



TLS-412xxx

Technical Service Manual

501290 Rev. C

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-412xxx Technical Service Manual 501290 Rev. C, Revised June 08, 2005 | TLS Executive Firmware 700105 Version 2.24 |

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vide 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:

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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.

The following topics are covered in the TLS-412xxx Installation and Operation Manual (Qualstar document number [501300](#)):

- **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 SCSI-2 Interface Manual | 500523 |
| Installation & Operation | TLS-412xxx Installation and Operation Manual | 501300 |
| Specifications | TLS-412xxx Product Specification | 500119 |
| 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 Document 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 is a sophisticated, state-of-the-art computer peripheral. It should only be serviced by a competent service technician who is experienced with the operation and maintenance of tape libraries, and only after reading and understanding this manual and the TLS-412xxx 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

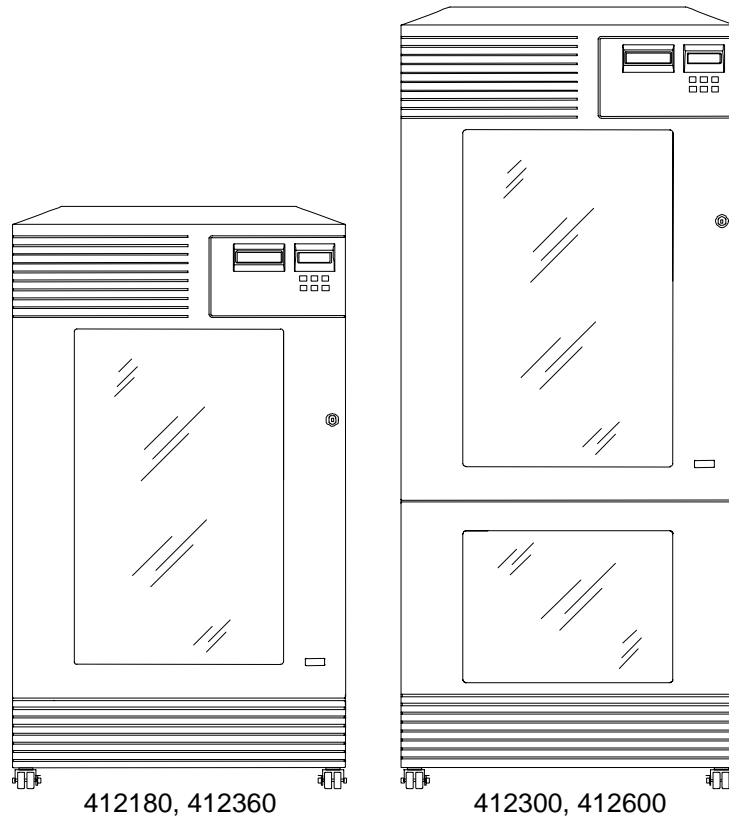


Figure 2-1 TLS-412xxx Models

| TLS-412xxx Feature/Model | 412180 | 412360 | 412300 | 412600 |
|-----------------------------------------------------------|--------|--------|--------|--------|
| Maximum number of tape drives | 12 | 12 | 12 | 12 |
| Media capacity in cartridges (10 cartridges per magazine) | 180 | 360 | 300 | 600 |
| Barcode Readers | Std. | Std. | Std. | Std. |
| I/O Port for automated cartridge insertion/removal | Std. | Std. | Std. | Std. |
| Carousels (rotary positioning of magazines) | 2 | 2 | 2 | 2 |
| Magazine configuration (# high x # wide) | 3x3 | 3x6 | 5x3 | 5x6 |
| Fibre Channel Option | Opt. | Opt. | Opt. | Opt. |
| Q-Link Remote Library Manager | Opt. | Opt. | Opt. | Opt. |

Table 2-1 TLS-412xxx Specifications

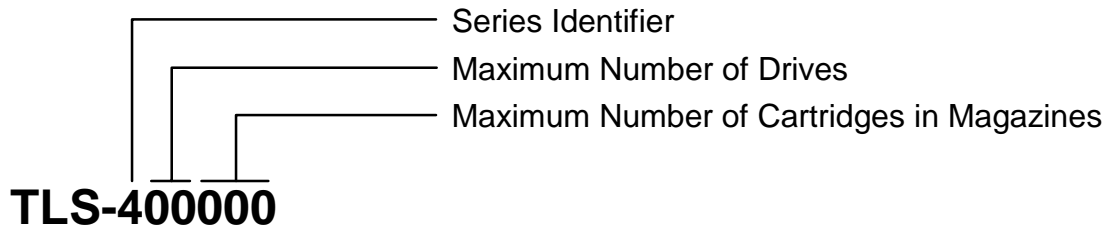


Figure 2-2 Model Number Identification

| MODEL | HEIGHT (in/cm) | WIDTH (in/cm) | DEPTH (in/cm) | NET ^② WEIGHT (lb/kg) | SHIPPING ^① WEIGHT (lb/kg) |
|----------------|-------------------|------------------|------------------|---------------------------------------|--------------------------------------------|
| 412180, 412360 | 51.6 / 131.1 | 29.6 / 75.2 | 25.5 / 64.0 | 261 / 118.4 | 456 / 206.8 |
| 412300, 412600 | 69.2 / 175.8 | 29.6 / 75.2 | 25.5 / 64.0 | 361 / 163.7 | 533 / 241.8 |

Figure 2-3 TLS-412xxx Dimensions (fully loaded units)

- ① Shipping weights include the TLS, data cartridge magazines and accessories.
Add 2.5 pounds for each installed tape drive. Weight includes accessory carton (s) (shipped separately).
- ② Weight without tape drive, magazines or tape cartridges.
Add 2.5 pounds per tape drive.
Add .9 pounds per magazine.
Add .15 pounds per tape cartridge.

