QUALSTAR ®

The Tape Library Experts™

TLS-4000

Technical
Service Manual

501380 Rev. B

Important Manual/Firmware Revision Information

This manual and the operating firmware for the 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 different part numbers or prior versions of the firmware. Check with Qualstar Technical Support about use of this manual with newer firmware.

Manual	Corresponding Firmware
TLS-4000 Technical Service Manual 501380 Rev. B, April 14, 2004	TLS Executive Firmware 700105 Version 2.21

Copyright Notice

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Notices

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

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.

Technical Support Information

The best source for service-related information is your system reseller. Alternately, the Qualstar Technical Support Department can be reached Monday through Friday, between the hours of 7:30 A.M. and 4:30 P.M. Pacific Time, at:

Qualstar Corporation

3990-B Heritage Oak Court
Simi Valley, CA 93063

Attn: Technical Support
Fax: (805) 583-7749
Phone: (877) 444-1744
Monday – Friday 7:30 a.m. to 4:30 p.m. PST
After hours support: (805) 526-7480 or (805) 583-7748
E-Mail support@qualstar.com

E-Mail: sales@qualstar.com
Web: www.qualstar.com

Table of Contents

1.   Introduction

1.1 Who Should Read This Manual

This *Technical Service Manual* is for Tape Library System (TLS) service personnel. It describes the Maintenance Menu, the Private Menu and Field Replacement Units (FRU's). It also contains troubleshooting procedures, instructions for removing and replacing FRU's and after–maintenance testing procedures. Finally, Chapter 9 contains the System Interconnect diagram.

The following topics are covered in the TLS-4000 Installation and Operation manual (Qualstar document number 501370):

- **Unpacking Instructions**

- **Control Panel**

- **Menu System**

- **System Configuration**

- **System Operation**

- **Preventative Maintenance**

- **Repacking Instructions**

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
SCSI Command Information	TLS-4000 SCSI-2 Interface Manual	500523
Installation and Operation	TLS-4000 Installation and Operation Manual	501370
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
Approved Data Cartridges	Product Information Note	PIN-038
Barcode Label Specifications	Product Information Note	PIN-040
SCSI-2	ANSI X3.131-1994	N/A
SCSI SPI-2 Specifications	ANSI X3.302-1998 SCSI Parallel Interface-2 (SPI-2)	N/A
SCSI-3	ANSI X3.253:199X and Amendment AM1 to X3.253.1995	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-4000 Series of Tape Libraries are sophisticated, state-of-the-art computer peripherals. They 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 Installation and Operation 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 NICHTBEGEFAHR DER SICHERHEITSANWEISUNG KANN ZU VERIET-ZUNGEN 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.

1.3 Lithium Battery

Please observe the following information 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.

2. Description and Theory of Operation

2.1 Model Identification

4210, 4212, 4222   4420, 4440, 4480   4660, 46120
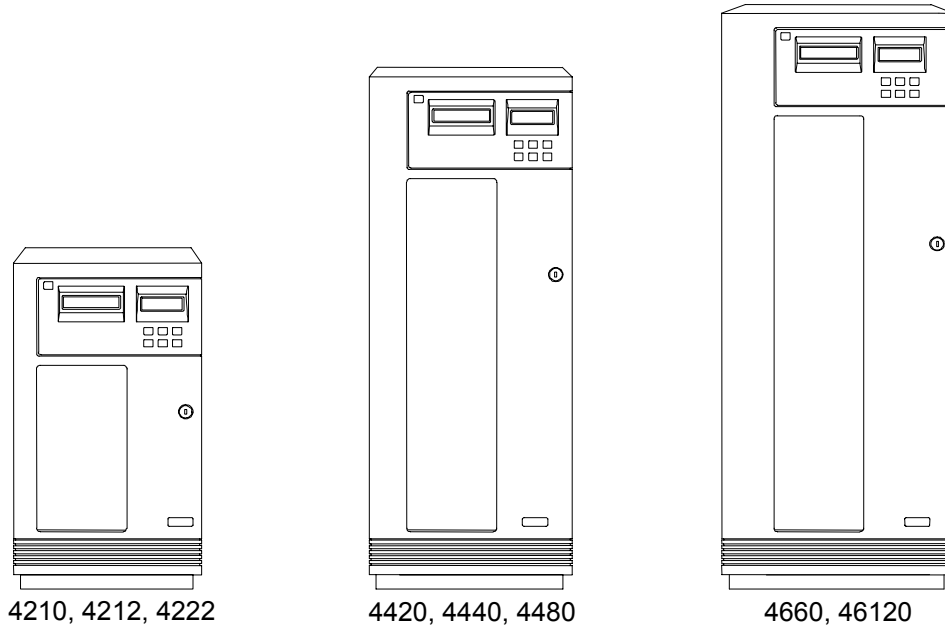
Figure 2-1   TLS-4000 Models

TLS-4000 Feature/Model	4210	4212*	4222*	4420	4440	4480	4660	46120
Maximum number of tape drives	2	2	2	4	4	4	6	6
Media capacity in cartridges (10 cartridges per magazine)	10	10	20	20	40	80	60	120
Additional fixed cartridge locations	2	4①	4②	2	2	4	3	6
Barcode Reader	Opt.	Opt.	Opt.	Opt.	Std.	Std.	Std.	Std.
I/O port for automated cartridge insertion/removal	Opt.	Opt.①	Opt·②	Std.	Std.	Std.	Std.	Std.
Magazine carousel (rotary positioning of magazines)	No	No	Yes	No	Yes	Yes	Yes	Yes
Magazine configuration (# high x # wide)	1x1	1x1	1x2	2x1	2x2	2x4	2x3	2x6
Fibre Channel Option	N/A	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Q-Link Remote Library Manager	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

* The 4212 and 4222 models support only 3.5-inch tape drives
① One fixed slot is lost when the optional I/O port is installed
② Two fixed slots are lost when the optional I/O port is installed

Figure 2-2   TLS-4000 Specifications

Series Identifier
Maximum Number of Drives
Maximum Number of Cartridges in Magazines

TLS-40000
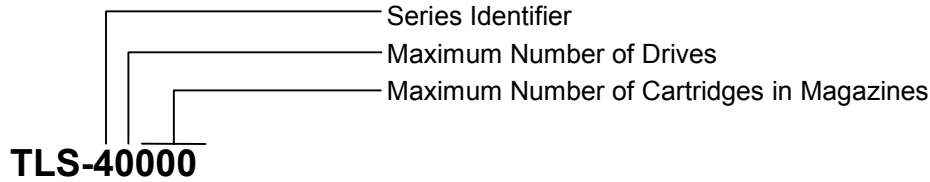
Figure 2-3   Model Number Identification

MODEL	HEIGHT (in./cm)	WIDTH (in./cm)	DEPTH (in./cm)	NET WEIGHT (lb./kg)	SHIPPING [2] WEIGHT (lb./kg)
4210, 4212, 4212i	22.7 / 57.7	13.0 / 33.0	21.3 / 54.1	60 / 27.2	85 / 38.5
4222, 4222i	22.7 / 57.7	13.0 / 33.0	21.3 / 54.1	63 / 28.6	97 / 44.0
4420	37.2 / 94.5	13.7 / 34.8[1]	22.2 / 56.4	85 / 38.6	110 / 49.9
4440	37.2 / 94.5	13.7 / 34.8[1]	22.2 / 56.4	89 / 40.4	127 / 57.6
4480	37.2 / 94.5	13.7 / 34.8[1]	22.2 / 56.4	89 / 40.4	127 / 57.6
4660, 46120	41.6 / 105.7	15.2 / 38.6[1]	25.2 / 64.0	104 / 47.2	146 / 66.2

[1] Stabilizer feet add 5.7 inches to the width.

[2] Shipping Weights include the TLS, data cartridge magazines and accessories.

Figure 2-4   TLS-4000 Dimensions

2.2 General Description

Each TLS-4000 cabinet contains a high-performance robotics system for handling data cartridges, a drive bay to accommodate the cartridge tape drives, at least one cartridge magazine, power supplies and printed circuit board assemblies (PCBAs) that contain the TLS electronics. All models operate on any internationally available AC power source. The TLS power cable and a single SCSI interface cable are the only required connections. The entire cabinet is pressurized and cooled by filtered air to ensure an optimum operating environment.

2.2.1 Motion Systems

TLS-4000 libraries contain up to four independent motion systems.

- **The Carriage moves up and down vertically along the Vertical (Y) Axis. The Carriage is driven by a brushless DC motor, which turns a nut around a fixed, precision leadscrew.**

- **The Handler assembly extends and retracts along the insertion (Z) Axis and is driven by a brushless DC motor that turn a precision leadscrew.**

- **The I/O port slot extends to receive or deliver a cartridge and then re-tracts. The I/O port slot's leadscrew is driven by a DC stepper motor.**

- **A large gear at the bottom of the Carousel Assembly is turned by a pinion gear on a DC stepper motor.**

The drive circuitry for all motion systems is located on the Executive Printed Circuit Board Assembly (PCBA). Each of the brushless DC motors has three internal Hall-Effect sensors. The Hall-Effect sensors are used to commutate the motors and determine their relative positions. The brushless DC motors are driven by a three-phase MOSFET bridge, using a 12 volt supply. Each stepper motor is driven by four discrete MOSFET devices from the regulated 12 volt supply.

Each motion system has an opto-switch (infrared, opto-interrupter-type detector), which is used to determine the reference position of the corresponding motion system.

2.2.2 Sensors

TLS models have two types of infrared optical sensors: analog and digital. Each optical sensor has two parts: an emitter and a corresponding detector.

Analog Sensor Operation
Analog sensors are used over longer distances than the digital sensors, which have a range of about only one inch.

All analog infrared optical sensors produce a DC voltage proportional to the strength of the infrared signal at the sensor. This signal is measured by the Analog to Digital (A/D) Converter on the Executive PCBAs.

Analog Sensors

- **I/O Port Clear Sensor**
  This sensor detects the presence of a tape cartridge in the I/O port slot.

- **Y-Clear Sensor**
  This sensor is referred to in the Installation and Operation manual as the Inventory Sentry Beam. A sensor consists of an infrared emitter mounted on the bottom pan and a detector mounted on the I/O port PCBA. The infrared beam is modulated at a high frequency. The sensor circuitry is AC–coupled to eliminate its sensitivity to ambient light. The Y–Clear sensor serves three purposes:

  1. When the front door is closed, the Y–Clear sensor verifies that the vertical path traveled by the handler is unobstructed and that, therefore, it is safe for the carriage to move vertically.

  2. When the front door is open, the Y–Clear sensor determines whether or not the inventory has been violated, by someone reaching inside the cabinet and removing or inserting a cartridge. Just the presence of someone's hand between the Y–Clear sensor's emitter and detector is sufficient to interrupt the sensor's infrared beam and trigger an audible alarm.

3. When inserting and removing cartridges, the Y–Clear sensor is used in conjunction with the Cartridge Presence sensor to check the position of a cartridge in the Handler's Gripper assembly.

- **Cartridge Presence Sensor**
  This sensor, which is mounted on the handler, detects the presence of a tape cartridge in any storage location, including a tape drive (cartridge must be in ejected position). It utilizes the same modulated circuit as the Y–Clear sensor. The Cartridge Presence sensor also works in conjunction with the Y–Clear sensor to determine the position of a cartridge in the Handler's Gripper assembly.

Digital Sensor Operation

The processor on the Executive PCBA reads the digital levels produced by the digital sensors' detectors.

The carousel axis has a position sensor, which looks at a pattern encoded on the gear guard. The other three axes of motion (I/O port, vertical and insertion) have home position sensors. These sensors are used for reference purposes during initialization and operation.

Digital Sensors

- **Door Sensor**
  This sensor detects the condition of the cabinet door: open or closed. When a door-open condition is detected, the system stops all moving assemblies.

- **Carousel Position Sensor**
  The pattern output to this sensor by the carousel is used to determine the position of the carousel.

- **Vertical Axis Home Sensor**
  This sensor uses the tall pin mounted in the bottom of the cabinet to detect when the Carriage Assembly reaches its home position at the bottom of the cabinet.

- **Insertion Axis Home Sensor**
  This sensor detects when the Carriage's Handler Assembly (on the insertion axis) is in its home position: fully retracted.

- **I/O Port Full Sensor**
  This sensor detects when a tape cartridge is fully inserted into the I/O port slot. It consists of an infrared emitter on a small PCBA in the I/O port assembly and a sensor on the I/O port PCBA.

- **I/O Port Home Sensor**
  This sensor detects when the I/O port slot is in its home position: fully retracted.

- **I/O Port Clear Sensor**
  This sensor detects the presence of a tape cartridge in the I/O port slot.

2.2.3 Handler Solenoid

A solenoid-operated Gripper Assembly is mounted on the Handler for grasping and re-leasing cartridges. When current is applied to the solenoid's windings, the solenoid's plunger extends, opening the Gripper. When the current is removed, a spring closes the Gripper. The solenoid plunger's tip is covered with a wear-resistant nosepiece to provide extended life.

2.2.4 Barcode Reader

A barcode reader is standard on models 4440, 4480, 4660 and 46120, and optional on models 4210, 4212, 4222 and 4420. It is intended for use in systems where each car-tridge is identified by a barcode label. Preprinted barcode labels, which are both hu-man- and machine-readable, are available from a number of sources.

The barcode reader consists of a charge-coupled sensor (similar to those used in video cameras) 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. Cartridges in some upper slots, includ-ing the I/O port, must each be moved to a temporary location before their barcode la-bels can be read.

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 TLS then returns the cartridge to its original location.

2.2.5 Barcode Labels

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

Barcode labels must conform to ANSI/AIM BCI-1995, Uniform Symbology Specifica-tion 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 con-figuration 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.

2.3   Barcode Labels Usage

If the library contains a barcode reader (and barcode labels are affixed to the car-tridges), when barcode information is read, it is stored as part of the inventory data-base in the library's non-volatile RAM, and is available to the host computer upon re-

quest. When the changer moves a cartridge, the inventory database is updated to reflect the change.

If the changers' inventory becomes invalid (e.g. if the Inventory Sentry Beam is violated), the changer rescans the inventory. The updated barcode label and cartridge position data is then stored in the inventory database. Example: After an alert that invalidates the inventory (e.g., when a cartridge is moved by hand) is cleared, the changer rescans the inventory. Any existing barcode labels are read and the new inventory data is stored in the inventory database.

By default, the library expects a modulus 43 check character. The user must change the changers' configuration option before using barcode labels without a check character. All of the labels within the TLS must be of the same check character definition: either all with or all without.

The following steps will allow the changers' configuration option to be set to not expect a check character.

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

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

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

4. Press the ENTER key once to enter the `\Configuration\Advanced\Changer` menu.

5. Use the ▼ (DOWN) key to move the pointer to `LabelCheckChar`.

6. Press the ENTER key once to begin editing the `LabelCheckChar` value.

7. Press the ▲ (UP) or ▼ (DOWN) key to change the `LabelCheckChar` value from `YES` to `NO`.

8. Press the MENU key to return to the `Top Menu`.

2.4 Component Identification

Most of the major components are common to all models. The number of tape drives varies between models (from one to six), depending upon the size of the TLS and the number of drives installed.

Optional, model-dependent features:

*   Barcode Reader
*   I/O Port
*   Carousel

The theory of operation is basically the same for all models, regardless of which hardware configuration is used.

2.4.1 TLS Models

Figure 2-5 and Figure 2-6 show the location of the major components in both types of libraries: carousel and fixed-magazine models.
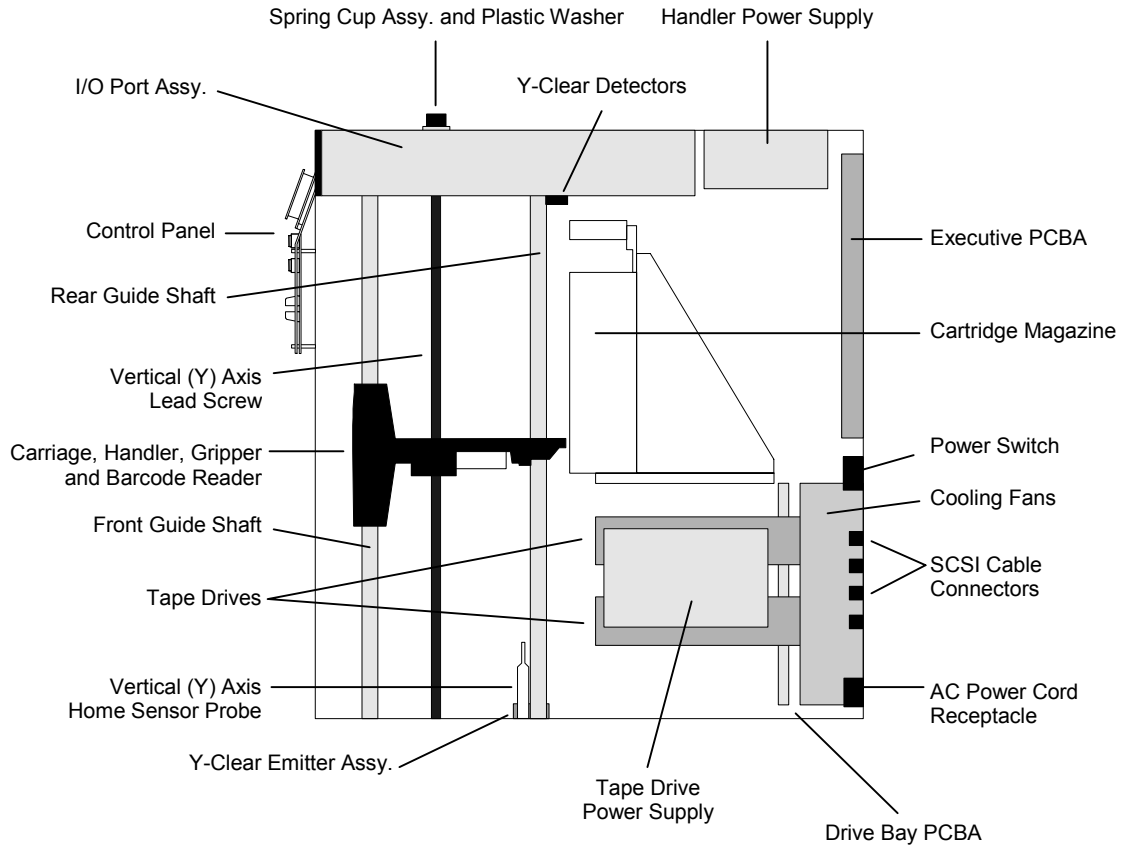
Figure 2-5   TLS Side View – Fixed Magazine Model
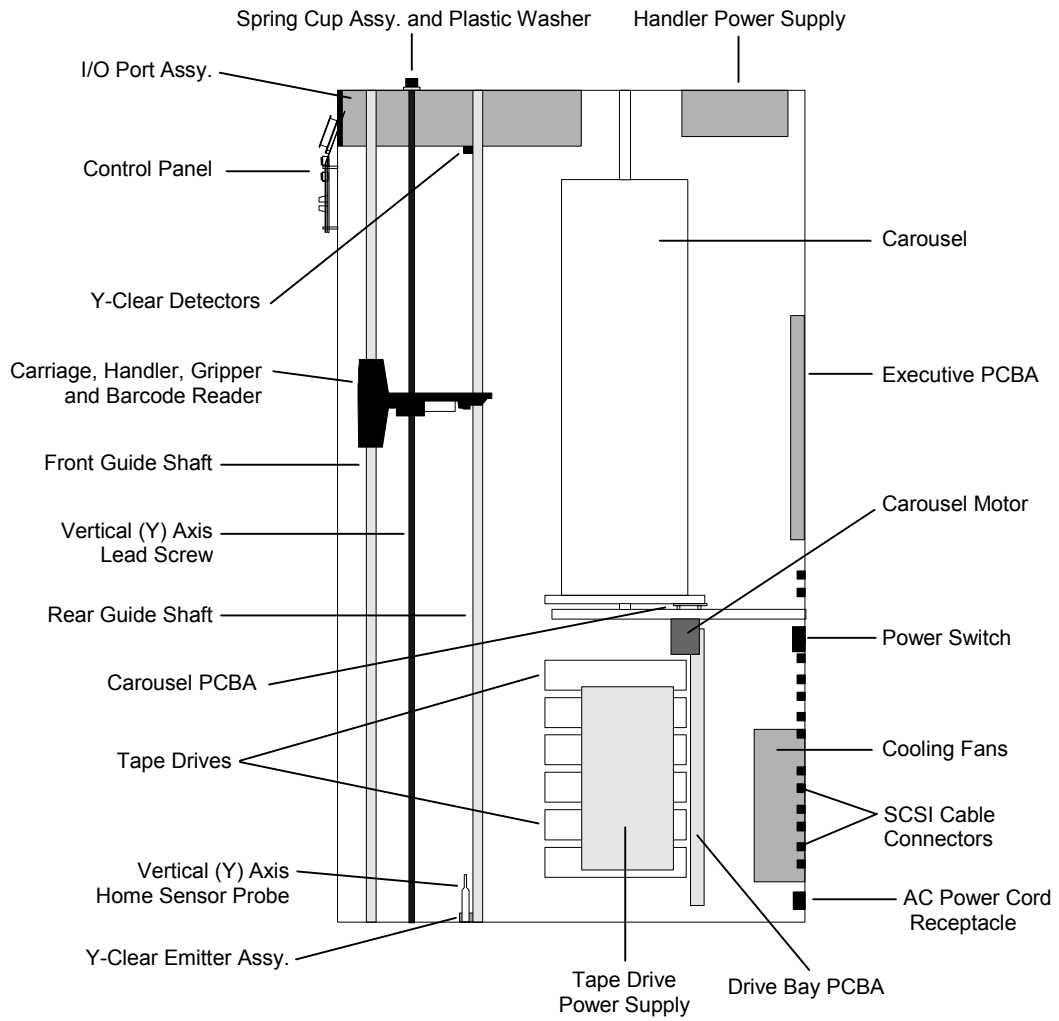
Figure 2-6   TLS Side View – Carousel Model

2.4.2 Handler

Figure 2-7 shows the major components of the TLS-4000 cartridge Handler. All TLS-4000 models use the same Handler.

Cartridge Presence Sensor

Gripper Assembly

Insertion (Z) Axis Motor

Top View

Barcode Reader

Vertical(Y) Axis Motor
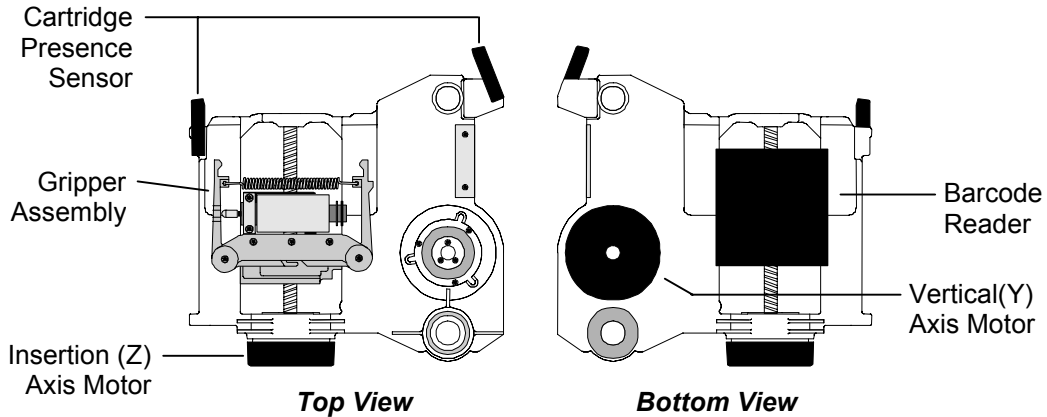
Bottom View

Figure 2-7   TLS-4000 Handler – Top and Bottom Views

2.4.3 I/O Port Assembly

Figure 2-8 shows the major components of the TLS I/O Port Assembly. The CALL switch is mounted to the front panel and connects to the I/O port PCBA. All TLS-4000 models use the same type of I/O Port Assembly.

I/O Port Axis Motor

I/O Port Lead Screw

I/O Port Slot

Call Switch Cable Plug

Motor Cable Plug

I/O Port Cable Plug

I/O Port PCBA

5 PCBA Mounting Screws

Bottom View

I/O Port Door

I/O Full: I/O Clear Sensor Emitter PCBA

Note: The LED's Cable Plug is located underneath the I/O Port PCBA
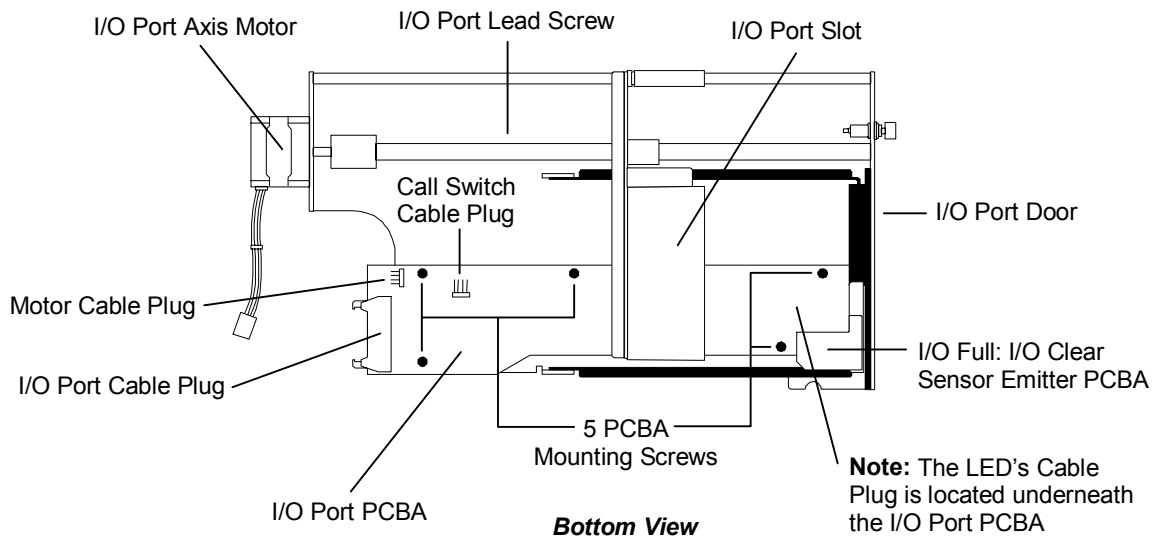
Figure 2-8   I/O Port Assembly

2.4.4 Field-Replaceable Units (FRUs)

Many of the library's major components are available separately as Field-Replaceable Units (FRUs). These components can be removed and replaced in the field by qualified personnel. See Chapter 7 for a complete list of FRUs, their part numbers and removal/replacement instructions.

Some FRUs can be added to a unit as an expansion item. The instructions for installing an expansion FRU for the first time, or for permanently removing an expansion FRU are contained in Chapter 8.

3. The Menu System

The menu system allows the user to perform routine operations. It also allows a qualified individual to make configuration changes to the TLS and to perform diagnostics. This chapter explains the menu system, the types of information it presents, and how to use it. Specific information about Configuration or Operation menu items can be found in the TLS-4000 Installation and Operation Manual (Qualstar document number 501370).

3.1 Using the Menu 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 3-1.
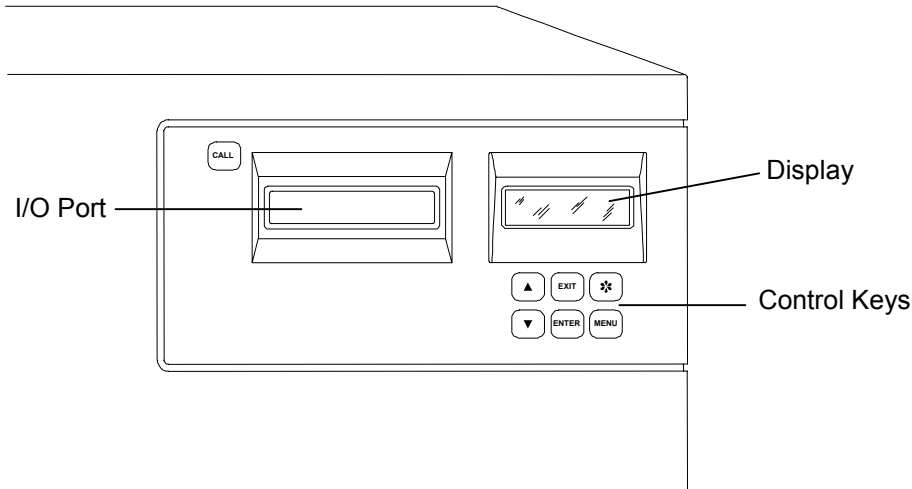
Figure 3-1   TLS-4000 Control Keys

3.1.1 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 3-4). If the Top Menu is displayed, press the MENU key to return to the Operating Display.

3.1.2 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 3.1.3 below.**

- 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.

3.1.3 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 ENTER 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.

3.1.4 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.

3.1.5 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.

3.1.6 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.

3.1.6.1.1 Operating the I/O Port

1. While the operating display is visible (Figure 3-1), press and hold down the ✤ (Daisy) key to view the ✤ (Daisy) key display (Figure 3-2), 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.

```
 _____
|                                        |
|  PARK HIGH                        ✤     |
|                                        |
|                                        |
|                                        |
|                                        |
|  PARK LOW              I/O PORT         |
|_____|
```
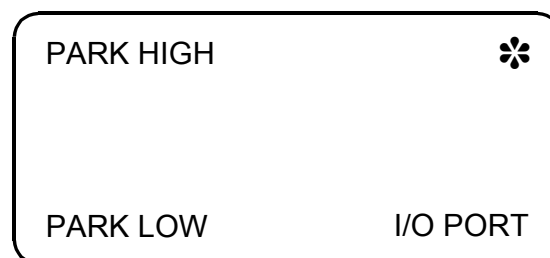
Figure 3-2 ✤ (Daisy) Key Display

2. Make certain the Write Enable/Protect tab on the tape cartridge is set correctly (see Figure 3-3), 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.

CALL

NOTE:

The AIT-1 tape cartridge is write protected when the Enable/Protect Tab is open.

The AIT-2 and AIT-3 tape cartridges are write protected when the Enable/Protect Tab is up towards the label side of the cartridge.

Label Side

0 0 0 0 1 9

AIT-1 Tape Cartridge

AIT-2 & 3 Tape Cartridge

Attach the barcode label to the cartridge with the numbers at the top as shown.

Write Enabled/Protect Tab Shown with Write Enabled.

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

3.1.6.2   Parking the Handler

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

3.2 The Top Menu

To see the Top Menu, turn on the TLS, wait until it displays the date and time, then press the MENU key. The operator should see a display like the one in Figure 3-4.

Display line one always indicates the title (or its abbreviation) of the current menu or function.

T	o	p		M	e	n	u												
→	•	C	o	n	f	i	g	u	r	a	t	i	o	n					
	•	M	a	i	n	t	e	n	a	n	c	e							
	•	O	p	e	r	a	t	i	o	n									↓

The **item pointer** to the left of an item indicates which item will be acted upon when the ENTER key is pressed. For example, press ENTER when the arrow points to Configuration and the display will change to the Configuration menu.

A dot in front of an item indicates a sub-menu. To go to the sub-menu, press the ENTER key.

DOWN and UP arrows indicate additional lines are to be seen by scrolling the display with the UP and DOWN key.

Figure 3-4   Top Menu Display

If the arrow is positioned next to Operation and then ENTER is pressed, a display similar to that shown in Figure 3-5 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.

Display line one gives the title of the current menu or function. The TLS will always try to spell out menu names as completely as possible in the 20 characters available.

A series of leading dots indicates that the next higher menu is the Top Menu.

•	•	•	•	•	•	•	•	•	•	•	O	p	e	r	a	t	i	o	n
→	•	E	l	e	m	e	n	t		S	t	a	t	u	s				
	•	E	x	c	h	a	n	g	e		C	a	r	t	s	.			
	•	M	o	v	e		C	a	r	t	r	i	d	g	e				↓
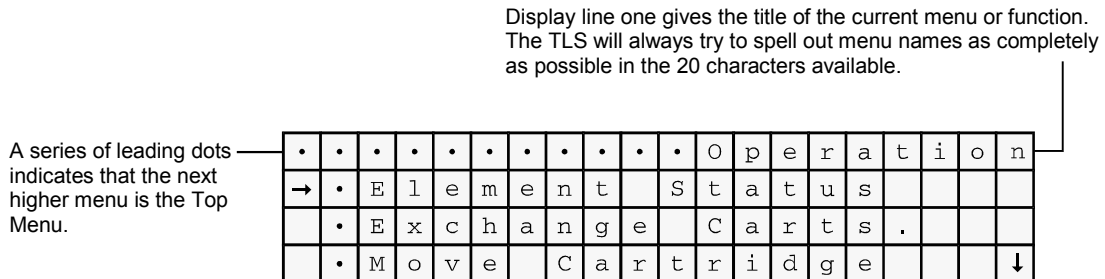
Figure 3-5   The Operation Menu

3.3 Menu Elements

3.3.1 Menu Items

Line 1 of any menu display always indicates the name of the menu, with the exception of the Top Menu, where menu names are right justified. If space permits, the name of, or an acronym for, the parent menu will precede the menu name. The parent menu name (if it is displayed) is 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.

3.3.2 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:

3.3.2.1   Numeric Values

These values may contain leading zeros. 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 neighbors. 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 numeric 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 upper case letters A-F. Leading zeros are always indicated.
  Examples:
        003F, FE10

3.3.2.2   Alpha/Numeric Values

These values can contain up to 96 different characters including ten digits (0-9), upper and lower case letters and special characters, such as spaces, dashes, etc. There is no roll-over between digits. (See Table 3-4)
Example:
Qualstar TLS-4210

3.3.2.3   Multiple Choice Values

Each multiple choice value has its own list of valid choices. These values are 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.

3.3.3 Location Designators

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 3-1   The *physical* Location Field

Character	Definition
Space	This character is always a lower-case "p" when describing the *physical* 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 four 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.
Slot	These two digits are used to describe which tape drive or which magazine slot is selected.

Table 3-2   *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 3-3   Location Designator Examples

By changing the Space character from a "p" to an "a", you can view the SCSI element address of the physical location described in the *physical* space. More on this subject in the next chapter. Element addresses are in the range of 0 to 65535.

3.3.4 Editing Values

To change a displayed value, point to its name using the ▲ (UP) and ▼ (DOWN) keys, then press ENTER. Not all values are editable. If the cursor does not appear over the value when the ENTER key is pressed, then the value cannot be changed. If the 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.

3.3.4.1 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, then press EXIT when done. The list of choices wraps around, so the operator can see all the choices by using just the ▲ (UP) or ▼ (DOWN) key.

3.3.4.2 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 numeric, alphanumeric, 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.

3.3.4.3 Editing Numeric Values

Numeric 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 is true 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 system 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.

3.3.4.4 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.

The following table shows the available alphanumeric characters (A/N) and their hexadecimal (hex) equivalents. The 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 hex 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 3-4 Alphanumeric Characters and their "ACSII" Hexadecimal Equivalents

3.3.4.5   Editing Cartridge Location Values

There are two ways to edit cartridge location values with either the ▲ (UP) or the ▼ (DOWN) key. First, like an alpha/numeric value, a cartridge location value can be edited one character at a time. Alternately, the entire cartridge location value can be incremented or decremented, through a range of locations, by editing the least significant digit (or intermediate digits), in a manner similar to editing a numeric value. Refer to Section 3.3.4.3 for details about editing numeric values.

Cartridge location designators always contain one letter as follows:

A or **B**	Magazine Locations
F	Fixed Locations
H	Handler
I	I/O Slot
P	Private Slot
T	Tape Drive Locations

Refer to Chapter 3 in the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for the ranges of location values and their physical locations.

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

3.4 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 EXIT key to exit the menu mode. Figure 3-6 shows the available menu items in the Top Menu. The line items in menus and sub-menus are organized in alphabetical order.

```
Line 1 ——  | T | o | p |   | M | e | n | u |   |   |   |   |   |   |   |   |   |   |   |
Line 2 ——→ | • | C | o | n | f | i | g | u | r | a | t | i | o | n |   |   |   |   |   |
Line 3 ——  | • | M | a | i | n | t | e | n | a | n | c | e |   |   |   |   |   |   |   |
Line 4 ——  | • | O | p | e | r | a | t | i | o | n |   |   |   |   |   |   |   |   |   |
```

Figure 3-6   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 functions available under the Configuration menu are fully explained in the TLS-4000 Installation and Operation Manual (Qualstar document number 501370).

NOTE

Be aware that the configuration parameters may also be set by the SCSI interface. A change may have been caused by the host software.

The Maintenance menu is designed to help a qualified repair technician diagnose and repair the TLS.

The Operation menu is designed for the user, and lets the user perform off-line tasks associated with the operation of the TLS. The Operation menu is described in detail in the TLS-4000 Installation and Operation Manual (Qualstar document number 501370).

3.5 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 Revisions` sub-menu. Press the ENTER key to view the Date, Part Number, Revision, Checksum and Id of the changer's installed firmware.

3.6 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 3-7 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.

3.7 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 Clean Drive Menu 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.

4. Maintenance Menu

The Maintenance menu is used to display detailed information about the TLS and its operating history, and to test the functionality of the liquid crystal display and menu control keys. The Maintenance menu is available to the system user and is considered safe. The user cannot break anything by using, or misusing, this menu. A diagram showing the entire structure of the Maintenance menu system is shown in Figure 4-1.
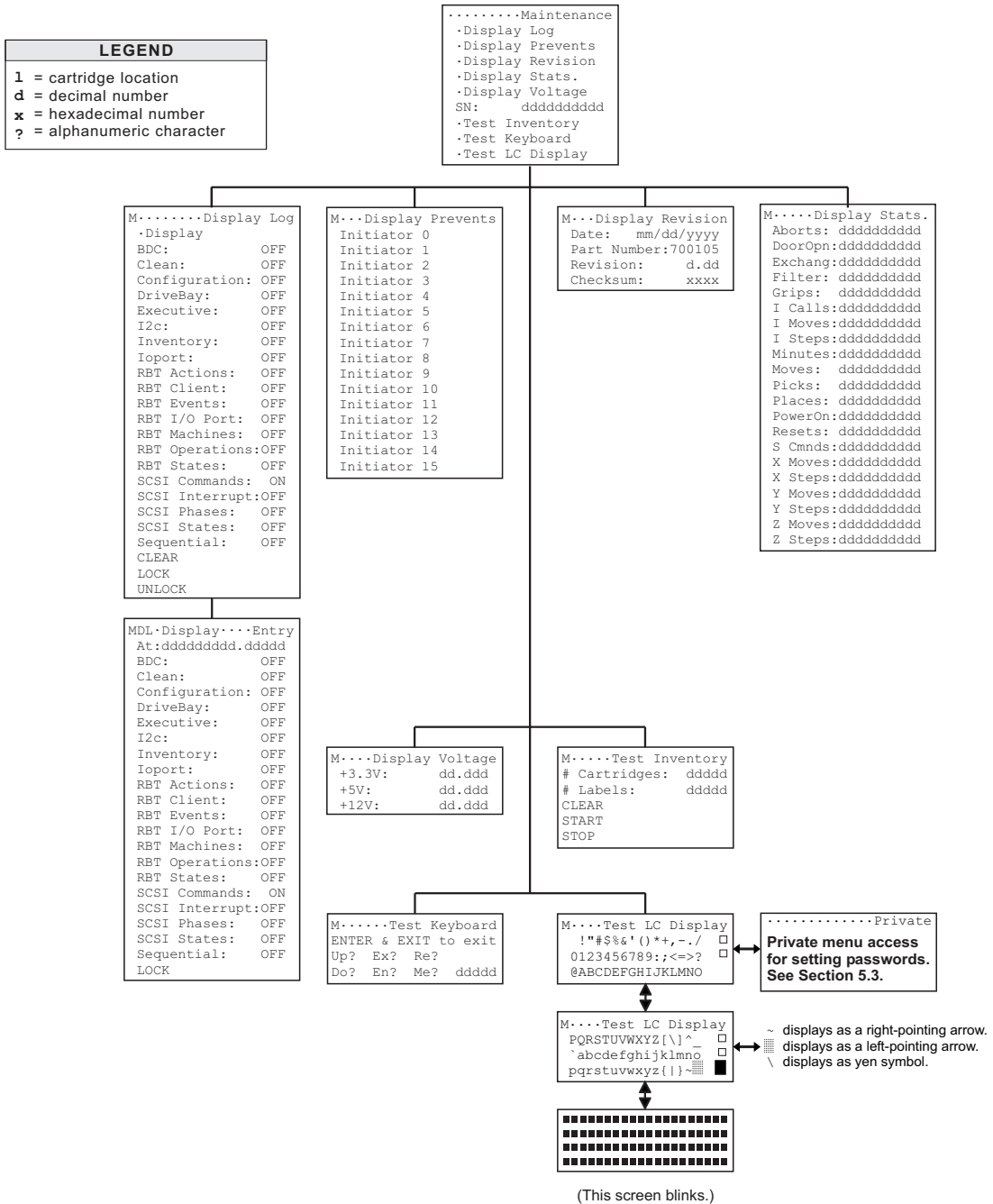
```
                              ·········Maintenance
                              ·Display Log
                              ·Display Prevents
                              ·Display Revision
   ┌──────────────────────┐   ·Display Stats.
   │        LEGEND        │   ·Display Voltage
   ├──────────────────────┤   SN:     ddddddddd
   │ l = cartridge location│  ·Test Inventory
   │ d = decimal number    │  ·Test Keyboard
   │ x = hexadecimal number│  ·Test LC Display
   │ ? = alphanumeric character│
   └──────────────────────┘
```

```
M········Display Log      M···Display Prevents     M···Display Revision    M·····Display Stats.
·Display                  Initiator 0              Date:   mm/dd/yyyy      Aborts: ddddddddd
BDC:            OFF       Initiator 1              Part Number:700105      DoorOpn:ddddddddd
Clean:          OFF       Initiator 2              Revision:    d.dd       Exchang:ddddddddd
Configuration: OFF        Initiator 3              Checksum:    xxxx       Filter: ddddddddd
DriveBay:       OFF       Initiator 4                                      Grips:  ddddddddd
Executive:      OFF       Initiator 5                                      I Calls:ddddddddd
I2c:            OFF       Initiator 6                                      I Moves:ddddddddd
Inventory:      OFF       Initiator 7                                      I Steps:ddddddddd
Ioport:         OFF       Initiator 8                                      Minutes:ddddddddd
RBT Actions:    OFF       Initiator 9                                      Moves:  ddddddddd
RBT Client:     OFF       Initiator 10                                     Picks:  ddddddddd
RBT Events:     OFF       Initiator 11                                     Places: ddddddddd
RBT I/O Port:   OFF       Initiator 12                                     PowerOn:ddddddddd
RBT Machines:   OFF       Initiator 13                                     Resets: ddddddddd
RBT Operations:OFF        Initiator 14                                     S Cmnds:ddddddddd
RBT States:     OFF       Initiator 15                                     X Moves:ddddddddd
SCSI Commands:  ON                                                         X Steps:ddddddddd
SCSI Interrupt:OFF                                                         Y Moves:ddddddddd
SCSI Phases:    OFF                                                        Y Steps:ddddddddd
SCSI States:    OFF                                                        Z Moves:ddddddddd
Sequential:     OFF                                                        Z Steps:ddddddddd
CLEAR
LOCK
UNLOCK
```

```
MDL·Display····Entry
At:ddddddddd.ddddd
BDC:            OFF
Clean:          OFF
Configuration: OFF
DriveBay:       OFF
Executive:      OFF
I2c:            OFF
Inventory:      OFF
Ioport:         OFF
RBT Actions:    OFF
RBT Client:     OFF
RBT Events:     OFF
RBT I/O Port:   OFF
RBT Machines:   OFF
RBT Operations:OFF
RBT States:     OFF
SCSI Commands:  ON
SCSI Interrupt:OFF
SCSI Phases:    OFF
SCSI States:    OFF
Sequential:     OFF
LOCK
```

```
M····Display Voltage      M·····Test Inventory
+3.3V:      dd.ddd        # Cartridges:  ddddd
+5V:        dd.ddd        # Labels:      ddddd
+12V:       dd.ddd        CLEAR
                          START
                          STOP
```

```
M······Test Keyboard      M····Test LC Display         ············Private
ENTER & EXIT to exit       !"#$%&'()*+,-./   □          Private menu access
Up? Ex? Re?               0123456789:;<=>?  □          for setting passwords.
Do? En? Me?  ddddd        @ABCDEFGHIJKLMNO             See Section 5.3.
```

```
M····Test LC Display       ~ displays as a right-pointing arrow.
PQRSTUVWXYZ[\]^_   □       ▦ displays as a left-pointing arrow.
`abcdefghijklmno  □       \ displays as yen symbol.
pqrstuvwxyz{|}~▦  ■
```

(This screen blinks.)

Figure 4-1   Maintenance Menu

4.1 Maintenance Menu

```
·········Maintenance
·Display Log
·Display Prevents
·Display Revision
·Display Stats.
·Display Voltage
SN:    dddddddddd
·Test Inventory
·Test Keyboard
·Test LC Display
```

The Maintenance menu contains multiple Display items. Display items look like the sub-menus found in the Configuration and Operation menus, but they generally do not contain editable values or executable functions. We prefer to call the Display items status screens, because they display the present status of various TLS elements.

4.1.1 SN

This number is the serial number of the library, which corresponds to the number printed on the nameplate label located on the rear of the library.

4.2 Maintenance\Display Log Menu

```
M········Display Log
 ·Display
 BDC:          OFF
 Clean:        OFF
 Configuration: OFF
 DriveBay:     OFF
 Executive:    OFF
 I2c:          OFF
 Inventory:    OFF
 Ioport:       OFF
 RBT Actions:  OFF
 RBT Client:   OFF
 RBT Events:   OFF
 RBT I/O Port: OFF
 RBT Machines: OFF
 RBT Operations:OFF
 RBT States:   OFF
 SCSI Commands:  ON
 SCSI Interrupt:OFF
 SCSI Phases:  OFF
 SCSI States:  OFF
 Sequential:   OFF
 CLEAR
 LOCK
 UNLOCK
```

4.2.1 Introduction

The TLS has a built-in logging facility that can keep track of various system activities. The settings made in the Configuration\Advanced\Log menu determine which TLS activities are logged. (See the TLS-4000 Installation and Operation Manual. Qualstar document number 501370). This menu determines which of the logged items are to be displayed. If an item is set ON, any of its logged data will be displayed. If an item is set OFF, it will not be displayed. The logging facility is normally used to analyze complex SCSI interface or Handler operation problems.

The logging system is most effectively used by a field service person who is working under the direction of a Qualstar Technical Support technician. First, the field service person reports a problem's symptom(s) to a Qualstar Technical Support technician, then the technician directs the field service person to look only at problem-specific logged data. Finally, the logged data is evaluated to help determine the cause of the problem.

The TLS logs so much data about its internal workings that the data can overwhelm an inexperienced person. If intermittent or unusual system problems are encountered, we recommend that the user contact Qualstar's Technical Support Department first, before the user tries to analyze the problem using the logged activity information presented in this section.

4.2.2 Data Logging – General Description

For display purposes only, each data class can be turned on or off from the Display Log menu, depending upon the kind of problem the user is trying to solve. Since the log may contain a great many items, it may be helpful to turn off the data categories that the user is not interested in at the moment, so that there will be fewer log entries to view. *Turning a logged data class on or off using the Maintenance menu only affects the display of data; it does not determine which data gets logged (see NOTE below).*

NOTE

Use the Configuration menu to control which categories of information get logged. Since the data log memory size is fixed, turning off unwanted data categories frees up log memory space for the data categories that the user wishes to log. Refer to the Configuration\Advanced\Log section in the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for details.

4.2.2.1 Maintenance\Display Log\CLEAR Command

CAUTION

Invoking the CLEAR command clears the entire data log.

4.2.2.2 Maintenance\Display Log\LOCK Command

This command locks the log so that no entries can be changed or new ones added.

4.2.2.3 Maintenance\Display Log\UNLOCK Command

This command unlocks the log and allows data to be tabulated.

A complete description of all of the possible data logged by the TLS is beyond the scope of field service requirements and is therefore not included in this manual. The logging system is most effectively used by a field service person who is working under the direction of a Qualstar Technical Support technician.

