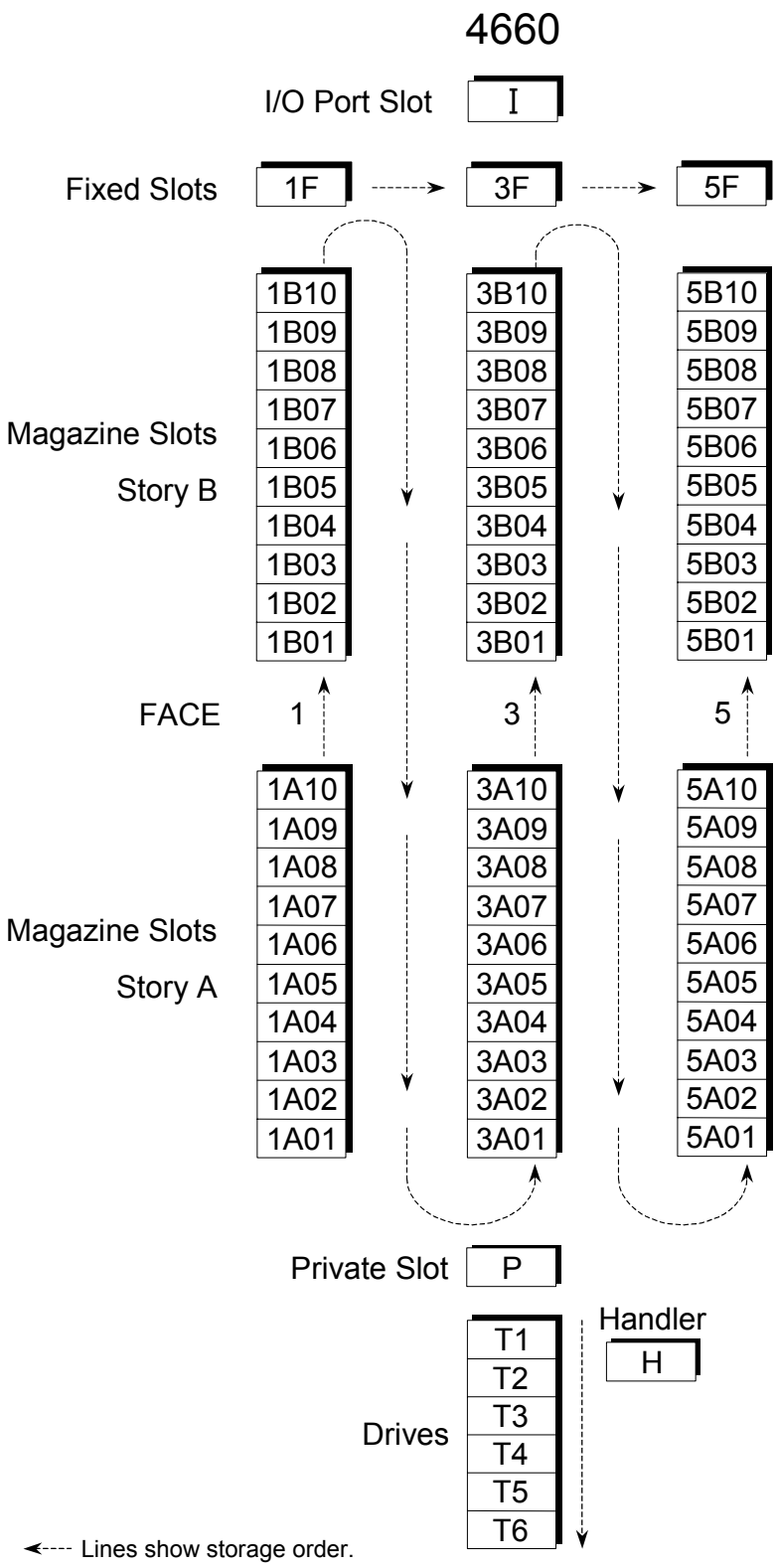


Figure 3-13 4660 Cartridge Location Designators

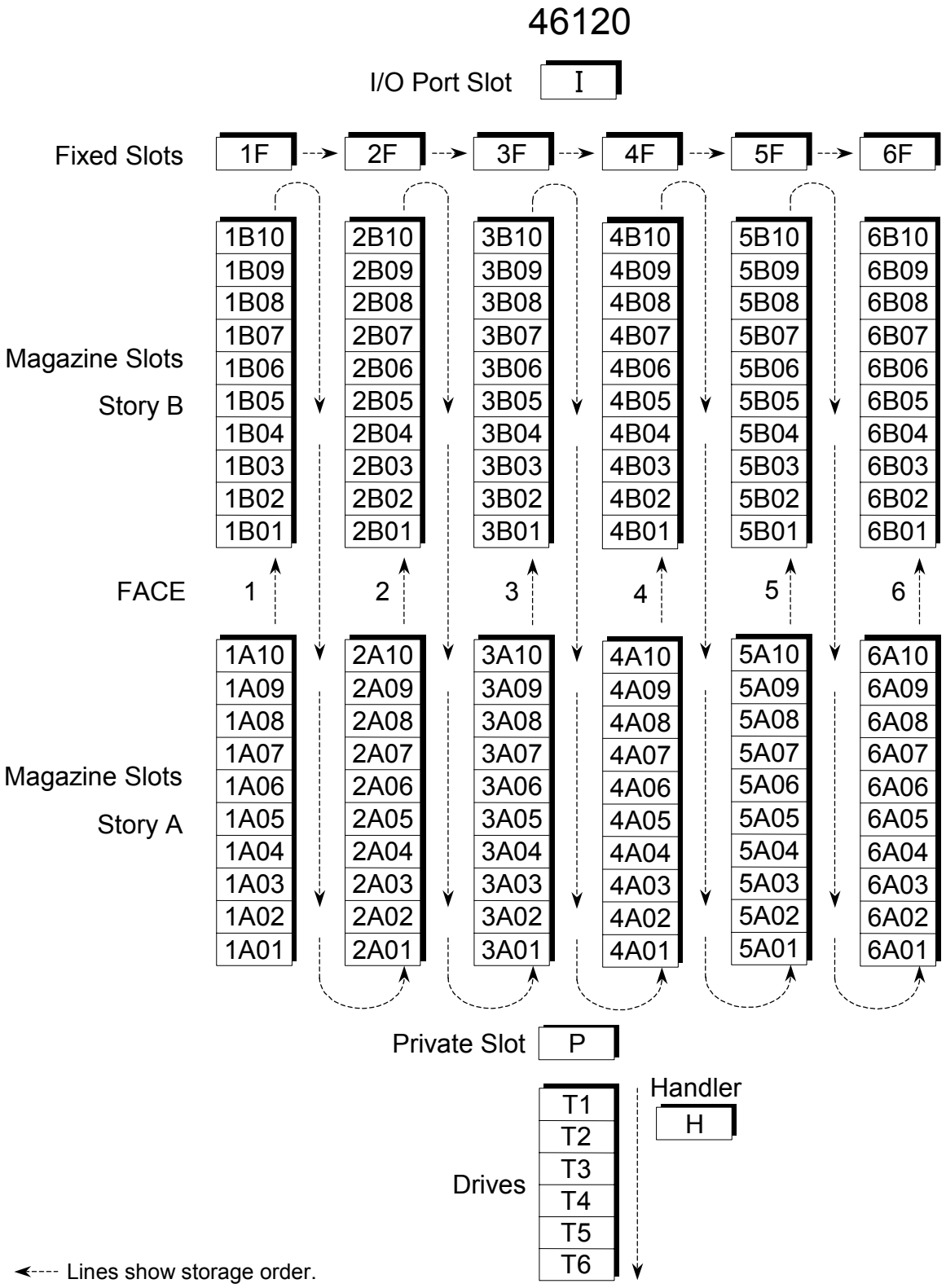


Figure 3-14 46120 Cartridge Location Designators

4. Control Panel

The Control Panel shown in Figure 4-1 is used to configure and control the library system and to add or remove cartridges from the library. The CALL Key can be disabled by a SCSI command to prevent unauthorized access. Additionally, manual cartridge movement commands can be locked to prevent inventory tampering. An audible alarm is also provided behind the panel.

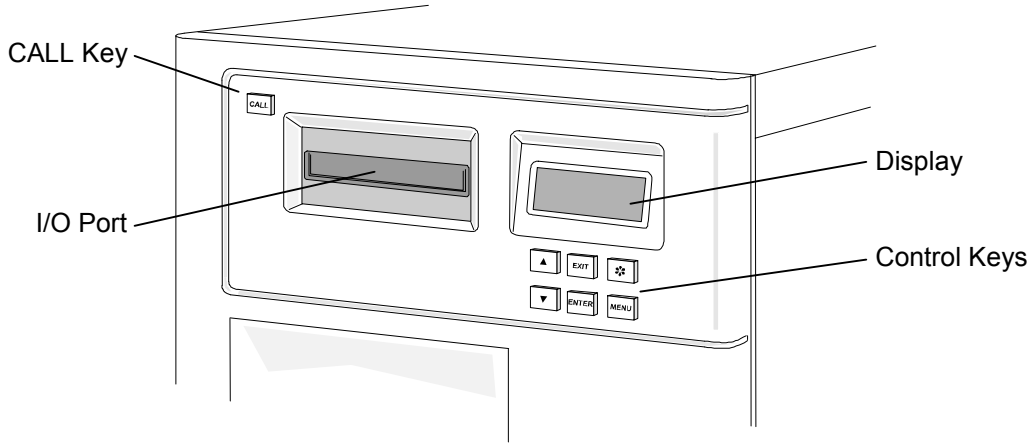


Figure 4-1 TLS Control Panel

4.1 Display

The display provides information about the operating condition of the unit. It also displays alert and error information, and is used to set various operating parameters. The display's contrast can be controlled by functions in the menu system.

The display contains four lines of twenty characters each. In the normal operating mode, it displays the information shown in Figure 4-2.

Line 1: Manufacturer and Model Number
Line 2: Blank
Line 3: Changer's Current Status (dynamic)
Line 4: Message provided by the host computer

Q	u	a	l	s	t	a	r					T	L	S	-	4	2	1	2
				S	T	A	T	U	S		L	I	N	E					
	H	O	S	T		M	E	S	S	A	G	E	S		L	I	N	E	

Figure 4-2 The Control Panel Operating Display

4.2 Control Keys

The six control keys make it possible to point to a particular item and change or edit its value, or to execute a command. The function of each control key is dependent upon the location within the menu structure. Control key functions are explained in Chapter 6.

4.3 I/O Port and CALL Key

The I/O port is located to the left of the display and provides for insertion and removal of cartridges, one at a time, while maintaining the integrity of the cartridge inventory. To insert a cartridge:

1. Press the CALL key to extend the I/O port slot and open the I/O port door. *If no cartridge is inserted after one or two minutes (menu selectable) from pressing the CALL key, the door will close and the I/O port slot will automatically retract.*

2. Make certain the Write Enable/Protect tab on the cartridge is set correctly (see Figure 4-3), then fully insert the cartridge, label side up with its write-protect tab facing out on the right-hand side, into the I/O port slot.

   When the optical sensors detect a fully inserted cartridge, the I/O port slot retracts, closing the I/O port door. *If the cartridge is not fully seated, the door will remain open.*

3. The host system then determines where the cartridge should be stored. The storage location can also be manually determined using the menu system, provided this feature has not been locked by the system administrator.

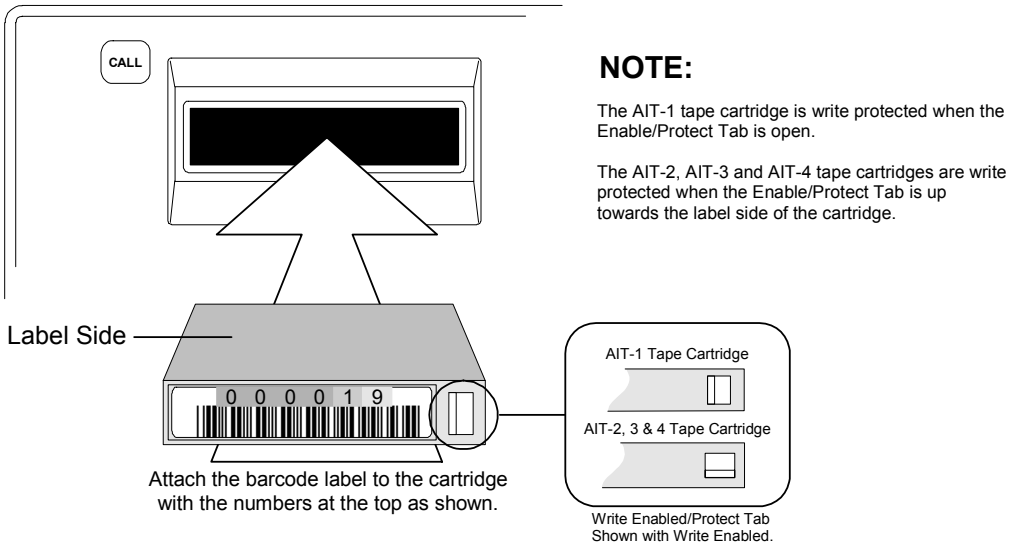


Figure 4-3 Inserting a Cartridge into the I/O Port

5. Installation

5.1 Installation Considerations

When selecting a location for the TLS, be sure to consider the unit weight and provide a stable operating location. These tape libraries are not intended for use in mobile applications. They were designed for use in an office environment. Also remember to provide sufficient free space around the unit to allow for loading/unloading media/drives, establishing cable connections, and airflow considerations.

5.1.1 Operating Environment

The TLS is designed to operate in an ambient environment from 41°F to 95°F (5°C to 35°C), 20% to 80% relative humidity, and at altitudes from -1000 to +10,000 feet. Moisture must not be allowed to condense inside the system.

5.1.2 Ventilation

When selecting a location for the TLS, be sure nothing will block the air intake at the inlet air filters or the top air vent slots. An outline drawing and exterior dimensions are given in Figure 5-1 and Table 5-2.

5.1.3 Power Requirements and Consumption

The TLS power supplies operate over a voltage range of 100-120 VAC or 200-240 VAC at 50 Hz or 60 Hz, without needing any internal changes or adjustments. Table 5-1 lists the power requirements for the various models.

The supplied detachable power cord complies with the following specifications:

- **100-120 volt applications** UL listed and CSA certified three-conductor 18 AWG SJT vinyl-jacketed cord. One end is terminated with an IEC 320 C13 style connector. The other end is terminated with a NEMA 5-15P type plug.
- **200-240 volt applications** Harmonized three-conductor HO5VV F3G 1.0mm vinyl-jacketed cord. One end is terminated with an IEC 320 C13 style connector. The other end is terminated with the European CEE7 Standard VII type plug.

NOTE

Always wait at least ten seconds after power is turned off before reapplying power to the TLS. The TLS must have sufficient time to complete it's logical power down sequence.

MODEL	IDLE	PEAK	PEAK V-A
4212, 4222	≤ 68 watts ≤ 232 BTUs/hr	≤ 266 watts ≤ 908 BTUs/hr	≤ 333 V-A
4440, 4480	≤ 96 watts ≤ 328 BTUs/hr	≤ 320 watts ≤ 1092 BTUs/hr	≤ 400 V-A
4660, 46120	≤ 124 watts ≤ 423 BTUs/hr	≤ 373 watts ≤ 1273 BTUs/hr	≤ 466 V-A

Table 5-1 Power Requirements

Power consumption varies with the number of tape drives installed and the particular operation being performed. Table 5-1 is based on a full complement of tape drives installed in each model specified. The idle power figures indicate the power consumed when the changer and tape drives are idle. The peak power figures indicate the peak power consumed when the carriage accelerates and the tape drives are active. The peak power levels are not expected to last for more than two seconds at a time. The peak V-A values indicate the maximum current drawn, times the applied voltage.

5.2 Power Source Disturbances

The TLS will continue to operate uninterrupted and without damage over a one-cycle line dropout, however, longer power disturbances can occur. Qualstar recommends the use of an UPS to minimize the potential for data loss in case of an unexpected power interruption. The UPS should be rated to handle the peak V-A values indicted in Table 5-1. The host computer and all other devices on the SCSI bus should also be protected by the UPS.

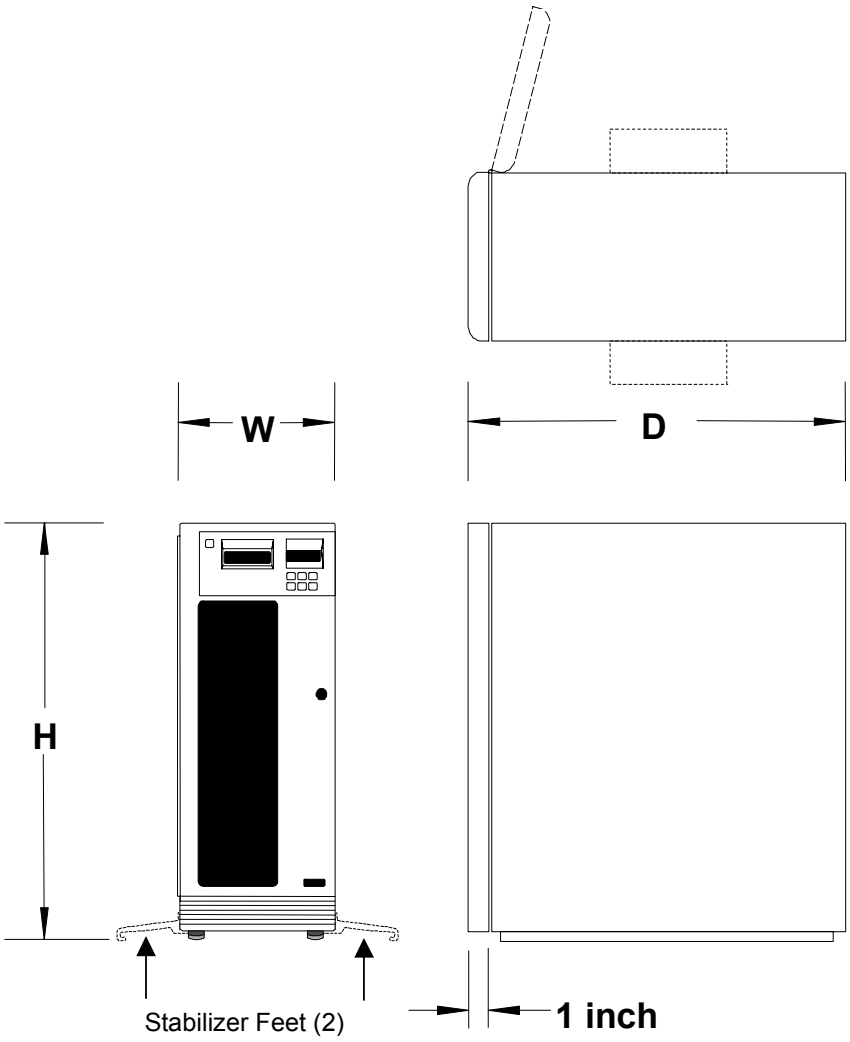


Figure 5-1 External Dimensions

MODEL	HEIGHT (in/cm)	WIDTH (in/cm)	DEPTH (in/cm)	SHIPPING② WEIGHT (lb/kg)
4212, 4212i	22.7 / 57.7	13.0 / 33.0	21.3 / 54.1	85 / 38.5
4222, 4222i	22.7 / 57.7	13.0 / 33.0	21.3 / 54.1	97 / 44.0
4440	37.2 / 94.5	13.7 / 34.8①	22.2 / 56.4	127 / 57.6
4480	37.2 / 94.5	13.7 / 34.8①	22.2 / 56.4	127 / 57.6
4660, 46120	41.6 / 105.7	15.2 / 38.6①	25.2 / 64.0	146 / 66.2

Table 5-2 External Dimensions and Maximum Weights (fully loaded units)

① Stabilizer feet add 5.7 inches (14.5 cm) to the base width of the 44xx and 46xx series.
② Shipping weights include the TLS, data cartridge magazines and accessories.

5.3 Stabilizer Feet Installation

Each TLS unit, *except models 4212 and 4222*, must have stabilizer feet installed on the sides of the cabinet to meet safety requirements. Therefore, two Stabilizer Feet are included in the Accessory Pack shipped with all models except the 4212 and 4222. These add 5.7 inches to the width.

Tools Required: No. 2 Phillips Screwdriver

1. Unpack the unit and stand it upright on its feet.

2. **a)** For all models except 4660 and 46120:
   Remove two screws in the bottom of the cabinet side panel on each side of the unit (Figure 5-2A).

   b) For models 4660 and 46120:
   Remove two screws in the bottom of the cabinet side panel on each side of the unit (Figure 5-2B).

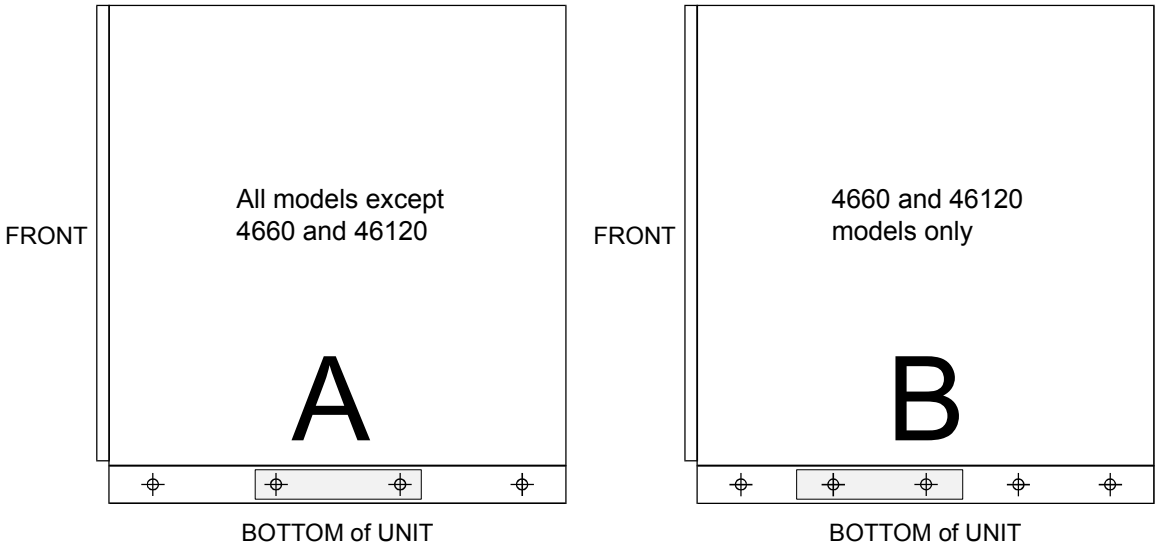


Figure 5-2 Right Side View

3. Refer to Figure 5-3. With the help of an assistant, tilt the cabinet slightly and position a Stabilizer Foot as shown, so that the holes in the Stabilizer Foot align with the empty screw holes (for the screws removed in step 2) in the unit's right side panel.

4. Reinstall two of the screws removed in step 2 to secure the Stabilizer Foot.

5. Lower the cabinet back down.

6. Repeat steps 3 through 5 to install a Stabilizer Foot for the left side of the cabinet.

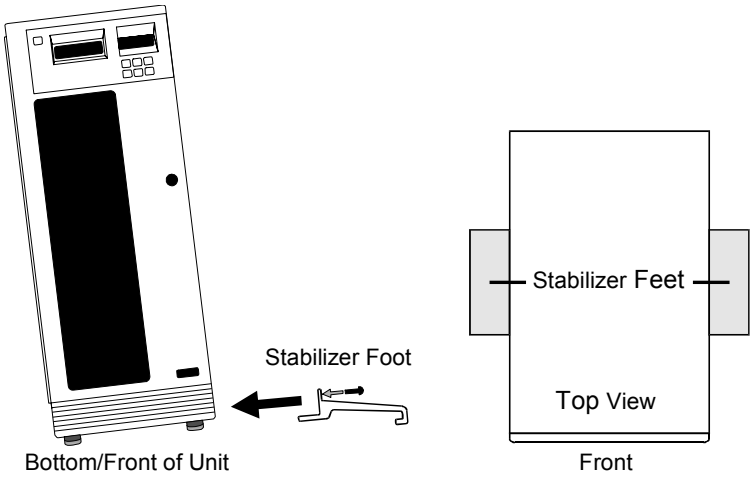


Figure 5-3 Stabilizer Foot Installation

5.4 Testing the Installation

This section explains how to test the TLS, first as a stand-alone device, and then as a SCSI peripheral on the host system.

5.4.1 Initial Power Up

Attach the power cord to the TLS and an adequate outlet. Apply power to the TLS as follows:

1. Close the door.
2. Locate the AC power switch (Figure 5-50) and switch it to the ON position. The fans will start, and the carriage will go to its home (bottom) position. Then the unit will perform its power-up diagnostics and indicate the power up sequence steps on the display. The handler will then scan the cartridge inventory.

   a) If the diagnostics complete successfully, display line one will indicate Qualstar and the TLS model number.

   b) If the diagnostics fail, an error message will be displayed. Consult the TLS-4000 Technical Service Manual (Qualstar document number 501380).
3. Turn off the AC power switch and remove the power cord.

5.5 Supported Tape Drives and Data Cartridge Compatibility

Qualstar tape libraries will only operate with certain models of tape drives sold by Qualstar. Use of tape drives not sold by Qualstar will void all warranties. PIN-014 is the current list of supported tape drives.

Qualstar Corporation warranties presume the use of data cartridges from approved manufacturers. PIN-038 is the current list of approved media. Using non-approved media may invalidate warranties. PINs are maintained at **www.qualstar.com.**

5.6 Tape Drive Installation

NOTICE

The TLS-4000 Underwriters Laboratories (UL) listing requires that only UL Recognized NWGQ2 tape drives be installed within the TLS models. The tape drive power consumption must also be suitably rated. Only supported tape drives should be used in the system. The list of supported tape drives is contained in Product Information Note 014 available at **www.qualstar.com**.

This installation procedure should only be performed by qualified service personnel in accordance with each manufacturer's published instructions.

Your TLS may have had its tape drives installed at the factory. However, if you are adding tape drives at this time, please follow the instructions listed below.

5.6.1 Tape Drive Installation Overview

1. Unpack the tape drive(s).
2. Make certain that each tape drive's SCSI interface matches that of the SCSI bus to which it is to be connected (68 pin, LVD, SE or optional HVD).
3. Attach the mounting tray or brackets to the drive.
4. Attach the AIT control and power cables to the drive.
5. Open the front door of the library.
6. Install the drives into the TLS-4000 and lock in place with the two 1/4-Turn Fasteners on the mounting brackets.
7. Open the rear of the library for drive access.
8. Connect the AIT Control and power cable to the Drive Bay or Power Distribution board.
9. Connect the internal SCSI cable to the drive.
10. Power-up the library and check the tape drive power supplies.
11. Setup the `Configuration\Drive\T?` menus for each installed drive.

NOTE

Some application programs require that all tape drives in a library be sequentially numbered and that their SCSI ID's are correspondingly numbered. Qualstar therefore recommends that drives be installed beginning at location T1 and that no drive positions should be skipped as additional drives are added.

AIT tape drives come in two basic types: Desktop and Library. Only library ready drives may be used in any TLS. AIT library ready drives are identified with an "L" at the end of the model number. Check the barcode label on the rear of the drive to determine its model number. Figure 5-8 and Figure 5-9 depict the library required Automation Bezel.

5.6.2 Tape Drive Installation Kits

Tape Drive Installation Kits are available from Qualstar. Only Qualstar-furnished mounting trays or brackets can be used to install tape drives. The following table explains the usage and part numbers available.

Drive Make/Model	Use in TLS-4212/4222	Installation Kit P/N
AIT (Library version only) 5.25-inch mount	No	500849-05-4
AIT (Library version only) 3.50-inch mount	Yes	500849-07-0

Table 5-3 Tape Drive Mounting Kit Options

NOTE

The TLS-4212 and 4222 models can only accept AIT drives with special 3.5-inch mounting kits. All other TLS models accept both 3.5-inch and 5.25-inch AIT tape drives with appropriate mounting kits.

Each 500849-05-4 5.25-inch AIT Tape Drive Installation Kit contains the following items:

- One Mounting Tray
- Bag of four M3 x 5mm screws
- Power Cable
- One AIT Control Cable

Each 500849-07-0 3.50-inch AIT Tape Drive Installation Kit contains the following items:

- Two Mounting Brackets
- Bag of four M3 x 4mm screws
- Power Cable
- One AIT Control Cable

5.6.3 AIT Tape Drive Dip Switch Settings

The DIP switches are found on the bottom of the tape drive as shown in Figure 5-4. These switches must be set before installing an AIT tape drive. Figure 5-5, Figure 5-6 and Figure 5-7 define their functions and the factory default settings. DIP switch settings only take effect at the moment the drive is powered on.

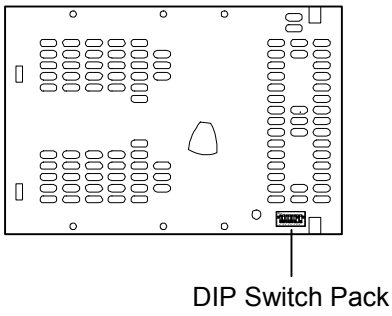


Figure 5-4 AIT Tape Drives - Bottom View

5.6.3.1 AIT-1 and AIT-2 DIP Switch Settings

- DIP switch numbers 1-4 are legacy system compatibility switches and are no longer needed. They should all be set to the OFF (down) position. Consult the appropriate Sony manual for further details.
- DIP switch number 5, Termination Power:
  This switch turns the internal SCSI termination power ON or OFF to the drive's SCSI connector. Bus termination power should be turned on only if this drive is at one end of a SCSI bus.
- DIP switch number 6 is reserved and should be set to the OFF position.
- DIP switch number 7, Data Compression Enable:
  Data Compression will be enabled at power-on if switch number 7 is set to ON.
- DIP switch number 8, Data Compression Remote Control:
  Data Compression can be controlled by the host system when switch number 8 is set to OFF.

Switch No.	Definition	Setting
1	Reserved for configuration	OFF (down)
2	Reserved for configuration	OFF (down)
3	Reserved for configuration	OFF (down)
4	Reserved for configuration	OFF (down)
5	SCSI Termination Power	OFF (down)
6	Reserved for configuration	OFF (down)
7	Data Compression Enable	ON (up)
8	Data Compression Remote Control	OFF (down)

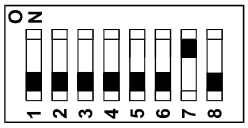


Figure 5-5 AIT-1 and AIT-2 Default DIP Switch Settings and Definitions

5.6.3.2 AIT-3 DIP Switch Settings

- DIP switch numbers 1-4 allow for the setting of AIT-2 emulation and Disaster Recovery mode. They should all be set to the OFF (down) position. Consult the appropriate Sony manual for further details.
- DIP switch number 5, Termination Power:
  This switch turns the internal SCSI termination power ON or OFF to the drive's SCSI connector. Bus termination power should be turned on only if this drive is at one end of a SCSI bus.
- DIP switch number 6, Periodic Cleaning Request:
  The Periodic Cleaning Request (every 100 hours of operation) will be enabled if switch number 6 is set to ON.
- DIP switch number 7, Data Compression Enable:
  Data Compression will be enabled at power-on if switch number 7 is set to ON.
- DIP switch number 8, Data Compression Remote Control:
  Data Compression can be controlled by the host system when switch number 8 is set to OFF.

Switch No.	Definition	Setting
1	AIT-2 configuration	OFF (down)
2	AIT-2 configuration	OFF (down)
3	AIT-2 configuration	OFF (down)
4	AIT-2 configuration	OFF (down)
5	SCSI Termination Power	OFF (down)
6	Periodic Cleaning Request	ON (up)
7	Data Compression Enable	ON (up)
8	Data Compression Remote Control	OFF (down)

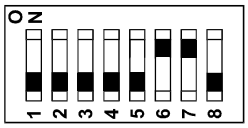


Figure 5-6 AIT-3 Default DIP Switch Settings and Definitions

5.6.3.3 AIT-4 DIP Switch Settings

- DIP switch number 1 allows for the setting of Disaster Recovery mode. It should be set to the OFF (down) position. Consult the appropriate Sony manual for further details.
- DIP switch number 2 allows for the setting of AIT-3 emulation. It should be set to the OFF (down) position. Consult the appropriate Sony manual for further details.
- DIP switch number 3, AIT Library Interface Mode.
  This switch allows the drive to function in a library and must be set to ON.
- DIP switch number 4 is reserved and should be set to the OFF position.
- DIP switch number 5, Termination Power:
  This switch turns the internal SCSI termination power ON or OFF to the drive's SCSI connector. Bus termination power should be turned on only if this drive is at one end of a SCSI bus.

- DIP switch number 6, Periodic Cleaning Request:
  The Periodic Cleaning Request (every 100 hours of operation) will be enabled if switch number 6 is set to ON.
- DIP switch number 7, Data Compression Enable:
  Data Compression will be enabled at power-on if switch number 7 is set to ON.
- DIP switch number 8, Data Compression Remote Control:
  Data Compression can be controlled by the host system when switch number 8 is set to OFF.

Switch No.	Definition	Setting
1	DR (Disaster Recovery) Mode	OFF (down)
2	Emulation Mode	OFF (down)
3	AIT Library Interface Mode	ON (up)
4	Reserved for configuration	OFF (down)
5	SCSI Termination Power	OFF (down)
6	Periodic Cleaning Request	ON (up)
7	Data Compression Enable	ON (up)
8	Data Compression Remote Control	OFF (down)

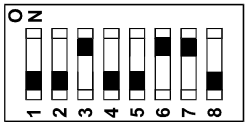


Figure 5-7 AIT-4 Default DIP Switch Settings and Definitions

5.6.4 Drive Installation

Requires one AIT Drive Installation Kit (Qualstar P/N 500849-05-4 or 500849-07-0) for each drive to be installed and a No. 1 Phillips Screwdriver.

NOTICE

AIT tape drives are produced in two versions: automation-specific and stand-alone. Only automation-specific tape drives can be used in the TLS-4000 Series libraries. The front bezel of the automation-specific tape drives is shown in Figure 5-8.

1. Open the Drive Installation Kit and remove the four M3 screws from their bag.
2. For 5.25 inch drive bay installation refer to Figure 5-8 and mount the drive to the mounting tray using the four M3 screws and a No. 1 Phillips screwdriver. Do not over-tighten.

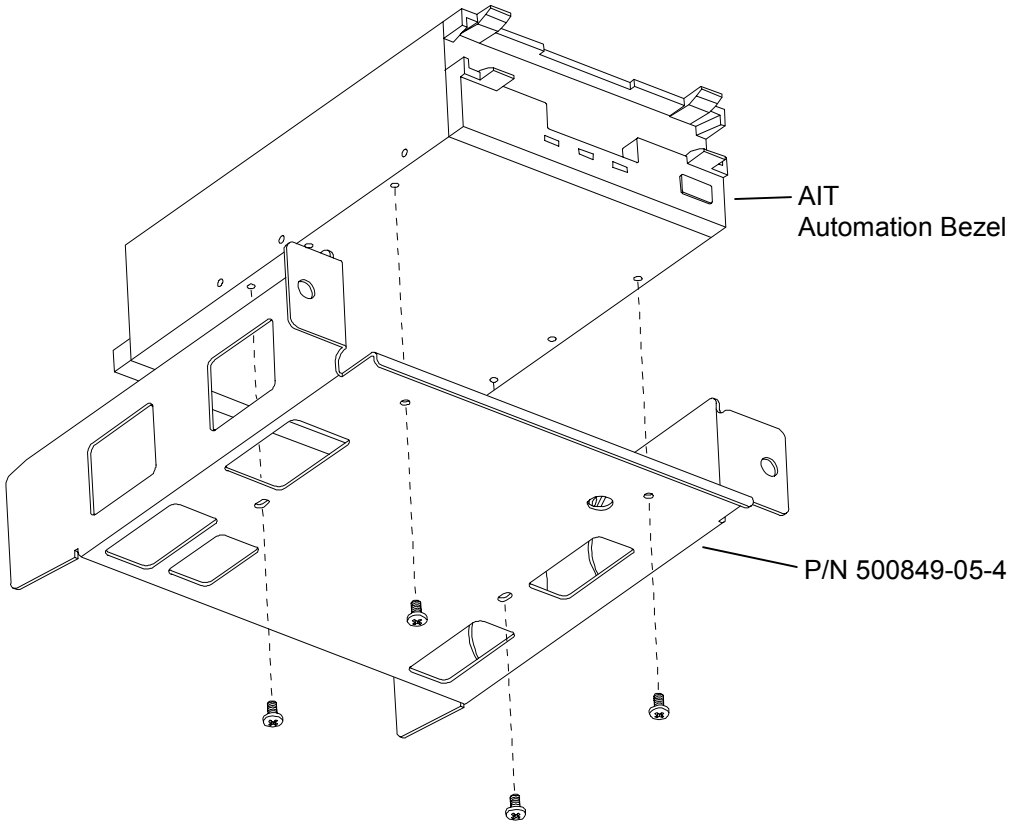


Figure 5-8 Bottom View of AIT Series Mounting Tray (not for TLS-4212/4222)

3. For 3.50 inch drive bay installation refer to Figure 5-9 and attach a mounting bracket to each side of the drive using the four M3 screws and a No. 1 Phillips screwdriver. Do not over-tighten.

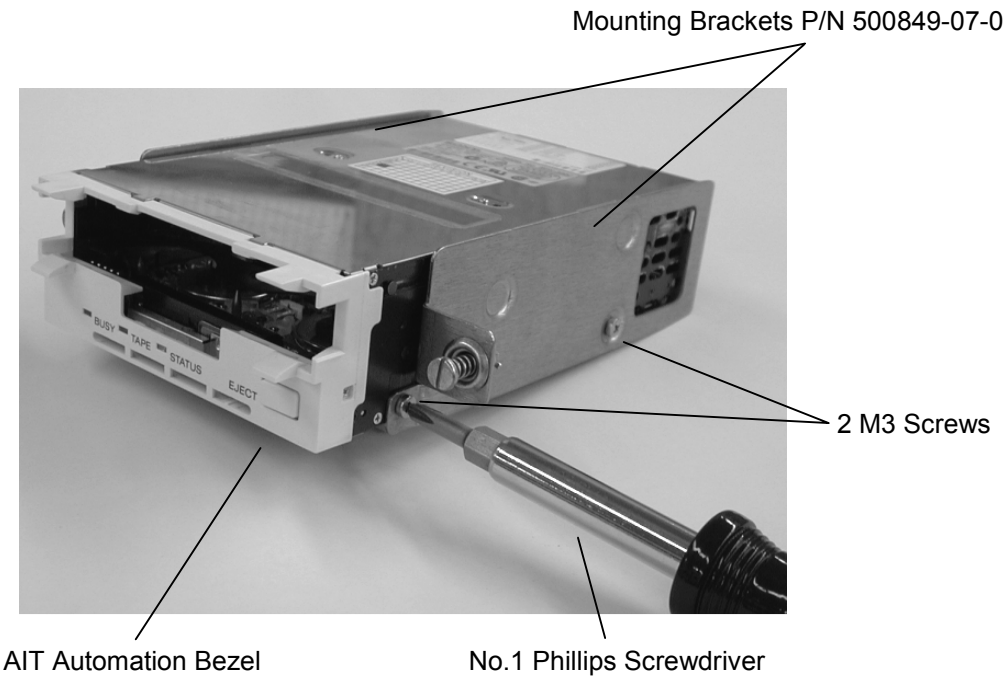


Figure 5-9 View of AIT Series Mounting Brackets (for TLS-4212/4222 only)

4. Remove the four jumpers on the right side of the drive's SCSI ID connector. See Figure 5-10.

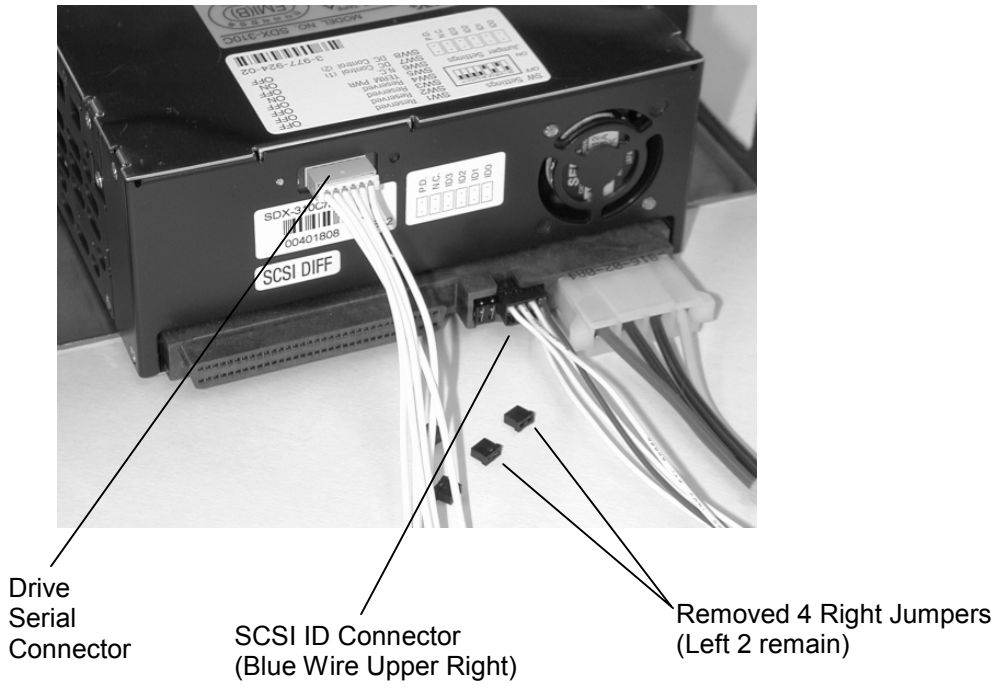


Figure 5-10 AIT Control Cable Details for AIT-1 and AIT-2 Tape Drives

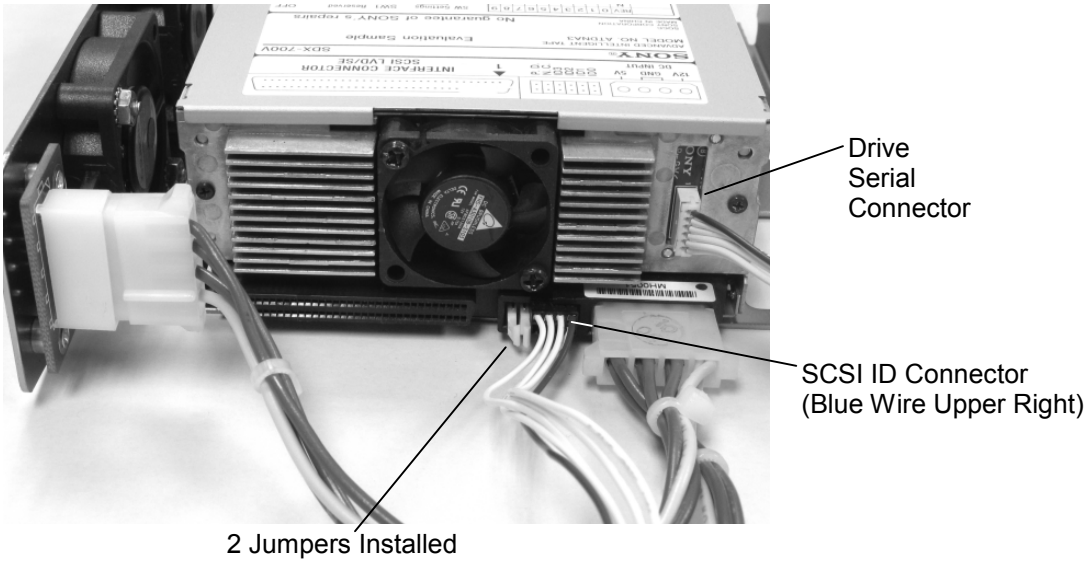


Figure 5-11 AIT Control Cable Details for AIT-3 and AIT-4 Tape Drives

5. Refer to Figure 5-10 and connect the AIT Control Cable to the drive's serial connector. This connector is keyed.

6. Connect the AIT Control Cable to the drive's SCSI ID jumper pins. Note that this connector is not keyed and the blue wire must be oriented to the upper right corner (top pin of ID0).