2.2 General Description

Each TLS-412xxx cabinet contains a high-performance robotics system for handling data cartridges, two drive bays to accommodate the cartridge tape drives, removable cartridge magazines, power supplies and printed circuit board assemblies (PCBAs) that contain the TLS electronics. An I/O Port for inserting and removing cartridges under secured host system control is supported in all models. All units operate on any internationally available AC power source, with the TLS power cable and SCSI interface cables being the only required connections. The entire cabinet is pressurized and cooled by filtered air to ensure an optimum operating environment.

These tape libraries are not intended for use in mobile applications. They were designed for use in an office environment.

2.2.1 Motion Systems

TLS-412xxx libraries contain up to five independent motion systems.

- **The Carriages move up and down vertically along the Vertical (Y) Axis and are driven by brushless DC motors, which turn a nut around a fixed, precision leadscrew.**
- **The Handler assemblies extend and retract along the Insertion (Z) Axis and are driven by brushless DC motors that turn precision leadscrews.**
- **The I/O Port Slot extends to receive or deliver a cartridge and then retracts. The I/O Port Slot's leadscrew is driven by a DC stepper motor.**
- **A large gear at the bottom of each Carousel Assembly is turned by a pinion gear on a DC stepper motor.**
- **The Shuttle travels along the Horizontal (X) Axis to allow for the transferring on single cartridges between the left and right sides. It is driven by a brushless DC motor that turns a leadscrew.**

The drive circuitry for all motion systems is located on the Executive Printed Circuit Board Assemblies (PCBAs). 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 same 12 volt supply.

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

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

- **Y-Clear Sensors**
These sensors are 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 at the top of the library. The detector on the right side of the library is mounted on the I/O Port PCBA and the one on the left is mounted on the Y-Receiver 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 it is therefore 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 Sensors**
These sensors, which are mounted on each handler, detect the presence of a tape cartridge in any storage location, including a tape drive (cartridge must be in ejected position). They utilize the same modulated circuit as the Y-Clear sensors. The Cartridge Presence sensors also work in conjunction with the Y-Clear sensors to determine the position of a cartridge in a Handler's Gripper Assembly.

Digital Sensor Operation

The processor on the Executive PCBAs read the digital signals 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 Sensors**
The pattern output to these sensors by each carousel is used to determine the position of the carousels.
- **Vertical Axis Home Sensors**
These sensors use the tall pins mounted in the bottom of the cabinet to detect when each Carriage Assembly reaches its home position at the bottom of the cabinet.
- **Insertion Axis Home Sensors**
These sensors detect when a 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 each Handler for grasping and releasing 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 for each carriage is standard on 412xxx models. They are intended for use in systems where each cartridge is identified by a barcode label. Preprinted barcode labels, which are both human- and machine-readable, are available from a number of sources.

The barcode reader consists of a charge-coupled sensor (similar to those used in video cameras) and associated electronics. They are mounted under the carriages. The barcode readers can scan all cartridges in the TLS (except those loaded inside tape drives), as well as cartridges introduced into the I/O Port.

NOTE

The changer automatically moves a cartridge in the I/O Port slot, to a temporary location where its barcode label can be scanned. The changer 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 available from a number of sources including Qualstar.

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

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

of the labels within the TLS must match the check character configuration: either all with or all without a check character.

2.3 Component Identification

The major components are common to all models. The number of tape drives that can be installed varies from one to twelve.

Figure 2-4 through Figure 2-11 show the location of the major components in 412xxx models.