4.3 Maintenance\Display Log\Display\Entry Menu

```
MDL·Display····Entry
 At:ddddddddd.ddddd
 BDC:          OFF
 Clean:        OFF
 Configuration: OFF
 DriveBay:     OFF
 Executive:    OFF
 I2c:          OFF
 Inventory:    OFF
 Ioport        OFF
 RBT Actions:  OFF
 RBT Client:   OFF
 RBT Events:   OFF
 RBT I/O Port: OFF
 RBT Machines: OFF
 RBT Operations:OFF
 RBT States:   OFF
 SCSI Commands:  ON
 SCSI Interrupt:OFF
 SCSI Phases:  OFF
 SCSI States:  OFF
 Sequential:   OFF
 LOCK
```

CAUTION

<u>The information in the data log is frozen when the user enters the Entry menu.</u> No events are logged while the Entry menu is displayed. However, the system does track the number of events that would have been logged, while the Entry menu was displayed, and then adds that number as a log entry when the user exits the Entry menu. This tells the user how many events occurred while the Entry menu was displayed.

1. To view the Entry menu, press the ENTER key while the Maintenance\Display Status screen is displayed. The Display Log\Entry menu is the same as the Display Log menu, except that the Entry and the At items have been added and the CLEAR and UNLOCK commands have been deleted.

   Each log entry is numbered. The Entry item in the Display Log\Entry menu allows the user to see which numbered log entry is currently being viewed. Optionally, the user may edit the Entry value to enter the number of the desired log entry and display the corresponding log entry. Since the log may contain a great many entries, directly selecting a log entry by number can eliminate unnecessary scrolling through the data log.

NOTE

Use the Configuration menu to control which classes of information get logged. Since the data log memory size is fixed, turning off unwanted data classes frees up log memory space for the data classes that the user wishes to log. Refer to the Configuration\Advanced\Log section in the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for details.

The user can also use the Display Log\Entry menu to turn the data display class masks on or off, as the user can do with the Display Log menu. The difference here is that logging activity is suspended when the user enters Display Status screen, and remains suspended while the Display Log\Entry menu is displayed. Logging activity is reactivated when the user returns to the Maintenance\Display Log menu.

2. Press the EXIT key twice to return to the Maintenance\Display Log menu.

4.4 Maintenance\Display\Prevents Status Screen

```
M...Display Prevents
 Initiator 0
 Initiator 1
 Initiator 2
 Initiator 3
 Initiator 4
 Initiator 5
 Initiator 6
 Initiator 7
 Initiator 8
 Initiator 9
 Initiator 10
 Initiator 11
 Initiator 12
 Initiator 13
 Initiator 14
 Initiator 15
```

The Display\Prevents Status screen displays the Initiator number (host SCSI ID) of every host that has issued a Prevent/Allow Medium Removal SCSI command with it's Prevent Bit set. Setting this bit completely disables the I/O port. This menu allows one to determine *who* disabled the I/O port.

4.5 Maintenance\Display Revision Status Screen

```
M···Display Revision
 Date:   mm/dd/yyyy
 Part Number:700105
 Revision:    d.dd
 Checksum:    xxxx
```

The Display Revision status screen displays the current revision level of the operating firmware and the unique identification number of the TLS. The values displayed include:

- Date:
  This date is the release date of the current firmware.

- Part Number:
  This is the manufacturing part number of the current firmware.

- Revision:
  This is the revision number of the current firmware.

- Checksum:
  This is the checksum value of the current firmware. (It takes a second to calculate this value).

4.6 Maintenance\Display Stats. Status Screen

```
M·····Display Stats.
 Aborts: dddddddddd
 DoorOpn:dddddddddd
 Exchang:dddddddddd
 Filter: dddddddddd
 Grips:  dddddddddd
 I Calls:dddddddddd
 I Moves:dddddddddd
 I Steps:dddddddddd
 Minutes:dddddddddd
 Moves:  dddddddddd
 Picks:  dddddddddd
 Places: dddddddddd
 PowerOn:dddddddddd
 Resets: dddddddddd
 S Cmnds:dddddddddd
 X Moves:dddddddddd
 X Steps:dddddddddd
 Y Moves:dddddddddd
 Y Steps:dddddddddd
 Z Moves:dddddddddd
 Z Steps:dddddddddd
```

The Display Statistics status screen displays a summary of events that have occurred between the time the TLS was built and the current time. All values are decimal counts of the number of times an event has occurred. Displayed values include:

- Aborts
  This value is the number of times that a Handler movement has been aborted. The most frequent cause for Handler aborts is opening the Front Panel/Door without using the control panel.

- DoorOpn
  This value is the number of times that the front door has been opened.

- Exchang
  This value is the number of cartridge exchanges that have been performed, including exchanges executed by SCSI command and exchanges executed by operator command via the menu system.

- Filter
  This value is the number of minutes since the air filter was last changed.

- Grips
  This value is the number of times that the cartridge Gripper solenoid has been actuated.

- I Calls
  This value is the number of times that the CALL key has been pressed.

- I Moves

  This value is the number of times that the I/O port slot has moved. (The I/O port slot's extend/retract cycle counts as two moves.)

- I Steps

  This value is the number of I/O port stepper motor steps (200/revolution, 800/inch).

- Minutes

  This value is the number of power-on minutes.

- Moves

  This value is the number of cartridge moves.

- Picks

  This value is the number of times that a cartridge has been removed from a drive or storage location.

- Places

  This value is the number of times that a cartridge has been placed into a drive or storage location.

- PowerOn

  This value is the number of times that the power has been turned on.

- Resets

  This value is the number of Executive CPU resets, including power-on resets and SCSI bus resets.

- S Cmnds

  This value is the number of SCSI commands received by the TLS.

- X Moves

  This value is the number of carousel movements (N/A on fixed-magazine models).

- X Steps

  This value is the number of X–axis (carousel) motor steps (3200 steps/revolution – N/A on fixed-magazine models).

- Y Moves

  This value is the number of vertical Y–axis (up/down) cartridge Handler movements. (Note that some movements can be very small.)

- Y-Steps

  This value is the number of Y–axis motor commutations (24/revolution).

- Z Moves

  This value is the number of Z–axis (in/out) cartridge Handler movements.

- Z Steps

  This value is the number of Z–axis motor commutations (24/revolution, 120/inch).

4.7 Maintenance\Display Voltage Status Screen

```
M····Display Voltage
 +3.3V:      dd.ddd
 +5V:        dd.ddd
 +12V:       dd.ddd
```

The Display Voltage status screen displays the current Handler power supply voltages. The +12V supply is the voltage coming into the Executive PCBA from the Handler power supply. This supply is used by all of the circuit boards in the TLS, with the exception of the Drive Bay PCBA. The presence (but not the value) of the +12V supply is indicated by an LED on the Executive PCBA.

The +5Vand +3.3V supplies are the output of the switch mode regulator on the Executive PCBA. The +5V supply provides +5 volts to all of the circuit boards in the TLS, with the exception of the Drive Bay PCBA. The +3.3V supply provides +3.3V power to the Executive PCBA. The presence (but not the value) of the +5V and +3.3V supply is indicated by an LED on the Executive PCBA.

4.8 Maintenance\Test Inventory Status Screen

```
M.....Test Inventory
# Cartridges:  ddddd
# Labels:      ddddd
CLEAR
START
STOP
```

The Test Inventory operation allows continuous scans of the TLS. Updates to the # Cartridges and # Labels occurs at the end of each scan. The # cartridges and # Labels are accumulated values. The increment that occurs for each scan should match the physical contents of the TLS. The Test Inventory menu is only visible if an access word has been entered into the TLS. (See Sections 5.3.1 and 5.3.2)

Perform a CLEAR command to clear the contents of the two accumulators. Perform a START command to start the test. Perform a STOP command to stop the test. STOP only appears when a test is running. START and CLEAR only appear when a test is stopped.

4.9 Maintenance\Test Keyboard Status Screen

```
M······Test Keyboard
ENTER & EXIT to exit
Up*  Ex*  Re*
Do*  En*  Me*  ddddd
```

The Test Keyboard status screen provides a direct indication of menu control key functionality. Whenever a key is pressed, its 2-character abbreviation appears on the screen (Up, Ex, Re, Do, En, Me). If a key is pressed and held down, a blinking asterisk (*) appears on the screen next to the key's abbreviation. If an asterisk does not appear when a key is pressed and held down, it is probably because the key bounced when it was pressed. In this case, press (and hold down) the key again.

NOTE

During normal operation, pressing and holding a key down results in automatic repeat keystroke activity.

The blinking asterisk always appears next to the abbreviation for the key that was pressed last. Example: If a key is pressed and held down, and then another key is pressed and held down without releasing the first key, the first key's abbreviation remains on the screen and the blinking asterisk appears next to the second key's abbreviation.

If one control key is pressed and held down, and then a second control key is pressed and held down without releasing the first key, the blinking asterisk appears next to the second key's abbreviation (as mentioned above). Then, if the first key is released, its abbreviation and the blinking asterisk both disappear from the display.
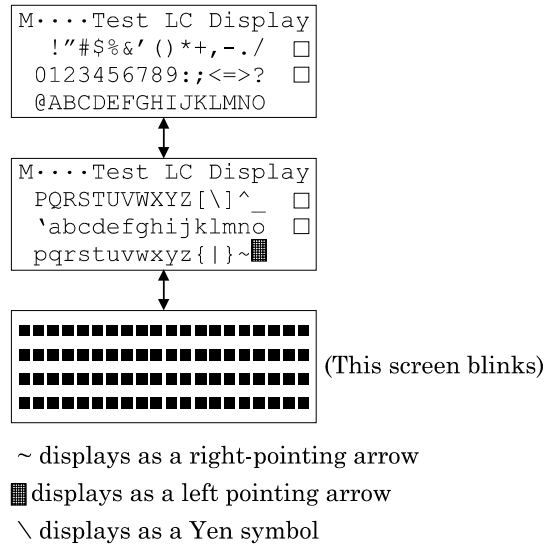
When all keys are released, the bottom two lines of the Test Keyboard screen should be blank, with the exception of the keystroke counter display in the lower-right corner of the screen.

The keystroke counter display indicates the number of key presses that occur while the Test Keyboard screen is in use. The keystroke count should increase by one and only one number each time a control key is pressed. The keystroke count should not increase while a key is held down or when a key is released. If the keystroke count does increase while a key is held down, or when a key is released, a problem with a control key switch or the keypad ground connection may exist. In this case, please refer to Chapter 6 of this manual for additional troubleshooting information.

To exit the Test Keyboard screen and return to the Maintenance menu, press the EXIT and ENTER keys at the same time.

4.10 Maintenance\Test LC Display Status Screen

```
┌─────────────────────┐
│M····Test LC Display │
│  !"#$%&'()*+,-./  □ │
│ 0123456789:;<=>?  □ │
│ @ABCDEFGHIJKLMNO    │
└─────────────────────┘
          ↕
┌─────────────────────┐
│M····Test LC Display │
│ PQRSTUVWXYZ[\]^_   □ │
│ `abcdefghijklmno  □ │
│ pqrstuvwxyz{|}~▉    │
└─────────────────────┘
          ↕
┌─────────────────────┐
│■■■■■■■■■■■■■■■■■■■■■│
│■■■■■■■■■■■■■■■■■■■■■│  (This screen blinks)
│■■■■■■■■■■■■■■■■■■■■■│
│■■■■■■■■■■■■■■■■■■■■■│
└─────────────────────┘
```

~ displays as a right-pointing arrow

▉ displays as a left pointing arrow

\ displays as a Yen symbol

The TLS uses a four-line Liquid Crystal Display that displays 20 characters per line. This status screen uses three different test screens to check the operation of the display. After selecting the Maintenance\Test LC Display screen, use either the ▲ (UP) or ▼ (DOWN) key to select any one of the three test screens.

The first two test screens display the character set used by the TLS. The third test screen checks the operation of all display pixels, by turning them all on or all off at the same time (the screen blinks). When all of the pixels are turned on, the user should see four lines of 20 solid rectangles each. When all of the pixels are turned off, all four lines should be blank.

Press the EXIT key to return to the Maintenance menu.

5. The Private Menu

```
.............Private
Access: ??????????
 ·Calibration
 CALIBRATE
 ·Carousel
 CLEAR ACCESS
 ·Configuration
 ·Display A/D
 ·Display Locations
 ·Display Positions
 ·Display Sensors
 ·DriveBay
 ·Executive
 RESET SCSI BUS
```

```
+-----------------------------+
|            LEGEND           |
+-----------------------------+
| l = cartridge location      |
| d = decimal number          |
| x = hexadecimal number      |
| ? = alphanumeric character  |
+-----------------------------+
```

```
Private··Calibration
 Calibrated:      NO
 Valid:           NO
 CRTPRS  Thrs:ddddd
 I/OCLR  Thrs:ddddd
 I/OFULL Thrs:ddddd
 YCLEAR  Thrs:ddddd
 YCLEARM Thrs:ddddd
 Y DATA 0:    ±ddddd
 Y DRIVE Ofst0:±ddd
 Y DRIVE Ofst1:±ddd
 Y DRIVE Ofst2:±ddd
 Y DRIVE Ofst3:±ddd
 Y FIXED 0:   ±ddddd
 Y FIXED 1:   ±ddddd
 Y I/O PORT: ±ddddd
 Y PRIVATE:  ±ddddd
 Y STORY 0:  ±ddddd
```

```
Private·····Carousel
 Current Stop:     d
 Demand Stop:      d
 ABORT SLEW
 SLEW
 Current Pos:±ddddd
 Index:      BLOCKED
 STEP DOWN
 STEP UP
```

```
P······Configuration
 ·Defaults
 Demonstrations:YES
 ·SCSI
```

```
Private··Display A/D
 +12V          ddddd
 +3.3V         ddddd
 +5V           ddddd
 CARSPR:       ddddd
 CRTPRS:       ddddd
 I/O CLEAR:    ddddd
 I/O FULL:     ddddd
 Internal 0:   ddddd
 Internal Mid:ddddd
 InternalFull:ddddd
 TPWR:         ddddd
 YCLEAR:       ddddd
 YCLEARM:      ddddd
```

```
PC··········Defaults
 LCD Line 1:DEFAULT
  1-10: ??????????
  11-20: ??????????
 LCD Line 2:DEFAULT
  1-10: ??????????
  11-20: ??????????
 LCD Line 3:DEFAULT
  1-10: ??????????
  11-20: ??????????
 LCD Line 4:DEFAULT
  1-10: ??????????
  11-20: ??????????
 SCSI Vndr:????????
 SCSI Prod:????????
           ????????
 SCSI Revision:????
 CLEAR
```

```
P·Configuration·SCSI
 PostPlaceDly:ddddd
 PrePickRetries:ddd
```

```
P··Display Locations
 Location:    llllll
 Accessable:  FALSE
 Access.Valid:FALSE
 Barcodeable: FALSE
 Label:   ??????????
 Label Error: FALSE
 Label Valid: FALSE
 Occupied:    FALSE
 Occup.Valid: FALSE
 On My Side:  FALSE
 Present:     FALSE
 Pres. Valid: FALSE
 Source Valid:FALSE
 Source Loc.:llllll
 Synchronized:FALSE
 Type:        DRIVE
 Tape Ejected:FALSE
```

Continued in Figure 5-2

Figure 5-1   The Private Menu (Part 1)

```
┌─────────────────────────┐  ┌─────────────────────────┐        ┌─────────────────────────┐
│ P··Display Positions    │  │ P····Display Sensors    │        │ Private·····DriveBay    │
│  IS:          ±ddddd    │  │  !Adapt:           0    │        │   ·Bay                  │
│  X:           ±ddddd    │  │  ISHome:           0    │        │   ·EEPROM               │
│  Y:           ±ddddd    │  │  Locked:           0    │        └─────────────────────────┘
│  Period Y:     ddddd    │  │  !Open:            0    │
│  Z:           ±ddddd    │  │  !ScsiDF:          0    │
│  Period Z:     ddddd    │  │  !Shunt1:          0    │
└─────────────────────────┘  │  !Shunt2:          0    │
                             │  XIndex:           0    │
                             │  YHome:            0    │
                             │  ZHome:            0    │
                             └─────────────────────────┘

                             ┌─────────────────────────┐        ┌──────────────────────────┐  ┌──────────────────────────┐
                             │ Private····Executive    │        │ Private·DriveBay·Bay     │  │ P·DriveBay····EEPROM     │
                             │  Firmware:    ??????    │        │  Address:         xx     │  │   xx: xx xx xx xx        │
                             │  I2C Address:     xx    │        │  Type:       ???????     │  │   xx: xx xx xx xx        │
                             │  PCB Number: 501??7     │        │  Revision:        ddd    │  │   xx: xx xx xx xx        │
                             │  PCB Revision:    ?     │        │  Count Mode:      OFF    │  └──────────────────────────┘
                             └─────────────────────────┘        │  Temperature:     ddd    │
                                                                │  12V:             ddd    │
                                                                │  5V:              ddd    │
                                                                └──────────────────────────┘
```
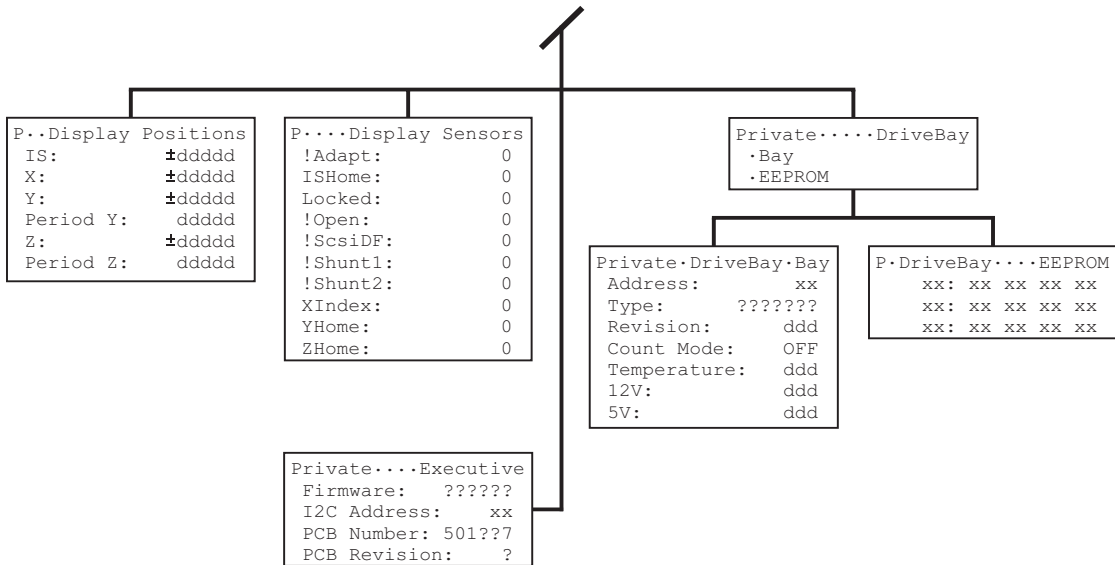
Figure 5-2 The Private Menu (Part 2)

NOTE

The menus in this chapter reflect revision 2.21 of the Executive PCBA EPROM software. If the user has an earlier revision of the software, some items may not appear in the menus. Also, not all menu items appear all the time: Some menu items are model-dependent.

5.1 Introduction

The \Private menu, the root menu for the protected service menus, is also a privileged, password-protected menu. This means that a password must be set to gain access to the items in the \Private menu. The password to the \Private menu is cleared before the TLS is shipped from the factory, because the menu is intended for use by field service personnel only.

Passwords are used together with security locks to protect the TLS' configuration against unauthorized or unintentional changes, and unauthorized manual operations. Therefore, the Master security lock must be disabled before a password can be set in the \Private menu.

5.2 Security Locks

There are four types of security locks: `Configuration`, `Inventory`, `Master` and `Door`. The `\Configuration\Security` menu (shown below) is used to set the `Configuration`, `Inventory`, and `Master` security locks to `ON` or `OFF` (the default value is `OFF`). The `Door` lock is controlled by opening or closing the cabinet's door.

Refer to the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for a complete discussion of TLS security locks.

```
C•••••••••••Security
➜Configuration:  ON
 Inventory:      ON
 Master:         ON
```

NOTE

All items in the `\Configuration\Security` *menu are locked by the* `Door` *lock.*

5.2.1 Door Lock

When the cabinet's door is closed, the `Door` lock is `ON`, and the items in the `\Configuration\Security` menu cannot be changed.

5.2.2 Master Lock

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

5.2.3 Disabling the Master Security Lock

NOTE

See the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for details about the TLS Security options.

Follow the instructions below, which assume that all TLS security locks are set to `ON`, to disable the `Master` security lock.

1.   Open the cabinet door (to disable the `Door` lock).

2.   Press the MENU key to display the `Top Menu`.

```
Top Menu
➜•Configuration
 •Maintenance
 •Operation
```

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

```
•••••••Configuration
 •Advanced
 •Drive
 SCSI ID:        dd
➜•Security
 SET TO DEFAULTS
```

4. Use the ▼ (DOWN) key to move the pointer to `Security`.

5. Press the ENTER key to enter the `C\Security` menu.

```
C•••••••••••Security
 Configuration:  ON
 Inventory:      ON
➜Master:         ON
```

6. Use the ▼ (DOWN) key to move the pointer to `Master`.

7. Press the ENTER key once to begin editing the `Master` value.

8. Use the ▼ (DOWN) key to change the `Master` value from `ON` to `OFF`.

9. Press the MENU key twice to leave the menu system.

10. Close the cabinet door.

5.3 Enabling the Private Menu

NOTE

Not all items shown in the menu illustrations appear all the time. For example, some items (like Carousel) are model-dependent. Carousel appears in the Private menu only if the unit's model number is set to a carousel model in the Configuration\Advanced\Changer\Mechanics menu.

5.3.1 Access

`Access` is a text string used to set a password, which unlocks the `\Private` menu. It is easy to find out if a password is currently set. Just press the MENU key to display the `Top Menu`, then use the ▼ (DOWN) key to scroll down through all of the menu items. If `Private` is visible in the menu, press ENTER to enter the `\Private` Menu. If `CLEAR ACCESS` is visible in the `\Private` menu, a password has been set.

- **Service is the password used by qualified service personnel to access certain \Private menu items while servicing the TLS. Please note that only the first letter is capitalized.**

- **Update is the password used by qualified service personnel to access other \Private menu items while upgrading a TLS, adding or removing a Barcode Reader, or replacing the Executive PCBA. Please note that only the first letter is capitalized.**

The current password should always be cleared (removed) after the user finishes servicing a unit to prevent unauthorized access to the \Private menu. Clearing a password will also remove the \Private sub-menu from the top menu.

5.3.2 Setting a Password

Once set, a password remains set (even if the power is removed from the TLS), until it is intentionally cleared (removed) by executing the Private menu's CLEAR ACCESS command.

Three things happen when a user sets a password:

- **Private appears at the bottom of the Top Menu.**

- **Access (shown in step 9 below) disappears from the Private menu.**

- **CLEAR ACCESS (shown in Section 5.3.3) appears in the Private menu.**

```
Top Menu
➜•Configuration
 •Maintenance
 •Operation
 •Private
```

NOTE

Passwords are case-sensitive. Be sure to use the correct capital and lower-case letters while setting passwords.

1. Turn the power on.

2. Press the MENU key to display the Top Menu.

```
Top Menu
 •Configuration
➜•Maintenance
 •Operation
```

3. Use the ▼ (DOWN) key to move the pointer to Maintenance.

4. Press the ENTER key to enter the Maintenance menu.

```
••••••••••Maintenance
•Display Log
 •Display Prevents
 •Display Reservs.
 •Display Revision
 •Display Sense
 •Display Stats.
 •Display Voltage
 •Test Inventory
 •Test Keyboard
➜•Test LC Display
```

5. Use the ▼ (DOWN) key to move the pointer to Test LC Display.

6. Press the ENTER key to enter the
    Maintenance\Test LC Display menu.

7. Press and release the ▼ (DOWN) key once.

8. This step must be executed quickly (within 1.5 seconds). Sequentially press and
    hold down the ▼ (DOWN), **ENTER** and **MENU** control keys, in the order shown
    (Do not press all three control keys at the same time.)

9. Simultaneously release the three control keys. If the Top Menu reappears at
    this point, repeat steps 3-8 above to display the Private menu.

10. The Private menu should now be displayed.

These two do not appear
until after a legitimate
password is entered.

```
•••••••••••••Private
➜Access: ??????????
•Calibration
 CALIBRATE
•Carousel
•Defaults
•Display A/D
•Display Locations
•Display Positions
•Display Sensors
•DriveBay
•Executive
 RESET SCSI BUS
•Restrictions
•SCSI
```

11. If necessary, use the ▼ (DOWN) key to move the pointer to Access.

12. Press the ENTER key to start editing the Access value (entering a password).
    A flashing cursor should appear at the first character's position.

NOTE

If a MASTER SECURITY message appears, instead of a flashing cursor in step 11 above, follow the instructions in Section 5.2.3 to disable the Master Security Lock, then repeat this section to set the desired password.

13. Press the ▲ (UP) or ▼ (DOWN) key repeatedly to select the desired character (be sure to use the correct capital and lower-case letters), then press the ENTER key once to shift the flashing cursor to the next character position.

14. Repeat step 12 to finish entering the password.

15. Press the MENU key repeatedly to leave the menu system and set the password.

5.3.3 Clearing the Password

Clearing (removing) the current password prevents unauthorized personnel from accessing the `Private` menu and accidentally disabling the TLS. **The current password should always be removed after the service technician finishes using the Private menu.**

Three things happen when a user clears the password:

- **`Private` disappears from the `Top Menu`.**
- **`Access` reappears in the `Private` menu.**
- **`CLEAR ACCESS` (shown in Section 5.3.3) disappears from the `Private` menu.**

1. Press the MENU key to open the `Top Menu`.

2. Use the ▼ (DOWN) key to move the pointer to `Private`.

3. Press the ENTER key to enter the `Private` menu.

```
•••••••••••••Private
•Blower
•Calibration Left
•Calibration Right
CALIBRATE
•Carousel
➜CLEAR ACCESS
•Configuration
•Display A/D
•Display Locations
•Display Positions
•Display Sensors
•DriveBay
•Executive
RESET SCSI BUS
```

4. Use the ▼ (DOWN) key to move the pointer to `CLEAR ACCESS`.

5. Press the ENTER key to execute the CLEAR ACCESS command.

6. Press the MENU key twice to exit the menu system.

The password is now cleared. Notice that `Private` is no longer visible in the `Top Menu`.

5.4 The Private Menu

5.4.1 Private\CALIBRATE Command

The CALIBRATE command should not be executed without a specific reason for doing so, because it involves risk. For example, if the CALIBRATE command is used incorrectly, improper Handler operation may result. Therefore, if the Handler is properly picking and placing cartridges, and the user does not have a specific reason for using the CALIBRATE command, recalibrating the TLS is not recommended.

Sometimes it is necessary to execute the CALIBRATE command. For example, the TLS must be recalibrated after new hardware is installed or if the model number is changed.

The CALIBRATE command causes the TLS to:

- **Determine the Vertical (Y-Axis) position(s) of the magazine(s).**

- **Determine the Vertical (Y-Axis) positions of the fixed and private slots.**

- **Calculate the drive position(s) based upon the measured location of the private slot.**

- **Verify that the Carriage can sense its Vertical (Y-Axis) home position (bottom of vertical travel), using the Vertical Axis Home Sensor.**

- **Verify that the Handler can sense its Insertion (Z-Axis) home position (Gripper fully retracted), using the Insertion Axis Home Sensor.**

- **Verify that the Carousel can sense its home position (face 1 detent, model dependent), using the Carousel Position Sensor (carousel models only).**

- **Verify that the I/O port can sense its I/O port axis home position (I/O port slot fully retracted), using the I/O port home sensor.**

- **Verify the full-scale outputs from the I/O port full and I/O port clear optical sensors, while the sensors are in an unobstructed, full-scale state. Determines threshold values for their use based upon the full-scale readings.**

- **Calibrate the Inventory Sentry Beam (Y–Clear) detector by measuring the sensor's full-scale output (sensor unobstructed) and the minimum output (sensor obstructed). Calculates the new threshold value between the full-scale and minimum output readings.**

- **Calibrate the Cartridge Presence sensor's optical detector by measuring the full scale output (sensor unobstructed) and the minimum output (sensor obstructed). Calculates the new threshold value between the full-scale and minimum output readings.**

All of these calibration steps are checked against acceptance range parameters. Each position or optical output reading must fall within its acceptable range before subsequent positions and thresholds are determined.

CAUTION

> *If the TLS is not properly set up prior to invoking the CALIBRATE command, the calibration process can result in invalid calibration data, which may prevent Handler operation.*

Using the CALIBRATE Command

1. Press the MENU key to open the Top Menu.

2. Use the ▼ (DOWN) key to move the pointer in the left column to Private, then press the ENTER key to open the Private menu.

3. Use the ▼ (DOWN) key to move the pointer to CALIBRATE.

```
•••••••••••••Private
•Calibration
➜CALIBRATE
•Carousel
CLEAR ACCESS
•Configuration
•Display A/D
•Display Locations
•Display Positions
•Display Sensors
•DriveBay
•Executive
RESET SCSI BUS
```

4. Press the ENTER key to execute the CALIBRATE command.

5. Follow the instructions that appear on the LCD display: remove all cartridges, install all empty magazines, press the ENTER key. Use the ▼ (DOWN) key to read the whole message.

   The calibration process takes about 80 seconds to complete. If the calibration process does not succeed, an Alert message indicating that a fault occurred during calibration is displayed.

5.4.2 Private\CLEAR ACCESS Command

This command is used to clear the Access value (the active password) and defeat Private menu access, as explained in Section 5.3.3.

5.4.3 RESET SCSI BUS Command

This command forces a BUS RESET command on the SCSI bus. It may be used with caution to solve system development problems. However, using this command could prove quite disruptive on a live system.

Executing a RESET SCSI BUS Command could adversely affect another device or host system that is connected to the same SCSI bus. Use this command with great caution!

To Reset the SCSI Bus:

1. Press the MENU key to open the Top Menu.

2. Use the ▼ (DOWN) key to move the pointer to Private, then press the ENTER key to open the Private menu.

3. Use the ▲ (UP) or ▼ (DOWN) key to move the pointer to RESET SCSI BUS.

4. Press the ENTER key to execute the RESET SCSI BUS command.

NOTE

The RESET SCSI BUS command is locked by both the Master Security Lock and the Inventory Lock. If the user gets a SECURITY message, the user must first unlock the security locks before proceeding. Use the procedure in section 5.2 to enter the Security menu and disable the Master Security Lock. The user can also disable the Inventory Lock while the Security menu is displayed.

5.4.4 The Private\Calibration Data Status Screen

```
P········Calibration
 Calibrated:     NO
 Valid:          NO
 CRTPRS  Thrs:ddddd
 I/OCLR  Thrs:ddddd
 I/OFULL Thrs:ddddd
 YCLEAR  Thrs:ddddd
 YCLEARM Thrs:ddddd
 Y DATA 0:    ±ddddd
 Y Drive Ofst0:±ddd
 Y Drive Ofst1:±ddd
 Y Drive Ofst2:±ddd
 Y Drive Ofst3:±ddd
 Y FIXED 0:   ±ddddd
 Y FIXED 1:   ±ddddd
 Y I/O PORT: ±ddddd
 Y PRIVATE:   ±ddddd
 Y SHUTTLE:   ±ddddd
 Y STORY 0:   ±ddddd
```

The Calibration Data Status screen displays the calibration data determined by the CALIBRATION command. If, for example, the user encounters some particularly difficult Handler problem, it may become necessary to relay the data on this screen to a Qualstar Technical Support technician.

The Calibrated value and the Valid value indicate whether or not the calibration data determined by the CALIBRATION command is within acceptable limits. If the calibration data is not valid, the Handler will not operate.

The following calibration data is displayed on the Calibration Data Status screen:

- Calibrated (YES/NO)
  This value shows whether or not the calibration process was successfully completed.

- Valid (YES/NO)
  This value shows whether or not the calibration data has been initialized.

- CRTPRS
  This value is the threshold for the Cartridge Presence sensor's optical detector.

- I/OCLR
  This value is the threshold for the I/O port clear sensor's optical detector.

- I/OFULL
  This value is the threshold for the I/O port full sensor's optical detector.

- YCLEAR
  This value is the threshold for the Inventory Sentry Beam's optical detector. (This sensor is also known as the Y-Clear Sensor).

- YCLEARM
  This item appears in the menu, but it is not used for TLS-4000 libraries.

- Y DATA 0
  This value is the location of the top tape drive.

- Y Drive Ofst0 through Y Drive Ofst3
  These values are the distances between tape drives.

- Y FIXED 0
  This value is the location of the first fixed slot.

- Y FIXED 1
  This value is the location of the second fixed slot.

- Y I/O PORT
  This value is the location of the I/O port slot.

- Y PRIVATE
  This value is the location of the Private Slot.

- Y SHUTTLE
  This item appears in the menu, but it is not used for TLS-4000 libraries.

- Y STORY 0
  This value is the location of the bottom slot, in the bottom magazine, on the first face.

5.4.5 The Private\Carousel Menu

```
Private·····Carousel
 Current Stop:    d
 Demand Stop:     d
 ABORT SLEW
 SLEW
 Current Pos:±ddddd
 Index:      BLOCKED
 STEP DOWN
 STEP UP
```

The Carousel menu allows the user to completely control the Carousel and to display the Carousel's current position.

NOTE

Carousel is a model-dependent item. It appears in the Private menu only if the unit's model number is set to a carousel model in the Configuration\Advanced\Changer\Mechanics menu (model 4222, 4440, 4480, 4660, or 46120).

Some items in the Private\Carousel menu are function-dependent items. For example, ABORT and SLEW only appear while the Carousel is busy.

General Carousel Information

The Carousel is moved by a four-phase, DC stepper motor. There are 200 steps per motor shaft revolution. A pinion gear on the motor shaft drives the carousel gear, which is housed inside the gear guard.

The gear guard contains indexing slots, which are placed in a specific pattern. Since carousels have either four or six faces, the gear guard has indexing slots for each face, including a single, extra-wide indexing slot. These slots are sensed by the Carousel Position sensor.

The Carousel Position sensor is an optical switch pair, mounted on the carousel PCBA (P/N 500617-01-4). As the gear guard rotates, it passes between the sensor's emitter and detector, interrupting the sensor's beam. As each indexing slot in the gear guard passes through the sensor, it allows the sensor's beam to reach the detector. The pattern of indexing slots that the detector sees is used to determine the Carousel's position. The extra-wide indexing slot is used to establish an absolute position reference.

Table 5-1 shows the relationship between carousel face Stop numbers and the corresponding carousel faces for each TLS model. It also shows the number of motor shaft rotation steps required to move counterclockwise from Stop 0 (the face 1 stop) to each Stop number. Counterclockwise rotation, as viewed from above, is the forward direction of rotation (position step increments).

	Face Number on Model:					
STOP	**4222**	**4440**	**4480**	**4660**	**46120**	**Nominal Position**
8						2888
7					2	2667
6			2			2400
5				3	3	2133
4	3	3	3		4	1600
3				5	5	1067
2			4			800
1					6	533
0	1	1	1	1	1	0

Table 5-1   Carousel Rotation Information

The Carousel menu contains the following values:

- Current Stop
  This value is the current Stop number (Table 5-1) A value of 255 indicates that the carousel is between Stops, or that the Carousel has been bumped off of a Stop.

- Demand Stop
  Set this value prior to commanding the carousel to rotate. The Carousel rotates to this Stop number when the SLEW command is invoked.

- ABORT SLEW
  This command will immediately stop Carousel rotation.

- SLEW
  This command will start the Carousel rotating to the Demand Stop position. The direction of rotation for the shortest movement will be used. No rotation occurs if the Current Stop number is equal to the Demand Stop number.

- Current Pos:
  This value indicates the Carousel's current position in motor steps (Table 5-1). Normally the number is always positive and wraps around from 3199 to 0. But if the user steps below zero, a negative number is displayed.

- Index:
  This value indicates whether or not the Carousel Position sensor on the carousel PCBA is OPEN (with light passing through an indexing slot), or BLOCKED (by the gear guard). It changes state as the gear guard's slots pass through the sensor's beam.

- STEP DOWN
  Execute this command to rotate the Carousel one motor shaft rotation step in the clockwise direction. The Current Pos value will decrease by one.

- STEP UP
  Execute this command to rotate the Carousel one motor shaft rotation step in the counterclockwise direction. The Current Pos value will increase by one.

5.4.6 The Private\Configuration Menu

```
P......Configuration
 ·Defaults
 Demonstrations:YES
 ·Restrictions
 ·SCSI
```

5.4.6.1 Demonstrations

This menu allows for the Operation\Demonstrations menu to be hidden.

YES   The Operation\Demonstrations menu is visible and allows for the selection of Feature List or Random Moves. The Feature List item is used to display messages about TLS features. The Random Moves causes the changer to make continuous random cartridge moves.

NO   The Operation\Demonstrations menu is hidden.

5.4.7 The Private\Defaults Menu

```
Private·····Defaults
 LCD Line 1:DEFAULT
   1-10: ??????????
  11-20: ??????????
 LCD Line 2:DEFAULT
   1-10: ??????????
  11-20: ??????????
 LCD Line 3:DEFAULT
   1-10: ??????????
  11-20: ??????????
 LCD Line 4:DEFAULT
   1-10: ??????????
  11-20: ??????????
 SCSI Vndr:????????
 SCSI Prod:????????
          ????????
 SCSI Revision:????
 CLEAR
```

The items in this menu are used to create *custom default data* for various menu system items.

Example 1: The default text used on line 1 of the main display for a TLS-4210 is Qualstar TLS-4210. However, an operator can enter custom data (e.g., different text) for the main display line 1 over the SCSI bus, or by using the Configuration\Advanced\Control Panel\Display menu. If either of these methods is used, and the operator then executes the Configuration menu's SET TO DEFAULTS command, the custom text data is lost and the system's default text (Qualstar TLS-4210) is displayed again.

Example 2: The Private\Defaults\LCD Line 1 menu item, and its sub items 1-10 and 11-20, can also be used to change the text used on line 1 of the main display. *Unlike Example 1*, text data entered in the Private\Defaults menu becomes the new system default data. Therefore, the custom data entered in this menu

is also used as the system's default data when an operator executes the Configuration menu's `SET TO DEFAULTS` command.

- SCSI Vndr
  Allows for vendors or resellers name to be entered which will replace the system's default menu display text (**Qualstar**).

- SCSI Prod
  Allows for vendors or resellers product name to be entered which will replace the system's default menu display text (**TLS-4210**).

- SCSI Revision
  Allows for vendors or resellers revision tracking name to be entered which will replace the system's default menu display text (X.XX).

- CLEAR
  Evoking the **CLEAR** command will eliminate all data entries in the **Private/ Defaults menu and all the systems** menu display text will return to the system defaults.

5.4.8 The Private\Configuration\SCSI Menu

The `Private\SCSI` menu provides a means of fine-tuning the time delay and number of retries used when moving cartridges in and out of tape drives. Adjusting the values in this menu can help to reduce some of the problems associated with inflexible host software. Both decimal values are editable.

```
P•Configuration•SCSI
 PostPlaceDly:ddddd
 PrePickRetries:ddd
```

The `PostPlaceDly` value is a period of time, measured in 250^{ths} of a second. It determines the delay from the physical insertion of a tape cartridge into a tape drive, to the notification to the host computer that the cartridge movement has is completed. A longer value gives the tape drive more time to change its status from "empty" to "loading a tape." The default value is 250 or one second.

Sometimes a tape drive is slow to eject a tape cartridge, after the tape drive notifies the host computer that it has finished the ejection sequence. The `PrePickRetries` value, measured at one retry per second, controls the number of times (and seconds) the Handler will look for the ejected tape cartridge with its Cartridge Presence opto-sensor. The default value is `10` (or ten seconds). If the ejected cartridge is not detected after the specified number of retries (and seconds), the TLS will issue an Alert message.

5.4.9 The Private\Display A/D Status Screen

```
Private··Display A/D
 +12V          ddddd
 +3.3V         ddddd
 +5V           ddddd
 CARSPR:       ddddd
 CRTPRS:       ddddd
 I/O CLEAR:    ddddd
 I/O FULL:     ddddd
 Internal 0:   ddddd
 Internal Mid:ddddd
 InternalFull:ddddd
 TPWR:         ddddd
 YCLEAR:       ddddd
 YCLEARM:      ddddd
```

The Display A/D Status screen displays the current analog to digital converter output values. There are up to fourteen A/D channels (depending on the revision of the Executive PCBA) that constantly measure the Handler power supplies, Opto-Sensors and other signals. The signal names generally correspond to those found on the Executive PCBA schematic diagram (drawing no. 501388). The signals for the various Executive PCBA revisions are shown in Table 5-2 below.

The A/D converter is an 8-bit unit. Output values range from 0 to 255. These output values correspond to input voltages ranging from 0 to 5.000 VDC, which equates to an input voltage at U1 on the Executive PCBA of 19.61 millivolts per count.

Input Signals	Description
+12V	The Handler Power Supply +12V Output
+3.3V	The Executive PCBA +3.3V Regulator Output
+5V	The Executive PCBA +5V Regulator Output
CARSPR	Not used on this model library.
CRTPRS	Cartridge Presence Opto-Sensor Output Lower readings indicate a cartridge is present in Millivolts
I/O CLEAR	I/O Port M-Clear Opto-Sensor in Millivolts
I/O FULL	I/O Port M-Full Opto-Sensor in Millivolts
Internal 0	A/D Converter Internal Check Channel Should always indicate a value of 2502
Internal Mid	A/D Converter Internal Check Channel Should indicate a value of 2502
InternalFull	A/D Converter Internal Check Channel Should indicate a value of 5000
TPWR	Term Power voltage
YCLEAR	Y-Clear (Inventory Sentry Beam) Opto-Sensor in Millivolts
YCLEARM	Y-Clear m (Inventory Sentry Beam) Opto-Sensor in Millivolts

Table 5-2 A/D Converter Inputs

5.4.10 The Private\Display Locations Menu

```
P··Display Locations
 Location:   llllll
 Accessable:  FALSE
 Access.Valid:FALSE
 Barcodeable: FALSE
 Label:  ??????????
 Label Error: FALSE
 Label Valid: FALSE
 Occupied:    FALSE
 Occup.Valid: FALSE
 On My Side:  FALSE
 Present:     FALSE
 Pres. Valid: FALSE
 Source Valid:FALSE
 Source Loc.:llllll
 Synchronized:FALSE
 Type:        DRIVE
 Tape Ejected:FALSE
```

NOTE

The Tape Ejected item only appears in the menu if the Type menu item is DRIVE.

The Display Locations menu contains data from the library's internal inventory data-base. The data in this menu differs from the data found in the `Operation\ Element Status\Display` menu, because it pertains to the library's physical world and does not contain references to SCSI element addresses.

The only editable value in this menu is the `Location` value, which corresponds to a physical location. Once a `Location` is selected, all the internal database information for that location is displayed as follows:

Value	Type	Description
Accessible	TRUE/FALSE	A TRUE value indicates that the drive has no cartridge inside and that it is accessible.
Access.Valid	TRUE/FALSE	A TRUE value indicates that the drive is communicating with the library. However this does not verify that the drive ID is working. That can only be done by setting ID's and looking for the drives on the SCSI bus.
Barcodeable	Data	This value indicates whether or not the barcode reader can scan the barcode label at the selected position. If the Barcodeable value is FALSE, the cartridge must be moved to another location before its barcode label can be scanned.
Label	Data	This item is the barcode label data for the selected location, provided barcode information is available.
Label Error	TRUE/FALSE	A TRUE value indicates that an error occurred while reading the barcode label for the selected location.
Label Valid	TRUE/FALSE	A TRUE value indicates that the Label and Label Error data for the selected location are valid.
Occupied	TRUE/FALSE	A TRUE value indicates that the selected location is occupied by a cartridge.
Occup.Valid	TRUE/FALSE	A TRUE value means the Occupied status for the selected location is valid.
On My Side	TRUE/FALSE	Not used on TLS-4xxx models.
Present	TRUE/FALSE	A TRUE value indicates that a drive, holder, or other device is present at the selected location.
Pres. Valid	TRUE/FALSE	A TRUE value means the Present status for the selected location is valid.
Source Valid	TRUE/FALSE	A TRUE value means the Source Location data for the selected location is valid.
Source Loc.	Data	The Source value indicates the prior location of the cartridge that is currently at the selected location. The Item value is an internal number. It is useful only to a Qualstar Technical Support technician.
Synchronized	TRUE/FALSE	When an inventory item is modified on one side of the library, the data is first only in the corresponding sides Executive PCBA. The data will not be transferred to the opposite sides Executive PCBA until a synchronization occurs.
Type	Data	This value indicates the type of element that is at the selected location: DRIVE, HANDLER, I/O PORT, or magazine SLOT.
Tape Ejected	Data	When the Type value is set to DRIVE, this value is displayed for the drive at the selected location. The default value is FALSE. However, if the most recent inventory scan found a tape ejected from the drive, this value will be TRUE.

Table 5-3   Private\Display Locations Data

5.4.11 The Private\Display Positions Status Screen

```
P··Display Positions
 IS:           ±ddddd
 X:            ±ddddd
 Y:            ±ddddd
 PeriodY:       ddddd
 Z:            ±ddddd
 PeriodZ:       ddddd
```

The Display Positions status screen displays the current position of the four motor-driven positioners. The positions are given in motor steps, counted from the home position of each axis. There are 24 steps per revolution for the Vertical (Y) Axis and Insertion (Z) Axis motors. There are 200 steps per revolution for the I/O port Axis and Carousel (X) Axis motors.

- IS
  This value indicates the current I/O Port carrier position. A value of 0 means that the I/O Port Slot is at its home position (fully retracted).

- X
  This value indicates the current Carousel position. A value of 0 means that the Carousel is at its home position (face 1).

- Y
  This value indicates the current vertical position of the Carriage. A value of 0 means that the Carriage is at its home position (at the bottom of its travel range).

- Period Y
  Used primarily for diagnostics, this value represents the period of time that it takes for the Hall-Effect sensors in the Y-axis brushless DC motor to move between two points. The maximum value of 65,535 will be shown when the motor is not moving.

- Z
  This value indicates the current position of the Handler's Gripper. A value of 0 means that the Handler's Gripper is in its home position (fully retracted).

- Period Z
  Used primarily for diagnostics, this value represents the period of time that it takes for the Hall-Effect sensors in the Z-axis brushless DC motor to move between two points. The maximum value of 65,535 will be shown when the motor is not moving.

5.4.12 The Private\Display Sensors Status Screen

```
P····Display Sensors
 !Adapt:           0
 ISHome:           0
 Locked:           0
 !Open:            0
 !ScsiDF:          0
 !Shunt1:          0
 !Shunt2:          0
 XIndex:           0
 YHome:            0
 ZHome:            0
```

The Display Sensors Status screen displays the current logical state (1 or 0) of the various control inputs.

- !Adapt
  A 0 indicates that a adapter is installed on the Executive PCBA.

- ISHome
  A 1 indicates that the I/O port slot is fully retracted.

- Locked
  A 1 indicates that the front door is locked (an optional feature).

- !Open
  A 1 indicates that the front door is closed.

- !ScsiDF
  A 0 indicates that a SCSI HVD differential adapter is installed on the Executive PCBA.

- !Shunt1
  The Shunt1 value is not currently used on TLS-4xxx libraries.

- !Shunt2
  The Shunt2 value is not currently used on TLS-4xxx libraries.

- Xindex
  A 1 indicates that the Carousel Position sensor sees an indexing slot in the gear guard skirt.

- Yhome
  A 1 indicates that the Carriage is at its home position (bottom of its travel range).

- Zhome
  A 1 indicates that the Handler's Gripper is at its home position (fully retracted).

5.4.13 The Private\DriveBay Menu

```
Private·····DriveBay
·Bay
·EEPROM
```

The `Private\DriveBay` menus show the status of the Drive Bay circuit board and the EEPROM on the circuit board. The meaning of the EEPROM data is beyond the scope of this document.

5.4.13.1 The Private\DriveBay\Bay Menu

```
Private·DriveBay·Bay
 Address          xx
 Type:      ???????
 Revision:      ddd
 Count Mode:    OFF
 Temperature:   ddd
 12V:           ddd
 5V:            ddd
```

- Address
  This value indicates the I²C SCSI bus address.

- Type
  This value indicates the type of communications protocol used by the DriveBay board. The current value is 01.

- Revision
  This value indicates the revision of the DriveBay firmware and ranges from 1 to 255.

- Count Mode
  The Count Mode value is used for diagnostic purposes. When on it sends I²C messages to the Drive Bay.

- Temperature
  This feature is not implemented.

- 12V
  Divide this value by 17.1 to determine the approximate value of the 12V power supply for the tape drives.

- 5V
  Divide this value by 34.1 to determine the approximate value of the 5V power supply for the tape drives.

5.4.14 The Private\Executive Menu

```
Private····Executive
 Firmware:   ??????
 I2C Address:    xx
 PCB Number: 501??7
 PCB Revision:    ?
```

- Firmware
  Indicates the current revision of the Executive firmware.