7. Connect one end of the drive power cable to the drive – note the connector is keyed by two chamfered corners.

8. The back of the drive should now look like the one in Figure 5-12.

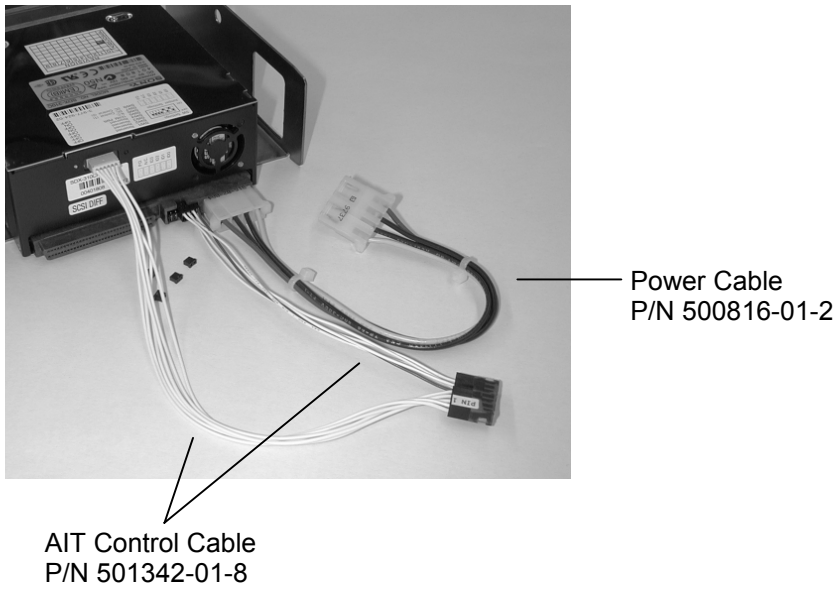


Figure 5-12 AIT Control & Power Cables for AIT-1 and AIT-2 Tape Drives

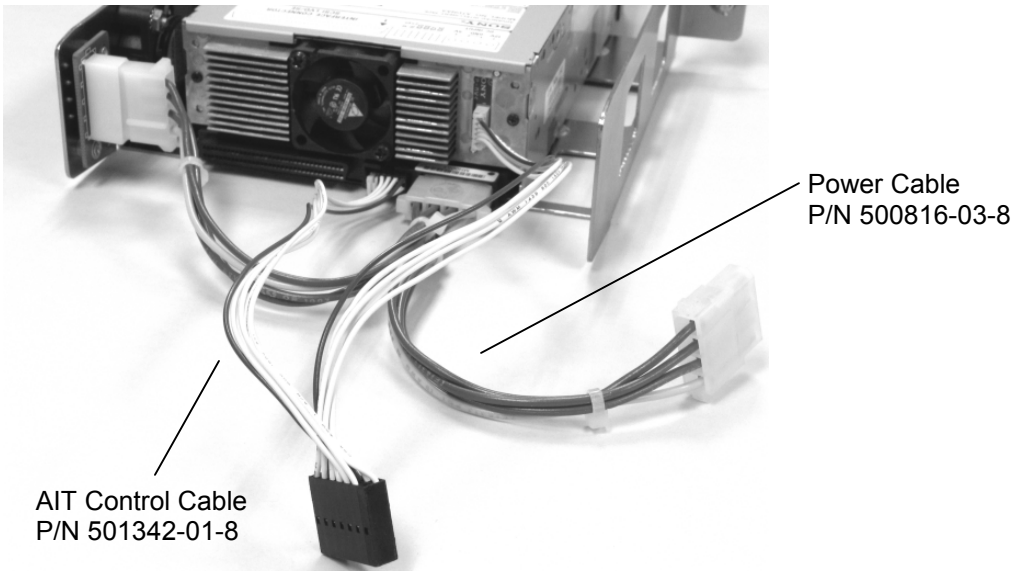


Figure 5-13 AIT Control & Power Cables for AIT-3 and AIT-4 Tape Drives

5.6.5 Open the Drive Access Hatch or Remove the Drive Access Cover

CAUTION

Make certain that the TLS power switch is OFF and the power cord is removed.

1. On TLS-42xx series libraries, unlock the Drive Access Hatch at the rear of the TLS by turning the two 1/4-Turn Fasteners one-quarter turn counter-clockwise (see Figure 5-14).
2. Lower the Drive Access Hatch to gain access to the tape drives and Drive Bay board. The hatch swings down on hinges to provide access to the back if the drive bay.

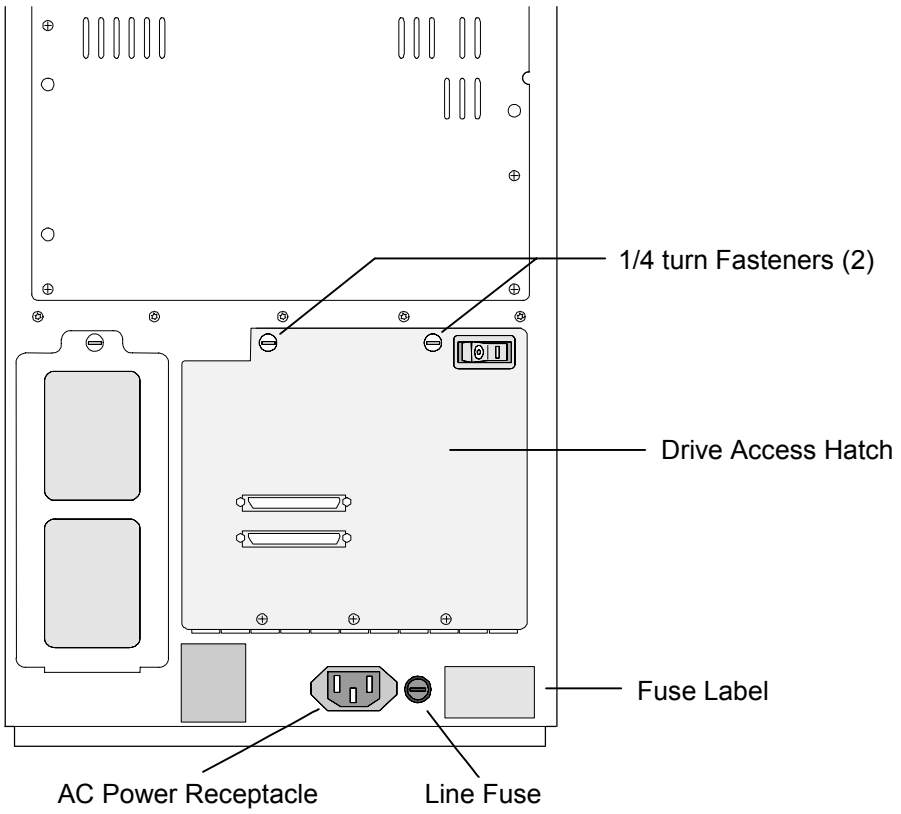


Figure 5-14 TLS Rear View (42xx shown)

On TLS-44xx and TLS-46xx series libraries, remove the Drive Access Panel at the rear of the TLS by turning the three or four 1/4-Turn Fasteners one quarter-turn counter-clockwise, then remove the panel (see Figure 5-15).

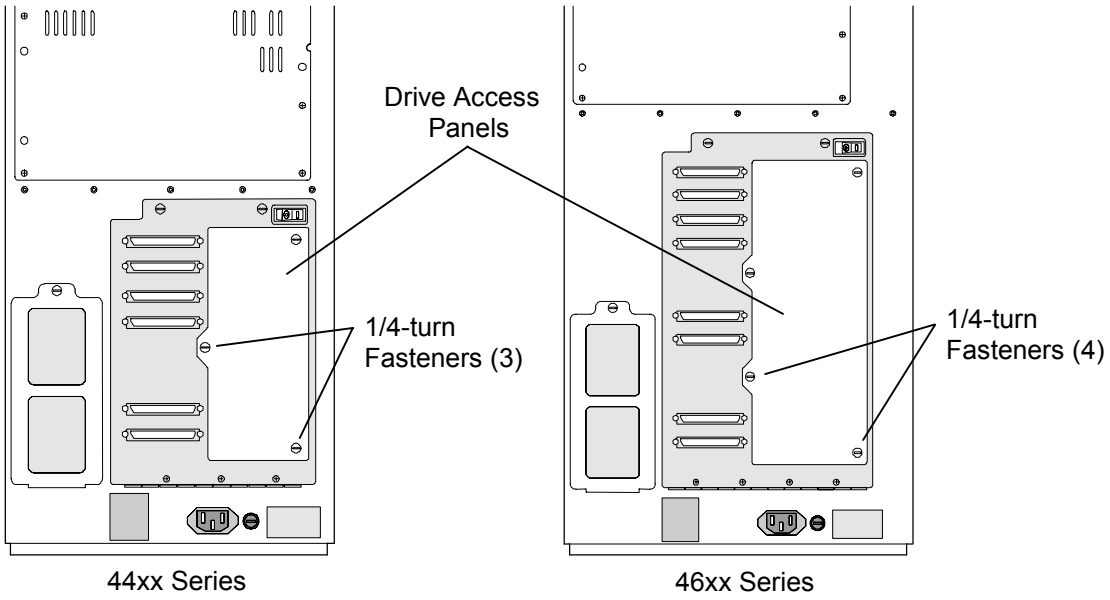


Figure 5-15 TLS Rear View (44xx and 46xx shown)

5.6.6 Installing the Tape Drives into the Drive Bay

CAUTION

Make certain that the TLS power switch is OFF and the power cord is removed.

1. Open the front door and if necessary, manually lift the carriage up and out of the way of the drive bay.
2. Slide the tape drive into its assigned location from the front of the TLS while guiding the attached AIT Control and Power cables so that they pass easily to the rear of the drive bay. It may be helpful to temporarily hold the cables in place over the back of the drive with a strip of masking or cellophane tape.
3. Secure the tape drive to the drive bay by depressing and simultaneously turning the two 1/4-Turn Fasteners on the mounting brackets one quarter-turn clockwise as shown in Figure 5-16.
4. Repeat steps 2 & 3 to mount additional tape drives.



Figure 5-16 Installing the Drive into the Drive Bay

5.6.7 Plug the Power and AIT Control Cables into the Drive Bay Circuit Board

1. Plug the drive's drive power cable into the corresponding numbered drive power header on the Drive Bay circuit board (e.g. T1 to D1PWR (top), T2 to D2PWR, etc.; the connectors are polarized). See Figure 5-17.

NOTE

Libraries manufactured prior to July of 1999 (S/N < 907xxx) utilize a Power Distribution board instead of the Drive Bay board. The power connection is identical.

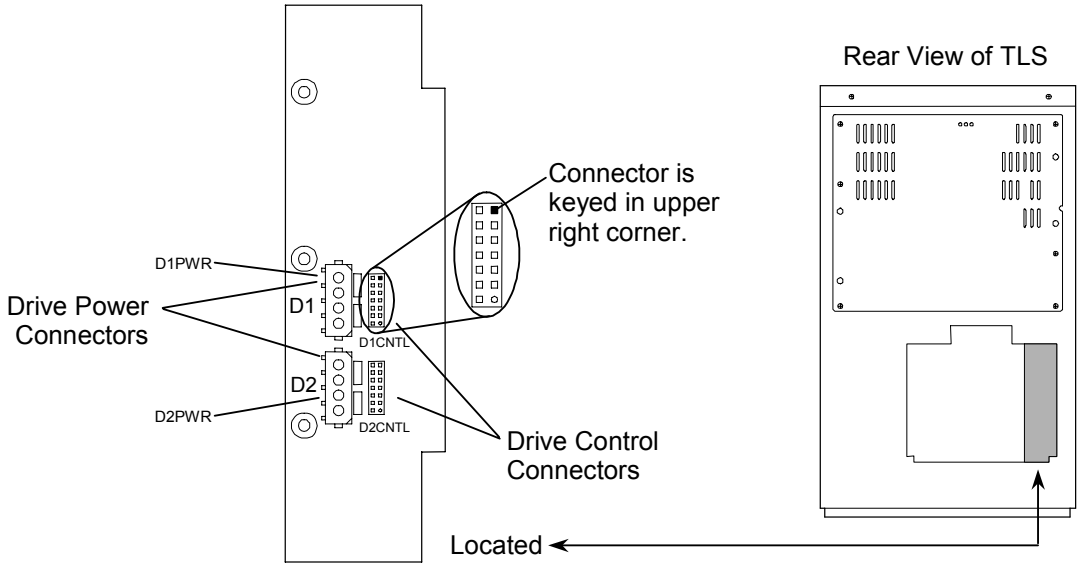


Figure 5-17 Drive Bay PCBA Connectors (42xx shown)

2. Connect the AIT Control Cable to the corresponding DxCNTL header on the Drive Bay board. Note the connector is keyed. See Figure 5-19.

3. Repeat steps 1 & 2 for the remaining tape drives. Connector D2PWR goes to the second tape drive from the top, etc.

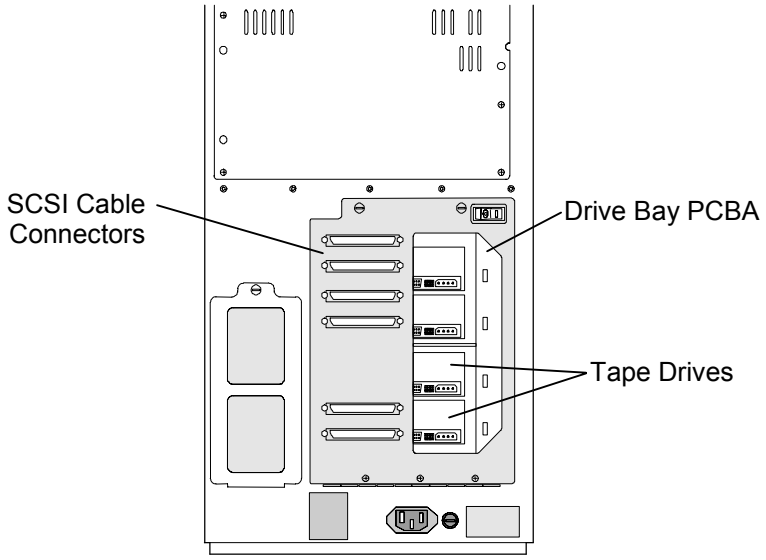


Figure 5-18 Tape Drives & Drive Bay PCBA (TLS Rear View)

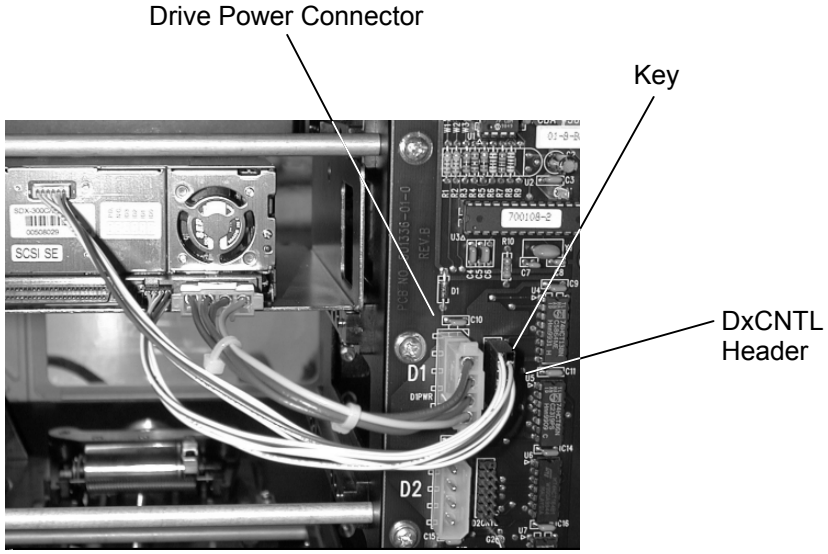


Figure 5-19 AIT Control and Power Cables

5.6.8 Connecting the SCSI Data Cable

CAUTION

SCSI cables are fragile and can be damaged by pulling on the cable instead of the pull-tab provided at each connector.

1. Connect the top SCSI Data Cable Connector to the top tape drive. Make certain the connector is fully inserted at both ends.
2. If additional tape drives are being installed, be sure to connect the Data Cable Connectors in order, top to bottom.

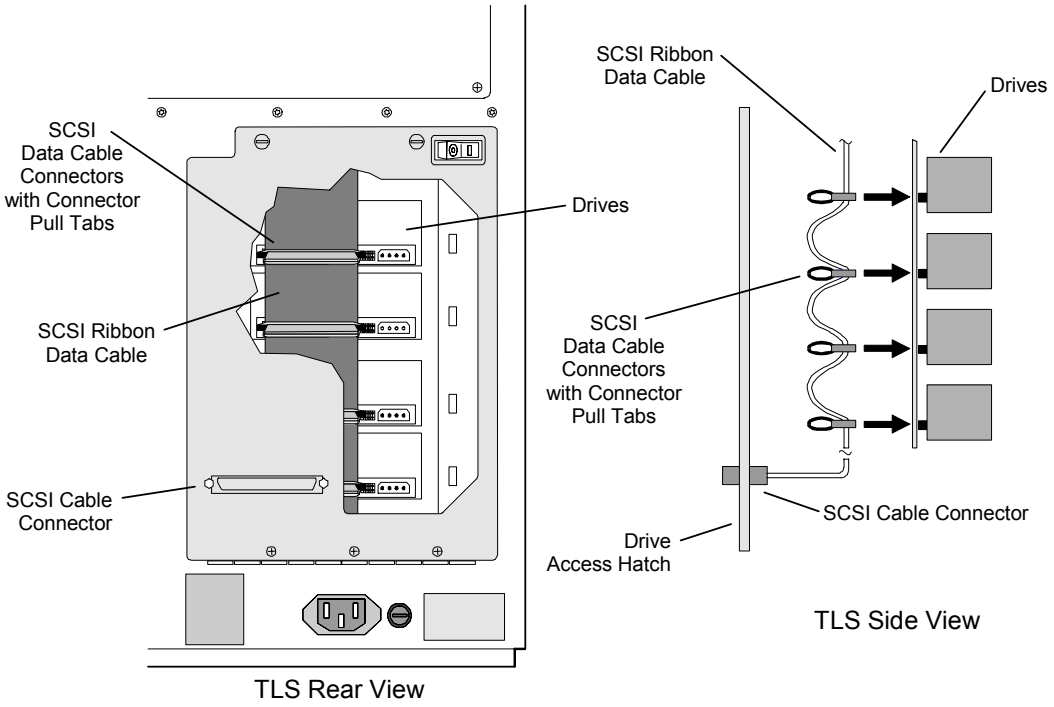


Figure 5-20 Connecting SCSI Data Cables

NOTE

Figure 5-20 shows 1 SCSI Ribbon Data Cable Connected to 4 Drives. Complete cabling options for each TLS model are shown in Section 5.12.1.

5.6.9 Check Tape Drive Power

DANGER

Remove all tools, extraneous materials and body parts from inside the TLS. Failure to do so could result in harm to the installer or damage to the TLS.

1. Attach the power cord to the library and turn its power switch on.
2. Observe that the two green LEDS (+5V & +12V) on the Drive Bay board (or Power Distribution board on libraries manufactured prior to July of 1999 (S/N < 907xxx)) are fully illuminated. They should be of nearly equal brilliance and must remain steadily on. Any deviation from two bright & steady LEDS indicates a problem with the drive power supply, a tape drive or the drive power wiring. If a problem exists, contact Qualstar Technical Support.
3. Turn off the library's power switch and remove the power cord.

5.6.10 Replace the Drive Access Panel or Close the Drive Access Hatch

1. On TLS-42xx series libraries, lift the Drive Access Hatch to its closed position and secure by turning the two 1/4-Turn Fasteners one-quarter turn clockwise (see Figure 5-14).

2. On TLS-44xx and TLS-46xx series libraries, replace the Drive Access Panel at the rear of the TLS and secure by turning the three or four 1/4-Turn Fasteners one quarter-turn clockwise (see Figure 5-15)

5.6.11 Medium-changer Configuration

For the sake of clarity and compliance with the SCSI specifications, the controller portion of the TLS is defined as a "Medium-changer" abbreviated as "MC". After drives are installed, the MC must be reconfigured to reflect the addition of the new drives. Regardless of whether the drives were installed by you or the factory, this procedure should be followed to correctly set or verify the tape drive configuration data.

CAUTION

The MC must be correctly configured for each installed tape drive. Incorrect configuration may result in failure to insert or remove cartridges from the tape drive(s). All tape drive positions must be configured. The configuration for any tape drive position (T1-Tx) that is empty, or that contains a drive that will not be used, must be set to NONE.

Follow the steps in Section 8.20 to inform the MC about the drive locations, the SCSI bus the drives are connected to, the make and model of the drives and SCSI ID's for the installed tape drives. Refer to Chapter 7 (Resource Management) and Chapter 8 (The Configuration Menu) for additional information.

Service Technician Action:	Display:
Open the door to unlock the menu system for drive configuration.	
Plug the power cord into the TLS and the power source, then turn the TLS power on.	
Press the MENU key.	Top Menu ➜•Configuration
Press the ENTER key followed by the ▼ key.	•••••••Configuration •Advanced ➜••Drive
Press the ENTER key. If needed, press the ▼ key to select the desired drive number. Press the ENTER key.	Configuration••Drive ➜••T1: NONE •T2: NONE
Mdl stands for the drive make and Model. If not installed, NONE must be indicated. Press the ENTER key. Use the ▼ key to select the drive make and model installed for the selected drive location. Press the EXIT key.	C•Drive••••••••••T1 ➜Mdl: SDX-500C/L SN:???????????? Enabled: YES Revision: ???? SCSI Bus: CHANGER SCSI Id: dd
Press the ▼ key followed by the ENTER key to edit the SCSI Bus value. This value is reported to the SCSI host computer as an element descriptor. Its value does not affect the operation of the MC. There are three choices: **CHANGER** (default value) indicates the drive is connected to the same SCSI bus as the MC. **OTHER** indicates the drive is connected to a different SCSI bus than the MC. **INVALID** tells the MC to report the SCSI bus information is invalid and should be ignored. Press the ▼ key until the desired value is displayed, then press the EXIT key.	C•Drive••••••••••T1 Mdl: SDX-500C/L SN:???????????? Enabled: YES Revision: ???? SCSI Bus: CHANGER SCSI Id: dd
Press the ▼ key followed by the ENTER key to edit the SCSI Id value. This value will determine the SCSI ID of those tape drives which have a SCSI ID cable connected to the MC. Otherwise, it must be set to the current SCSI ID of the drive as determined by the jumpers installed on the drive. Press the ▼ key until the desired value is displayed, then press the EXIT key. The remaining values in this menu should be set later. Refer to chapters 7, 8, 9 and 10.	C•Drive••••••••••T1 Mdl: SDX-500C/L SN:???????????? Enabled: YES Revision: ???? SCSI Bus: CHANGER ➜SCSI Id: dd
Press the MENU key to return to the Top Menu. Repeat this procedure for all installed drives.	
After configuring the last drive, press the MENU key followed by the EXIT key to exit the menu system. Follow the instructions in the NOTICE below.	

Table 5-5 Configuring the Tape Drive Location, Model, SCSI Bus and SCSI ID

NOTICE

Changing the SCSI ID of a tape drive via the menu system causes the TLS to change the state of signals connected to the tape drive. However, the tape drive only checks these signals when power is applied or following a SCSI bus reset. Therefore, the SCSI ID's of the tape drives will not immediately change after setting them.

When you exit the Configuration\Drive menu after having changed a drive's SCSI ID, you will see an advisory note indicating the new ID's will not take effect until the tape drives are reset and to press ENTER to RESET. If the ENTER key is pressed at this time, the TLS will issue a SCSI bus reset command to all devices connected to the same SCSI bus as the Medium changer.

A SCSI bus reset is acceptable to the tape drives but may adversely affect any host computer attached to the TLS' Medium changer (control interface). Therefore, it is recommended that the SCSI bus be reset only when there are no attached host computers.

Press the EXIT key to dismiss the press ENTER to RESET prompt without resetting the SCSI bus. Then cycle the power on the TLS to reset the tape drives.

5.7 Tape Drive Removal

The tape drive removal procedure is the reverse of the installation procedure (Section 5.6.3). If a tape drive is removed, or replaced, the MC must be correctly reconfigured to reflect any changes. Refer to Section 5.6.11 for the necessary configuration procedures.

5.8 AIT-1 and AIT-2 Tape Drive LED Indications

AIT-1 and AIT-2 tape drive's LEDs have five different methods of reporting the current status/operation of the drive, as shown in Table 5-6. Figure 5-31 shows the locations of the tape drive's front panel LEDs. Table 5-7 defines each of the tape drive's LED indications.

LED Function	Meaning	Defined in
Off	Not active	—
On	Activity	—
Flashing - Mode 1	Drive Activity	Figure 5-32
Flashing - Mode 2	Warning	Figure 5-33
Flashing - Code 1 or 2	Failure	Figure 5-34 & Figure 5-35

Table 5-6 Possible LED indications

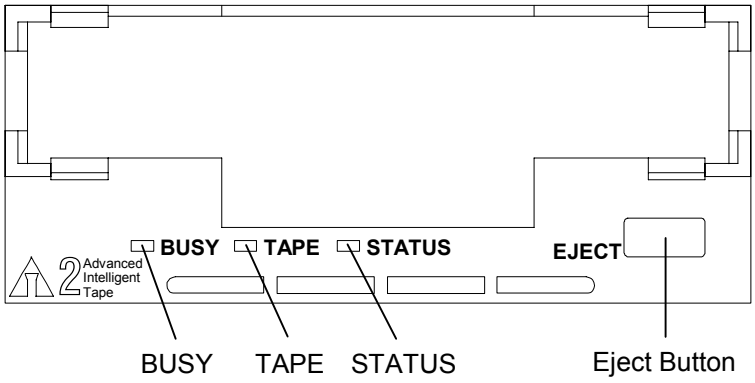


Figure 5-31 Tape Drive LEDs on AIT-1 and AIT-2 Models

	Busy LED	Tape LED	Status LED
Off	Not Busy	Unloaded	
On	SCSI active	Loaded	Write Protected
Flashing - Mode 1	Drive active	Loading/Unloading	Cleaning Tape at EOM
Flashing - Mode 2		Error Rate Warning	Cleaning Request
Flashing - Code 1	Waiting for Reset	Waiting for Eject	
Flashing - Code 2			Selftest Failure

Table 5-7 LED Indications

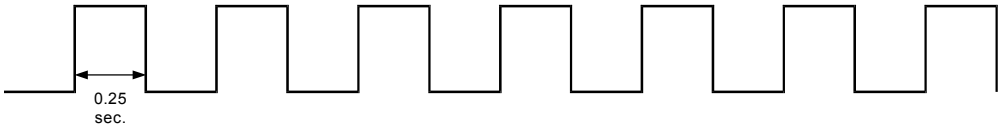


Figure 5-32 LED Flashing Mode 1 Diagram: 0.25 sec ON/ 0.25 sec OFF

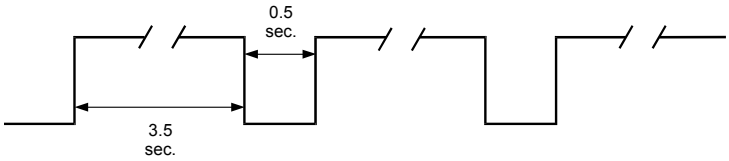


Figure 5-33 LED Flashing Mode 2 Diagram: 3.5 sec ON/0.5 sec OFF

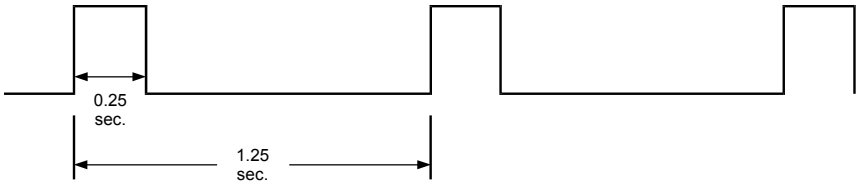


Figure 5-34 LED Flashing Code 1 Diagram: One Pulse

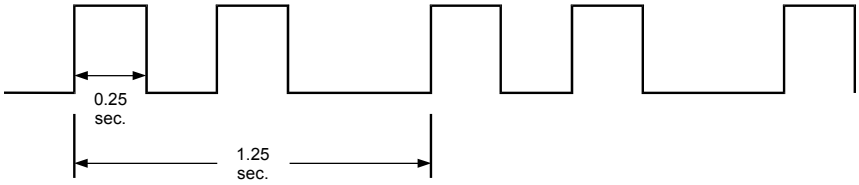


Figure 5-35 LED Flashing Code 2 Diagram: Two Pulses

5.9 AIT-3 and AIT-4 Tape Drive LED Indications

AIT-3 and AIT-4 tape drives have three LED's on the front panel of the drive. The "Tape Motion" LED illuminates when the tape is moving within the drive. The "Cleaning Request" LED illuminates when the drive requires cleaning. The "Replace Tape" LED illuminates when the tape cartridge needs to be replaced. It also illuminates when a medium error occurs. All of the LED's will flash fast simultaneously, if there is a tape drive malfunction.

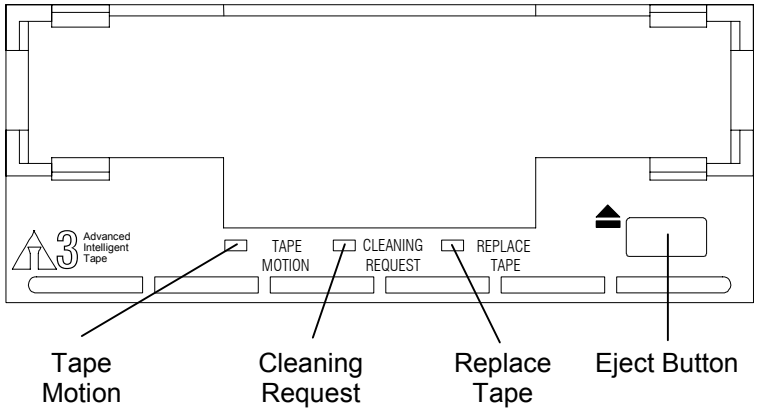


Figure 5-36 Tape Drive LEDs on AIT-3 and AIT-4 Models

Table 5-8 defines each of the tape drive's LED indications.

	Tape Motion LED	Cleaning Request LED	Replace Tape LED
Off	No Tape is Loaded	Cleaning is Not Necessary	No Media Error Occurred
On	Tape is Loaded	Cleaning is Requested	Media Error Occurred
Flashing - Slowly	Tape Access in Progress (Write/Read)	Cleaning is Not Completed	Media Warning
Flashing - Rapidly	Tape Access in Progress (Other than Write/Read)		
All LED's Flashing Rapidly	Hardware Error Occurred		

Table 5-8 AIT-3 and AIT-4 Tape Drive LED Indications

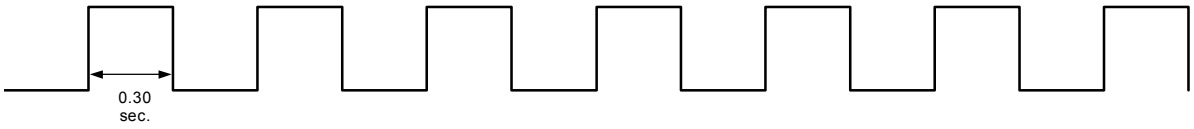


Figure 5-37 LED Flashing Rapidly Diagram: 0.30 sec ON/ 0.30 sec OFF

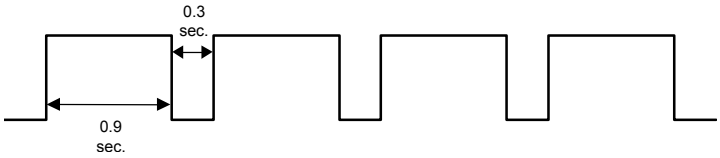


Figure 5-38 LED Flashing Slowly Diagram: 0.9 sec ON/ 0.3 sec OFF

5.10 Installing Media

CAUTION

The choice of media for use in the TLS is important. It* must *meet all of the requirements of the tape drive manufacturer.

5.10.1 Static Precautions

Before handling data cartridges, it is a good idea to eliminate any static charge that may exist. To protect the data stored on the tape cartridges, just follow the simple procedure below before loading, moving, or removing any data cartridges.

1. Open the door and locate the grounding strap connected between the door and the lower-left corner of the TLS (Figure 5-39).

2. Touch by hand the head of the screw that connects the grounding strap and the lower-left corner of the TLS (Figure 5-39), to remove any static charge that may exist. Then load, move, or remove the desired data cartridges and magazines as described in Section 5.10.2 and Section 5.11.

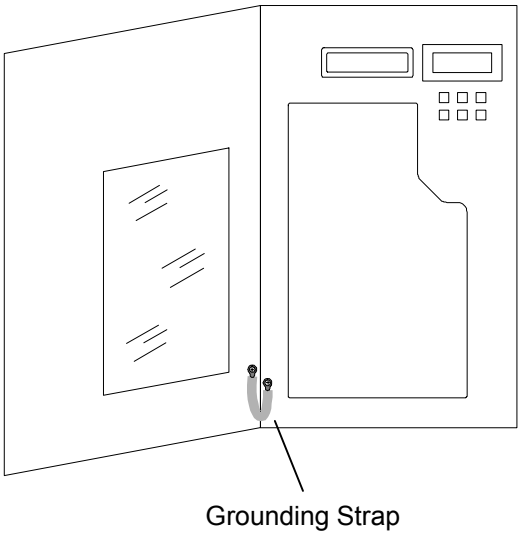


Figure 5-39 TLS Grounding Strap

5.10.2 Loading a Magazine

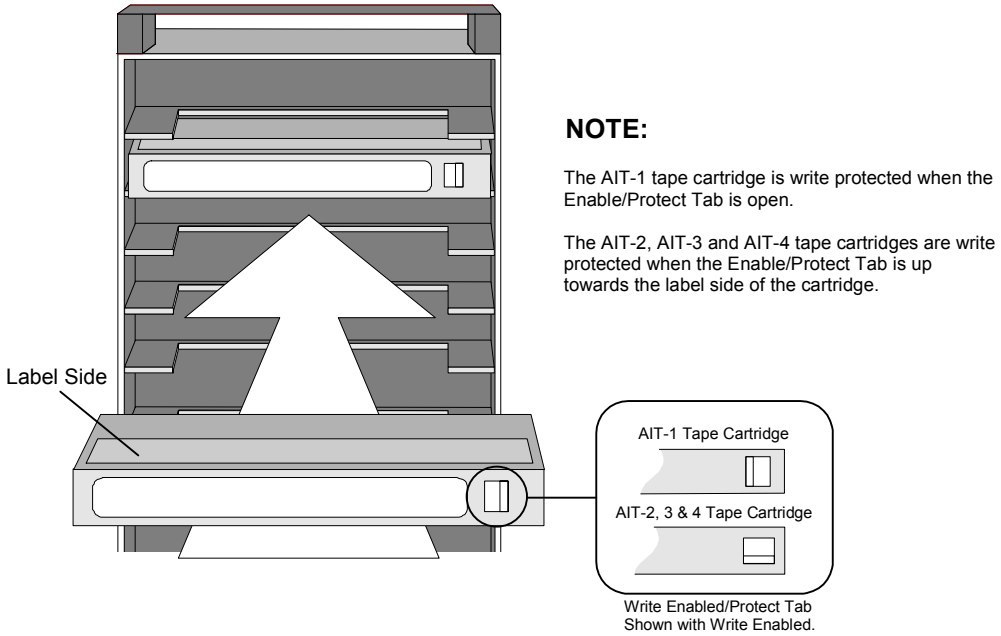


Figure 5-40 Loading a Cartridge Magazine

Loading a magazine is quite easy. The top end of the magazine has a carrying handle. Slide each cartridge fully into a magazine slot with the Write Enable/Protect Tab

facing out and on the right. The magazines slots have small lips on the magazine separators that hold the cartridges in place. Make certain that the Write Enable/Protect tab is set correctly for the intended use (see Figure 5-40). Refer to Figure 5-41 to determine the correct orientation of the magazine. Magazines may be loaded before or after being installed in the TLS.

CAUTION

When loading a magazine, be sure that the tape cartridges are installed correctly with the Write Enable/Protect Tab on the right side, as shown in Figure 5-40.

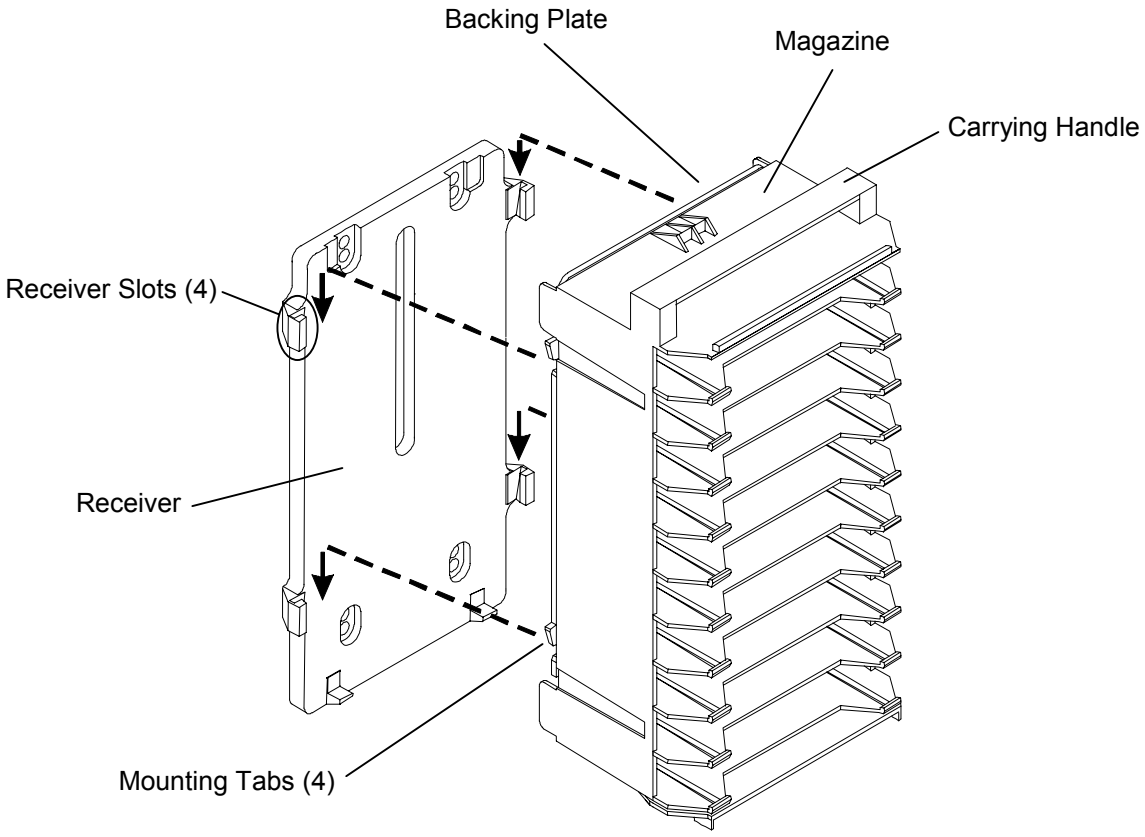
5.11 Installing and Removing Magazines

The magazines are designed for easy installation and removal without the use of tools. **Be sure to remove a magazine's dust cover before installing the magazine.**

1. On carousel-equipped models, slowly turn the carousel by hand until the desired magazine mount faces forward. This may be done with power on or off.
2. Push the carriage up or down by hand to a position that does not interfere with magazine insertion.
3. Remove the magazine dust cover, if attached, before installing the magazine in the TLS.
4. The magazines use a metal backing plate with four mounting tabs. These tabs lock into slots in the receiver (see Figure 5-41) Simply press the magazine's backing plate against the receiver with its mounting tabs slight above the receiver slots. Let the magazine's four mounting tabs fall into the receiver slots.
5. Give the magazine a slight tug to determine if all four mounting tabs are engaged with the receiver slots.
6. Check that cartridges are fully seated in the magazine.
7. To remove a magazine, lift up the magazine until the mounting tabs clear the receiver slots. Then pull the magazine straight out from the receiver.
8. After installing or removing all the desired magazines, close the library's door. The MC will then scan the inventory and update its inventory database.

NOTICE

The following patent applies to Qualstar 8mm Data Cartridge Magazines: Pat. No. Des 392,147.



Data Cartridge Magazine: Qualstar P/N 501110-02-1

Figure 5-41 Data Cartridge Magazine

5.12 SCSI Interface

The standard SCSI control-interface to the MC is both Low Voltage Differential (LVD) and Single-Ended (SE) capable. This is defined by ANSI as Multimode Low Voltage Differential or MLVD and is called LVD/SE in the vernacular. A High Voltage Differential (HVD) SCSI interface to the MC is optional.

Tape drives are available in all of these interface types. All devices on a single SCSI bus must be compatible with each other as indicated in Table 5-9 below. Wide (16-bit) and narrow (8-bit) devices may always be mixed together on the same bus. The interface type of the MC is available in the menu `Configuration\Advanced\SCSI`.

Interface Type	Bus Compatibility
HVD	May not be mixed with any other type.
LVD	May not be mixed with HVD or SE.
MLVD (LVD/SE) (Multimode)	May be mixed with single-ended (SE). The bus operates in the SE mode when an SE devices is present.
Single-ended (SE)	May be mixed with MLVD (LVD/SE). The bus will always operate only in the single-ended mode.

Table 5-9 SCSI Interface Compatibility

5.12.1 Standard SCSI LVD/SE Cabling for TLS-4000 Libraries

SCSI cabling is an extremely important part of any system installation. Attention must be paid to several parameters in order to assure reliable SCSI bus operation.

All TLS-4000 SCSI cabling consists of high-performance, 68 conductor Ultra SCSI cable to provide for the highest possible data transfer rates.

Most models offer a choice of internal cabling options so that the TLS can be optimized for its intended installation. This will permit the TLS (MC and all of its tape drives) to be connected to a single or multiple SCSI buses. Multiple SCSI buses provide the needed data bandwidth when many high-performance tape drives are used in a single TLS. The MC requires extremely little data bandwidth and so is frequently connected to the same SCSI bus as the top group of tape drives.

The internal cabling options for all models are graphically displayed in Figure 5-42 through Figure 5-48.