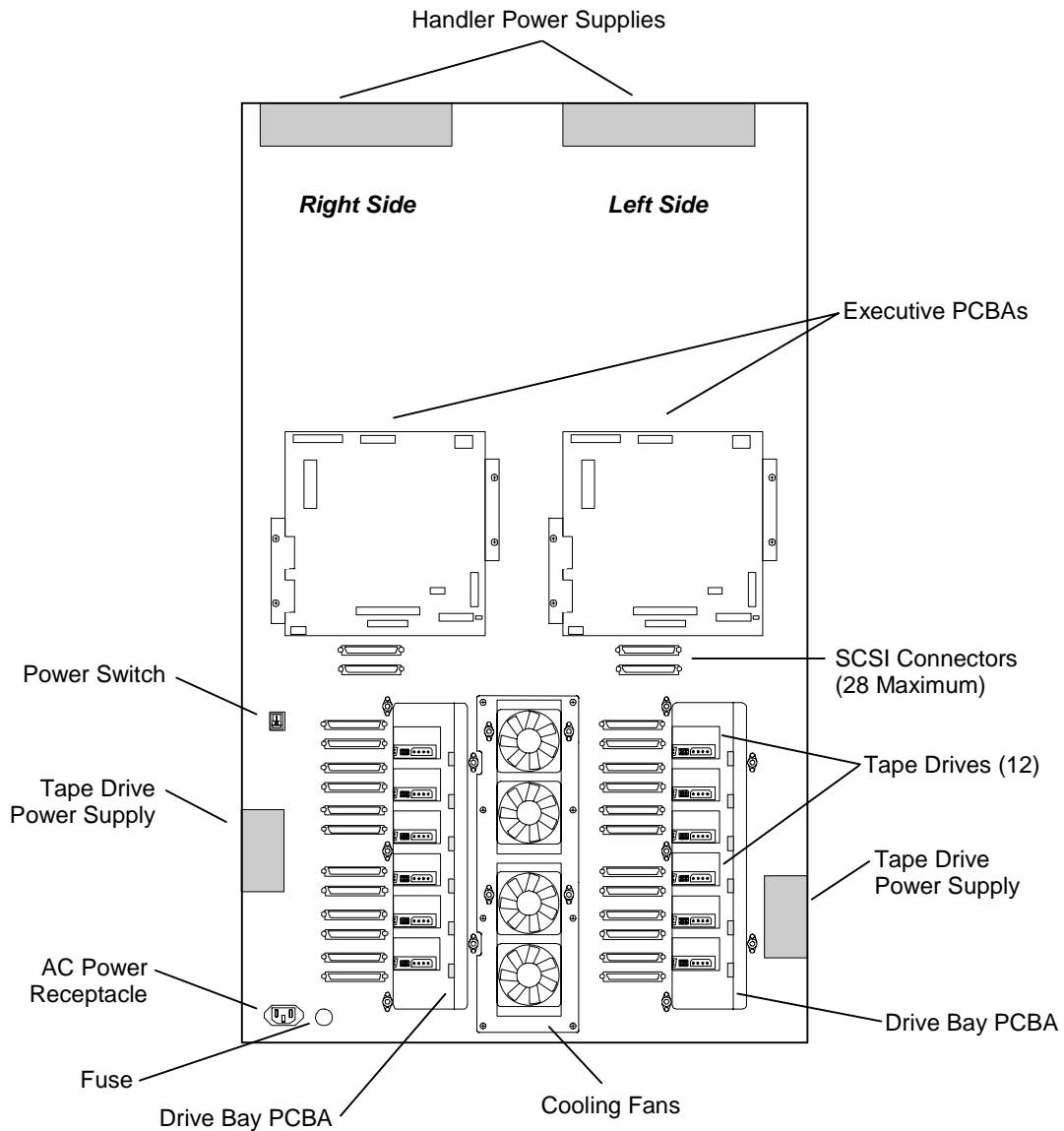


Figure 2-4 TLS-412180/360 Rear View

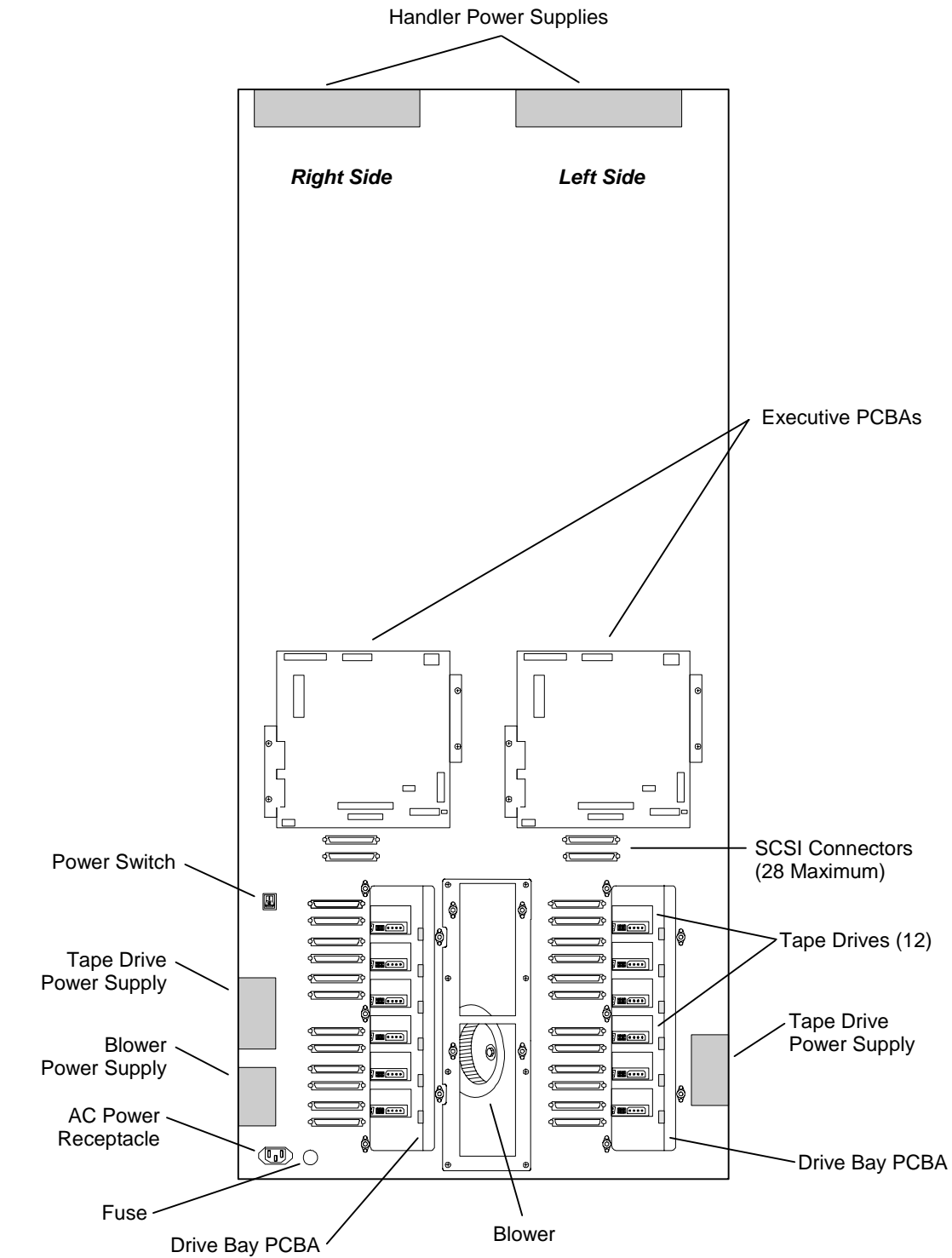


Figure 2-5 TLS-412300/600 Rear View