- I2C Address
  The address of the Executive PCBA on the I²C bus.

- PCB Number
  The part number of the Executive PCBA.

- PCB Revision
  The major revision letter of the Executive PCBA. A, B, C, etc.

6.   Troubleshooting

After a Tape Library System (TLS) is serviced in the field, there are three types of failures that might occur when power is reapplied: Power Up and Initialization, Operation, or Calibration. This chapter lists the possible failures that might occur in each category and also the possible causes for each type of problem. Should a problem occur after the TLS is serviced, use this chapter to quickly identify and remedy the problem.

NOTE

> *Important: Some problems will result in an alert message on the LCD display, followed by a ten-digit number. Our technical support department will need this number to diagnose the problem if you contact them. So always, record this number, along with the general context of the problem.*

Troubleshooting Index

6.1 Power Up and Initialization Failures

When the library's power is first turned on, it does a Power-On Sequence Test and then scans the inventory. The errors in this section occur during the power-on/inventory-taking process.

6.1.1 When the power is turned on, no motion occurs, the control panel display does not light up and the machine makes a regular, clicking sound.

The power supply modules are equipped with a feature that shuts them off if a short on the output is detected, and a moment later they attempt to restart. They will repeat this until the problem is cleared or the power is turn off. This sequence causes and audible click, which can be an aid in finding the problem.

Possible causes:

1.   The Handler power supply module has failed.

2.   There is a short in the Executive PCBA's +12V circuits.

6.1.2 When the power is turned on, no motion occurs, the control panel display does not light up and the machine is quiet.

Possible causes:

1.   The unit is not connected to an AC power source.

2.   The AC power source is not active.

3.   The fuse is blown.

4.   The AC power is not connected properly internally.

5.   The fuse is blown due to a short in the internal wiring.

6.   The fuse is blown due to a failed power supply module.

7.   The Handler power supply module is not connected to the Executive PCBA.

8.   The Handler power supply module has failed.

9.   There is a short in the Executive PCBA's +12 volt circuits.

6.1.3 When the power is turned on, the control panel display lights up but does not show text and nothing moves.

Possible causes:

1.   The Executive PCBA has failed.

2.   The Executive PCBA has never been factory-initialized.

3. The firmware on the Executive PCBA was destroyed because the power was interrupted while uploading new code. If this happens, you must replace the executive PCBA, or replace the DIP Flash-Memory chip on the Executive PCBA.

6.1.4 When the power is turned on, the control panel display lights up and shows text, no errors are displayed, but nothing moves.

Possible causes:

1. The door is ajar.

2. The door is not completely closed. (The door appears to be closed, but is not completely shut.)

3. The Door Sensor is not working properly.

4. The library is configured to be a model "None".

5. The Control Panel Assembly has failed, or the cable to the Executive PCBA is damaged, or the plug on the cable is improperly seated.

6.1.5 When the power is turned on, the Handler moves normally, but the control panel display remains dark and shows no text.

Possible causes:

1. The Control Panel Assembly has failed or the cable to the Executive PCBA is disconnected or damaged.

2. The LCD display has failed, or the cable is disconnected or damaged.

6.1.6 When the power is turned on, the Handler moves normally, the control panel display shows text, but the control panel display remains dark.

Possible causes:

1. The Control Panel Display's backlight value is set to OFF in the library's Configuration menu, or it is set to turn itself off in five minutes, and the time has elapsed.

2. The Control Panel Assembly has failed, or the cable to the Executive PCBA is disconnected or damaged.

3. The LCD display has failed, or the LCD display cable is disconnected or damaged.

6.1.7 When the power is turned on, the Handler moves normally and the control panel display illuminates, but it does not show text.

Possible causes:

1. The LCD display cable is not properly connected, or the cable is damaged.

2. The LCD display has failed.

6.1.8 When the power is turned on, the alert `Bcr Failure` appears in the control panel display.

On power up, the library attempts to communicate with the bar code reader module. If the library is configured for a bar code reader, but this communication fails, this error results.

Possible causes:

1. The Barcode Reader is not plugged into the Carriage PCBA.

2. The unit is configured for a Barcode Reader, but a Barcode Reader is not installed.

3. The cable connecting the Executive PCBA to the Carriage PCBA is damaged, or not properly connected.

4. The Barcode Reader has failed.

5. The Carriage PCBA has failed

6. The Executive PCBA has failed.

6.1.9 When the power is turned on, the alert `Yhome Fail` appears on the control panel display, and the Carriage does not reach the bottom of its vertical travel.

When the power is turned on, the library attempts to drive the carriage to the bottom of the machine, then verifies that the Y home sensor detects the carriage. This error results if this process fails.

Possible causes:

1. An object is preventing the Carriage from reaching the bottom of its travel.

2. The Vertical Axis is jammed, or not running freely.

3. The Carriage cable is damaged, or not properly connected.

4. The Vertical Axis motor is not plugged into the Carriage PCBA, or has failed.

6.1.10 When the power is turned on, the alert `YHome Fail` appears on the control panel display, after the Carriage reaches the bottom of its vertical travel.

When the power is turned on, the library attempts to drive the carriage to the bottom of the machine, then verifies that the Y home sensor detects the carriage. This error results if this process fails.

Possible causes:

1. The Vertical Axis Home Sensor has failed.

2. The Carriage cable is damaged, or not properly connected.

3. The Vertical Axis Home Sensor Probe (see Figure 2-5) is missing or damaged.

4. The Vertical Axis motor is not properly connected.

5. The Vertical Axis motor has failed.

6.1.11 When the power is turned on, the alert `Ioport Jammed` appears on the control panel display, and you do not hear a whining sound for several seconds before the alert occurs.

During the power up sequence, the I/O port (if present) is driven back to its home position above the magazines. If the motor is operating but the I/O port is not moving, it will make a loud buzzing sound. Failure to make this noise indicates one of the following causes:

1. The cable from the Executive PCBA to the I/O port PCBA is damaged or disconnected.

2. The I/O port motor cable is damaged or disconnected.

3. The unit is configured for an I/O port, but no I/O port is installed.

4. The I/O port motor has failed.

5. The Executive PCBA is damaged.

6.1.12 When the power is turned on, the alert `Ioport Jammed` appears on the control panel display, and you do hear a whining sound for several seconds before the alert occurs.

During the power up sequence, the I/O port (if present) is driven back to its home position above the magazines. If the motor is operating but the I/O port is not moving, it will make a loud buzzing sound. This condition indicates one of the following causes:

1. The I/O port mechanism is binding, due to misalignment of the guides.

2. The Carriage is parked in front of the I/O port, with a cartridge that is still in the I/O port slot engaging the grippers on the Handler.

3. The metal vane on the I/O port carriage is not obstructing the light beam of the I/O port Home Sensor.

4. The I/O port Home Sensor opto-interrupter pair is bent or damaged.

5. The I/O port mechanism is jammed, due to a mechanical obstruction, or it is binding against a stop.

6. The I/O port mechanism is binding, because the leadscrew shaft coupling was set with too much compression.

7. The Shaft Coupling between the I/O port motor and the leadscrew is not clamped properly. This case makes a quieter buzzing sound than the others.

6.1.13 When the power is turned on, the message `Needs Calibration` appears on the control panel display.

Possible cause:

The unit needs to be calibrated, due to an Executive PCBA replacement, Configuration change, or a failed calibration attempt.

6.1.14 When the power is turned on, the alert `Carousel Jammed` appears on the control panel display, and the Carousel motor does not rotate or make any noise.

When the power is turned on in a library with a carousel, one of the things that happens is the carousel attempts to home itself. This means it attempts to find the small slots in the gear guard using the opto sensors on the carousel PCBA, and align itself with one of these slots. It counts the number of stepper motor steps between the slots, to verify proper operation. Any problem in this process results in this alert. If the library make no noise during this process, this indicates that the motor is not being driven.

Possible causes:

1. The cable from the Executive PCBA to the Carousel PCBA is damaged or disconnected.

2. The Carousel motor cable is damaged or disconnected.

3. The unit is configured to be a carousel model and no carousel is installed.

4. The Executive PCBA has failed.

5. The Carousel motor has failed.

6.1.15 When the power is turned on, the alerts `Carousel Jammed` appears on the control panel display. Also, the Carousel motor makes a loud noise and does not turn, or the carousel turns, then stops and makes a loud noise.

When the power is turned on in a library with a carousel, one of the things that happens is the carousel attempts to home itself. This means it attempts to find the small slots in the gear guard using the opto sensors on the carousel PCBA, and align itself with one of these slots. It counts the stepper motor steps between the slots, to verify proper operation. Any problem in this process results in this alert. If the library makes a loud buzzing noise during this process, this indicates that the motor is being driven, but the carousel is not free to rotate, or the motor is not operating properly.

Possible causes:

1. The Carousel is jammed, or binding and does not turn freely, generally caused by a cartridge not fully inserted in a magazine or storage slot. Also may be caused by a magazine not properly installed on its mount.

2. The Cable from the Executive PCBA to the Carousel PCBA is damaged, or not properly seated.

3. The Carousel motor cable is not properly seated in the Carousel PCBA.

4. The internal SCSI cable is caught on the carousel.

5. The carousel drive gears are damaged or binding on debris.

6.1.16 When the power is turned on, the Carousel turns for awhile, then the alert `XHome Fail` appears on the control panel display.

When the power is turned on in a library with a carousel, one of the things that happens is the carousel attempts to home itself. This means it attempts to find the small slots in the gear guard using the opto sensors on the carousel PCBA, and align itself with one of these slots. It counts the number of stepper motor steps between the slots, to verify proper operation. Any problem in this process results in this alert. If the carousel turns for a while then stops with this alert, this indicates that the library was unable to find all the slots on the gear guard.

Possible causes:

1. The Carousel Position Sensor pair on the Carousel PCBA is bent or damaged.

2. The slots in the Carousel's gear guard are damaged, or blocked by a foreign object, like a label.

3. The cable from the Executive PCBA to the Carousel PCBA is damaged or disconnected.

4. The Executive PCBA has failed.

6.1.17 When the power is turned on, the alert `ZHome Fail` appears on the control panel display, and the Insertion Axis is all the way back (nearest the cabinet door).

When the power is turned on, the library attempts to drive the gripper (Z axis) all the way toward the door, then verifies that the Z home sensor detects the gripper assembly. This error results if this process fails.

Possible causes:

1. The Z Axis Home Sensor pair is bent or damaged.

2. The Carriage cable is damaged.

6.1.18 When the power is turned on, the alert `ZHome Fail` appears on the control panel display, and the Insertion Axis is not all the way back (nearest the cabinet door).

When the power is turned on, the library attempts to drive the gripper (Z axis) all the way toward the door, then verifies that the Z home sensor detects the gripper assembly. This error results if this process fails. If the gripper is not all the way against the stop nearest the front door, then the library was unable to completely drive the gripper motor or transmission.

Possible causes:

1. The Insertion Axis (Z Axis) is jammed or binding.

2. The Insertion Axis motor is not turning freely

3. The Insertion Axis motor is not properly connected to the I/O port carriage PCBA.

4. The I/O port carriage cable is damaged.

6.1.19 When the power is turned on, the alert `Not Clear` appears on the control panel display.

This indicates that the Sentry Beam (also known as the "Y Clear") is unexpectedly obstructed. The Sentry beam is an invisible light beam, which travels from an emitter at the bottom of the library to a sensor at the top, between the carriage and the cartridges. Its function is to detect possible collisions between the carriage and other objects in the library.

Possible causes:

1. A cartridge is not fully inserted into a magazine storage slot, or is hanging off of the Handler.

2. A magazine is not fully seated.

3. A tape is inserted in a magazine or storage slot backwards or inverted.

4. A tape is protruding excessively from a tape drive.

5. An object is blocking the Y–Clear Sensor's (Inventory Sentry Beam's) optical path. Possibly a cartridge lying in the bottom of the library.

6. The Y–Clear Sensor's (Inventory Sentry Beam's) detector or emitter is dirty or obscured.

7. The unit is configured for no I/O port, but one is installed and it is not positioned all the way against the back stop.

8. The unit requires calibration, due to a component or FRU change.

6.2 Operation Failures

The problems in this section occur during normal operation.

6.2.1 During operation, a key on the key pad works intermittently, or completely fails to operate.

Possible cause:

A switch on the Control Panel PCBA has failed. It is possible to pry the cap off the switch and clean the contacts. If you try this, pry the cap off using a thin knife blade and be careful not to lose the "X" shaped contact spring inside. Clean the contact spring and the two contacts inside the switch by wiping with a plastic safe contact cleaner or with alcohol. If this fails, replace the entire front panel FRU.

6.2.2 The library tries to insert a tape into a tape drive that is already occupied.

When the library attempts to put a tape into an occupied drive, it is not a failure. For example, if the library takes an inventory after a tape is inserted into a drive, then the library does not know if a tape is in the drive. If commanded to do so, the library will attempt to put a tape into the occupied drive. After it fails to insert the tape into the occupied drive, the library will put the tape back where it came from, and update the inventory information to show that the drive is occupied.

6.2.3 The Barcode Reader does not read any bar code labels.

The library uses the Code 3 of 9 (also know as code 39) barcode format for the cartridge labels. In the default configuration, a check character is expected. This can be altered in the configuration. If the library is configured for a check character, and none is present on the labels, then the library will be unable to read the labels. If the library is configured for no check character, and there are check characters on the label, the library will interpret the check character as an additional character, and you will see one extra character in the element label reported on the SCSI bus or in the menus.

Possible causes:

1. The barcode labels are printed in a code that the library configuration does not understand.

2. The configuration is set to the wrong type of barcode reader.

3. The Configuration\Advanced\Changer\LabelCheckChar (label check character) option is not set correctly.

4. The lens on the face of the bar code reader is not clean.

5. The barcode labels are not of a high enough quality for reliable reading.

6. The bar code reader has failed.

7. The barcode labels are dirty or damaged.

6.2.4 The Barcode Reader does not read bar code labels reliably.

The library uses the Code 3 of 9 (also know as code 39) barcode format for the cartridge labels. In the default configuration, a check character is expected. This can be altered in the configuration. If the library is configured for a check character, and none is present on the labels, then the library will be unable to read the labels. If the library is configured for no check character, and there are check characters on the label, the library will interpret the check character as an additional character, and you will see one extra character in the element label reported on the SCSI bus or in the menus.

Possible causes:

1. The barcode labels are not of a high enough quality for reliable reading.

2. The barcode labels are dirty or damaged.

3. The barcode labels are printed in a code that the library configuration does not understand.

4. The lens on the face of the barcode reader is not clean.

5. The configuration is set to the wrong type of barcode reader.

6. The barcode reader has failed.

7. The Configuration\Advanced\Changer\LabelCheckChar (label check character) option is not set correctly.

6.2.5 When the library takes an inventory and reads the barcode labels, it scans the tapes without barcode labels repeatedly.

The library can be configured to make several attempts to read a label with the barcode reader, if it cannot read the label the first attempt. If the library is configured this way, and no label is on the cartridge, it will be scanned several times before the library abandons the effort.

Possible causes:

1. The Fixed Labels value in the Configuration\Advanced\Changer\Inventory menu is set to ALL, and some of the Fixed Slot cartridges do not have barcode labels. Change the Fixed Labels value to SOME, or put bar code labels on all of the Fixed Slot cartridges.

2. The Mag. Labels value in the Configuration\Advanced\Changer\Inventory menu is set to ALL, and some of the magazine cartridges do not have bar code labels. Change the Mag. Labels value to SOME, or put barcode labels on all of the magazine cartridges.

3. The Seq.Labels value in the Configuration\Advanced\Changer\Inventory menu is set to ALL, and some of the sequential cartridges do not have bar code labels. Change the Seq.Labels value to SOME, or put bar code labels on all of the sequential cartridges.

6.2.6 During operation, the alert `Cart Jammed` appears on the control panel display, and there is no cartridge in the Handler's gripper.

This is typically the result of the gripper attempting to remove a cartridge from a storage location or tape drive, and it fails.

Possible causes:

1. The target magazine is not fully seated.

2. The target cartridge is installed in the magazine upside-down.

3. The target cartridge is stuck in the magazine.

4. The library is configured for the wrong TLS model.

5. If the location is a tape drive, the drive is configured to the wrong type.

6. The Handler's gripper solenoid mechanism has malfunctioned.

7. The Handler's gripper solenoid is out of adjustment.

8. The Handler's gripper spring has failed.

9. The calibration data is corrupt and the library needs to be recalibrated.

10. The Cartridge Presence sensor is obscured, by a foreign object, or by dust on the optics.

11. The Cartridge Presence sensor has malfunctioned.

12. If the target is a tape drive, the cartridge is stuck in the drive.

6.2.7 During operation, the alert `Handler Jammed` appears on the control panel display, and a cartridge is in the gripper.

This is typically the result of the library attempting to insert a cartridge into a storage location or tape drive, and failing.

Possible causes:

1. The target magazine is not fully seated.

2. The target magazine is damaged.

3. The target is a tape drive, which has a tape in it already.

4. The cartridge present sensor has become dirty or failed.

5. The retaining spring in a fixed slot or the I/O port has broken off.

6. The library is configured for the wrong TLS model.

7. If the location is a tape drive, the drive is configured to the wrong type.

8. The calibration data is corrupt and the library needs to be recalibrated.

9. The Insertion Axis is binding near the magazine end of its travel.

6.2.8 During operation, the alert `Handler Jammed` appears on the control panel display.

Possible causes:

1. The Insertion Axis is binding.

2. The Insertion Axis is jammed against a stop.

3. The Insertion Axis motor is unplugged.

4. If the location is a tape drive, the drive is configured to the wrong type.

5. The Insertion Axis has a tape jammed against the I/O Slot.

6. The Insertion Axis motor system has malfunctioned.

6.2.9 During operation, the alert `Vertcl Axis Jammed` appears on the control panel display.

This occurs when the carriage attempts to move vertically but is unable.

Possible causes:

1. The carriage is jammed by a cartridge and unable to move freely up or down.

2. A magazine is not seated properly and is colliding with the carriage.

3. A cartridge is hanging off the carriage and is colliding with a magazine or tape drive.

4. The I/O port is interfering with the carriage.

5. The Vertical Axis motor system has failed.

6. The Vertical (Y) Axis leadscrew is binding.

7. The Vertical Axis leadscrew is not attached properly at both ends.

8. The library is configured to the wrong model, and the carriage is colliding with the top of the library.

6.2.10 During operation, the alert `Not Clear` appears on the control panel display.

This indicates that the Sentry Beam (also known as the "Y Clear") is unexpectedly obstructed. The Sentry beam is an invisible light beam, which travels from an emitter at the bottom of the library to a sensor at the top, between the carriage and the cartridges. Its function is to detect possible collisions between the carriage and other objects in the library.

Possible causes:

1. A cartridge is not fully inserted into a magazine storage slot, or is hanging off of the Handler.

2. A magazine is not fully seated.

3. A tape is inserted in a magazine or storage slot backwards or inverted.

4. A tape is protruding excessively from a tape drive.

5. An object is blocking the Y–Clear Sensor's (Inventory Sentry Beam's) optical path. Possibly a cartridge lying in the bottom of the library.

6. The Y–Clear Sensor's (Inventory Sentry Beam's) detector or emitter is dirty or obscured.

7. The unit is configured for no I/O port, but one is installed and it is not positioned all the way against the back stop.

8. The unit requires calibration, due to a component or FRU change.

6.2.11 During operation, the alert `Ioport Jammed` appears on the control panel display.

Possible causes:

1. The Carriage is parked in front of the I/O port, with a cartridge that is still in the I/O port slot engaging the grippers on the Handler.

2. The I/O port mechanism is jammed, due to a mechanical obstruction, or it is binding against a stop.

3. The I/O port door is bent and the I/O port slot or a cartridge in the slot is colliding with the door.

4. The Shaft Coupling between the I/O port motor and the lead screw is not clamped properly.

6.3 Calibration Failures

These are problems that occur when a calibration command was issued, but did not execute successfully. Occasionally a spurious calibration failure can be corrected by repeating the calibration procedure.

IMPORTANT:

Refer to section 6.1 (Power Up and Initialization Failures) for problems not listed in this section.

6.3.1 During Calibration, the alert `YClear Fail` appears on the control panel display.

The calibration sequence blocks and unblocks the path of the Y clear light beam, and reads the sensor output level to determine proper operation, and to calculate a threshold for detecting a blocked condition. This fault indicates that the sensor or emitter is not functioning correctly.

Possible causes:

1. The emitter assembly at the bottom of the cabinet is not properly connected to the Power Distribution PCBA. On some models, the emitter assembly plugs directly into the executive PCBA.

2. The Power Distribution PCBA is not properly connected to the Executive PCBA.

3. The sensor gain select jumpers on the I/O port PCBA are in the wrong position. Most models have a jumper you can set on the I/O port PCBA to set the sensitivity of the sensor. On some models without I/O ports, or on the left side of some double-sided models, there may be a special sensor PCBA under the top cover of the machine, or in place of the I/O port PCBA. Typically, libraries with one story of magazines should be set on "S", and libraries with more than one should be set on "T". If a library is set correctly to the "S" position and stills fails calibration with this problem, try moving the jumper to the "T" position and recalibrating.

4. Something is blocking the Y–Clear Sensor's (Inventory Sentry Beam's) optical path.

5. The Y–Clear Sensor's (Inventory Sentry Beam's) emitters do not work.

6. The Y–Clear Sensor's (Inventory Sentry Beam's) detector circuit on the I/O port PCBA has failed.

7. The emitters or detectors have dust or debris on their lenses.

8. The unit is not configured for an I/O port (`I/O Port` in the `Configuration\Handler\Mechanics` menu is set to `NONE`). However, an I/O port is installed and the I/O port slot is not fully retracted, which blocks the Inventory Sensor beam.
   Solution: Manually turn the I/O port's leadscrew to position the I/O port slot at its back stop.

6.3.2 During Calibration, the alert `Crtprs Sensor Fail` appears on the control panel display.

The calibration sequence blocks and unblocks the path of the CRTPRS light beam, and reads the sensor output level to determine proper operation, and to calculate a

threshold for detecting a blocked condition. This fault indicates that the sensor or emitter is not functioning correctly.

Possible causes:

1. The Cartridge Presence Sensor's emitter or detector is not properly connected. There are small connectors on the PCBA on the bottom of the carriage that carry the signals to the emitter and detector. These may come unplugged during service or other activities.

2. The Cartridge Presence Sensor's emitter or detector has failed.

3. There is an object blocking the Cartridge Presence Sensor's optical path.

4. The Cartridge Presence Sensor's emitter or detector has dust or debris on its lens.

5. The optical emitter and detector may have become misaligned. Normally any alignment possible within the adjustment should work. However, you could try to loosen the screws holding the emitter and detector, and while looking at the CRTPRS value in the Private/Display A/D menu, try to maximize the signal. Re-tighten the screws and retry calibration.

6.3.3 During Calibration, the alert `IClear Sensor Fail` appears on the control panel display.

The I/O port clear sensor is located in the mouth of the I/O port, and detects when a cartridge is partially inserted in the opening.

Possible causes:

1. The bracket holding the LED for the I/O port clear sensor is bent.

2. The cable connecting the I/O port PCBA to the I/O port emitter PCBA is disconnected or damaged.

3. The I/O port emitter PCBA has failed.

4. The I/O port PCBA has failed.

6.3.4 During Calibration, the alert `IFull Sensor Fail` appears on the control panel display.

The I/O port full sensor is located about 4 cm inside the mouth of the I/O port, and detects when a cartridge is fully inserted in the opening.

Possible causes:

1. The bracket holding the LED for the I/O port full sensor is bent.

2. The cable connecting the I/O port PCBA to the I/O port emitter PCBA is disconnected or damaged.

3. The I/O port emitter PCBA has failed.

4. The I/O port PCBA has failed.

6.3.5 During Calibration, the alert `Calibration Failed` appears on the control panel display.

During calibration, the library "feels" for the height of some of the storage slots to compensate for mechanical variations. This fault indicates that the library was unable to calibrate one of the slots. Observe which slot the carriage is sitting in front of. This is the calibration location referred to below.

Possible causes:

1. There is no magazine present in the calibration location, and it is a magazine location. Place a magazine in this position and try again.

2. There is a cartridge in the magazine in the calibration location. Remove the cartridge and try again.

3. The magazine in the calibration location is not properly seated.

4. The Insertion Axis (Z axis) is not free to travel to its forward stop. Turn the lead screw with your fingers and insure it is free to travel stop to stop.

5. The Insertion Axis does not run smoothly.

6. The machine is not assembled correctly. If the unit was just expanded or upgraded, double check that the new features are mounted in the correct holes.

7. The machine is configured as the wrong model. Check that the model and other configuration information is set correctly. You can freely add and remove tape drives from the configuration with no affect on the calibration.

7. Field–Replaceable Units (FRUs)

7.1 Introduction

Many of the major components in the TLS are available from Qualstar as separate Field-Replaceable Units (FRUs). Each FRU can be removed and replaced on-site by qualified personnel. Some of the FRUs are mechanical assemblies while others are Printed Circuit Board Assemblies (PCBAs) or Integrated Circuits.

This chapter lists all of the available FRUs, their Qualstar part numbers and provides detailed removal and replacement instructions.

7.2 Field-Replaceable Units (FRUs)

Table 7-1 lists all of the FRUs available from Qualstar for the TLS-4000 libraries.

Field Replaceable Unit Description	FRU Part Number	Section	Page	Time Min.
Carriage Assembly	500650-01-5	7.5	7-6	30
Carriage PCBA	500627-01-3	7.6	7-16	40
Barcode Reader Assembly	500983-01-0	7.7	7-18	10
Fan Assembly / Air Filter	500700-01-8 / 500584-01-6	7.8	7-21	30/5
I/O Port Assembly	500750-01-3	7.9	7-29	20
I/O Port PCBA	500607-01-5	7.10	7-31	30
Switch Bracket Assembly (Front Panel / Display)	500815-01-4	7.11	7-33	15
Handler Power Supply 110W	500826-01-1, 500826-07-8 or 500826-10-2	7.12	7-36	15
Handler Power Supply 150W	500826-05-2 or 500826-09-4	7.12	7-36	15
Handler Power Supply 160W	500826-13-6	7.12	7-36	15
Tape Drive Power Supply 40W	500826-02-9	7.13	7-42	20
Tape Drive Power Supply 110W	500826-03-7	7.13	7-42	20
Tape Drive Power Supply 125W	500826-12-8	7.13	7-42	20
Executive II PCBA	501137-01-2	7.14	7-44	10
Executive III PCBA	501387-01-3	7.14	7-44	10
Executive IV PCBA	501447-01-5	7.14	7-44	10
2–Drive Drive Bay PCBA	501326-01-1	7.15	7-53	30
4–Drive Drive Bay PCBA	501336-01-0	7.15	7-53	30
6–Drive Drive Bay PCBA	501357-01-1	7.15	7-53	30
Carousel PCBA	500617-01-4	7.16	7-55	10
Carousel Motor Assembly	500822-76-2	7.17	7-57	35
SCSI HVD Adapter PCBA	501407-01-1	7.18	7-61	10
Q-Link	501657-01-9	7.19	7-63	10

Table 7-1   Field-Replaceable Units (FRUs)

The times in the Time Min. column are the maximum estimated times (in minutes) required for an experienced technician to replace the corresponding FRU.

7.3 Required Tools and Materials

Table 7-2 is a complete list of the tools that are required for all FRU replacement/installation procedures.

Tools List
3/32-inch Allen (Hex) Wrench
7/64-inch Allen (Hex) Wrench
1/8-inch Allen (Hex) Wrench
9/64-inch Allen (Hex) Wrench
1/4-inch Nutdriver or open-end Wrench
Number 1 Phillips Screwdriver
Number 2 Phillips Screwdriver
Flat Blade Screwdriver
Torque Wrench capable of at least 50 in-pounds
Small Mirror
5/16-inch Wrench (open-end, box, or adjustable)
Diagonal Wire Cutters

Table 7-2   Required Tools

The materials listed in Table 7-3 may be required when replacing some FRUs.

3-inch X 3/32-inch Replacement Cable Ties   Qualstar P/N 669-1001-9
Loctite 242 Instant Adhesive
Leadscrew Lubricant   Qualstar P/N 732-0003-2 Latex Glove **IMPORTANT:** Leadscrew lubricant and a latex glove are required during Carriage Assembly replacement.

Table 7-3   Replacement Materials

7.4 Top and Side Panels

Tools Required:
- Number 2 Phillips Screwdriver
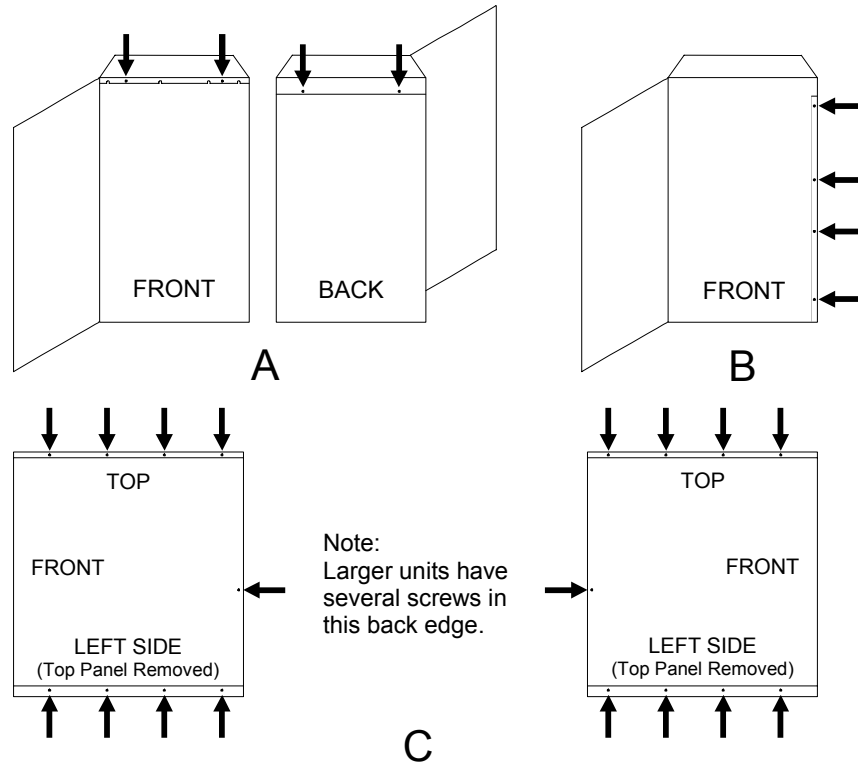
Figure 7-1   Top and Side Panels – Model 4210

7.4.1 Top Panel Removal

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. Remove the screws from the front of the Top Panel (Figure 7-1A).

4. Remove the screws from the back of the Top Panel (Figure 7-1A).

5. Lift the Top Panel off of the TLS.

7.4.2 Top Panel Replacement

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. Place the Top Panel on the TLS with the scalloped edge facing the front (Figure 7-1A).

4. Reinstall the screws removed in Section 7.4.1, step 3.

5. Reinstall the screws removed in Section 7.4.1, step 4.

6. Close the cabinet door.

7.4.3 Side Panel Removal (Left or Right)

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. Remove the Top Panel (Section 7.4.1).

4. When removing the right Side Panel, remove the screws from the front of the Side Panel (Figure 7-1B).

NOTE

The left Side Panel does not have front mounting screws, as shown for the right Side Panel in Figure 7-1B.

5. For either Side Panel, remove the screws from the top, bottom and back edges of the Side Panel (Figure 7-1C).

6. If your TLS has two or three nuts inside the left Side Panel (Figure 7-2), remove them.

7. Lift the Side Panel off of the TLS.

FRONT
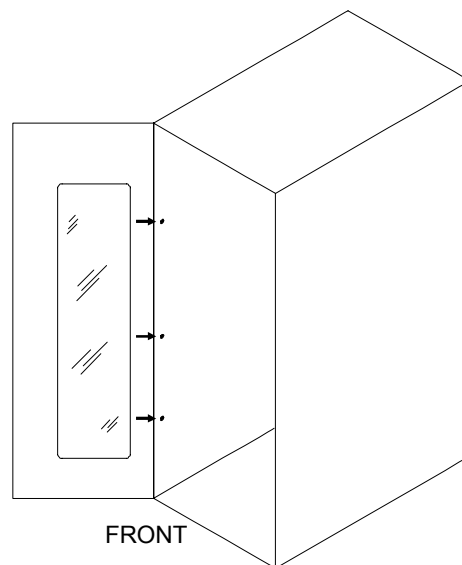
(Some models do not have these nuts)

Figure 7-2   Side Panel Nuts – Model 46120

7.4.4 Side Panel Replacement (Left or Right)

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. For either Side Panel, place the Side Panel (left or right side) on the TLS.

4. If you are replacing the right Side Panel, replace the screws removed in Section 7.4.3, step 4.

5. For either Side Panel, replace the screws removed in Section 7.4.3, step 5.

6. If you are replacing the left Side Panel, and any nuts were removed in Section 7.4.3, step 6, replace them now.

7. Replace the Top Panel (Section 7.4.2).

8. Close the cabinet door.

7.5 Carriage Assembly

P/N 500650-01-5

The Carriage Assembly contains the Gripper assembly (for grasping the tape cartridges), the Carriage PCBA, the Cartridge Presence Sensor, the Vertical Axis Home Sensor and the Barcode Reader. (A barcode reader is optional). Because the Carriage Assembly is used to move tape cartridges, it is referred to as the Changer in all of the TLS menus.

A Revision B Carriage Assembly must be installed in order to use Sony Tape Drives. Also, the library must be properly configured to use the Revision B Carriage; i.e., the Carriage item in the `Configuration\Advanced\Changer\Mechanics` menu must be set to B, to match the installed Carriage type.

This section includes FRU information for the entire Carriage Assembly and lubricating instructions for the Insertion (Z) Axis Leadscrew and the Vertical (Y) Axis Leadscrew.

CAUTION

Be very careful not to damage the Vertical Axis Home sensor while removing the Carriage Assembly. There is very little clearance between the sensor (underneath and to the rear of the Carriage Assembly) and the Vertical Axis Home Sensor Probe (Figure 7-3), which is mounted on the floor of the cabinet.

Tools Required:
- Number 2 Phillips Screwdriver
- 7/64-inch Allen (Hex) Wrench
- 1/8-inch Allen (Hex) Wrench
- Torque Wrench
  (Capable of at least 50 in-pounds)

Material Required:
- Loctite 242 Threadlocker
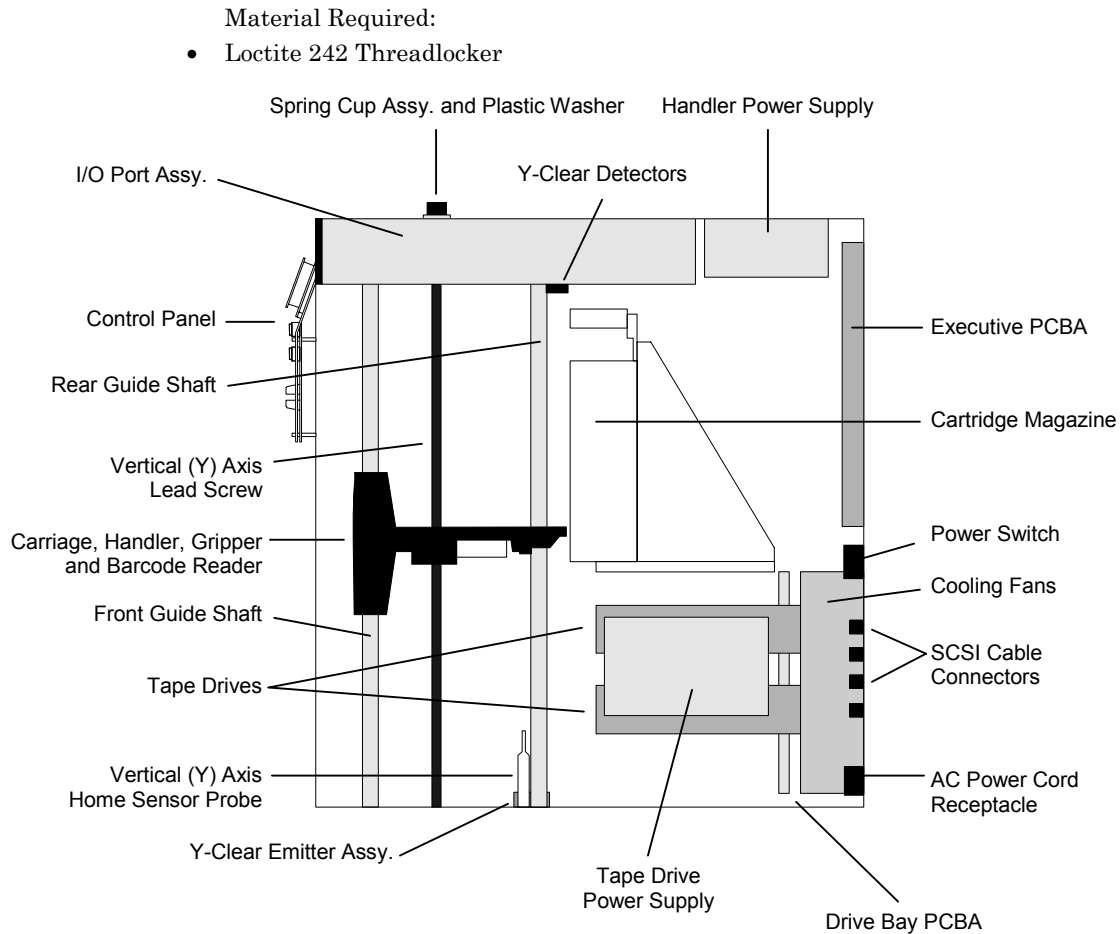
Figure 7-3   TLS-4000 Side View – Fixed-magazine Models

7.5.1 Carriage Assembly Removal

1. Turn off the TLS power and remove the power cord.

2. Remove the Top Panel as described in Section 7.4.1.

3. Use a 7/64-inch Allen wrench to remove both socket-head Carriage Cable Clamp mounting screws (Figure 7-4).

4. Manually raise the Carriage Assembly up sufficiently to expose the ribbon cable connector on the underside.

5. Disconnect the Carriage Assembly's double ribbon cable connector by pushing outwards on both ejectors (located on the ends of the connector). Set the cable to the right side of the cabinet.

6. Lower the carriage to the bottom of the TLS.

7. Use a 1/8-inch Allen Wrench to loosen the upper Leadscrew retaining screw.
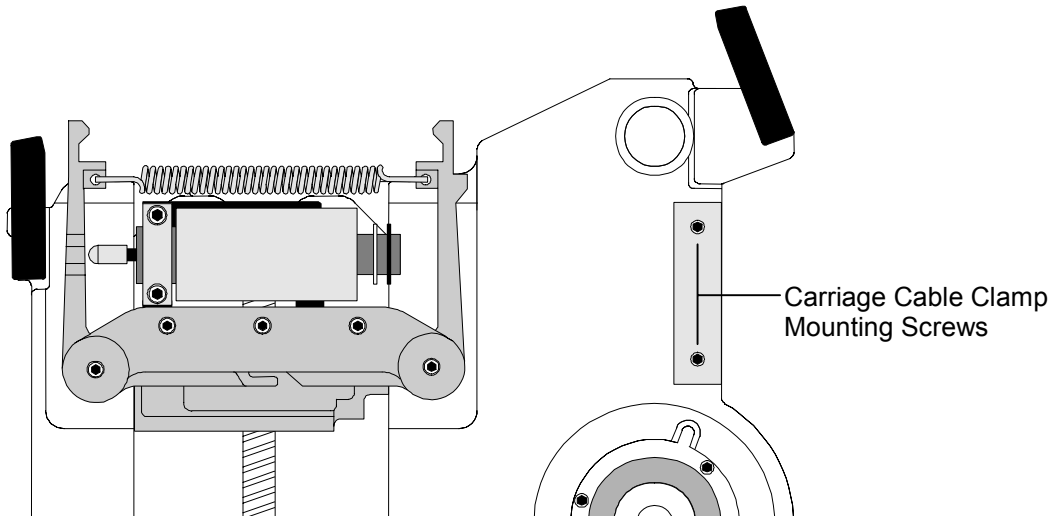
Figure 7-4   The TLS-4000 Carriage Assembly – Top View

8.   Lay the TLS on its left side (as seen from the front) to gain access to the bottom Leadscrew retaining screw (Figure 7-5).
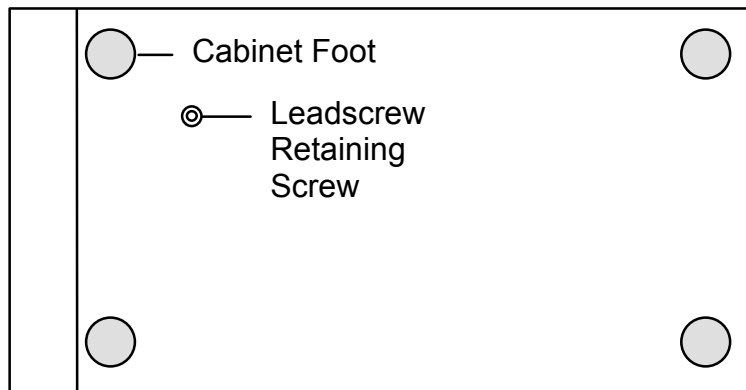
Figure 7-5   The TLS Cabinet – Bottom View

9.   Use a 1/8-inch Allen wrench to remove the Leadscrew retaining screw (Figure 7-5), then stand the TLS upright on its feet.

NOTE

The Teflon® coating on the Leadscrew is easily scratched. Please handle the Leadscrew with care. The Leadscrew and Spring Cup Assembly will be removed as a subassembly (Figure 7-3).

10. Remove the Leadscrew/Spring Cup subassembly through the top plate by gently raising the Carriage Assembly all the way to the top of the Vertical (Y) Axis range of motion.

NOTE

In the next step, a thin metal spacer may come loose from the bottom of the Leadscrew.

11. While holding the Carriage Assembly at the top of its vertical range of motion, rotate the Leadscrew counter-clockwise to disengage it from the Vertical (Y) Axis Leadscrew Motor/Nut (Figure 7-6). This may require holding the (Y) Axis nut to prevent it from rotating. Finally lift the Leadscrew out of the top plate and set it in a safe place. Locate the thin metal spacer and place it in a safe location.

12. Lower the Carriage Assembly back down onto the bottom plate.

13. There are two Guide Shaft Strike Plates mounted on the top plate. Gently move the Switch Bracket ribbon cable out of the way. Remove all four Guide Shaft Strike Plate mounting screws, then remove both Guide Shaft Strike Plates (Figure 7-7).

14. Slowly lift the rear Guide Shaft up and out of the TLS.

CAUTION

Be very careful not to damage the Vertical (Y) Axis Home Sensor on the Vertical Axis Home Sensor Probe (Figure 7-3) when you move the Carriage Assembly.

15. Hold the Carriage Assembly with the left hand. Failure to do so, will cause the Carriage Assembly to tip over after the shaft is removed, possibly damaging the Vertical (Y) Axis Home Sensor. Lift the front Guide Shaft far enough to clear the Carriage Assembly. Gently lift the Carriage Assembly and remove it from the cabinet, then lower the front Guide Shaft down onto the bottom plate.

16. Slowly lift the front Guide Shaft up and out of the TLS. Be sure to put the orange rubber bushing (located at the bottom of the Guide Shaft) in a safe place. It must be reinstalled before the Guide Shaft is reinstalled.

Rear Guide Shaft Bearing

Carriage Cable Clamp

Vertical (Y) Axis
Leadscrew Motor/Nut

Front Guide Shaft Bearing

Insertion Axis Motor
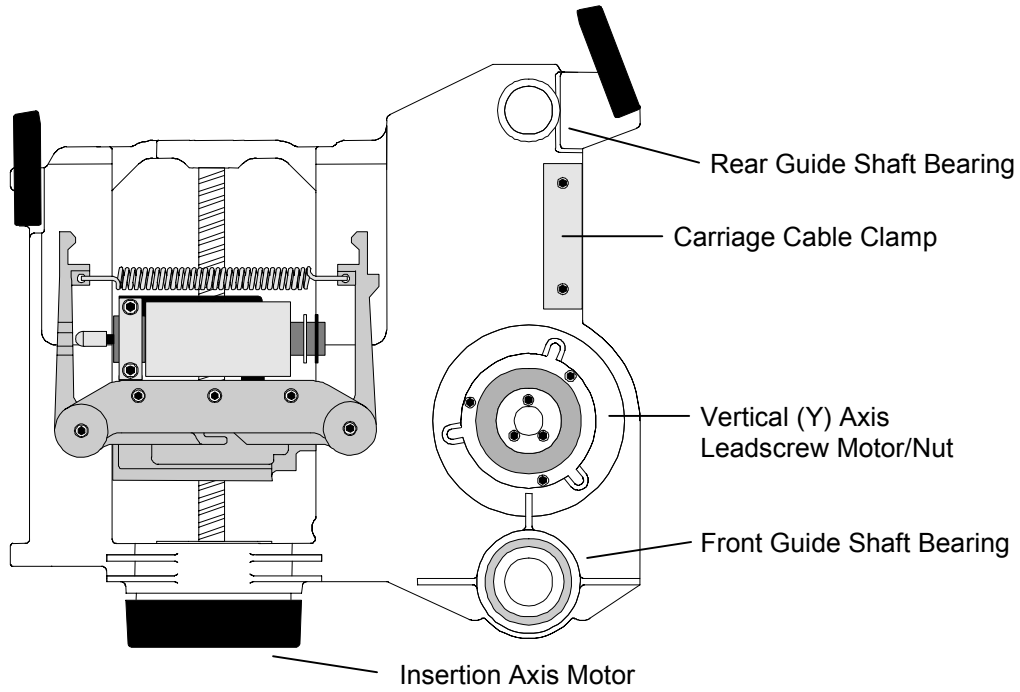
Figure 7-6   The TLS-4000 Carriage Assembly

Spring Cup Assembly
and
Enclosure Washer

Robotics (Handler)
Power Supply

I/O Port Full/Clear
Sensor Cable

Guide Shaft Strike Plate
Mounting Screws (4)

Screen
Mounting
Screws

I/O Port Cable

Switch Bracket
(Front Panel
Cable)

Switch Bracket
(Front Panel)
Cable)

Guide Shaft Strike Plates
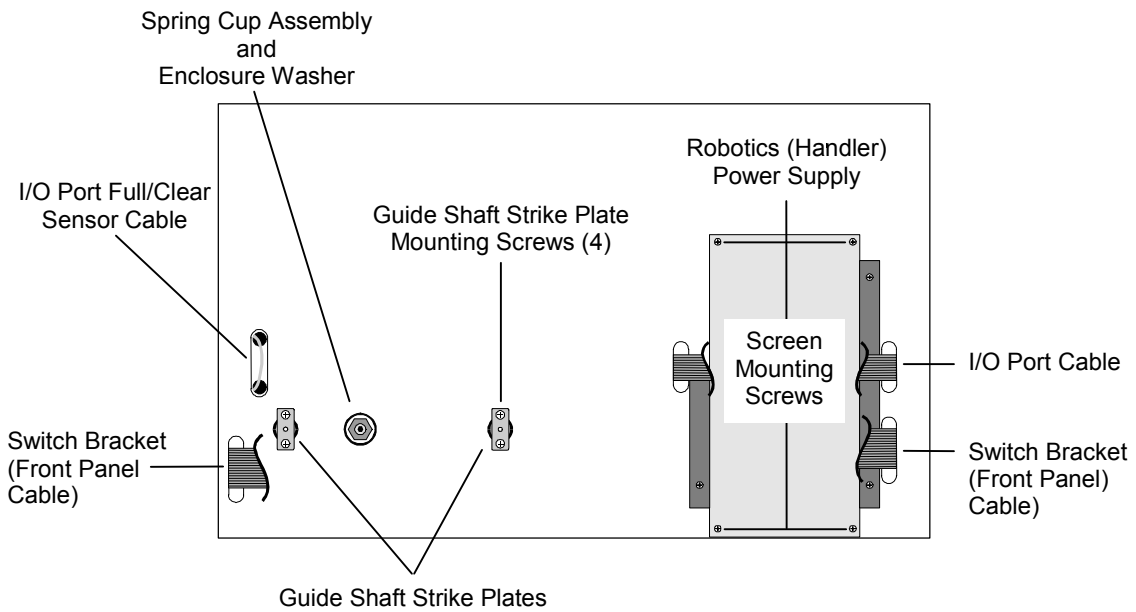
Figure 7-7   The TLS Cabinet – Top View (Top Panel Removed)

7.5.2 Carriage Assembly Replacement

This procedure assumes that the Carriage Assembly was removed in Section 7.5.1.