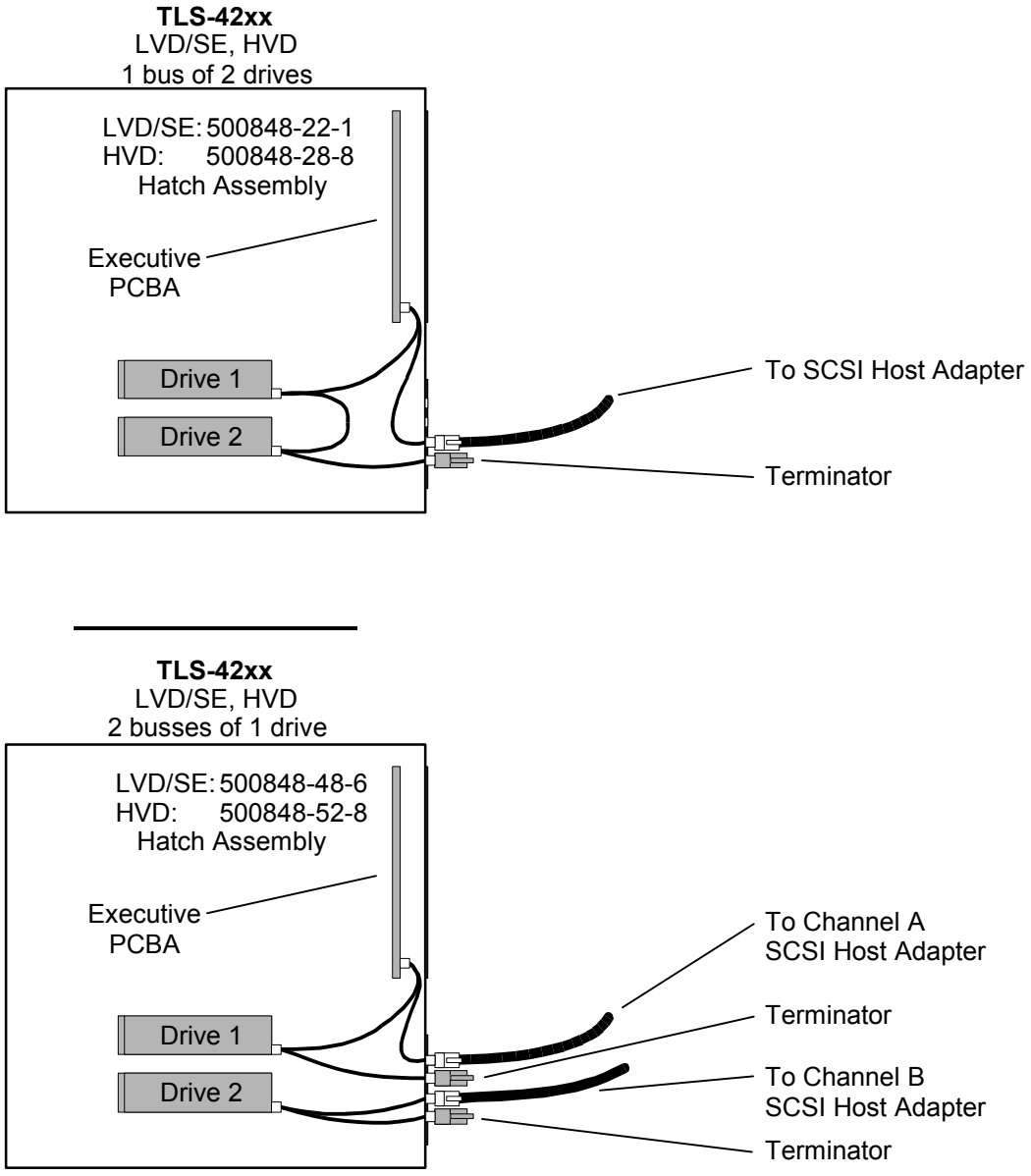


Figure 5-42 TLS-42xx Internal Cabling Diagrams

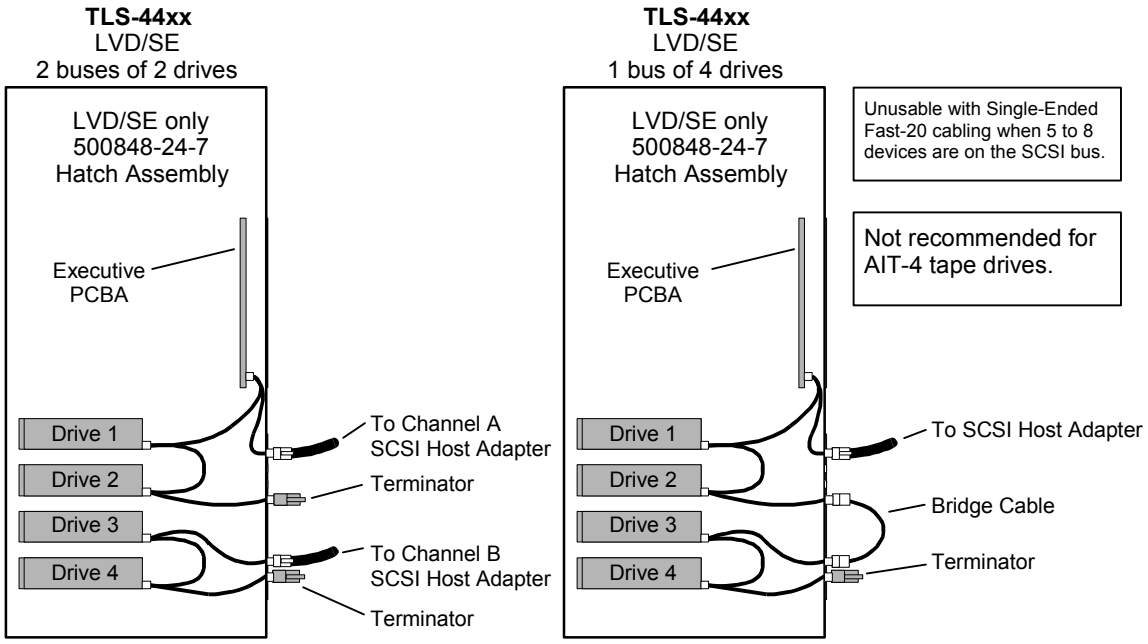


Figure 5-43 TLS-44xx LVD/SE Internal Cabling Diagrams

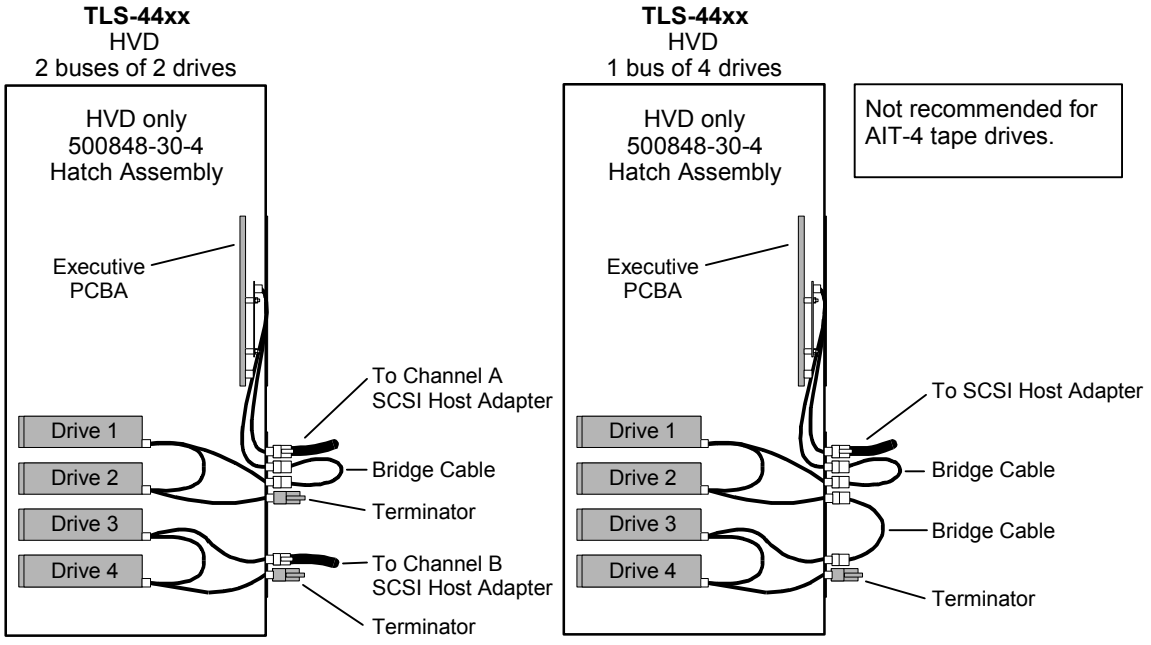


Figure 5-44 TLS-44xx HVD Internal Cabling Diagrams

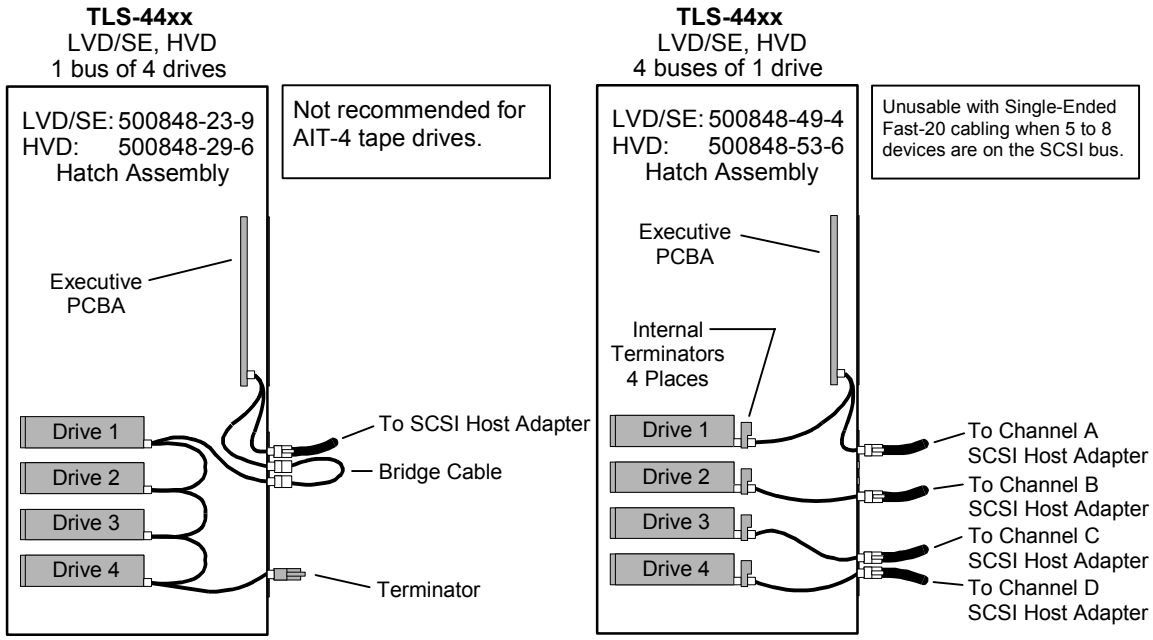


Figure 5-45 TLS-44xx Internal Cabling Diagrams

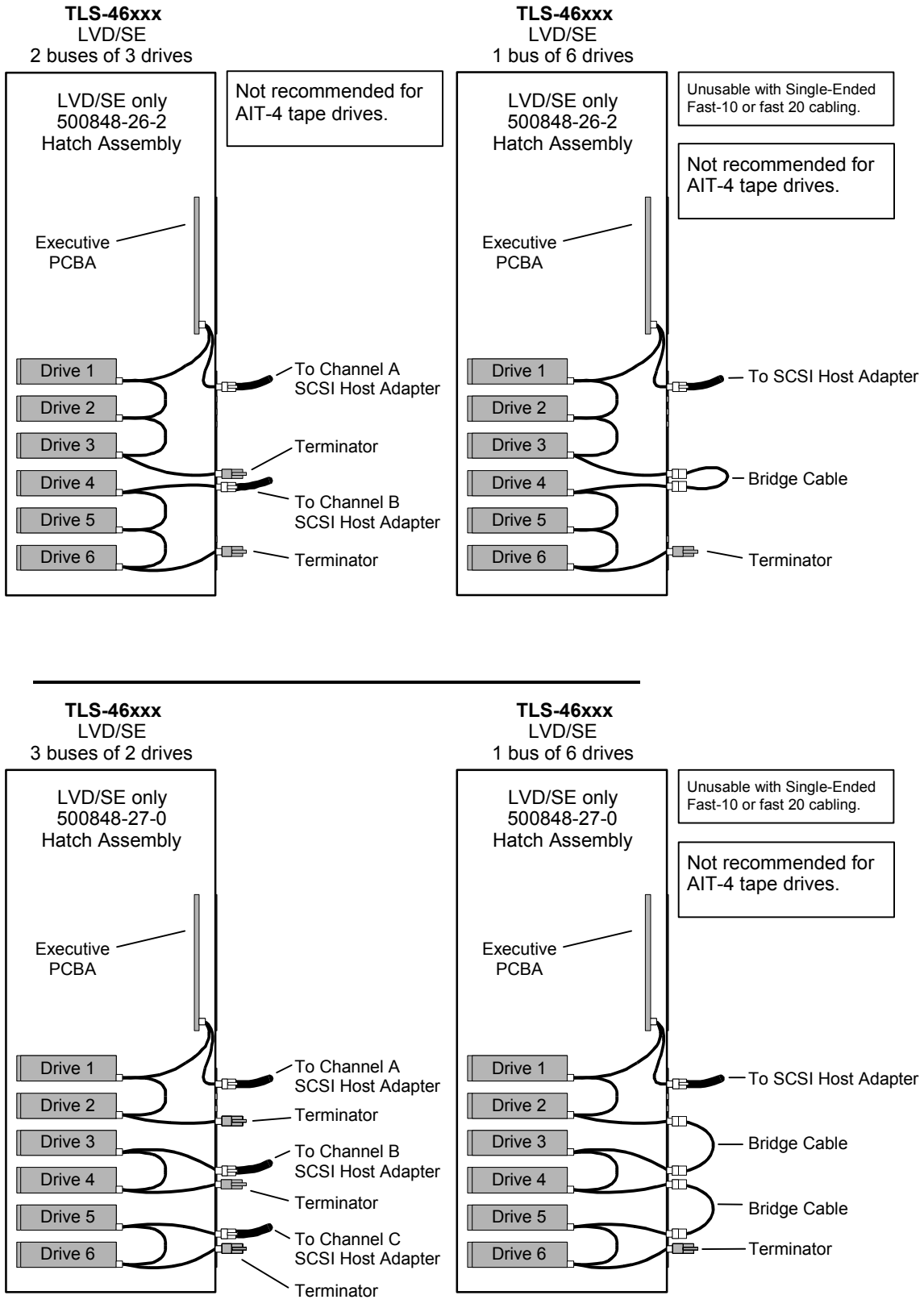


Figure 5-46 TLS-46xxx LVD/SE Internal SCSI Cabling Diagrams

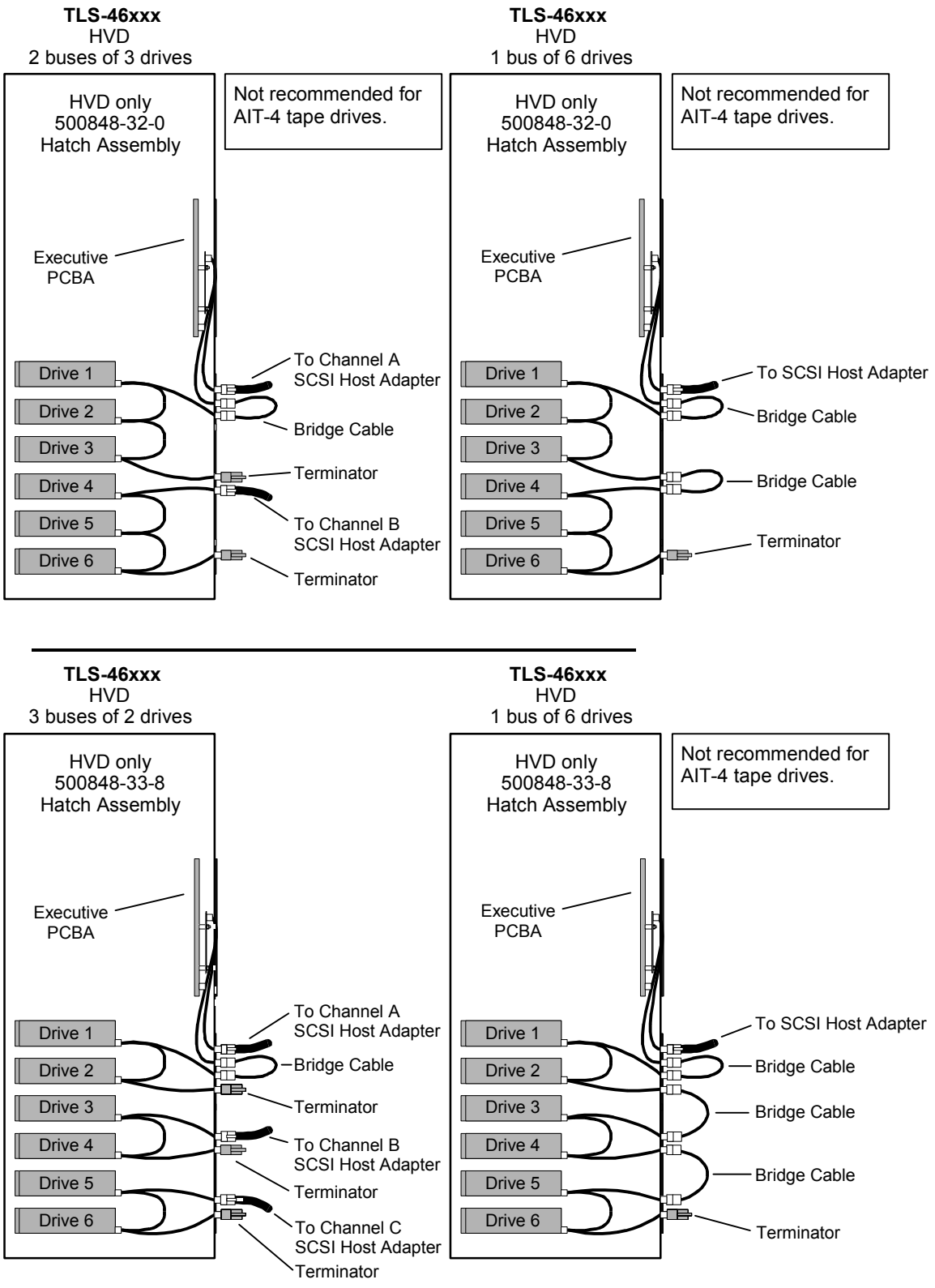


Figure 5-47 TLS-46xxx HVD Internal SCSI Cabling Diagrams

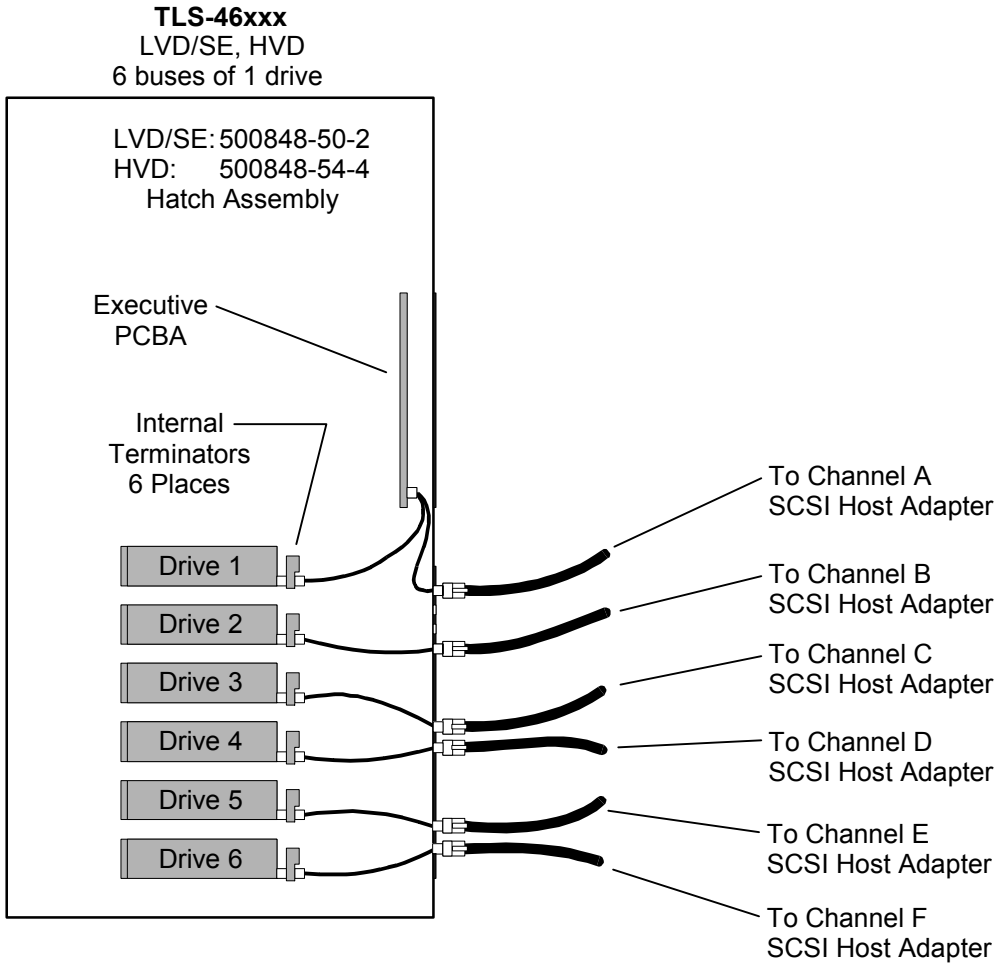


Figure 5-48 TLS-46xxx Internal SCSI Cabling Diagrams

It is imperative that the installer determines the maximum bus speeds of the devices on the bus and then limits the external cable length as indicated in Table 5-11 and Table 5-12. Furthermore, the type of cable and terminators used must be suitable for the intended configuration (details follow in this chapter).

Supported tape drives have the following SCSI capabilities:

Drive Make & Model	SCSI Bus Type	Bus Speeds Supported
AIT-1	SE Wide	Fast-5, Fast-10
AIT-1	HVD Wide	Fast-5, Fast-10
AIT-2	LVD/SE Wide	Fast-5, Fast-10, Fast-20
AIT-2	HVD Wide	Fast-5, Fast-10, Fast-20
AIT-3	LVD/SE Wide	Fast-5, Fast-10, Fast-20 Fast-40, Fast-80, Fast-160
AIT-4	LVD/SE Wide	Fast-5, Fast-10, Fast-20 Fast-40, Fast-80, Fast-160

Table 5-10 Tape Drive SCSI Interfaces

Transfer rates between devices becomes an important consideration for Single-Ended installations. These facts should help in determining and controlling the bus speeds. The initiator and target negotiate their transfer rate based upon their capability without regard to the cables between them or the other devices on the bus. The slower device determines the transfer rate between the two. Each device on the bus negotiates separately and can therefore operate at different rates than its peers.

Should the cabling in an installation not meet the criteria specified in this chapter or the SCSI specifications, the host adapter board may provide a means of limiting the bus speed for each target device. If this becomes necessary, then every target device (MC and tape drives) on the same bus should be limited to a speed as determined by the total cable length.

		Maximum Permitted External Cable Length			
TLS Model	**Cabling Configuration**	**LVD Fast-20**	**SE Fast-5**	**SE Fast-10 (or Fast-20 with 1 to 4 devices)**	**SE Fast-20 with 5 to 8 devices**
42xx	MC + both drives	10.8 m / 35.4 ft	4.8m / 15.7 ft	1.8 m / 5.9 ft	0.3 m / 1.0 ft
42xx	MC + top drive	11.1 m / 36.4 ft	5.1 m / 16.7 ft	2.1 m / 6.9 ft	.6 m / 2.0 ft
	Bottom drive	11.4 m / 37.4 ft	5.4 m / 17.7 ft	2.4 m / 7.9 ft	.9 m / 3.0 ft
44xx	MC + 4 drives + bridge	10.0 m / 33.0 ft	4.0 m / 13.3. ft	1.0 m / 3.5 ft	**Unusable**
1 bus of	MC only	11.7 m / 38.4 ft	5.7 m / 18.7 ft	2.7 m / 8.9 ft	1.2 m / 4.0 ft
4 drives	All 4 drives	10.5 m / 34.4 ft	4.5 m / 14.7 ft	1.5 m / 4.9 ft	**Unusable**
44xx	MC + top drive	11.4 m / 37.4 ft	5.4 m / 17.7 ft	2.4 m / 7.9 ft	.9 m / 3.0 ft
4 buses of 1 drive	Individual Drives	11.7 m / 38.4 ft	5.7 m / 18.7 ft	2.7 m / 8.9 ft	.8 m / 2.6 ft
44xx	MC + 4 drives + bridge	9.7 m / 32.0 ft	3.8 m / 12.4 ft	0.8 m / 2.5 ft	**Unusable**
2 buses of	MC + top 2 drives	10.8 m / 35.4 ft	4.8m / 15.7 ft	1.8 m / 5.9 ft	0.3 m / 1.0 ft
2 drives	Bottom 2 drives	11.1 m / 36.4 ft	5.1m / 16.7 ft	2.1 m / 6.9 ft	0.6 m / 2.0 ft
46xxx	MC + 6 drives + bridge	9.16 m / 30.0 ft	3.2 m / 10.4 ft	**Unusable**	**Unusable**
2 buses of	MC + top 3 drives	10.5 m / 34.4 ft	4.5 m / 14.7 ft	1.5 m / 4.9 ft	**Unusable**
3 drives	Bottom 3 drives	10.8 m / 35.4 ft	4.8m / 15.7 ft	1.8 m / 5.9 ft	0.3 m / 1.0 ft
46xxx	MC + 6 drives + 2 bridges	8.7 m / 28.5 ft	2.7 m / 8.8 ft	**Unusable**	**Unusable**
3 buses of	MC + top 2 drives	10.8 m / 35.4 ft	4.8m / 15.7 ft	1.8 m / 5.9 ft	0.3 m / 1.0 ft
2 drives	Middle or bottom 2 drives	11.1 m / 36.4 ft	5.1m / 16.7 ft	2.1 m / 6.9 ft	0.6 m / 2.0 ft
46xxx	MC + top drive	11.4 m / 37.4 ft	5.4 m / 17.7 ft	2.4 m / 7.9 ft	.9 m / 3.0 ft
6 buses of 1 drive	Individual Drives	11.7 m / 38.4 ft	5.7 m / 18.7 ft	2.7 m / 8.9 ft	.8 m / 2.6 ft

Shading indicates a **Not-Recommended** combination.
MC = Medium-changer
bridge = bridge cable assembly

Table 5-11 Maximum External LVD/SE Cable Lengths

5.12.2 Optional HVD Cabling for TLS-4000 libraries

The SCSI High Voltage Differential interface is available on some tape drives and is optional for the MC. This interface provides the cable lengths up to 25 meters at speeds up to Fast-20. The cabling options for HVD are described in Table 5-12.

The `Configuration\Advanced\SCSI\Interface` value indicates which type of SCSI interface (LVD/SE or HVD) is installed for the MC. The value is non-editable. The HVD Adapter board must be added or removed to change the Interface value.

```
C•Advanced••••••SCSI
 •Library
 Disconnect
 Enable:          ON
♦Interface:   LVD/SE
 LUN:             0
 Parity:      ABORT
 Synchronous:   OFF
```

TLS Model	Cabling Configuration	HVD Fast-20/10
SCSI Max.		**25 meters**
42xx	MC & 2 drives	23.3 m / 76.5 ft
42xx	MC + top drive	23.9 m / 78.4 ft
	Bottom drive	24.4 m / 80.0 ft
44xx	MC + 4 drives + 1 bridge	22.4 m / 73.7 ft
1 bus of	MC only	24.1 m / 79.0 ft
4 drives	All 4 drives	23.5 m / 77.0 ft
44xx	MC + top drive	24.4 m / 80.1 ft
4 buses of 1 drive	Individual drives	24.3 m / 79.7 ft
44xx	MC + 4 drives + 2 bridges	22.0 m / 72.3 ft
2 buses	MC + top 2 drives + bridge	23.0 m / 75.7 ft
of	MC only	24.1 m / 79.0 ft
2 drives	Top or Bottom 2 drives	24.1 m / 79.0 ft
46xxx	MC + 6 drives + 2 bridges	21.4 m / 70.3 ft
2 busses	MC + top 3 drives + bridge	22.7 m / 74.7 ft
of	MC only	24.1 m / 79.0 ft
3 drives	Top or Bottom 3 drives	23.8 m / 78.0 ft
46xxx	MC + 6 drives + 3 bridges	21.0 m / 69.0 ft
3 busses	MC + top 2 drives + bridge	23.0 m / 75.7 ft
of	MC only	24.1 m / 79.0 ft
2 drives	Any 2 drive group	24.1 m / 79.0 ft
46xxx	MC + top drive	24.4 m / 80.1 ft
6 buses of 1 drive	Individual drives	24.3 m / 79.7 ft

MC = Medium-changer
bridge = bridge cable assembly

Table 5-12 Maximum External HVD Cable Lengths

5.12.3 External Cable Requirements

The SCSI specifications require higher performance external cables to facilitate the faster data transfer rates. The following is a brief cable specification for purchasing purposes:

1. The cable is to meet the requirements of American National Standard for SCSI Parallel Interface-2, Document No. X3.302:1998 for transfer rates up to Fast-20 or the Working Draft American National Standard T10 Project 1320D for transfer rates up to Fast-80.

5.12.4 SCSI Connectors

Depending upon the model and cabling options ordered, one or more pairs of SCSI connectors are provided on the rear of the TLS. The MC will always be connected to the upper pair of connectors. Consult Figure 5-42 through Figure 5-48 for your cable configuration to determine which drives are found on which connectors. The Hatch Assembly P/N (500848-xx-x) can be found on the rear panel of the TLS.

The standard connector on the TLS rear panel is a 68-pin female, wide, high-density, SPI-2 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.

5.12.5 SCSI Terminators

The SCSI bus must be properly terminated at each of its ends. The host adapter board is usually one terminus. The other end usually appears at the library and requires the installation of a SCSI terminator at the furthest connector from the host. The recommended terminators are listed in Table 5-13. Some library models contain in-line terminators, which are located inside the library. They provide termination and no external terminators are required with these models. There must never be more than two SCSI terminators on a single bus. Single-ended passive terminators, including regulated passive terminators are not recommended.

The MC does not contain an internal terminator. Some tape drives contain internal terminators, but they are disabled at the factory. If new drives are to be installed, make certain that any internal SCSI terminators are disabled.

SCSI Bus Type	QUALSTAR P/N
Low Voltage Differential or Single-Ended – **LVD/SE**	117-0011-9
High-Voltage Differential – **HVD**	117-0006-9

Table 5-13 68 Pin SPI-2/SPI-3 Terminators

5.12.6 SCSI Termination Power

The TLS can supply up to 2 amps of termination power to the SCSI bus connected to the MC. 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 5-49. The termination power is periodically monitored and, if it is missing, the front panel will display an appropriate error message.

Tape drives can also be configured to provide SCSI bus termination power. However, it is recommended that termination power be enabled only on the tape drive which is adjacent to external SCSI terminators for each SCSI bus. If the termination power were enabled on all tape drives on a bus, an accidental short-circuit on the SCSI bus could cause permanent damage to anything connected to the bus including the cables.

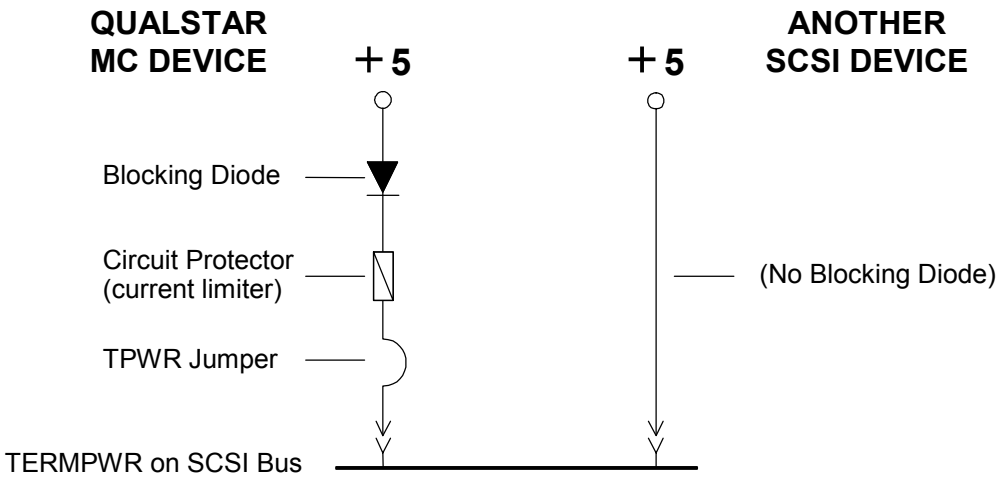


Figure 5-49 SCSI Termination Power Diagram

5.12.6.1 Circuit Protector

A solid-state current limiter protects the TLS from excessive current draw due to an overload on the SCSI bus TERMPWR line. The current limiter is connected in series between the termination voltage supply and TERMPWR on the SCSI bus. If the current through the circuit protector is excessive, it will limit the current to a safe level until the overload condition is removed. However, the reduced current will not be enough to properly terminate the SCSI signals, and unpredictable operation may result.

5.12.6.2 Termination Power Jumper

A removable jumper is connected in series with the termination power. Removing the jumper (TPWR) disconnects the termination power from TERMPWR on the SCSI bus. The TLS is shipped with the jumper installed and Qualstar recommends that it not be removed. If the jumper is removed, TERMPWR must be available from another device on the SCSI bus. The TPWR jumper is found at the bottom of the Executive PCBA, which is located behind the Rear Service Panel (Figure 5-50).

5.12.6.3 Blocking Diode

The blocking diode prevents the TLS from drawing current from the SCSI TERMPWR line when the TLS power is off.

A problem can arise if another SCSI device, which does not have a blocking diode, is connected to the SCSI bus as shown in Figure 5-49. If the TPWR jumper on the TLS is installed and the power of the other device is off, its termination power supply will draw current from the TLS. If the current drawn is excessive, the current limiter in the TLS will activate and disconnect the termination voltage from TERMPWR, which could disable the entire SCSI bus. The current limiter will deactivate when an excessive current is removed.

If the host system does not have a blocking diode, do one of the following things:

a) Remove the termination power jumper (TPWR) from the TLS,
or
b) Always turn the TLS off ***before*** turning the host computer system off, ***and*** always turn the TLS on ***after*** applying power to the host computer system. Be sure that the TLS is never turned on when the host computer system is off. The host computer may need to be rebooted, depending on the operation of the host SCSI interface.

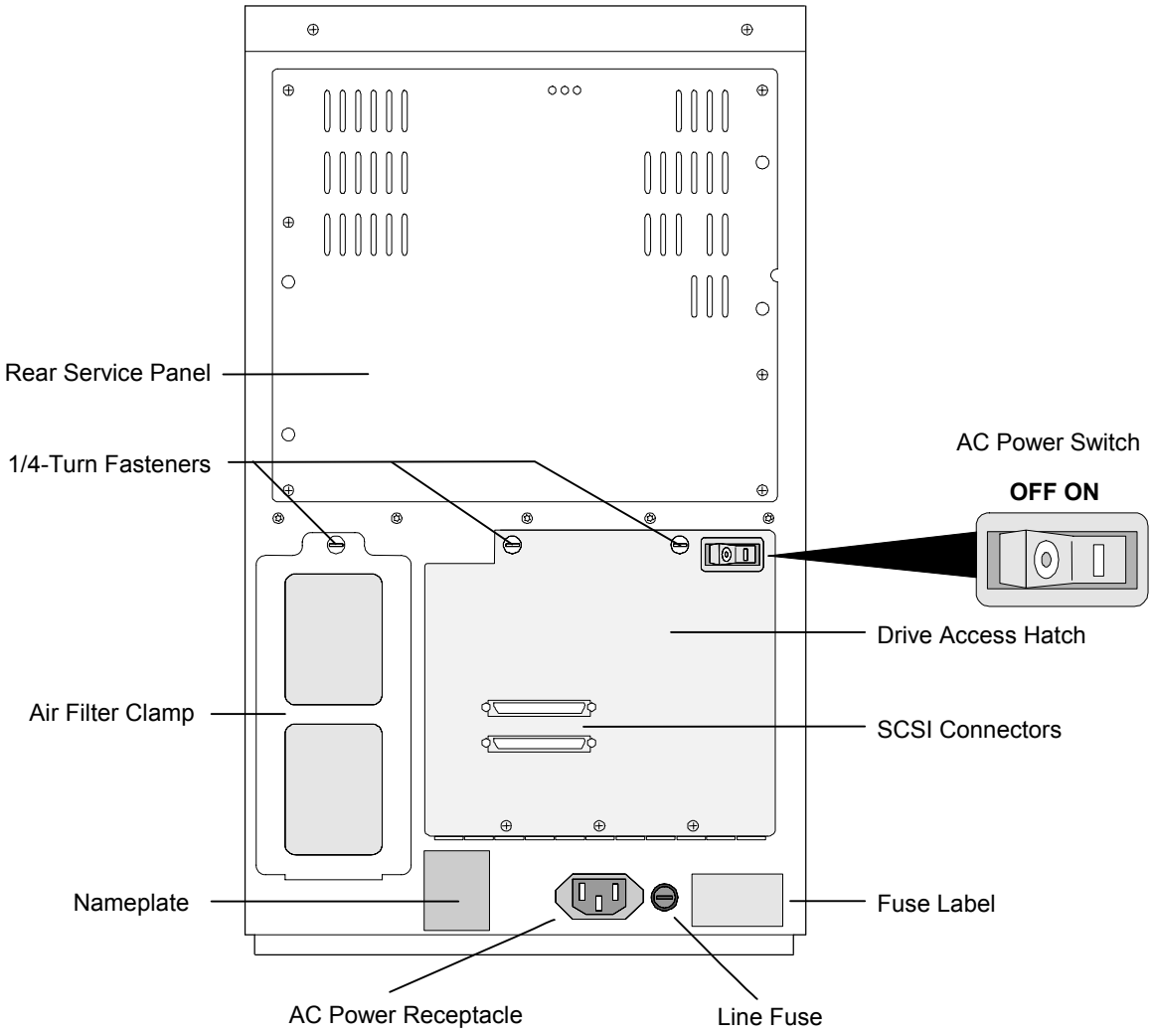


Figure 5-50 TLS 4212 Rear View

5.12.7 Checking the TLS SCSI Configuration

At this point, the tape drives, magazines, cartridges have been installed, and the SCSI cables have been connected. Also, the TLS power has been turned on and the MC has proven to be basically functional (successful completion of the power-up sequence). The TLS MC is now configured to the default values for use with the drives and with the host computers.

5.12.8 Testing Basic SCSI Operation

The MC, can now be tested to verify that it responds correctly to commands from the host. The simplest way of doing this is to issue a Test Unit Ready command to the MC. If the changer returns a GOOD status, then it is certain that the SCSI communications protocol and SCSI cable (and associated line drivers and receivers) are operational. Once the Media-changer returns a GOOD status, the system is ready for a more thorough checkout.

The factory-default settings are sufficient for 90% of the SCSI applications in the field. This means that in nine out of ten installations, the system will transfer data and function normally. Some systems, however, may not function optimally using the factory-default settings. For example, the application may require a particular SCSI Inquiry string, which differs from the default inquiry string. Refer to Chapters 6 through 10 for additional information on configuring a MC.

6. The Menu System

The menu system allows the user to perform manual operations. It also allows a qualified individual to make configuration changes to the changer and monitor maintenance and operation. This chapter explains the menu system, the types of information it presents, and how to use it. Specific information about any given menu item can be found in subsequent chapters of this manual.

6.1 Using the Control Keys

The control keys make it possible to point to a particular item and change or edit its value, or to execute a command. The function of each control key is dependent upon the location within the menu structure. The control keys are shown in Figure 6-1.

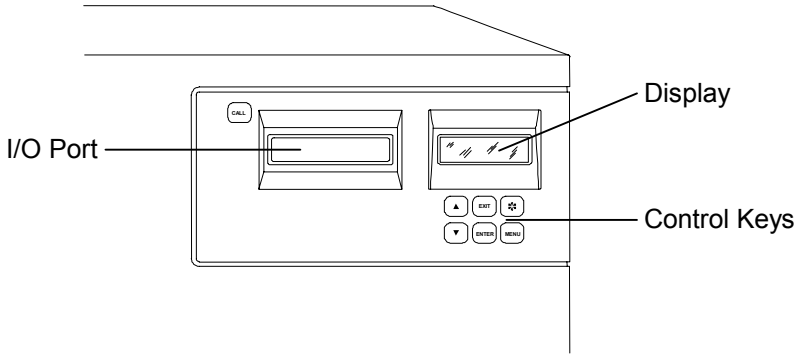


Figure 6-1 TLS Control Panel

6.1.1 The MENU Control Key

Press the MENU key to enable the menu system. The menu system can be used without interrupting ongoing changer operations. If the Top Menu is not displayed, pressing the MENU key at any time always returns control to the Top Menu (Figure 6-4). If the Top Menu is displayed, press the MENU or EXIT key to return to the Operating Display.

6.1.2 The ▲ (UP) and ▼ (DOWN) Control Keys

- While navigating through the menu system, the ▲ (UP) and ▼ (DOWN) keys move the item pointer (right-pointing arrow) up and down the left column of the display. The display automatically scrolls when necessary. The pointer identifies the current selection, as shown in Section 6.1.3.
- If a value is highlighted, the ▲ (UP) and ▼ (DOWN) keys change the value of the highlighted character or word. The ▼ (DOWN) key changes the character to the preceding character in the sequence (i.e., from B to A, or from 2 to 1. Pressing the ▲ (UP) key has the opposite effect.

- If a multiple-choice value is highlighted, the ▲ (UP) and ▼ (DOWN) keys cycle through the available choices.
- If the ▲ (UP) or ▼ (DOWN) key is pressed and held down, the control key's action repeats at a rapid rate.

6.1.3 The ENTER Control Key

The ENTER key behaves as follows:

- If the item pointer is pointing at a sub-menu (indicated by a leading bullet), pressing ENTER will display the selected sub-menu.

```
O•••••Element Status
➜••Display
 •Find Label
 INITIALIZE
    Skip Labels: NO
 INVALIDATE
 SET DRIVES EMPTY
```

- If the item pointer points to a command such as POSITION (commands are always displayed in all upper case letters), pressing ENTER executes the command.

```
O•••Position Handler
 To Location:llllll
➜POSITION
```

- When a command is executed, only the top line of the menu and the command name (centered on the third line) are displayed for the duration of the command's execution.

```
O•••Position Handler

       POSITION
```

- If a value contains an editable field, pressing ENTER highlights the first character of the field by superimposing a flashing cursor over it. This indicates the Edit mode is active and the value of the highlighted character can now be changed using the ▲ (UP) and ▼ (DOWN) keys.
- In the Edit mode, pressing ENTER moves the cursor one character to the right. If the cursor is over the rightmost character, pressing ENTER moves it back around to the leftmost character. The action repeats if the control key is held down.
- If a value contains a multiple-choice field, pressing ENTER highlights the field by superimposing a flashing cursor over it. Pressing ENTER again has no effect.

6.1.4 The EXIT Control Key

The EXIT key behaves as follows:

While editing a menu item's value, pressing the EXIT key exits the editor and restores the pointer to the menu item. Note that all values changed during editing are actually changed, exiting does not undo those changes. Press the EXIT key, while pointing to

any item in a menu, to return to the next higher menu. Press the EXIT key while the Top Menu is displayed to exit the Menu mode and return to the operating display.

6.1.5 The CALL Control Key

Pressing CALL causes the I/O port slot to extend and open the I/O port door. Fully inserting a cartridge causes the I/O port slot to retract and close the I/O port door. Pressing CALL a second time will also retract the I/O port slot and close the door. This function is duplicated using the daisy key (described below).

6.1.6 The ✽ (Daisy) Key and I/O Port Operation

When the Operating Display is visible, the ✽ (Daisy) key can be used together with the ▲ (UP), ▼ (DOWN), or MENU key to perform any one of three special functions:

✽ + MENU: Operates the I/O port (same as pressing the CALL control key).

✽ + ▲: Executes the PARK HIGH command.
This command moves the carriage to the top of its range of motion in the TLS.

✽ + ▼: Executes the PARK LOW command.
This command moves the carriage to the bottom of its range of motion in the TLS.

6.1.6.1 Operating the I/O Port

1. While the operating display is visible (Figure 6-1), press and hold down the ✽ (Daisy) key to view the ✽ (Daisy) key display (Figure 6-2), press the MENU key to extend the I/O port slot, then release both keys. The I/O port door opens automatically when the I/O port slot extends.

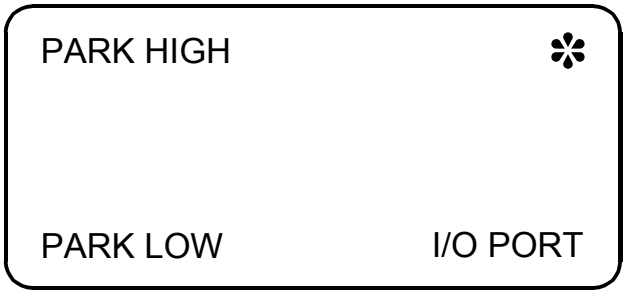


Figure 6-2 ✽ (Daisy) Key Display

2. Make certain the Write Enable/Protect tab on the tape cartridge is set correctly (see Figure 6-3), then fully insert the tape cartridge into the I/O port slot as shown (Write Enable/Protect tab facing out and on the right-hand side).

   - When the optical sensors detect a fully-inserted tape cartridge, the I/O port slot retracts, closing the I/O port door.
   - If the tape cartridge is not fully inserted, the door will remain open.

- If no tape is inserted, the I/O port slot retracts one or two minutes after the I/O port is summoned. Use the `Configuration\Advanced\Changer\I/O Port CALL Key` menu item to select either the one or two minute delay time.

3. The host software then determines where the tape cartridge should be stored. The storage location can also be manually determined using the menu system provided the menu system has not been locked by the system administrator.

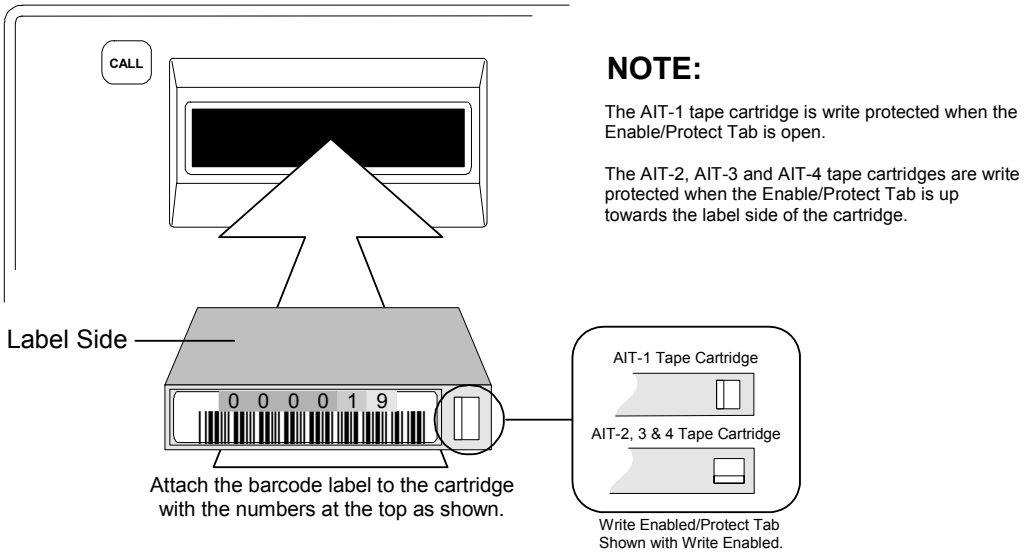


Figure 6-3 Inserting a Tape Cartridge into the I/O Port

6.1.6.2 Parking the Handler

While the operating display is visible (Figure 6-1), press and hold down the ✻ (Daisy) key to view the ✻ (Daisy) key menu (Figure 6-3), press the ▲ (UP) or ▼ (DOWN) key to execute the `PARK HIGH` or `PARK LOW` command, then release both keys.

6.2 The Top Menu

To see the Top Menu, turn on the TLS, wait until the display shows model number, then press the MENU key. The display should resemble the one in Figure 6-4.

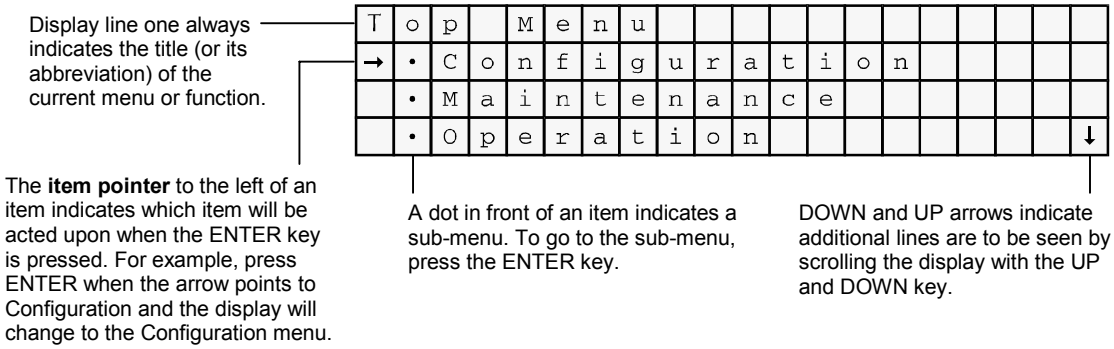


Figure 6-4 Top Menu Display

If the arrow is positioned next to Operation and then ENTER is pressed, a display similar to that shown in Figure 6-5 will be observed.

The up and down arrows at the right edge of the display indicate that additional choices are available. These additional choices can be viewed by using the ▲ (UP) and ▼ (DOWN) keys to scroll the display.

To go back to the Top Menu from any point, press the EXIT key until the Top Menu is displayed. The MENU key can also be pressed to accomplish the same result with a single keystroke. To leave the menu system entirely, press the EXIT or MENU key while the Top Menu is displayed.