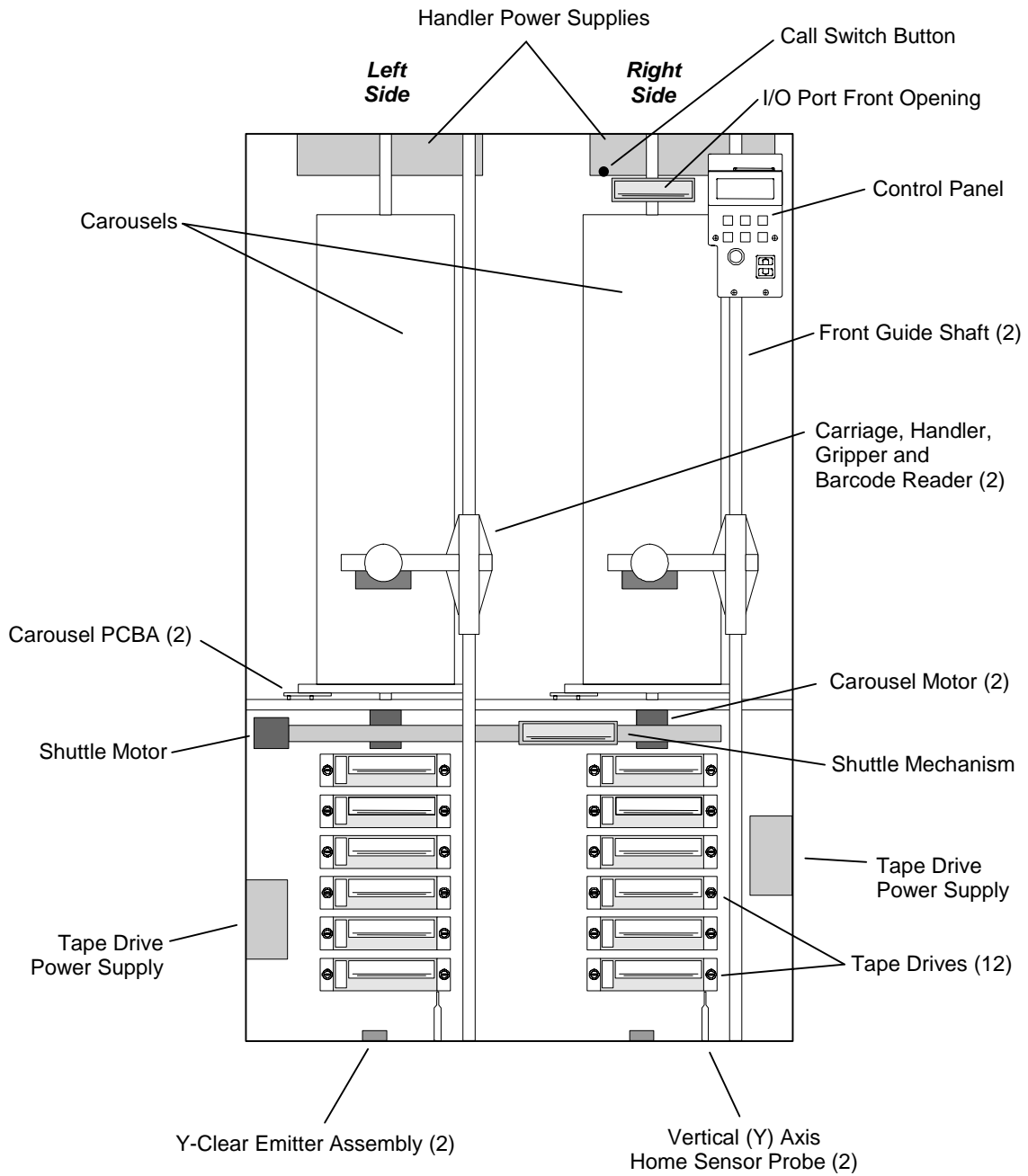


Figure 2-6 TLS-412180/360 Front View

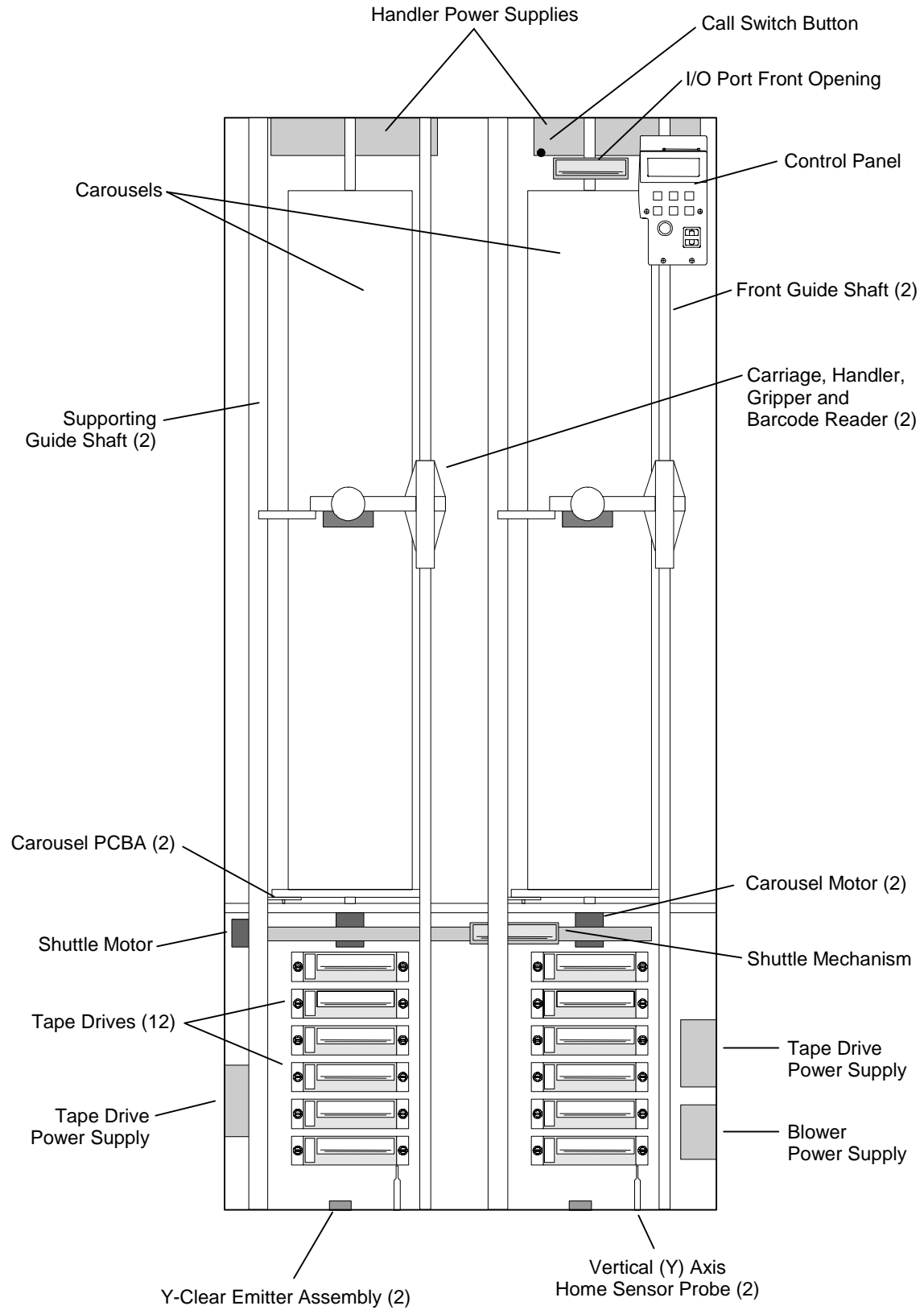


Figure 2-7 TLS-412300/600 Front View