CAUTION

Recalibrate the TLS after replacing the Carriage Assembly.

Be very careful not to damage the Vertical Axis Home Sensor while installing the Carriage Assembly. There is very little clearance between the sensor (underneath and to the rear of the Carriage Assembly) and the Vertical (Y) Axis Home Sensor Probe, which is mounted on the floor of the cabinet (Figure 7-3).

1. Locate both Guide Shafts. The Guide Shafts are identical. Note that the top end of each Guide Shaft has a white spacer applied to it, while the bottom end of each Guide Shaft is bare metal.

2. Place the orange rubber bushing (removed in Section 7.5.1) over the front Guide Shaft hole in the bottom plate.

3. Insert the bottom end of one Guide Shaft (the end without the white spacer) into the front Guide Shaft hole in the top plate (Figure 7-3), then gently lower the Guide Shaft down through the hole. This is best accomplished by resting the hand holding the shaft on the top plate, and then guiding the shaft from inside the TLS with the other hand.

4. Hold the front Guide Shaft about 10 inches above the bottom plate with the left hand. Insert the Carriage Assembly into the cabinet and slide the Front Guide Shaft Bearing over the Front Guide Shaft. Lower the Front Guide Shaft down through the orange rubber bushing and into the hole in the bottom plate.

NOTE

In the next step a small mirror may be helpful to view the hole in the Carriage PCBA as it approaches the Vertical (Y) Axis Home Sensor Probe.

5. Slowly lower the Carriage Assembly, while using a gentle rocking motion, until the Vertical (Y) Axis Home Sensor Probe (Figure 7-3) fits into the hole in the Carriage PCBA, and the Carriage Assembly rests on the orange rubber bushing on the bottom plate.

6. Insert the bottom end of the other Guide Shaft (the end without the white spacer) into the rear Guide Shaft hole in the top plate, then gently lower the Rear Guide Shaft down through the hole. This is best accomplished by resting the hand holding the shaft on the top plate, and then guiding the shaft from inside the TLS with the other hand.

7. Lower the Rear Guide Shaft down through the Rear Guide Shaft bearing in the Carriage Assembly (Figure 7-3) and into the hole in the bottom plate.

CAUTION

> **To prevent scratching the Leadscrew's delicate Teflon® coating, carefully follow the instructions below.**

8. To install the Leadscrew/Spring Cup subassembly, lift the Carriage Assembly all the way up to the top of the Vertical (Y) Axis range of motion and hold it there.

9. Insert the bottom end of the Leadscrew (Figure 7-8) into its hole in the top plate, then lower the Leadscrew down into the threaded hole in the Vertical (Y) Axis Leadscrew Motor/Nut (Figure 7-6).

Thin metal spacer on end of Leadscrew.

Lower this end into the cabinet.
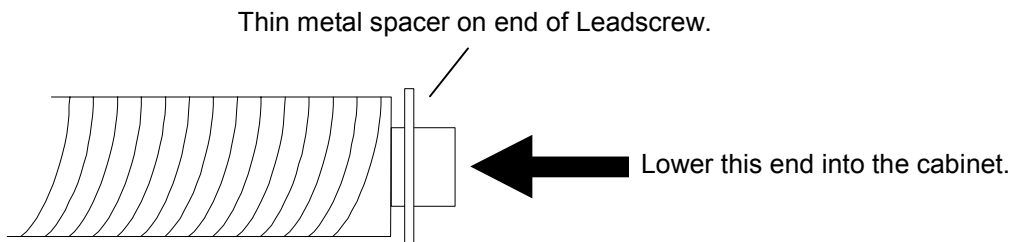
Figure 7-8   The Carriage Assembly Leadscrew

10. Make sure that the thin metal spacer is positioned on the end of the Leadscrew. See Figure 7-8.

11. Lower the Carriage Assembly back down onto the bottom plate.

12. Manually rotate the Leadscrew clockwise (as seen from the top of the TLS) until you feel resistance to further rotation. This resistance indicates that the Leadscrew is fully inserted into the hole in the bottom plate.

13. Lay the TLS on its left side (as seen from the front) to gain access to the bottom Leadscrew retaining screw.

14. Apply one drop of Loctite 242 to the threads on the Leadscrew Retaining Screw (a 10-32 x 3/8-inch Button Head Socket Cap screw), then insert the screw through the bottom plate and into the threaded end of the Leadscrew. Firmly tighten the screw with a 1/8-inch Allen wrench.

NOTE

> *If you do not apply Loctite 242 to the leadscrew retaining screw before reinstalling it, the leadscrew will vibrate loose during operation.*
>
> *Though the Leadscrew may rotate slightly while you tighten the retaining screw. It should become firmly locked to the bottom plate when the retaining screw is fully tightened.*

15. Stand the TLS upright on its feet.

16. Place a Guide Shaft strike plate over each of the two Guide Shaft holes on the top plate (Figure 7-7).

17. Gently move the Switch Bracket ribbon cable out of the way, then insert all four Guide Shaft Strike Plate mounting screws (6-32 x 3/8 pan head screws with integral lock washers) into the Guide Shaft Strike Plate mounting holes (Figure 7-7). Use a number 2 Phillips screwdriver to firmly tighten the screws.

If the Spring Cup __was not__ removed from the Leadscrew during disassembly, go to step 24. If the Spring Cup __was__ removed from the Leadscrew during disassembly, go to step 17.

Refer to Figure 7-9 for the remaining steps of this procedure.

18. Place the Polyurethane Enclosure Spacer over the Leadscrew mounting hole in the top plate.

19. If the Belleville spring washer stack __is__ still inside the Spring Cup, go to step 18. If the spring washer stack __is not__ inside the Spring Cup, use 12 Belleville spring washers to assemble the spring washer stack as follows:

a) Remove all of the spring washers from the Spring Cup.

b) First, place two Belleville spring washers into the Spring Cup with their **concave** sides facing up. Then, place two more Belleville spring washers into the cup with their **convex** sides facing up.

c) Repeat step **b)** two more times, until the spring washer stack looks like the one shown in Figure 7-9.

Belleville Spring Washer Stack
– 3 sets of 4 washers each.
– Each washer set has two washers facing up, and two washers facing down.

Spring Cup

Polyurethane Enclosure Spacer

Upper Leadscrew Retaining Screw
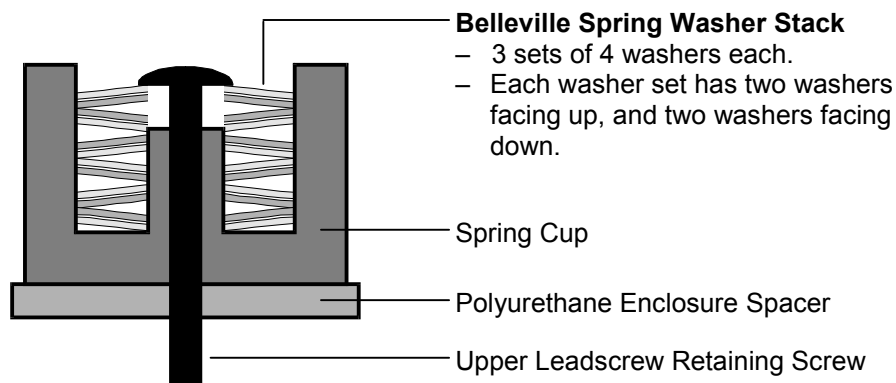
Figure 7-9   The Spring Cup Assembly and Enclosure Spacer

20. Place the Spring Cup (with 12 Belleville washers) over the Enclosure Spacer. Insert the Upper Leadscrew Retaining Screw (a 10-32 x 5/8-inch Button Head Socket Cap screw) into the threaded end of the Leadscrew.

NOTE

If the Spring Cup was removed from the top of the Leadscrew during dismantling:

When you reinstall the Spring Cup, you will need to press down on the upper Leadscrew retaining screw at first, to compress the Belleville spring washers enough to engage the threads in the top of the Leadscrew.

21. Use a 1/8-inch Allen wrench to install the upper Leadscrew retaining screw.

22. Use a 1/8-inch Allen wrench to back the upper Leadscrew retaining screw out until the top Belleville washer is flush with the top of the Spring Cup.

23. Retighten the upper Leadscrew retaining screw using a torque wrench set to 40 in-lbs. At this point, the top Belleville spring washer should be about a 1/16-inch below the top of the Spring Cup.

24. Finally, loosen the upper Leadscrew retaining screw exactly one complete turn (360°). No Carriage Assembly adjustments are necessary.

25. Manually raise the Carriage Assembly up far enough to expose the ribbon cable connector on the underside. Verify that the ejectors on the connector are in the open position.

26. Connect the Carriage Assembly's double ribbon cable connector by pressing inwards until both ejectors (located on the ends of the connector) lock over the mating connector on the cable.

27. Insert the Carriage Cable Clamp into the mating recess on the Carriage casting (Figure 7-4).

28. Insert both Carriage Cable Clamp mounting screws (6-32 x 1/4-inch Socket Head Cap screws) into the mounting holes in the Carriage Cable Clamp (Figure 7-4), then firmly tighten the screws with a 7/64-inch Allen wrench.

29. Continue with Section 7.5.3 to lubricate the Leadscrew and recalibrate the unit.

7.5.3 Lubricating the Vertical (Y) Axis Leadscrew

The Vertical (Y) Axis Leadscrew requires relubrication every two years, or after approximately 200,000 Y-Axis moves (whichever comes first), or whenever the Carriage Assembly (P/N 500650-01-5) is changed. The number of Y-Axis moves is displayed in the Maintenance\Display Stats. status screen (see Section 4.6).

IMPORTANT:
Use only Qualstar Leadscrew Lubricant, part number **732-0003-2**, for this procedure.

NOTE

The white lubricant used for this procedure is non-toxic (it is used in food processing equip-
ment), but it is still wise to use a latex glove on the hand that applies the lubricant. If the lubri-
cant contacts your skin, wash with soap and water.

1.   **a)** For short Vertical (Y) Axis Leadscrews, use a single, 0.25-inch cube of Qual-
     star Leadscrew Lubricant.

     b) For tall Vertical (Y) Axis Leadscrews, use a single, 0.3-inch cube of Qualstar
     Leadscrew Lubricant.

     Apply the lubricant to the tip of your index finger, then rub your thumb and in-
     dex finger together to spread the lubricant evenly on your fingertips.

2.   Run your thumb and index finger over the length of the Leadscrew several
     times, at different angles, to apply the grease to as much of the Leadscrew's sur-
     face as possible. Each thread should receive a small amount of grease.

3.   Remove the latex glove. If you did not use a latex glove, wash you hands with
     soap and water.

4.   Lift the Carriage Assembly 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.

5.   If the Carriage Assembly has been removed or replaced, recalibrate the unit
     (Section 5.3.2).

7.6 Carriage PCBA

P/N 500627-01-3

Tools Required:

• Number 1 Phillips Screwdriver

The Carriage Assembly must be removed before replacing the Carriage PCBA.

Hole for Vertical (Y) Axis
Home Sensor Probe

PCBA Mounting Screws (4)

CRTEMT

Cable Clamps (2)

CRTDET
Cable

CRTDET

GRIPA

GRIPB

Carriage PCBA

CARAGE

MOTORY

Barcode Reader
Mounting Plate

Barcode Reader

Barcode Reader
Mounting Plate
Screws (4)

BCR   MOTORZ
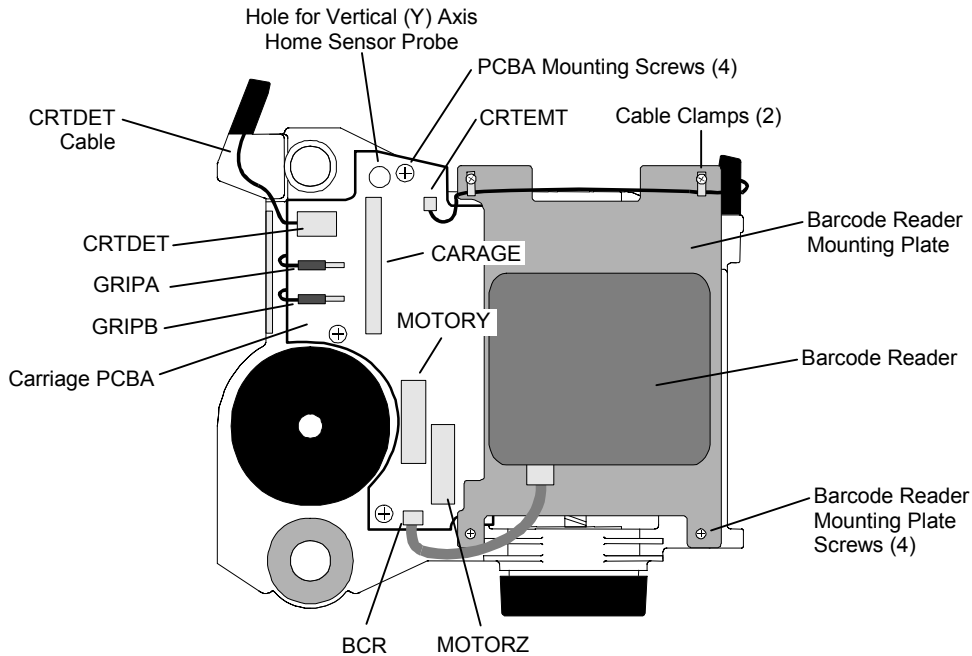
Figure 7-10   Carriage PCBA (Handler Bottom View)

7.6.1 Carriage PCBA Removal

Refer to Figure 7-10.

1.   Remove the Carriage Assembly (see Section 7.5.1 for details).

2.   If the Carriage Assembly is equipped with a Barcode Reader, unplug the cable at the BCR connector on the Carriage PCBA.

3.   Remove all four Barcode Reader mounting plate screws using a number 1 Phillips screwdriver.

4.   Unplug the cable at the CRTEMT connector on the Carriage PCBA and move the cable aside.

5.   Remove the Barcode Reader Mounting Plate. (It is not necessary to remove the Barcode Reader before removing the Barcode Reader Mounting Plate.)

6.   Unplug the motor cables from the MOTORY and MOTORZ connectors.

7.   Unplug the cable from the CRTDET connector.

8. Unplug the two gripper solenoid wires from the GRIPA and GRIPB terminals.

9. Use a number 1 Phillips Screwdriver to remove all four PCBA mounting screws.

7.6.2 Carriage PCBA Replacement

Refer to Figure 7-10.

This procedure assumes the Carriage PCBA was removed in Section 7.6.1.

CAUTION

After replacing the Carriage Assembly PCBA, the TLS must be recalibrated after the Carriage Assembly is reinstalled.

1. Align all four mounting screw holes in the new Carriage PCBA with the mounting screw holes in the Carriage Assembly, then install all four PCBA mounting screws. Securely tighten the mounting screws with a number 1 Phillips Screwdriver.

2. Plug the two-wire CRTDET cable into the CRTDET connector. Note that the connector is keyed.

3. Plug the two gripper solenoid wires onto the GRIPA and GRIPB terminals. Either wire can be connected to either terminal.

4. Plug the Y-Axis motor cable into the MOTORY connector. (The Y motor is immediately adjacent to the MOTORY connector.) Note that the connector is polarized.

5. Plug the Z-Axis motor cable into the MOTORZ connector. The Z-Axis motor moves the gripper mechanism. Note that the connector is polarized.

6. Align all four mounting screw holes in the Barcode Reader Mounting Plate with the mounting screw holes in the Carriage Assembly.

7. Route the two-wire CRTEMT cable over the Barcode Reader Mounting Plate as shown, then place one metal cable clamp over each of the top two Barcode Reader Mounting Plate mounting screw holes and the CRTEMT cable.

8. Align the metal cable clamps with the two top Barcode Reader Mounting Plate mounting screw holes, then install all four Barcode Reader Mounting Plate mounting screws. Use a number 1 Phillips screwdriver to securely tighten the mounting screws.

9. If the carriage is equipped with a Barcode Reader, plug the BCR cable into the BCR connector on the Carriage PCBA.

10. Plug the CRTEMT cable into the CRTEMT connector on the Carriage PCBA.

11. Replace the `Carriage Assembly`, then recalibrate the TLS (See Section 7.5.2 for details.)

7.7 Barcode Reader

P/N 500983-01-0

A barcode reader is optional on some TLS units and standard on others (Figure 2-2). The instructions in this section assume that a barcode reader exists in the unit, and that it will be removed and then replaced.

If you are installing a new barcode reader for the first time, or permanently removing the currently-installed barcode reader, follow the instructions in Chapter 8.

There are two types of TLS barcode readers in use: Welch Allyn models 3600 and 3700. Either unit mounts onto the Barcode Reader Mounting Plate, located on the Carriage Assembly, using the same mounting screws, mounting screw holes, and identical cables. However, the 3700 model includes a special bracket (already mounted onto the Barcode Reader), which makes it interchangeable with the larger 3600 model.

If a model 3600 Barcode Reader is replaced by a model 3700 (or vice versa) during this replacement procedure, the TLS *must* be reconfigured to reflect the change in hardware. Use the `Configuration\Advanced\Changer\Mechanics` menu's BCR value to reconfigure the TLS for the proper Barcode Reader model number.

NOTE

The installation of a Welch Allyn model 3700 Barcode Reader requires that the TLS firmware be at Revision 1.09 or higher. Enter the Maintenance\Display Revision menu to view the Revision value; it must be 1.09 or higher. If the Revision value is 1.08 or lower, you must first upgrade the TLS firmware. This can be accomplished via a variety of procedures as described in this manual or Product Information Note #012.

Tools Required:
- Number 2 Phillips Screwdriver
- 9/64-inch Allen (Hex) Wrench
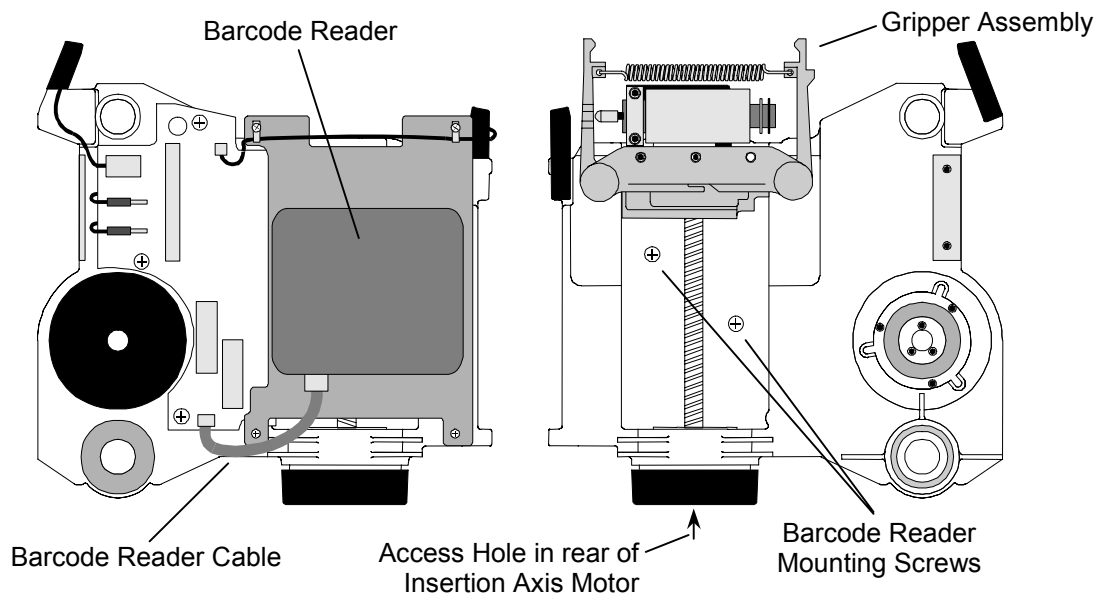
Figure 7-11   Barcode Reader (TLS-180/360 Model Shown)

Refer to Figure 7-11.

7.7.1 Barcode Reader Removal

NOTE

It is not necessary to remove the Carriage Assembly from the TLS before removing the Barcode Reader.

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. It may be necessary to manually lower or raise the Carriage Assembly, so that it is approximately in the middle of its vertical range of motion. Grasp the Carriage Assembly and gently lift it up, or push it down.

4. Unplug the Barcode Reader cable from the back of the Barcode Reader.

5. Insert a 9/64-inch Allen wrench into the Access Hole in the rear of the Insertion Axis Motor.

6. Gently turn the Allen wrench counter-clockwise to move the Gripper forward, until both Barcode Reader mounting screws are accessible, then remove the wrench.

7. Place your hand under the Barcode Reader. Use a number 2 Phillips screwdriver to remove both Barcode Reader mounting screws (6x32 by 1/4-inch Flathead

screws) from the top side of the Carriage Assembly, then remove the Barcode Reader from the TLS.

7.7.2 Barcode Reader Replacement

This procedure assumes that the barcode reader was removed in Section 7.7.1.

1. Position the Barcode Reader under the Carriage Assembly, with the mounting screw holes in the Barcode Reader facing up, and the BCR cable's plug facing the cabinet door.

2. Align the mounting screw holes in the Barcode Reader with the mounting screw holes in the Carriage Assembly.

3. Install both BCR mounting screws (6-32 x 1/4-inch Flathead screws) from the top side of the Carriage Assembly. Use a number 2 Phillips screwdriver to securely tighten both BCR mounting screws.

4. Insert a 9/64-inch Allen wrench into the Access Hole in the rear of the Insertion Axis Motor again.

5. Gently turn the Allen wrench clockwise, until the Gripper is completely re-tracted (towards the cabinet door), then remove the wrench.

6. Connect the Barcode Reader cable to the jack in the back of the Barcode Reader.

7. Close the cabinet door.

7.7.3 Reconfiguring the TLS for a Different Model Barcode Reader

If the type of barcode reader used in the TLS (model 3600 or 3700) has changed during the replacement procedure (Section 7.7.2), the TLS *must* be reconfigured to accept the new barcode reader.

NOTE

The installation of a Welch Allyn model 3700 Barcode Reader requires that the TLS firmware be at Revision 1.09 or higher. Enter the Maintenance\Display Revision menu to view the Revision value; it must be 1.09 or higher. If the Revision value is 1.08 or lower, you must first upgrade the TLS firmware. This can be accomplished via the SCSI interface, or by replacing the Flash-PROM as described in this manual or Product Information Note #012.

1. Follow the instructions in Section 5.3.1 to enter `Update` as the password in the Private menu.

2. Follow the instructions in the TLS-4000 Installation and Operation manual (Qualstar document number 501370), to edit the `BCR` value in the `Configuration\Advanced\Changer\Mechanics` menu, to reflect the correct model number for the currently-installed barcode reader.

3. Follow the instructions in Section 5.3.3 to clear the `Update` password, to prevent unauthorized access to the Private menu.

4. Follow the instructions in the `Configuration\Advanced\Changer` menu section in the TLS-4000 Installation and Operation manual (Qualstar dcument number 501370) edit the LabelCheckChar value in the `Configuration\Advanced\Changer`.

7.8 Air Filter and Fan Assembly

Air Filter P/N 500584-01-6
42xx Fan Assembly P/N 500700-01-8
44xx and 46xxx Fan Assembly P/N 500700-01-8

Some Fan Assembly housings are made of aluminum sheet metal, while new assemblies are made with a molded plastic housing. Both housing styles are completely interchangeable.

Tools Required:
- Flat-blade Screwdriver
- Number 2 Phillips Screwdriver
- Diagonal Wire Cutters

Material Required:
- 3-inch x 3/32-inch Cable Ties

7.8.1 Air Filter Removal/Replacement

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.
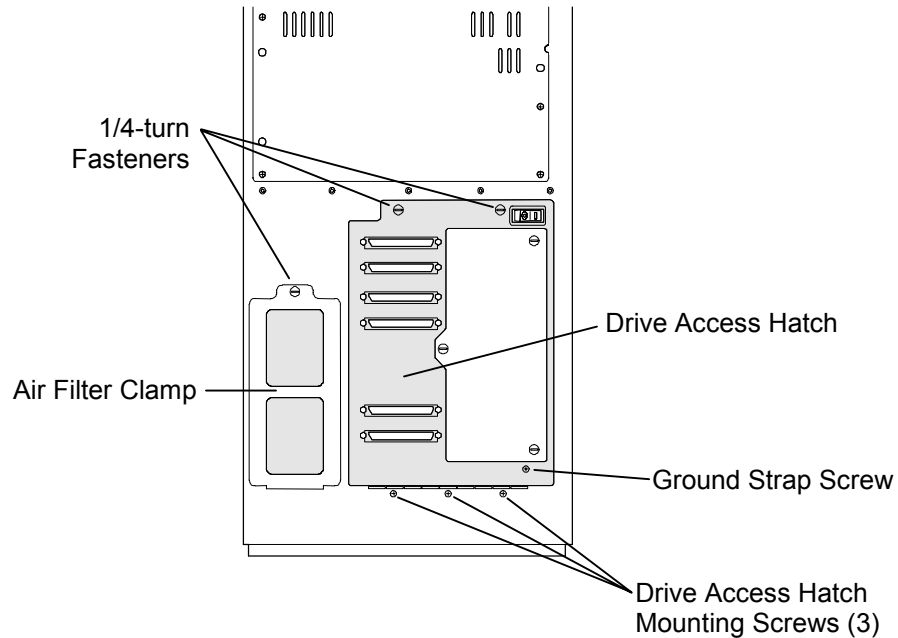
Figure 7-12   TLS Rear View

1. Use a flat-blade screwdriver to turn the single 1/4-turn fastener at the top of the Air Filter Clamp counter-clockwise (Figure 7-12).

2. Open the Air Filter Clamp and lift it off of the TLS.

3. Remove the Air Filter.

   a) If you only want to replace the Air Filter at this time, replace the old Air Filter with a new one (Figure 7-13), then reinstall the Air Filter Clamp.

   IMPORTANT
   Never try to clean and reuse an old Air Filter. When you install a new Air Filter, or reinstall one that is not yet dirty enough to be replaced, be sure to install it with the arrows on the edge of the filter's frame pointing ***into*** the cabinet, as shown in Figure 7-13.

   b) If you want to remove the Fan Assembly, leave the Air Filter and Air Filter Clamp off of the TLS and continue on to Section 7.8.2.
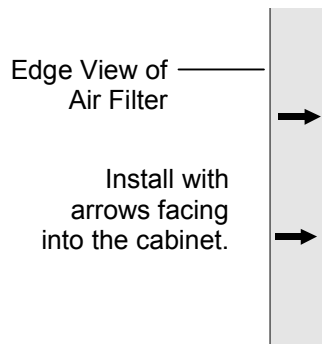
Figure 7-13   Air Filter - Edge View

7.8.2 Fan Assembly Removal 42xx Models

Refer to Figure 7-12.

1. Remove the Top Panel (Section 7.4.1), then remove the right Side Panel (Section 7.4.3). The openings in the right side of the TLS' frame give access to the nuts on the back of the Fan Assembly's mounting screws.

2. Remove the Tape Drive Power Supply (Section 7.13).

3. Use a flat-blade screwdriver to turn both 1/4-turn fasteners at the top of the Drive Access Hatch counter-clockwise and open the hatch.

NOTE

In the next step, the nuts on the back of the screws come loose when the screws are removed.

4. Remove the ground strap screw (Figure 7-12 and Figure 7-14), and the flat head mounting screws at the bottom of the Drive Access Hatch, then lift the Drive Access Hatch off of the TLS (Figure 7-15).
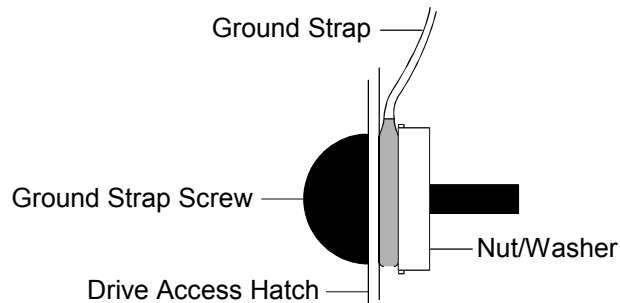
Figure 7-14   Ground Strap Screw

5. Disconnect the SCSI Cable(s) from the Drive Access Hatch.

6. Lift the Line Plug Cover out of the TLS.

7. Use a number 2 Phillips screwdriver to remove all six Rear Service Panel mounting screws, then remove the Rear Service Panel (Figure 7-25).

8. Carefully cut the Cable Tie on the Executive PCBA that is attached to the Fan Assembly's power cables. See (Figure 7-16).

9. Unplug the Fan Assembly's power cable from the Executive PCBA at the 12V Fans connector (Figure 7-16).
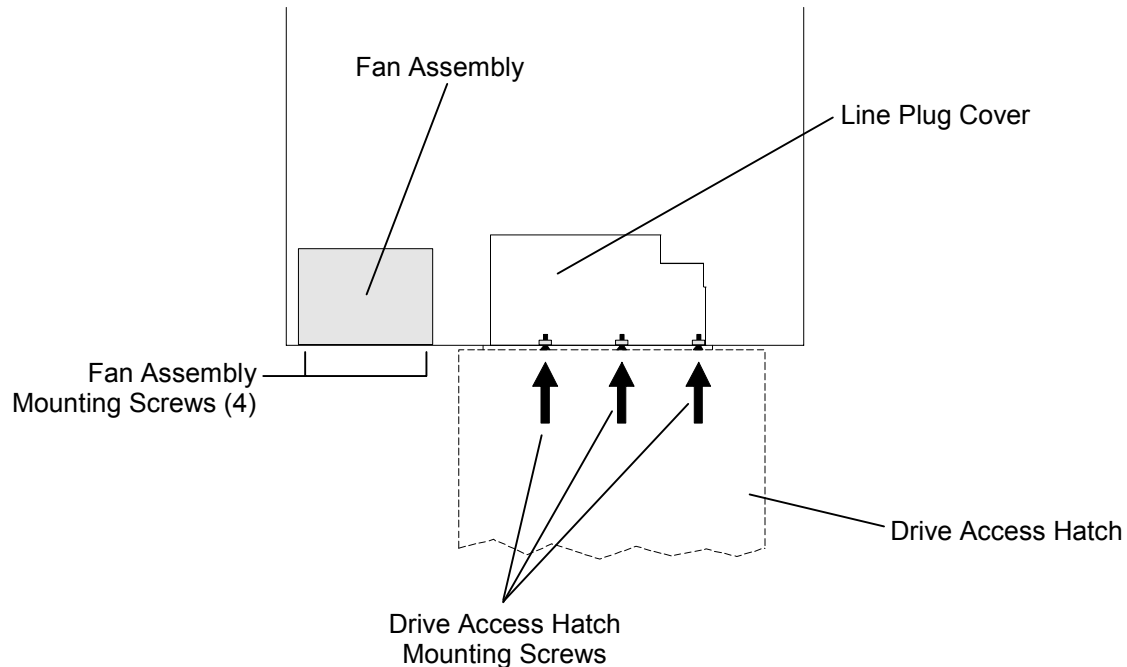
Figure 7-15   Rear view of a TLS as seen from the Top

10. Unplug the SCSI Cable from the Executive PCBA (Figure 7-16), disconnect it from the tape drives, then remove it from the TLS.

11. If the TLS has a Serial Port Connector, remove the Serial Port Connector's mounting screws (Figure 7-28), then lower the connector out of the TLS through the Drive Access Hatch opening.

NOTE

Some styles of Fan Assembly housings have nuts attached to the mounting screws and some allow the mounting screws to thread directly into the housing. In the next step, those housings that use nuts will have the nuts come loose when the screws are removed. Use the holes in the left side of the TLS' frame to reach the nuts on the back/left side of the Fan Assembly.

12. Remove all four Fan Assembly mounting screws (See Figure 7-15).

13. Move the bottom of the Fan Assembly toward the Drive Access Hatch opening and rotate the Fan Assembly about 90° counter-clockwise (Figure 7-16).
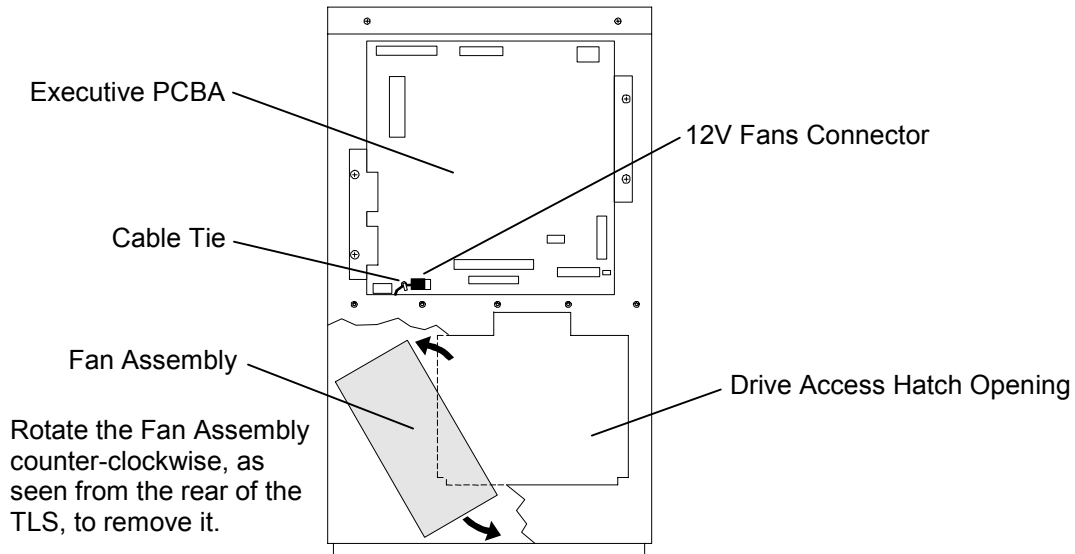
Figure 7-16   Removing the Fan Assembly from a 42xx Library

14. Lift the Fan Assembly out of the TLS through the Drive Access Hatch opening.

7.8.3 Fan Assembly Replacement 42xx Models

1. Insert the Fan Assembly into the TLS through the Drive Access Hatch and rotate it about 90o counter-clockwise (Figure 7-16).

2. Move the Fan Assembly into position in the left side of the cabinet, while rotating it upright (clockwise).

CAUTION

Be sure to observe the position of the power cable, coming from the Tape Drive Power Supply on the left side of the TLS that runs under the Fan Assembly. Do not pinch this cable when installing the Fan Assembly.

3. Align the Fan Assembly's mounting screw holes with the mounting screw holes in the TLS, then reinstall all four Fan Assembly mounting screws (Figure 7-15).

4. Reconnect the Fan Assembly's power connector to the Executive PCBA (Figure 7-16).

5. Replace the cable tie that was removed earlier, which held the power connector to the Executive PCBA See Figure 7-16.

6. If a Serial Port Connector was removed in Section 7.8.2, reinstall it with the wider part of the connector facing the bottom of the cabinet (Figure 7-28).

7. Reconnect the SCSI Cable to the Executive PCBA, then reconnect it to the tape drives (Figure 7-28).

8. Insert the line plug cover through the Drive Access Hatch, with the mounting screw holes in the flange facing the Drive Access Hatch (Figure 7-17).

Drive Access Hatch

Line Plug Cover

Drive Access Hatch
Mounting Screws
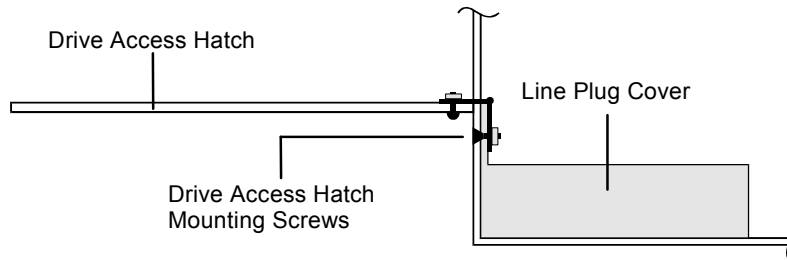
Figure 7-17   The Drive Access Hatch – Side View

9. Reinstall the Drive Access Hatch. Be sure that the hinge on the bottom of the Drive Access Hatch goes inside the TLS, behind the line plug cover's flange (Figure 7-17).

10. Reinstall all three flat head Drive Access Hatch mounting screws, through the line plug cover's flange and the Drive Access Hatch's hinge (Figure 7-17).

11. Adjust the position of the Drive Access Hatch as follows:

   a) Tighten the mounting screws until snug, then unscrew them about one turn, leaving the Drive Access Hatch slightly loose.

   b) Close the Drive Access Hatch, fasten the 1/4-turn fasteners, then retighten the mounting screws until they are snug.

   c) Try opening and closing the Drive Access Hatch. If necessary, repeat steps a) and b) until the Drive Access Hatch opens and closes freely.

12. Reinstall the ground strap screw, the ground strap, and the ground strap screw's nut/washer in the Drive Access Hatch (Figure 7-12 and Figure 7-14).

13. Reattach the SCSI cable to the Drive Access Hatch.

14. Close the Drive Access Hatch, then use a flat-blade screwdriver to turn both 1/4-turn fasteners at the top of the hatch clockwise (Figure 7-12).

15. Reinstall the Rear Service Panel, then use a number 2 Phillips screwdriver to re-install all six Rear Service Panel mounting screws (Figure 7-25).

16. Reinstall the Air Filter (or install a new one), with the arrows on the edge of the filter's frame pointing *into* the cabinet, then reinstall the Air Filter Clamp (Figure 7-12 and Figure 7-13).

17. Reinstall the Tape Drive Power Supply (Section 7.13.2).

18. Reinstall the right Side Panel (Section 7.4.4), then reinstall the Top Panel (Section 7.4.2).

7.8.4 Fan Assembly Removal 44xx and 46xxx Models

1. Remove the Top Panel (Section 7.4.1), then remove the right Side Panel (Section 7.4.3). The openings in the right side of the TLS' frame give access to the nuts on the back of the Fan Assembly's mounting screws.

2. Use a flat-blade screwdriver to turn both 1/4-turn fasteners at the top of the Drive Access Hatch counter-clockwise and open the hatch.

3. Use a number 2 Phillips screwdriver to remove all six Rear Service Panel mounting screws, then remove the Rear Service Panel (Figure 7-25).

4. Carefully cut the Cable Tie on the Executive PCBA that is attached to the Fan Assembly's power cables. See Figure 7-18.

5. Unplug the Fan Assembly's power cable from the Executive PCBA at the 12V Fans connector (Figure 7-18).

NOTE

Some styles of Fan Assembly housings have nuts attached to the mounting screws and some allow the mounting screws to thread directly into the housing. In the next step, those housings that use nuts will have the nuts come loose when the screws are removed. Use the holes in the left side of the TLS' frame to reach the nuts on the back/left side of the Fan Assembly.

6. Remove all four Fan Assembly mounting screws See Figure 7-15.

7. Move the Fan Assembly toward the Drive Access Hatch opening and then lift the Fan Assembly out of the TLS through the Drive Access Hatch opening. See Figure 7-18.
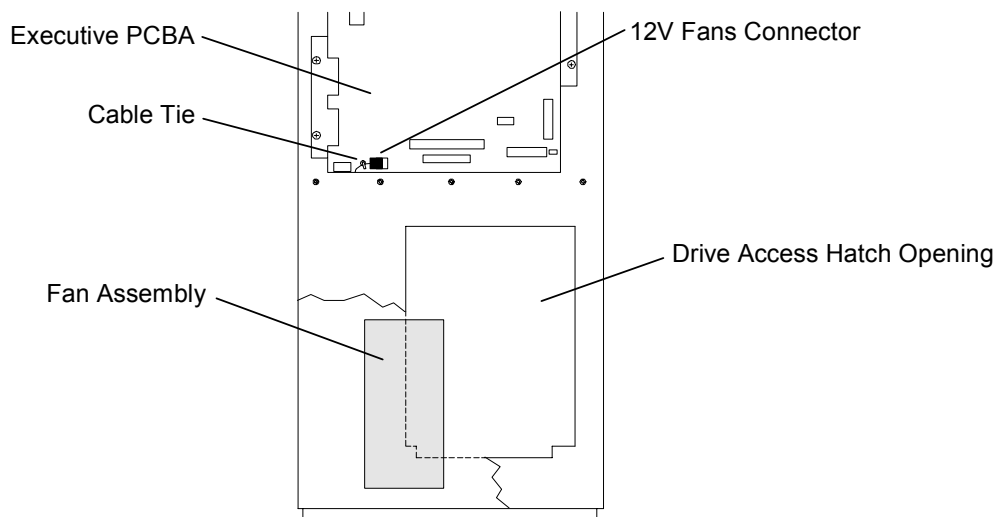
Figure 7-18   Removing the Fan Assembly from a 44xx or 46xxx Library

7.8.5 Fan Assembly Replacement 44xx and 46xxx Models

1. Insert the Fan Assembly into the TLS through the Drive Access Hatch and move the Fan Assembly into position in the left side of the cabinet (Figure 7-18).

2. Align the Fan Assembly's mounting screw holes with the mounting screw holes in the TLS, then reinstall all four Fan Assembly mounting screws (Figure 7-15).

3. Reconnect the Fan Assembly's power connector to the Executive PCBA (Figure 7-18).

4. Replace the cable tie that was removed earlier, which held the power connector to the Executive PCBA. See Figure 7-18.

5. Close the Drive Access Hatch, then use a flat-blade screwdriver to turn both 1/4-turn fasteners at the top of the hatch clockwise (Figure 7-12).

6. Reinstall the Rear Service Panel, then use a number 2 Phillips screwdriver to re-install all six Rear Service Panel mounting screws (Figure 7-25).

7. Reinstall the Air Filter (or install a new one), with the arrows on the edge of the filter's frame pointing *into* the cabinet, then reinstall the Air Filter Clamp (Figure 7-12 and Figure 7-13).

8. Reinstall the right Side Panel (Section 7.4.4), then reinstall the Top Panel (Section 7.4.2).

7.9 I/O Port Assembly

P/N 500750-01-3

Tools Required:
- Number 2 Phillips Screwdriver
- 5/16-inch Open-end Wrench
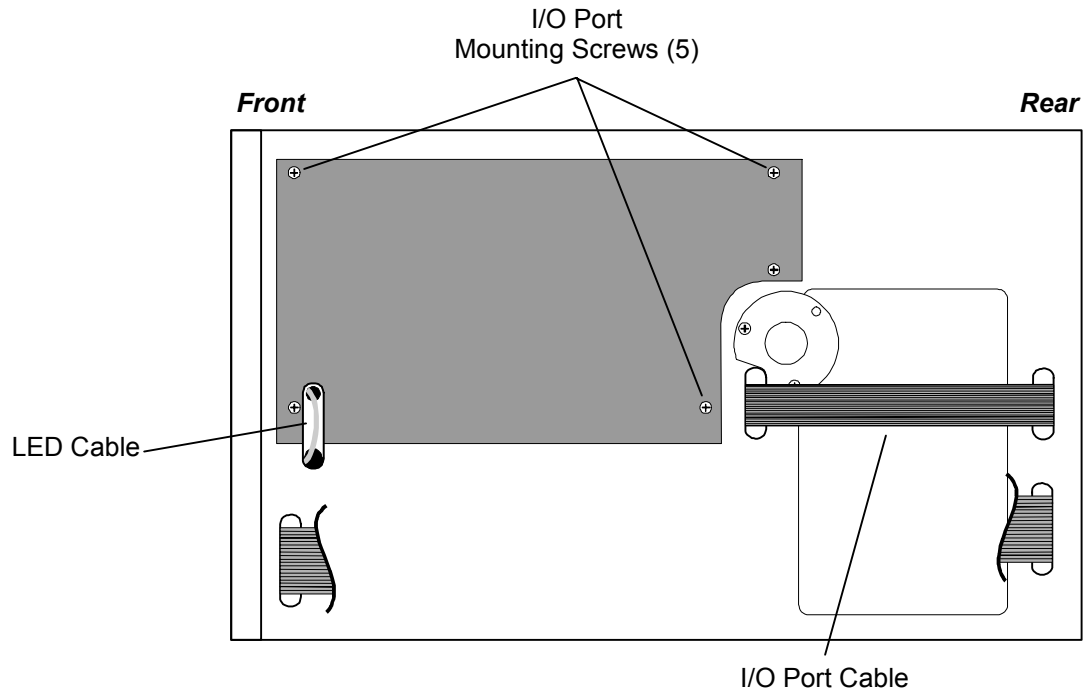
Figure 7-19   Top View of Library

7.9.1 I/O Port Assembly Removal

1.   Turn off the TLS power and remove the power cord.

2.   Open the cabinet door.

3.   Remove the Top Panel (Section 7.4.1).

NOTE

If you remove a Side Panel (Section 7.4.3), the holes in the side of the TLS' frame give easy access to the I/O port cable's plug.

4.   Gently turn the I/O port leadscrew by hand to move the I/O port slot forward (towards the cabinet door) to gain access to the I/OPORT ribbon cable connector. Do not extend the I/O port slot all the way forward.

5.   Unplug the I/O port ribbon cable from the I/O port PCBA (Figure 7-21).

6. Gently pull on the Call switch button to remove it (Figure 7-20).

7. Support the I/O port assembly with one hand, then remove all five I/O port mounting screws (Figure 7-19).

8. Gently move the I/O port assembly about one inch toward the rear of the TLS, until the Call switch clears the TLS' frame, then lower the I/O port assembly and remove it through the front of the TLS.

7.9.2 I/O Port Assembly Replacement

CAUTION

The unit must be recalibrated after the I/O port assembly replaced in the TLS.

NOTE

If desired, remove a Side Panel (Section 7.4.3), to gain easy access to the I/O port assembly Cable Assembly's plug through the holes in the side of the TLS' frame.

1. Turn off the TLS power and remove the power cord.

2. Before installing an I/O port assembly, look at the front of the assembly to determine if the Call switch is in the proper position for the library model. The Call switch should be in the inner position for 42xx models and located in the outer position for model 44xx and 46xxx libraries. See Figure 7-20. If needed, use of a 5/16-inch wrench to move the Call switch to the proper position.
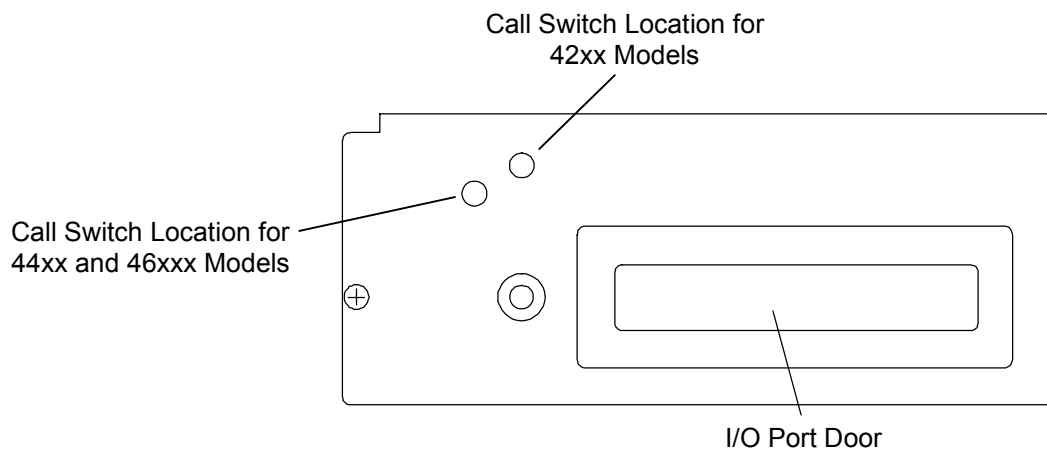
Figure 7-20 Call Switch Mounting Positions

3. Gently turn the I/O port leadscrew by hand to position the I/O port slot in the middle of the I/O port assembly, so that it will clear the Magazine when the assembly is installed in the library (Figure 2-8).

4. Gently pull on the Call switch button to remove it (Figure 2-8).

5. Insert the I/O port assembly through the open cabinet door. Be careful not to damage the Call switch while inserting it through the hole in the TLS' frame.

6. Make sure that the LEDs cable is positioned in the center of the cutout in the TLS' frame (Figure 7-19).

7. Support the I/O port assembly with one hand and install all five mounting screws (Figure 7-19).

8. Plug the I/O port ribbon cable into the I/OPORT connector on the PCBA (Figure 7-21).

9. Gently press the Call switch button back onto the Call switch.

10. If you removed a Side Panel, reinstall it (Section 7.4.4).

11. Recalibrate the TLS. (See Section 5.3.2 for details.)

7.10 I/O Port PCBA

P/N 500607-01-5

CAUTION

After the I/O port PCBA is replaced in the I/O port assembly, the unit must be re-calibrated after the I/O port assembly is replaced in the TLS.

The I/O port assembly must be removed from the TLS before the I/O port PCBA can be replaced.