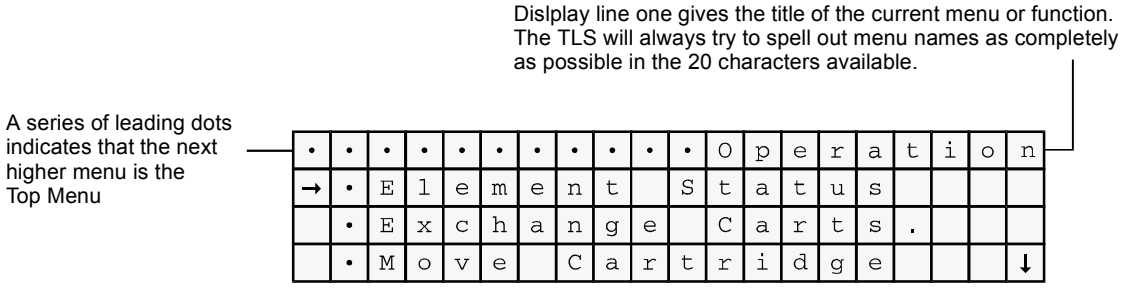


Figure 6-5 The Operation Menu

6.3 Menu Elements

6.3.1 Menu Items

Line 1 of any menu display always indicates the name of the menu right justified, with the exception of the Top Menu, where menu names are left justified. The name of, or an acronym for, the parent menu will precede the menu name and will be left justified. Bullets fill the space between the two menu names. Examples:

LINE 1 DISPLAY	INTERPRETATION
`Top Menu`	Top Menu
`•••••••Configuration`	Configuration Menu
`CA•••••Control Panel`	Configuration\Advanced\Control Panel Menu
`CA•Changer•Inventory`	Configuration\Advanced\Changer\Inventory Menu
`OES••••••••••Display`	Operation\Element Status\Display Menu

Lines 2 through 4 of any menu display may contain the following items:

Menu Name — A Menu Name is displayed with a single leading bullet and an upper/lower case name. Example:

- `Maintenance`

Command Name — A Command Name is displayed in all upper case letters without a bullet or colon. Example:

`SET TO DEFAULTS`

Value Name — A Value Name is displayed with an initial capital letter, a colon after the name, followed by a right-justified value field. Example:

`Contrast:    48`

Menu Name with Status — There are a few Menu Names that are followed by a status message. This is indicated by colon after the menu name followed by the status message, which summarizes the state of the sub-menu about to be entered. The status message is not editable. Example:

- `T1: Random     04`

In this example, Tape Drive T1 is in the Random mode and is set to SCSI ID 4. Pressing the ENTER key when selected will enter the Tape Drive T1 sub-menu.

6.3.2 Values

The data to the right of the colon after a value name represents the current value of that item. There are several types of values:

6.3.2.1 Numeric Values

These values may contain leading zeros. Some leading zeros are displayed during editing, but are blank up to the first non-zero digit when the menu is exited. Valid values are separately determined for each item and are always within a contiguous range. All numeric values carry and borrow to or from their more significant digits. There are three types of numeric values found within the system:

Unsigned Decimal Values	Examples: `23, 07, 123`
Signed Decimal Values	These values are always indicated by the presence of a plus or minus sign in front of the numerical value. The plus or minus signs are editable. Examples: `+07, +7, -123`
Hexadecimal Values	These values are always unsigned and consist of the digits 0-9 and A-F. Leading zeros are always indicated. Examples: `003F, FE10`

6.3.2.2 Alphanumeric Values

These values can contain up to 96 different characters (see Section 6.3.4.4), including ten numerals (0-9), upper and lower case letters and special characters, like spaces, dashes, etc. There is no rollover between digits. Example:

```
Qualstar TLS-4212
```

6.3.2.3 Multiple-Choice Values

Each multiple-choice value has its own list of valid choices. These values are selectable, but not editable. The choices available may vary with different system configurations. Examples:

```
YES, NO, BOTH, FRONT, HOST
```

NOTICE

The values displayed are always the actual values. If a displayed value is changed in the display, it is immediately changed within the system. If it is necessary to change back to an original value, the displayed value must be changed back to the original value.

6.3.3 Location Designators

Refer to Section 3.4.8 for definitions of locations and SCSI elements.

A Location Designator contains six characters used to describe any *physical* location. A "**p**" in the first character signifies a *physical* location and then the five remaining characters are defined below. **When a character is not required to define a particular location, the character is replaced with a decimal point or dot.**

Space	Reserved	Face	Type/Story	Digit	Digit
p	•	•,1-6	A,B,F,H,I,P or T	•,0-9	•,0-9

Table 6-1 The *physical* Location Field

Character	Definition
Space	This character is always a lower-case "p" when describing the *physical* space. Characters a-d indicate logical libraries a-d element address space.
Face	This character is only needed to describe which face the desired magazine is located on. A decimal point appears when this character is not needed.
Type/ Story	When describing a magazine location, the story (A, or B) is defined here. Note that stories are always uppercase. Besides magazine location, there are five other types of locations defined by this character: F for Fixed, H for Handler, I for I/O port, P for Private and T for Tape Drive.
Digits	These two digits are used to describe which tape drive or which magazine slot is selected.

Table 6-2 *physical* Character Definitions

Example	Definition
p..H..	The Handler
p..I..	The I/O port
p.1A01	The first magazine storage location: Face 1, Story A, Slot 01
p.1A10	The last storage location in the first magazine: Face 1, Story A, Slot 10
p..T1.	The topmost tape drive.
p.1F..	The first Fixed location on a carousel.
p.....	An unassigned location

Table 6-3 Location Designator Examples

By changing the Space character from a "p" to an "a", "b", "c" or "d" you can view the SCSI element address of the physical location described in the *physical* space of logical libraries a, b, c, or d. More on this subject in the next chapter.

Space	Ten-Thousands	Thousands	Hundreds	Tens	Units
a,b,c or d	0-6	0-9	0-9	0-9	0-9

Table 6-4 Element Address Library "a-d" Definition

6.3.4 Editing Values

When changing a displayed value, point to its name using the ▲ (UP) and ▼ (DOWN) keys, then press ENTER. Not all values are editable. If a cursor does not appear over the value when the ENTER key is pressed, then the value cannot be changed. If a cursor appears over the first character only, the value is either numeric, alphanumeric, or a cartridge location. If the cursor appears over the entire value, it is a multiple-choice value.

6.3.4.1 Editing Multiple-Choice Values

If the item contains a multiple-choice value, the entire value will be overlaid with flashing block cursors. Use the ▲ (UP) key to select the next value and the ▼ (DOWN) key to select the previous value and press the EXIT key when done. The list of choices wraps around, so all the choices are visible by using just the ▲ (UP) or ▼ (DOWN) key.

6.3.4.2 Editing non-Multiple-Choice Values

If only the first character of the value is highlighted with a flashing block cursor after pressing the ENTER key, the value is either numerical, alphanumerical, or a cartridge location. These values may be edited one character at a time using the ENTER key to select the character to be edited and then using the ▲ (UP) or ▼ (DOWN) key to change the character's value.

NOTE

The cursor wraps around from the last to the first character. Also, the ENTER, ▲ (UP) or ▼ (DOWN) keys automatically repeat when held down.

6.3.4.3 Editing Numerical Values

Numerical values may be edited one digit at a time or the entire value may be changed by simply incrementing or decrementing the least significant digit (or any intermediate digit). When incrementing the digit 9, it goes to 0 and a carry is added to the more significant digits. The opposite effect occurs for decrementing. This process will automatically stop at the upper and lower limits of the valid range for each item. Remember to take advantage of the automatic key repeat feature by holding down either the ▲ (UP) or the ▼ (DOWN) key.

The TLS will never allow making any value invalid. The choice for each digit is limited to valid values. For example, valid values for SCSI ID's range from 00 to 15. The range of some valid values may change with a system's particular configuration. In this example, if the X1 digit was selected, then the value can be incremented all the way from 00 to 15 and rolling over to 00 again by simply holding down the ▲ (UP) key. Holding the ▼ (DOWN) key will decrement the value to 00 and stop there.

6.3.4.4 Editing Alphanumeric Values

Either the ▲ (UP) or the ▼ (DOWN) keys can be used to edit alphanumeric characters one at a time. There are no carries or borrows to other characters. The choice for each

particular character will be limited to valid characters, which vary with the item and the character's position within it.

Table 6-5 shows the available alphanumeric characters (A/N) and their hexadecimal (hex) equivalents. The menu display A/N characters occur in the order shown in the table, starting with the "space" character, followed by the "A" character and ending with the " ` " character. The hexadecimal equivalents are those values sent over the SCSI interface in response to SCSI commands.

A/N	hex	A/N	hex	A/N	hex	A/N	hex	A/N	hex	A/N	hex	A/N	hex	A/N	hex
(space)	20	L	4C	X	58	j	6A	v	76	7	37	*	2A	[	5B
A	41	M	4D	Y	59	k	6B	w	77	8	38	+	2B	¥	5C
B	42	N	4E	Z	5A	l	6C	x	78	9	39	,	2C	]	5D
C	43	O	4F	a	61	m	6D	y	79	!	21	-	2D	^	5E
D	44	P	50	b	62	n	6E	z	7A	"	22	.	2E	_	5F
E	45	Q	51	c	63	o	6F	0	30	#	23	/	2F	{	7B
F	46	R	52	d	64	p	70	1	31	$	24	:	3A	|	7C
G	47	S	53	e	65	q	71	2	32	%	25	;	3B	}	7D
H	48	T	54	f	66	r	72	3	33	&	26	<	3C	→	7E
I	49	U	55	g	67	s	73	4	34	'	27	=	3D	←	7F
J	4A	V	56	h	68	t	74	5	35	(	28	>	3E	@	40
K	4B	W	57	i	69	u	75	6	36	)	29	?	3F	`	60

Table 6-5 Alphanumeric Characters and Hexadecimal Equivalents

6.3.4.5 Editing Cartridge Location Values (Designators)

There are two ways to edit cartridge location designators with either the ▲ (UP) or the ▼ (DOWN) key. First, like an alphanumeric value, a cartridge location designator can be edited one character at a time. Alternately, the entire cartridge location designator can be increment or decrement through a range of locations by editing the least significant digit (or intermediate digits) in a manner similar to editing a numerical value (see Editing Numerical Values in Section 6.3.4.3).

Cartridge location designators always contain one letter as follows:

A or **B** Magazine Stories (story B not found on all models)

F Fixed Locations (not available on all models)

H Handler

I I/O Slot (optional on some models)

P Private Slot (not available on all models)

T Tape Drive Locations

Refer to Figure 3-9 through Figure 3-14 in this manual to identify the location designators and their physical locations within the TLS.

To select a different designator, place the cursor on the letter and use the ▲ (UP) or the ▼ (DOWN) key to select a different letter. To further select a location that has digits, place the cursor over a digit. When magazine location digits are incremented or decremented, the value rolls over to the next (or previous) magazine. Examples:

```
A to B, 3B10 to 4A01, or 4A01 to 3B10
```

6.4 The Menu Hierarchy

The hierarchical menu system is divided into three menus: Configuration, Maintenance and Operation. Each of these menus contains several sub-menus. Some of the sub-menus may also contain more sub-menus beneath them.

The Top Menu is the highest level in the menu hierarchy. Press the MENU key to go to the top level at any time and from any point within the menu system. When the Top Menu is displayed, press the MENU or EXIT key to exit the menu mode. Figure 6-6 shows the available menu items in the Top Menu. The line items in menus and sub-menus are organized in alphabetical order.

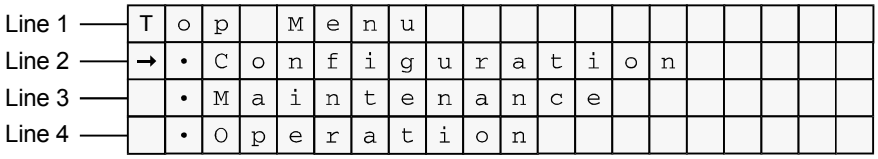


Figure 6-6 Top Menu

The Configuration menu contains items that may need to be changed when the TLS is installed. Once the configuration parameters have been correctly set for a given installation, they are not changed unless something in the system's configuration is changed. The Configuration menu is fully explained in Chapter 8.

NOTE

Be aware that the configuration parameters may also be set by the SCSI interface. An unexpected change may have been caused by the host system.

The Maintenance menu is designed to help a qualified repair technician diagnose and repair the TLS. Its functions are outside the scope of this manual and are fully explained in the TLS-4000 Technical Service Manual (Qualstar document number 501380).

The Operation menu is designed for the user. It allows an operator to perform tasks associated with the operation of the changer. A detailed description of the Operation menu appears in Chapter 9.

6.5 Displaying the TLS Firmware Revision

The revision of the changer's firmware may be displayed by using the `Maintenance` menu. Press the MENU key to display the `Top Menu`. Press the ▼ (DOWN) key until the arrow on the left side of the display points to `MAINTENANCE`, then press the ENTER key. Again, press the ▼ (DOWN) key until the arrow on the left side of the display points to the `Display Revision` sub-menu. Press the ENTER key to view the Date, Part Number, Revision, Checksum and ID of the Medium-changer's operating firmware. There may be a second or two of delay before this menu is displayed because the changer is calculating the firmware checksum.

6.6 Alerts

Alerts are important messages, which take over the entire display and remain visible until dismissed by the operator. If the alert message is longer than four lines, a down arrow in the lower right corner indicates more text is visible by scrolling the display with the ▼ (DOWN) key. The top line of an alert is always displayed in upper case letters and is centered with bullets filling out the line. Example:

•	•	•	M	O	V	E		C	A	R	T	R	I	D	G	E	•	•	•
	T	h	e		d	e	s	t	i	n	a	t	i	o	n		i	s	
	f	u	l	l	.														

Figure 6-7 Alert Example

Alerts can always be dismissed by pressing the EXIT key. When the EXIT key is pressed while an alert message is visible, the unit returns to the state it was in before the alert. The MENU key can also be used to dismiss alerts. When the MENU key is pressed while an alert message is visible, the display returns to the Top Menu.

6.7 Dynamic Menus and Menu Items

Dynamic menus and menu items only appear if all the required conditions for the menu have been configured and satisfied. For example, the `Operation\Clean Drive` menu (Section 9.3) only appears when all conditions are correct. Additionally, the `Operation\Sequential` menu will only appear when one or more tape drives are configured for Sequential operation.

7. Resource Management

7.1 Introduction

The physical resources of a TLS-4000 tape library may be sub-divided for multiple purposes by allocating tape drives and storage locations (which include Magazine slots and Fixed slots) to specific partitions. The Handler is a shared resource, which cannot be dedicated to any single task. To avoid contention problems, the physical I/O port can be assigned to only one partition however a VIOP may be assigned to any partition.

Resources cannot be shared between two enabled partitions. A logical library is enabled when it's Enable: value is set to ON (see section 8.13.1). A drive is enabled when it's Mode: value is set to Sequential, Recycle or Dual-Bin (see Section 8.20.8).

A good example of dedicated resources is that of a Sequential tape drive and its allocated storage locations. A sequential tape drive looks to the host computer as a singular tape drive with an operator supplying it with tapes. A host backup application which is not aware of tape libraries can simply write its backup data to the drive until the tape becomes filled. It then causes the tape to be rewound and ejected from the drive. A human operator or the changer can then insert the next tape needed to continue the backup operation. The host application is completely unaware of how the next tape gets inserted into the drive as well as where the tapes come from and go to.

For this example to succeed in an automated tape library, one or more tape cartridges must be dedicated to the Sequential backup performed by the drive. To the changer (referred to as the Medium-changer in the SCSI specifications), the tape drive and a group of cartridges are reserved for that task. These dedicated resources cannot be used for any other purpose. If this example is all that is required of the changer, then only a single drive is installed and all of the cartridges are dedicated to this single task.

However, the TLS-4000 libraries are much more flexible than our example. They can perform three modes of sequential backups on multiple tape drives for multiple host systems while simultaneously running multiple random logical library operations with other tape drives and cartridge locations. Before the library is put to use, you have to decide how it is to be used and then allocate the available resources to meet the requirements. This chapter will deal with this task.

7.2 Logical Libraries

When shipped from the factory, all TLS-4000 libraries look like a single library with all of its tape drives and storage slots dedicated to the random operation of Library-"a". This is generally the correct configuration for a single-host system running a library specific 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*. Physically, there is still one cabinet with one SCSI Medium-changer within it. That Medium-changer senses the SCSI ID of the host computer that is selecting it and can therefore indicate to that host that only a pre-determined (pre-configured) list of physical resources are available to it. Up to four of these library partitions are available.

Logical library partitioning is only possible when the hosts and the Medium Changer use SCSI to communicate. This feature is not available when the Medium Changer is connected via Fibre Channel.

If more than one logical library is to be defined, then a list of tape drives and cartridge locations for each of logical library must be made. No overlapping of resources (for either logical libraries or sequential drives) is allowed and the allocations need not be equal. The drives, fixed locations and magazine slots must be allocated in contiguous ranges (from First-to Last).

7.3 Sequential Operations

A sequential tape drive looks to the host computer as a stand-alone tape drive with an operator supplying it with tapes. A host backup application which is not aware of tape libraries can simply write its backup data to the drive until the tape becomes filled. It then causes the tape to be rewound and ejected from the drive. A human operator or the Medium-changer can then insert the next tape needed to complete the backup operation. The host application is completely unaware of how the next tape gets inserted into the drive as well as where the tapes come from and go to. When the Medium-changer does the work of supplying tapes to and removing them from a tape drive, the process is called Sequential operation.

There are three types of Sequential operation: Sequential, Recycle and Dual-Bin. For Sequential or Recycle operation, a single contiguous range of cartridge locations (Input) is assigned to each sequential drive for its exclusive use. Sequential operation stops when the last cartridge has been returned to it original storage slot while Recycle operation will restart the cycle after its completion. To put it another way – Sequential operation is a single pass mode while the Recycle mode runs continuously. In both of 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.

There can be many Sequential or Recycle drives and each requires one contiguous range of magazine storage locations. Each Dual-Bin drive requires two contiguous ranges of magazine storage locations (which do not have to be adjoining). Care should be used when allocating these ranges so that unusable gaps between ranges do not occur as those storage locations will not be available for any other use.

This flexible design allows the user to partition the library's resources to best meet overall system needs. With a TLS-46120, for example, it is possible to have one library serve as the tape storage device for six separate systems. See Chapter 10 for detailed information on Sequential Operation.

7.4 Resource Inventory

The first order of business is to document precisely what is in your TLS. This data will then be used when allocating resources to different partitions. The following table indicates the resources available for each model.

Model	Tape Drives	Carousel	I/O Port	VIOP	Fixed Slots	Magazine Mounts
TLS-4212	T1, T2	No	Never	Yes	F1, F2, F3, F4	A
TLS-4212i	T1, T2	No	Yes	Yes	F1, F2, F3	A
TLS-4222	T1, T2	Yes	Never	Yes	F1, F2, 1F, 2F *	1A, 2A
TLS-4222i	T1, T2	Yes	Yes	Yes	F1, F2	1A, 2A
TLS-4440	T1, T2, T3, T4	Yes	Yes	Yes	1F, 3F	1A, 1B, 3A, 3B
TLS-4480	T1, T2, T3, T4	Yes	Yes	Yes	1F, 2F, 3F, 4F	1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B
TLS-4660	T1, T2, T3, T4, T5, T6	Yes	Yes	Yes	1F, 3F, 5F	1A, 1B, 3A, 3B, 5A, 5B
TLS-46120	T1, T2, T3, T4, T5, T6	Yes	Yes	Yes	1F, 2F, 3F, 4F, 5F, 6F	1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B

There are 10 slots per magazine. Not all mounts may have magazines installed.
* This is not an error. F1 and F2 are fixed on the drive bay. 1F and 2F rotate on the carousel and are found on Faces 1 and 2.

Table 7-1 Available TLS Resources by Model

Fill out the TLS-Model line and the Tape Drive Allocation Table below to indicate which resources are installed in your TLS as well as some of their facts (why not use a pencil or first make a copy of this page). The "MC" row in the table is for the TLS' changer (referred to as a SCSI Medium-changer (MC)). The MC is frequently connected to the same bus as some of the tape drives.

The number of tape drives is model dependent and not all of them need be installed. Because of limitations in some applications, all tape drives on the same SCSI bus should be installed from top to bottom (in numerical order from D1 to D6).

Observe the hatch assembly number on the rear of the TLS and then view Figure 5-45 or Figure 5-46 to determine the internal SCSI wiring. Decide if multiple internal cables will be bridged together externally. Then make certain that HVD drives are never mixed on the same SCSI bus with SE or LVD drives or the standard LVD/SE Medium-changer.

It is possible to have up to four separate SCSI busses connected to a TLS-4000. After Table 7-2 has been filled out, make certain there are no SCSI ID conflicts within each SCSI bus. Multiple buses may be bridged together – see Section 5.12.

7.5 Resource Allocation Worksheet

TLS-Model: TLS-_____, HVD Adapter (Y/N)_____, Hatch Assembly P/N:_____

Device	Make	Model	SCSI Interface	SCSI Bus	SCSI ID	Allocated to:*
MC	Qualstar	TLS-4xxxx	[LVD/SE-16]		[0]	
T1					[1]	
T2					[2]	
T3					[3]	
T4					[4]	
T5					[5]	
T6					[6]	

- Factory Default Values are shown in brackets [default value]
- SCSI Interface Types: SE-8, SE-16, HVD-8, HVD-16, LVD/SE-16.
  Never mix HVD with SE or LVD on the same bus.
- Tape Drive Information:
  AIT-1: Sony SDX-300C/L SE-16, Sony SDX-310C/L HVD-16
  AIT-2: Sony SDX-500C/L LVD/SE-16, Sony SDX-510C/L HVD-16
  AIT-3: Sony SDX-700C/L LVD/SE-16; Sony SDX-700V LVD/SE-16
  AIT-4: Sony SDX-900V LVD/SE-16

* Allocated to: [Library-a], Library-b, Library-c, Library-d, or Sequential # (where # is the Drive number).

Table 7-2 Tape Drive Allocation Table

Partition	Tape Drives		Fixed Slots		Magazine Slots		VIOP Slots*		I/O Port * Assigned To: ⑨	Initiators SCSI ID ⑩
	From ①	To ②	From ③	To ④	From ⑤	To ⑥	From ⑦	To ⑧		
Library-a										
Library-b										
Library-c										
Library-d										

Presently, the I/O port can be assigned to only one logical library however a VIOP may be assigned to any logical library.

Table 7-3 Logical Library Resource Allocations

Partition (drive specific)	Sequential Mode ①	Input Mag. Slots		Output Mag. Slots*	
		First ②	Last ③	First ④	Last ⑤
Sequential-T1					
Sequential-T2					
Sequential-T3					
Sequential-T4					
Sequential-T5					
Sequential-T6					

Sequential Modes: Sequential, Recycle and Dual-Bin (see Section–7.3)
* Output Magazine Slots used for Dual-Bin mode only. Must be same or greater number of slots than the Input magazine. slots.

Table 7-4 Sequential Tape Drive Resource Allocations

7.5.1 Resource Allocation Procedure

1. Fill out the line just above Table 7-2. If a SCSI HVD adapter is installed, a HVD SCSI label will appear adjacent to the top SCSI connector. Otherwise, an LVD/SE label indicates the default SCSI interface for the Medium-changer.

2. Refer to Cartridge Location Diagrams in Figure 3-9 through Figure 3-14.

3. Fill out all but the last column of the Tape Drive Allocation chart (Table 7-2). The SCSI bus column may be used to indicate separate busses.

4. Decide if the Medium-changer will be sub-divided with sequential tape drives or logical libraries. If resources will not be sub-divided, then they will all be allocated to *random* Library-a. Fill in the first row for Table 7-3 to match the installed drives and magazine mounts. You are done with this procedure.

5. If there is to be more than one logical library , allocate the tape drives for Library-a in the Resource Allocations table (Table 7-3). Repeat this process for each additional logical library (limited to four). Then allocate the fixed tape slots. Finally allocate the magazine slots for each partition. Although it is permissible to place an allocation dividing line in the middle of a magazine, this is not recommended because when a magazine is manually removed, it may contain tapes from more than one partition. It is preferable to allocate cartridge locations by whole magazines (10 slots each) to any partition. Indicate the SCSI ID of all host computers (SCSI Initiators) which will communicate with each library in the last column.

6. If there are to be any sequential tape drives, fill in Table 7-4 at this time. Line out those drives which are allocated to logical libraries or not installed. Indicate which sequential mode is to be used for each drive. Use the unallocated magazine slots from the Table 7-3 to allocate slots to each sequential drive. Sequential drives running in the Dual-bin mode require two identical slot allocations because of their separate input- and output-bins. The input and output bins need not be adjacent, although that is a good practice.

7. Verify that only existing resources have been allocated and that there are no resources allocated to more than one partition. All resources do not have to be allocated.

7.5.2 Resource Allocation Examples

Example 1: TLS-46120 with all six drives installed. Partitioned into 1 logical library with 1 sequential drive and 1 dual-bin sequential drive. Two host computers at SCSI ID's 14 and 15 are communicating with the medium changer.

Partition	Tape Drives		Fixed Slots		Magazine Slots		VIOP Slots*		I/O Port * Assigned To: ⑨	Initiators SCSI ID ⑩
	From ①	To ②	From ③	To ④	From ⑤	To ⑥	From ⑦	To ⑧		
Library-a	T1	T4	1F	6F	1A01	4A10	5A01	5A10		14, 15
~~Library-b~~										
~~Library-c~~										
~~Library-d~~										

Partition (drive specific)	Sequential Mode ①	Input Mag. Slots		Output Mag. Slots*	
		First ②	Last ③	First ④	Last ⑤
~~Sequential-T1~~					
~~Sequential-T2~~					
~~Sequential-T3~~					
~~Sequential-T4~~					
Sequential-T5	Sequential	5B01	5B10	N/A	N/A
Sequential-T6	Dual-Bin	6A01	6A10	6B01	6B10

* Presently, the I/O port can be assigned to only one logical library however a VIOP may be assigned to any logical library.

Example 2: TLS-46120 with all six drives installed. Partitioned into 2 logical libraries and no sequential drives.

Partition	Tape Drives		Fixed Slots		Magazine Slots		VIOP Slots*		I/O Port * Assigned To: ⑨	Initiators SCSI ID ⑩
	From ①	To ②	From ③	To ④	From ⑤	To ⑥	From ⑦	To ⑧		
Library-a	T1	T3	1F	3F	1A01	3B10	6B01	6B10		6, 14
Library-b	T4	T6	4F	6F	4A01	6A10			Here	7, 15
~~Library-c~~										
~~Library-d~~										

* Presently, the I/O port can be assigned to only one logical library however a VIOP may be assigned to any logical library.

7.6 Configuring the TLS for the Desired Allocations

Follow this procedure to change the resource allocation for more than one logical library (library-a) or the addition of sequential tape drives. This procedure assumes you are familiar with the menu structure and its operation. If not, refer to Chapter 6 for instructions.

Note

The TLS will not allow a single resource to be allocated to two or more enabled partitions. Partitions are disabled automatically if a change is made to any resource allocation. (Library to OFF, Drive to Random, etc.). The partition cannot be re-enabled if an overlapping condition occurs.

1. Allocate the drives, fixed and magazine slots for Logical Library-a. Refer to the `Configuration\Advanced\Library ?` table below (Table 7-5) to set the indicated value or the values from the columns indicated in the Logical Libraries Resource Allocations table (Table 7-3). Leave all Logical Libraries disabled (`Enable: OFF`) until any sequential tape drives have been configured (refer to Section 8.13).

2. If necessary, repeat Step 1 for each logical library b–d.

`Configuration\Advanced\Library ?` menu	
Variable	**Value From Column # of Table 7-3**
Enable:	OFF
Drive First:	1
Drive Last:	2
Fixed First:	3
Fixed Last:	4
Slot First:	5
Slot Last:	6
VIOP First:	7
VIOP Last:	8
I/O Port:	9

"?" represents the partition being configured (a, b, c, or d). If an I/O port is installed, then it may be allocated to only one partition however a VIOP may be assigned to any logical library.

Table 7-5 Configuration\Advanced Library ?

3. Unlock and open the door before configuring the tape drives. Any given drive can be allocated to a Logical Library or sequential operation, but not both.

4. If logical libraries exist, indicate which SCSI Initiators each library responds to in the `Configuration\Advanced\SCSI\Library` menu as indicated in column 8 of the Logical Library Resource Allocations table (Table 7-3).

5. Enter the `Configuration\Drive\T1` menu (see Sections 8.19 and 8.20). If this drive is assigned to a logical library, be certain that its Mode: value is set to Random. If the Mode: value is set to Random, then ignore the input and output range values. Refer to the `Configuration\Drive\T?` table below to set the values in the Sequential Tape Drive Resource Allocations table (Table 7-4).

6. Repeat step 4 for each installed tape drive (T2…T6).

`Configuration\Drive\T?` menu	
Variable	**Value From Column # of Table 7-4**
Mode:	1
Input First:	2
Input Last:	3
Output First:	4
Output Last:	5

"?" represents the partition being configured (a, b, etc.).

Table 7-6 Configuration\Drive\T?

7. Configure each library and drive according to all of the parameters of Sections 8.13 and 8.20.

8. Now enable the active Logical Libraries by changing their `Configuration\Advanced\Library ?\Enable:` values to `ON`. If the value cannot be set to ON, the problem may be that a resource has been allocated to more than one library or sequential drive.

9. If logical libraries exist, each one must know to which SCSI initiators (host computers) it should respond. For each logical library, set its letter (a–d) following each Initiator ID that it is to respond to in the `Configuration\Advanced\SCSI\Library` menu (refer to Section 8.17).

8. The Configuration Menu

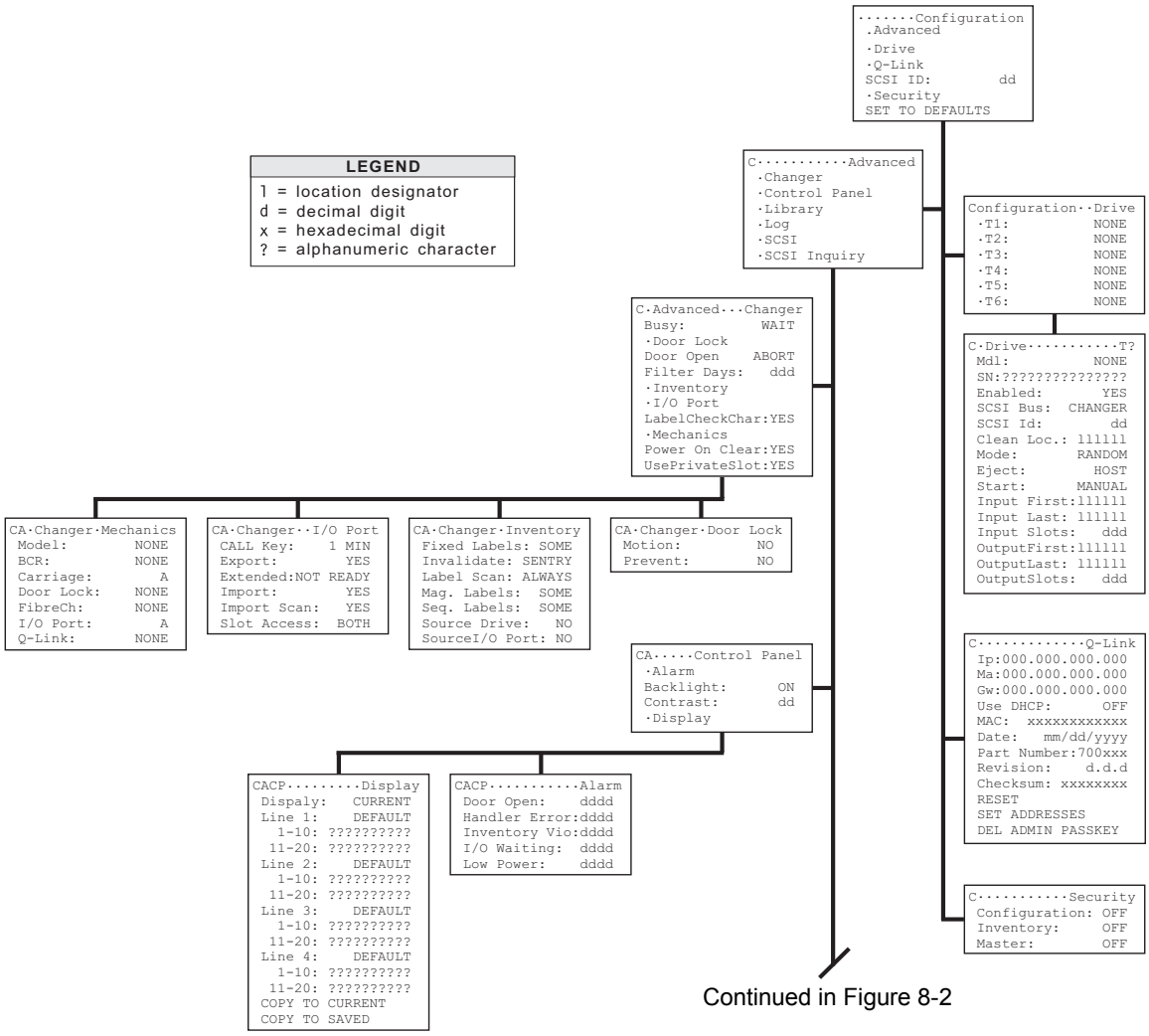


Figure 8-1 The Configuration Menu (Part 1)

The `Configuration` menu is used to customize the operation of the TLS-4000 to meet the system requirements. The `Configuration` menu consists of several sub-menus, some affecting the unit's interaction with the SCSI system, and others affecting the unit's interaction with the user. Once the items in the `Configuration` menu have been customized, the `Configuration` menu should not have to be revisited, unless the configuration of the changer or the SCSI system (e.g. adding or removing tape drives) is changed.

The following sections explain each menu in detail. An explanation of the display and detailed instructions on navigating the menu system are contained in Chapter 6. Not all values or menu items appear at all times; some depend upon the model of library in use, other configuration parameters and incomplete prerequisite conditions. Menu items and values appear in alphabetic order in the menus or lists of menu items.

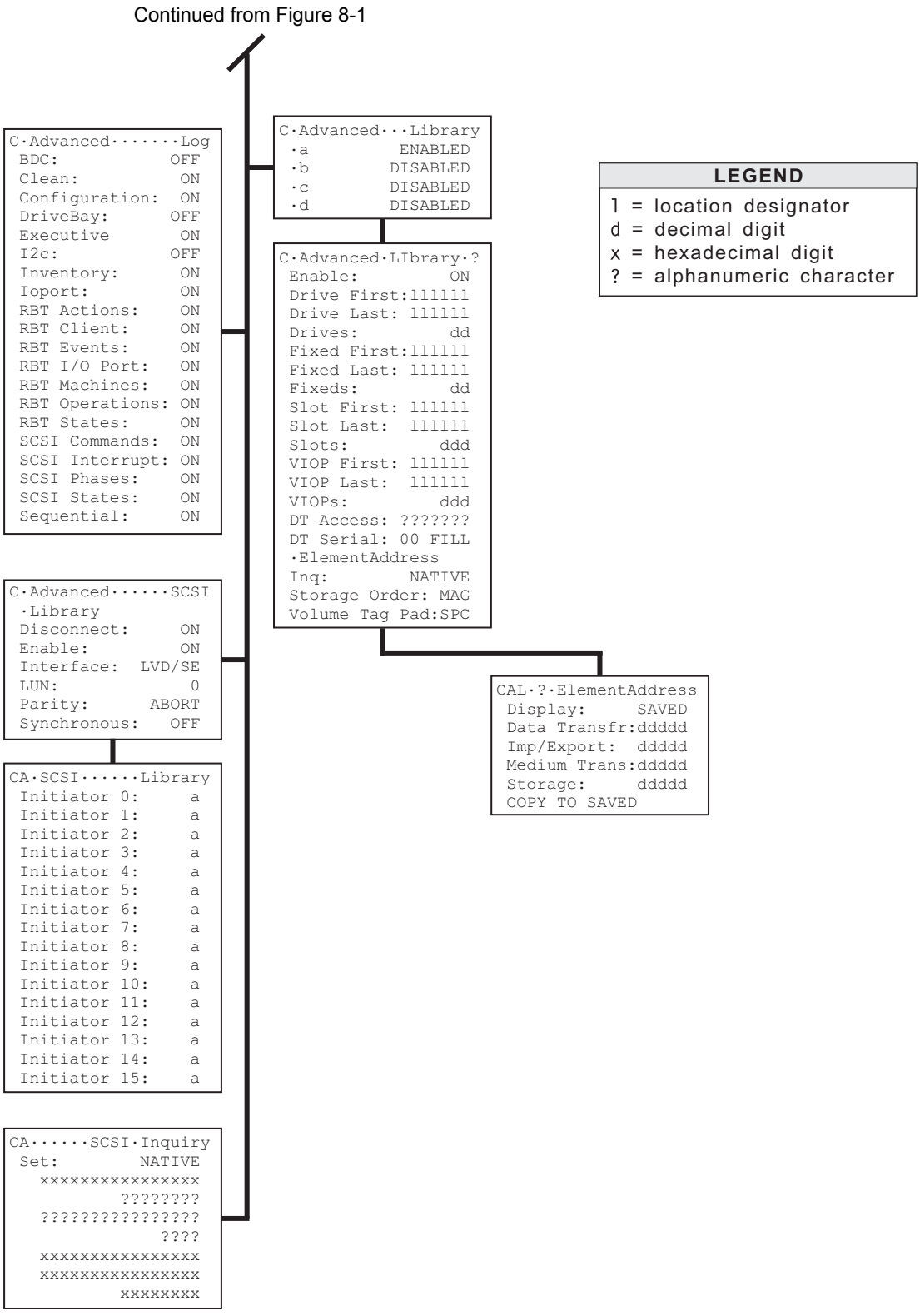


Figure 8-2 The Configuration Menu (Part 2)

The Legends in Figure 8-1 and Figure 8-2 indicate the types of digits found in the value items of the Configuration menu's sub-menus. An explanation of each type is given below in Table 8-1.

Legend	Explanation
d	**Decimal** digit (0-9): A Decimal value contains one or more decimal digits, indicating the present value of the item. Examples: **Face** value: This value indicates which carousel face is currently presented to the carriage. Face values range from 1 to 6. **Element** address (sometimes abbreviated **Elem**.): This value is the address used by the SCSI host to select a system element. Address values range from 0 to 65535.
l	**Location Designators**: This value describes the physical location of a cartridge, tape drive, etc. See Section 6.3.3
x	**Hexadecimal** digit (0-9, A-F): A hexadecimal value contains one or more hexadecimal digits, indicating the present value of the item.
?	**Alphanumeric** character: An alphanumeric value contains one or more alphanumeric characters, indicating the present value of the item.

Table 8-1 Legend of Configuration Menu's Digits

8.1 Configuration\Security Menu

```
C••••••••••Security
 Configuration: OFF
 Inventory:     OFF
 Master:        OFF
```

NOTE

All items in this menu are locked by the Door Lock.

There are four types of security locks in the changer's menu system: Configuration, Inventory, Master and Door. They are used to prevent inadvertent or unauthorized modification of the library's configuration or inventory. The locks are also used to prevent any kind of unauthorized manual operations.

The Security menu is used to set the first three locking items to ON or OFF. The Door lock is controlled by opening or closing the door. For example, when the door is open, the Door lock is unlocked (OFF). When the door is closed, the Door lock is locked (ON). The Door lock's unlocked state (cabinet door open) is equivalent to the OFF condition for the other three types of security locks.

Setting any or all of the security locks to ON does not disable navigation through the menu structure, rather it simply prevents certain values from being changed, or the execution of certain commands. When an item is secured by more than one lock, all of the locks used to secure the item must be set to OFF, before the locked item can be changed or executed.

If an attempt is made to change or invoke a locked item, an Alert message appears in the display, explaining why it cannot be changed or invoked. Table 8-2 shows which items can be secured by each of the four security locks.

8.1.1 Door Lock

The Door lock provides an added measure of security, because the Door lock controls access to the items in the Security menu. Since the Security menu items are used to open or lock the other three security locks (Configuration, Inventory and Master), locking the cabinet door and controlling access to the door key prevents any person without a key from opening or locking the other three security locks.

Example:
If a menu item is locked by the Door lock (see Table 8-2), the menu item can only be changed while the cabinet door is open. Therefore, the cabinet door must first be unlocked with the door key, and then opened, before the locked menu item can be changed.

8.1.2 Configuration Lock

When the Configuration lock is ON, certain values found in the Configuration menu cannot be changed. This prevents unauthorized changes to a secured changer configuration.

8.1.3 Inventory Lock

When the Inventory lock is ON, cartridges cannot be moved and the inventory cannot be invalidated using commands in the Operation menu. Since the PARK HANDLER and POSITION HANDLER commands do not alter the inventory, they are not affected by the security locks. Therefore, the two commands can always be executed at any time.

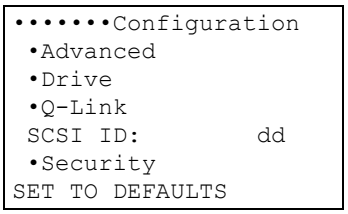
8.1.4 Master Lock

The Master lock provides the maximum system security. When the Master lock is set to ON, the control keys cannot be used to change the changer's configuration, initiate any operations, or execute any commands. Only the host system can control the changer, effectively configuring the system for remote operation only.

Door Lock	Configuration Lock	Inventory Lock	Master Lock	Menu	Item
✓	✓		✓	\Configuration	SCSI ID:
	✓		✓		SET TO DEFAULTS
	✓		✓	\Configuration\Advanced\ Control Panel\Alarm	*all items*
	✓		✓	\Configuration\Advanced\ Control Panel\Display	*all items*
	✓		✓	\Configuration\Advanced\Changer	Busy:, Door Open:, Filter Days:, LabelCheckChar:, Power On Clear:, Use Private Slot:
	✓		✓	\Configuration\Advanced\Changer \Door Lock	Motion:, Prevent:
	✓		✓	\Configuration\Advanced\Changer \Inventory	*all items*
	✓		✓	\Configuration\Advanced\Changer \I/O Port	*all items*
✓	✓		✓	\Configuration\Advanced\Changer \Mechanics	*all items*
	✓		✓	\Configuration\Advanced\Library	a:, b:, c:, d:
✓	✓		✓	\Configuration\Advanced\Library ?	Enable:, Drive First:, Drive Last:, Drives:, Fixed First:, Fixed Last:, Fixeds:, Slot First:, Slot Last: Slots:, VIOP First:, VIOP Last:, Storage Order:
	✓		✓		DT Access:, DT Serial:, Inq:, Volume Tag Pad:
	✓		✓	\Configuration\Advanced\Library ? \ElementAddress	*all items except* Display:
	✓		✓	\Configuration\Advanced\Log	*all items*
	✓		✓	\Configuration\Advanced\SCSI	Disconnect:, Enable:, Parity:, Synchronous:
✓	✓		✓		LUN:
✓	✓		✓	\Configuration\Advanced\SCSI \Library	*all items*
	✓		✓	\Configuration\Advanced\SCSI \Inquiry	*all items except* Inquiry:
✓	✓		✓	\Configuration\Drive T?	Mdl:, Enabled:, Mode:, Start:, Input First:, Input Last:, Input Slots:, OutputFirst:, OutputLast:, OutputSlots
	✓		✓		SCSI Bus:, SCSI Id:, Clean Loc.:, Eject:
✓				\Configuration\Security	*all items*
			✓	\Maintenance\Display Log	CLEAR, LOCK, UNLOCK
			✓	\Operation\Clean Drive	*all items*
		✓	✓	\Operation\Demonstrations	START RANDOM MOVES
		✓	✓	\Operation\Element Status	INITIALIZE, INVALIDATE, SET DRIVES EMPTY
		✓	✓	\Operation\Exchange Cartridges	EXCHANGE
		✓	✓	\Operation\Move Cartridge	MOVE
			✓	\Operation\Sequential\T?	EMPTY, START, STOP

Table 8-2 TLS Security Locks

8.2 Configuration Menu

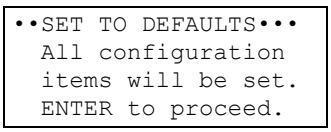


This menu is the root configuration menu. It contains sub-menus and commands.

8.2.1 SCSI ID

Assigns a SCSI ID to the Medium-changer. Valid values are 0 through 15 with 0 being the initial value. This value is not changed by the `SET TO DEFAULTS` command.

8.2.2 SET TO DEFAULTS

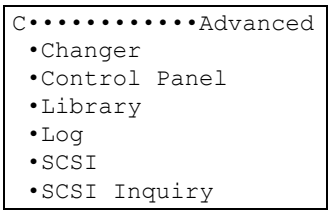


NOTE

This command is locked by the Configuration Lock and the Master Lock.

This command resets most items in the `Configuration` menu having a default value to their factory default settings. Select `SET TO DEFAULTS`, then press the ENTER key to execute the command. SCSI ID's (changer or drives) are not changed by this command. Default values, if any exist, are given in the individual descriptions for each menu item.

8.3 Configuration\Advanced Menu



This `Configuration\Advanced` menu lists six sub-menus.