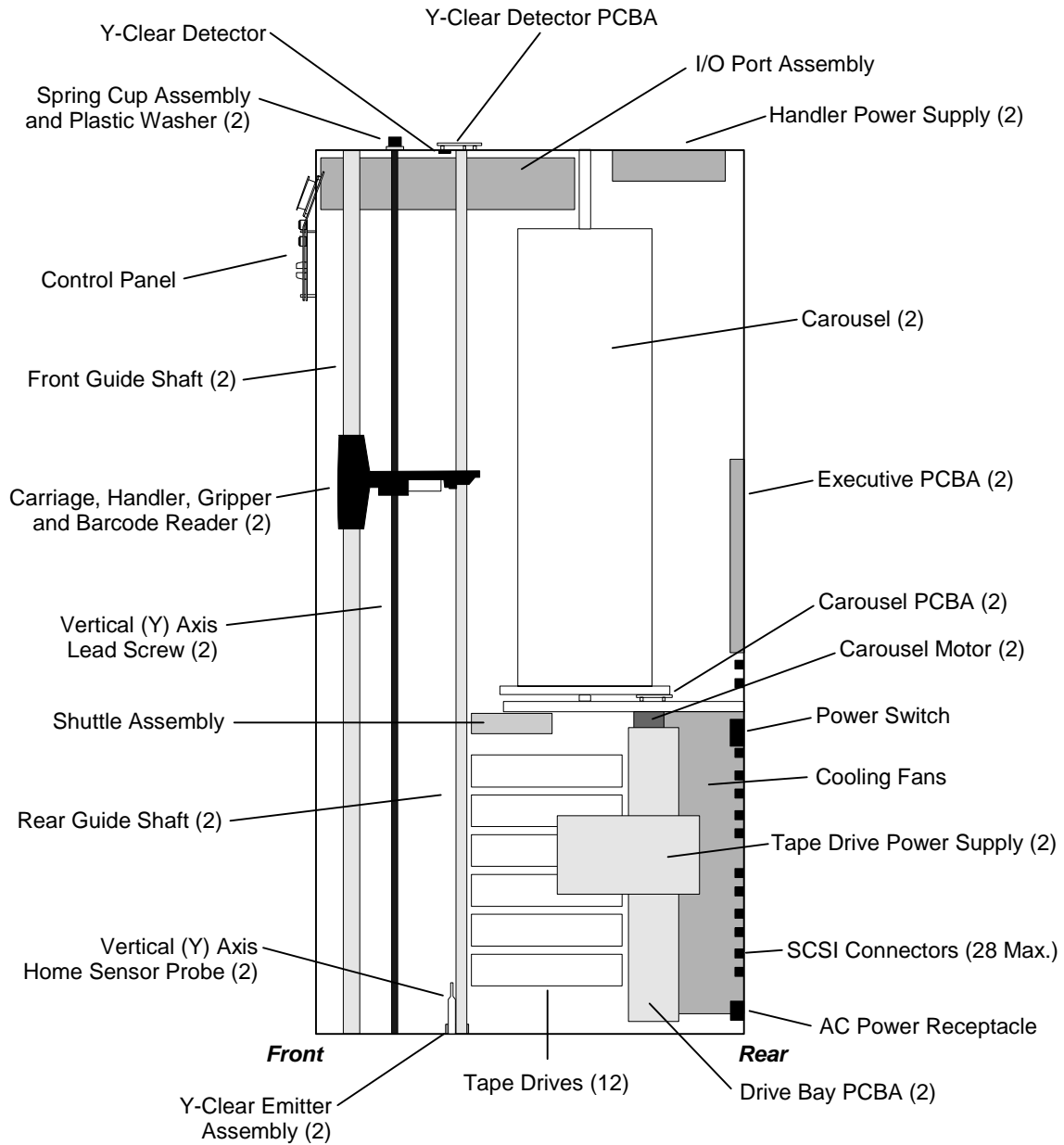


Figure 2-8 TLS-412180/360 Side View

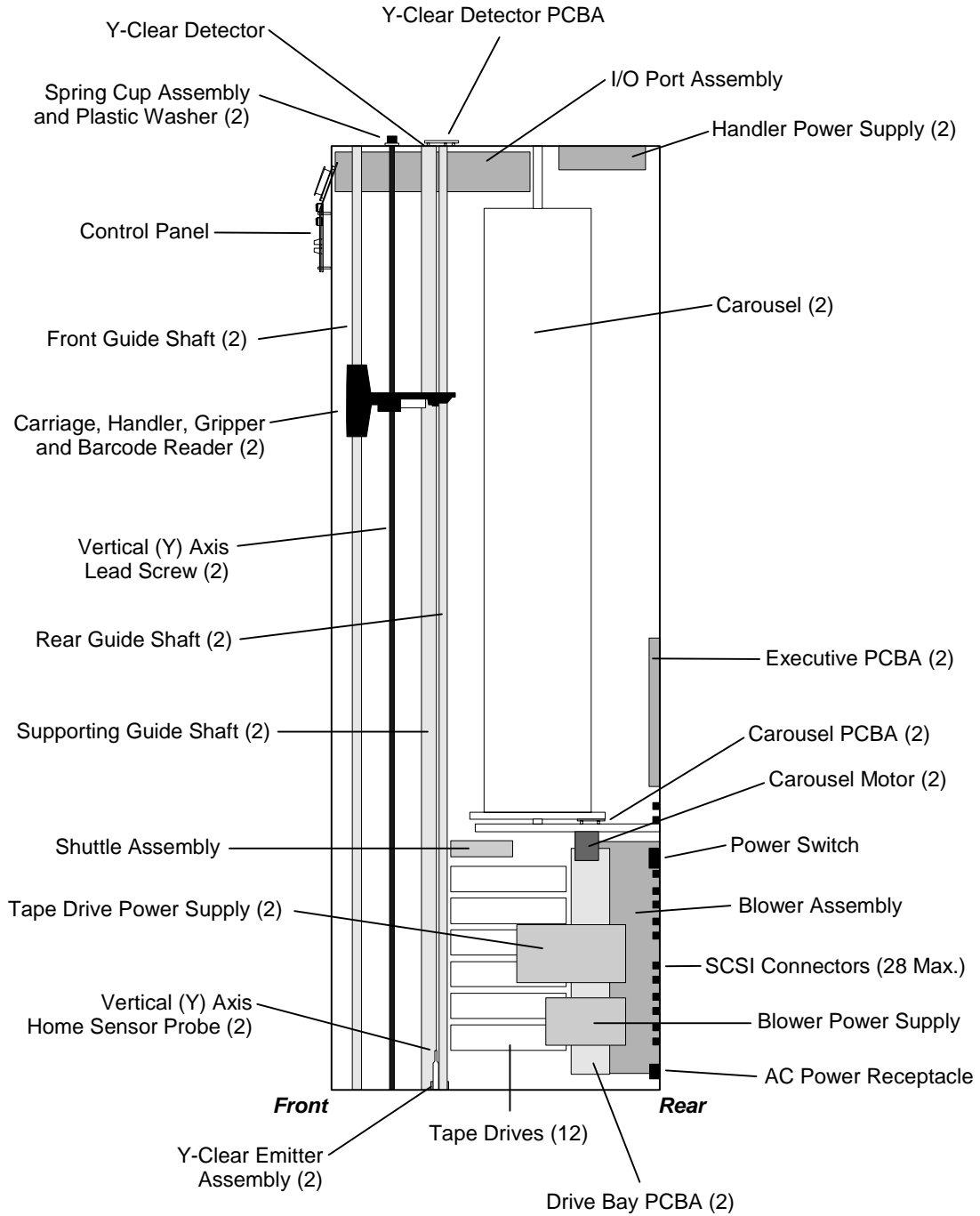


Figure 2-9 TLS-412300/600 Side View

2.3.1 Handler

Figure 2-10 shows the major components of a cartridge Handler. The components of the left and right Handlers are identical.