Tools Required:
• Number 2 Phillips Screwdriver

7.10.1 I/O Port PCBA Removal

1. Remove the I/O port assembly from the TLS (Section 7.9.1).

Labels in figure:
- I/O Port Axis Motor
- I/O Port Lead Screw
- I/O Port Slot
- KCALL Connector
- I/O Port Door
- MOTOR Connector
- I/O Port Cable Plug
- I/O Full: I/O Clear Sensor Emitter PCBA
- 5 PCBA Mounting Screws
- I/O Port PCBA
- **Note:** The LED's Cable Plug is located underneath the I/O Port PCBA
- *Bottom View*
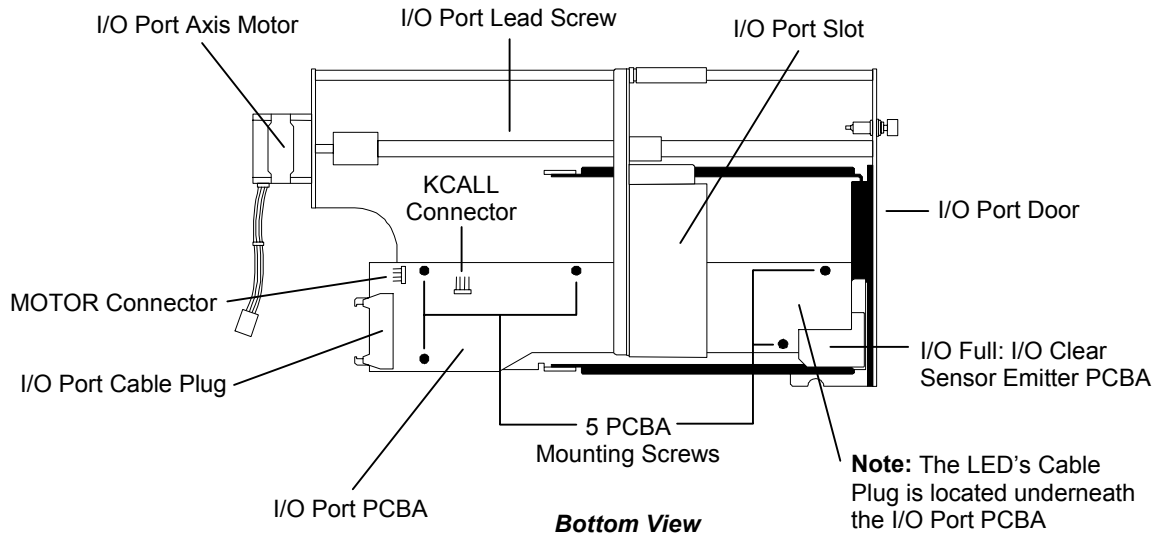
Figure 7-21   I/O Port Assembly

2. Gently turn the I/O port leadscrew by hand, to move the I/O port slot away from the five PCBA mounting screws (Figure 7-21).

3. Disconnect the Motor cable from the I/O port PCBA at the MOTOR connector.

4. Disconnect the Call switch cable from the I/O port PCBA at the KCALL connector.

5. Turn the I/O port assembly over and unplug the LEDs cable.

6. Remove all five PCBA mounting screws (Figure 7-21).

7. Lift the I/O port PCBA out of the I/O port assembly.

7.10.2 I/O Port PCBA Replacement

This procedure assumes that the I/O port PCBA was removed in Section 7.10.1

1. If necessary, gently turn the I/O port leadscrew by hand, to move the I/O port slot away from the five PCBA mounting screws holes in the I/O port assembly's frame (Figure 7-21).

2. Lower the I/O port PCBA into the I/O port assembly and install all five PCBA mounting screws (Figure 7-21).

3. Connect the Motor cable at the MOTOR connector on the I/O port PCBA (Figure 7-21). Note that the connector is keyed for correct orientation.

4. Connect the Call switch cable at the KCALL connector on the I/O port PCBA (Figure 7-21). Note that the connector is keyed for correct orientation.

5. Turn the I/O port assembly over and connect the LEDs cable. Note that the connector is keyed for correct orientation.

6. Reinstall the I/O port assembly (Section 7.9.2).

7. Recalibrate the TLS. (See Section 5.3.2 for details.)

7.11 Switch Bracket Assembly (Front Panel)

P/N 500815-01-4

Tools Required:
- 1/4-inch Hex Nutdriver or Wrench

Material Required:
- 3-inch x 3/32-inch Cable Ties
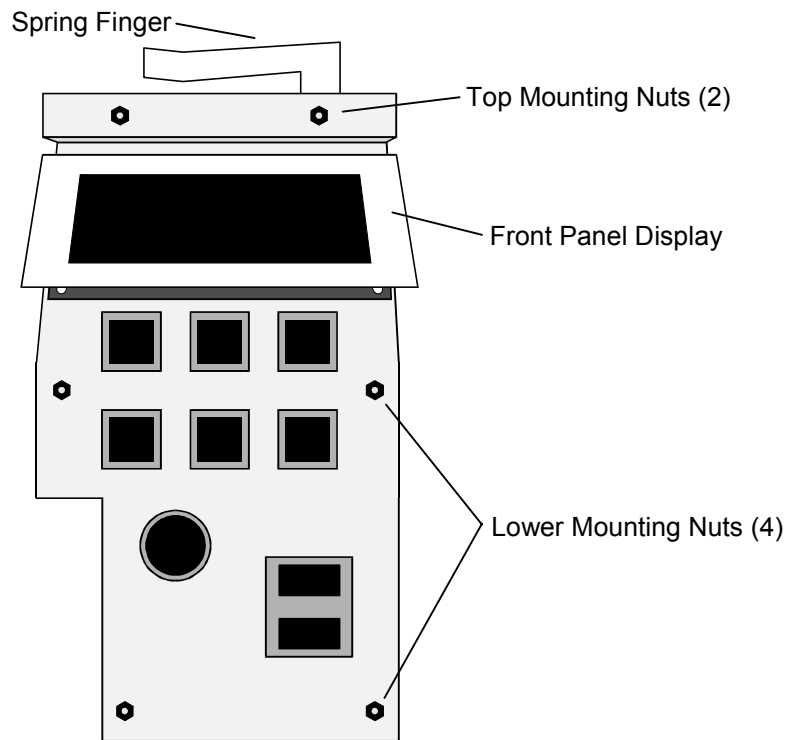
Figure 7-22   The Switch Bracket Assembly (Front Panel)

7.11.1 Switch Bracket Assembly Removal

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

> *In the next step, the spacers behind the Switch Bracket Assembly come loose when the mounting nuts are removed. The top two spacers are shorter than the lower spacers.*

3. Remove all six mounting nuts from the Switch Bracket Assembly mounting studs using a 1/4-inch nutdriver (Figure 7-22).

4. Lift the Switch Bracket Assembly off of the mounting studs. Be careful not to drop the spacers.

5. Reinstall all six mounting nuts onto the mounting studs to retain the spacers.

6. Clip the Nylon Cable Ties (3 pairs of ties) mounted around the ribbon cable (Figure 7-23), then remove them completely.

7. Unplug the ribbon cable from the FRONT connector on the Front Panel PCBA (Figure 7-23).
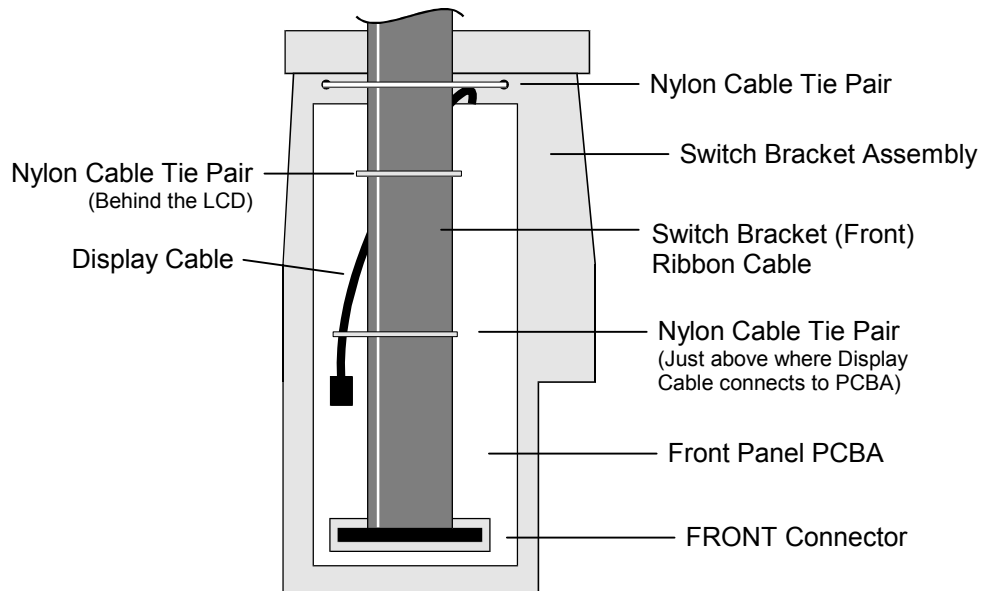
Figure 7-23   Switch Bracket Assembly (Rear View)

7.11.2 Switch Bracket Assembly Replacement

1. Plug the Switch Bracket Ribbon Cable into the FRONT connector on the Front Panel PCBA (Figure 7-23). Make sure that the cable is not twisted, and that the colored stripe aligns with the right side of the TLS. Press the connector in firmly, until both locking tabs on the FRONT connector close over the Switch Bracket Ribbon Cable's connector.

2. Insert a Nylon Cable Tie in through both holes in the Switch Bracket Assembly, just above the LCD (Figure 7-23).

3. Position a second Nylon Cable Tie over the Switch Bracket Ribbon Cable, then attach it to both ends of the Nylon Cable Tie in the Switch Bracket Assembly (Figure 7-23).

4. Tighten the Nylon Cable Ties, *without crimping the cable,* until they secure the Switch Bracket Ribbon Cable to the Switch Bracket Assembly.

5. Trim off the excess length of plastic from each Nylon Cable Tie.

6. Starting behind the LCD, position one Nylon Cable Tie behind the Switch Bracket Ribbon Cable and the Display Cable, then position a second Nylon Cable Tie over the both cables, and attach the cable ties to each other (Figure 7-23).

7. Tighten the cable ties, *without crimping the cables*, until they secure the Switch Bracket Ribbon Cable to the Display Cable.

8. Trim off the excess length of plastic from each Nylon Cable Tie.

9. Starting above where the Display Cable connects to the PCBA, position one Nylon Cable Tie behind the Switch Bracket Ribbon Cable and the Display Cable. Next position a second Nylon Cable Tie over the both cables, and attach the cable ties to each other (Figure 7-23).

10. Tighten the cable ties, *without crimping the cables*, until they secure the Switch Bracket Ribbon Cable to the Display Cable.

11. Trim off the excess length of plastic from each Nylon Cable Tie.

12. Remove all six mounting nuts from the Switch Bracket Assembly mounting studs (Figure 7-22).

13. If the spacers and the Spring Finger (if the unit has a Spring Finger) were removed, mount the Spring Finger onto the right top mounting stud, then place the two short spacers onto the top mounting studs. Place the four longer spacers onto the four lower mounting studs (Figure 7-22).

14. Slide the Switch Bracket Assembly onto the mounting studs (Figure 7-22).

15. Thread all six mounting nuts onto the mounting studs, then use a 1/4-inch nutdriver to tighten the mounting nuts until they are snug (Figure 7-22).

16. Remove the slack in the ribbon cable, so that it doesn't interfere with the carriage movement, by gently feeding any excess cable up through the opening in the top plate.

7.12 Handler Power Supplies

TLS-4212 and 4222 Models:
110W P/N 500826-07-8
150W P/N 500826-05-2
160W P/N 500826-13-6

TLS-4210, 44xx and 46xxx Models:
110W P/N 500826-01-1 or 500826-10-2
150W P/N 500826-05-2 or 500826-09-4
160W P/N 500826-13-6

The 4212 and 4222 models Handler Power Supplies are mounted on the left side of the
TLS (as seen from the front) while the 4210, 44xx and 46xxx models supplies are
mounted on the top of the TLS.

Tools Required:
- Number 2 Phillips Screwdriver

7.12.1 Handler Power Supply Removal – 4212 and 4222 Models

NOTE

*To determine which model of Handler power supply is installed in the library , remove the top
and left side panels then read the Handler Power Supply Label located on the power supply. See
Figure 7-26. The label will read 500826-xx-x. Make sure that the replacement power supply has
the same part number (or its equivalent) as the one that is to be removed.*

1.   Turn off the TLS power and remove the power cord.

2.   Remove the Top Panel (Section 7.4.1).

3.   Remove the left Side Panel, as seen from the front of the TLS (Section 7.4.3).
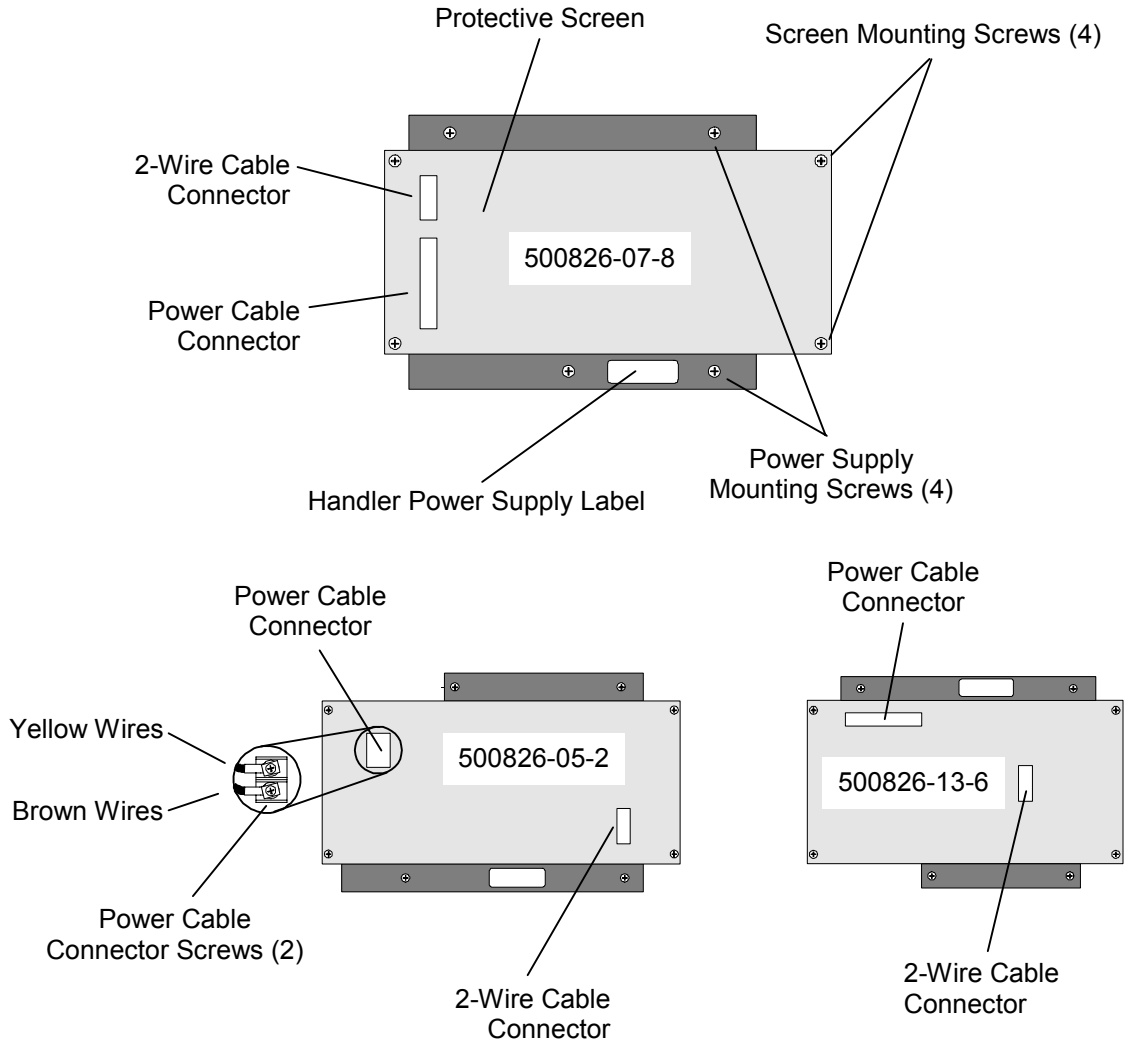
Figure 7-24   The Handler Power Supply – 4212 and 4222 Models

4.   Remove all four protective Screen mounting screws (Figure 7-24).

5.   Disconnect the Power Cable and the 2-Wire Cable connectors from the Power Supply PCBA (Figure 7-24).
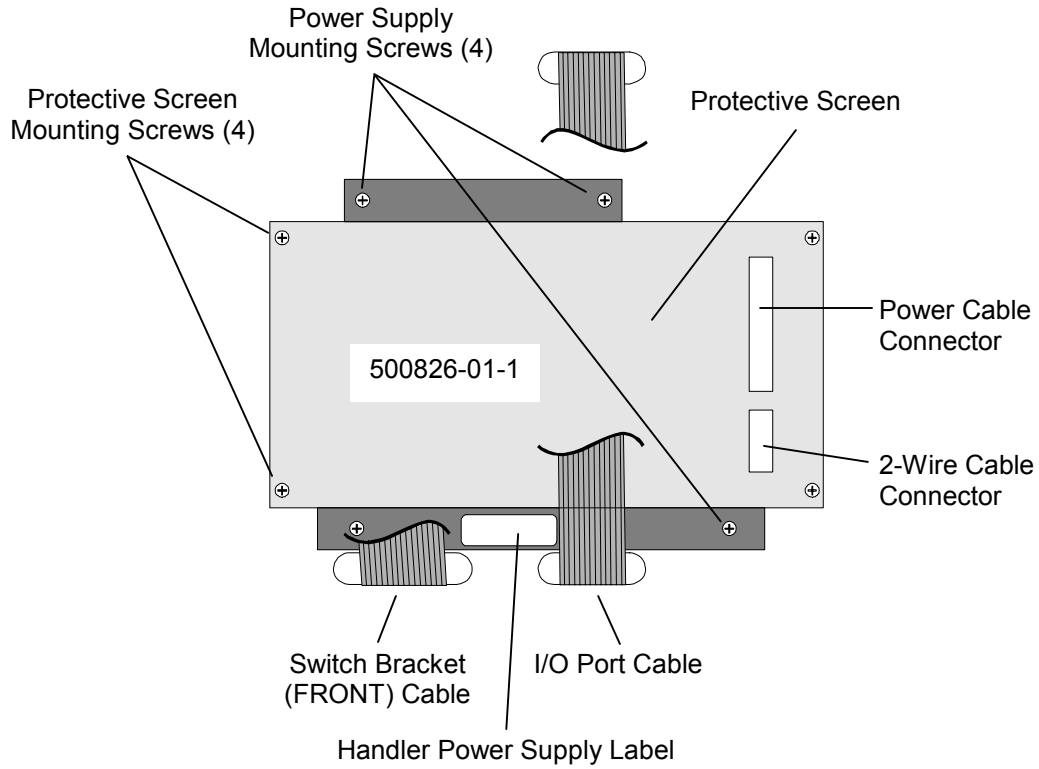
6.   Remove all four Power Supply mounting screws (Figure 7-24).

7.   Lift the Power Supply out of the TLS.

7.12.2 Handler Power Supply Replacement – 4212 and 4222 Models

1. Insert the Power Supply into place in the side of the TLS with its connectors towards the rear of the TLS.

2. Install all four Power Supply mounting screws (Figure 7-24).

3. Reconnect the Power Cable and 2-Wire Cable connectors to the Power Supply PCBA (Figure 7-24).

4. Place the protective Screen on top of the Power Supply with the standoffs facing towards the library and install all four Screen mounting screws (Figure 7-24).

5. Replace the left Side Panel (Section 7.4.4).

6. Replace the Top Panel (Section 7.4.2).

7.12.3 Handler Power Supply Removal – 4210, 44xx and 46xxx Models

NOTE

To determine which model of Handler power supply is installed in the library, remove the top panel and read the Handler Power Supply Label located on the power supply. See Figure 7-26. The label will read 500826-xx-x. Make sure that the replacement power supply has the same part number (or its equivalent) as the one that is to be removed.

1. Turn off the TLS power and remove the power cord.

2. Remove the Top Panel (Section 7.4.1).

3. Use a Number 2 Phillips screwdriver to remove all six Rear Service Panel mounting screws (Figure 7-25), then remove the Rear Service Panel.

4. Disconnect the Switch Bracket (Front) cable and the I/O port cable from the Executive PCBA (Figure 7-25), then lift the cables out through the openings in the top of the TLS (Figure 7-26).

5. Remove all four protective Screen mounting screws, then lift the Screen off of the TLS (Figure 7-26).

6. Disconnect the Power Cable and the 2-Wire Cable connectors from the Power Supply PCBA (Figure 7-26).
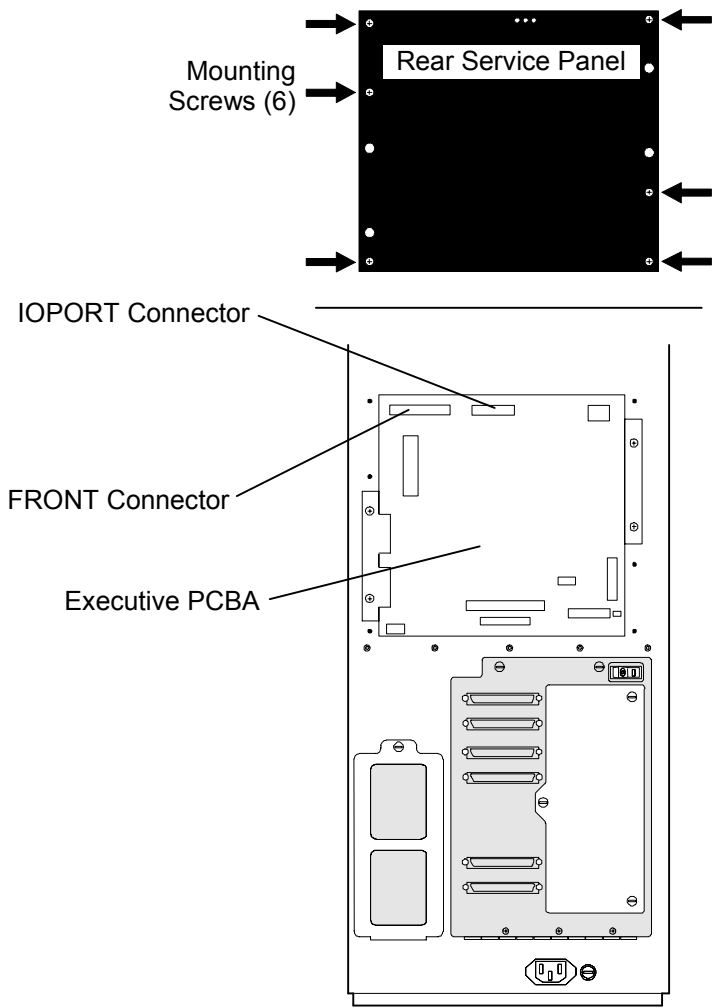
Figure 7-25   TLS Rear View
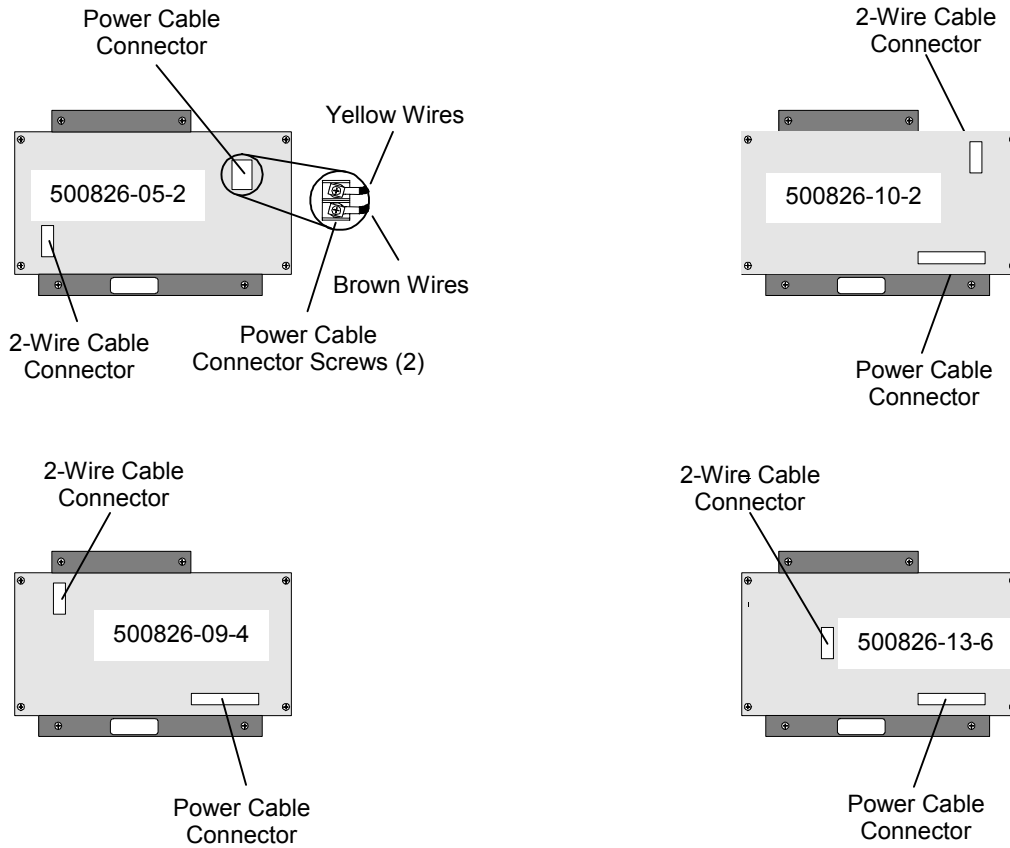
Figure 7-26   The Handler Power Supply (Top View, as seen from the back of the TLS.)

7. Remove all four Power Supply mounting screws (Figure 7-26).

8. Lift the Power Supply up and out of the TLS.

7.12.4 Handler Power Supply Replacement – 4210, 44xx and 46xxx Models

1. Lower the Power Supply down into place on top of the TLS.

NOTE

Make sure that the Power Supply is turned so that the Power Cable Connector on its PCBA is facing the right side of the library, as seen from the back of the TLS (Figure 7-26).

2. Install all four Power Supply mounting screws (Figure 7-26).

3. Reconnect the Power Cable and 2-Wire Cable connectors to the Power Supply PCBA (Figure 7-26).

4. Place the protective Screen on top of the Power Supply, then install all four Screen mounting screws (Figure 7-26). Make sure that neither power cable is pinched by the Screen.

5. Reconnect the Switch Bracket (FRONT) cable and the I/O port cable to the Executive PCBA (Figure 7-25). Make sure that the connectors are fully inserted, until the locking tabs of the mating connectors are fully closed.

6. Place the Rear Service Panel onto the TLS, then use a number 2 Phillips screwdriver to reinstall all six Rear Service Panel mounting screws (Figure 7-25).

7. Replace the Top Panel (Section 7.4.2).

7.13 Tape Drive Power Supplies

DANGER

> TO AVOID THE RISK OF PERSONAL INJURY, ALWAYS WAIT ABOUT ONE MIN-
> UTE AFTER THE POWER IS TURNED OFF AND THE POWER CORD IS DISCON-
> NECTED, BEFORE TOUCHING THE HANDLER POWER SUPPLY OR THE TAPE
> DRIVE POWER SUPPLY.

GEFAHR

> UM VERLETZUNGEN ZU VERHINDERN WARTEN SIE BITTE 1 MINUTE NACH-
> DEM SIE DEN STROM AUSGESCHALTET HABEN UND DAS STROMKABEL ENT-
> FERNT HABEN, BEVOR SIE DAS HANDLER-NETZTEIL SOWIE DAS TAPE-DRIVE-
> NETZTEIL BERUEHREN.

40W P/N 500826-02-9
110W P/N 500826-03-7
125W P/N 500826-12-8

Tools Required:
- Number 2 Phillips Screwdriver

7.13.1 Tape Drive Power Supply Removal

NOTE

> *To determine which model of Tape Drive power supply is installed in the library , remove the
> top and right side panels then read the Tape Drive Power Supply Label located on the power
> supply. See Figure 7-27. The label will read 500826-xx-x. Make sure that the replacement power
> supply has the same part number (or its equivalent) as the one that is to be removed.*

1. Turn off the TLS power and remove the power cord.

2. Remove the Top Panel (Section 7.4.1).

3. Remove the right Side Panel, as seen from the front of the TLS (Section 7.4.3).

4. Remove all four protective Screen mounting screws (Figure 7-27).

5. Disconnect the Power Cable and the 2-Wire Cable connectors from the Power
    Supply PCBA (Figure 7-27).

Power Supply Mounting Screws (4)

Power Cable Connector

500826-02-9

2-Wire Cable Connector

Protective Screen

Tape Drive Power Supply Label

Screen Mounting Screws (4)

Power Supply Mounting Screws (4)   Screen Mounting Screws (4)

500826-03-7

Tape Drive Power Supply Label

500826-12-8

Protective Screen

Power Cable Connector

2-Wire Cable Connector

2-Wire Cable Connector

Power Cable Connector
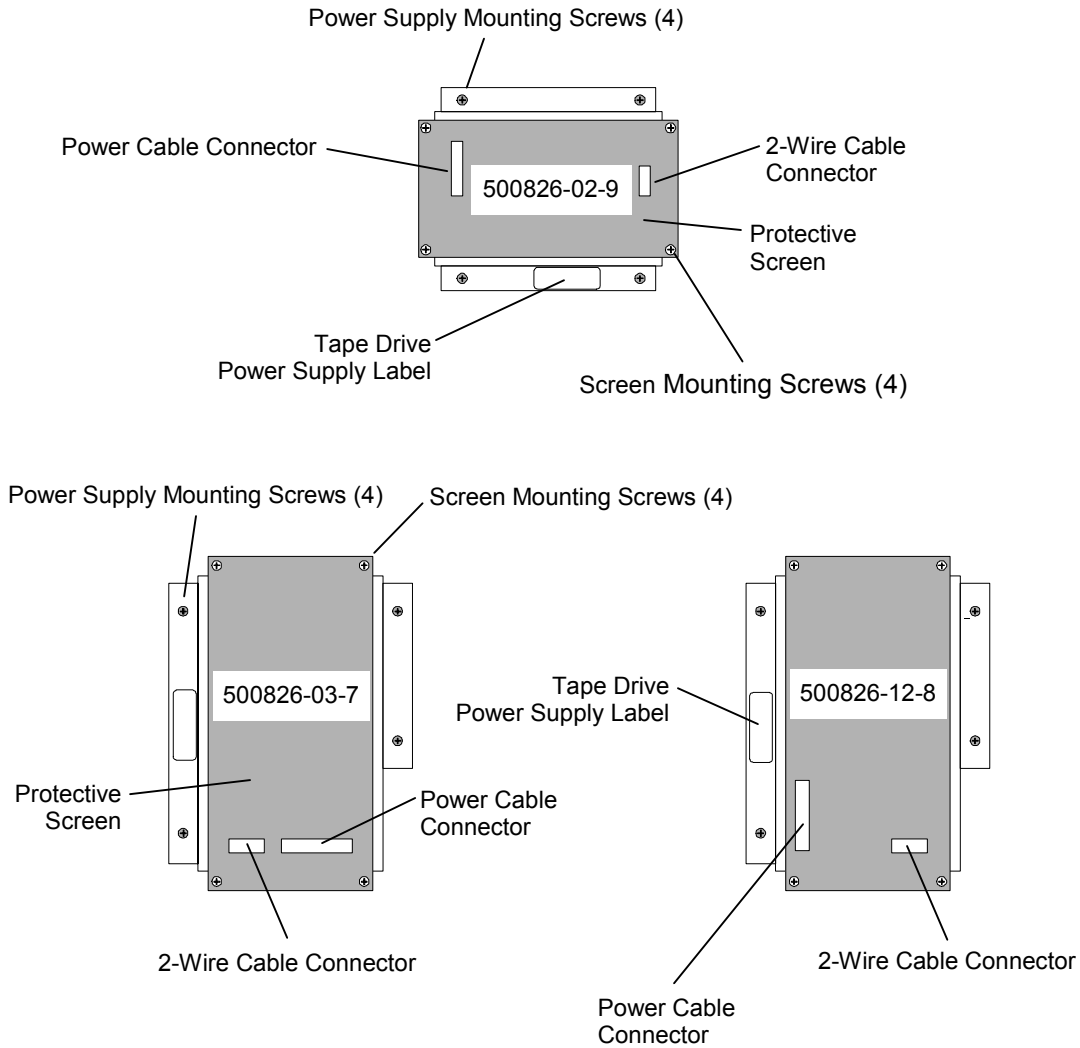
Figure 7-27   Tape Drive Power Supplies

6. Remove all four Power Supply mounting screws (Figure 7-27).

7. Lift the Power Supply out of the TLS.

7.13.2 Tape Drive Power Supply Replacement

1. Insert the Power Supply into place in the side of the TLS with its 2-Wire Cable connector towards the bottom or rear of the TLS.

NOTE

Make sure that the Power Supply is turned so that the 2-Wire Cable connector on the PCBA is facing down, for vertical-mounting power supplies (on the larger libraries), or towards the back of the library, for horizontal-mounting power supplies (on the smaller libraries).

2. Install all four Power Supply mounting screws (Figure 7-27).

3. Reconnect the Power Cable and the 2-Wire Cable connectors to the Power Supply PCBA (Figure 7-27).

4. Place the protective Screen on top of the Power Supply and install all four Screen mounting screws (Figure 7-27).

5. Replace the right Side Panel (Section 7.4.4).

6. Replace the Top Panel (Section 7.4.2).

7.14 Executive PCBA

Executive II P/N 501137-01-2
Executive III P/N 501387-01-3
Executive IV P/N 501447-01-5
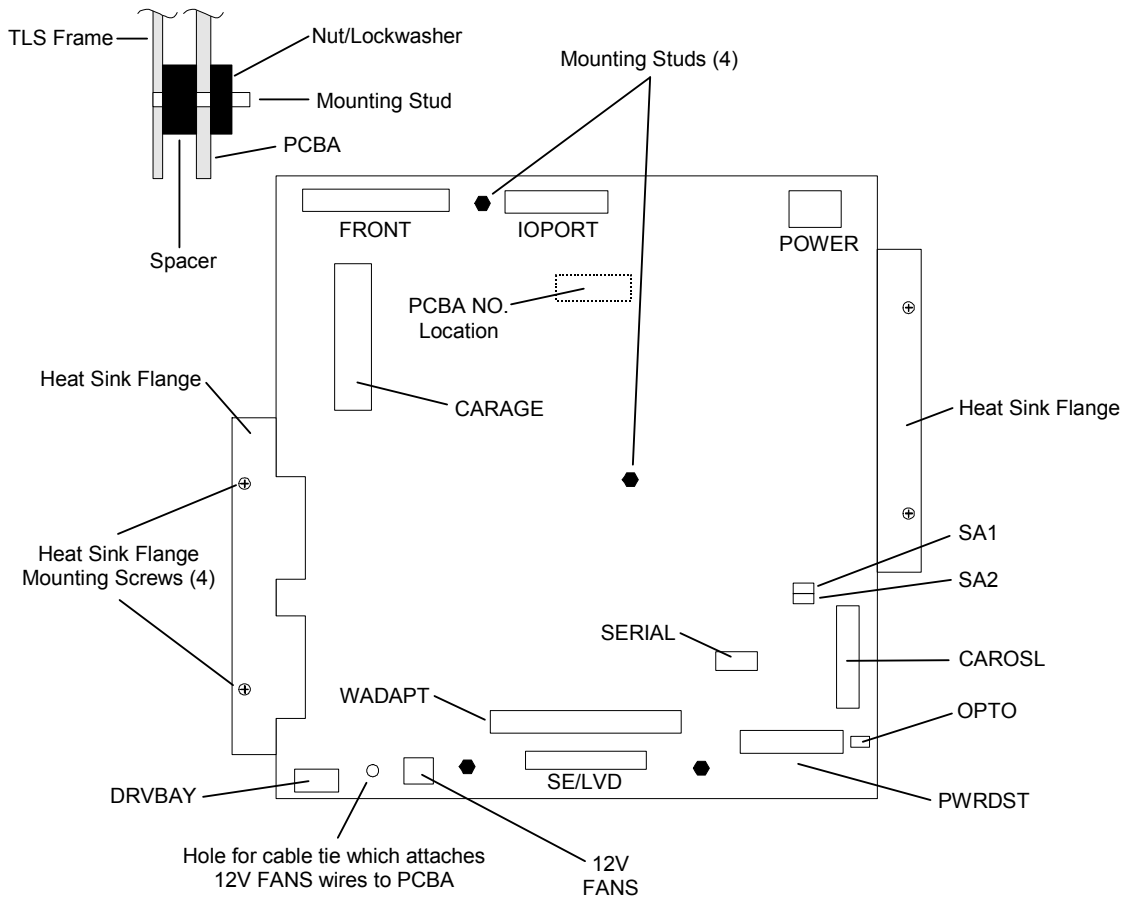
Figure 7-28   Executive II and III PCBAs
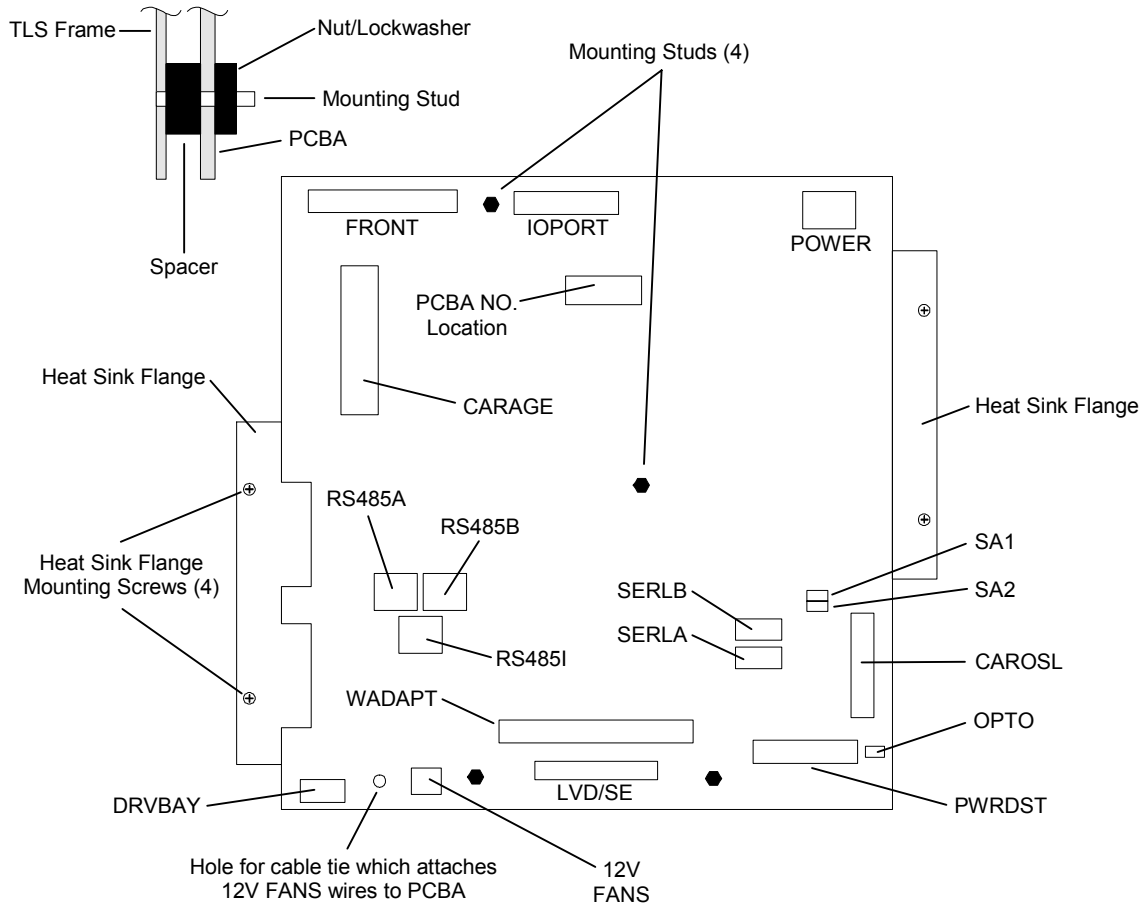
Figure 7-29   Executive IV PCBA

7.14.1 Executive PCBA Removal

Refer to Figure 7-28 or Figure 7-29.

Refer to Table 7-4 for a list of the Executive PCBAs board names and their part numbers. The Executive PCBAs type can be determined by reading the part number printed on the circuit board. For example, a board with a PCBA NO. 501387- printed on it is an Executive III board.

Board Name	Board P/N
Executive II	501137-01-2
Executive III	501387-01-3
Executive IV	501447-01-5

Table 7-4   Executive PCBA Identification

Tools Required:
- Number 2 Phillips Screwdriver
- 1/4-inch Hex Nutdriver

Material Required:
- 3-inch x 3/32-inch Cable Ties

NOTICE

> If a history of the configuration changes that were made at the time of initial
> TLS installation is not available, and if the menu system is still operational,
> enter the `Configuration` menu. Record all of the custom configuration set-
> tings, in all of the sub-menus, except for the `Log` and `Emulation` sub-menus.
> This custom configuration information must be re–entered after the new Ex-
> ecutive board is installed (Section 7.14.2).

1.   Turn off the TLS power and remove the power cord.

2.   Use a number 2 Phillips screwdriver to remove all six Rear Service Panel mount-
     ing screws, then remove the Rear Service Panel (Figure 7-30).
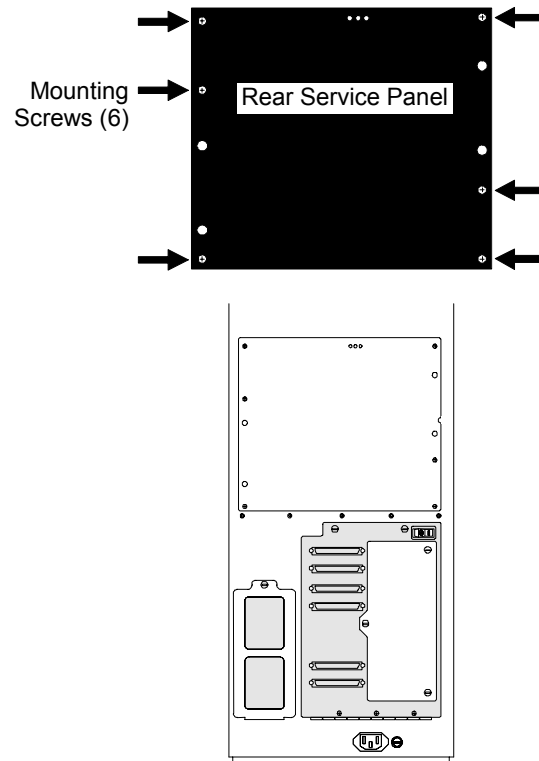
Figure 7-30   View of Rear Service Panel

3.   Disconnect all of the cable connectors from the Executive PCBA. (There are at
     least 7 cables. The Carosl (Carousel), RS485A, RS485B, RS485I, SERLA, SERLB
     and Serial cables are model-dependent/optional cables.)

4. If a HVD Adapter PCBA is mounted on the Executive PCBA, follow the procedure in Section 7.18 to remove it and mount it onto the replacement Executive PCBA (Figure 7-40).

5. Remove all four Phillips mounting screws from the Heat Sink Flanges.

NOTE

In the next step, the spacers behind the Executive PCBA come loose when the PCBA mounting nuts are removed.

6. Use 1/4-inch a nutdriver (a magnetic nutdriver works best for this job) to remove all four PCBA mounting nuts from the PCBA Mounting Studs. Be careful not to drop the nuts into the bottom of the TLS.

7. Lift the Executive PCBA off of the PCBA Mounting Studs and out of the TLS.

8. Reinstall all four PCBA mounting nuts onto the PCBA Mounting Studs, to keep the PCBA spacers in place.

7.14.2 Executive PCBA Replacement

Refer to Figure 7-28 or Figure 7-29.

7.14.2.1 Introduction

Executive PCBA FRUs are not configured for any particular TLS model (or any specific TLS unit) at the factory. Also, since all of a unit's configuration, calibration and inventory information is stored in its Executive PCBA's non-volatile Clock/RAM chip (which is permanently attached to the Executive PCBA), all this information is lost when the Executive PCBA is replaced. Therefore, the configuration information in the Executive PCBA FRU *will not match* the configuration of the TLS when it is first installed.

After replacing the Executive PCBA, ***before doing anything else***, the user must update the configuration information in the new Executive PCBA to match the library's installed hardware (see Section 7.14.3). *Do not, under any circumstances, apply power to the TLS while the cabinet door is closed if you think the unit's configuration is incorrect*. If in doubt, open the cabinet door, apply power to the TLS and check the unit's configuration – ***never guess!***

CAUTION

> ***To prevent possible injury or equipment damage, <u>BEFORE APPLYING POWER</u> af-
> ter the Executive PCBA is replaced, <u>MAKE SURE THE CABINETDOOR IS OPEN</u>.***
>
> ***When power is applied to the TLS while the cabinet door is open, no TLS motors
> will operate. The configuration information in the new Executive PCBA must be
> updated to match the library's installed hardware, <u>BEFORE</u> any TLS motors are al-
> lowed to operate. See Section 7.14.3.***

Executive PCBA Flash PROM

The flash PROM on the Executive PCBA contains only the operating firmware and
none of a unit's configuration information. The number of items in the configuration
data set may change with firmware revisions. It is always recommended that when
changing the Executive PCBA, the firmware revision level remain unchanged until
the new board is properly installed and the unit works satisfactorily. Only then
should the firmware be upgraded. Don't attempt to do two things at once, it can cause
problems.

7.14.2.2   Replacing the Executive PCBA

NOTE

> *In the next step, the spacers behind the mounting nuts on the PCBA Mounting Studs come loose
> when the nuts are removed.*

1.   Remove all four nuts from the PCBA mounting studs, then make sure that all
     four PCBA spacers are in place on the PCBA mounting studs.

2.   Lift the top of the Executive PCBA into the rear panel opening, but do not place
     it onto the mounting studs.

3.   Press the Front cable firmly into the FRONT connector, until both locking tabs
     on the FRONT connector close over the Front cable's connector.

4.   Press the I/O port cable firmly into the IOPORT connector, until both locking
     tabs on the IOPORT connector close over the I/O port cable's connector.

5.   If a ground lug exits, plug in onto the FRAME terminal.

6.   Plug the Power cable onto the POWER connector.

7.   First, make sure that the remaining cables are not behind the Executive PCBA,
     and that they have not fallen down inside of the TLS. Next, lift the Executive
     PCBA up into the Rear Panel opening, past the mounting studs. Finally, push
     the bottom edge of the Executive PCBA into the Rear Panel opening.

8.   Lower the Executive PCBA to align all four mounting stud holes in the PCBA
     with all four PCBA mounting studs, then install the PCBA onto the studs.

9. Reinstall all four PCBA mounting nuts (with lockwashers) onto the mounting studs, then use a 1/4-inch nutdriver to tighten the mounting nuts firmly against the Executive PCBA.

10. Reinstall all four Phillips mounting screws in the Heat Sink Flanges, then use a number 2 Phillips screwdriver to tighten the mounting screws until they are snug.

11. Reconnect all the remaining cables to the Executive PCBA.
   a) For each ribbon cable, press the ribbon cable's connector firmly into its mating connector, until both locking tabs on the mating connector close over the ribbon cable's connector.

   b) For each non-ribbon cable, make sure that *all* of the pins on the cable's connector are fully engaged with the corresponding mating connector.

   c) The remaining cables include:

   - **CAROSL (Carousel)**
     This cable is only found on units with a Carousel.

   - **PWRDST**

   - **SERIAL (Executive II and III PCBA's only)**
     Connect this cable so that the stripe on the ribbon cable is on the right side of the SERIAL connector, as shown below.
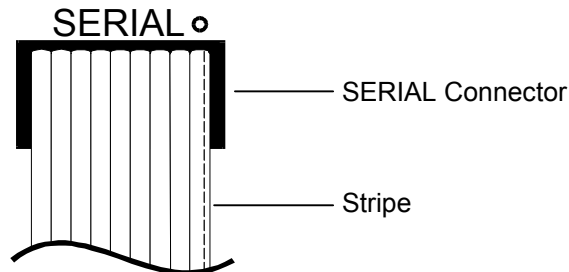
   - **SE/LVD or LVD/SE**
     a) If a HVD Adapter PCBA _is not_ installed on the replacement Executive PCBA, connect the SCSI cable to the SE/LVD connector on the Executive PCBA (the bottom SCSI connector in Figure 7-40).

     b) If a HVD Adapter PCBA _is_ installed on the replacement Executive PCBA, connect the SCSI cable to the SCSIID connector on the HVD Adapter PCBA (Figure 7-40). See Section 7.18 for details about connecting the SCSI Differential Adapter PCBA.