8.4 Configuration\Advanced\Changer Menu

```
C•Advanced•••Changer
 Busy:          WAIT
 •Door Lock
 Door Open:    ABORT
 Filter Days     ddd
 •Inventory
 •I/O Port
 LabelCheckChar:YES
 •Mechanics
 Power On Clear:YES
 UsePrivateSlot:YES
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. See Section 8.1.

This menu permits control of certain aspects of TLS operation.

8.4.1 Busy

This value determines how the changer responds to the host if it receives a command while it is busy.

BUSY The changer returns a BUSY status to the host.

WAIT The changer will wait until it is not busy before executing the command. If it is allowed, the changer will disconnect from the SCSI bus (default value).

NOT READY The changer returns a CHECK CONDITION status with a Sense Key value of NOT READY, plus the appropriate information in the ASC and ASCQ data. Refer to the TLS-4000 SCSI-2 Interface Manual, Qualstar document number 500523.

8.4.2 Door Open

This value determines the action the carriage/handler takes when the door is opened while the carriage/handler is moving.

ABORT The carriage/handler stops and does not resume operation when the door is closed (default value).

HOLD The carriage/handler stops, and then resumes operation when the door is closed.

8.4.3 Filter Days

The `Filter Days` value determines how often the changer reminds the operator to check the air filter. The default value is 120 power-on days. The maximum value permitted is 365 power-on days.

The time from the last reset of the Filter Days parameter is counted by the power-on filter timer. When the cumulative filter time reaches the value specified by the `Filter Days` parameter, the "Check the air filter" alert message appears on the Control Panel Display. The alert message will not appear on the Control Panel Display while any menu is displayed, but it will appear within one minute after exiting the menu system. Power interruptions *do not* affect the power-on filter count or reset the counter to zero.

When the air filter alert message appears, pressing either the ENTER key or the EXIT key will dismiss the message. If the ENTER key is pressed, the power-on filter timer is reset to zero. Then, the alert message will not reappear until the cumulative power-on-days exceeds the `Filter Days` value once more. If the EXIT key is pressed, the timer continues to count. In this case, the alert message will reappear within one minute after the EXIT key is pressed, unless the `Filter Days` value is increased.

The optimum value for the time between air filter changes depends upon the cleanliness of the operating environment. Start with the default value of 120 days. Then, after gaining experience with the operating environment, adjust the `Filter Days` value to fit the particular operating conditions. The procedure for checking the air filter is given in Chapter 12.

8.4.4 LabelCheckChar

The LabelCheckChar value determines whether the changer expects a check character on barcode labels.

YES A barcode label must contain a valid check character in order to be read with valid status. It is possible for some labels without check characters to read correctly, because the last character on the label happens to be the same as a valid check character for the preceding characters (default value).

If the labels do not have check characters, approximately 2% of them will read without error but will have one less character than expected.

NO The changer will not expect a check character. However, if one is present, it will appear as an extra character in the barcode label data.

8.4.5 Power On Clear

The `Power On Clear` value determines how the changer deals with the abnormal presence of a cartridge in the Handler when TLS power is applied. The default (and generally preferred) `Power On Clear` value is YES.

YES If a cartridge is present in the Handler when TLS power is applied and the `Power On Clear` value is set to YES, the changer stores the cartridge in an available magazine location. If no magazine location is available, then the cartridge remains where it is.

NO If there is a cartridge in the Handler when TLS power is applied, it remains where it is, and it is up to the SCSI host to store the cartridge.

8.4.6 UsePrivateSlot

If your model has a Private Slot, then the changer can perform a cartridge exchange command with a completely full system (all locations occupied). In addition, barcodes on cartridges stored in upper fixed slots and the I/O port can be read, even if the system is completely full.

YES If the `UsePrivateSlot` value is set to `YES`, the changer can use the Private Slot (default value).

NO If the `UsePrivateSlot` value is set to `NO`, the changer never uses the Private Slot.

There is a remote possibility that a power failure could occur while a cartridge is temporarily stored in the Private Slot. Since the Private Slot is not visible to the SCSI host, if the `Configuration\Advanced\Changer\Power On Clear` value is set to `NO`, the cartridge stored in the Private Slot disappears from the inventory data available to host or operator when TLS power is reapplied (the changer still knows its there). This never happens when the `UsePrivateSlot` value is set to `NO`. However, a `NO` setting may prevent a cartridge exchange if the system is completely full (no available slots). In addition, if the system is completely full and `UsePrivateSlot` is set to `NO`, the changer will not be able to read the barcode labels on cartridges stored in upper fixed slots or the I/O port.

8.5 Configuration\Advanced\Changer\Door Lock Menu

```
CA•Changer•Door Lock
 Motion:          NO
 Prevent:         NO
```

This feature is currently not available on TLS-4000 libraries.

8.6 Configuration\Advanced\Changer\Inventory Menu

```
CA•Changer•Inventory
 Fixed Labels: SOME
 Invalidate: SENTRY
 Label Scan: ALWAYS
 Mag. Labels:  SOME
 Seq. Labels:  SOME
 Source Drive:   NO
 SourceI/O Port: NO
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. See Section 8.1.

This menu defines the conditions under which the inventory will be rescanned, and which items will be rescanned. It also defines how the changer reports to the SCSI host the source of cartridges that may have come from a tape drive or the I/O port.

The values in this menu interact with each other and with the SCSI host software. An understanding of the following concepts will help in determining the best settings for the particular application.

Inventory — At all times, the changer maintains an internal database of the library contents called the inventory. Barcode information is also stored as part of the inventory database. Whenever the handler moves a cartridge, the changer updates the inventory to reflect the change.

Scanning — A scan or rescan operation gathers current information about the inventory. The presence or absence of cartridges at all locations must be known. In addition, the barcode data must be recorded for each location with a barcode label. Generally, to save time, the changer only scans invalid locations. For example, if a barcoded cartridge is introduced through the I/O port, only that one new cartridge must be scanned.

If power is lost, or if the Inventory Sentry Beam is disturbed, the entire inventory is invalidated. The changer must then scan the entire inventory to validate its database. If this scanning operation is interrupted (perhaps by opening the door), only the remaining invalid locations must be scanned when scanning resumes.

Barcodes — Barcodes complicate the inventory scanning process. If a cartridge is present, it may or may not have a barcode label attached to it. Because the changer cannot tell whether a cartridge has a barcode label, the Barcode Reader always tries to read a barcode on each cartridge. For example, if the Barcode Reader cannot read a valid barcode on a given cartridge, it tries several times to correctly read the label.

8.6.1 Fixed Labels

The `Fixed Labels` value indicates whether barcode labels are expected in the Fixed slots of the library. `Fixed Labels` only appears in the menu when a Barcode Reader is installed.

`Fixed Labels` is a multiple-choice value with the options listed below:

SOME The changer expects *some* cartridges in the Fixed Labels area to contain barcode labels.
All cartridges in the Fixed Labels area are scanned for barcodes.
Invalid barcode labels *are not* rescanned (default value).

ALL The changer expects *all* cartridges in the Fixed Labels area to contain barcode labels.
All cartridges in the Fixed Labels area are scanned for barcodes.
Invalid barcode labels *are* rescanned.

NONE The changer does not scan cartridges in the Fixed Labels area for barcode labels.

8.6.2 Invalidate

This value indicates the condition that invalidates the inventory.

`Invalidate` is a multiple-choice value with the options listed below:

SENTRY The inventory is invalidated whenever the Inventory Sentry Beam is disturbed (default value).

DOOR The inventory is invalidated whenever the door is opened.

NEVER The changer never invalidates the inventory.

8.6.3 Label Scan

This value controls barcode scanning. When the changer scans the inventory, it always checks for occupied locations and the Barcode Reader can also scan barcode labels.

`Label Scan` is a multiple-choice value with the options listed below:

ALWAYS When the changer checks the inventory for occupied storage locations, it also scans for barcode labels in those storage areas indicated by the `Mag. Labels` and `Seq. Labels` items in this menu. The changer indicates Not Ready to the host SCSI system during this scanning sequence (default value).

COMMAND The changer does not scan for barcode labels when it checks the inventory for occupied storage locations. A SCSI Initialize Element Status command, or an INITIALIZE command, with Skip Labels set to `NO` and an invalid label inventory database, is required to initiate barcode scanning.

8.6.4 Mag. Labels

The `Mag. Labels` value indicates whether barcode labels are expected in the Magazine slots, Handler, I/O port and tape drives. `Mag. Labels` only appears in the menu when a Barcode Reader is installed.

`Mag. Labels` is a multiple-choice value with the options listed below:

SOME The changer expects *some* cartridges in the Mag. Labels area to contain barcode labels. All cartridges in the Mag. Labels area are scanned for barcodes. Invalid barcode labels *are not* rescanned (default value).

ALL The changer expects *all* cartridges in the Mag. Labels area to contain barcode labels. All cartridges in the Mag. Labels area are scanned for barcodes. Invalid barcode labels *are* rescanned.

NONE The changer does not scan cartridges in the Mag. Labels area for barcode labels.

8.6.5 Seq. Labels

The `Seq. Labels` value indicates if barcode labels are expected in magazine locations allocated to Sequential operation.

`Seq. Labels` is a multiple-choice value with the options listed below:

SOME The changer expects *some* cartridges in the Sequential area to contain barcode labels. All cartridges in magazines of the allocated locations and tape drives are scanned for barcodes. Invalid barcode labels *are not* rescanned (default value).

ALL The changer expects *all* cartridges in the Sequential area to contain barcode labels. All cartridges in magazines of the allocated locations and the tape drives are scanned for barcodes. Invalid barcode labels *are* rescanned.

NONE The changer does not scan cartridges in the Sequential area or the tape drives for barcode labels.

8.6.6 Source Drive

The SCSI specification states that a cartridge's source address is the most recent storage element address that the cartridge occupied. The `Source Drive` value allows the use of tape drive element addresses when determining the source address of a cartridge. This value only has significance when a cartridge is moved from a tape drive to some other location (see Examples 1-2 below).

`Source Drive` is a multiple-choice value with the options listed below:

NO *Do not* use tape drive element addresses when determining the source address of a cartridge (default value).

YES *Do* use tape drive element addresses when determining the source address of a cartridge.

Example 1: The `Source Drive` value is set to `NO`.

1. First, a cartridge is moved from a magazine slot whose element address is 8, to a tape drive whose element address is 15.
2. Next, the cartridge is moved from the tape drive, to any slot.
3. The tape drive's element address is not included in the determination, so the source address of the cartridge is 8, its most recent storage element address.

Example 2: The `Source Drive` value is set to `YES`.

1. First, a cartridge is moved from a magazine slot whose element address is 8, to a tape drive whose element address is 15.
2. Next, the cartridge is moved from the tape drive, to any slot.
3. The tape drive's element address is included in determining the source address, so the source address of the cartridge is 15, its most recent data transfer element address.

8.6.7 SourceI/O Port

The SCSI specification states that the source address of a cartridge is the most recent storage element address that the cartridge occupied. The `SourceI/O Port` value allows the use of the element address of the I/O port slot when determining the source addresses of the cartridges. This value only has significance when a cartridge is moved from the I/O port to some other location (see Examples 1-2 below).

`SourceI/O Port` is a multiple-choice value with the options listed below:

NO — *Do not* use the element address of the I/O port when determining the source address of a cartridge (default value).

YES — *Do* use the element address of the I/O port when determining the source address of a cartridge.

Example 1: The `SourceI/O Port` value is set to `NO`.

1. First, a cartridge is moved from a magazine slot or fixed slot whose element address is 8, to the I/O port whose element address is 15.
2. Next, the cartridge is moved from the I/O port, to any slot.
3. The element address of the I/O port is not included as an element address, so the source address of the cartridge is 8, its most recent storage element address.

Example 2: The `SourceI/O Port` value is set to `YES`.

1. First, a cartridge is moved from a magazine slot or fixed slot whose element address is 8, to the I/O port whose element address is 15.
2. Next, the cartridge is moved from the I/O port, to any slot.

3. The element address of the I/O port is included as an element address, so the source address of the cartridge is 15, its most recent Import/Export element address.

8.7 Configuration\Advanced\Changer\I/O Port Menu

```
CA•Changer••I/O Port
 CALL Key:    1 MIN
 Export:        YES
 Extended:NOT READY
 Import:        YES
 Import Scan:   YES
 Slot Access:  BOTH
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. See Section 8.1.

The `Configuration\Advanced\Changer\I/O Port` menu facilitates control of certain aspects of the I/O port operation. It may help to think of the I/O port as having two distinct items that operate independently:

I/O Port Slot This is a slot inside the TLS which can be accessed by both the handler and the I/O port transport mechanism.

Transport Mechanism This is the mechanism that moves the I/O port slot between its internal park position and the I/O port door. It also opens and closes the I/O port door.

Some of the values in this menu affect the operation of the I/O port Slot, and others affect the operation of the Transport Mechanism.

NOTE

A SCSI interface PREVENT Medium Removal command will always override any `ALLOW` settings in the changer's menu system.

8.7.1 CALL Key

This value determines the action taken when the I/O port is called to open from a front panel command (✽ + ENTER) or by the CALL Key.

`CALL Key` is a multiple-choice value with the options listed below.

DISABLE Nothing happens when the I/O port is called. If the door is closed and locked and the key is removed, nobody will be able to remove or insert cartridges except under host control. This configuration provides the most security for the inventory.

1 MIN, 2 MIN The I\O port door opens when it is called. It closes when a cartridge is inserted, or when called a second time, or after one (or two) minutes have elapsed since the I/O port was opened. (1 MIN is the default value.)

8.7.2 Export

This value controls the changer's access to the I/O port slot. It also sets the value of the Export Enable bit in the SCSI Read Element Status and Read Volume Element Address commands.

`Export` is a multiple-choice value with the options listed below.

YES The changer is allowed to place cartridges into the I/O port slot, and the value of the Export Enable bit is set to one (default value).

NO The changer is not allowed to place cartridges into the I/O port slot, and the value of the Export Enable bit is set to zero. This prevents the host or menu operations from presenting cartridges to the operator.

8.7.3 Extended

This value determines how the changer responds to the host if it receives a move command involving the I/O port slot while it is extended.

`Extended` is a multiple-choice value with the options listed below.

NOT READY The changer returns a CHECK CONDITION status with a Sense Key of NOT READY, plus the appropriate information in the ASC and ASCQ data.

BUSY The changer returns a BUSY status to the host (default value).

RETRACT The changer retracts the I/O port slot and executes the command.

8.7.4 Import

This value controls the changer's access to the I/O port slot. It also sets the value of the Import Enable bit in the SCSI Read Element Status and Read Volume Element Address commands.

`Import` is a multiple-choice value with the options listed below.

YES The changer is allowed to remove cartridges from the I/O port slot, and the value of the Import Enable bit is set to one (default value).

NO The changer is not allowed to remove cartridges from the I/O port slot, and the value of the Import Enable bit is set to zero. This prevents the host or menu operations from accepting cartridges into the system.

8.7.5 Import Scan

This value determines whether the changer will scan barcode labels on cartridges when they are inserted into the I/O port.

`Import Scan` is a multiple-choice value with the options listed below:

YES The barcode label on the I/O port cartridge may be scanned depending upon the setting of the `Configurtion\Advanced\Changer\Inventory\Mag. Labels` value (default value).

NO Never scan the barcode label on the I/O port cartridge.

8.7.6 Slot Access

This value determines if the I/O port slot can be accessed by the Control Panel, the host, or both. The `Export` or `Import` values (described above) must be set to `YES`. If both values are set to `NO`, the Slot Access value has no effect.

`Slot Access` is a multiple-choice value with the options listed below:

BOTH Both the operator, via the Control Panel, and the host can command the changer to access the I/O port slot (default value).

FRONT Only the operator, using the Control Panel, can command the changer to move a cartridge into or out of the I/O port slot.

HOST Only the host can command the changer to move a cartridge into or out of the I/O port slot.

8.8 Configuration\Advanced\Changer\Mechanics Menu

```
CA•Changer•Mechanics
 Model:         4212
 BCR:           NONE
 Carriage          A
 Door Lock:     NONE
 FibreCh:       NONE
 I/O Port:         A
 Q-Link:        NONE
```

NOTE

All other Fibre Channel related menu items are discussed in the Fibre Channel Option Installation and Operation Manual (Qualstar document number 501440).

The `Configuration\Advanced\Changer\Mechanics` menu describes the hardware configuration of the TLS. The values in this menu are factory-set to reflect the unit's configuration at the time of shipping and are not changeable.

In the following paragraphs, no default values are given, as they vary from unit to unit.

8.8.1 Model

This value defines the model number of the TLS: 4212, etc.

8.8.2 BCR

This value defines the type of barcode reader currently installed:
`NONE, or WA3700/B-2221`

8.8.3 Carriage

This value defines which Carriage Assembly revision is currently installed: `A`.

8.8.4 Door Lock

`NONE` is the only allowed value for this menu item. The automatic electric Door Lock feature is not currently available.

8.8.5 FibreCh

This value indicates whether a Fibre Channel Option is currently installed: `A, B, C` or `NONE`.

8.8.6 I/O Port

This value defines whether an I/O port is currently installed: `A` or `NONE`.

8.8.7 Q-Link

This value indicates whether Q-Link is currently installed: A or NONE.

8.9 Configuration\Advanced\Control Panel Menu

```
CA•••••Control Panel
 •Alarm
 Backlight:       ON
 Contrast:        41
 •Display
```

The Configuration\Advanced\Control Panel menu allows customizing the Control Panel to suit the environment. The Control Panel Display and contrast can be changed with this menu.

8.9.1 Backlight

Backlight determines how the Control Panel Display backlighting functions:

ON The backlight is always on.

OFF The backlight is always off.

5 MIN The backlight will remain on for five minutes after the last control key has been touched, then it will turn off.

8.9.2 Contrast

Contrast indicates the Control Panel Display contrast setting. There are 65 contrast settings (0–64). Select the one that looks best.

8.10 Configuration\Advanced\Control Panel\Alarm Menu

```
CACP••••••••••••Alarm
 Door Open:     dddd
 Handler Error:dddd
 Inventory Vio:dddd
 I/O Waiting:   dddd
 Low Power:     dddd
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. See Section 8.1.

The changer can provide an audible alert tone for certain alarm conditions. This menu allows selection of the tone for each of the indicated alarm conditions. The values indicated approximate the tone's frequency in Hertz. When editing the values, the new tone can be heard for approximately one second after each change. Determine the

pitch of each alarm tone by setting a value from 0001 through 9999. Higher values result in higher-pitched alarm tones. For no alarm tone at all, set the value to 0000.

8.10.1 Door Open

This alarm sounds whenever the door is opened. The default value is `0000`.

8.10.2 Handler Error

This alarm sounds whenever the handler has a problem which requires manual intervention (e.g. a stuck cartridge). The default value is `3700`.

8.10.3 Inventory Violation

A condition has occurred, such as breaking the Inventory Sentry beam, which may have compromised the integrity of the inventory. The default value is `4700`.

8.10.4 I/O Waiting

This alarm sounds whenever the I/O port moves a cartridge to the I/O port door. This item does not appear if the `Configuration\Advanced\Changer\Mechanics\I/O Port` value is set to `NONE`. The default value is `1800`.

8.10.5 Low Power

This alarm tone sounds whenever the internal power supplies fall below satisfactory operating levels. The default value is `2400`.

8.11 Configuration\Advanced\Control Panel\Display Menu

```
CACP•••••••••Display
 Display:   CURRENT
 Line 1:    DEFAULT
   1-10: ??????????
  11-20: ??????????
 Line 2:    DEFAULT
   1-10: ??????????
  11-20: ??????????
 Line 3:    DEFAULT
   1-10: ??????????
  11-20: ??????????
 Line 4:    DEFAULT
   1-10: ??????????
  11-20: ??????????
 COPY TO CURRENT
 COPY TO SAVED
```

NOTE

All items in this menu except Display are locked by the Configuration Lock and the Master Lock (see Section 8.1).

This menu allows customizing the Operating Display (while not in the menu system). Any or all four of the display lines can be changed to static alphanumeric strings of choice.

Display Files

There are three sets of display data: CURRENT, SAVED, and DEFAULT. The host can read all three sets of display data, and can change the CURRENT set or the SAVED set.

In addition, the CACP Display menu can be used to manually edit the CURRENT or SAVED files. The SAVED or DEFAULT files can also copied to the CURRENT file, or the CURRENT or DEFAULT files can copied to the SAVED file.

Each of the four display lines (Line 1-Line 4) requires three menu values as follows:

Line#: DEFAULT or Line #: CUSTOM	This line is not editable. Initially, DEFAULT is displayed. If any changes have been made to the display contents for the indicated line, CUSTOM is displayed.
1-10:	This line displays the first ten characters of the indicated line. The alphanumeric string value may be edited.
11-20:	This line displays the last ten characters of the indicated line. The alphanumeric string value may be edited.

The COPY TO CURRENT and COPY TO SAVED functions appear dynamically, depending upon the set being displayed or edited. For example, if the CURRENT set is displayed or being edited, or the DEFAULT set is displayed, the COPY TO SAVED function appears. The contents of the CURRENT set will always be displayed when in the Operating Display.

8.12 Configuration\Advanced\Library Menu

```
C•Advanced•••Library
 •a:         ENABLED
 •b:        DISABLED
 •c:        DISABLED
 •d:        DISABLED
```

The TLS may be partitioned into as many as four logical libraries. Within each logical library is a range of tape drives, fixed and magazine storage locations and certain SCSI operating parameters exclusive to that logical library. The handler is shared by all logical libraries. The I/O port may be used by only one library however a VIOP may be assigned to any library.

The TLS is normally shipped with all resources allocated to a single logical library: “a”.

This menu lists the four logical library partitions (a, b, c, d) and whether or not each partition is enabled. Each partition listed is actually a sub-menu where the partition is configured. See Chapter 7 – Resource Management – for more information on multiple logical libraries.

8.13 Configuration\Advanced\Library\? Menu

```
C•Advanced•Library•?
 Enable:          ON
 Drive First:llllll
 Drive Last: llllll
 Drives:          dd
 Fixed First:llllll
 Fixed Last: llllll
 Fixeds:          dd
 Slot First: llllll
 Slot Last:  llllll
 Slots:          ddd
 VIOP First: llllll
 VIOP Last:  llllll
 VIOPs:          ddd
 DT Access: ???????
 DT Serial: 00 FILL
 •ElementAddress
 Inq:         NATIVE
 Storage Order: MAG
 Volume Tag Pad:SPC
```

NOTE

All items in this menu except DT Access, DT Serial, Inq, and Volume Tag Pad are locked by the Door Lock, Configuration Lock and the Master Lock. DT Access, DT Serial, Inq, and Volume Tag Pad are locked by the Configuration Lock and the Master Lock. See Section 8.1.

This menu is used to enable and allocate resources to the a partition (logical library) within the TLS. There are four possible logical libraries (`a,b,c,d`). The choice of which logical library to edit is made in the parent of this menu. When all resources are allocated to a single logical library, disable all partitions except "`a`". The values and sub-menus within this menu only affect the selected partition (logical Library).

NOTICE

Changing any of the values in this menu (this partition/logical library) will automatically disable the partition (the `Enable`: value changes to `OFF`). The partition cannot be re-enabled if there are conflicts in the resources allocated in this menu. Make certain all values are correct before attempting to set the `Enable:` value back to `ON`.

Be certain to set `Enable:` back to `ON` or the partition will be invisible to the host computer and its resources will not be available to other partitions.

8.13.1 Enable

This value controls whether the logical library partition may respond to a SCSI Initiator (host system). During normal operation, the `Enable` value should always be

set to ON for a library operating under host control. However, it may sometimes become desirable to take the library off-line, for test or demonstration purposes, or when the Medium-changer is used strictly in the Sequential mode. The changer will automatically turn Enable OFF whenever any resource allocation is changed. After partitioning the library, set Enable: back to ON.

The Enable is a multiple-choice value with the options listed below:

OFF The library does not respond to the SCSI selection process or to the SCSI bus RESET command (as if the unit was not connected to the SCSI bus).

ON Select this option for normal operation (default value).

8.13.2 Drive First

This value defines the first tape drive assigned to this partition. The drives are numbered from T1 to T6. All tape drives from Drive First: to Drive Last: (inclusive) will be allocated to the selected partition.

8.13.3 Drive Last

This value defines the last tape drive assigned to this partition. The drives are numbered from T1 to T6. All tape drives from Drive First: to Drive Last: (inclusive) will be allocated to the selected partition.

8.13.4 Drives

This value indicates the number of tape drives assigned to this partition. If this value is edited the following happens: If it is decreased, the Drive Last: value decreases a corresponding amount. If it is increased, the Drive Last: value increases until it reaches T6 and then the Drive First: value begins to decrease until it stops at T1. For drives to occur in the display Drive Last must be later in the drive location sequence, and Drive First and Drive Last must not be the unassigned value (•••••).

8.13.5 Fixed First

This value defines the first fixed slot assigned to this partition. The slots are numbered from 1F to 6F. All slots from Fixed First: to Fixed Last: (inclusive) will be allocated to the selected partition.

8.13.6 Fixed Last

This value defines the last fixed slot assigned to this partition. The slots are numbered from 1F to 6F. All slots from Fixed First: to Fixed Last: (inclusive) will be allocated to the selected partition. Some models have fewer fixed slots.

8.13.7 Fixeds

This value indicates the number of fixed slots assigned to this partition. If this value is edited the following happens: If it is decreased, the Fixed Last: value decreases a

corresponding amount. If it is increased, the Fixed Last: value increases until it reaches the upper limit and then the Fixed First: value begins to decrease until it stops at the lower limit.

8.13.8 Slot First

This value defines the first magazine slot assigned to this partition. The slots are numbered from `1A01 to 6B10`. All slots from Slot First: to Slot Last: (inclusive) will be allocated to the selected partition.

8.13.9 Slot Last

This value defines the last magazine slot assigned to this partition. The slots are numbered from `1A01 to 6B10`. All slots from Slot First: to Slot Last: (inclusive) will be allocated to the selected partition.

8.13.10 Slots

This value indicates the number of slots assigned to this partition. If this value is edited the following happens: If it is decreased, the Slot Last: value decreases a corresponding amount. If it is increased, the Slot Last: value increases until it reaches the upper limit and then the Slot First: value begins to decrease until it stops at the lower limit.

8.13.11 VIOP First

This value defines the first VIOP slot assigned to this partition. The slots are numbered from `L1A01` to `R6E10` (model dependent). All VIOP slots from VIOP First: to VIOPLast: (inclusive) will be allocated to the selected partition.

`VIOP First` has three types of editable values of which examples are listed below:

`p.....` Means that there is no I/O port assigned to this partition.

`p..I..` Means that the physical I/O port is assigned to this partition.

`p.1A10` A location designator example like this one means a VIOP has been assigned to this partition.

8.13.12 VIOP Last

This value defines the last VIOP slot assigned to this partition. The slots are numbered from `L1A01` to `R6E10` (model dependent). All VIOP slots from VIOP First: to VIOP Last: (inclusive) will be allocated to the selected partition.

`VIOP Last` has three types of editable values of which examples are listed below:

`p.....` Means that there is no I/O port assigned to this partition.

`p..I..` Means that the physical I/O port is assigned to this partition.

`p.L1A01` A location designator example like this one means a VIOP has been assigned to this partition.

NOTE

Since no physical entity can be allocated more than once, the number of slots allocated to normal cartridge storage must be reduced by the quantity of slots allocated to VIOP use. Edit the `Slots Last:` *item and set its value to the slot prior to the first VIOP slot.*

8.13.13 VIOPs

This value indicates the number of slots assigned for VIOP or I/O port (1 for a physical I/O port) and is not editable. This value is not displayed when neither a physical I/O port nor VIOP is configured.

8.13.14 DT Access

This value determines how this partition will set the Access bit of the Data Transfer Element Descriptor (which may be returned in response to the SCSI Read Element Status or Request Volume Element Address commands). Refer to the SCSI Interface Manual (document 500523) for details about the Access bit.

`DT Access` is a multiple-choice value with the options listed below:

EJECTED If the Drive is configured as installed in the `Configuration\Drive` menu, *and* the handler has scanned a tape ejected from it, the Access bit is set (default value).

!INSIDE If the Drive is configured as installed in the `Configuration\Drive` menu, *and* the handler has scanned a tape ejected from it, *or* the tape drive has no tape inside it, the bit is set.

INSTALL If the Drive is configured as installed in the `Configuration\Drive` menu, the bit is set.

8.13.15 DT Serial

This value determines if the tape drive serial numbers are reported to the SCSI host as part of the Data Transfer Element Descriptor. Refer to the SCSI Interface Manual (document 500523) for details.

The default value, `00-FILL` causes the tape drive serial numbers to be padded with the NUL character (hex 00). Some software and equipment manufacturers do not adhere to this standard and pad the field with spaces. In order to provide emulation capabilities for these units, the `DT Serial` value allows selecting from the following:

00 FILL This value pads the tape drive serial numbers with the NUL character (hex 00). This is the default value.

SPC FILL This value pads the tape drive serial numbers with the space character.

NONE The tape drive serial numbers will not be transferred.

8.13.16 Inq

NOTE

Inq is locked by the Configuration Lock and the Master Lock. See Section 8.1.

`Inq` (Inquiry) is a multiple-choice value with the options listed below (`NATIVE` is the default value):

```
NATIVE, CUSTOM, EXABYTE 10e, EXABYTE 10i, EXABYTE 120,
EXABYTE 210, EXABYTE 218, EXABYTE 440, EXABYTE 480
```

When the changer receives an Inquiry command, it returns a data file that contains `Inq` string data. The changer has several predefined strings that can be loaded into the data file. Use the `Inq` value to select which string is returned. To change to a different inquiry string, use the data in section 8.17. Figure 8-3 shows the available predefined strings and the data they contain.

8.13.17 Storage Order

This value is required to enable the Medium-changer to emulate different tape library products. Magazine and Fixed slots are lumped together as one contiguous array of storage elements in the SCSI Storage Element Type. This item determines which order the magazine and fixed slots are assigned addresses and subsequently reported to the SCSI host. This menu item does not exist unless some Fixed locations are allocated to this library.

NOTE

This value is automatically set by the commands in the Configuration\Advanced\Library\ Emulation menu.

`Storage Order` is a multiple-choice value with the options listed below:

MAG Magazine element addresses are assigned and reported before Fixed element addresses (default value).

FIX Fixed element addresses are assigned and reported before Magazine element addresses. This value is required to emulate other tape libraries.

8.13.18 Volume Tag Pad

The changer maintains an internal inventory database which, when equipped with a barcode reader, contains the barcode data referred to in the SCSI specification as the Volume Tag. The SCSI specification requires the 32-byte Volume Identifier data field of the Volume Tag to be left justified and padded with spaces. Some other equipment manufacturers do not adhere to this specification and pad the field with NULS (Hex 00). In order to provide emulation capabilities for these units, the `Volume Tag Pad` value allows selecting for this partition between the two pad characters as follows:

SPC This value pads the Volume Identifiers with the SCSI standard space character. This is the default value.

00 This value pads the Volume Identifiers with the non-standard NUL character (hex 00).

8.14 Configuration\Advanced\Library\Element Address Menu

```
CAL•?•ElementAddress
 Display:   CURRENT
 Data Transfr:ddddd
 Imp/Export:  ddddd
 Medium Trans:ddddd
 Storage:     ddddd
COPY TO SAVED
```

NOTE

All items except Display are locked by the Configuration Lock and the Master Lock. See Section 8.1.

This menu contains the starting SCSI element addresses for the four major element types of a SCSI Medium-changer: Data Transfer, Import Export, Medium Transport, and Storage. Those addresses apply only to this logical library partition.

The Default Element Addresses as shown in the table below. Duplicate element addresses can exist in other logical libraries. For a detailed list of Default Element Addresses, see Table 3-3.

Menu Item	SCSI Element Type	Assigned to Logical Library Location	Default Element Address
Storage:	Storage Element	First Storage Slot	0
Data Transfr:	Data Transfer Element	First Drive	63000
Imp/Export:	Import/Export Element	I/O Port	64000
Medium Tran:	Medium Transport Element	Handler	65000

Table 8-3 Default Element Addresses

The number of each element type varies with the logical library configuration. The element address values are decimal, with a range of from zero to 65,535, and leading zeroes are suppressed in the display. See the TLS-4000 SCSI-2 Interface Manual for additional information on element addresses.

NOTE

With only the a: logical library enabled, Drive T2 has an element address of 63001. If T2 is partitioned to b, c or d then it will be the First Drive of that library and will be assigned Data Transfer Element Address 63000.

8.14.1 Configuration\Advanced\Library\ElementAddress\Display

There are two sets of element addresses. They are selectable in the menu and function as follows:

SAVED This set of element addresses stored in non-volatile memory. The `SAVED` set is the set that will be in use following a Reset event. A Reset event can be caused by any one of the following three conditions:

- When the TLS Power is turned On.
- When a SCSI Bus Reset occurs (hardware reset).
- When a SCSI Bus Device Reset Message is directed to the changer by the host.

DEFAULT This is the set of uneditable factory-specified element addresses. The DEFAULT set may be copied to the `SAVED` set (stored in non-volatile memory).

The SCSI-2 specification allows the host to read the values of the two sets of element addresses: `SAVED and DEFAULT`. The SCSI-2 specification also allows the host to modify the values of the `SAVED` set.

In addition, the `CAL·?·ElementAddress` menu can be used to manually edit the `SAVED` files. The `DEFAULT` files can also be copied to the `SAVED` file.

The `COPY TO SAVED` functions appear dynamically, depending upon the set being displayed or edited. For example, if the `DEFAULT` set is displayed, the `COPY TO SAVED` function appears.

8.15 Configuration\Advanced\Log Menu

```
C•Advanced•••••••Log
 BDC:            OFF
 Clean:           ON
 Configuration:   ON
 DriveBay:       OFF
 Executive:       ON
 I2c:            OFF
 Inventory:       ON
 Ioport:          ON
 RBT Actions:     ON
 RBT Events:      ON
 RBT I/O Port:    ON
 RBT Machines:    ON
 RBT Operations: ON
 RBT States:      ON
 SCSI Commands:   ON
 SCSI Interrupt: ON
 SCSI Phases:     ON
 SCSI States:     ON
 Sequential:      ON
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. See Section 8.1.

The changer maintains a log that consists of a list of internal events. This menu determines which events are logged. The purpose of the log is to assist in testing and isolating problems with the assistance of Qualstar support personnel.

Each item in the `Configuration\Log` menu has two choices:

ON Logging of the individual menu item enabled.

OFF Logging of the individual menu item disabled.

The log is limited to a fixed amount of memory. By default, almost all event logs are initially enabled (`ON`), to provide a broad history in case a problem occurs. Log items can be individually disabled by selecting `OFF` to provide more memory to the remaining log items. `RBT` in this menu stands for ROBOT or the robotics handling mechanism.

8.16 Configuration\Advanced\SCSI Menu

```
C•Advanced••••••SCSI
 •Library
 Disconnect:      ON
 Enable:          ON
 Interface    LVD/SE
 LUN:              0
 Parity:       ABORT
 Synchronous:    OFF
```

NOTE

Many of the items in this menu are locked by one or more of the security locks. See 8.1 for details.

This menu allows configuring the Medium-changer to match the system's SCSI requirements.

8.16.1 Disconnect

This value determines whether the Medium-changer will be allowed to disconnect from the SCSI bus during a SCSI command. Disconnects can improve SCSI bus performance when multiple devices are being accessed.

`Disconnect` is a multiple-choice value with the options listed below:

ON The Medium-changer is allowed to disconnect, as long as a disconnect is permitted by the host (default value).

OFF The Medium-changer will not disconnect under any circumstances.

NOTE

`Disconnect` is locked by the Configuration Lock and the Master Lock. See Section 8.1.

8.16.2 Enable

This value controls whether the Medium-changer will respond to an assigned SCSI Initiator (host system). If the changer is set to respond to an initiator, the `Enable` value also controls the nature of the changer's response.

During normal operation, the `Enable` value should always be set to `ON` for a Medium-changer operating under host control. However, it may sometimes become desirable to take the Medium-changer off-line, for test or demonstration purposes, or when the changer is used strictly in the Sequential mode (see ***CAUTION*** note below).

The Enable is a multiple-choice value with the options listed below:

BUSY The Medium-changer responds to any SCSI command with a status of BUSY and the command is not executed.

INFO ONLY The Medium-changer responds to all SCSI commands, except INQUIRY and REQUEST SENSE, with a status of BUSY (see BUSY above). INQUIRY and REQUEST SENSE commands execute normally.

In particular, note that TEST UNIT READY will respond with a status of BUSY.

OFF The Medium-changer does not respond to the SCSI selection process or to the SCSI bus RESET command (as if the unit was not connected to the SCSI bus).

ON Select this option for normal operation (default value).

CAUTION

Some host systems may lock up the SCSI bus if the BUSY or INFO ONLY SCSI Enable value is selected. If this occurs, change the SCSI Enable value to OFF or ON only.

8.16.3 Interface

This value is not editable. It indicates the physical type of SCSI interface of the Medium-changer. The possibilities are: LVD/SE (Low Voltage Differential or Single-ended) and HVD (High Voltage Differential which requires a 501407-01-9 HVD Adapter Board inside the TLS.)

8.16.4 LUN

This value assigns a Logical Unit Number (LUN) to the Medium-changer: 0, 1, 2, 3, 4, 5, 6, 7, or ANY. The ANY value means that the Medium-changer will respond to any LUN. The default value is 0.

NOTE

LUN is locked by the Door Lock, the Configuration Lock and the Master Lock. See Section 8.1.

8.16.5 Parity

This value determines what action the Medium-changer will take when it detects a parity error on the SCSI bus during a Command Out, Data Out, Status Out, or Message Out phase.

`Parity` is a multiple-choice value with the options listed below:

MESSAGE Use this option if the host adapter supports messages involving parity errors detected during one of the Out phases. If the LUN is known and a parity error is detected, the Medium-changer will perform a retry sequence before aborting the command.

ABORT Use this option if the host adapter does not support messages involving parity errors detected during one of the Out phases. The Medium-changer will abort the command without performing the retry sequence (default value).

IGNORE The Medium-changer will accept the data and will not notify the initiator that it detected a parity error.

8.16.6 Synchronous

This value is used to enable synchronous data transfer during any data out phase. The factory default is `OFF` to allow the Medium-changer to operate with the majority of systems when first installed. Asynchronous is slower than synchronous.

`Synchronous` is a multiple-choice value with the options listed below:

ON Places the Medium-changer in the Synchronous mode. The Synchronous mode is faster than the Asynchronous mode.

OFF Places the Medium-changer in the Asynchronous mode.

8.17 Configuration\Advanced\SCSI\Library Menu

```
CA•SCSI••••••Library
 Initiator 0:     a
 Initiator 1:     a
 Initiator 2:     a
 Initiator 3:     a
 Initiator 4:     a
 Initiator 5:     a
 Initiator 6:     a
 Initiator 7:     a
 Initiator 8:     a
 Initiator 9:     a
 Initiator 10:    a
 Initiator 11:    a
 Initiator 12:    a
 Initiator 13:    a
 Initiator 14:    a
 Initiator 15:    a
```

NOTE

All items in this menu are locked by the Door Lock, the Configuration Lock and the Master Lock. See Section 8.1.

This menu is used to determine which initiators (host computers) each logical library will respond to. A logical library (a…d) can respond to as many as 15 initiators. The menu lists the 16 SCSI ID's of possible initiators and the logical library that will respond to that SCSI ID. The default setting is that Library-a responds to every SCSI initiator on the bus. It doesn't matter that a logical library is told to respond to a SCSI ID that doesn't exist or belongs to another target such as a tape drive or even to itself. It becomes evident when looking at this menu that any initiator can control only one logical library, but each logical library can respond to more than one initiator.

8.17.1 Initiator ID

The value of each SCSI ID is the letter of a logical library that will respond to its commands. Determine which initiators a given logical library is to respond to and then change the value for each Initiator ID to that letter.

8.18 Configuration\Advanced\SCSI Inquiry Menu

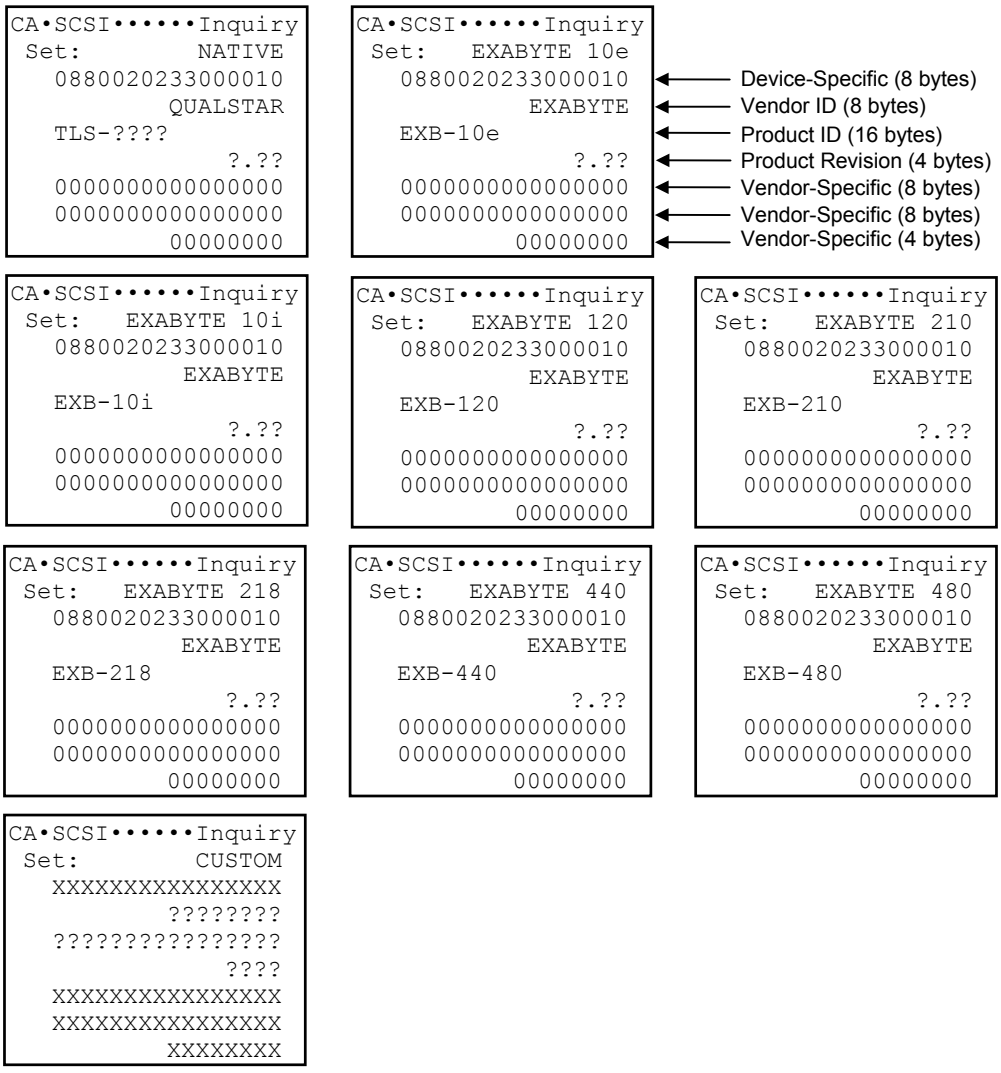


Figure 8-3 Inquiry Data File Contents

Selecting different Inquiry strings changes the information the changer reports but does not change the operation of the library system.

In this menu the name to the right of `Set:` is the name of a data file, and the subsequent lines display the contents of that data file.

Custom is a special case. There is not a Custom data file that can be selected, until a pre-existing data file is edited. The word Custom indicates that the displayed data file has been altered by someone using the Control Panel. The pre-existing data file is not modified. Only one Custom file can exist. If any other existing file is modified, the older Custom file is replaced. This menu configures a custom file only. For selection of the custom file use the data in section 8.13.16.

Selecting an Inquiry String

Use the control keys as follows to copy the desired Inquiry string into the display. See Figure 8-3 for a list of available Inquiry data files.

1. With the pointer at Set:, press the ENTER key. The name of a data file is highlighted.
2. Use the ▲ (UP) or ▼ (DOWN) key to select the desired data file.
3. When the desired data file appears, press EXIT. Then use the ▲ (UP) and ▼ (DOWN) key to view the file. Any custom string that existed will be cancelled when any other string is accessed.

Creating a Custom Inquiry String

If none of the predefined `Inquiry` strings meet the requirements, a Custom Inquiry string can be created by modifying one of the predefined ones. The four fields that make up the SCSI Inquiry data file are described in detail in the TLS-4000 SCSI-2 Interface Manual.

Device-Specific	These eight bytes of hexadecimal data are device-specific. Edit these bytes with care to maintain the compatibility of the device with SCSI systems.
Vendor ID	These eight bytes of data are normally used to identify the equipment vendor.
Product ID	These sixteen bytes of data are normally used to describe the product by name, model, etc.
Product Revision	These four bytes of data are normally used to indicate the firmware revision level of the TLS.
Vendor-Specific	These twenty bytes of hexadecimal data are vendor-specific.

To create a Custom Inquiry string:

1. Follow steps 1 through 3 in the preceding section to select the predefined Inquiry string that most closely matches the system requirements.
2. Use the ▲ (UP) or ▼ (DOWN) key to move the pointer to the line to be changed.
3. Edit the line as follows:

   a) Press ENTER. A blinking cursor appears over the first position of the editable field.

   b) Use the ▲ (UP) or ▼ (DOWN) key to change the highlighted character, press ENTER to move to the next character, and then press EXIT to complete the edit. Notice that the name of the Inquiry string changes to CUSTOM after making the first edit.

4. When the line editing is completed, move the pointer to the next line to be edited.

5. Press ENTER and edit the line as previously described.

6. When all the lines are satisfactory, press EXIT.

NOTE

If Custom string was created and then a predefined string is later chosen, the Custom string is deleted from the menu.

Follow these steps to change to a different Inquiry string:

1. Press the MENU key once to display the `Top Menu`.

2. Press the ENTER key to enter the `Configuration` menu.

3. Press the ENTER key to enter the `Configuration\Advanced` menu.

4. Press the ▼ (DOWN) key to move the pointer to `Library`, then press the ENTER key to enter the `Configuration\Advanced\Library` menu. If necessary, press the ▼ (DOWN) key to move the pointer to the appropriate library (a-d).

5. Press the ENTER key to enter the `Configuration\Advanced\Library\?` menu.

6. Press the ▼ (DOWN) key to move the pointer to `Inq`, then press the ENTER key to enter the `Configuration\Advanced\Library\?\Inq` menu.

7. Press the ▲ (UP) or ▼ (DOWN) key to select the desired data file.

8. When the desired data file appears, press exit.

8.19 Configuration\Drive Menu

```
Configuration••Drive
 •T1: DISABLED    9
 •T2: RANDOM     10
 •T3: 1A01  10   11
 •T4: 6A01  20+  12
 •T5:          NONE
 •T6: 3A01  15+  14
```

The `Configuration\Drive` menu has up to six sub-menus – one for each tape drive position. The sub-menus are T1, T2, etc. Following the tape drive number is a summary report of the settings for that drive as determined in the drive's sub-menu. There are several types of summary reports as shown in Table 8-4 below. Refer to Chapter 10 for an explanation of the Random, Sequential, Recycle and Dual-Bin modes. To see the actual details of a drive's configuration, press the ENTER key to descend into its sub-menu. That is where the configuration can be changed.

Drive State	Menu Format	Description
Not Installed	`T5:  NONE`	The drive is disabled.
Installed but Disabled	`T1: Disabled  9`	Drive T1 is disabled at SCSI ID 9. The drive is treated by the Medium-changer as though it were not installed.
Random Mode	`T2: RANDOM  10`	Drive T2 is in the Random Mode at SCSI ID 10.
Sequential Mode	`T3: 1A01  10  11`	Drive T3 is in the Sequential Mode at SCSI ID 11. 10 Magazine slots are allocated to this drive beginning at slot `1A01`.
Recycle Mode	`T4: 5A01  20+  12`	Drive T4 is in the Recycle Mode (+) at SCSI ID 12. 20 Magazine slots are allocated to this drive beginning at slot `5A01`.
Dual-Bin Mode	`T6: 3A01  10+  15`	Drive T6 is in the Dual-Bin Mode (+) at SCSI ID 15. 10 Magazine slots are allocated to this drive beginning at slot `3A01`.

Table 8-4 Tape Drive Status Summary

8.20 Configuration\Drive\T? Menu

```
C•Drive••••••••••T?
 Mdl:          NONE
 SN:?????????????
 Enabled:       YES
 Revision:     ????
 SCSI Bus:  CHANGER
 SCSI Id:        dd
 Clean Loc:  llllll
 Mode:        RANDOM
 Eject:         HOST
 Start:       MANUAL
 Input First:llllll
 Input Last: llllll
 Input Slots:   ddd
 OutputFirst:llllll
 OutputLast: llllll
 OutputSlots:   ddd
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. Additionally, all items except `SCSI Bus:`, `SCSI Id:` and `Cleaning LOC:` are locked by the Door Lock. See Section 8.1.