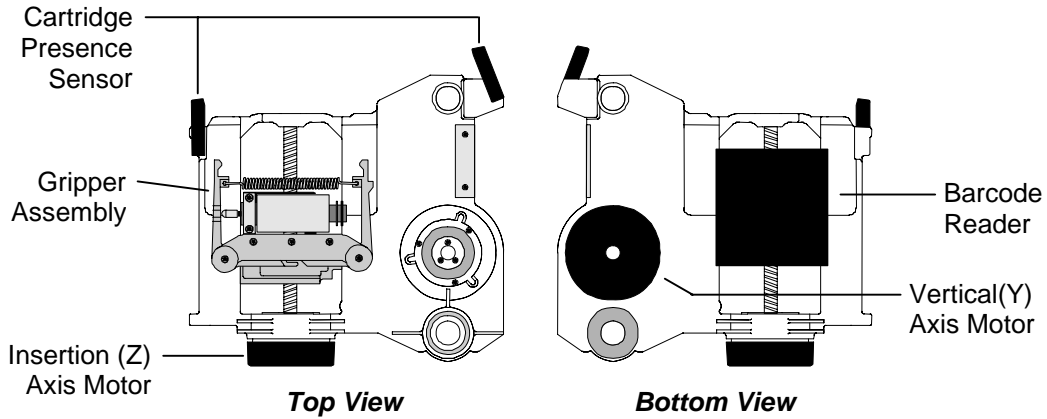


Figure 2-10 Handler – Top and Bottom Views

2.3.2 I/O Port Assembly

Figure 2-11 shows the major components of the I/O Port Assembly.

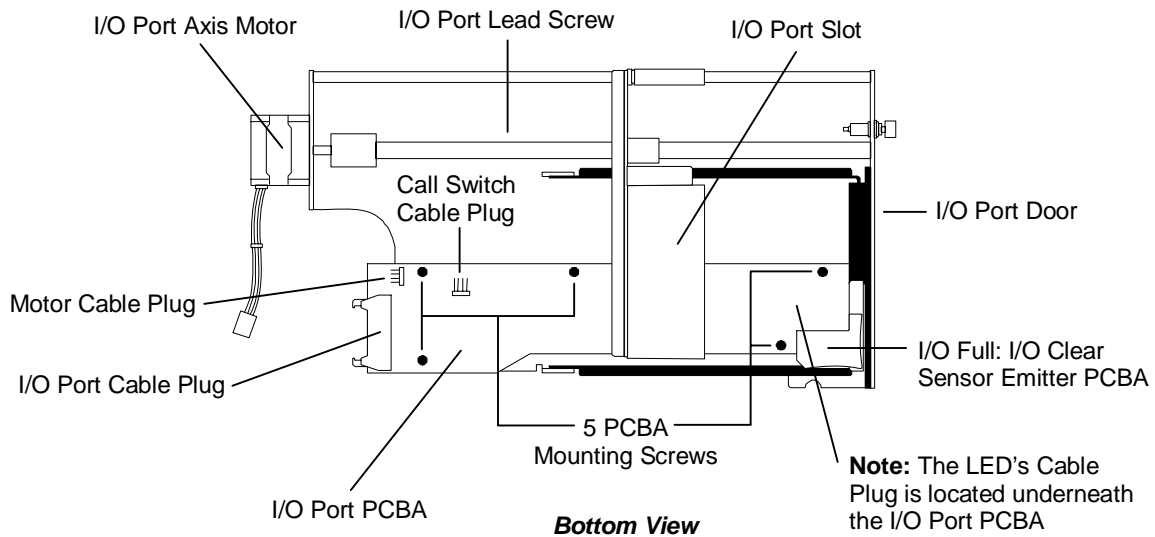


Figure 2-11 I/O Port Assembly

2.3.3 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 9.

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-412xxx Installation and Operation Manual (Qualstar document number 501300).

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.

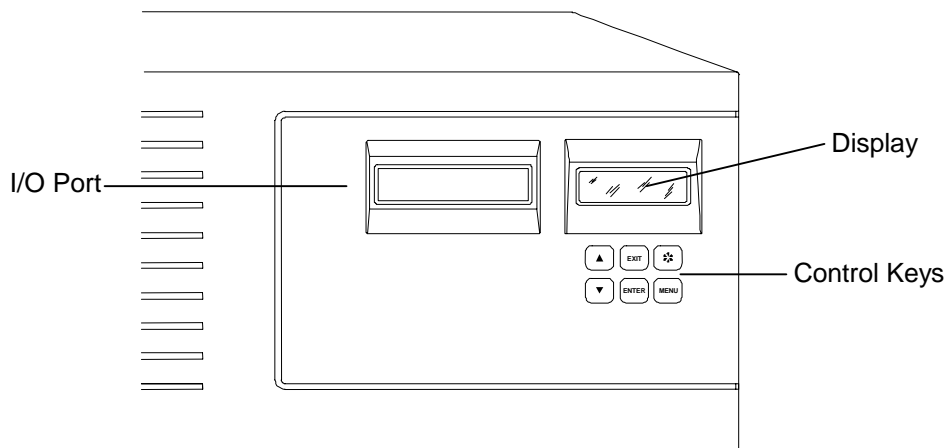


Figure 3-1 TLS Control Keys

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 charac-

ter 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 ❁ (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.

❁ + ▲: Executes the PARK HIGH command.