   - **12VFANS**
     The connector is not polarity-sensitive or keyed. After the connector is attached to the PCBA, insert a Cable Tie through the hole in the Executive PCBA (Figure 7-28 or Figure 7-29), then secure the Fan Assembly's power cable to the Executive PCBA.

- **RS485A, RS485 or RS485I (Executive IV PCBA's only)**
  These connectors are keyed.

CAUTION

> *To avoid equipment damage, be sure that all pins on the 12VFANS cable's plug mate correctly with all pins on the 12VFANS connector on the Executive PCBA.*

- **CARAGE (Carriage)**
- **OPTO**
  This connector is keyed.
- **DRVBAY (Drive Bay)**

12. Reinstall the Rear Service Panel, then use a number 2 Phillips screwdriver to re-install all six Rear Service Panel mounting screws (Figure 7-30).

13. Open the cabinet door.

7.14.3 Reconfiguring the TLS

CAUTION

> *To prevent possible injury or equipment damage, <u>BEFORE APPLYING POWER</u> after the Executive PCBA is replaced, <u>MAKE SURE THE CABINETDOOR IS OPEN</u>.*
>
> *When power is applied to the TLS while the cabinet door is open, no TLS motors will operate. The configuration information in the new Executive PCBA must be updated to match the library's installed hardware, <u>BEFORE</u> any TLS motors are allowed to operate.*

1. <u>Make sure that the cabinet door is open</u>, then reconnect the power cord and turn on the TLS power.

NOTE

> *Both the +12V and +5V LEDs at the top of the Executive board must light.*
> *Confirm that the Front Panel display lights and that characters are displayed.*

2. Inspect the label on the rear-panel to determine the unit's model number.

NOTE

> *If the TLS was upgraded in the field to a larger model, the rear-panel label may not indicate the correct, current model number.*

3. Inspect the label on the Carriage to determine its revision level
    (e.g., `Carriage: B`). See Figure 7-31.

4. If a Barcode Reader is installed, inspect its label to determine its model number
    (e.g., `WA3700/B-2221`). See Figure 7-31.

Barcode Reader

Barcode Reader
(Rear View)

Barcode Reader
Label

Barcode Reader Label

Carriage Assembly
Label

Carriage Assembly
(Bottom View)

Carriage Assembly Label
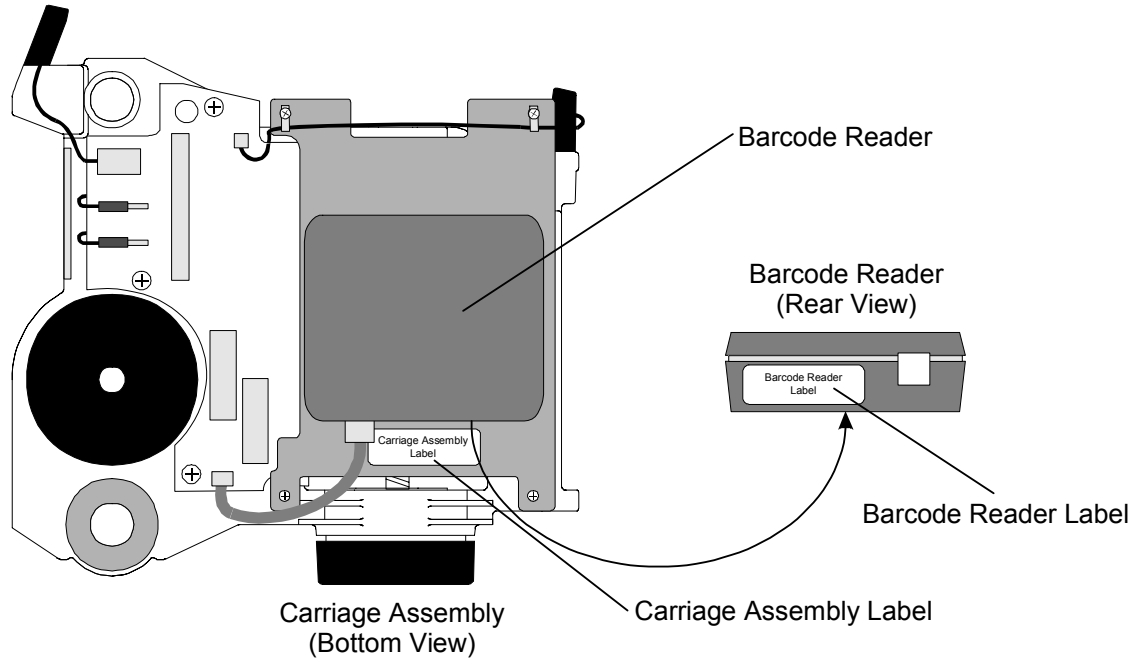
Figure 7-31   Carriage Assembly and Barcode Reader Labels

5. Inspect the label on the I/O port assembly to determine its revision level
    (e.g., `I/O Port: A`). See Figure 7-32.

I/O Port Carriage Assembly Label

I/O Port Assembly
Label
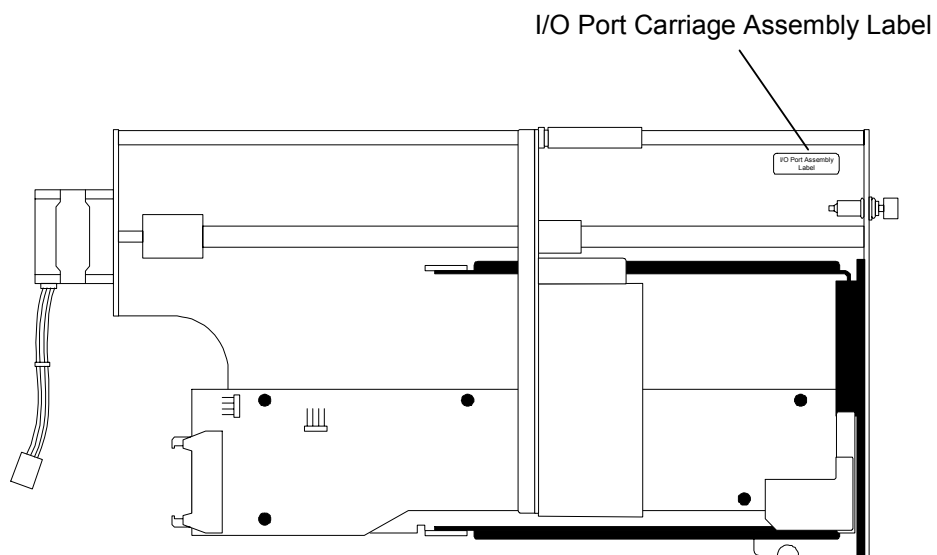
Figure 7-32   I/O Port Assembly Label

6. Follow the instructions in Section 5.3.1 to enter `Update` for the password in the Private menu.

7. Enter the `Configuration\Advanced\Changer\Mechanics` menu.

8. **a)** Edit the `Configuration\Advanced\Changer\Mechanics` menu as necessary to make sure that **_all_** the menu items match the hardware installed in the TLS.

   Be especially sure that the proper Carriage revision level (A, B, etc.) is displayed in the menu. The TLS will not operate properly if the Carriage item is not correct.

   b) If the configuration data was recorded before the old Executive PCBA was removed (Section 7.14.1), that information can now be used to reconfigure the new Executive PCBA. However, _double check to make sure that **all** the_ `Configuration\Advanced\Changer\Mechanics` _menu items match the hardware installed in the TLS._

NOTE

The TLS automatically rebuilds the calibration data during the calibration operation (Section 7.14.4). The inventory data is automatically restored when the unit is returned to service. However, the custom configuration data (e.g., the Carriage revision level) must be manually re-entered.

The contents of the Configuration\Advanced\Changer\Mechanics menu may change in future revisions of the TLS firmware. Always make sure that all the menu items match the installed hardware.

7.14.4 Recalibrating the TLS

1. After making sure that the unit is properly configured (see Section 7.14.3), close the cabinet door.

NOTE

For units with firmware revision 1.22 or earlier, after changing the unit's configuration, switch the TLS power off and then back on before calibrating the unit. This procedure ensures proper operation of the CALIBRATE command in step two below

2. Follow the instructions in Section 5.3.2 to recalibrate the unit.

3. Follow the instructions in Section 5.3.3 to clear any existing passwords, to prevent unauthorized access to the Private menu.

7.15 Drive Bay PCBA

2–Drive P/N 501326-01-1
4–Drive P/N 501336-01-0
6–Drive P/N 501357-01-1

Tools Required:
- Flat-blade Screwdriver
- Number 2 Phillips Screwdriver
- 1/4-inch Hex Nutdriver

7.15.1 Drive Bay PCBA Removal

1.   Turn off the TLS power and remove the power cord.

2.   Remove the Top Panel (Section 7.4.1).

3.   Remove the left Side Panel, as seen from the front of the TLS (Section 7.4.3).

4.   Use a flat-blade screwdriver to turn both 1/4-turn fasteners at the top of the Drive Access Hatch counter-clockwise, then open the hatch (Figure 7-33).
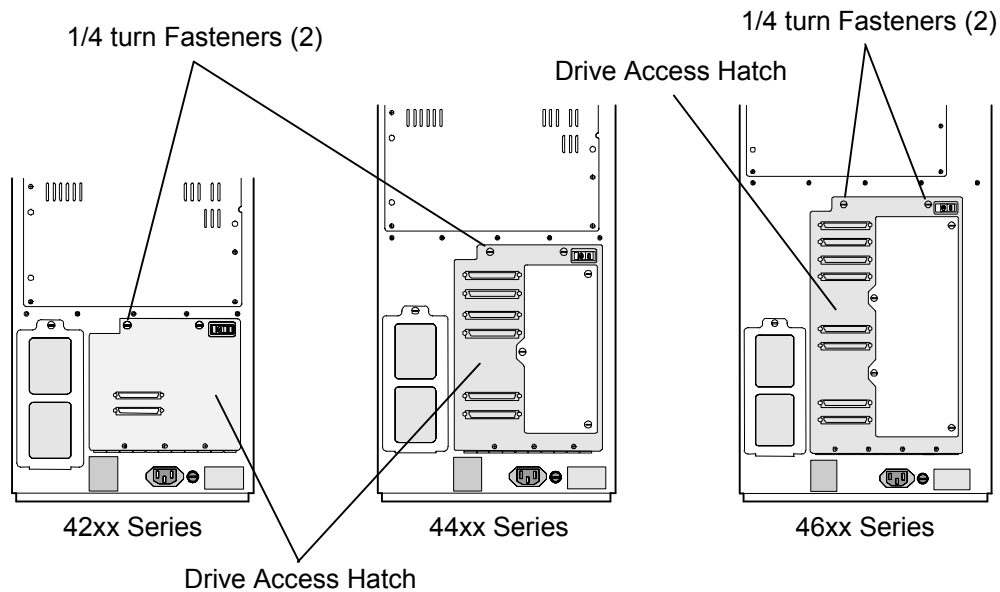
Figure 7-33   TLS Rear Views

5.   Disconnect all the cables from the Drive Bay PCBA (Figure 7-34).
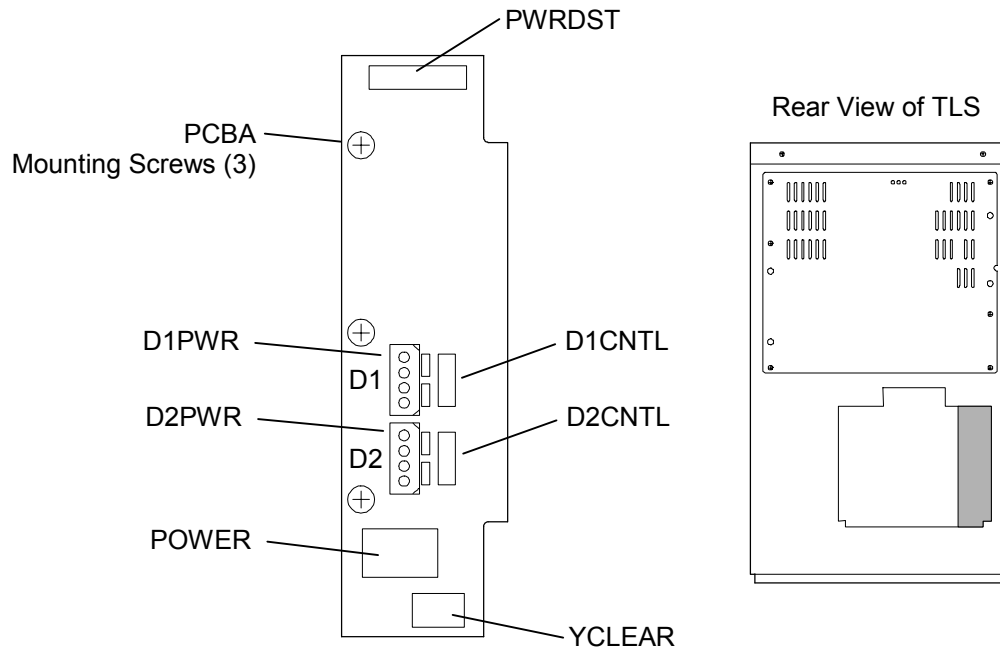
Figure 7-34   Drive Bay PCBA (42xx model shown)

NOTE

In the next step, the nuts on the back of the PCBA mounting screws come loose when the screws are removed.

Some model libraries have 3 PCBA mounting screws, while others have 5 or 7 PCBA mounting screws.

6. Hold the PCBA mounting nut on the back of a PCBA mounting screw with a 1/4-inch nutdriver, then use a number 2 Phillips screwdriver to remove the PCBA mounting screw (Figure 7-34). Remove the remaining PCBA mounting screws the same way.

7. Lift the Drive Bay PCBA out of the TLS.

7.15.2 Drive Bay PCBA Replacement

1. Insert the Drive Bay PCBA into the TLS and align its mounting screw holes with the PCBA mounting screw holes in the TLS' frame (Figure 7-34).

2. Install a PCBA mounting screw, then thread a PCBA mounting nut onto the PCBA mounting screw. Reinstall the remaining PCBA mounting screws the same way.

3. Hold a PCBA mounting nut with a 1/4-inch nutdriver, then use a number 2 Phillips screwdriver to tighten the PCBA mounting screw until it is snug (Figure 7-34). Tighten the remaining PCBA mounting screws the same way.

4. Reconnect all the cables to the Drive Bay PCBA (Figure 7-34).

5. Close the Drive Access Hatch, then use a flat-blade screwdriver to turn both 1/4-turn fasteners at the top of the Drive Access Hatch clockwise (Figure 7-12).

6. Replace the left Side Panel (Section 7.4.4).

7. Replace the Top Panel (Section 7.4.2).

7.16 Carousel PCBA

P/N 500617-01-4

This section applies only to libraries with carousels.

Tools Required:
- Number 2 Phillips Screwdriver

NOTICE

There are two versions of the Carousel Printed Circuit Board Assembly: PCB/500617-01-4 and PCB/500617-02-2. The -01 version uses a 20-pin, vertical CAROSL (Carousel) connector, while the -02 version uses a 20-pin, right-angle CAROSL connector. The TLS-4000 models require the -01 version with the vertical CAROSL connector.

7.16.1 Carousel PCBA Removal
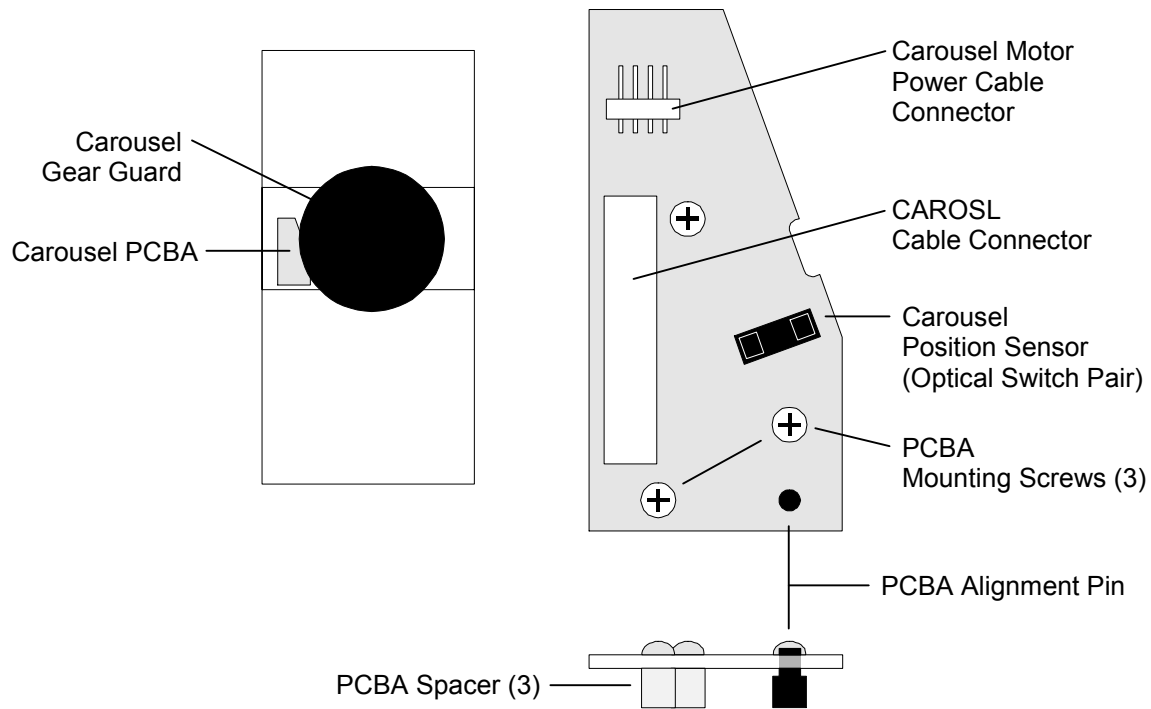
Figure 7-35   The Carousel PCBA (3 Views)

1.   Turn off the TLS power and remove the power cord.

2.   Open the cabinet door.

3.   Reach in through the cabinet door and disconnect CAROSL Cable and the Carousel Motor Power Cable from the Carousel PCBA (Figure 7-35).

NOTE

If necessary, remove magazines and rotate the carousel slightly by hand to reach each PCBA mounting screw (Figure 7-35).

4.   Use a number 2 Phillips screwdriver to remove all three PCBA mounting screws and PCBA spacers (Figure 7-35).

CAUTION

In the next step, be careful not to damage the Carousel Position Sensor on the Carousel Gear Guard (Figure 7-35), as you remove the Carousel PCBA.

5.   Lift the Carousel PCBA slightly to clear the PCBA Alignment Pin, then gently slide the PCBA along the Carousel Gear Guard toward the front, center of the

cabinet. When the Carousel Position Sensor is in front of the Carousel Gear Guard, slide the Carousel PCBA towards the cabinet door to remove it (Figure 7-35).

7.16.2 Carousel PCBA Replacement

CAUTION

In the next steps, be careful not to damage the Carousel Position Sensor on the Carousel Gear Guard (Figure 7-35), as you install the Carousel PCBA.

Make sure that the Carousel PCBA is replaced with the 500617-01-4 version of the PCBA.

1.   Turn off the TLS power and remove the power cord.

2.   Hold the Carousel PCBA level and turn it so that the Carousel Position Sensor faces the Carousel Gear Guard.

3.   Gently slide the PCBA along the Carousel Gear Guard toward the left, rear of the cabinet and fit the PCBA down over the PCBA Alignment Pin (Figure 7-35).

4.   Align the Carousel PCBA spacers under the PCBA with the PCBA mounting screw holes (Figure 7-35).

5.   Use a Phillips screwdriver to install all 3 PCBA mounting screws, then tighten the screws until they are snug (Figure 7-35). If necessary, rotate the carousel slightly by hand to reach each PCBA mounting screw.

6.   Reach in through the cabinet door and connect the CAROSL Cable and the Carousel Motor Power Cable to the Carousel PCBA (Figure 7-35). The connectors are keyed to fit only one way.

7.   Replace any magazines that were removed and close the cabinet door.

7.17 Carousel Motor

P/N 500822-76-2

Tools Required:
- Number 2 Phillips Screwdriver
- 3/32-inch Allen (Hex) Wrench

Material Required:
- 3-inch x 3/32-inch Cable Ties

7.17.1 Carousel Motor Removal

1.   Turn off the TLS power and remove the power cord.

2.   Remove the Top Panel (Section 7.4.1).

3. Remove the right Side Panel (Section 7.4.3).

4. Open the cabinet door.

5. For TLS models 4440 and 4480 only, follow the procedure in Section 7.9 to re-move the I/O port assembly.

6. Use a number 2 Phillips screwdriver to remove all three mounting screws from the Upper Carousel Pivot Support (Figure 7-36), then lift the Upper Carousel Pivot Support up out of the TLS (Figure 7-37).

Handler
Power Supply

Mounting
Screws (3)

Upper Carousel
Pivot Support
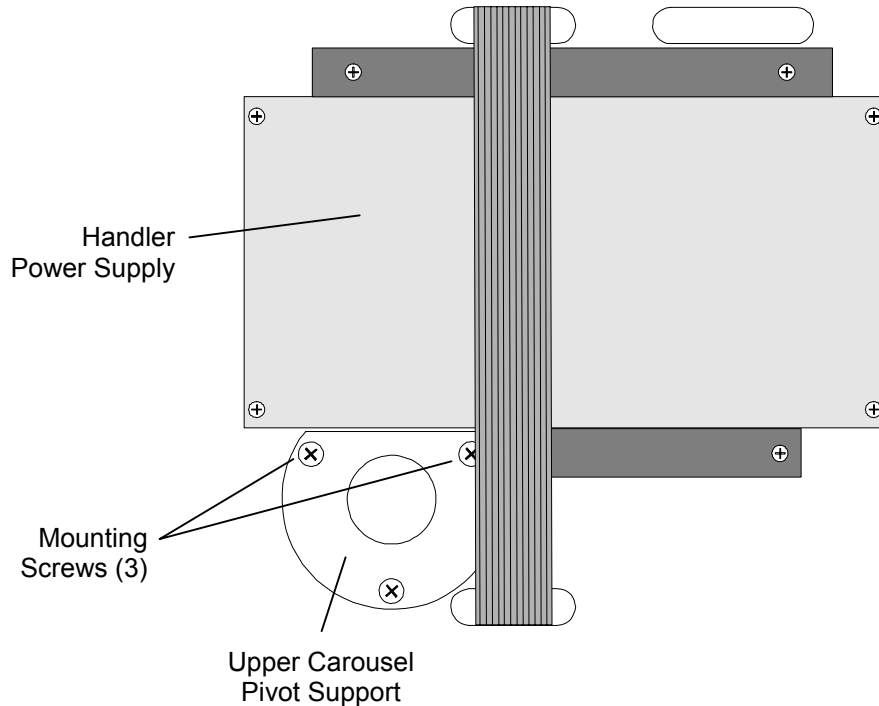
Figure 7-36   TLS Top View (TLS-44xx shown)

CAUTION

Be careful not to damage the Carousel Position Sensor with the Carousel Gear Guard when you remove the Carousel (Figure 7-35).

7. **a)** For TLS models 4440 and 4480, lift the Carousel up until the Lower Carousel Bearing clears the TLS Midplate, then move the Carousel about three inches to-ward the right side of the cabinet, to gain access to the Carousel Motor's mount-ing screws (Figure 7-37).

b) For TLS models 4660 and 46120, lift the Carousel up until the Lower Carou-sel Bearing clears the TLS Midplate, then move the Carousel about four inches forward, then about one inch toward the left side of the cabinet, to gain access to the Carousel Motor's mounting screws (Figure 7-37).
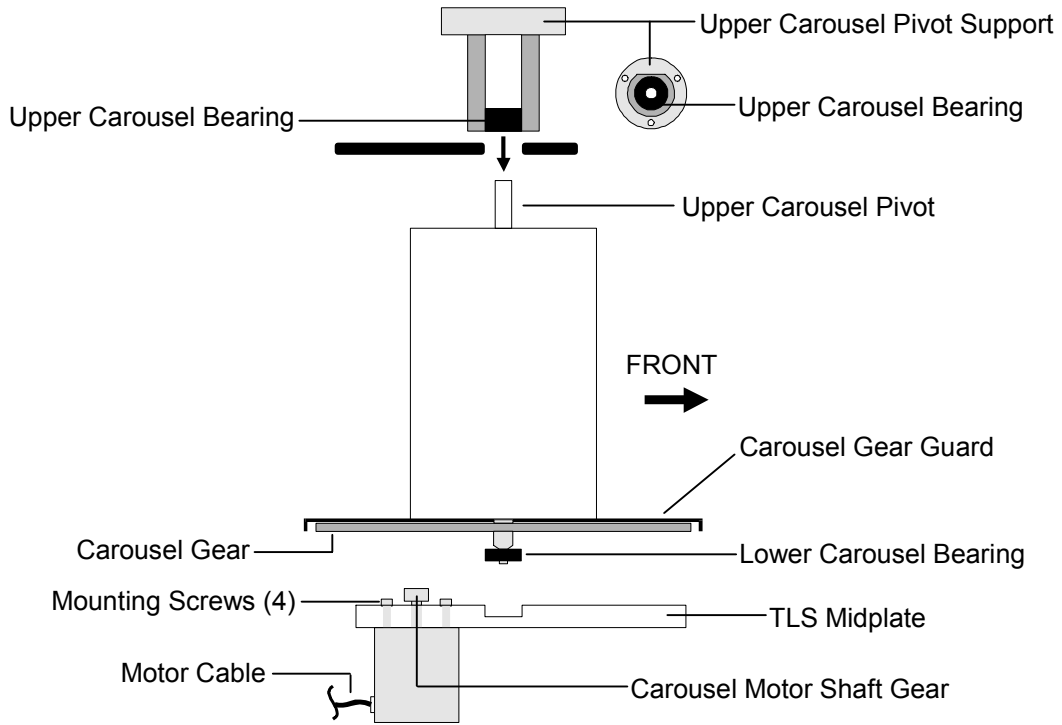
Figure 7-37   A Carousel Assembly

8. Disconnect the Carousel Motor cable from the Carousel PCBA (Figure 7-35).

9. For TLS models 4660 and 46120, remove any nylon cable ties that are attached to the motor cable (Figure 7-38).
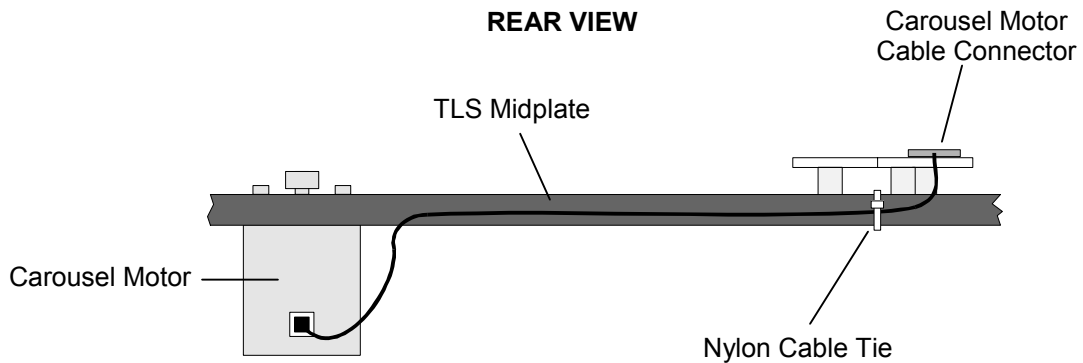
Figure 7-38   Carousel Motor Nylon Cable Ties – TLS Models 4660 and 46120

NOTE

For TLS models 4660 and 46120, the Carousel Motor is mounted in the right side of the cabinet (as seen from the front). For all other TLS models, the Carousel Motor is mounted in the left side of the cabinet.

10. Use a 3/32-inch Allen wrench to remove all four Carousel Motor mounting screws (Figure 7-37).

11. Remove the Carousel Motor from the cabinet.

7.17.2 Carousel Motor Replacement

1. Align the mounting holes in the Carousel Motor with the corresponding mounting holes in the TLS' Midplate, so that the motor's cable faces the rear of the TLS (Figure 7-37).

NOTE

For TLS models 4660 and 46120, the Carousel Motor is mounted in the right side of the cabinet (as seen from the front). For all other TLS models, the Carousel Motor is mounted in the left side of the cabinet.

2. Use an 3/32-inch Allen wrench to install and securely tighten all four Carousel Motor mounting screws.

3. Reconnect the Carousel Motor cable to the Carousel PCBA (Figure 7-35).

4. For TLS models 4660 and 46120, replace any nylon cable ties that were removed earlier from the motor cable (Figure 7-38).

CAUTION

Be careful not to damage the Carousel Position Sensor with the Carousel Gear Guard when you reinstall the Carousel (Figure 7-35).

5. Align the lower Carousel Bearing with the TLS Midplate, then lower the Carousel down into place (Figure 7-37). Be sure to align the Carousel Gear with the gear on the Carousel Motor shaft as you lower the Carousel into position.

6. Align the Upper Carousel Bearing with the Upper Carousel Pivot Support, then lower the Upper Carousel Pivot Support down through the top of the TLS onto the Upper Carousel Pivot (Figure 7-37).

7. Align the mounting screw holes in the Upper Carousel Pivot Support with the mounting screw holes in the TLS, then use a number 2 Phillips screwdriver to install all three Upper Carousel Pivot Support mounting screws (Figure 7-36).

8. Replace the right Side Panel (Section 7.4.4).

9. Replace the Top Panel (Section 7.4.2).

7.18 SCSI High Voltage Differential Adapter PCBA

P/N 501407-01-1

Tools Required:
- Number 2 Phillips Screwdriver

Mounting Screws (6)
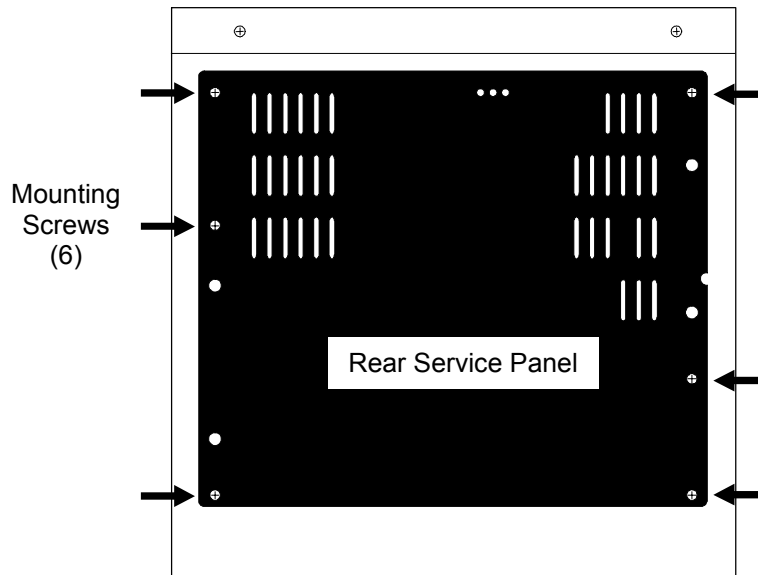
Rear Service Panel

Figure 7-39 TLS Rear View

7.18.1 SCSI High Voltage Differential Adapter PCBA Removal

1. Turn off the TLS power and remove the power cord.

2. Use a number 2 Phillips screwdriver to remove all six Rear Service Panel mounting screws (Figure 7-39), then remove the panel.

3. Disconnect the SCSI cable from connector SCSIID on the HVD Adapter PCBA (Figure 7-40).

4. Gently pull the HVD Adapter PCBA away from the Executive PCBA (Figure 7-40).

Executive PCBA
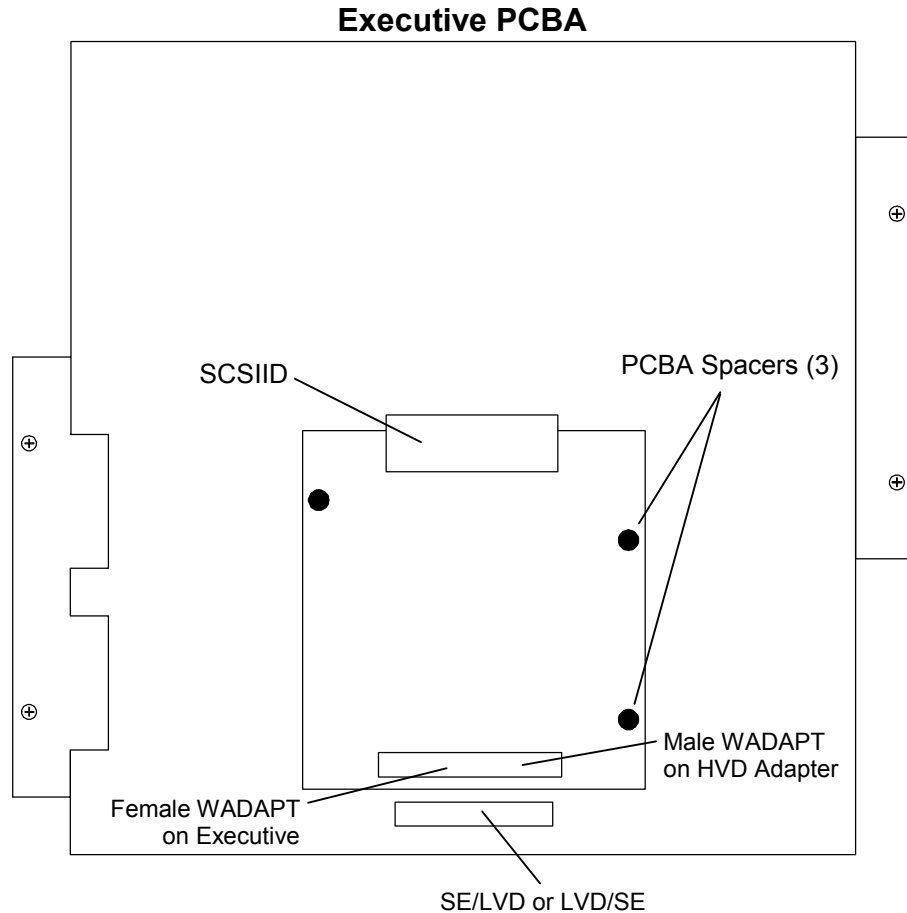
Figure 7-40   HVD Adapter PCBA

7.18.2 SCSI High Voltage Differential Adapter PCBA Replacement

This procedure assumes that the PCBA was removed in Section 7.18.1.

1.   Insert all three PCBA spacers on the HVD Adapter PCBA into the mounting holes in the Executive PCBA making sure that the female WADAPT connector is aligned with the male ADAPT connector on the Executive PCBA. See Figure 7-40.

2.   Gently press the HVD Adapter PCBA into place. Make sure that the male and female WADAPT connectors are fully seated.

3.   Connect the SCSI Cable Assembly to connector SCSIID on the HVD Adapter PCBA (Figure 7-40).

4.   Place the Rear Service Panel onto the TLS, then use a number 2 Phillips screw-driver to reinstall all six Rear Service Panel mounting screws (Figure 7-39).

7.19 Q-Link

P/N 501657-01-9

Tools Required:

• Number 2 Phillips Screwdriver

Mounting
Screws
(6)
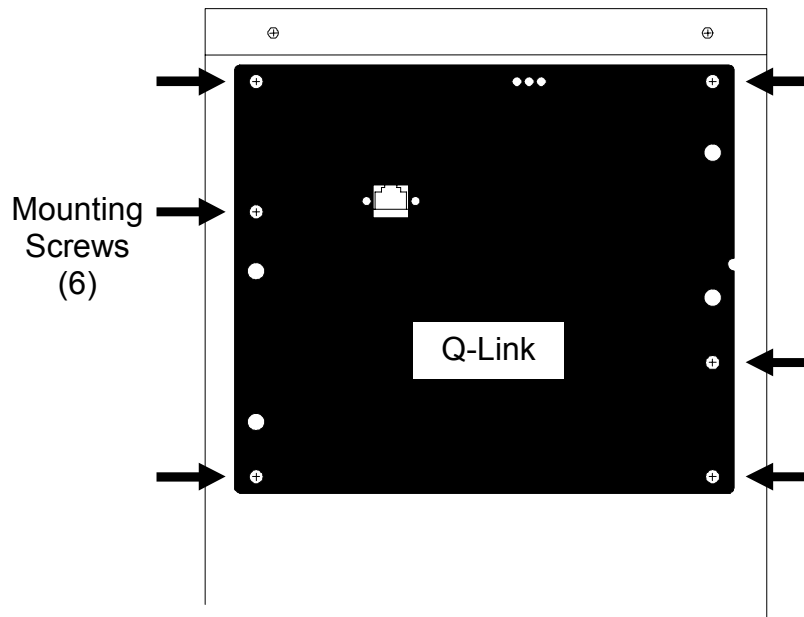
Q-Link

Figure 7-41   Q-Link on Rear of TLS

7.19.1 Q-Link Removal

1. Turn off the TLS power and remove the power cord.

2. Use a number 2 Phillips screwdriver to remove all six Q-Link panels mounting screws (Figure 7-41), then move the panel backwards to access the cables.

3. Disconnect the AUPWR cable from the POWER connector on the Q-Link PCBA as shown in Figure 7-42.

4. Disconnect the SERIAL ribbon cable from the SERIAL connector on the Q-Link PCBA as shown in Figure 7-42.

Executive PCBA

SERIAL Connector

SERIAL Ribbon Cable

AUXPWR Connector (behind ribbon cable)

Q-Link PCBA

AUXPWR Cable

SERIAL Connector
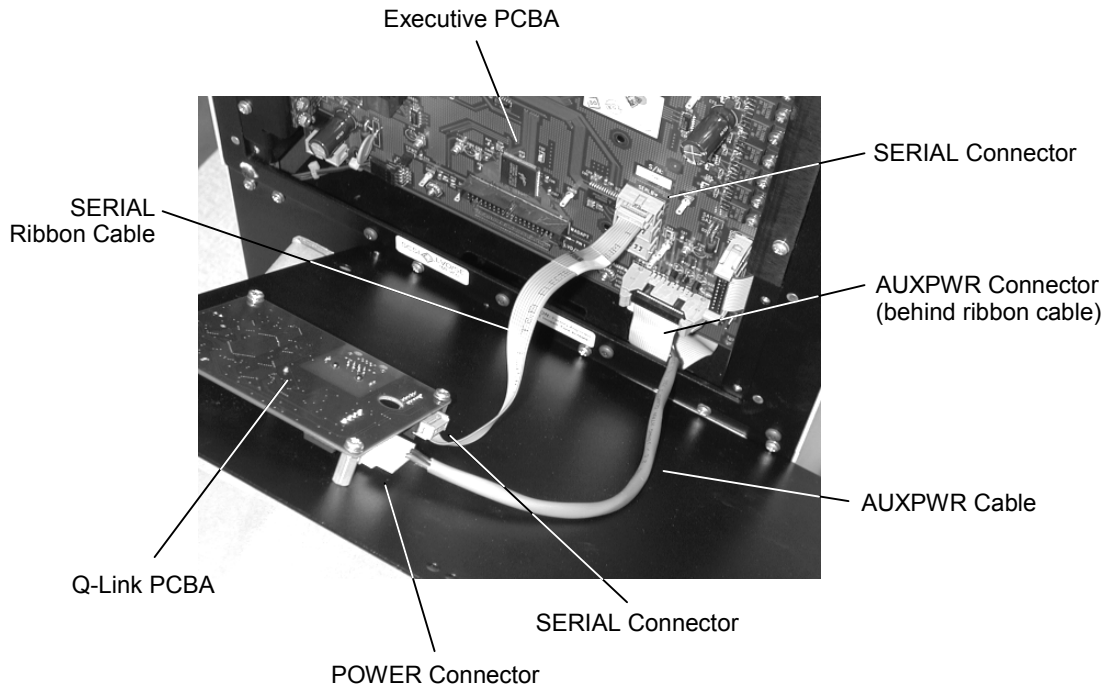
POWER Connector

Figure 7-42   Detail of AUXPWR and SERIAL Cable Connections on Q-Link PCBA

7.19.2 Q-Link Replacement

This procedure assumes that the PCBA was removed in Section 7.19.1.

1. Connect the AUPWR cable to the POWER connector on the Q-Link PCBA as shown in Figure 7-42.

2. Connect the SERIAL ribbon cable to the SERIAL connector on the Q-Link PCBA as shown in Figure 7-42 Make sure that the colored edge of the ribbon cable faces to your right side when the cable is installed.

3. Carefully align the Q-Link panels six mounting screw holes with the six threaded holes in the rear on the TLS.

4. Using a Phillips screwdriver, secure Q-Link to the rear of the TLS using the six screws removed earlier. Refer to Figure 7-41.

7.20 After-maintenance Test Procedures

The maintenance procedures listed below ***do affect*** the TLS' calibration. After any of these procedures are completed, follow the instructions in Section 5.3.2 to recalibrate the TLS.

- **Remove and replace the Carriage Assembly.**

- **Remove and replace the Carriage Assembly PCBA.**

- **Remove and replace the I/O port assembly.**

- **Remove and reinstall/replace the I/O port assembly PCBA.**

- **Remove and replace the Executive PCBA.**

If you have performed maintenance that ***does not affect*** the TLS' calibration, like changing an air filter or the fan assembly, no special after-maintenance test procedures are necessary. In this case, executing the CALIBRATE command ***is not*** recommended.

8.   Firmware Updating

8.1 Firmware Replacement

All firmware is contained in *dual-inline* integrated circuits, which are easily changed without the need for special tools. Refer to Table 8-1 for a list of the applicable boards (PCBA's – Printed Circuit Board Assemblies) and firmware part numbers.

Additionally, the firmware found on the Executive boards is contained in Flash-EPROMs which may be uploaded through the Medium changer's interface (SCSI or optional Fibre Channel), the Q-Conn RS-232 interface (using XMODEM file transfer) or the optional Q-Link Web Interface. The Q-Link Web Interface firmware can only be uploaded through its LAN or Internet connection.

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

Board Name	Board P/N	Firmware
Executive I	500657-01-0	700099
Executive III	501387-01-8	700105
Executive IV	501447-01-5	700115
Drive Bay, 2X	501326-01-1	700108
Drive Bay, 4X	501336-01-0	700108
Drive Bay, 6X	501357-01-1	700108

Table 8-1   Boards Containing Updateable Firmware

Tools Required:
- Number 2 Phillips Screwdriver
  (Flash-Memory IC Replacement only)
- Flat Blade Screwdriver
  (Flash-Memory IC Replacement only)

8.2 Determining the Installed Hardware and Required Firmware

1. The Executive PCBAs type can be determined by removing the service panel from the rear of the library and reading the part number printed on the Executive PCBA.

2. Remove power from the TLS: first turn the power switch off and then remove the power cord.

3. Remove the six Phillips screws securing the service panel on the rear of the library. Refer to Figure 8-1. Care must be taken to not remove the four screws securing the heatsink panels.

Phillips Screws (6)

Location of Part Number on Executive PCBA

Do not remove these screws

Do not remove these screws
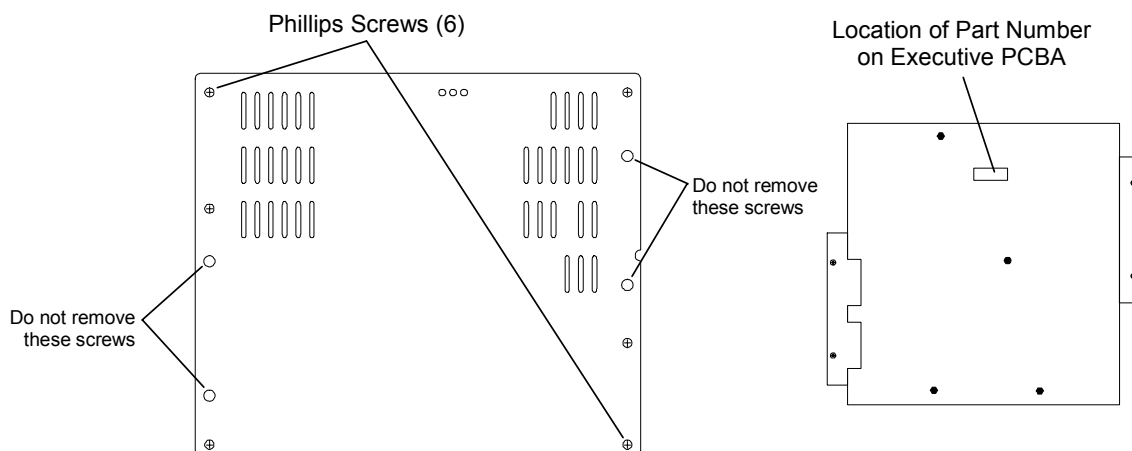
Figure 8-1   Rear Service Panel and PCBA Part Number Location

4. Refer to Table 8-2 for a list of the Executive PCBA board names, part numbers and corresponding firmware part numbers The Executive PCBAs type can be determined by reading the part number printed on the circuit board. For example, a board with a PCBA NO. 501387- printed on it is an Executive III board.

Board Name	Board Part Number	Firmware P/N
Executive I	500657-01-0	700099
Executive III	501387-01-3	700105
Executive IV	501447-01-5	700115

Table 8-2   Executive PCBA Identification

5. The current Executive firmware part number and revision can be determined by viewing the Display Revision status screen under the Maintenance menu. Follow the steps in Table 8-3.

Service Technician Action:	Display:

Press the MENU key followed by the ▼ key.	```Top Menu```
	 ``` •Configuration```
	 ```➜•Maintenance```

Press the ENTER key followed by the ▼ key.	```•••••••••Maintenance```
	 ``` •Display Log```
	 ``` •Display Prevents```
	 ``` •Display Reservs.```
	 ```➜•Display Revision```

Press the ENTER key.
 	
 In this example, the firmware part number is 700105 and the revision is 2.11.
	```M•••Display Revision```
	 ``` Date: mm/dd/yy```
	 ``` Part Number:700105```
	 ``` Revision: 2.11```
	 ``` Checksum: xxxx```
	 ``` Id: xxxxxxxx```

Press the MENU key to return to the top menu.	

Table 8-3 Steps to View the Display Revision Status Screen

6. In all TLS-4000 models with Executive III or IV boards a Drive Bay board is utilized to interface the tape drives to the Executive board. There are three sizes of Drive Bay boards (2-drive, 4-drive and 6-drive) and each contains a programmed micro-controller I.C. that is also replaceable. The firmware part number is 700108 for the 4 and 6-drive boards and 700111 for the 2-drive board.

8.2.1 Firmware Update via the SCSI of Fibre Channel Interface

A working SCSI or fibre channel interface to the TLS' Medium changer is required. To update via the SCSI interface a PC compatible computer running DOS, Windows 95, 98, XP, NT, or 2000 is required. To update via the fibre channel interface a PC compatible computer running Windows XP, NT or 2000 is required.

NOTE

Using a DOS system requires the use of Adaptec's ASPI interface for SCSI.

1. The TLS must be powered on and connected to the host computer prior to booting the host computer. [Note that when updating the firmware in a dual bay library (with two executive PCBAs), only one of the PCBAs needs to be connected. While one PCBA is being updated, the firmware will be transferred to the other PCBA].

2. The Windows console program `upload.exe` is used to upload firmware to the library. These files are contained in a self-extracting zip file `UploadUtil.exe`.

3. Execute the `UploadUtil.exe` to extract the following ZIPed files:

    - Upload.exe   - Qualstar's TLS Library firmware upload program.
    - Scanscsi.exe   - Utility to search the bus for SCSI devices.

4. Execute the program scanscsi.exe from a Windows command prompt or "DOS box". This program will perform a SCSI Inquiry operation on Ids (0-15), Luns (0-15) and Hosts (0-15). If a device is found, it will display the general information obtained from the inquiry response.

Example of scanscsi execution and response.
>scanscsi *,*,*

Id,Lun,Host	Device Type	Vendor	Product	Revision
0, 0, 1	Medium-changer	QUALSTAR	TLS-4660	2091
1, 0, 1	Sequential-access	SONY	SDX-700C	2255
2, 0, 1	Sequential-access	SONY	SDX-700C	2255

In this example, the SCSI bus scan found three devices. The first device is a Qualstar TLS-4660, followed by two Quantum Tape Drives.