The `Configuration\Drive\T?` menu is used to configure the changer for each tape drive. It can also specify a location for a cleaning cartridge to be used when executing the `CLEAN DRIVE` command in the `Operations` menu. The Random, Sequential, Recycle or Dual-Bin mode, for each tape drive, is also determined along with the cartridge location parameters for the Sequential, Recycle or Dual-Bin modes.

All parameters specified in this menu refer to only the tape drive number indicated in the upper right corner of the menu.

If a tape drive location contains an enabled drive, then all items must be configured correctly. Otherwise a `Mdl` of `NONE` should be chosen.

8.20.1 Mdl

`Mdl` is an abbreviation for Model. The model value informs the changer of the model of the tape drive installed at the indicated location. Because the changer uses this information during cartridge movements to the drive, incorrect values may result in incorrect changer operation. The selectable values in this menu are TLS model and option dependent.

Refer to Qualstar Product Information Note 014 for an up-to-date list of supported tape drives.

Whenever adding or removing tape drives from the system, this menu item must be used to reflect the change. If a tape drive location contains no drive, set its corresponding value to `NONE`. All remaining items in this menu are meaningless if the model value is set to `NONE`. The selection in this item is not affected by the `SET TO DEFAULTS` command.

8.20.2 SN

This value indicates the serial number of the tape drive. The value has no effect on the operation of the library and it is not editable.

8.20.3 Enabled

YES The drive is considered ready to be loaded.

NO The drive is considered inoperable and is removed from the list of resources. A cartridge cannot be moved to or from a disabled drive.

8.20.4 Revision

This value indicates the revision level of the tape drives firmware and it is not editable.

8.20.5 SCSI Bus

This value indicates to which SCSI bus the tape drive is connected. This value is reported to the SCSI host computer as an element descriptor. Its value does not affect the operation of the Medium-changer.

Some TLS models are equipped with *optional* separate SCSI bus connections for the tape drives. This affects the reporting of Data Transfer Element Descriptors to the host computer, since some or all of the tape drives may reside on a different SCSI bus than the Medium-changer.

There is a multiple-choice value with the following options:

CHANGER	Indicates the tape drive is connected to the same SCSI bus as the Medium-changer (standard configuration, default value).
OTHER	Indicates the tape drive is connected to a different SCSI bus than the Medium-changer (optional configuration).
INVALID	It does not matter which SCSI bus the tape drive is connected to; the changer will report its SCSI ID information as *Invalid*.

8.20.6 SCSI ID

This value determines the SCSI ID of the tape drive when the drive is installed with a Drive Control cable (See Chapter 5). When the SCSI ID of the tape drive is instead set using jumpers on the back of the drive, this value should be set to match that ID number. The changer reports the SCSI ID's of all Random mode tape drives to the host computer upon request, but does not otherwise make use of the value. Drives and the assigned locations in a Sequential mode are not reported to the host computer.

Values range from `0` to `15` for wide devices and `0` to `7` for narrow devices. The default values are `1` through `6` for tape drives `T1` through `T6` respectively. The default SCSI ID value for the Medium-changer is `0`.

NOTICE

Changing the SCSI ID of a tape drive via the menu system causes the TLS to change the state of signals connected to the tape drive. However, the tape drive only checks these signals when power is applied or following a SCSI bus reset. Therefore, the SCSI ID's of the tape drives will not immediately change after setting them.

When you exit the Configuration\Drive menu after having changed a drive's SCSI ID, you will see an advisory note indicating the new ID's will not take effect until the tape drives are reset and to press ENTER to RESET. If the ENTER key is pressed at this time, the TLS will issue a SCSI bus reset command to all devices connected to the same SCSI bus as the Medium changer.

A SCSI bus reset is acceptable to the tape drives but may adversely affect any host computer attached to the TLS' Medium changer (control interface). Therefore, it is recommended that the SCSI bus be reset only when there are no attached host computers.

Press the EXIT key to dismiss the press ENTER to RESET prompt without resetting the SCSI bus. Then cycle the power on the TLS to reset the tape drives.

NOTE

When tape drives are attached to the same SCSI bus as the Medium-changer, each drive must be assigned a SCSI ID that has not been assigned to the Medium-changer, any hosts, another drive, or any other device connected to the SCSI bus. The changer does not check for this - it is the operator's responsibility to avoid conflicts.

*When tape drives are attached to separate SCSI busses, duplicate SCSI ID numbers are permitted from bus to bus. However**, no two devices on the same SCSI bus may have the same SCSI ID number.** This of course depends upon the system configuration.*

In a TLS system with narrow SCSI drives the host initiator SCSI ID's should be in the range 0-7.

8.20.7 Clean Loc

The setting of this value is optional. If one or more cleaning cartridges will be installed in the TLS, then this value should be set to the location of the cleaning cartridge to be used for cleaning this tape drive. Cleaning cartridges may be shared between tape drives by being specified for more than one drive, or dedicated to individual drives by being specified for only one drive.

The value may be set to any magazine or fixed storage location. If no cleaning cartridge location is to be specified for this tape drive, the value must be set to "....." (five periods). To set the value to ".....", move the cursor to the third column and then use the Up arrow key until "....." is displayed.

When this tape drive (upper right corner of this menu) is selected from the `Operations\Clean Drive` menu, the changer will go to this location to fetch the cleaning cartridge.

8.20.8 Mode

Each installed tape drive in the TLS will be in one of four modes: Random, Sequential, Recycle or Dual-Bin. Briefly, in the Random mode, the tape drive is available within a library to the host computer as a source/destination location for cartridge movements. In the Sequential, Recycle and Dual-Bin modes, the host cannot cause cartridge movements to or from the tape drive. See Chapter 10 for a complete description of the Sequential, Recycle and Dual-Bin modes of operation.

RANDOM The tape drive is available for normal library cartridge movement operations to and from the drive under host computer control. The drive must be within an enabled logical library.

The remaining parameters below the Mode value in this menu are not used during Random mode operations, but are used during Sequential mode operations.

SEQUENTIAL The tape drive is dedicated to receiving cartridges under changer control. The changer will reject host-requested cartridge movements to this device.

RECYCLE The Recycle mode shares the attributes of the Sequential mode. It has the additional feature of automatically restarting the cartridge movement cycle after the last cartridge in the drive's location range has been returned.

DUAL-BIN The tape drive is dedicated to receiving cartridges under changer control. The changer will reject host-requested cartridge movements to this device. This mode is similar to Sequential except the source and destination cartridge locations are separate and distinct.

8.20.9 Eject

This item determines the TLS' response to a SCSI Move Medium command when the *from* location is a tape drive with its tape still inside the drive.

`Eject` is a multiple-choice value with the options listed below:

HOST The HOST's command immediately terminates in a failure.

BOTH The changer sends an eject command to the drive through its serial interface and moves the tape once it's ejected.

NOTE

Eject is locked only by the Configuration Lock and the Master Lock. See Section 8.1.

8.20.10 Start

The Start value allows a tape drive that is configured for one of the three sequential modes to automatically start at power-on or after an inventory violation has stopped the library when set for `INVENTORY` or `POWER-ON`. Any tape drives configured for the Random mode will ignore the Start value.

The Start value has three possible settings:

MANUAL If a cartridge is in the tape drive at power-on, the library stops and waits for the operator to either manually eject the cartridge or call upon the host system to eject it. After the cartridge is ejected it must be moved back to the location it came from. The sequential operation can then be restarted by manually invoking the `START` command.

If a cartridge is in the tape drive after a library has stopped because of an inventory violation, the library attempts to continue from where it left off.

INVENTORY	If a cartridge is in the tape drive at power-on or after an inventory violation, the previous input and output slots are invalidated. If after the library completes an inventory scan and finds the input and output slots are both valid, the library attempts to continue from where it left off. If the input and output slots are both invalid, the library will search at the beginning of the range for the first empty slot. It will then restart using the next tape that was found after the first empty slot in the input range. In any other case the library will stop.
POWER-ON	This mode behaves like INVENTORY, but it only starts the library at power-on.

8.20.11 Input First

The Input First value determines the first magazine cartridge location allocated for Sequential or Recycle operation for this tape drive. For Dual-Bin operation this value determines the first magazine cartridge location for the Input range. See Chapter 10.

8.20.12 Input Last

The Input Last value determines the last magazine cartridge location allocated for Sequential or Recycle operation for this tape drive. For Dual-Bin operation this value determines the last magazine cartridge location for the Input range. See Chapter 10.

8.20.13 Input Slots

The Input Slots value indicates the number of magazine cartridge locations allocated for Sequential or Recycle operation for this tape drive. For Dual-Bin operation this value indicates the number of input magazine cartridge locations allocated. Changing this value will change the `Input First` value or the `Input Last` value to allocate the requested number of cartridges. When the first and last locations are set, this value is automatically set to the number of magazine locations defined by the first and last values and does not need to be edited. This item will not display if `Input First` is after `Input Last` in the location sequence. See Chapter 10.

8.20.14 OutputFirst

The Output First value determines the first magazine cartridge location for the Output range allocated for Dual-Bin operation for this tape drive. See Chapter 10.

8.20.15 OutputLast

The Output Last value determines the last magazine cartridge location for the Output range allocated for Dual-Bin operation for this tape drive. See Chapter 10.

8.20.16 OutputSlots

This value indicates the number of output magazine cartridge locations allocated for Dual-Bin operation for this tape drive. Changing this value will change the `Output First` value or the `Output Last` value to allocate the requested number of cartridges. When the first and last locations are set, this value is automatically set to the number of magazine locations defined by the first and last values and does not need to be edited. This item will not display if `Output First` is after `Output Last` in the location sequence. See Chapter 10.

8.21 Configuration\Q-Link Menu

Q-Link is an optional feature consisting of hardware and additional firmware providing remote web accessed management capability to TLS tape libraries. It allows a user/supervisor to observe, configure, control and possibly trouble-shoot a TLS library remotely over the Internet or a LAN. Please see section 11 for Q-Link set up and operation instructions.

```
C••••••••••••••Q-Link
 Ip:192.168.0.2
 Ma:255.255.255.0
 Gw:0.0.0.0
 Use DHCP:       OFF
 MAC:  xxxxxxxxxxxx
 Date:   mm/dd/yyyy
 Part Number:700xxx
 Revision:    d.d.d
 Checksum: xxxxxxxx
 RESET
 SET ADDRESSES
 DEL ADMIN PASSKEY
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. See Section 8.1.

The `Configuration\Q-Link` menu displays the network address information obtained from the Q-Link module.

8.21.1 Ip

This value is Q-Link's current IP address. When the `Use DHCP` value is set to `ON`, this value is supplied by a DHCP server. When `Use DHCP` is `OFF`, the IP address may be manually edited.

8.21.2 Ma

This value is Q-Link IP mask. When the `Use DHCP` value is set to `ON`, this value is supplied via DHCP. When `Use DHCP` is `OFF`, the IP mask may be manually edited.

8.21.3 Gw

This value is the IP address of Q-Link network gateway. When the Use DHCP value is set to ON, this value is supplied via DHCP. When Use DHCP is OFF, the gateway IP address may be manually edited.

8.21.4 Use DHCP

This option enables the Q-Link network interface to use DHCP to obtain its network address values. If Use DHCP is set to YES, the Ip, and Ma and Gw fields cannot be edited.

8.21.5 MAC

The MAC (media access control) value indicates the unique hardware address of Q-Link that is used when communicating in a network environment.

8.21.6 Date

This is the date that the Q-Link firmware version installed in the TLS was created.

8.21.7 Part Number

This is the part number of the Q-Link firmware installed in the TLS.

8.21.8 Revision

This is the Revision number of the Q-Link firmware installed in the TLS.

8.21.9 Checksum

This is the Checksum number of the Q-Link firmware installed in the TLS.

8.21.10 RESET

Executing this command performs a software reset of the Q-Link firmware. All existing data settings in the firmware will disappear and be replaced when new values become available.

8.21.11 SET ADDRESSES

This command sets the Q-Link network values edited above. The SET ADDRESSES command only appears if an address field has been edited.

8.21.12 DEL ADMIN PASSKEY

Executing this command resets the default User 1 (Admin) Passkey (user name and password become blank). The DEL ADMIN PASSKEY command only appears when update access is valid and requires that the Configuration and Master security locks must be set to OFF.

9. The Operation Menu

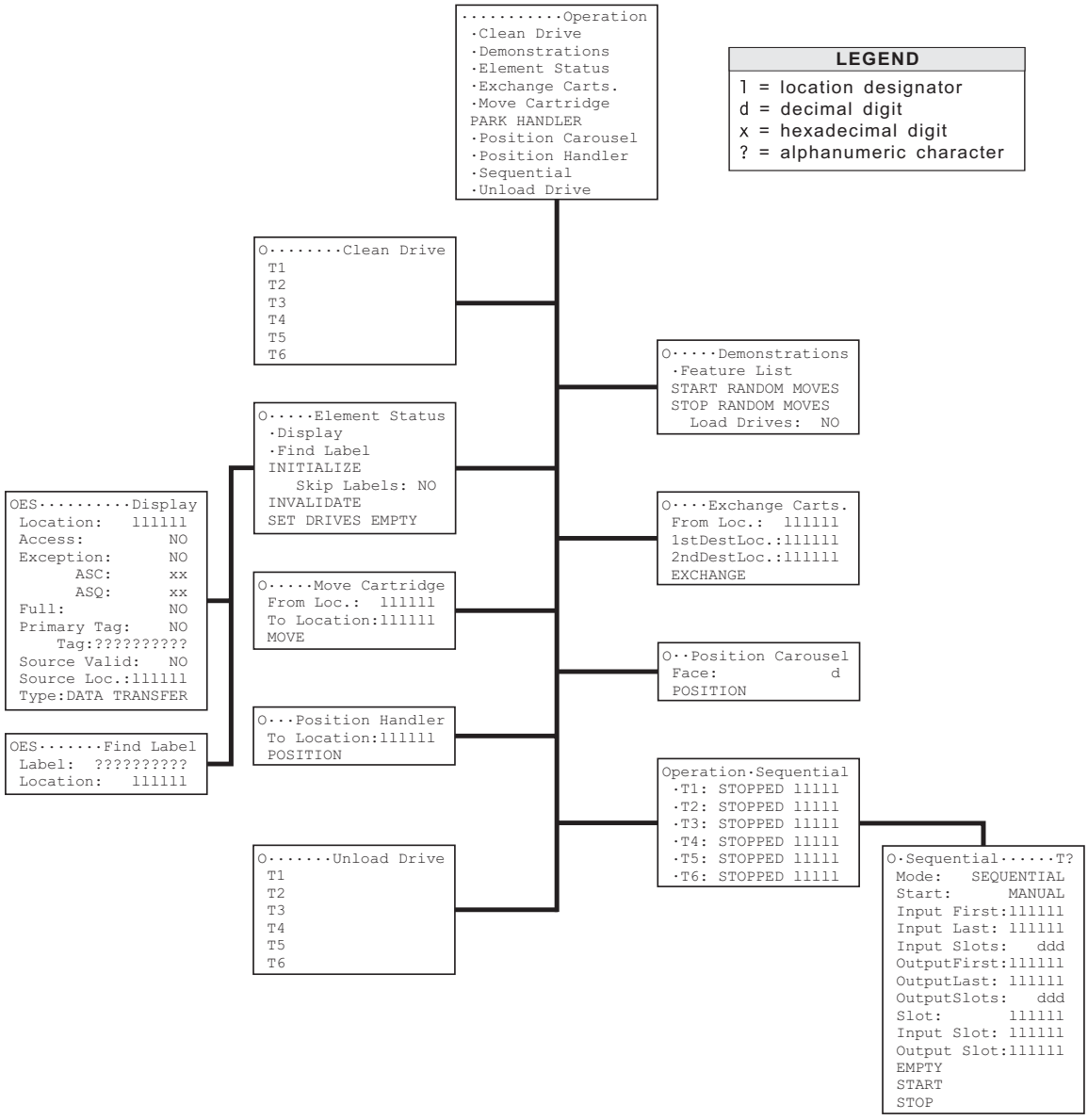


Figure 9-1 The Operation Menu Structure

9.1 Introduction

Be sure to read the Menu System and Configuration Menu chapters before proceeding with this chapter.

The `Operation` menu and its sub-menus are used for the following purposes:

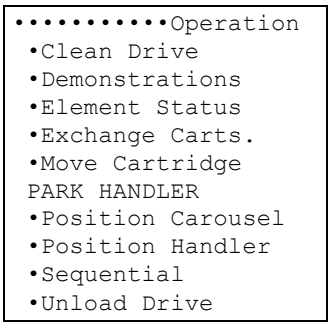
- Control of Sequential operation (unattended backup with multiple tape cartridges per tape drive).
- Manually moving or exchanging cartridges within the TLS using the handler (with the door locked).
- Positioning the Handler to a specific location or parking the changer's carriage (with the door locked).
- Querying the changer for details on the inventory database, including barcode label data.
- Invalidating or initializing the inventory database.

The Legend in Figure 9-1 indicates the types of values found in the value items of the `Operation` menu's sub-menus. An explanation of each type is given below.

Legend	Explanation
`d`	**Decimal** digit (0-9): A Decimal value contains one or more decimal digits, indicating the present value of the item. Examples: **Face** value: This value indicates which carousel face is currently presented to the carriage. Face values range from 1 to 6. **Element** address (sometimes abbreviated **Elem**.): This value is the address used by the SCSI host to select a system element. Address values range from 0 to 65535.
`l`	**Location** digit: This value describes the physical location of a cartridge, tape drive, etc. Examples: A01, B10, 6B09, T1, 5F
`x`	**Hexadecimal** digit (0-9, A-F): A hexadecimal value contains one or more hexadecimal digits, indicating the present value of the item.
`?`	**Alphanumeric** character: An alphanumeric value contains one or more alphanumeric character, indicating the present value of the item.

Table 9-1 Legend of Operation Menu's Digits

9.2 Operation Menu



The `Operation` menu contains a list of sub-menus and the `PARK HANDLER` command. Most of the sub-menus contain commands, many of which simulate SCSI-2 commands. SCSI-2 commands are described in the TLS-4000 SCSI-2 Interface Manual (Qualstar document number 500523).

All storage locations displayed in the menus contain the `Location` value. The `Location` value is the element's physical location designator. This value is an index into the inventory database.

The physical `Location` value (1A07, 3B08, etc.) can be edited. The values are displayed to indicate the relationship between the logical locations of the host software and the physical locations of the changer. The address assignments are not being edited. Only the index into the inventory database is being edited.

The following sections explain each sub-menu of the `Operation` menu in detail. Each section header uses one or more backslashes (\) to show the path from the `Operation` menu down to the section's sub-menu.

9.2.1 PARK HANDLER Command

This command is used to move the carriage to the bottom of the TLS. Use this command to gain a clear view of the drives and magazines. The carriage will remain at the bottom until it receives a request to move a cartridge. Using this command will not disrupt any of the features or functions of the changer.

9.3 Operation\Clean Drive Menu

```
O••••••••Clean Drive
 T1
 T2
 T3
 T4
 T5
 T6
```

This menu is used to manually initiate the automatic insertion of a cleaning cartridge into a tape drive. After the tape drive has been cleaned, and it has ejected the cleaning cartridge, the cleaning cartridge is automatically returned to its original location.

During the configuration of the changer, it was possible to indicate a magazine or fixed cartridge location, for each tape drive, where a cleaning cartridge was located (see the `Configuration\Drive\T?` menu). If *all* of the following conditions are met for any tape drive, then that drive's number will appear in the menu:

- A cleaning cartridge location was specified in the `Configuration\Drive\T?` menu
- A cartridge is present in the specified location
- The tape drive is currently empty
- The tape drive model (`Mdl`) is not configured as `NONE`.

Note that the `Clean Drive` menu is dynamic in nature. Only tape drives meeting the above requirements appear in the menu. If the status of the tape drives change while the menu is being viewed, then the menu display will change accordingly. If none of the tape drives meet the automated cleaning requirements, the `Clean Drive` menu will not display.

To initiate the cleaning of a tape drive, move the item pointer to point to the desired drive and press the ENTER key. The tape drive will then disappear from the menu and the clean drive operation will be performed.

9.4 Operation\Demonstrations Menu

```
O•••••Demonstrations
 •Feature List
 START RANDOM MOVES
 STOP RANDOM MOVES
   Load Drives:  NO
```

The `Demonstrations` menu is primarily used in trade show exhibits to demonstrate the TLS. The commands in this menu cause the changer to start and to stop making continuous, random cartridge moves. The Feature List item is used to display messages about TLS features.

CAUTION

Do not enter the Demonstrations menu on a live system, where the TLS is connected to a functioning host computer.

9.4.1 Feature List

When the `Feature List` item is selected, a slide show type of presentation begins. The slide show displays a continuous series of messages that highlight various TLS features. Each message is displayed for a few seconds, then a new message appears. The slide show continues until the door is opened and the `EXIT` or `MENU` key is pressed.

9.4.2 START RANDOM MOVES Command

NOTE

This command is locked by the Inventory Lock and the Master Lock.

The `START RANDOM MOVES` command starts a continuous sequence of random cartridge moves, providing a visual presentation for trade shows and other demonstrations. The changer continues randomly moving cartridges until the `STOP RANDOM MOVES` command is invoked.

The `START RANDOM MOVES` command disappears from the menu after it is invoked. It reappears in the menu after the `STOP RANDOM MOVES` command is invoked to stop the demonstration.

9.4.3 STOP RANDOM MOVES Command

The `STOP RANDOM MOVES` command stops the continuous sequence of random cartridge moves that begins when the `START RANDOM MOVES` command is invoked.

The `STOP RANDOM MOVES` command appears in the menu after the `START RANDOM MOVES` command is invoked. It disappears from the menu after it is invoked to stop the demonstration.

9.4.4 Load Drives

NOTE

Currently the Load Drives feature only functions with AIT tape drives.

This feature is used to enable the full insertion of a tape cartridge into an enabled tape drive during Random Moves. Use of this feature can dramatically slow the number of cartridge moves made per as well as cause additional wear to the tape cartridges and tape drives used. When the feature is disabled, tapes are only partially inserted into the tape drives such that the drive never threads the tape.

YES Tape cartridges will be fully loaded, threaded and later unloaded from all enabled tape drives during Random Moves.

NO Tape cartridges will be partially loaded, but not threaded in all enabled tape drives during Random Moves.

CAUTION

Make certain that all tapes in the TLS are good quality data tapes and acceptable to the drives prior to enabling the Load Drives feature for Random Moves. The use of non-data-grade tapes could damage the tape drives.

9.5 Operation\Element Status Menu

```
O•••••Element Status
 •Display
 •Find Label
 INITIALIZE
    Skip Labels: NO
 INVALIDATE
 SET DRIVES EMPTY
```

NOTE

The Find Label and Skip Labels menu items only appear if the TLS is equipped with a barcode reader.

This menu lists the `Operation\Element Status\Display` menu, and the `INITIALIZE`, `INVALIDATE`, and `SET DRIVES EMPTY` commands. If the TLS contains a barcode reader, this menu also contains the `Operation\Element Status\Find Label` menu and the `Skip Labels` value.

The `INITIALIZE, INVALIDATE` and `SET DRIVES EMPTY` commands are used to manage the changer's inventory database, which the changer maintains within its

non-volatile RAM. This information is available to the host software through the SCSI-2 Read Element Status command.

The changer never forgets its inventory (cartridge locations and their optional barcode label values). However, under default configuration settings, the changer assumes the inventory information is invalid if power is removed, or if the inventory is INVALIDATED when the Inventory Sentry Beam is broken. Therefore, each storage element has some validity information associated with it. Element validity information is displayed in the `Operation\Element Status\Display` menu, and is sent to the host in a Read Element Status operation.

The changer uses its inventory database to keep track of its cartridges. Part of this inventory information is the internal inventory state of each tape drive.

Section 9.5.4 discusses two components of a tape drive's internal inventory state: the *fullness* component (`FULL` or `EMPTY`) and the *fullness certainty* component (`CERTAIN` or `UNCERTAIN`). In Section 9.5.4, *fullness state* refers to the *fullness* component of a tape drive's internal inventory state. In addition, *certainty state* refers to the *fullness certainty* component of a tape drive's internal inventory state.

Some application software does not correctly use some of the tape drives' internal inventory state information. The usual result is that such software might incorrectly believe that a tape drive is full when it is empty. The `SET DRIVES EMPTY` command is provided to clear this condition.

9.5.1 INITIALIZE Command

NOTE

This command is locked by the Inventory Lock and the Master Lock.

The `INITIALIZE` command is used to force the changer to review the validity of its cartridge inventory database. If the whole database is considered valid by the changer, no further action is taken. If any parts of the database are considered invalid, or unknown, the changer will rescan those parts. The database will be updated according to the rescan. This task can also be accomplished using the SCSI-2 Initialize Element Status command. Note that the host will not be aware of any changes to the changer cartridge inventory database that occurred at the completion of the Initialize Element Status command update.

9.5.2 Skip Labels

If the TLS model contains a barcode reader, the `Skip Labels` value appears in the `Operation\Element Status` menu, beneath the `INITIALIZE` command. If the `Skip Labels` value is `NO`, then barcode labels will be read, and their values will be recorded in the `Element Status` database when an `INITIALIZE` command occurs. If the `Skip Labels` value is `YES`, then barcode labels will not be read.

9.5.3 INVALIDATE Command

NOTE

This command is locked by the Inventory Lock and the Master Lock.

The INVALIDATE command is used to invalidate the entire cartridge inventory database maintained by the changer. The changer will not allow an invalid database to exist if it has not reviewed the invalid or unknown parts. Therefore, the INVALIDATE command causes the changer to **always** rescan the entire cartridge inventory and to update its cartridge inventory database accordingly.

The INVALIDATE command has no effect upon Sequential or Random mode operations, or any other host-to-changer command in progress. Any host-to-changer command in progress is completed before the INVALIDATE command is performed. Further host-to-changer commands, received by the changer while the INVALIDATE command is in progress, will not be performed until the INVALIDATE command is completed. Note that the host will not be aware of any updates to the changer's cartridge inventory database that occurred at the completion of the INVALIDATE command update.

9.5.4 SET DRIVES EMPTY Command

NOTE

The discussion in the following section concerns only the changer's assessment of the drives' states. This assessment does not necessarily correlate to any data that may be obtained from the drives through the drives' SCSI interface.

This command is locked by the Inventory Lock and the Master Lock.

9.5.4.1 Tape Drive Internal Inventory States

Whenever the changer's inventory is violated, each tape drive's *certainty state* is set to UNCERTAIN. Then, one of two things will occur when the inventory is re-scanned:

a) If a tape cartridge is in the tape drive, or if the tape drive is empty:
The tape drive's *certainty state* remains set to UNCERTAIN and its *fullness state* is left in the last certain state: FULL or EMPTY.

or

b) If a tape cartridge is detected in the tape drive in the ejected position:
The tape drive's *certainty state* is set to CERTAIN and its *fullness state* is set to FULL (that is, a cartridge is present in the drive).

When the changer receives a SCSI command to report inventory information, it reports the tape drives' fullness and certainty states. However, some application software does not use the tape drives' *certainty* information correctly and therefore might misinterpret a drive's internal inventory state. The usual result is a condition

where such software might stop using an empty tape drive because the software thinks it is full.

A common cause of this condition is when a user opens the cabinet's door, manually removes a cartridge from a tape drive and then closes the door. Resetting the unit, or turning the TLS' power off and then back on, cannot clear this condition because the changer stores inventory information in non–volatile memory. However, the `SET DRIVES EMPTY` command does clear this condition by resetting the drives' internal inventory states.

9.5.4.2 Using the SET DRIVES EMPTY Command

Whenever the drives' *fullness states* are set to UNCERTAIN (for example, after an inventory violation), the `SET DRIVES EMPTY` command allows the user to set the drives' *fullness states* to EMPTY. This is true whether the tape drives are full or empty, since the system has no way of knowing the actual condition of the drives.

If the software stops using an empty tape drive (for example, after an inventory violation), the software may incorrectly think that the drive is full. In this case, execute the `SET DRIVES EMPTY` command to reset the tape drives' internal inventory states.

If the system is asked to move a cartridge to a tape drive with an UNCERTAIN and EMPTY internal inventory state, and the drive is full, the move will fail. No physical damage will occur and the cartridge will be returned to its source location. In addition, the tape drive's internal inventory state will be changed from UNCERTAIN and EMPTY to CERTAIN and FULL.

NOTE

If the cartridge move (to a full tape drive) was requested via the menu, an error indication will appear on the display, indicating the destination location is full. If the SCSI bus was used to request the cartridge move, no error message will be displayed.

9.6 Operation\Element Status\Display Menu

```
OES••••••••••Display
 Location:   llllll
 Access:         NO
 Exception:      NO
       ASC:      xx
       ASQ:      xx
 Full:           NO
 Primary Tag:    NO
     Tag:??????????
 Source Valid:   NO
 Source Loc.:llllll
 Type:DATA TRANSFER
```

This menu displays specific information about any element in the changer. It displays the same information about a given element that the host would receive from issuing a SCSI-2 Read Element Status command. The SCSI-2 Read Element Status command is described in the TLS-4000 SCSI-2 Interface Manual (Qualstar document 500523). Please refer to the Interface Manual for a detailed explanation of all the element status values displayed in the `Operation\Element Status\Display` menu.

The only editable values in the `Operation\Element Status\Display` menu are the `Location` and `Source Loc.` values.

Operation\Element Status\Display menu–Displayed Values

ASC and ASQ	These items only display when the value of `Exception` is `YES`.
TAG	This item only displays when the value of `Primary Tag` is `YES`.
Source Valid	This value is set to `YES` when the source data is valid.
Source Loc.	This item only displays when the value of `Source Valid` is `YES`.

9.7 Operation\Element Status\Find Label Menu

```
OES•••••••Find Label
 Label:  ??????????
 Location:   llllll
```

NOTE

The Find Label menu only appears in the Operation\Element Status menu if the TLS is equipped with a barcode reader.

Use the `Find Label` menu to find the location of a cartridge with a unique or partially specified barcode search mask.

9.7.1 The Search Mask

To conduct a label search, first enter a search mask that can contain up to 10 alphanumeric characters from the following character set: 0-9, A-Z, the space character. Question marks (?) may be used to indicate *don't care* characters. Examples:

```
040A03????     ??3?Q?01??     ???????1??
```

The changer left-justifies barcode label data and fills the remaining characters with spaces, before comparing the barcode data to the search mask. Each search mask position without a question mark must exactly compare with each barcode position.

A label search takes a few milliseconds to complete. Label searches are conducted through the changer's internal inventory database in the order of possible physical cartridge locations, not in the order of element addresses, as follows:

Tape Drives	T1 and up
Magazine Slots	1A01 and up (including VIOP slots)
Fixed Slots	F
I/O Port	I
Handler	H
Private Slot	P

When a match occurs, only the first location matching the search mask is displayed. Further label searches using the same search mask will yield the same result.

9.7.2 Entering a Search Mask

Place the item pointer to the left of the `Label` value, then press the ENTER key. A blinking cursor appears at the first character location. Use the ▲ (UP) and ▼ (DOWN) keys to select the first character, then press the ENTER key to move the cursor to the next character. Repeat this process until the desired search mask has been entered. Generally, the last two characters in the search mask may remain as question marks, since most barcode labels have eight, or less, characters.

9.7.3 Starting a Label Search

Press the EXIT key to start the label search operation. If a match is found, the complete label string, element address and location designator of the detected label is displayed. This *found* information would not be updated if the located cartridge were moved after the label search. If no match is found, the `Label` value does not change. Examples:

Search Mask before search	`LABEL  A3C 75????`
Search result with no match	`LABEL  A3C 75????`
Search result with a match	`LABEL  A3C 75` `Location:  1A03`

NOTE

`Find Label` will only find a cartridge that has a valid barcode label that has been scanned.

Each search operation is independent; "previous match" and "next match" searches are not possible.

9.8 Operation\Exchange Cartridges Menu

```
O••••Exchange Carts.
 From Loc.:  llllll
 1stDestLoc.:llllll
 2ndDestLoc.:llllll
 EXCHANGE
```

NOTE

The `EXCHANGE` command is locked by the Inventory Lock and the Master Lock.

This menu is used to manually exchange cartridges between two or three locations. It performs the same function as the SCSI-2 Exchange Medium command. There are three Element/Location values involved: From location, 1st Destination/Location, and 2nd Destination/Location.

CAUTION

Exchanging cartridges will change the inventory, regardless of Sequential mode allocation, or host reservation status. This may have adverse effects upon Random or Sequential operations. Use of this Function is not recommended unless its effect on the host system is fully understood.

The `EXCHANGE` command can make two-location and three-location exchanges. A two-location exchange swaps cartridges between two locations. A three-location exchange moves the `From Loc.` cartridge to the `1st DestLoc.` location and the `1st DestLoc.` cartridge to the `2nd DestLoc.` location.

Any valid locations within the system may be used for exchanging cartridges, including tape drives, magazine slots, fixed slots, private slots, the handler and the I/O port. There must always be cartridges located in the `From Loc.` and `1st DesLoc.` locations. For a three-location exchange, the `2nd DestLoc.` location must be empty.

When the `EXCHANGE` command is invoked, the changer moves the cartridges in the following order:

Three-Location Exchange (`From Loc.` **and** `2nd DestLoc.` **values are different)**	The `1st DestLoc.` cartridge moves to the `2nd DestLoc.` Location which must initially be empty, then the `From Loc.` cartridge moves to the `1st DestLoc.` location.
Two-Location Exchange (`From Loc.` **and** `2nd DestLoc.` **values are identical)**	The `1st DestLoc.` Cartridge moves to a temporary slot, then the `From Loc.` cartridge moves to the `1st DestLoc.` location. Finally, the cartridge in the temporary slot moves to the `From Loc.` location.

If no cartridge is at the `From Loc.` location or the `1st DestLoc.` location, or if the `2nd DestLoc.` location is not empty, the `EXCHANGE` command will not be attempted. If an `EXCHANGE` command is not attempted, an Alert message appears on the display.

9.9 Operation\Move Cartridge Menu

```
O•••••Move Cartridge
 From Loc.:  llllll
 To Location:llllll
 MOVE
```

NOTE

The `MOVE` command is locked by the Inventory Lock and the Master Lock.

This menu is used to move a cartridge to an empty location. It contains the `MOVE` command, which performs the same function as the SCSI-2 Move Medium command. The `MOVE` command uses the `From Loc.` and `To Location` value pairs. Simply edit the `From Loc.` and the `To Location` values, and then invoke the `MOVE` command. If no cartridge is at the `From Loc.`, or if the `To Location` is occupied, the `MOVE` command will not be attempted. If a `MOVE` command is not attempted, an Alert message appears on the display.

A cartridge move from a location to itself is not considered an error, unless the location is empty, or a tape drive is occupied, but the tape cartridge is not ejected. A side effect for tape drives is that an ejected tape cartridge is reinserted into the drive.

CAUTION

Moving cartridges will change the inventory, regardless of Sequential mode allocation, or host reservation status. This may have adverse effects upon Random or Sequential operations. Use of this Function is not recommended unless its effect on the host system is fully understood.

9.10 Operation\Position Carousel Menu

```
O••Position Carousel
 Face:            d
 POSITION
```

This menu is used to position a carousel so that a specific face (1-6) of the carousel is facing towards the front of the library. Simply edit the `Face:` value, and then invoke the `POSITION` command. Moving a carriage or carousel will not disrupt Random or Sequential operations, nor change the inventory status.

9.11 Operation\Position Handler Menu

```
O•••Position Handler
 To Location:llllll
 POSITION
```

This menu is used to position the handler at a specific location. Using the `POSITION` command is a convenient way to locate a particular slot. It performs the same function as the SCSI-2 Position to Element command. Simply edit the `To Location:` value, and then invoke the `POSITION` command. Moving the carriage or carousel will not disrupt Random or Sequential operations, nor change the changer inventory status.

9.12 Operation\Sequential Menu

```
Operation•Sequential
 •T1:  STOPPED•••••
 •T2:  EMPTY  •2B06
 •T3:  RUNNING•3A10
 •T4:  STOPPED•••••
 •T5:  EMPTY  •2A01
 •T6:  RUNNING•6B01
```

This menu is dynamic. It only appears in the `Operation` menu if at least one tape drive is configured for the Sequential, Recycle or Dual-Bin modes. Furthermore, only those tape drives configured for the Sequential, Recycle or Dual-Bin modes will appear in this menu. Note that the word "Sequential" appears in this menu when Sequential, Recycle or Dual-Bin modes have been configured. For complete information on the Sequential, Recycle and Dual-Bin modes, see Chapter 10.

NOTE

Use the `Configuration\Drive\T?` menu to configure a tape drive for the Sequential mode.

There is a sub-menu item for each tape drive that appears. The information following the tape drive's number is status information about the Sequential operation of that drive and only the `Slot:` value is editable.

There are three possible states for Sequential operation. The following table describes those states and the location values that are displayed after them:

Sequential State	State Description	Location Description
STOPPED	Idle - waiting to start	Location of the cartridge to be loaded when next started
RUNNING	Sequential mode in progress	The return to location of the cartridge presently in the tape drive
EMPTY	Stopped, but waiting for the cartridge in the tape drive to be ejected	The return to location of the cartridge presently in the tape drive

Table 9-2 Operation\Sequential Status Display Details

Notice there is a sub-menu for each tape drive that appears in the `Operation\Sequential` menu. This is indicated by a bullet in front of each drive's number. To control the Sequential operation of a tape drive, point to the drive's number and then press the ENTER key, to descend into the Sequential menu for the selected drive.

9.13 Operation\Sequential\T? Menu

```
O•Sequential••••••T?
 Mode:   SEQUENTIAL
 Start:      MANUAL
 Input First:llllll
 Input Last: llllll
 Input Slots:   ddd
 OutputFirst:llllll
 OutputLast: llllll
 OutputSlots:   ddd
 Slot:       llllll
 Input Slot: llllll
 Output Slot:llllll
 EMPTY
 START
 STOP
```

NOTE

The `EMPTY`, `START` and `STOP` commands are locked by the Master Lock.

This menu is used to control Sequential operation of the tape drive specified in the upper-right corner of the display. The Sequential mode is used to perform large,

unattended backups to a single tape drive. The use of this menu, and the entire subject of Sequential operation, is discussed in Chapter 10.

NOTE

The item `T?` in the menu shown above represents what is actually seen in the display, namely the number of the tape drive whose parameters are being displayed (e.g., T1, T2, T3, etc.).

9.14 Operation\Unload Drive Menu

```
O•••••••Unload Drive
 T1
 T2
 T3
 T4
 T5
 T6
```

NOTE

Currently the Unload Drives feature only functions with AIT tape drives.

This menu will only appear when at least one tape drive has a tape cartridge loaded and is in the state of being ready to be unloaded. Selecting a listed drive and pressing the ENTER key will cause the tape drive to eject the cartridge and the drive will not appear in the menu until it again has a tape cartridge loaded.

10. Sequential Operation

10.1 Introduction

A sequential tape drive looks to the host computer as a singular tape drive with an operator supplying it with tapes. A host backup application which is not aware of tape libraries can simply write its backup data to the drive until the tape becomes filled. It then causes the tape to be rewound and ejected from the drive. A human operator or the Medium-changer can then insert the next tape needed to complete the backup operation. The host application is completely unaware of how the next tape gets inserted into the drive as well as where the tapes come from and go to. When the Medium-changer does the work of supplying tapes to and removing them from a tape drive, the process is called Sequential 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 under the control of a host computer. If a drive and associated cartridge storage locations are configured for one of the Sequential modes, then the drive is referred to as a sequential drive it cannot be allocated for any other use. The insertion and removal of tapes to and from a Sequential tape drives is automatically performed by the Medium-changer when configured and manually started via the menu system.

There are three types of Sequential operation: Sequential, Recycle and Dual-Bin. 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 a given sequential drive belong exclusively to that drive and may not be assigned to any other sequential drive or random library. 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 location 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 location 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 location 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 host computer communicating with a sequential drive only communicates with the drive and not the changer. This allows the use of applications lacking library-specific, cartridge-movement, operating software.

All tape drives can be configured for concurrent Sequential, Recycle or Dual-Bin operation. Care should be exercised in allocating drives and storage locations as all allocations are done with from-to ranges. Gaps between ranges may become inaccessible.

This flexible design allows the user to partition the library's resources to best meet overall system needs. With a TLS-46120, for example, it is possible to have one library serve as the tape storage device for multiple systems. See Chapter 7 for detailed information on Resource Management.

10.2 Configuration\Drive\T? Menu