NOTE

Upload.exe will not work if the Id is greater than 15, or the Lun is greater than 7 when updating the firmware in a fibre channel environment.

5. The upload console program is executed from a Windows command prompt or "DOS box". The program's command syntax is as follows:

Upload Id,[Lun[,Host]] f:<filename>

Command Parameters:

Id,Lun,Host - TLS Library SCSI address. This address can be found using the scanscsi utility program. The default Id, Lun and Host is 0.

Filename - Filename of the new firmware update. This file is provided by Qualstar Technical Support.

Upload program example:

6. Update the TLS Library with firmware file 700105c.209. The scanscsi program was used to locate the TLS Library is on SCSI Address : Id 0, Lun 0, and Host 1. Note that the firmware filename may contain a sub revision letter as shown in this example.

```
Upload 0,0,1 f:700105c.209
```

The program will display the upload transfers:

```
700105 Executive Firmware, Revision 2.09c
### Packets
```

7. <u>Do not turn off TLS power</u> while the update is in progress. The last packet is number 512.

8. The TLS will begin the firmware update process. Wait for the following message to appear on the library's display:

    ```
    FIRMWARE UPGRADE
    System Firmware
    is being changed;
    DO NOT POWER-OFF
    ```

9. It is very important not to power off the TLS while reprogramming is in progress. Doing so can cause the library to lose all of its program contents.

10. Following the upgrade, the TLS will perform an internal initialization function followed by a scanning of the TLS inventory.

11. The FIRMWARE UPGRADE message will be cleared when the process has completed.

12. Go to the `Maintenance\Display Revision` menu. The displayed Part Number and Revision must correlate with the firmware just uploaded.

8.3 Firmware Update via Q-Link

Q-Link allows for the uploading of library firmware using your web browser. Please see the 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.
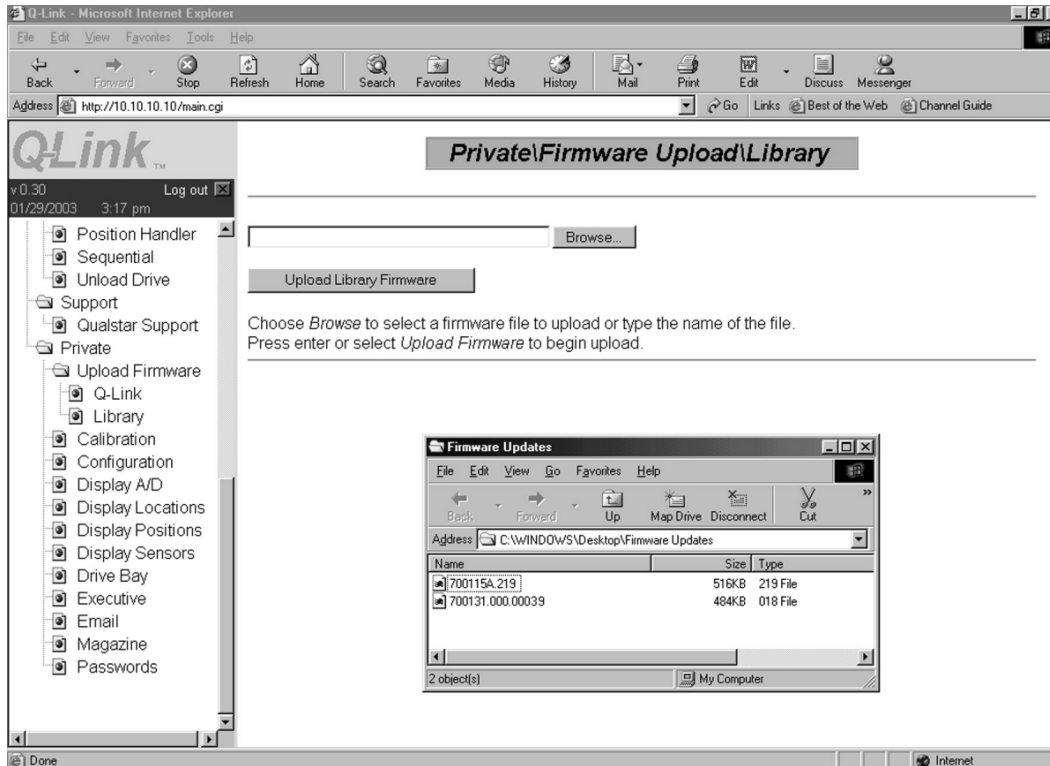
Figure 8-2 Sample of the Library Firmware Upload Screen

1. Access the firmware file by either clicking on the Browse button or typing the file path to the firmware file.

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 8-4 and Figure 8-5.

5. When the Q-Link uploading\programming is complete a screen will appear that shows the old and new firmware information. See Figure 8-3.

> 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 8-3 Sample of the Library Uploading/Programming Has Finished Screen
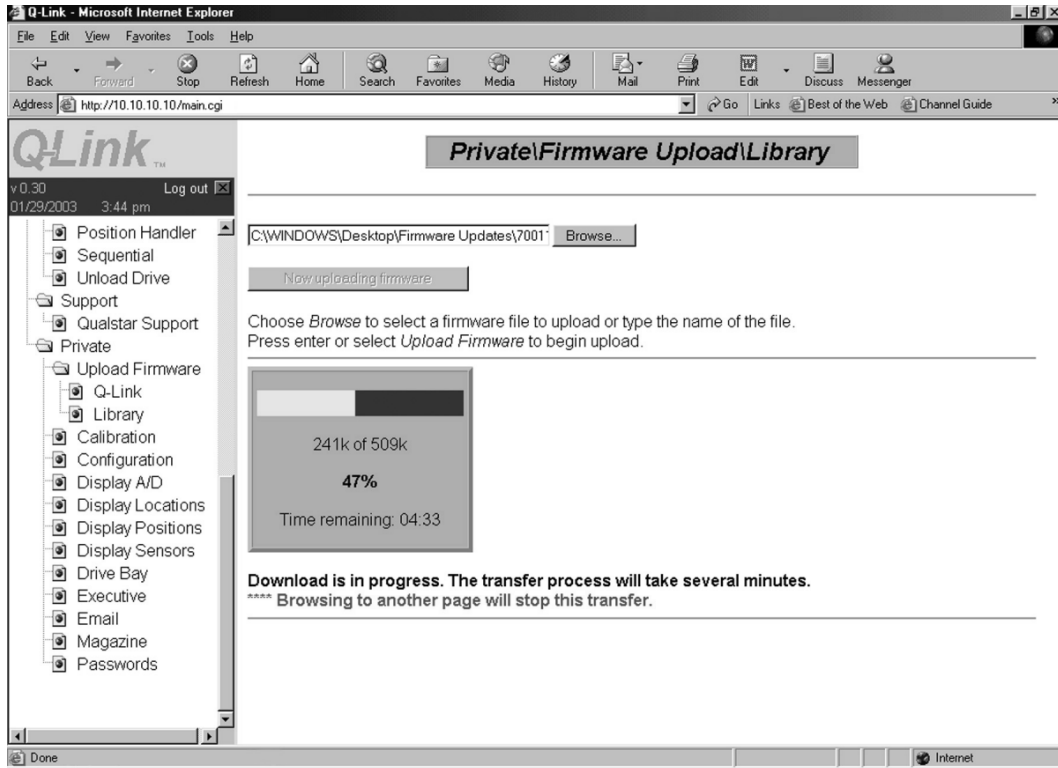
Figure 8-4   Sample of the Library Firmware Upload Progress Screen
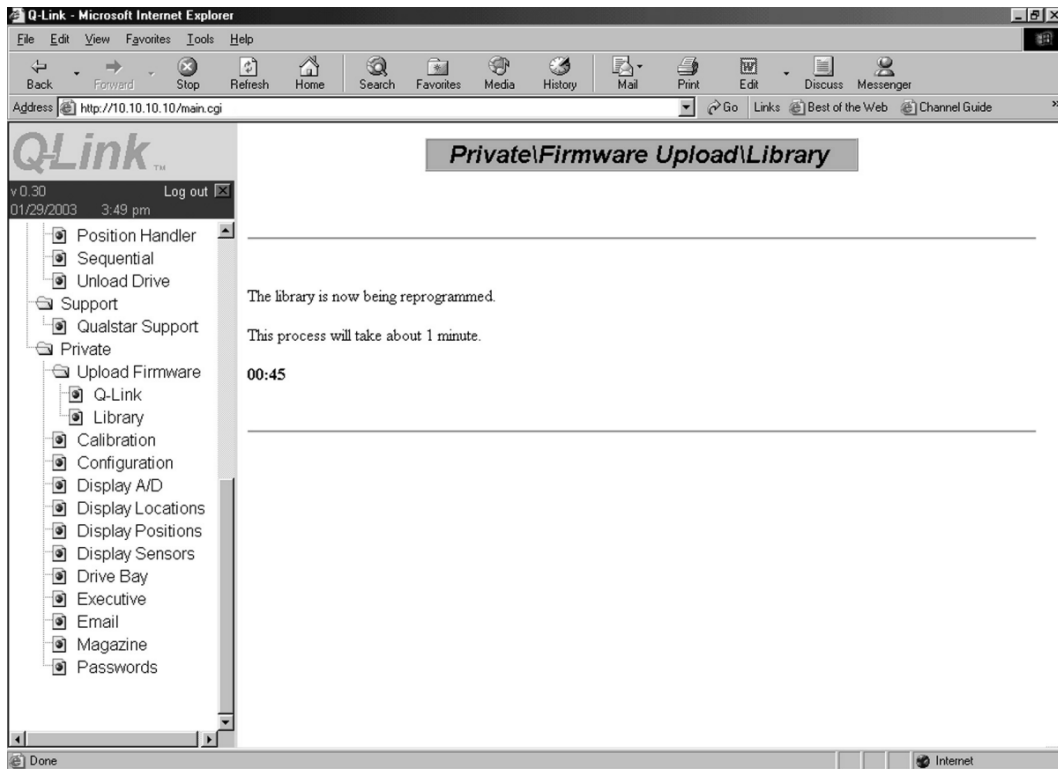
Figure 8-5   Sample of the Library Firmware Reprogramming Progress Screen

8.4 Firmware Update via Q-Conn

The user's host computer and the TLS are connected together using a NULL modem serial cable. This cable must have female DB-9 connectors at each end and wiring such that pins 2 and 3 are crossed over and pins 5 are connected to each other at both ends. See Table 8-4.
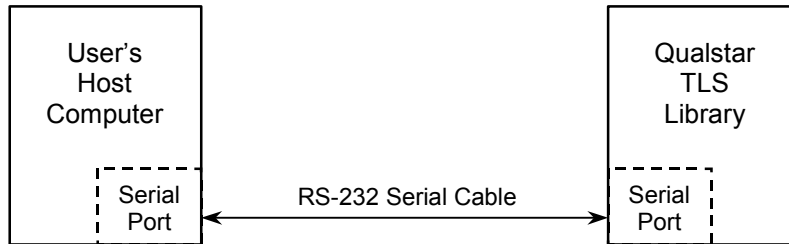
Figure 8-6 Host Computer Connected to TLS

8.4.1 RS-232 Cable Wiring

User Host or PC RS232 Serial Female DB-9 Connector		TLS Library RS232 Serial Female DB-9 Connector	
Signal Name	**Pin**	**Pin**	**Signal Name**
Receive Data	2	3	Transmit Data
Transmit Data	3	2	Receive Data
Ground	5	5	Ground

Table 8-4 RS-232 Cable Wiring Requirements

8.4.2 RS-232 Serial Communications Parameters

Communication Parameter	Setting
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	1

Table 8-5 RS-232 Serial Communication Parameters

8.4.3 User Terminal Software Setup Example

Windows 9x and NT users can use the Communications accessory program, Hyper-Terminal. Use the `File\Properties` menu selection to configure the application for direct communications. Select the appropriate communications port. See Figure 8-8.
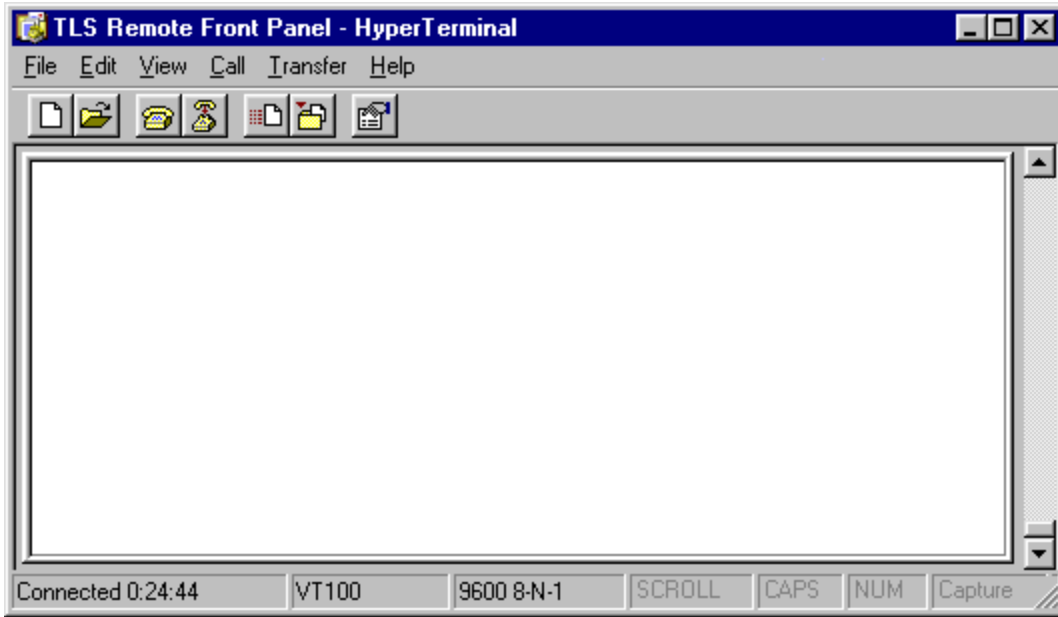
Figure 8-7 TLS Remote Front Panel Program Displayed in HyperTerminal

Select the Configure button to set the communications parameters for a baud-rate of 9600, with 8 data bits, no parity, one stop bit and no flow control. See Figure 8-9.
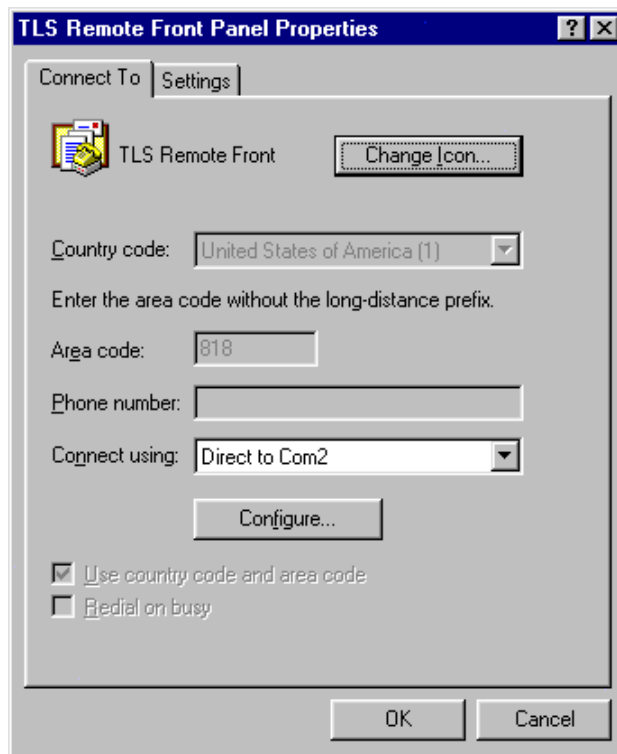
Figure 8-8 Properties Screen
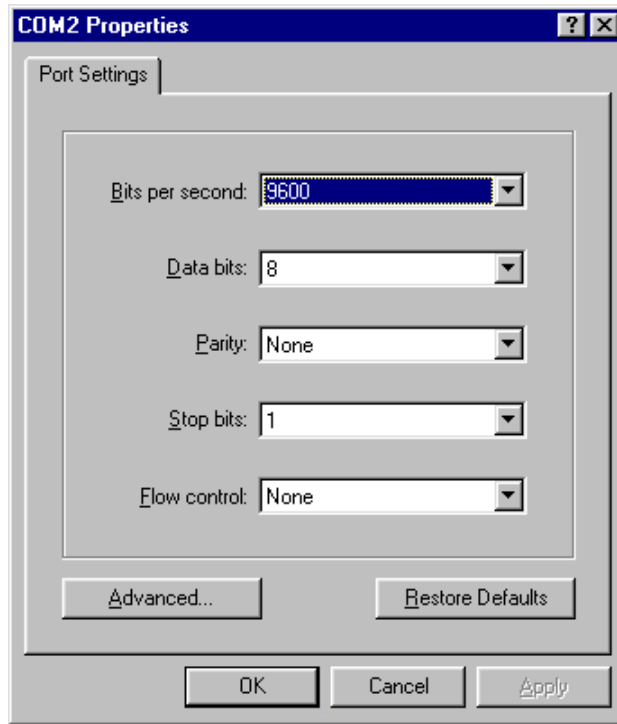
Figure 8-9   Configure Screen Under the Properties Menu

8.4.4 VT100 Terminal Emulation

Use the `File\Properties Settings` dialog tab to configure the application for VT100 terminal emulation. You may also consider `ASCII Setup` parameters to satisfy your display requirements.
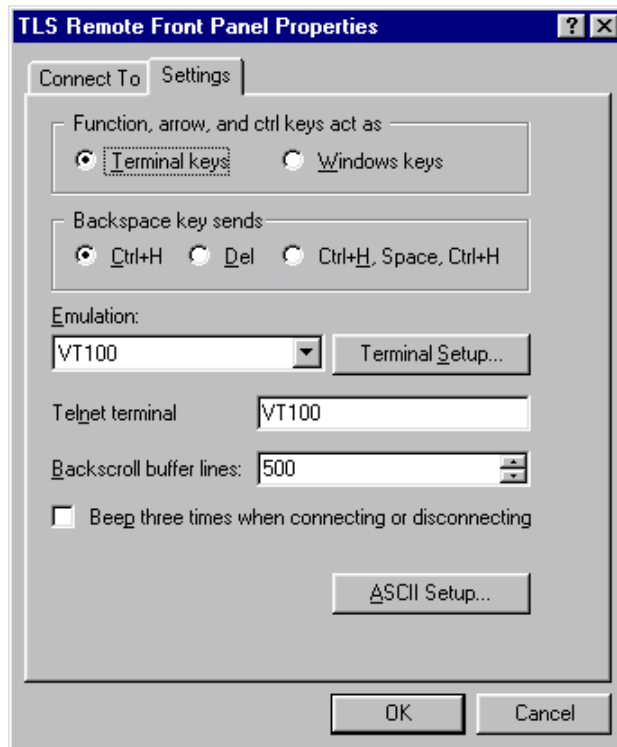
Figure 8-10   Settings Screen Under the Properties Menu
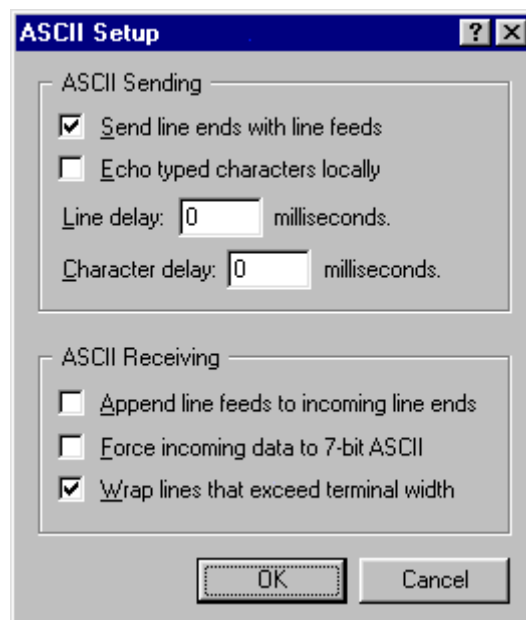
Figure 8-11   ASCII Setup Screen under Settings Screen

8.4.5 Remote Library Command Mode

To access the Remote Library Command Mode, press the ESC key and type "cmd" followed by the <Enter> key. This will display the Command Help screen depicted in Figure 8-12 followed by a DOS-like command prompt ">". Commands may now be entered in lower case text. All commands must end with the <Enter> key. Most terminal emulators support the backspace key for correcting typing errors. Quotation marks are shown for clarity and are not to be typed in the actual command line.

```
Com2_96 - HyperTerminal
File   Edit   View   Call   Transfer   Help

Qualstar Remote Library Commands
--------------------------------
?       - Command Help
drive # - Drive select (AIT only)
exit    - Exit to Front Panel
lock    - Lock log
log     - Log
rst     - Reset TLS
unlock  - Unlock log
xdl     - Xmodem firmware download

>

Connected 1:06:47    VT100    9600 8-N-1    SCROLL   CAPS   NUM   Capture
```
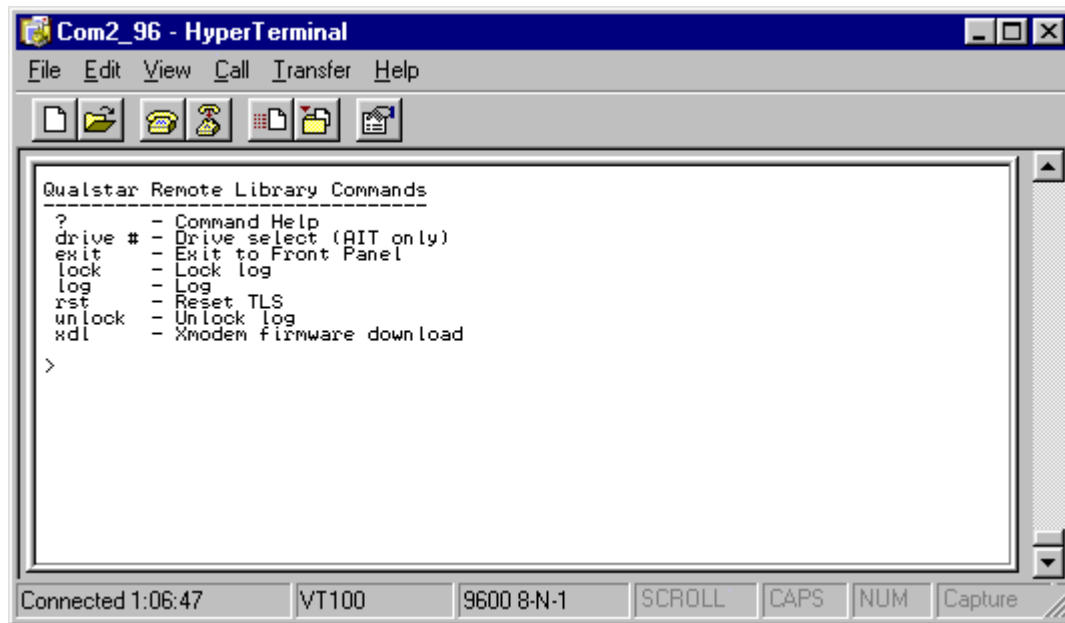
Figure 8-12   Remote Library Commands

8.4.6 Xmodem Firmware Download <xdl>

The "xdl" command instructs the library to receive new TLS firmware via an object file on the remote terminal computer using the XMODEM communications protocol. If the transmission is terminated at the terminal emulator, the TLS will ignore the partial download. Do not turn off TLS power while the update is in progress. If the entire firmware object file is successfully downloaded, the TLS will reprogram itself and then restart automatically.

Once the library restarts, the user will see the Qualstar Remote Library Control Panel.

8.4.6.1   Example of a download session

Enter the command "xdl". The application will respond "Receiving TLS Firmware", to indicate it is waiting for the user's xmodem data.
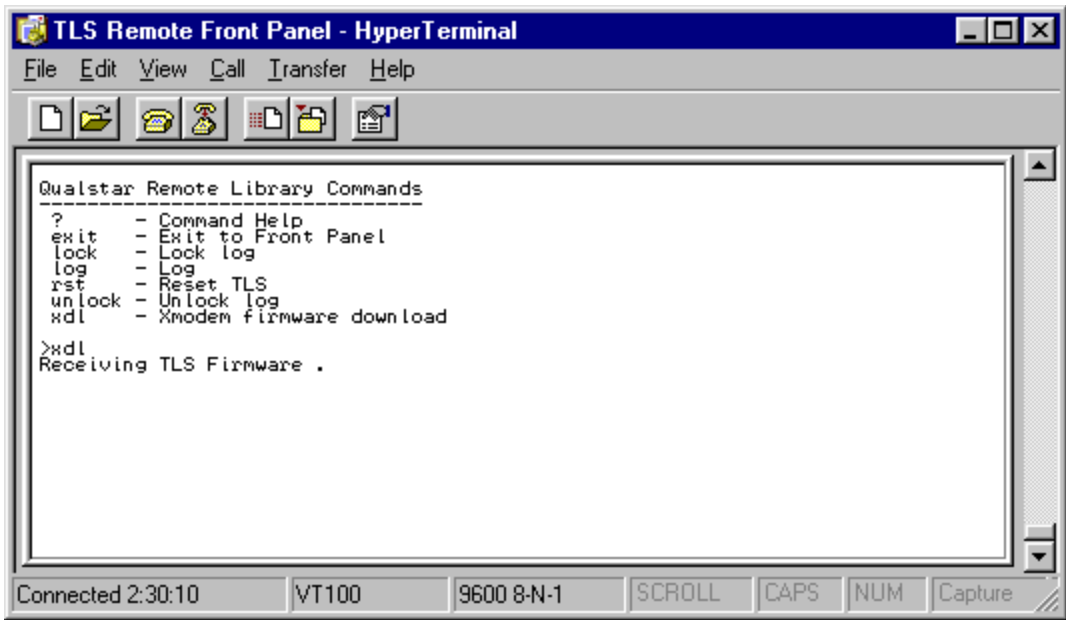
Figure 8-13   Example of Xmodem Firmware Download

Use the HyperTerminal menu function `Transfer->Send File`, to download the
TLS firmware file to the library. TLS firmware object files are typically named
700105.211 where 700105 represents the code-set name and 211 is the Version (Ver-
sion 2.11 in this example). A revision letter may follow the code-set name.

NOTE

*It is very important not to power off the TLS Library while reprogramming is in progress. Power-
ing off the TLS Library is not necessary and can cause the TLS Library to lose its program con-
tents.*
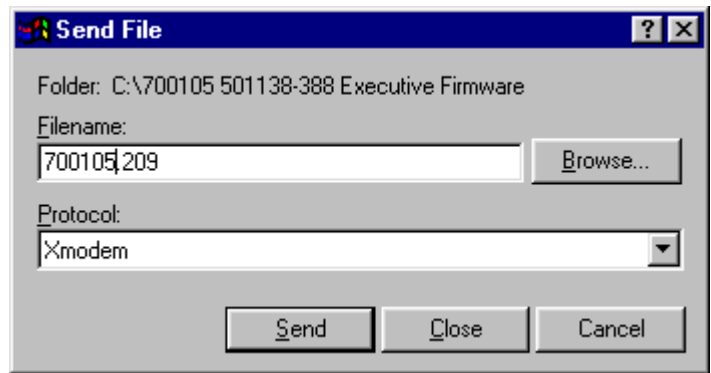
Figure 8-14   Send File Screen Under Transfer

8.4.7 Procedure for Replacing the Flash Memory I. C. on Executive I Boards

This procedure will lead you through the process of changing the TLS operating firmware on an Executive I board. It involves removing the rear service panel and replacing a 32-pin, DIP Flash-EPROM memory integrated circuit (IC). Contact Qualstar Technical Support to obtain the necessary integrated circuit (the Part Number is 700099).

1. Remove power from the TLS: first turn the power switch off and then remove the power cord.

2. Remove the six Phillips screws securing the access panel on the rear of the library – refer to Figure 8-15. Care must be taken to not remove the four screws securing the heatsink panels.

Phillips Screws (6)

Do not remove these screws

Do not remove these screws
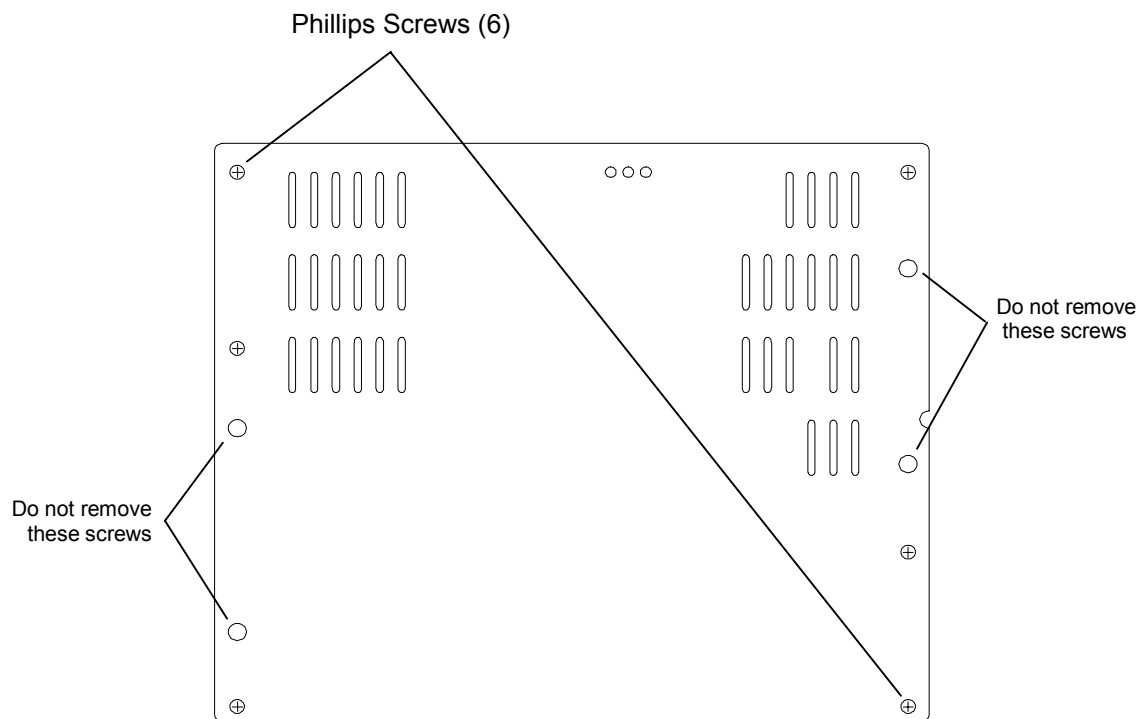
Figure 8-15   Access Panel

3. Remove the Flash-Memory IC at U10 (Part Number is 700099) from the Executive I PCBA using a flat blade screwdriver or equivalent tool. Pry the IC from either end slightly and repeat for the other end. Continue this procedure until the part is loosened enough to be removed by hand. Refer to Figure 8-16.
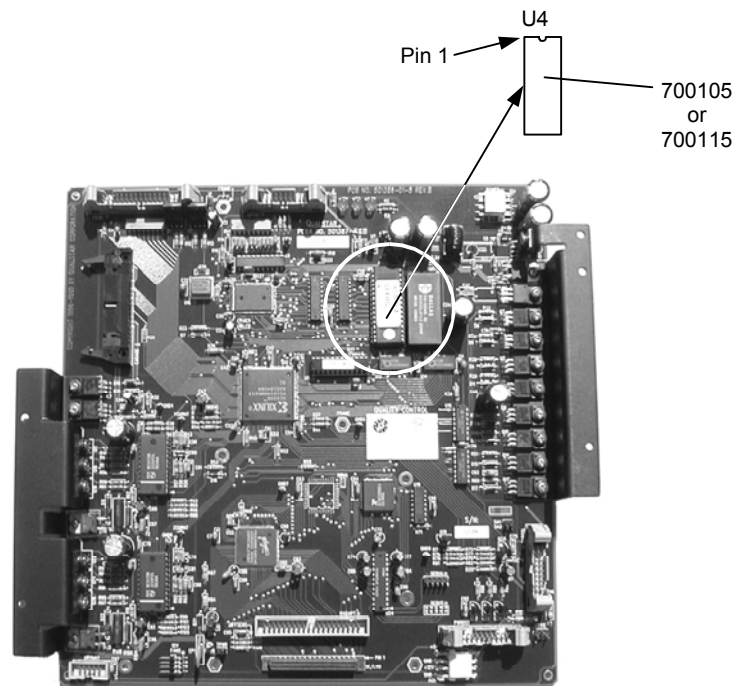
U10 700099
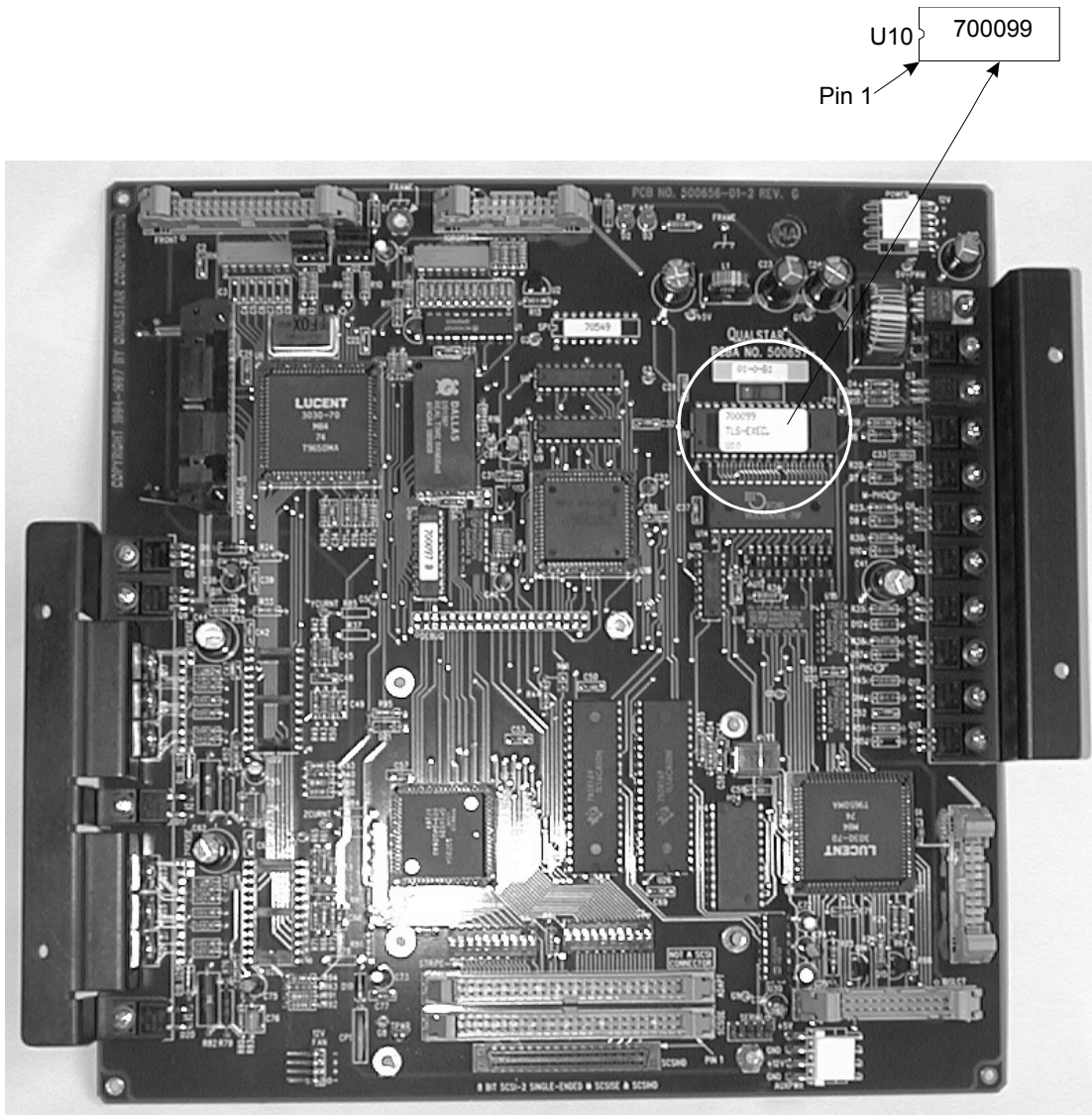
Pin 1

Figure 8-16   500657-01-0 Executive I PCBA

4. Install the new 700099 Flash-Memory IC at U10. Note the orientation of pin 1. Make certain that all pins are fully inserted into the socket.

5. Replace the access panel and secure it with the six Phillips screws.

6. Connect the power cord and switch the power on.

7. Go to the `Maintenance\Display Revision` menu and verify the firmware P/N and Revision are correct. See Table 8-3.

8.4.8 Procedure for Replacing the Flash Memory I.C. on Executive III or IV Boards

This procedure will lead you through the process of changing the TLS operating firmware on an Executive III or IV board. It involves removing the rear service panel and replacing a 32-pin, DIP Flash-EPROM memory integrated circuit (IC). Contact Qualstar Technical Support to obtain the necessary integrated circuit.

1. Remove power from the TLS: first turn the power switch off and then remove the power cord.

2. Remove the six Phillips screws securing the access panel on the rear of the library - refer to Figure 8-15. Care must be taken to not remove the four screws securing the heatsink panels.

3. Remove the Flash-Memory IC at U4 (Part Number is 700105) from the Executive PCBA using a flat blade screwdriver or equivalent tool. Note the IC location (U-number) is identical on Executive III and IV boards. Pry the IC from either end slightly and repeat for the other end. Continue this procedure until the part is loosened enough to be removed by hand. Refer to Figure 8-17.

Figure 8-17   Executive III or IV PCBA

4. Install the new 700105 or 700115 Flash-Memory IC at U4. Note the orientation of pin 1. Make certain that all pins are fully inserted into the socket.

5. Replace the access panel and secure it with the six Phillips screws.

6. Connect the power cord and switch the power on.

7. Go to the `Maintenance\Display Revision` menu and verify the firmware P/N and Revision are correct. See Table 8-3.

8.4.9 Procedure for Replacing the Flash Memory I.C. on Drive Bay Boards

This procedure will lead you through the process of changing the operating firmware on a TLS-4000 Drive Bay Board. It involves opening a drive access hatch or removing a drive access panel and replacing a 28 pin DIP Micro-controller integrated circuit (IC) on the Drive Bay board. Contact Qualstar Technical Support to obtain the necessary integrated circuit.

1. Remove power from the TLS: first turn the power switch off and then remove the power cord.

2. On TLS-42xx series libraries, open the Drive Access Hatch at the rear of the TLS by turning its two 1/4-Turn Fasteners one quarter-turn counter-clockwise (see Figure 8-18). On all other models, remove the Drive Access Panel at the rear of the TLS by turning the three to five 1/4-Turn Fasteners one quarter-turn counter-clockwise (see Figure 8-19).

42xx Series
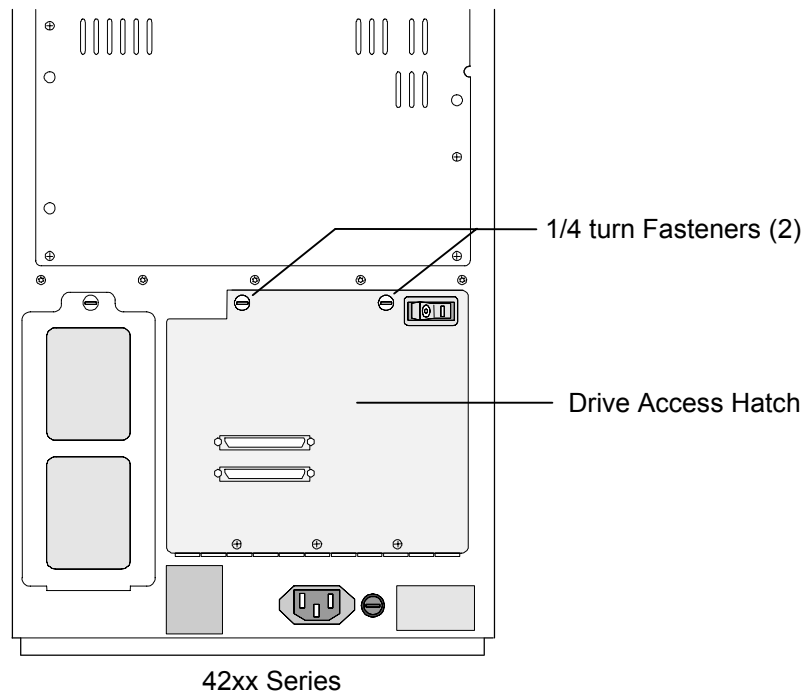
Figure 8-18   TLS Rear View (42xx shown)
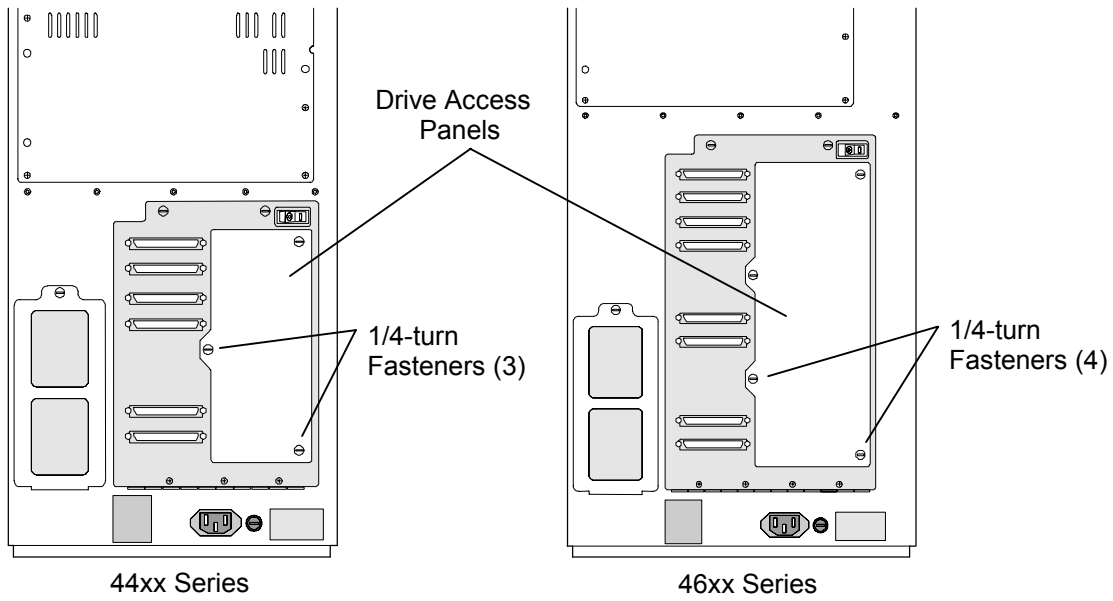
Figure 8-19   Rear View (44xx and 46xx shown)

3.   Locate the Drive Bay PCBA (Figure 8-20). Remove the Flash-Memory IC from the Drive Bay board (see Figure 8-21) using a flat blade screwdriver or equivalent tool. Pry the IC from either end slightly and repeat for the other end. Continue this procedure until the part is loosened enough to be removed by hand.
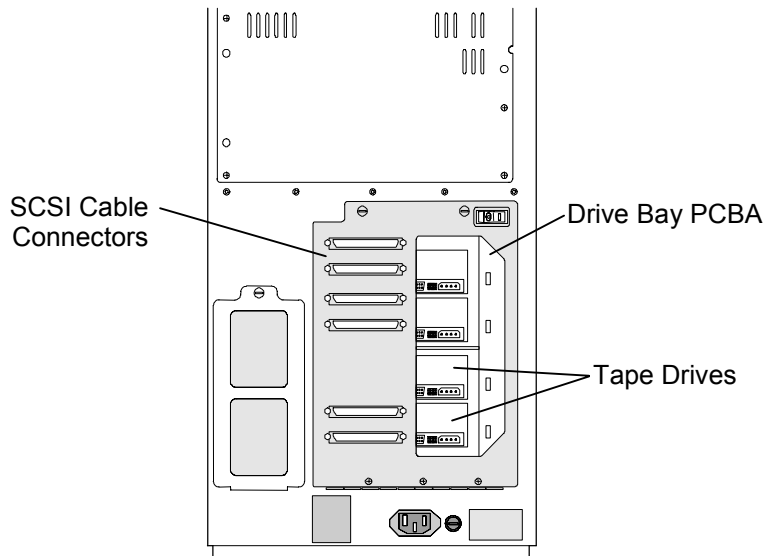
Figure 8-20   Drive Bay PCBA (TLS Rear View)
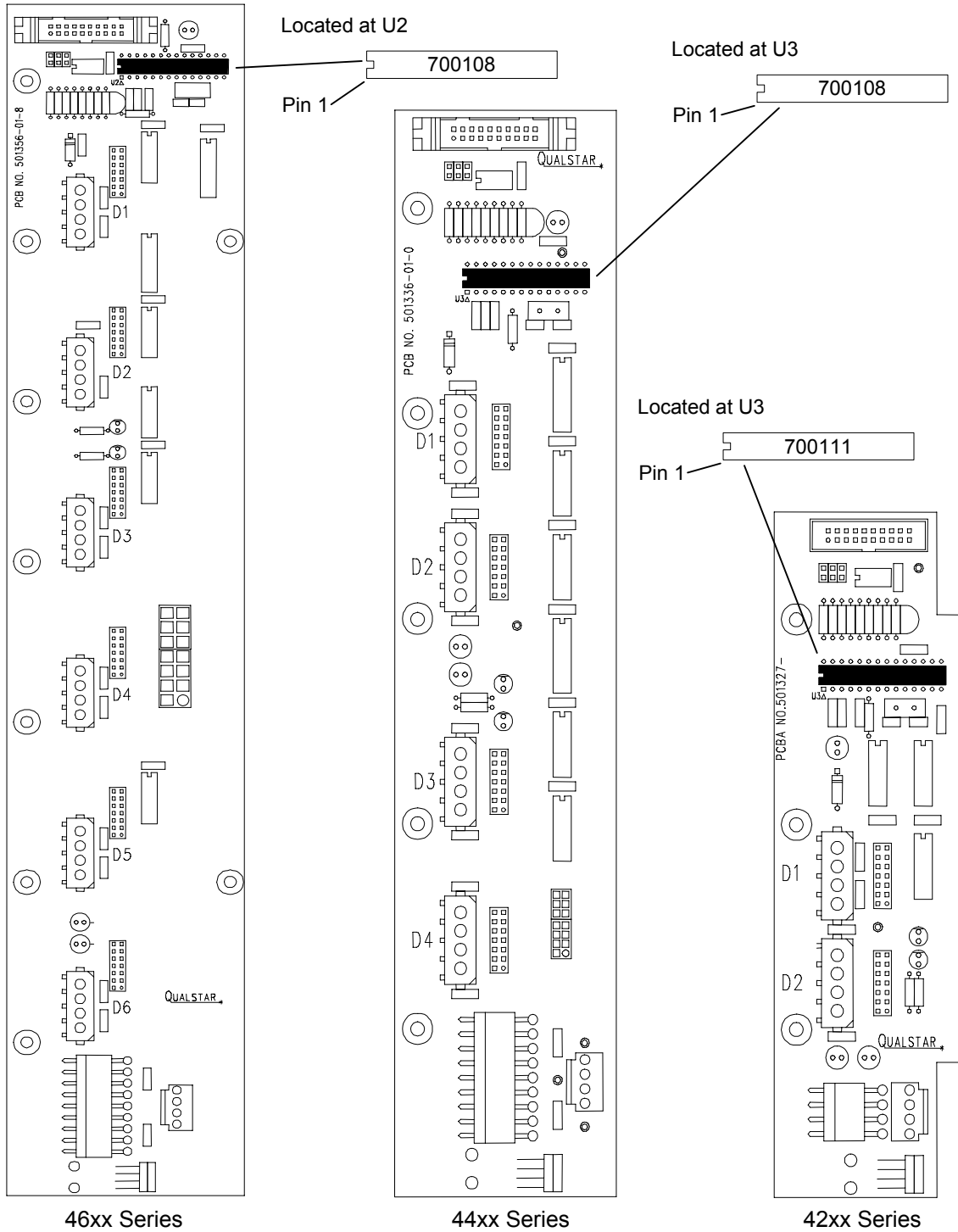
Figure 8-21   Drive Bay Boards: 6X, 4X and 2X

  4.   Install the new Flash-Memory IC on the Drive Bay PCBA. Note the orientation
          of pin 1. Make certain that all pins are fully inserted into the socket.

5. After replacing the Flash-Memory IC on a 42xx series library, close the Drive Access Hatch, then fasten it by turning the two 1/4-turn fasteners clockwise. On 44xx and 46xx series libraries align the Drive Access Panels three or four (model dependent) 1/4-turn fasteners with the corresponding receptacles on the rear panel, then fasten it by turning the 1/4-turn fasteners clockwise.

9.   TLS Expansions

9.1 Introduction

This chapter contains installation instructions for each TLS expansion kit. To replace
an existing FRU (Field-Replaceable Unit), follow the instructions in Chapter 7.

A number of expansion kits are available from Qualstar. Some expansion kits are
used to increase the cartridge capacity of some TLS models, while other expansion
kits are used to add a Barcode Reader (Section 9.3) to any TLS model. Installing or
removing an expansion kit changes the configuration of a unit. Therefore, after an ex-
pansion kit is installed, the unit must be reconfigured and, in some cases, recali-
brated.

9.2 Model Expansions

The capacity expansion kits are listed in Figure 9-1. Each kit should take less than 30 minutes to install.

Model Upgrade	Expansion Kit P/N	Capacity Increase		Section	Page
Model 4212 to 4222	500829-05-6	10 to 20	Cartridges	9.2.1.1	9-3
Model 4440 to 4480	500830-04-7	40 to 80	Cartridges	9.2.1.2	9-8
Model 4660 to 46120	500831-02-9	60 to 120	Cartridges	9.2.1.3	9-10

Figure 9-1 Available Model Expansion Kits

Installing an expansion kit is a five–step procedure:

1. Install the new hardware.

2. Enter `Update` for the password in the Private menu. (Reconfiguring the TLS model number and recalibrating the TLS are password-protected procedures.)

3. Reconfigure the Library's model number to reflect the hardware changes.

4. Recalibrate the Library.

5. Clear the password (`Update`) to prevent unauthorized access to the Private menu.

9.2.1 Installing a Model Expansion Kit

This procedure requires one expansion kit (described in Figure 9-1), plus a number 2 Phillips screwdriver to install the hardware.
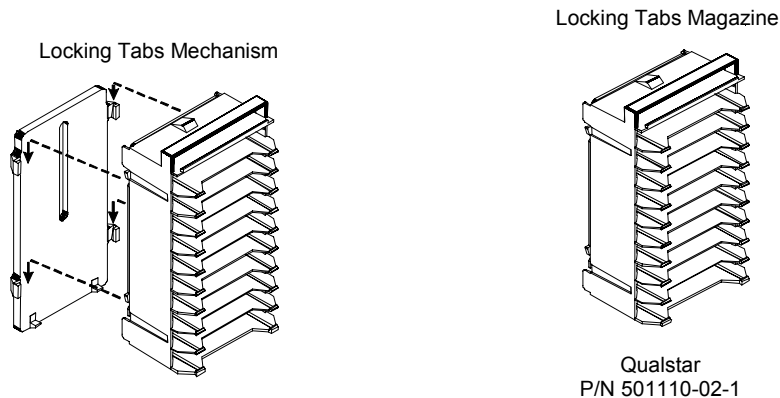

Figure 9-2 8mm Magazine Mechanism

9.2.1.1 Model 4212 to Model 4222 Expansion

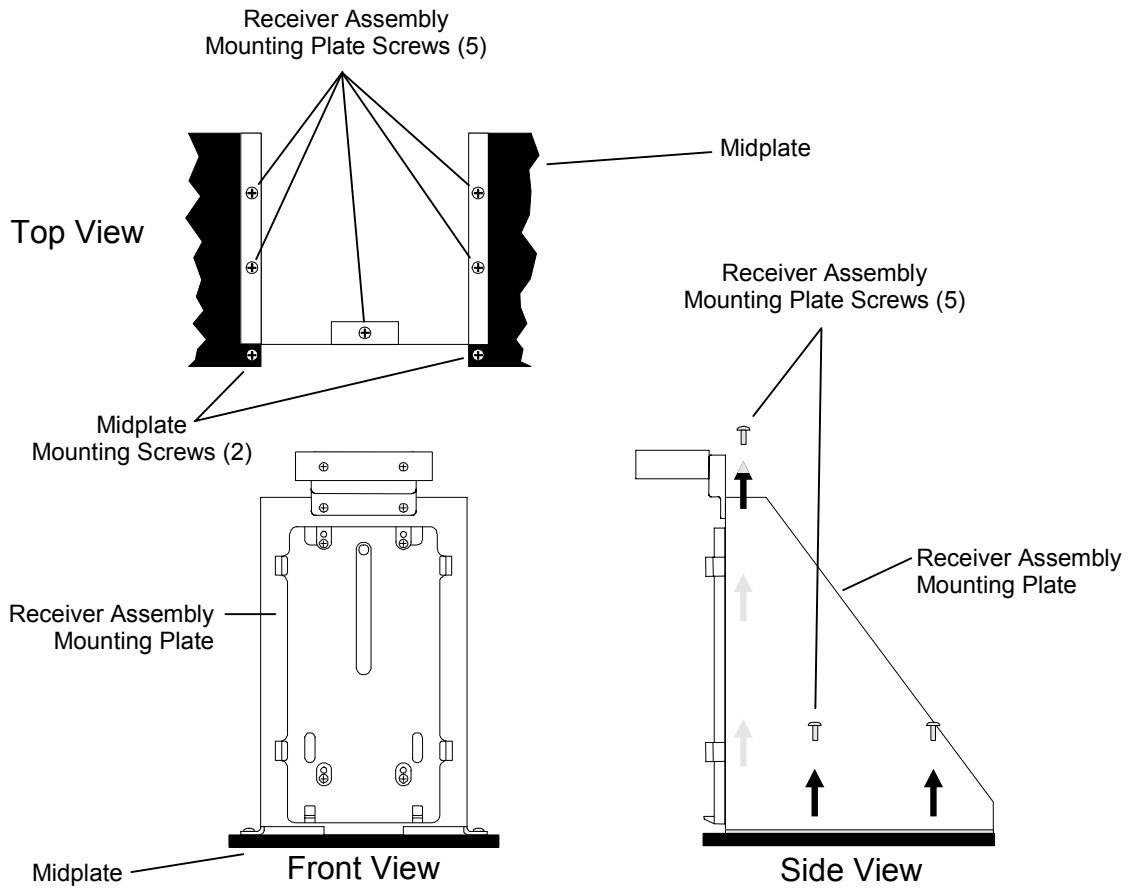This procedure replaces the Midplate, and adds a Carousel and two Receivers.

Receiver Assembly
Mounting Plate Screws (5)

Top View

Midplate

Receiver Assembly
Mounting Plate Screws (5)

Midplate
Mounting Screws (2)

Receiver Assembly
Mounting Plate

Receiver Assembly
Mounting Plate

Receiver Assembly
Mounting Plate

Midplate

Front View

Side View

Figure 9-3   4212 Receiver Assembly Mounting Plate

9.2.1.1.1 Removal of Receiver Assembly and Midplate

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. Remove the Top Panel and both Side Panels (Section 7.4).

4. If the TLS has an I/O port gently turn the I/O port leadscrew by hand to move the I/O port slot forward (towards the cabinet door).

5. Using a Philips screwdriver remove the five Receiver Assembly mounting screws (Figure 9-3).

6. Remove the Receiver Assembly Mounting Plate through the front of the TLS.
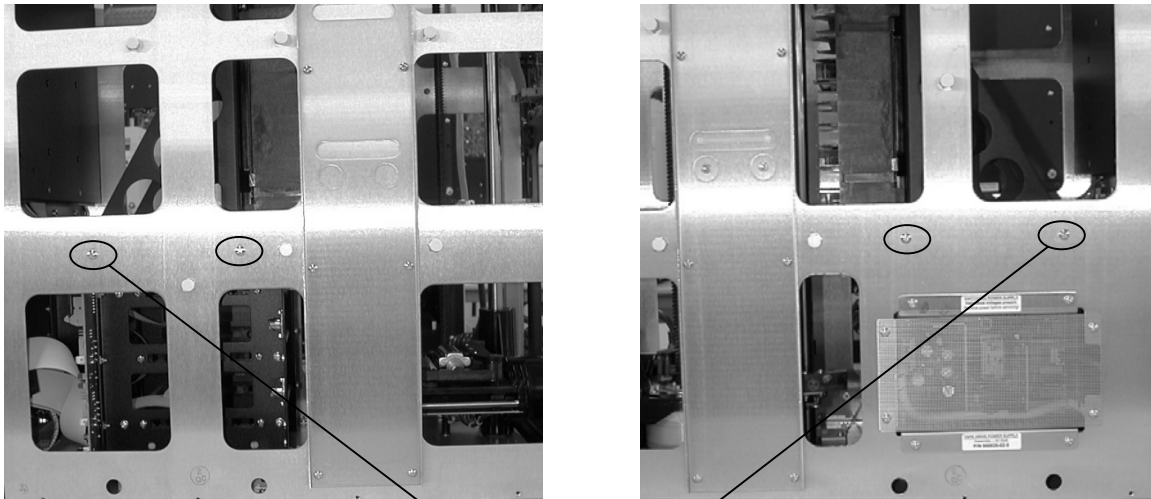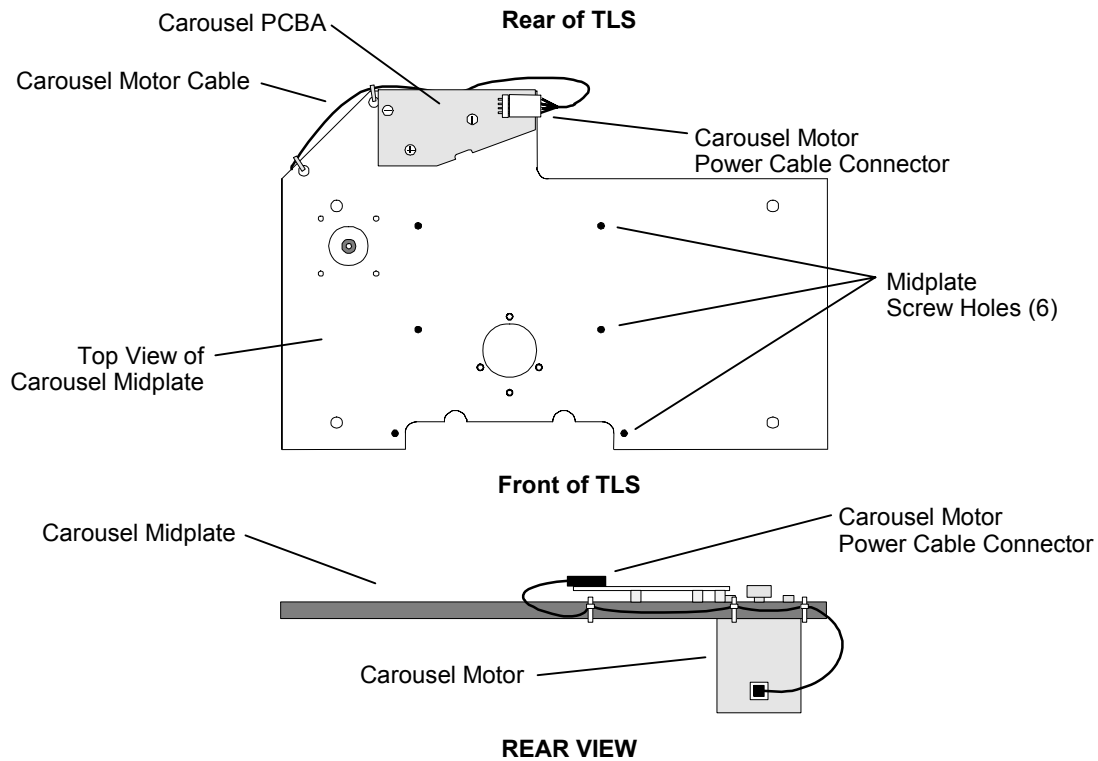
Midplate mounting screws (4)

Left Side of TLS   Right Side of TLS

Figure 9-4   Midplate mounting screws

7. From the left and right side of the TLS remove the four Midplate mounting screws (Figure 9-4).

8. From the inside of the TLS the remove two Midplate mounting screws (Figure 9-3), then remove the Midplate from the TLS.

9.2.1.1.2 Adding the Carousel Midplate

Figure 9-5 The Carousel Midplate with Motor and PCBA

1. Place the Carousel Midplate in the TLS and align it with the six mounting holes in the top of the drive bay sides. (Figure 9-5).

2. With a Phillips screwdriver attach the Midplate to the top of the drive bay sides using the Midplate and Receiver Assembly Mounting Plate screws that were removed earlier.

3. From the right and left sides of the TLS, use a Phillips screwdriver to install the four Midplate screws that were removed earlier. (Figure 9-4).

4. Attach one end of the CAROSL ribbon cable to the CAROSL connector on the Executive PCBA. See Figure 7-28.

CAROSL Cable

Executive PCBA

Frame of TLS

Upper Opening

Tie Wrap
Holes (6)

Nylon Cable
Tie Pair (3)
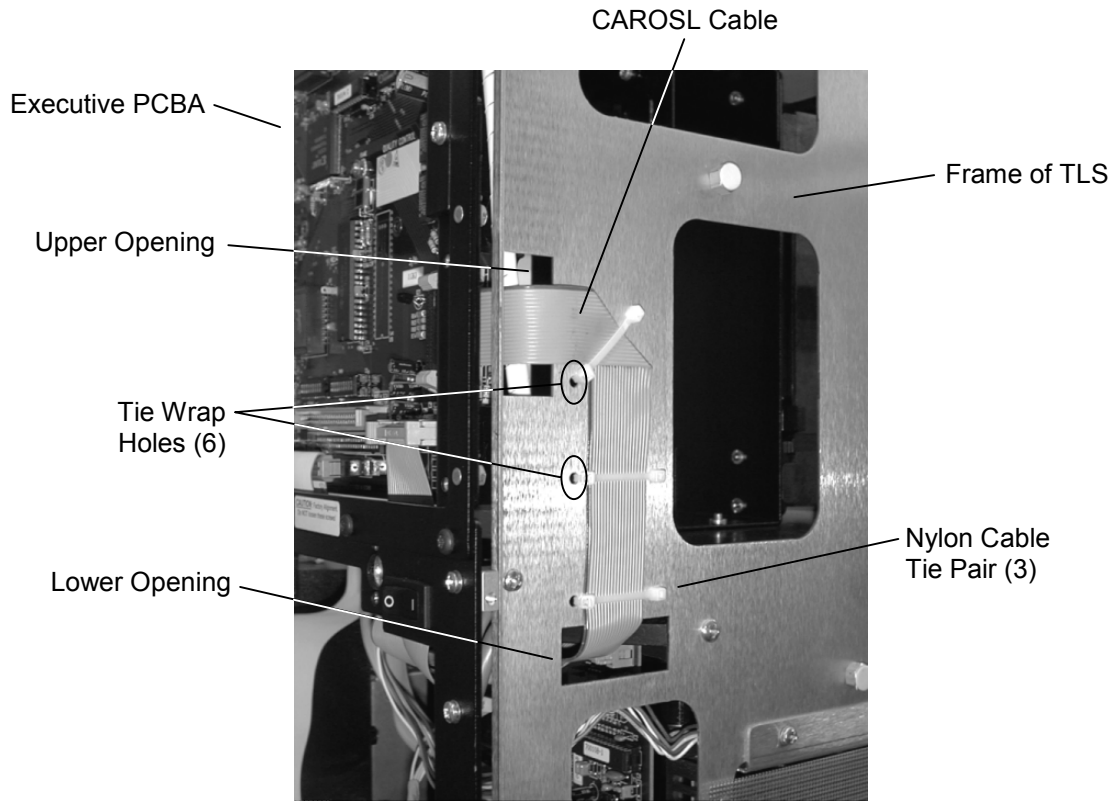
Lower Opening

Figure 9-6   CAROSL Ribbon Cable Attached to TLS Frame

NOTE

Six Nylon Cable Ties will be needed to secure the CAROSL ribbon cable to the TLS frame.

5.   Thread the CAROSL cable through the upper opening in the TLS frame as shown in Figure 9-6.

6.   Fold the CAROSL cable at a 45 degree angle so that the fold is centered between the first two tie wrap holes and the remaining length of cable is centered between the remaining tie wrap holes as shown in Figure 9-6.

7.   At the uppermost set of tie wrap holes insert a Nylon Cable Tie through both holes from the inside of the TLS.

8.   Position a second Nylon Cable Tie over the CAROSL cable, then attach it to both ends of the first Nylon Cable Tie.

9.   Tighten the Nylon Cable Ties, without crimping the cable, until they secure the CAROSL cable to the TLS frame.

10.   Repeat steps 7 through 9 for the two remaining sets of tie wrap holes. Make sure that no slack is left in the CAROSL cable after the Nylon Cable Ties are installed.

11. Thread the CAROSL cable through the lower opening in the TLS frame as shown in Figure 9-6.

12. Thread the CAROSL ribbon cable under the Midplate and attach it to the CAROSL connector on the Carousel PCBA. See Figure 9-7.
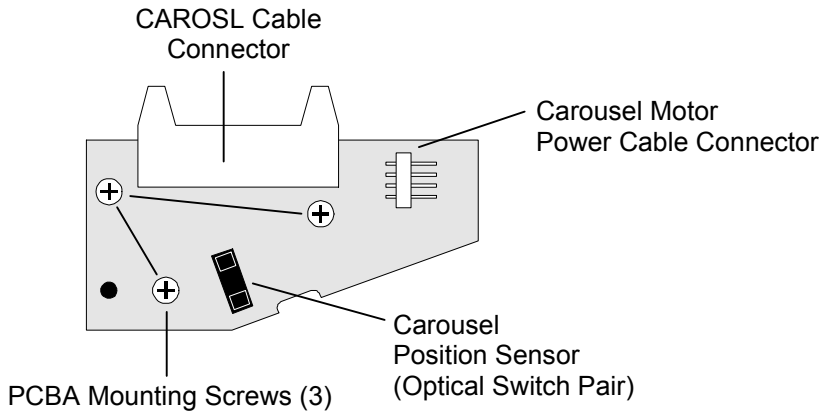
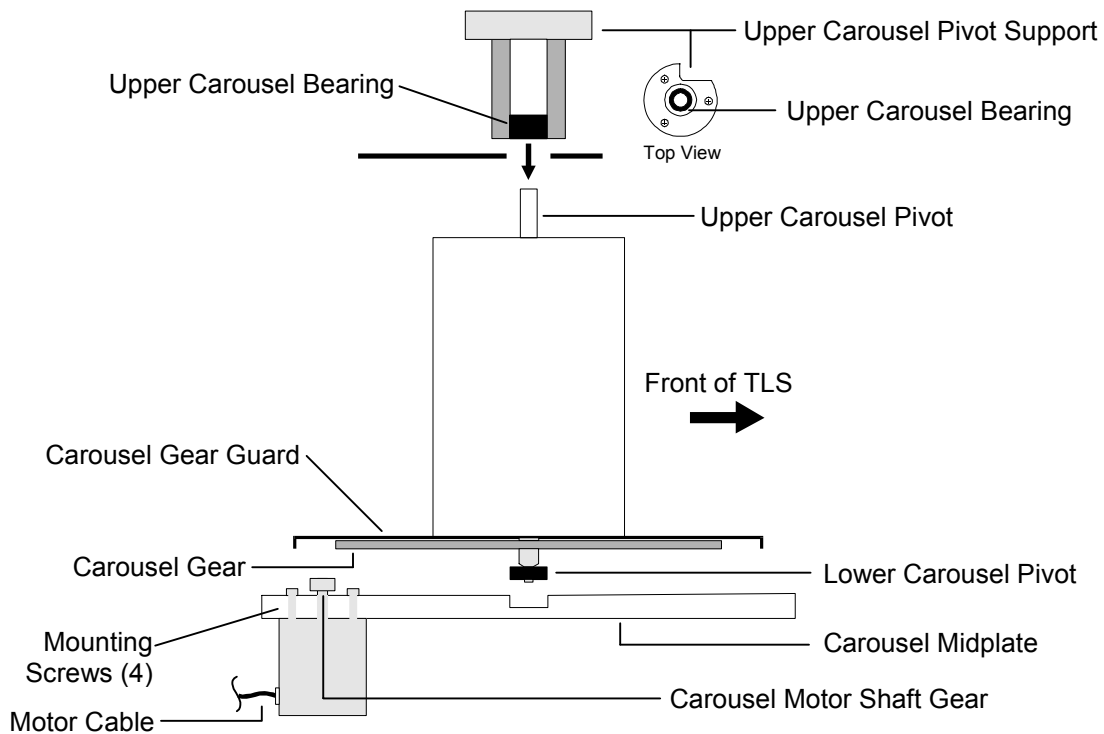**Figure 9-7   Carousel PCBA**

9.2.1.1.3 Adding the Carousel

Figure 9-8   The Carousel Assembly

CAUTION

Be careful not to damage the Carousel Position Sensor with the Carousel Gear Guard when you install the Carousel (Figure 9-7 and Figure 9-8).

1.   Insert the Carousel through the open cabinet door.

2.   Align the lower Carousel Bearing with the TLS Frame, then lower the Carousel down into place (Figure 9-8). Use caution as to not damage the Carousel Gear or the gear on the Carousel Motor shaft as you lower the Carousel into position.
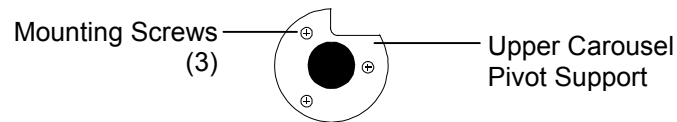
Figure 9-9   Top View of Upper Carousel Bearing

3.   Align the upper end of the Carousel Shaft with the Upper Carousel Pivot Support (Figure 9-8), then lower the Upper Carousel Pivot Support down through the top of the TLS onto the upper Carousel Pivot (Figure 9-9).

4.   Align the mounting screw holes in the Upper Carousel Pivot Support with the mounting screw holes in the TLS, then use a number 2 Phillips screwdriver to install all three 10/32 x 1/2 Upper Carousel Pivot Support mounting screws. Tighten the screws securely (Figure 9-9).

5.   Reinstall the Side Panels (Section 7.4.4), then reinstall the Top Panel (Section 7.4.2).

6.   Proceed to Section 9.2.2 of this chapter.

9.2.1.2   Model 4440 to Model 4480 Expansions

This procedure adds one Receiver Assembly and two Receptacle Assemblies to each of the two empty carousel faces [four Receiver Assemblies and two Receptacle Assemblies total].

Figure 9-11 shows the hole patterns for mounting the receivers.

Refer to Figure 9-10.

1.   Turn off the TLS power and remove the power cord.

2.   Open the cabinet door.

3.   Reach in through the cabinet door and rotate the Carousel by hand until an empty Carousel face (one without Receivers) faces you.

4.   Use four 6-32 x 3/8-inch screws to install a new Receiver Assembly onto the lower half of the empty Carousel face.

5. Use four 6-32 x 3/8-inch screws to install a new Receiver Assembly onto the upper half of the empty Carousel face.

6. Use two 6-32 x 5/8-inch screws to install a new Receptacle Assembly above the new top Receiver. Use the uppermost set of holes.

7. Rotate the Carousel by hand 180° to access the other empty Carousel face.

8. Repeat steps 4 through 6 to install two more Receiver Assemblies and one more Receptacle Assembly.

9. Proceed to Section 9.2.2. of this chapter.
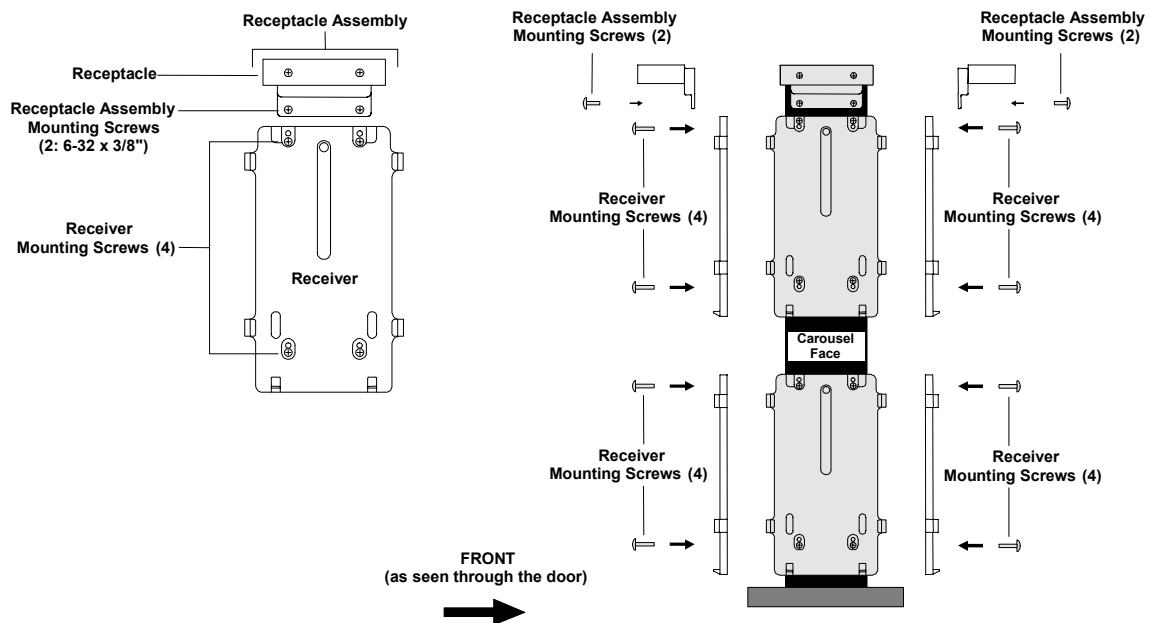
CAUTION

Do not apply power at this time.

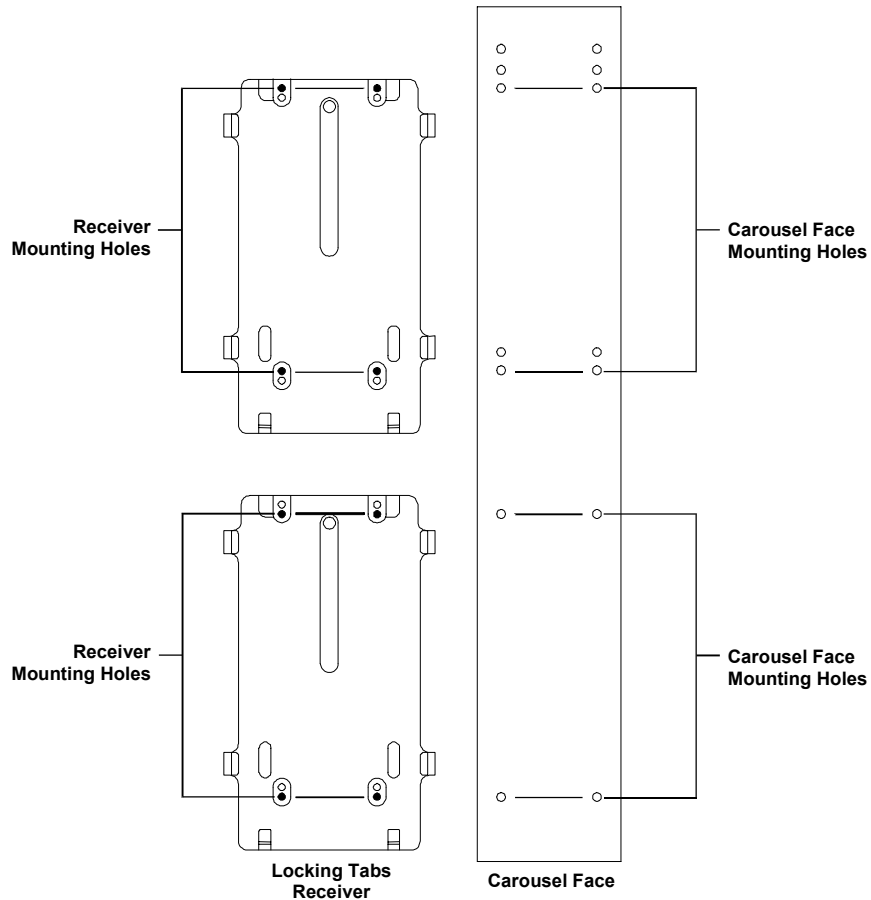**Figure 9-10   Converting a Model 4440 Library to a model 4480 Library**

Figure 9-11   Hole patterns for mounting receivers on carousels

9.2.1.3   Model 4660 to 46120 Expansion

Refer to Figure 9-10.

Follow the procedure in Section 9.2.1.2 to install the new hardware for the model 4660 – 46120 expansion. This procedure is the same as the Section 9.2.1.2 procedure, except that this expansion installs **six** new Receivers and **three** new Receptacle Assemblies.

9.2.2 Entering the Update Password

CAUTION

After installing new hardware to change the configuration of a library, to prevent possible damage to the unit, open the cabinet door before applying power. When the cabinet door is open, the carriage will not move when power is applied. The unit must be reconfigured for the new hardware, before the carriage is allowed to move under its own power.

1.   Open the cabinet door.

2. Reconnect the power cord and turn on the TLS power.

3. Follow the instructions in Section 5.3.1 to enter `Update` as the password.

4. Follow the instructions in Section 9.2.3 to reconfigure the TLS.

9.2.3 Reconfiguring the Model Number

NOTE

If the TLS is restricted, it may not be possible to change the TLS model number in the `Configuration\Advanced\Changer\Mechanics` menu. See Section 5.1 for details about restricted units.

1. Press the MENU key once to display the `Top Menu`, with the pointer in the left margin of the LCD pointing to `Configuration`.

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

NOTE

See the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for complete details about the `Configuration` menu.

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

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

5. Press the ▼ (DOWN) key repeatedly to move the pointer to `Mechanics`, then press the ENTER key to enter the `Configuration\Advanced\Changer\Mechanics` menu. If necessary, press the ▼ (DOWN) key to move the pointer to `Model`.

6. Make sure that the cabinet door is open, then press the ENTER key to begin editing the model number.

7. Press the ▲ (UP) or ▼ (DOWN) key repeatedly to change the model number to match the new hardware configuration (e.g. from `TLS-4440` to `TLS-4480`).

8. Close the cabinet door. (The Carriage remains stationary.)

9. Press the MENU key, then press the EXIT key to exit the menu system. (The display indicates that the unit must be recalibrated.)

Press the MENU key to return to the `Top Menu`.

9.2.4 Recalibrating the Unit

Follow the instructions in Section 5.3.2 to execute the `Private` menu's `CALIBRATE` command, to update the TLS configuration to match the newly-installed hardware.

9.2.5 Clearing the Password

Follow the instructions in Section 5.3.3 to execute the `Private` menu's `CLEAR AC-CESS` command, to remove the password (`Update`) and prevent unauthorized access to the `Private` menu.

9.3 Barcode Reader

Barcode readers are standard on models 4440, 4480, 4660 and 46120, and may be added to all other models. Adding a barcode reader should take less than 30 minutes.

Barcode reader expansion kit part numbers are listed in Section 9.3.1.

Installing a barcode reader is a six–step procedure:

1. Install the Barcode Reader hardware.

2. Enter `Update` for the password in the Private menu.

3. Edit the BCR value in the `Configuration\Advanced\Changer\Mechanics` menu.

4. Clear the password (`Update`) to prevent unauthorized access to the `Private` menu.

5. Edit the `LabelCheckChar` value in the `Configuration\Advanced\Changer` menu.

6. Test the Barcode Reader.

9.3.1 Required Parts and Tools

- **One Barcode Reader Kit – Qualstar P/N 500983-01-0**

- **9/64-inch Allen Wrench**

- **Number 2 Phillips Screwdriver**

- **A TLS-4000 Installation and Operation Manual (Qualstar document number 501370)**

NOTE

A barcode reader expansion kit contains a Barcode Reader, with attached bracket and cable, and two 6-32 x 1/4-inch flat-head screws.

9.3.2 Barcode Reader Installation

Follow the instructions in this Section to add a barcode reader to a TLS that currently does not have one (first-time installation). The Barcode Reader mounts on the underside of the Carriage Assembly (Figure 9-12).

NOTE

It is not necessary to remove the Carriage Assembly from the TLS before installing a Barcode Reader.

Do not remove the bracket from the Barcode Reader. If the bracket is removed, it will not be obvious how to replace it properly.
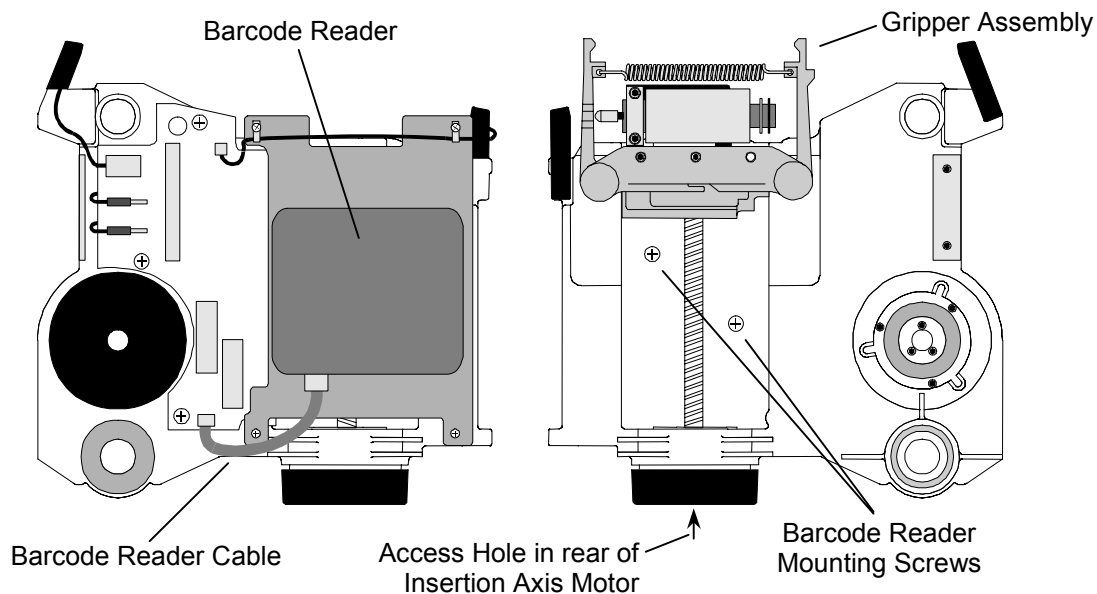

Figure 9-12   The TLS-4000 Carriage Assembly – Top View

9.3.2.1   Installing the Barcode Reader Hardware

Refer to Figure 9-12.

1. Turn off the TLS power and remove the power cord.

2. It may be necessary to manually lower or raise the Carriage Assembly so that it is approximately 6 inches above the bottom plate. Gently grasp the Carriage Assembly and lift it, or push down, to move it.

3. Insert a 9/64-inch Allen wrench into the Access Hole in the rear of the Insertion Axis Motor.

4. Gently turn the Allen wrench counter–clockwise to move the Gripper forward, until both Barcode Reader mounting screw holes are accessible, then remove the wrench.

5. Position the Barcode Reader under the Carriage Assembly, with the mounting holes in the bracket facing up, and the Barcode Reader's cable jack facing the cabinet door.

6. Align the mounting screw holes in the Barcode Reader bracket with the mounting screw holes in the Carriage Assembly.

7. Install both 6-32 x 1/4-inch flat-head mounting screws from the top side of the Carriage Assembly, then securely tighten both screws with a number 2 Phillips screwdriver.

8. Insert a 9/64-inch Allen wrench into the Access Hole in the rear of the Insertion Axis Motor.

9. Gently turn the Allen wrench clockwise, until the Gripper is completely retracted (toward the cabinet door), then remove the wrench.

10. If the supplied cable is not already connected to the Barcode Reader, connect it to the cable jack on the rear of the Barcode Reader. The cable's connector is keyed, but make certain that all pins are engaged.

11. Connect the Barcode Reader cable to the BCR connector on the underside of the Carriage Assembly. The cable's connector is keyed, but make certain that all pins are engaged. (It may be necessary to manually lift the Carriage Assembly to see the BCR connector on the Carriage Assembly PCBA.)

9.3.2.2 Disabling the Master Security Lock

Follow the instructions in Section 5.2 to disable the Master Security Lock.

9.3.2.3 Entering the Password

Follow the instructions in Sections 5.3.1 to enter the `Update` password.

9.3.2.4 Editing the BCR Value

NOTE

If the TLS is restricted, it may not be possible to change the BCR value in the `Configura-tion\Advanced\Changer\Mechanics` *menu. See Section 5.1 for details about restricted units.*

1. Press the MENU key to display the `Top Menu`. The pointer in the left margin of the LCD should be pointing to `Configuration`.

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

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

4. Press the Enter key to enter the `Configuration\Advanced\Changer` menu.

5. Press the ▼ (DOWN) key repeatedly to move the pointer to `Mechanics`.

6. Press the Enter key to enter the `Configuration\Advanced\Changer\ Mechanics` menu.

7. Use the ▼ (DOWN) key to move the pointer to `BCR`.

8. Open the cabinet door to defeat the DOOR security lock.

9. Press the Enter key to begin editing the `BCR` value.

10. Press the ▲ (UP) or ▼ (DOWN) key to change the `BCR` value from `NONE` to match the type of barcode reader installed in the TLS: `WA3700/B-2221` or `WA3600/A-111`.

11. Close the cabinet door.

12. Press the MENU key to return to the `Top Menu`.

9.3.2.5 Clearing the Password

Follow the instructions in Section 5.3.3 to execute the Private menu's `CLEAR AC-CESS` command, to remove the password (`Update`) and prevent unauthorized access to the Private menu.

9.3.2.6 Barcode Label Check Characters

Follow the instructions in the TLS-4000 Installation and Operation manual (501370) to properly configure the `LabelCheckChar` value.

9.3.2.7 Testing the Barcode Reader

1. Turn the TLS power off, then open the cabinet door.

2. Insert a labeled tape in location A01 (1A01 for carousel units). Refer to the TLS-4000 Installation and Operation Manual (Qualstar document number 501370) for tape cartridge location diagrams.

3. Close the cabinet door, then turn the TLS power on. If the Barcode Reader is not correctly connected to the Carriage Assembly, the error message "Barcode Reader Failure" appears on the front panel display. If this occurs, turn the TLS power off, open the cabinet door, check the connections at both ends of the Barcode Reader cable, then repeat this step.

4. Wait for the Handler to stop moving.

5. Press the MENU key to display the `Top Menu`.

6. Use the ▼ (DOWN) key to move the pointer to `Operation`.

7. Press the ENTER key to enter the `Operation menu`.

8. Use the ▼ (DOWN) key to move the pointer to `Element Status`.

9. Press the ENTER key to enter the `Operation\Element Status` menu.
(The pointer should be pointing at `Display`.)

10. Press the ENTER key to enter the `Operation\Element Status\Display` menu. (The pointer should be pointing at `Location`.)

11. Press the ENTER key to start editing the `Location` value.

12. Enter A01 (1A01 for carousel units) as the `Location` value. If you are unfamiliar with the value editing process, refer to the Editing Values section in the TLS-4000 Installation and Operation Manual (Qualstar Document number 501370).

13. Press the EXIT key to stop editing the `Location` value.

14. Use the ▼ (DOWN) key to move the pointer to `Primary Tag`.

15. Verify that the `Primary Tag` value is set to `YES`.

16. Verify that the `Tag` value (immediately below the `Primary Tag` value) is the same as the label on the tape. If the `Tag` value is incorrect, try changing the `LabelCheckChar` value in the `Configuration\Advanced\Changer` menu to its other option (`YES` or `NO`), then repeating this step.

17. Press the MENU key, then press the EXIT key to exit the menu system.

9.4 I/O Port

An I/O port may be added to models 4210, 4212 and 4222 and is standard on all other models. Adding an I/O port should take less than 30 minutes.

An I/O port assembly kit will be needed in order to complete the installation.

9.4.1 Required Parts and Tools

- One 8mm I/O port kit:
  Qualstar P/N 500750-01-3 for TLS-4210 and 4222 Models
  Qualstar P/N 500750-02-1 for TLS-4212 Models
- Number 2 Phillips Screwdriver
- A TLS-4000 Installation and Operation Manual (Qualstar document number 501370)

NOTE

An I/O port kit contains an I/O port with attached circuit board and five mounting screws. Kit P/N 500750-02-1 will also contain two single slot receptacles.

9.4.2 I/O Port Installation

Follow the instructions in this Section to add an I/O port to a TLS that currently does not have one (first-time installation). The I/O port mounts to the underside of the top of the TLS unit.

CAUTION

The unit must be recalibrated after the I/O port assembly is installed in the TLS.

NOTE

If desired, remove a Side Panel (Section 7.4.3), to gain easy access to the I/O port assembly cable assembly's plug through the holes in the side of the TLS' frame.

Front   **Rear**

I/O Port
Mounting Screws (5)

LED Cable

Inventory Sentry Beam
Circuit Board
Mounting Screws (3)
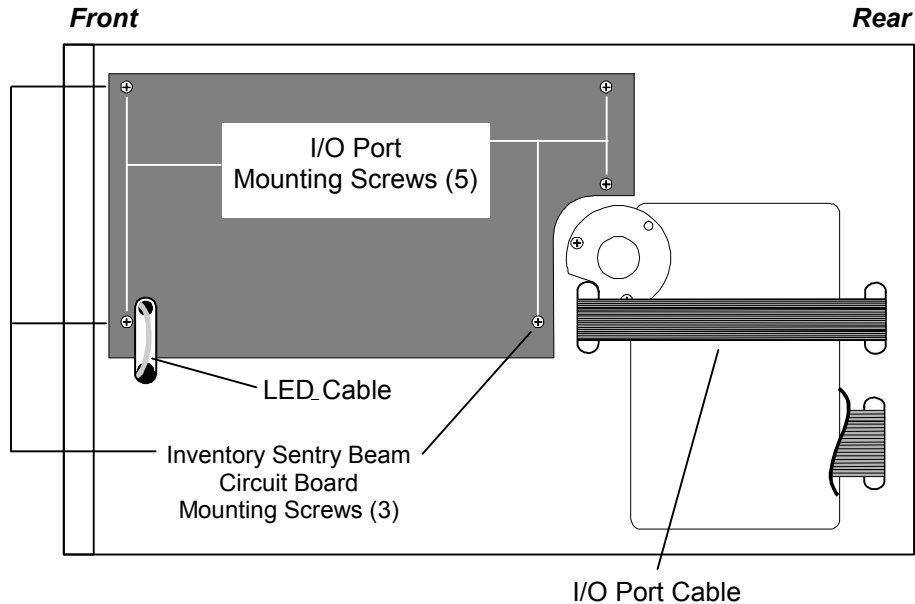
I/O Port Cable

Figure 9-13   Top View of TLS with Top Panel removed

9.4.2.1   Removing the inventory sentry beam circuit board

1. Turn off the TLS power and remove the power cord.

2. Open the cabinet door.

3. Remove the Top Panel (Section 7.4.1).

4. Unplug the I/O port ribbon cable from the inventory sentry beam circuit board (Figure 9-13).

5. Support the inventory sentry beam circuit board and bracket with one hand, then remove all three of it's mounting screws (Figure 9-13).

6. Gently lower the inventory sentry beam circuit board and bracket, then remove it through the front of the TLS.

9.4.2.2 Removing or Replacing Receptacles

Continue to Section 9.4.2.3 if the I/O port is being installed in a TLS-4210 library. TLS-4212 models must have the dual slot receptacles replaced with single slots and the TLS-4222s must have the receptacles removed before installing the I/O port.

1. For TLS-4212 models only, use a number 2 Phillips screwdriver to remove the two screws securing a dual slot receptacles bracket to the carousel and remove the receptacles. Using the same two screws, secure the single slot receptacles bracket to the carousel. Repeat for the remaining dual slot receptacles bracket. See Figure 9-14.

2. For TLS-4222 models only, use a number 2 Phillips screwdriver to remove the two screws securing a receptacles bracket to the carousel and remove the receptacle. Repeat for the remaining receptacle. Save the receptacles and screws in a safe location for possible future use. See Figure 9-14.
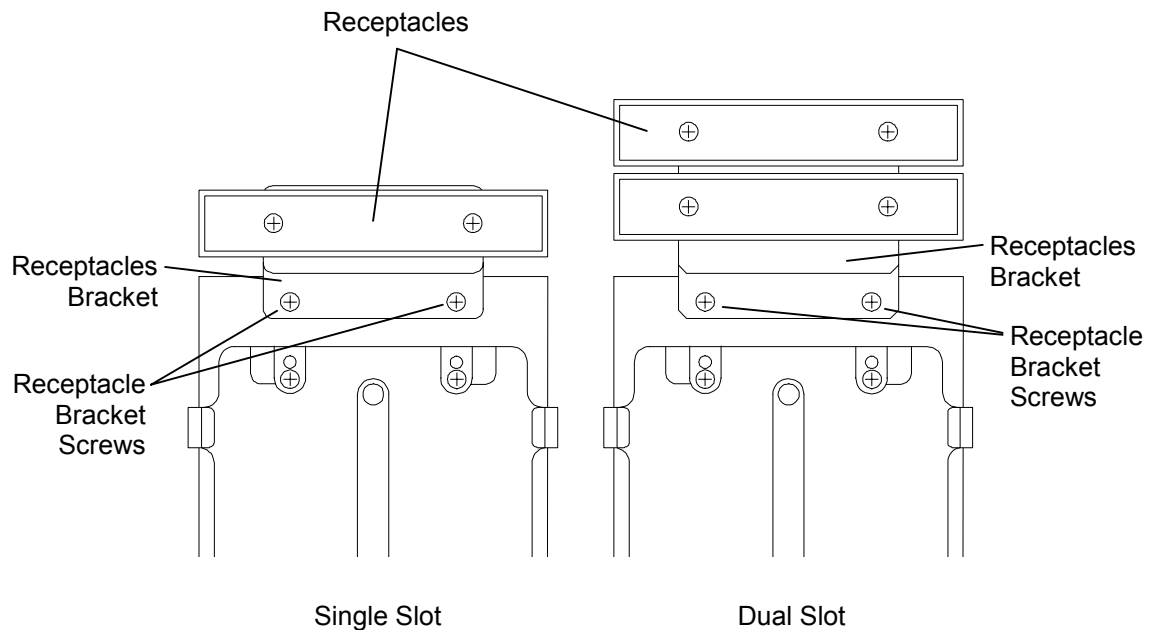

Figure 9-14   Single Slot and Dual Slot Receptacles

9.4.2.3 Installing the I/O Port Assembly

1. Gently turn the I/O port leadscrew by hand to position the I/O port slot in the middle of the I/O port assembly, so that it will clear the magazine when the assembly is installed in the library (Figure 2-8).

2. Gently pull on the Call switch button to remove it (Figure 2-8).

3. Insert the I/O port assembly through the open cabinet door. Be careful not to damage the Call switch while inserting it through the hole in the TLS' frame.

4. Make sure that the LEDs cable is positioned in the center of the cutout in the TLS' frame (Figure 9-13).

5. Support the I/O port assembly with one hand and install all five mounting screws (Figure 9-13).

6. Plug the I/O port ribbon cable into the IOPORT connector on the PCBA (Figure 2-8).

7. Gently press the Call switch button back onto the Call switch.

8. If you removed a Side Panel, reinstall it (Section 7.4.4), then reinstall the top Panel (Section 7.4.2).

9.4.2.4   Disabling the Master Security Lock

Follow the instructions in Section 5.2 to disable the Master Security Lock.

9.4.2.5   Entering the Password

Follow the instructions in Sections 5.3.1 to enter the Update password.

9.4.2.6   Editing the I/O Port Value

NOTE

If the TLS is restricted, it may not be possible to change the I/O port value in the `Configuration\Handler\Mechanics` *menu. See Section 5.1 for details about restricted units.*

1. Press the MENU key to display the Top Menu. The pointer in the left margin of the LCD should be pointing to Configuration.

2. Press the Enter key to enter the Configuration menu.

3. Press the Enter key to enter the Configuration\Advanced menu.

4. Press the Enter key to enter the Configuration\Advanced\Changer menu.

5. Press the ▼ (DOWN) key repeatedly to move the pointer to Mechanics.

6. Press the Enter key to enter the Configuration\Advanced\Changer\ Mechanics menu.

7. Use the ▼ (DOWN) key to move the pointer to I/O Port.

8. Open the cabinet door to defeat the DOOR security lock.

9. Press the Enter key to begin editing the I/O Port value.

10. Press the ▲ (UP) or ▼ (DOWN) key to change the I/O Port value from NONE to A.

11. Close the cabinet door.

12. Press the MENU key to return to the Top Menu.

9.4.2.7   Clearing the Password

Follow the instructions in Section 5.3.3 to execute the Private menu's `CLEAR AC-CESS` command, to remove the password (`Update`) and prevent unauthorized access to the Private menu.

9.4.2.8   Recalibration

Recalibrate the TLS. (See Section 5.3.2 for details.)

10. System Interconnect Diagram