```
C•Drive••••••••••T?
 Mdl:           NONE
 SN:??????????????
 Enabled:        YES
 SCSI Bus:   CHANGER
 SCSI Id:         dd
 Clean Loc:   llllll
 Mode:        RANDOM
 Eject:         HOST
 Start:       MANUAL
 Input First:llllll
 Input Last: llllll
 Input Slots:    ddd
 OutputFirst:llllll
 OutputLast: llllll
 OutputSlots:    ddd
```

NOTE

All items in this menu are locked by the Configuration Lock and the Master Lock. Additionally, all items except `SCSI Bus`, `SCSI Id` and `Cleaning Loc` are locked by the Door Lock. See Section 8.1.

The item `T?` in the menu shown above represents what is actually seen in the Display, namely the number of the tape drive whose parameters are being displayed (e.g., T1, T2, T3, etc.).

This section repeats some of the Sequential setup information from Chapter 8.

Before Sequential operation can begin, the user must first configure one or more tape drives for Sequential operation. This is done by setting up some of the items in the

Configuration\Drive\T? menu (shown above in bold type) for each Sequential tape drive. Each of these menu items is described in detail below.

10.2.1 Mode

Each installed tape drive in the TLS will be in one of four modes: Random, Sequential, Recycle or Dual-Bin. Briefly, in the Random mode, the tape drive is available to the host computer as a source/destination location for cartridge movements. In the Sequential, Recycle and Dual-Bin modes, the host computer cannot directly cause cartridge movements to or from the tape drive.

RANDOM	The tape drive is available for normal cartridge movement operations to and from the drive under host computer control. The remaining parameters below the Mode value in this menu are not used during Random mode operations, but are used during Sequential, Recycle or Dual-Bin mode operations.
SEQUENTIAL	The tape drive is dedicated to receiving cartridges under changer control. The changer will not perform host-requested cartridge movements to this device.
RECYCLE	The Recycle mode shares the attributes of the Sequential mode. It has the additional feature of automatically restarting the cartridge movement cycle after the last cartridge in the drive's location range has been returned.
DUAL-BIN	The tape drive is dedicated to receiving cartridges under changer control. The changer will not perform host-requested cartridge movements to this device. This mode is similar to Sequential except the source and destination cartridge locations are separate and distinct.

NOTE

The Mode value must be set after the Input and Output ranges have been set. Any changes to these values cause the Mode value to default to RANDOM.

10.2.2 Sequential or Recycle Configuration

The Mode value in the Configuration\Drive\T? menu cannot be set to Sequential or Recycle if one or more of the following conditions exist:

- The drive's allocated magazine storage locations conflict with an enabled logical library.
- The drive's allocated magazine storage locations conflict with another drive's allocated magazine storage locations, and that drive is already set to the Sequential, Recycle or Dual-Bin mode.

- The drive is reserved by the SCSI host.
- `Mdl` is configured as `NONE`.
- Either the `Input First` or the `Input Last` is unassigned.
  An unassigned value is indicated by five dots (•••••) in the Display.
- One or more of the drive's allocated magazine storage locations are reserved by the SCSI host (see the `Maintenance\Display Reservs.` menu).
- Resources must be unassigned before a library's mode can be changed from Random to Sequential, Recycle or Dual-Bin.

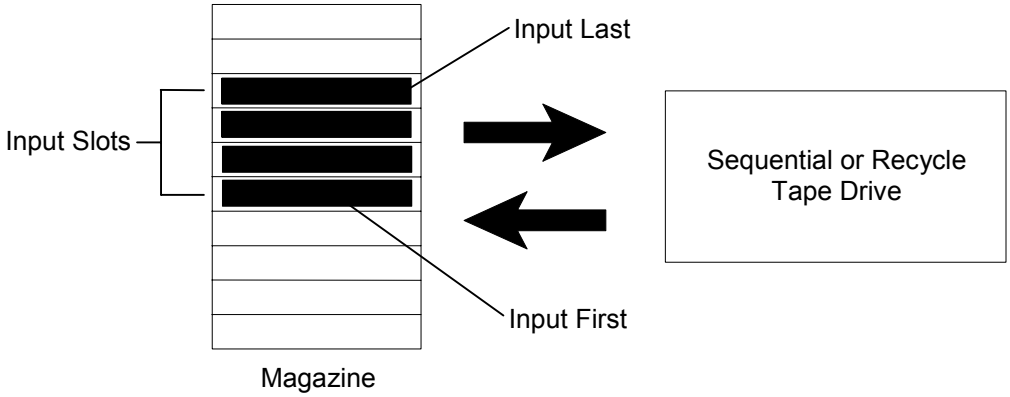


Figure 10-1 Sequential or Recycle Configuration Example

10.2.2.1 Input First

The `Input First` value works together with the `Input Last` value to allocate a contiguous range of magazine storage locations to this tape drive for Sequential or Recycle operation.

Allocate the first magazine storage location to this drive (`T?`) as follows:

1. Determine the number of cartridges for use with this drive (`T?`).
2. Select a continuous range of magazine storage location designators, locations not already allocated or reserved, to hold the cartridges selected in step one.
3. Set the Input First value of this menu to the location of the first magazine storage location selected in step 2.

10.2.2.2 Input Last

The `Input Last` value works together with the `Input First` value to allocate a contiguous range of magazine storage locations to the specified tape drive for Sequential or Recycle operation.

Allocate the last magazine storage location to this drive (`T?`) as follows:

1. Set this menu's Input First value as described in Section 10.2.2.1.

2. Set this menu's `Input Last` value to the location of the last magazine storage location selected in Section 10.2.2.1.

NOTE

When this menu's `Input First` value is set ***and*** *the number of cartridges allocated for Sequential or Recycle operation with this menu's drive (`T?`) is set in this menu's `Input Slots` value, it is not necessary to edit this menu's `Input Last` value.*

10.2.2.3 Input Slots

This value indicates the total number of magazine storage locations allocated for Sequential or Recycle operation with this drive. Changing this value will change the `Input Last` value, or it may change the `Input First` value if the `Input Last` value is already at the highest possible location. This menu item will not display if `Input First` is after `Input Last` in the location sequence, or if either value is unassigned.

When the `Input First` and `Input Last` values are changed, the `Input Slots` value automatically changes to reflect the total number of magazine storage locations allocated for the corresponding drive's Sequential or Recycle operation. This number includes the magazine storage locations specified by the `Input First` and `Input Last` values and all of the magazine storage locations between them. Therefore, when this menu's `Input First` and `Input Last` values are specified, it is not necessary to edit this menu's `Input Slots` value.

10.2.2.4 Mode

Set the `Mode` value to Sequential or Recycle. If the `Mode` value cannot be changed, then there is a conflict with another sequential drive or an enabled logical library.

10.2.3 Dual-Bin Configuration

The `Mode` value in the `Configuration\Drive\T?` menu cannot be set to `Dual-Bin` if one or more of the following conditions exist:

- The drive's allocated magazine storage locations conflict with an enabled logical library.
- The drive's allocated magazine storage locations conflict with another drive's allocated magazine storage locations, and that drive is already set to the Sequential, Recycle or Dual-Bin mode.
- The drive is reserved by the SCSI host.
- `Mdl` is configured as `NONE`.
- Any of the `Input First, Input Last, Output First or Output Last` values are unassigned. An unassigned value is indicated by five dots (•••••) in the Display.

- The drive's Input range (from `Input First` through `Input Last` values) overlaps the drive's Output range of (`Output First` through `Output Last` values).
- The drive's Input range (`Input Slots` value) is greater than the drive's Output range of magazine storage locations (`Output Slots` value).
- One or more of the drive's allocated magazine storage locations are reserved by the SCSI host (see the `Maintenance\Display Reservs.` menu).
- The entire changer is reserved by the SCSI host.

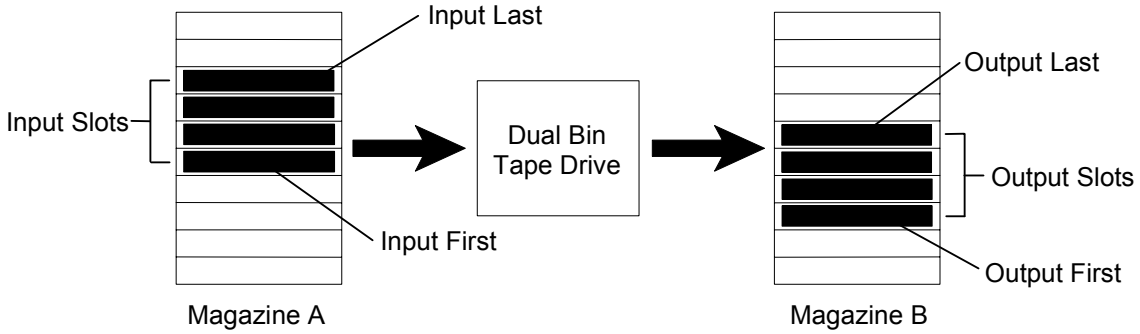


Figure 10-2 Dual-Bin Configuration Example

10.2.3.1 Input First

This value works together with the `Input Last` value to allocate a contiguous range of magazine storage locations for input to this tape drive (`T?`).

Allocate the magazine storage location as follows:

1. Determine the number of cartridges for use with this drive (`T?`).
2. Select a continuous range of input magazine storage locations not already allocated or Reserved, to hold the cartridges determined in step one.
3. Set the `Input First` value of this menu to the location of the first magazine storage location selected in step 2.

10.2.3.2 Input Last

This value works together with the `Input First` value to allocate a contiguous range of magazine storage locations to this tape drive (`T?`) to create the Input range for Dual-Bin operation.

Allocate the magazine storage location as follows:

1. Set the `Input First` value as described in Section 10.2.3.1.
2. Set the `Input Last` value to the location of the last magazine storage location selected in Section 10.2.3.1.

NOTE

*When this menu's `Input First` value is set **and** the number of cartridges allocated for Sequential or Recycle operation with this menu's drive (`T?`) is set in this menu's `Input Slots` value, it is not necessary to edit this menu's `Input Last` value.*

10.2.3.3 Input Slots

This value indicates the number of magazine storage locations allocated for the Input range for Dual-Bin operation with this drive. Changing this value will change the `Input Last` value, or it may change the `Input First` value if the `Input Last` value is already at the highest possible location. This menu item will not display if `Input First` is after `Input Last` in the location sequence.

When the `Input First` and `Input Last` values are changed, the `Input Slots` value automatically changes to reflect the total number of magazine storage locations allocated for the corresponding drive's Input range for Dual-Bin operation. This number includes the magazine storage locations specified by the `Input First` and `Input Last` values and all of the magazine storage locations between them. Therefore, when this menu's `Input First` and `Input Last` values are specified, it is not necessary to edit this menu's `Input Slots` value.

NOTE

The Dual-Bin mode will not be available if the Input range of magazine storage locations overlaps the Output range of magazine storage locations. Additionally the Output Slots value must be set equal to or greater than the Input Slots value.

10.2.3.4 Output First

This value works together with the `Output Last` value to allocate a contiguous range of magazine storage locations for the output of this tape drive (`T?`) in Dual-Bin operation.

Allocate the magazine storage location as follows:

1. Determine the number of Input cartridges selected for use in Section 10.2.3.1.
2. Select a continuous range of Output magazine storage locations not already allocated or reserved, to hold the Input cartridges determined in step one.
3. Set the `Output First` value of this menu to the location of the first Output magazine storage location selected in step 2.

10.2.3.5 Output Last

This value works together with this menu's `Output First` value to allocate a contiguous range of magazine storage locations to this drive (`T?`) to create the Output range for Dual-Bin operation.

Allocate the magazine storage location as follows:

1. Set this menu's `Output First` value as described in Section 10.2.3.4.
2. Set this menu's `Output Last` value to the location of the last magazine storage location selected in Section 10.2.3.4.

NOTE

*When this menu's `Output First` value is set **and** the number of cartridges allocated for Dual-Bin operation with this menu's drive (`T?`) is set in the `Output Slots` value, it is not necessary to edit this menu's `Output Last` value.*

10.2.3.6 Output Slots

This value indicates the number of magazine storage locations allocated for the Output range for Dual-Bin operation with this menu's drive. Changing this value will change this `Output Last` value, or it may change the `Output First` value if the `Output Last` value is already at the highest location. This menu item will not display if `Output First` is after `Output Last` in the location sequence.

When the `Output First` and `Output Last` values are changed, the `Output Slots` value automatically changes to reflect the total number of magazine storage locations allocated for this drive's Output. This number includes the magazine storage locations specified by the `Output First` and `Input Last` values and all of the magazine storage locations between them. Therefore, when this menu's `Output First` and `Output Last` values are specified, it is not necessary to edit this menu's `Output Slots` value.

10.2.3.7 Mode

Set the `Mode` value to Dual-Bin. If the `Mode` value cannot be changed, then there is a conflict with another sequential drive or an enabled logical library.

10.2.4 Start

The Start value allows a tape drive that is configured for one of the three sequential modes to automatically start at power-on or after an inventory violation has stopped the library when set for INVENTORY or POWER-ON. Any tape drives configured for the Random mode will ignore the Start value.

The Start value has three possible settings:

MANUAL If a cartridge is in the tape drive at power-on, the library stops and waits for the operator to either manually eject the cartridge or call upon the host system to eject it. After the cartridge is ejected it must be moved back to the location it came from. The sequential operation can then be restarted by manually invoking the START command.

If a cartridge is in the tape drive after a library has stopped because of an inventory violation, the library attempts to continue from where it left off.

INVENTORY If a cartridge is in the tape drive at power-on or after an inventory violation, the previous input and output slots are invalidated. If after the library completes an inventory scan and finds the input and output slots are both valid, the library attempts to continue from where it left off. If the input and output slots are both invalid, the library will search at the beginning of the range for the first empty slot. It will then restart using the next tape that was found after the first empty slot in the input range. In any other case the library will stop.

POWER-ON This mode behaves like INVENTORY, but it only starts the library at power-on.

10.3 Operation\Sequential Menu

```
Operation•Sequential
 •T1: STOPPED •••••
 •T2: EMPTY   •2B06
 •T3: RUNNING •3A10
 •T4: STOPPED •1B01
 •T5: EMPTY   •2A01
 •T6: RUNNING •6B01
```

This is a dynamic menu. It will only appear in the Operation menu if one or more tape drives have been configured for the Sequential, Recycle or Dual-Bin mode via the Configuration\Drive\T? menu. Furthermore, a sub-menu for only those drives that have been configured for the Sequential, Recycle or Dual-Bin mode will appear in this menu. Note that the word “Sequential” appears in this menu when Sequential, Recycle or Dual-Bin modes have been configured. The information following the drive number is state information about the Sequential operation of that drive and is not editable.

There are three possible states for Sequential operation. The following table describes those states and the locations that are displayed after them.

Sequential State	State Description	Location Description
STOPPED	Idle - waiting to be started.	Location of the cartridge to be loaded when next started. Five dots indicate a completed or unstarted Sequential operation (as shown above for drive T1).
RUNNING	Sequential mode in progress.	The return to location of the cartridge presently in the drive.
EMPTY	The drive has an ejected cartridge that has not yet been returned by the changer.	The return to location of the cartridge presently in the drive.

Table 10-1 Operation\Sequential Status Display Details

To control the Sequential operation of a drive, point to the drive number and press the ENTER key to descend into the Sequential menu for that drive.

10.4 Operation\Sequential\T? Menu

```
O•Sequential••••••T?
 Mode:   SEQUENTIAL
 Start:      MANUAL
 Input First:llllll
 Input Last: llllll
 Input Slots:   ddd
 Slot:       llllll
 EMPTY
 START
 STOP
```

Sequential or Recycle Modes

```
O•Sequential••••••T?
 Mode:     DUAL-BIN
 Start:      MANUAL
 Input First:llllll
 Input Last: llllll
 Input Slots:   ddd
 OutputFirst:llllll
 OutputLast: llllll
 OutputSlots:llllll
 Input Slot: llllll
 Output Slot:llllll
 EMPTY
 START
 STOP
```

Dual-Bin Mode

NOTE

The item `T?` in the menu shown above represents what is actually seen in the Display, namely the number of the tape drive whose parameters are being displayed (e.g. T1, T2, T3, T4, etc.).

There is an `Operation\Sequential\T?` menu for each tape drive that is configured for Sequential, Recycle or Dual-Bin operation. The display of this menu is distinctly different for the Dual-Bin mode, thus both are depicted above. The editable values are indicated in **bold** type. The current state of the operation determines which one of the three commands (EMPTY, START, or STOP) is visible. These commands start and stop the configured sequential mode. The `Input` and `Output`

values are those set in the `Configuration\Drive\T?` menu and are displayed here for reference (the values are not editable).

NOTE

The state of Sequential operation for the displayed drive must be `STOPPED` before the `Slot, Input Slot or Output Slot` values in this menu can be edited.

10.4.1 Slot

This value indicates the current cartridge location of the sequence. If the operation has not been started, this will be the unassigned value. The Slot value can be edited only when the Sequential state is stopped.

If the Slot value is unassigned, the Sequential operation will begin with the first cartridge encountered in its location range. If Slot is any other value, then the Sequential operation will begin with the first cartridge at or after the value.

10.4.2 Input Slot and Output Slot

These two values indicate the current input and output cartridge locations of the sequence. If operation has not been started, these will be unassigned values. The Input Slot and Output Slot values can be edited only when the Dual-Bin state is stopped.

If the Input Slot value is unassigned, the Dual-Bin operation will begin with the first cartridge encountered in its location range. If Input Slot is any other value, then the Dual-Bin operation will begin with the first cartridge at or after the value.

10.4.3 START Command

This command appears when sequential operation is stopped and no tape is present in the drive. Invoking this command will start the Sequential, Recycle or Dual-Bin operation. After the sequential operation begins, the STOP command appears instead of the START command.

10.4.4 STOP Command

This command appears when sequential operation is running. Invoking this command will stop the Sequential, Recycle or Dual-Bin operation. After the sequential operation stops, the START or EMPTY command appears instead of the STOP command.

Once started, a Sequential operation automatically runs to completion. Completion is defined as either one of the following two cases:

- When the changer can find no more cartridges in the allocated magazine storage location range.
- When the cartridge from the Last value is returned to its magazine storage location.

NOTE

During Sequential operation, the changer retrieves the next available cartridge in the allocated magazine location range. This means that it will skip over empty magazine slots in the allocated magazine location range with no ill effects.

When the Sequential operation for this drive is completed:

- The `Operation\Sequential` menu indicates `STOPPED` for this drive (T?).

```
•T?:   STOPPED •••••
```

- For Sequential or Recycle Configuration:
  In the `Operation\Sequential\T?` menu the `Slot` value indicates "•••••".

```
Slot:          •••••
```

- For Dual-Bin Configuration:
  In the `Operation\Sequential\T?` menu the `Input Slot` value indicates "•••••" and the Output Slot indicates the magazine cartridge location of the last tape placed in the output range.

```
Input Slot:    •••••
Output Slot:    llll
```

10.5 Interruptions

This section deals with the effects of interruptions to Sequential operation. These interruptions include:

- Power Failure/Interruption.
- Violation of the Inventory (as defined in the `Configuration\Advanced\Control Panel\Alarm` menu in Chapter 7).
- Unrecoverable Handler Fault.

10.5.1 Power Failure/Interruption

A power failure is an unintentional occurrence, while a power interruption is most likely the result of someone intentionally turning the power off. Unfortunately, the changer cannot distinguish between the two events. Under the `MANUAL` mode of the `Operation\Sequential\T?\Start` menu the changer cancels any previously–running sequential operations when power is applied (or reapplied). Under the `INVENTORY` and `POWER-ON` modes the changer will attempt to continue from where it left off when power is applied (or reapplied).

If a cartridge was in a sequential tape drive configured for the `MANUAL` mode of the `Operation\Sequential\T?\Start` menu when the power was interrupted, it will remain in the drive when the power comes back on. In this case, either open the door and manually eject the cartridge from the drive, or call upon the host system (which may also have experienced a power interruption) to eject it. Then use the `MOVE` command in the `Operation\Move Cartridge` menu to return the

cartridge to its proper magazine storage location. The Slot value may need to be changed before restarting Sequential operation (see Section 10.4.1).

10.5.2 Breaking the Inventory Sentry Beam

Breaking the Inventory Sentry Beam violates the changer's inventory and stops the sequential process. However, the sequential tape drive in use continues to operate when under the MANUAL and INVENTORY modes of the Operation\ Sequential\T?\Start menu. Any sequential tape drives under the POWER-ON mode will stop and have to be restarted using the START command.

If the cartridge is ejected from the sequential drive while the door is open, the changer will not automatically return the cartridge to its magazine storage location. At this point, the MOVE command in the Operation\Move Cartridge menu can be used to put the cartridge back into its magazine storage location.

10.5.3 EMPTY Command

This command appears when sequential operation is stopped and a tape remains in the drive. When the drive finally ejects the tape, this command may be invoked to return the tape to its destination slot. After invoking this command, the START command will appear.

10.5.4 Unrecoverable Handler Fault

An unrecoverable handler fault is a condition that requires operator intervention: for example, a cartridge incorrectly inserted into a magazine. The condition should be corrected before continuing. Pressing the EXIT key will clear the display if the condition has been adequately corrected.

11. Q-Link Remote Library Manager

The optional Q-Link provides a remote interface to Qualstar's TLS series tape libraries. This allows a user/supervisor to observe, configure, control and possibly trouble-shoot a TLS library over the Internet or a LAN using Internet Explorer 6 (and higher), Netscape 6.2 (and higher) web browsers, Java Virtual Machine 1.3.10 and the Microsoft Virtual Machine, which ships with Microsoft operating systems prior to XP. While other browsers can be used, the page display and operation may not be correct. The Mac interface has been certified using OS X Server (10.1.2) using Netscape V7.02 (Mozilla 1.0.2) for all functions except for writing data with the java applet interface.

Q-Link communicates to the outside world via a standard 10-BaseT interface. It derives its power from, and communicates with the TLS via a serial communications channel already provided on the TLS' executive printed circuit board.

Q-Link can provide the following features:

- Display Inventory and General Status
- Configure the TLS including Drives, SCSI, Logical Libraries
- Dump diagnostic logs
- Upload new TLS firmware
- Upload new Q-Link firmware
- Move inventory
- Clean or unload tape drives

Additionally, Q-Link can be configured to e-mail event or fault messages to a list of support staff when a name server and SMTP server are available.

11.1 Setup

Q-Link, like any other device on the Internet requires a unique address known as an IP (Internet Protocol) address. No two devices are ever allowed to share the same IP address. In addition to the IP address, a Subnet Mask and Gateway address are required to navigate the LAN on the way to the Internet. There are two ways to establish these three critical values. The values used in this section are indicated in bold in the menu figure below.

1. Just connect Q-Link to a LAN with a DHCP server (most LANs have this service) and set the `Use DHCP` value in the `Configure\Q-Link` menu to `ON`. The DHCP server will supply the three parameters for Q-Link automatically.

2. Establish fixed parameters (determined by your I.T. Manager) by first setting the `Use DHCP` value in the `Configure\Q-Link` menu to `OFF` and then manually editing the three values: `Ip, Ma,` and `Gw.`

11.1.1 Setting the IP Parameters Automatically

1. Confirm with your I.T. manager that DHCP service is running on the network that Q-Link will be connected to.

2. Navigate to the TLS menu item `Configuration\Q-Link` and press the ENTER key. This menu panel is used to set Q-Link network addresses.

3. Scroll down to the `Use DHCP` item with the ▼ (DOWN) key. If it is set to `OFF`, press the ENTER key and then the ▲ (UP) key to change the value to `ON`. Press the EXIT key.

4. Invoke the `SET ADDRESSES` command by scrolling down to it with the ▼ (DOWN) key and then pressing the ENTER key. This will cause Q-Link to request its IP parameters from your network's DHCP server. The TLS display will indicate "`IP Setup Operation in Progress`" for a few seconds while this process takes place. If this message persists, then Q-Link was unable to contact the DHCP server.

```
C••••••••••••Q-Link
 Ip:192.168.0.2
 Ma:255.255.255.0
 Gw:0.0.0.0
>Use DHCP:      OFF
 MAC:  xxxxxxxxxxxx
 Date:   mm/dd/yyyy
 Part Number:700xxx
 Revision:    d.d.d
 Checksum: xxxxxxxx
 RESET
 SET ADDRESSES
 DEL ADMIN PASSKEY
```

11.1.2 Setting Fixed IP Parameters

Note these parameters cannot be edited if `Use DHCP` is `ON`. Consult your LAN Administrator for the correct values for the following parameters:

- IP Address (Ip:)
- Subnet Mask (Ma:)
- Gateway Address (Gw:)

1. Navigate to the `Configuration\Q-Link menu`.

2. To change the IP address, use the ▲ (UP) and ▼ (DOWN) keys to navigate the selection indicator to the `Ip` field. Press the ENTER key to position the edit cursor to the desired character location. Use the ▲ (UP) and ▼ (DOWN) keys to change the digit to the required value. Select each additional numeral either the ENTER key and edit its value when required. When the Ip address is correct, press the EXIT key to end the edit operation.

3. Use the same procedure to change the Mask (`Ma`) and Gateway (`Gw`) values. Note that these values cannot be edited if `Use DHCP` is `ON`.

NOTE

The SET ADDRESSES command will only appear if the Ip, Ma or Gw addresses have been edited.

4. Use the ▲ (UP) and ▼ (DOWN) keys to navigate the selection indicator to the SET ADDRESSES command. Press the ENTER key to invoke the command. The display will change as follows to indicate the setup operation is in progress.

```
••••PLEASE•WAIT••••
IP Setup operation
in progress.
```

5. When the SET ADDRESS command completes, the LCD will display the new values obtained from the DHCP server.

```
C••••••••••••Q-Link
 Ip:192.168.0.10
 Ma:255.255.255.0
 Gw:0.0.0.1
 Use DHCP:       ON
 SET ADDRESSES
 DEL ADMIN PASSKEY
```

11.1.3 DEL ADMIN PASSKEY

This command resets Q-Link's User 1 (Admin) Passcode (user name or password) back to blank in the TLS while "**update**" access is valid. If the passcode (name and password) has been forgotten, follow the instructions below. This command will not affect the Ip, Ma and Gw values.

1. Use the ▼ (DOWN) key to navigate the selection indicator to the DEL ADMIN PASSKEY field.

```
C••••••••••••Q-Link
 Ip:192.168.0.2
 Ma:255.255.255.0
 Gw:0.0.0.0
 Use DHCP:      OFF
 MAC:  xxxxxxxxxxx
 Date:   mm/dd/yyyy
 Part Number:700xxx
 Revision:    d.d.d
 Checksum: xxxxxxxx
 RESET
 SET ADDRESSES
>DEL ADMIN PASSKEY
```

2. Press the ENTER key once and the display will change to indicate the confirmation message.

```
••••••WARNING•••••••
 Operation will set
 Q-Link defaults.
 ENTER to continue.
```

3. Press the ENTER key to execute the DEL ADMIN PASSKEY command.

11.2 Connect Q-Link to the Ethernet LAN

After Q-Link's Ethernet address is configured (see Section 8.21), it can be attached to your LAN.

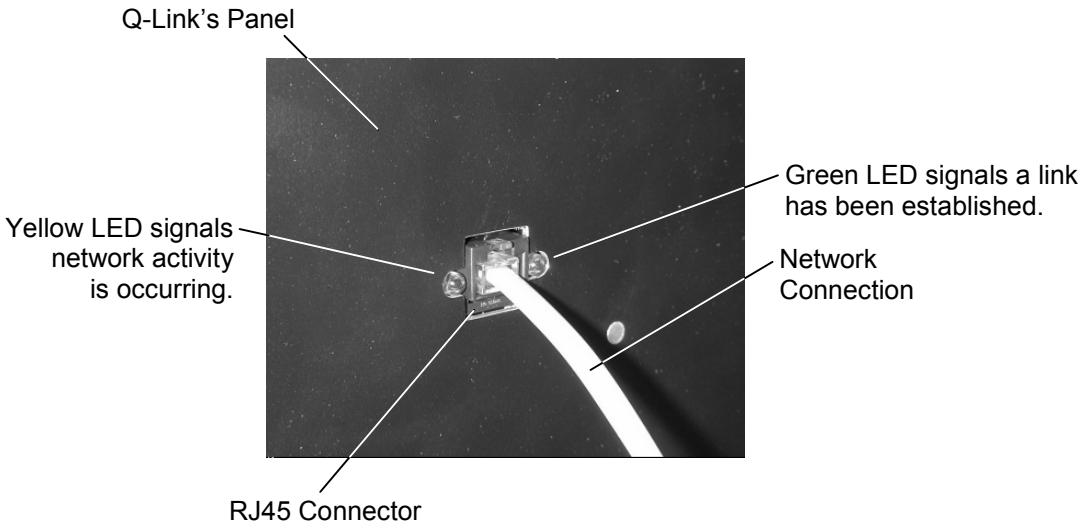


Figure 11-1 Detail of Network Connection Attached to Q-Link

11.3 Browser Compatibility

Q-Link has been tested with Internet Explorer 6 (and higher), Netscape 6.2 (and higher) web browsers, Java Virtual Machine 1.3.10 and the Microsoft Virtual Machine, which ships with Microsoft operating systems prior to XP. While other browsers can be used, the page display and operation may not be correct. The Mac interface has been certified using OS X Server (10.1.2) using Netscape V7.02 (Mozilla 1.0.2) for all functions except for writing data with the java applet interface.

11.3.1 Browser Requirements

1. An approved Java Virtual Machine must be installed on the computer.
2. Javascript must be enabled.
3. Cookies must be enabled.

11.4 E-mail Requirements

For e-mail capability, an SMTP server and a Name server must be specified.

11.5 Access Q-Link with a Web Browser

After Q-Link is connected to the Ethernet LAN, it can be accessed via Internet Explorer 6 or Netscape 6.2 web browsers. Target the web browser to Q-Link's IP address. The sample address shown in the following examples is: `http://10.10.10.10`

11.6 Quick Start Guide

- A factory default library will go directly to the Library Quick View screen.
- Type `http://10.10.10.10/paccess.cgi` (Your address will probable be different.) and press return. This will show the Private folder in the menu tree.
- Click on the Passwords menu item in the menu tree to access the Private\Passwords screen.
- Check the Edit Q-Link check box, the Edit email check box and any other desired privileges check boxes. Click Submit.
- Log out and then log in for the changes to take effect.
- Go to the Configuration\Advanced\Q-Link page to edit the Name server and SMTP server data. Click Submit Changes.
- Go to the Private\Email page to add email recipients and any event notices. Click Submit.
- Click Send Test Email and then check the recipient's inbox for the email.

For a more detailed explanation of Q-Link, please see the following sections.

11.7 Getting Started with Q-Link

In the following examples the sample address is: `http://10.10.10.10`. The address you will be using will probable be different. Additionally, when the word "passcode" is used it refers to both the User Name and Password information.

11.7.1 The Sign-In Screen

The default settings when Q-Link is shipped from the Qualstar factory are a blank User Name and a blank Password. Q-Link will bypass the sign in screen as long the User Name and Password are blank. If a User Name and Password have been assigned the sign in screen will appear as seen in Figure 11-2. Simply entering the correct User Name and Password followed by clicking on the Sign In button will allow access to Q-Link's menus.



Figure 11-2 User Name and Password required to enter this site sign in screen

If the Log Out button is clicked when the User Name and Password are blank a screen will appear that allows the user to log back into Q-Link. See Figure 11-3. Simply clicking on the underlined Log In words will allow the user to log back into Q-Link.

Q-Link: Logged Out from 10.10.10.10… Log In

Figure 11-3 Sample of the Log In screen when the User Name and Password are Blank

11.7.2 The Private Folder

The Private\Passwords menu supports up to 10 users, each with individual access privilege levels. The factory default settings do not show the Private Configuration page automatically so, to use the multi-user and privilege level features, type `http://10.10.10.10/paccess.cgi` (Your address will probable be different.) then press return. This will refresh the browser and show the Private folder in the menu tree.

11.7.3 The Private\Password Screen

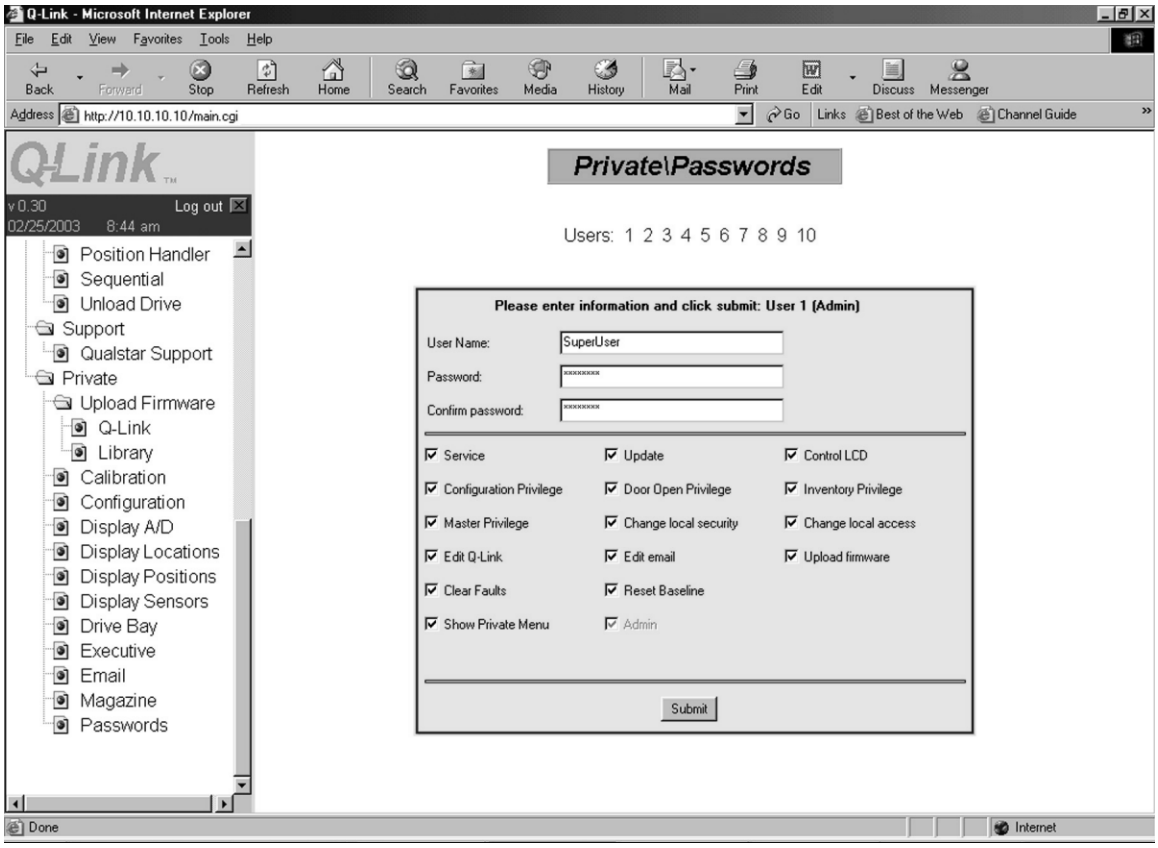


Figure 11-4 Example of the Private\Passwords Screen as seen on a Web Browser

Click on the Passwords menu item in the menu tree to access the Private\Passwords screen. User 1 (Admin) is the default administration user and it displays all privilege levels as selectable except for Admin, which is always checked for User 1.

When a user is logged in as Admin, all users are configurable. When a user is logged in without Admin privileges, the user is given no option to select other users and can only edit their own User Name and Password. See Figure 11-5.

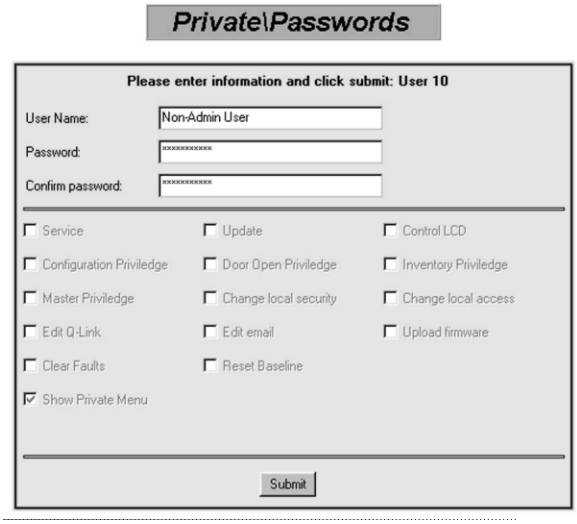


Figure 11-5 Sample of a Private\Passwords Screen without Admin Privileges

The Configuration, Door Open, Inventory and Master privileges are direct representations of the privileges in the TLS manuals and will allow/disallow a user to edit certain items as described in the appropriate TLS Installation and Operation/Technical Service Manuals. The Service and Update privileges function the same as having "Service" and "Update" as access words in the TLS. These six privileges function totally independently of the TLS' privileges. For example, giving a user service privileges does not change the privileges at the local library. The remainder of the privileges allow the user to manipulate items and pages in the web server.

After selecting or deselecting any privileges, type in the Password and Confirm password information, then press the submit button. If changing the Password is desired, follow the instructions below.

1. Click once in the Password text entry box and then type in your chosen password.

2. Press the Tab key or click once in the Confirm password text entry box and then type in the password exactly the same as it was in the Password text entry box.

3. Click once on the Submit button to complete the changing of Password.

In order for any changes to take effect, the operator must Log out from Q-Link and then Log in to update the settings.

If the Password and Confirm password information does not match upon pressing the submit button, the following text will be seen in a Q-Link Message window **`Password\Confirm Password entries are not the same. Please reenter them.`** See Figure 11-6. Click in the OK box of the message window and then retype the password and confirmation information to proceed.

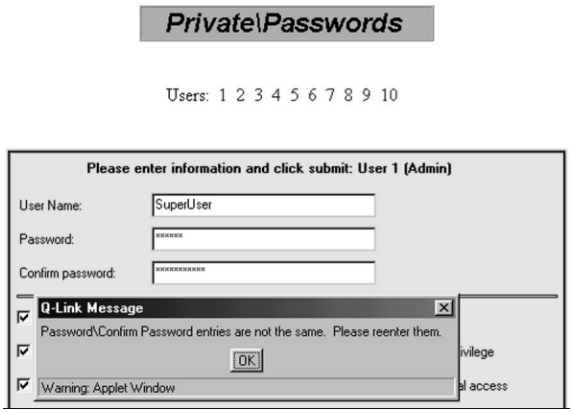


Figure 11-6 Password\Confirm Password entries are not the same Q-Link Message Window

NOTE

*If the User 1 (Admin) Passcode (user name or password) has been forgotten, it can be set to blank by using the DEL ADMIN PASSKEY command in the TLS while **"update"** access is valid. Please refer to the TLS-4000 Technical Service Manual, (Qualstar document number 501380).*

11.8 Edit the Name Server and SMTP Server Data

Click on the Q-Link menu item under the Advanced folder in the menu tree to access the Configuration\Advanced\Q-Link page and follow the instructions below.

1. Edit the Name server and SMTP server data.
2. Click the Submit Changes button.

11.9 Edit the Email Data

If your mail server provides ESMTP (Extended Simple Mail Transfer Protocol) services, you may provide a name and password for SMTP authentication. Additionally you may change the name (library name) and domain of the email server address. The default address for blank entries is Q-Link@Q-Link.com. See Figure 11-7.

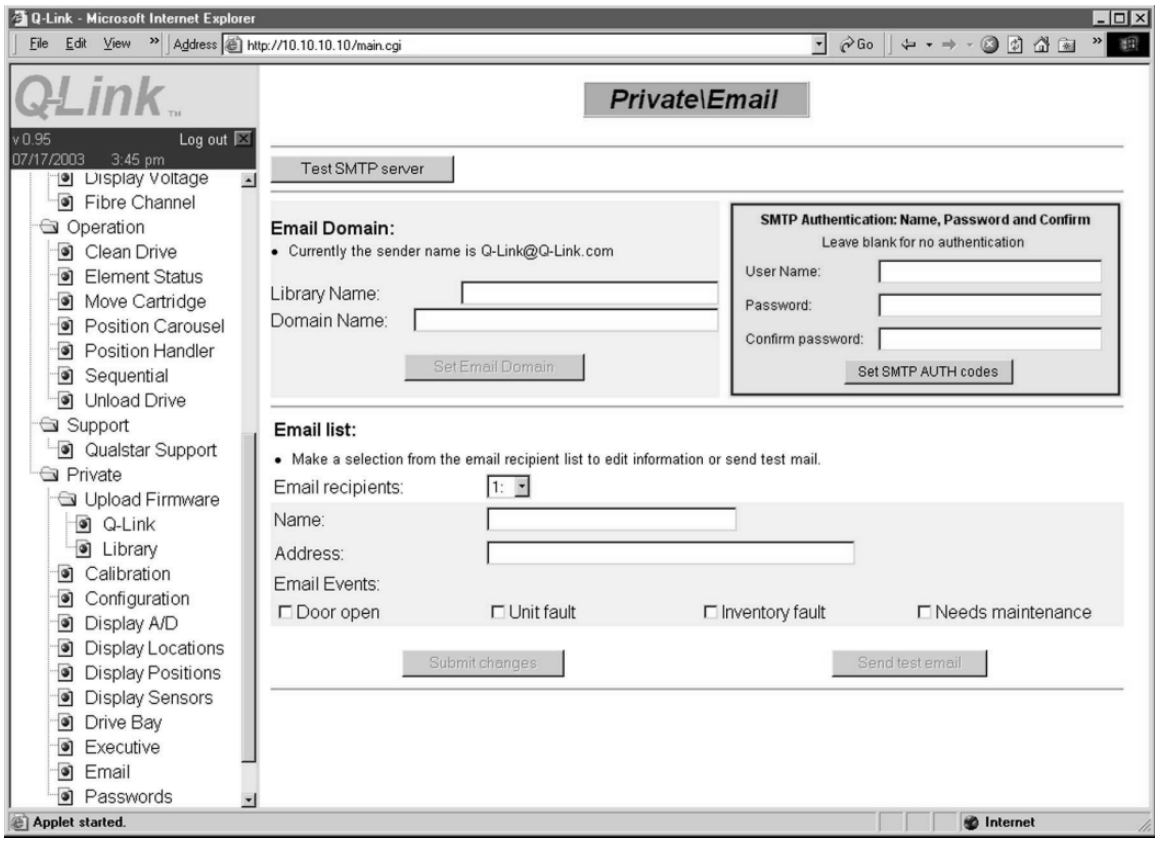


Figure 11-7 Sample of the Private\Email Screen

Q-Link supports up to 10 individual email addresses that can be assigned to receive an email message when one or more of the following events occur:

- Door open
- Unit fault
- Inventory fault
- Needs Maintenance

Click on the Email menu item under the Private folder in the menu tree to access the Private\Email page and follow the instructions below.

1. Type in the name and email address of an email recipient.
2. Check any event that you would like the email recipient to be notified of.
3. Click the Submit button.
4. Repeat steps 1 through 3 for each email recipient.
5. Click the Send Test Email button and then check the email recipient's inbox for the message.

11.10 SNMPv1 (Simple Network Management Protocol)

The simple network management protocol allows SNMP management software to get the status of various aspects of the library. This service is always active, but by default, traps (messages) are disabled until enabled by the user. The SNMP MIB is always available from the Configuration\Advanced\Q-Link screen. Click on "Retrieve the SNMP MIB" and Q-Link will serve up the MIB. There are three SNMP community names; "public" for read only access, "private" for read/write access and "trap" for trapdest.

Features of SNMP for Q-Link:

- SCSI, the optional fibre channel interface and various library performance statistics are displayed in the SNMP module.
- All tape drives are accessible with the drive indexer item.
- All tape cartridge inventory is accessible via the slot indexer item.
- The trap host is configurable via the SNMP interface item agentTrapDest.
- The enabling and disabling of traps is configurable via the SNMP interface item agentTrapsEnabled.
- The traps are the same as those offered in Q-Link: Door Open, Unit Fault, Inventory Violation and Needs Maintenance.

Traps are sent out five times: At first occurrence and then at two, four, eight and eight minute intervals.

11.11 Uploading Firmware

Q-link allows for the uploading of new Q-Link and library firmware.

NOTE

Firmware should only be updated after consulting with Qualstar's Technical Support Department. They can be reached at (805) 583-7744 or E-mail them at support@qualstar.com

11.11.1 Q-Link Firmware Uploading

Click on the Q-Link menu item under the Upload Firmware folder in the menu tree to access the Private\Firmware Upload\Q-Link screen and follow the instructions below.

1. Access the firmware file by either clicking on the Browse button or typing the file path to the firmware file. See Figure 11-8.

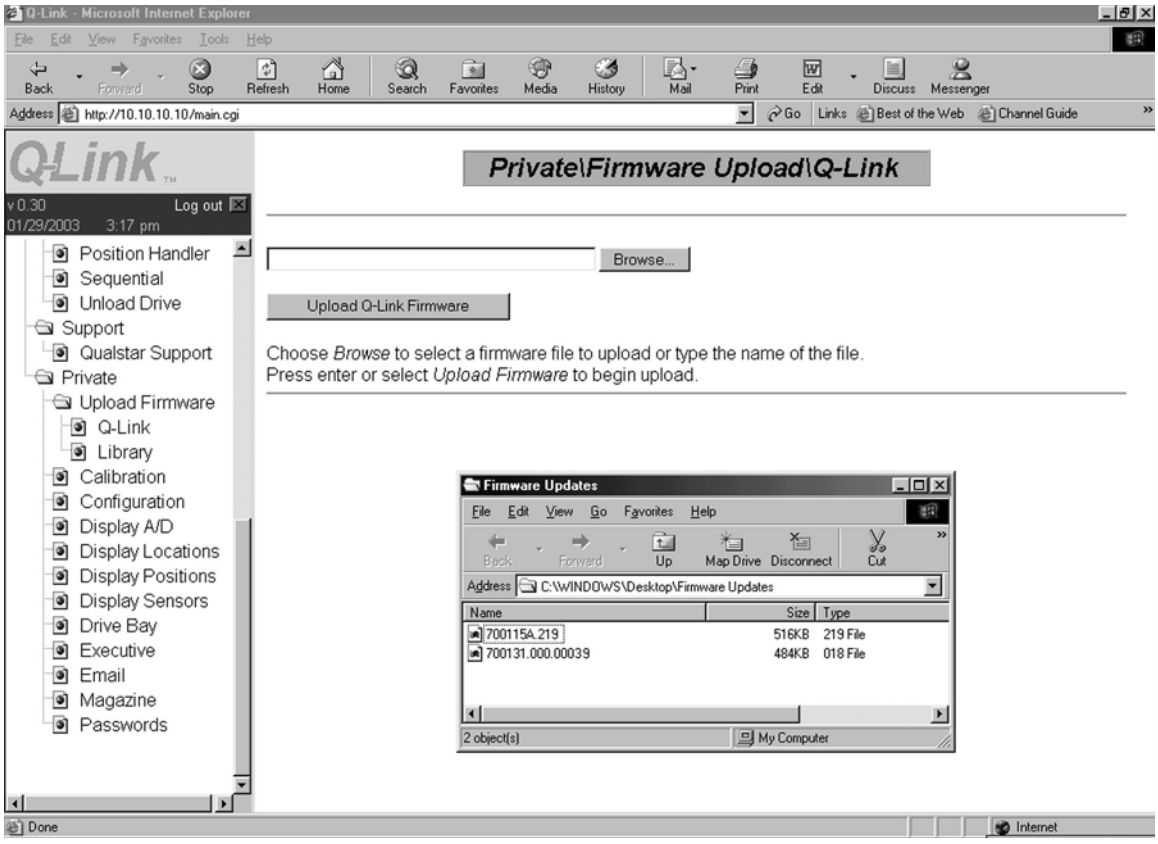


Figure 11-8 Sample of the Q-Link Firmware Upload Screen

2. Press the enter key or click on the Upload Firmware button to begin the uploading process.

3. Click once on the Submit button to complete the changing of Password.

4. Two different screens will appear as the uploading process proceeds. See Figure 11-9 and Figure 11-10.

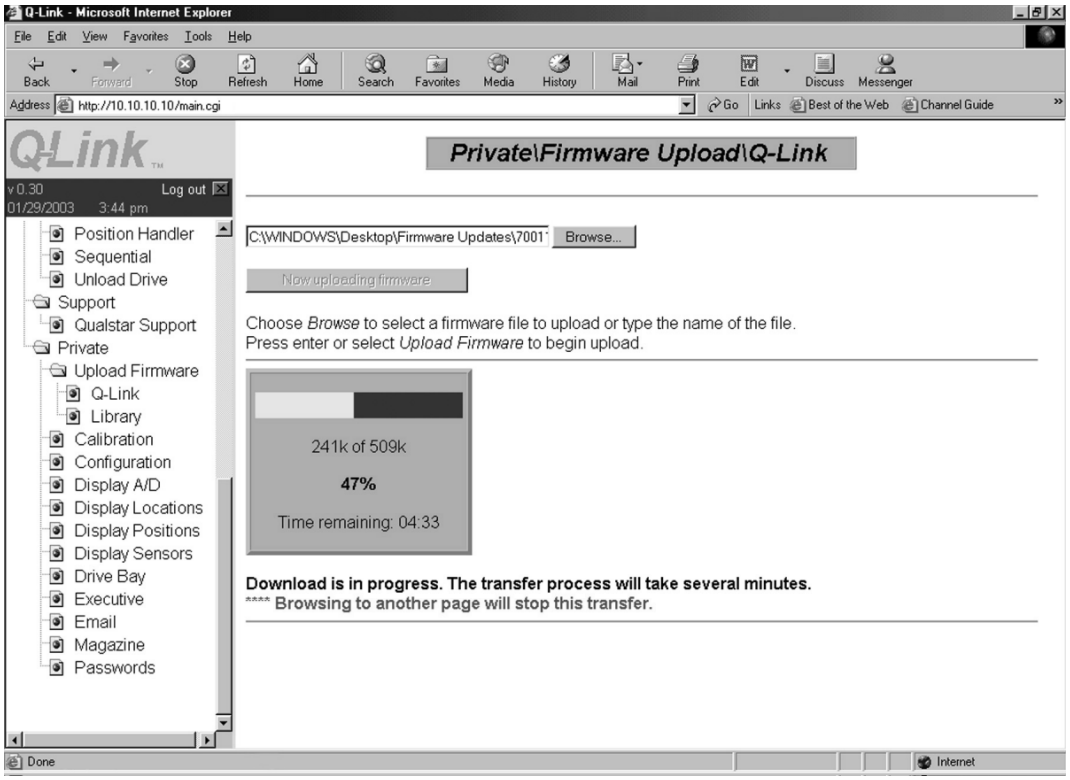


Figure 11-9 Sample of the Q-Link Firmware Upload Progress Screen

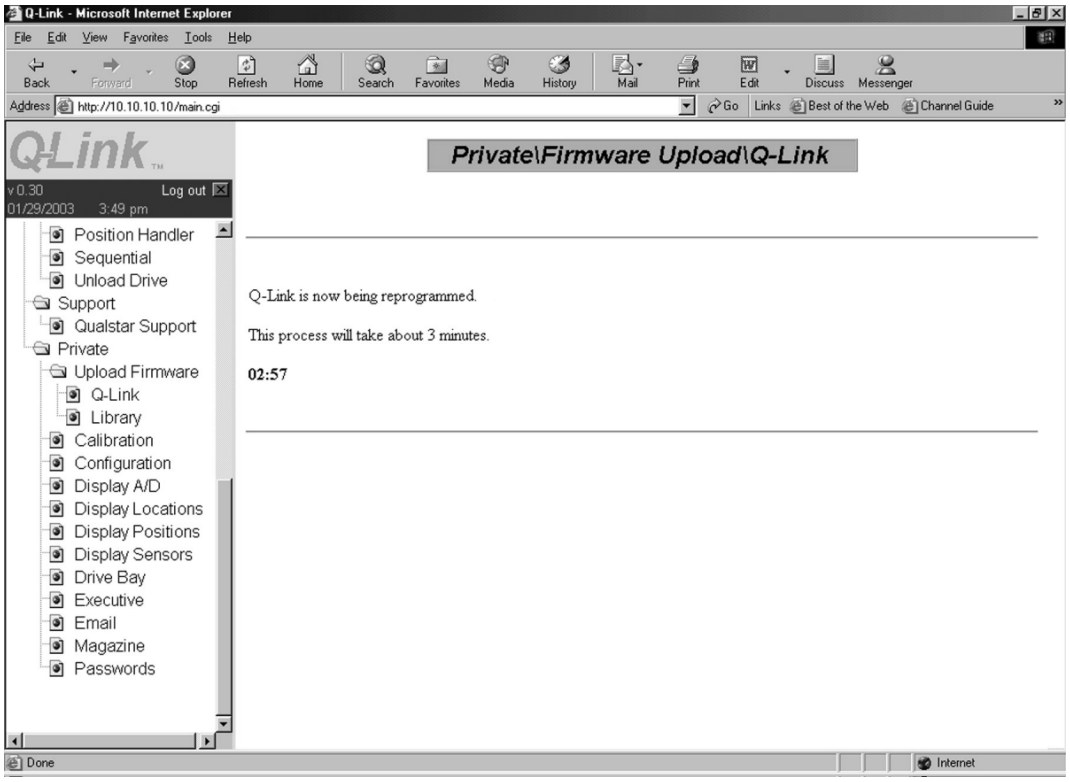


Figure 11-10 Sample of the Q-Link Firmware Reprogramming Progress Screen

5. When the Q-Link uploading\programming is complete a screen will appear that shows the old and new firmware information. See Figure 11-11.

Q-Link uploading/programming has finished.

Old firmware information:
Date: 9/15/2002
Part number: 700118
Revision: 000.00024

New firmware information:
Date: 1/30/2004
Part number: 700118
Revision: 000.00039

Figure 11-11 Sample of the Q-Link Uploading/Programming Has Finished Screen

11.11.2 Library Firmware Uploading

Click on the Library menu item under the Upload Firmware folder in the menu tree to access the Private\Firmware Upload\Library screen and follow the instructions below.

1. Access the firmware file by either clicking on the Browse button or typing the file path to the firmware file.

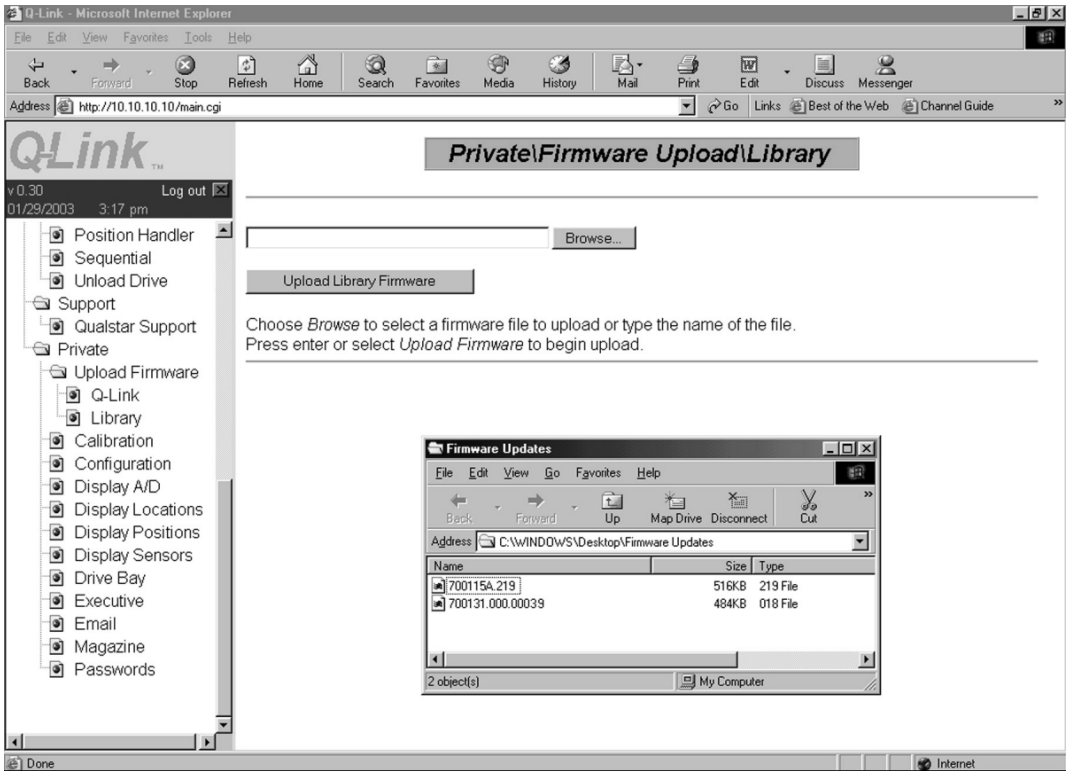


Figure 11-12 Sample of the Library Firmware Upload Screen

2. Press the enter key or click on the Upload Firmware button to begin the uploading process.

3. **Note that after the upload begins browsing to another page will stop the firmware uploading process.**

4. Two different screens will appear as the uploading process proceeds. See Figure 11-13 and Figure 11-14.

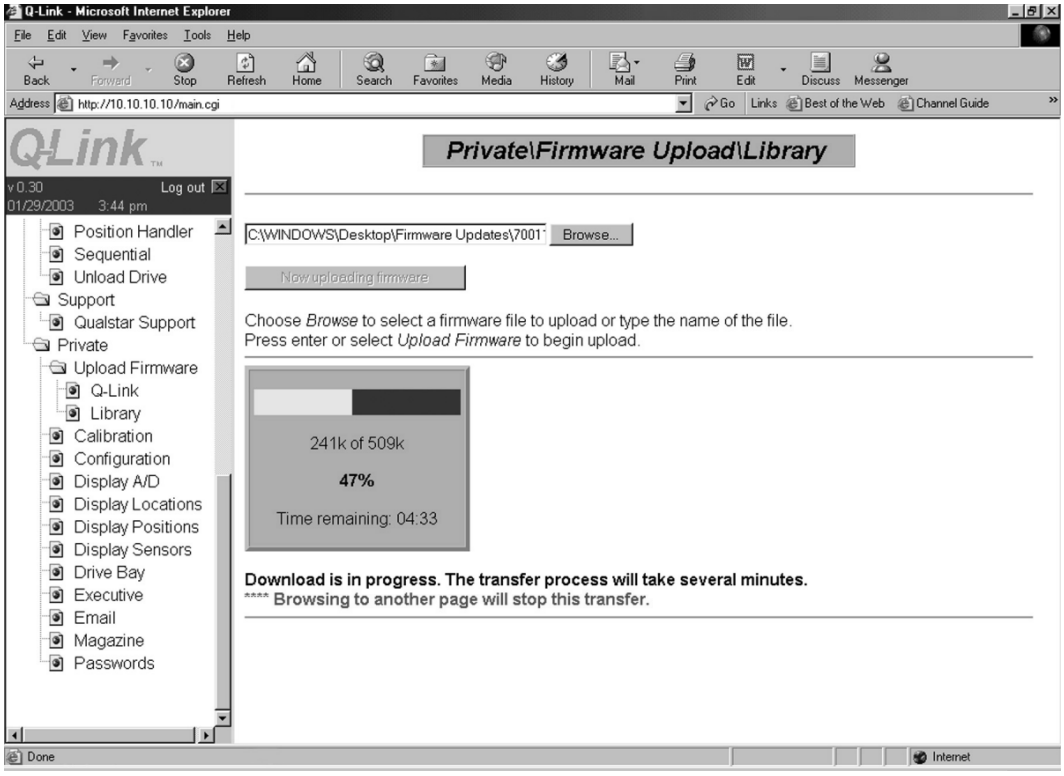


Figure 11-13 Sample of the Library Firmware Upload Progress Screen

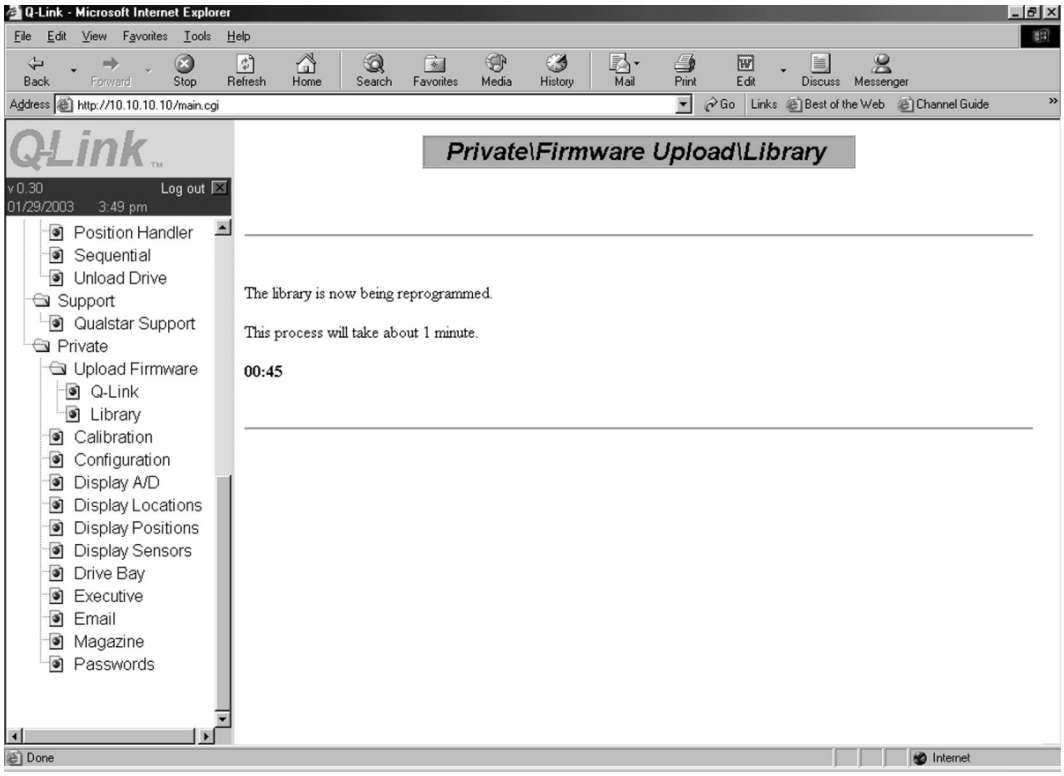


Figure 11-14 Sample of the Library Firmware Reprogramming Progress Screen

5. When the Q-Link uploading\programming is complete a screen will appear that shows the old and new firmware information. See Figure 11-15.

Library uploading\programming has finished.

Old Firmware Information:
Date: 7/15/2002
Part number: 700115
Revision: 2.17

New Firmware Information:
Date: 7/30/2002
Part number: 700115
Revision: 2.18

Figure 11-15 Sample of the Library Uploading\Programming Has Finished Screen

12. Preventive Maintenance

This chapter describes the things that can be done to keep the TLS running reliably.

DANGER

TO AVOID THE POSSIBILITY OF PERSONAL INJURY, BE SURE TO TURN OFF THE TLS' POWER AND DISCONNECT THE POWER CORD BEFORE DOING ANY WORK INSIDE THE CABINET.

GEFAHR

UM EVENTUELLE PERSÖNLICHE VERLETZUNGEN ZU VERMEIDEN, VERSICHERN SIE SICH VOR JEGLICHER ARBEIT INNERHALB DES GEHÄUSES DAß DER STROM DES TLS AUSGESCHALTET UND DAS STROMKABEL AUSGESTECKT IST.

NOTE

Do NOT loosen the libraries Torx head alignment screws.

12.1 Periodic Cleaning

After a library has completed 20,000 cartridge exchanges, the following message will appear in the display:

```
••••••••••••••••••••
 Time for Periodic
    Maintenance.
     See Manual
```

This message can be suppressed for up to one minute by pressing the MENU or EXIT key. It is recommended that the preventative maintenance instructions in this chapter be followed at this time. After preventative maintenance has been completed press the ENTER key to reset the counter and clear the display.

12.1.1 Cleaning the Exterior

Use any standard office equipment cleaner and a soft, clean cloth to clean the exterior of the TLS. Do not use ammonia-based cleaners, or other harsh cleaning solutions, as these may damage the unit's paint. The window is made of polycarbonate plastic and should be cleaned with an appropriate, ammonia-free, plastic-cleaning solution. Kleenmaster Brillianize is recommended.

NOTE

Kleenmaster® Brillianize® is produced by Chemical Products Co., Inc., Omaha, Nebraska.

12.1.2 Cleaning the Interior

The inside of the TLS cabinet is pressurized to keep out dust and cooled by filtered air to ensure an optimum operating environment. If a build-up of dust inside the unit should be noticed, check the condition of the air filter element and replace it if it is dirty. Instructions for checking and changing the air filter are given in Section 12.2 and Section 12.3.

Plastic dust from the cartridges may eventually accumulate on the gripper assembly and the bottom of the cabinet. This should be removed with a vacuum cleaner or slightly damp cloth.

12.1.3 Cleaning the Cartridge Presence Sensor

The emitter and detector of the Cartridge Presence Sensor's may become dusty over a prolonged period. About every six months or so, use an air spray can (like those sold in photography stores for dusting off camera lenses), to gently blow off any dust that may have accumulated on the sensor's emitter and detector.

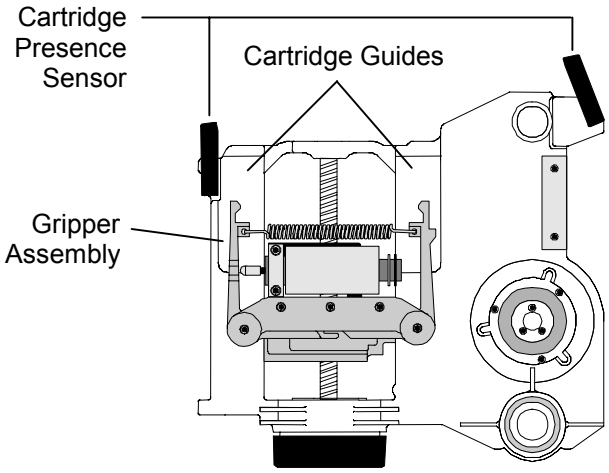


Figure 12-1 The Carriage - Cartridge Presence Sensor and Gripper

12.1.4 Cleaning the Gripper Assembly

Plastic dust from the cartridges may eventually accumulate on Gripper's arms or cartridge guides. This should be removed with a vacuum cleaner or slightly damp cloth. See Figure 12-1.

12.1.5 Cleaning the I/O Port Sensors

The I/O port has two sensors, each with an emitter and detector. These sensors may become slightly dusty over a prolonged use. Approximately every six months, use an air spray can (like those sold in photography stores for dusting off camera lenses), to gently blow off any dust that may have accumulated on the sensors' emitters and detectors (located on the I/O Port Sensor PCBA and on the I/O Port PCBA, directly above the I/O Port Sensor PCBA).

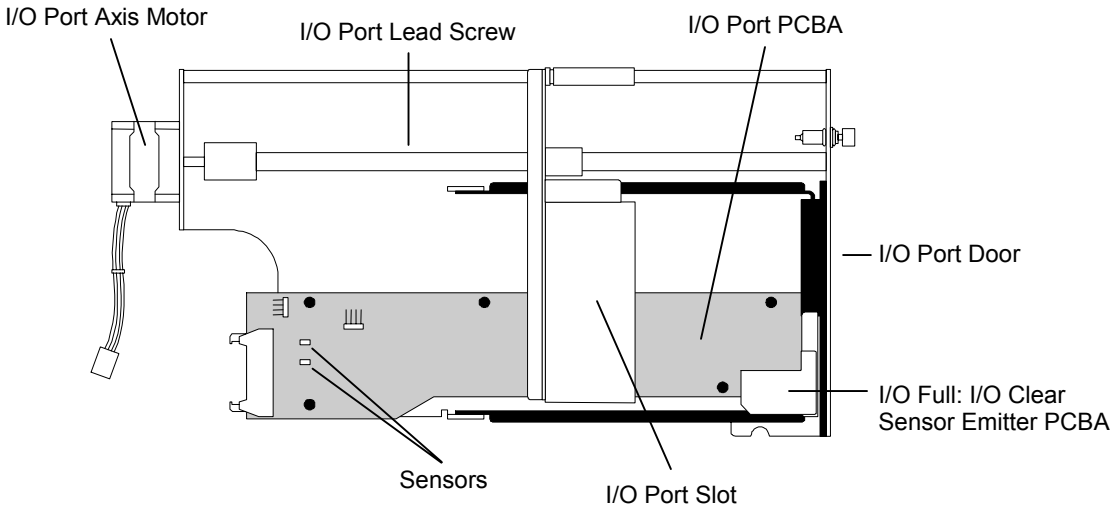


Figure 12-2 I/O Port Sensors (Bottom View of I/O Port Assembly)

12.1.6 Cleaning the Inventory Sentry Beam Emitter

The Inventory Sentry Beam Emitter is located on the bottom of the TLS cabinet and may become dirty from plastic cartridge dust. See Figure 12-3. Approximately every six months, use an air spray can (like those sold in photography stores for dusting off camera lenses), to gently blow off any dust that may have accumulated on the sensors' emitters. Direct the air flow into the two holes on the emitter.

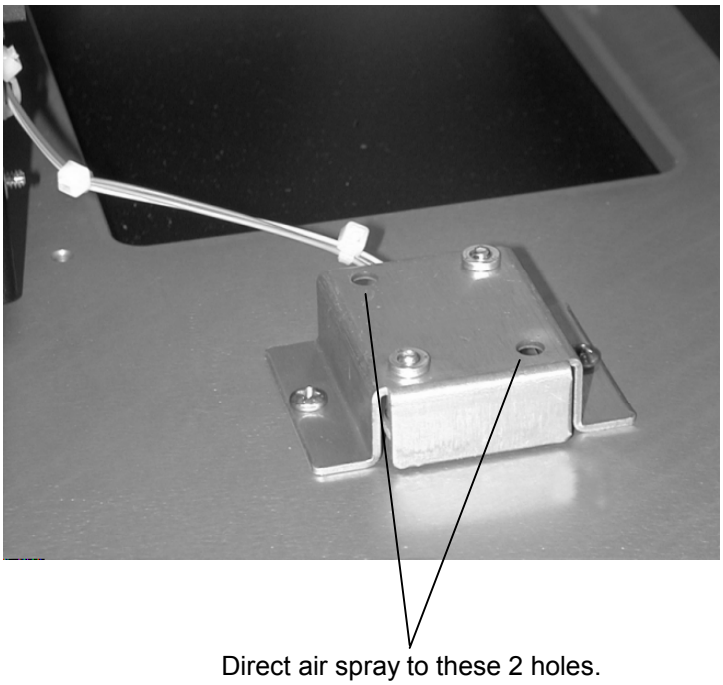


Figure 12-3 Inventory Sentry Beam Emitter

12.1.7 Cleaning the Tape Drives

Follow the procedures given in the documentation which came with the tape drives. The cleaning procedure can be automated by storing a cleaning cartridge in one of the fixed slots and using a host system's maintenance program, which automatically loads the cleaning cartridge into each tape drive.

12.2 Checking the Air Filter

The TLS and the tape drives are cooled by outside air that is drawn into the TLS enclosure through an air filter. This filter keeps dust and dirt from entering the enclosure, as its presence could degrade the reliability of the tape drives and media. If the filter becomes clogged with dust and dirt, the amount of airflow will be diminished. Diminished air flow could cause the tape drives to run hotter, again degrading their reliability. Therefore, it is important to periodically check the air filter replace it when it becomes dirty.

The time between filter changes is very dependent upon the local environment. Inspect the filter frequently when the TLS is first installed. Then, when the effects of the local environment become known, adjust the inspection schedule accordingly.

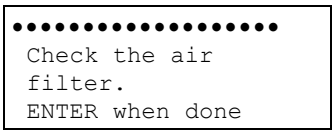


Figure 12-4 Air Filter Alert

The TLS automatically keeps track of its power-on time. The `Filter Days` value in the `Configuration\Advanced\Changer` menu determines how often the user will be reminded to check the air filter. New units are set to 120 days. An alert will be displayed when the operating time exceeds the Filter Days value provided the menu system is not active. When the `Check the air filter` alert displays (Figure 12-4 above), follow the steps below:

1. Visually inspect the air filter element at the lower left corner of the rear panel (Figure 12-5).

NOTE

New air filters are light green. A color change indicates the presence of some dirt, which is acceptable. However, if dirt is clinging to the outside filter surface, it is time to replace the filter.

2. When the air filter alert appears, if the filter does not need replacing, press the EXIT key. This will dismiss the alert, but will not reset the Filter Days timer.

3. Next, increase the `Filter Days` value in the `Configuration\Advanced\Changer` menu. If it is estimated that the filter could go an additional 90 days, increase the `Filter Days` value accordingly.

Example: Change the value from `120` to `210` days.
Since pressing the EXIT key to dismiss the air filter alert message does not reset the power-on-days timer, the timer continues counting from its present value and the next alert will occur in 90 power-on days.

When the next air filter alert occurs, if the filter needs replacing, leave the `Filter Days` value at 210 days. If the filter still does not need replacing, press the EXIT key, then increase the `Filter Days` value again. Keep increasing the `Filter Days` value each time the air filter alert appears until the maximum value for the given environment is determined.

4. If the filter does need replacing when the air filter alert message appears, press the ENTER key to dismiss the alert and reset the Filter Days timer. Then, follow the procedure in Section 12.3 to replace the air filter.

12.3 Replacing the Air Filter

DANGER

TO PREVENT THE POSSIBILITY OF PERSONAL INJURY, DO NOT REPLACE AN AIR FILTER ELEMENT WHILE THE TLS' POWER IS ON. ONCE AN AIR FILTER ELEMENT IS REMOVED, THERE IS NOTHING TO PREVENT ACCIDENTAL CONTACT WITH THE MOVING FAN BLADES.

GEFAHR

UM EVENTUELLE PERSÖNLICHE VERLETZUNGEN ZU VERMEIDEN, WECHSELN SIE KEINEN LUFTFILTER WÄHREND DER STROM DES TLS EINGESCHALTET IST. SOBALD DER LUFTFILTER ENTFERNT WURDE, IST NICHTS MEHR VORHANDEN, DAS VOR DEM VERSEHENTLICHEN KONTAKT MIT DEN VENTILATORENBLÄTTERN SCHÜTZT.

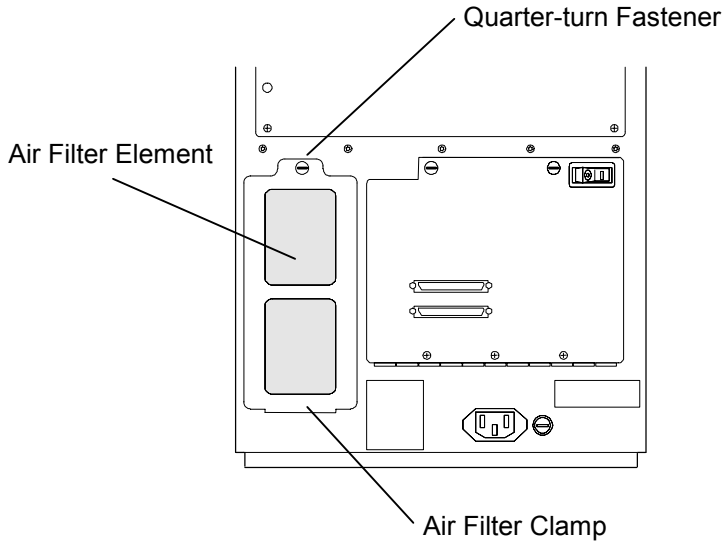


Figure 12-5 Rear View of TLS

Refer to Figure 12-5.

1. Turn off the TLS' power and remove the power cord.
2. Use a flat blade screwdriver to turn the single 1/4-Turn Fastener at the top of the Air Filter Clamp counter-clockwise.

3. Remove the Air Filter Clamp and replace the air filter element with a new one (Qualstar P/N 500584-01-6). If an old air filter element is not yet dirty enough to be replaced and is being reinstalled, make sure that the side that was facing the inside of the library is placed in the same direction as it was when it was removed. Reversing the direction of an old air filter element may cause dirt to be transferred into the library.

4. Replace the Air Filter Clamp and secure it by turning the 1/4-Turn Fastener clockwise.

5. Plug the power cord in and turn on the TLS.

6. Place your hand or a piece of paper in front of the filter to verify that the fans are functioning properly by drawing air into the library.

7. If either fan has failed, notify a service technician.

12.4 Lubricating the Leadscrews

The TLS should not normally require lubrication, with the following exceptions.

- The Vertical (Y) Axis Leadscrew requires re-lubrication after approximately 200,000 Y-Axis moves, which is approximately equal to about 100,000 cartridge exchanges. Under heavy use, this equates to about one and a half years of operation. The number of Y-Axis moves is displayed in the Maintenance\Display Stats. status screen (see the TLS-4000 Technical Service Manual, Qualstar document number 501380).
- Whenever the Carriage Assembly (P/N 500650-01-5) is changed.

Should it become necessary to lubricate part of the TLS, follow the procedure below, which assumes that the Carriage Assembly has not been removed from the TLS.

IMPORTANT:
Use only Qualstar Leadscrew Lubricant, part number **732-0003-2**, for this procedure.

NOTE

Note that all lubricant that is put into a TLS remains there; it never evaporates or spreads around very much. Also note that If too much lubricant is used, it may spatter the surrounding parts of the TLS.

The white lubricant used for this procedure is non-toxic (it is used in food processing equipment), but it is still wise to use a latex glove on the hand that applies the lubricant. If the lubricant contacts your skin, wash with soap and water.

1. For a Vertical (Y) Axis Leadscrew, an I/O port Leadscrew, or an Insertion (Z) Axis (Gripper) Leadscrew, apply a single pea sized ball of Qualstar Leadscrew Lubricant to the tip or your index finger. Then rub your thumb and index finger together to spread the lubricant evenly on your fingertips.

2. Run your thumb and index finger over the length of the Vertical (Y) Axis Leadscrew several times, at different angles, to apply the grease to as much of the Leadscrew's surface as possible. Apply the lubricant evenly, so that every thread receives a small amount of grease (the grease will not spread around very much during operation).

3. Remove the latex glove. If you did not use a latex glove, wash you hands with soap and water.

4. If the Y-axis Leadscrew has been lubricated, lift the Carriage up to the top of the Vertical (Y) Axis range of motion, then push it back down to the bottom stop. Repeat this process five more times.

12.5 Fixed/Private Slot FRU

The Fixed Slot(s), Private Slot and the I/O port Slot are Field-Replaceable Units (FRUs). Each FRU slot should be inspected at least once per year and replaced if any broken parts are noticed. Also, each FRU slot should be routinely replaced every five years. Refer to the TLS-4000 Technical Service Manual (Qualstar document number 501380) for details.

12.6 Magazines

Be sure to inspect each magazine at least once per year. Replace a magazine if it has any broken parts. Clean with a slightly damp cloth if dusty.

12.7 Cartridges

Cartridges should be replaced when their door mechanism breaks. This requires transferring the data to another cartridge and applying a new (and probable different) barcode label to the cartridge. Caution must be exercised to prevent a loss of data. Clean with a dry, lint free cloth if dust has accumulated in the recesses of the gripping area.

13. Repacking

This chapter explains how to properly repack the TLS for shipping.

DANGER

DEPENDING UPON THE MODEL, THE TLS WEIGHS OVER 140 POUNDS (64kg), EXCLUDING MAGAZINES AND CARTRIDGE DRIVES. IMPROPER LIFTING TECHNIQUES CAN RESULT IN BACK INJURY AND/OR EQUIPMENT DAMAGE. GET HELP WHEN LIFTING OR MOVING THE TLS.

GEFAHR

ABHAENGIG VOM MODELL BETRAEGT DAS GEWICHT DER TLS OHNE MAGAZIN UND CASSETTENLAUFWERK ÜBER 64kg (140 POUND). FALSCHES TRAGEN KANN ZU PERSONENVERLETZUNGEN UND/ODER ZU BESCHAEDIGUNGEN DES GERAETES FUEHREN. TRAGEN ODER BEWEGEN SIE DAS GERAET NIE OHNE MINDESTENS EINE ZWEITE HILFSPERSON.

The following items were packed in the original shipping carton:

Tape Library System (TLS)

An accessory pack containing:
- One Power Cord
- Two Door Keys
- The Installation and Operation Manual
- Tape Drive Mounting Hardware
- Two Stabilizer Feet (except for models 4212 and 4222)

NOTE

The Accessory Pack is shipped separately with the following models: 4440, 4480, 4660 and 46120.

13.1 Repacking the TLS

The TLS was originally shipped in a specially designed double carton with eight energy-absorbing corner blocks between the inner and outer boxes. When shipping the TLS, use the original shipping container and packing materials. If the original shipping container and packing materials are not available, order a new shipping container by calling Qualstar Technical Support.

CAUTION

Remove magazines and cartridges before proceeding. To prevent damage, do not ship the TLS with magazines or cartridges installed.

CAUTION

The TLS shipping container consists of an inner carton enclosed in an outer carton. The inner carton is suspended within the outer carton by energy absorbing corner blocks. ***NEVER*** *ship the library in the inner carton only. Both cartons and all eight-corner blocks are required to prevent damage.*

13.2 Preparation for Packing

Prepare the unit for packing as follows:

1. Remove all tape cartridges, cleaning cartridges and magazines.
2. Lock the door and stow the key set in the accessory carton.
3. Remove the power cord and place it in the accessory carton.
4. Remove the stabilizer feet and place them in the accessory carton.

13.3 Packing the TLS

Refer to Figure 13-1.

With the help of an assistant, follow the instructions below.

1. Place the unit on a flat working surface and tape the Cardboard Aft Liner to the rear of the unit (item 1).
2. Pull the Plastic Bag down over the top of the unit and the Cardboard Aft Liner (item 2).
3. Open the Inner Carton and lower the Inner Carton all the way down over the unit (item 3).
4. Turn the Inner Carton over so that the open flaps are facing upward with the TLS upside down, then close the Plastic Bag (item 4).
5. Place the Foam Base Liner on the bottom of the unit so that the unit's feet fit into its corner notches (item 4), then seal the Inner Carton with shipping tape.
6. Place the Outer Carton on the floor on its side, with the open flaps facing the Inner Carton (item 5).
7. Rock the top of the Inner Carton away from the Outer Carton, and then place two Corner Blocks under the Inner Carton, on the side closest to the Outer Carton (item 5).
8. Gently lower the Inner Carton back down onto the rear Corner Blocks, and then place two more Corner Blocks on top of the Inner Carton, on the side facing the Outer Carton (item 5).
9. Slide the Inner Carton into the Outer Carton (item 5), and then rotate the cartons so that the open flaps of the Outer Carton are facing up (item 6).
10. Install the remaining four Corner Blocks, then insert the Accessory Pack. ***Be sure to insert the Accessory Pack*** (for units shipped with the Accessory Pack inside the Outer Carton), then seal the Outer Carton with shipping tape.

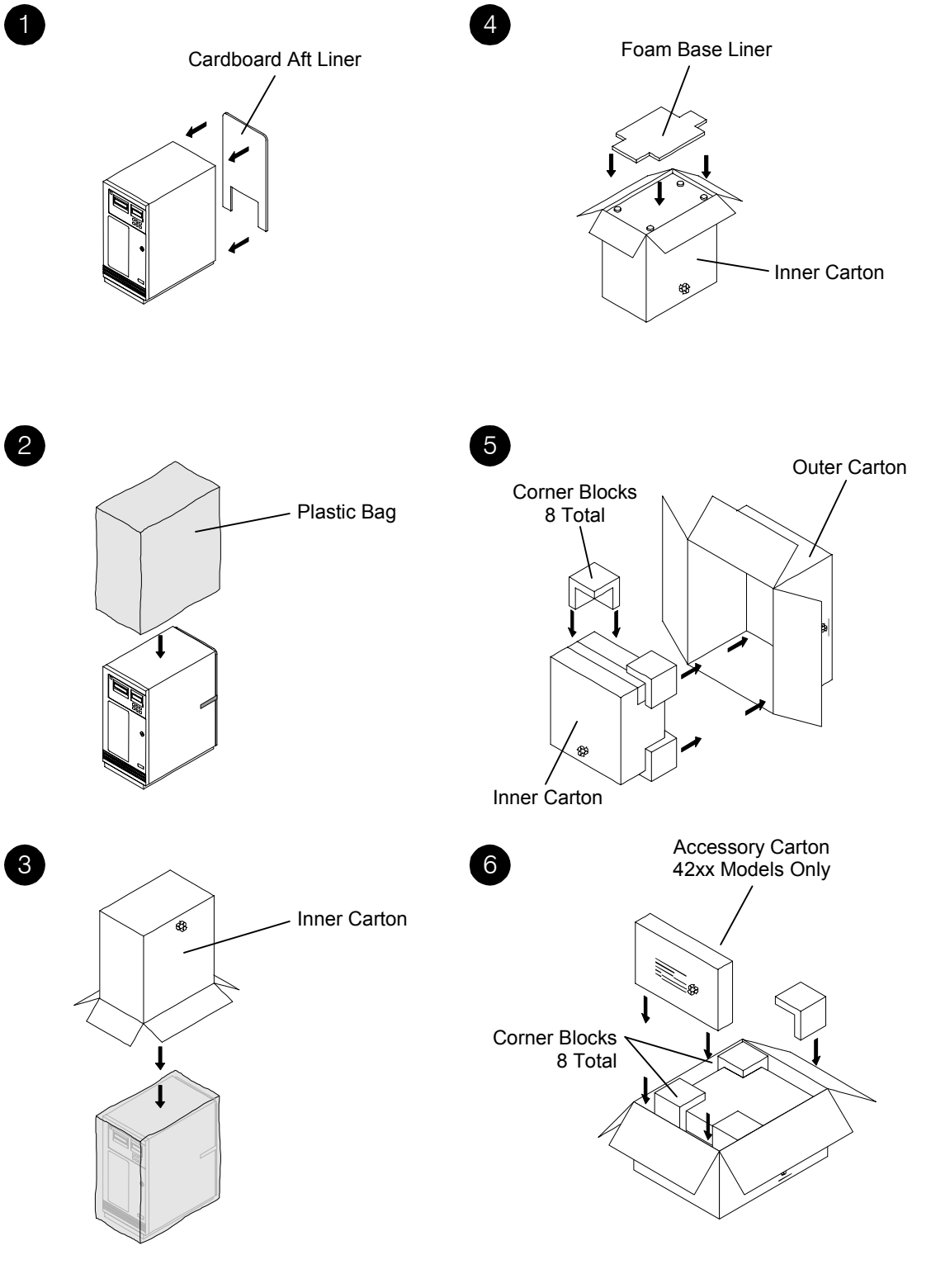


Figure 13-1 Repacking the TLS

14. Glossary

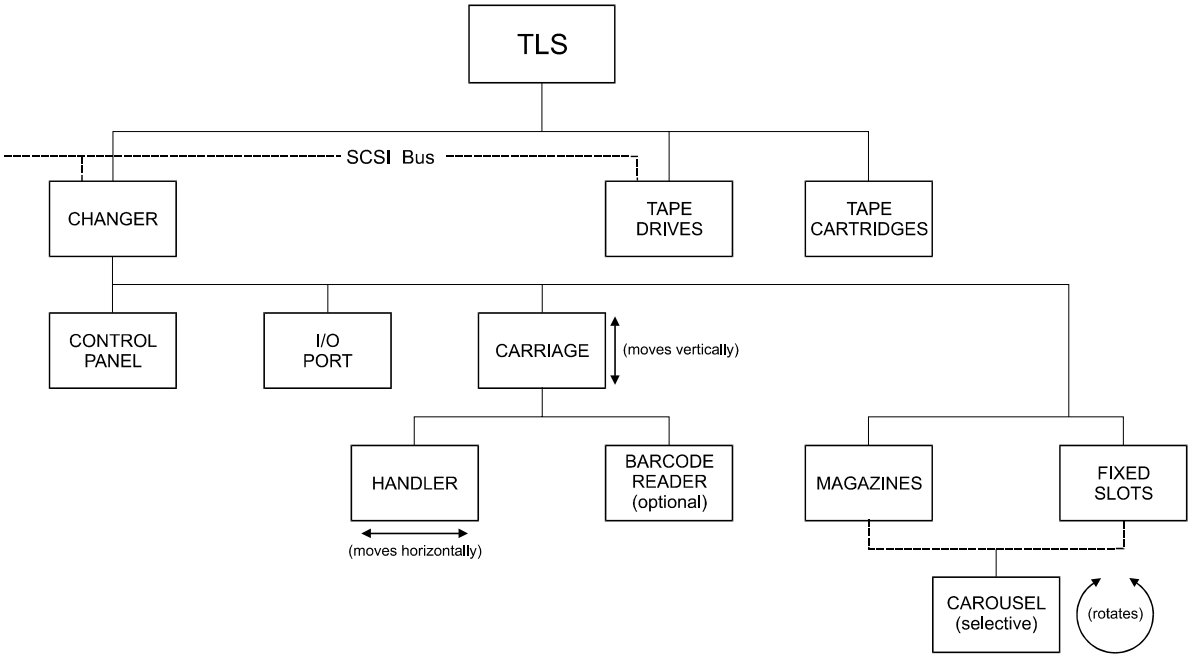


Figure 14-1 Diagram of Glossary Terms

AIT An acronym for "Advanced Intelligent Tape". This technology was developed by Sony Corporation. It is also manufactured by Seagate Corporation.

Barcode Reader This device (optional on some models) reads barcode labels found on Tape Cartridges. Barcode label information may be used to identify each Tape Cartridge in the TLS.

Browser An application program that runs on a computer and is used to browse the contents of web sites and pages on the Internet or LAN.

Carousel A Carousel is the mechanism that rotates the Magazines into position opposite the Carriage and the Handler. Only some models are equipped with carousels. Some models are equipped with two carousels.

Carriage A Carriage is the mechanism that travels vertically within the TLS in order to move Tape Cartridges. It contains the Handler and the optional Barcode Reader.

Changer The Changer is the central control system of the TLS. The Changer is the device that moves tapes to and from all locations. It is controlled by the SCSI host computer and/or the operator via the Control Panel. The Changer includes everything except the Tape Drives and Tape Cartridges.

Control Panel The Control Panel has a group of control keys and an alphanumeric display. The Control Panel is used to inform the operator of the Changer's status and to accept setup, operational and diagnostic commands from the operator.

Cookies A very small data file deposited on a computer by a web-based site for future recovery of the client's identification and preferences.

DHCP Dynamic Host Configuration Protocol – A system for dynamically allocating IP addresses.

DIFF See HVD

Ethernet The standard describing the physical characteristics and protocol used on most local area computer networks or LANs.

Fixed Slots Fixed Slots are storage locations that are not removable from the TLS. These slots are frequently used to store cleaning cartridges. These locations are also referred to as Storage Elements in the SCSI specification.

Gateway Address The address of the Internet Gateway on a LAN. The gateway is the path to the outside world.

Handler The Handler is a mechanism on the Carriage that holds onto Tape Cartridges using its Gripper mechanism. The Handler travels horizontally to insert and remove Tape Cartridges from the Tape Drives and storage locations. A Handler is referred to as the Medium Transport Element in the SCSI specification.

http: Hypertext Transfer Protocol

HVD High Voltage Differential type of SCSI interface.

I/O Port The I/O port is the mechanism that extends and retracts the I/O port Slot. It also takes Tape Cartridges from the Handler and presents them to the operator. It may be controlled by both the SCSI host and the Control Panel. The I/O port is referred to as the Import/Export Element in the SCSI specification.

IP Internet Protocol – The data transport protocol used by the Internet.

Java Script Java script used in web pages that is interpreted by the user's browser.

Java Virtual Machine A program that interprets Java script.

Location Designator A Location Designator contains alphanumeric characters used to describe any *physical* location inside a Qualstar library.

LAN Local Area Network – A physical interconnection medium allowing computers to communicate with each other.

LVD Low Voltage Differential type of SCSI interface.

LVD/SE See MLVD

Magazine A Magazine is a molded plastic container that holds 10 Tape Cartridges. A Magazine can be removed from a TLS without removing the Tape Cartridges in the Magazine. The locations within Magazines are referred to as Storage Elements in the SCSI specification.

MLVD Multimode Low Voltage Differential type of SCSI interface.

Name Server A computer on the internet that provides a service to translate names, such as www.qualstar.com, to an IP addresses.

PCBA Printed Circuit Board Assembly

Q-Link Qualstar's proprietary Remote Library Manager that provides a web site in the library.

Robotics Any part of the library that moves. This includes the Carousel, Carriage, Gripper, Handler, I/O port, etc.

SE Single-ended type of SCSI interface.

SMTP Simple Mail Transfer Protocol – The standard e-mail protocol on the Internet.

Stacker A term that refers to a "Single-pass, sequential-only Changer." A Stacker device changes Tape Cartridges for a single Tape Drive from a stack of available Tapes Cartridges. The sequence cannot be repeated without operator intervention. A Stacker needs no commands from a host computer to perform its function. All that is required of the host computer is for it to write its data to tape and then eject the tape when it becomes full.

Subset Mask The mask used on a LAN to determine if a packet is destined for another site on the LAN or outbound for the Internet.

Tape Cartridges Tape Cartridges are magnetic tape media used to store data. Tape Cartridges, including data and cleaning cartridges, may be placed in any of the physical locations.

Tape Drives Tape Drives are devices used to write and read data to and from Tape Cartridges. They are mounted in the TLS' drive bay, which supplies them with power and a SCSI connection to the host computer. The Changer and Tape Drives may reside on the same SCSI bus, but they never communicate with each other over that bus. The Tape Drives are referred to as Sequential-access devices in the SCSI specification.

TLS TLS stands for Tape Library System. The TLS is the complete storage system that includes the Changer, Tape Drives and Media.

VIOP The Variable I/O port (VIOP) feature allows the user to define from one to a magazine full of tape cartridges to be imported to or exported from the TLS. The VIOP is referred to as the Import/Export Element in the SCSI specification.

Web An abbreviated term for the World-Wide-Web (the commercial side of the Internet).