This command moves the carriages to the top of their range of motion in the TLS.

❁ + ▼: Executes the PARK LOW command.

This command moves the carriages to the bottom of their range of motion in the TLS.

3.1.5.1 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.

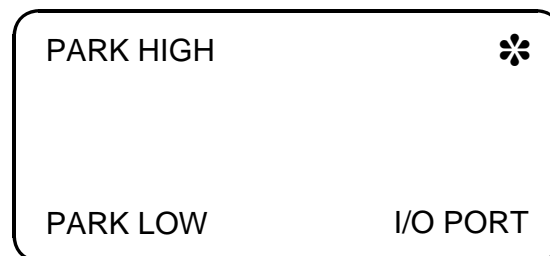


Figure 3-2 ❁ (Daisy) Key Display

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.

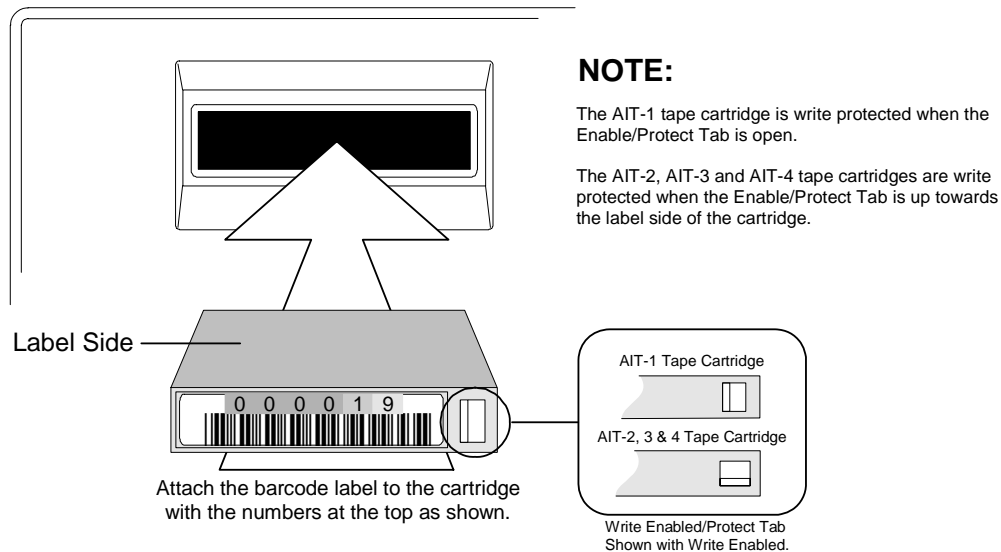


Figure 3-3 Inserting a Tape Cartridge into the I/O Port

3.1.5.2 Parking the Handlers

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.

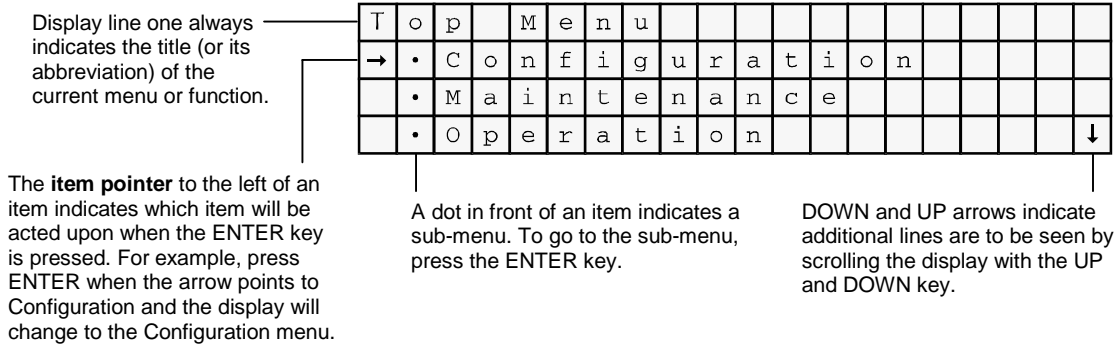


Figure 3-4 Top Menu Display

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.

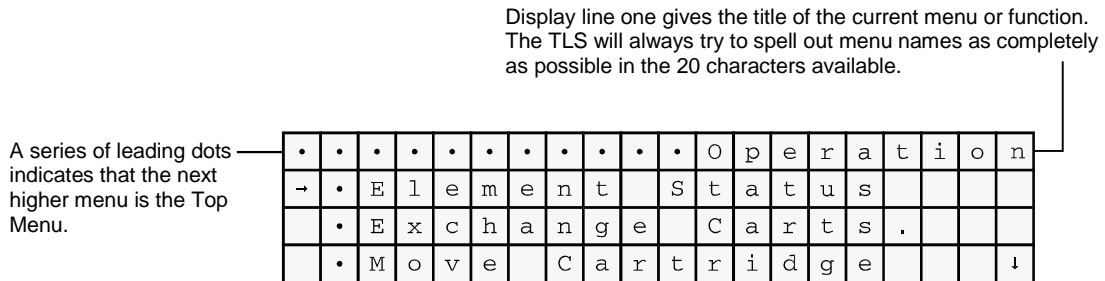


Figure 3-5 The Operation Menu

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: <ul style="list-style-type: none"> • 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 and Non-editable Name | The Menu Name, indicated by a single leading bullet and an initial capital letter, is followed by a Non-editable Name. The Menu Name has a sub-menu, as indicated by the leading bullet, containing Non-editable Names. Each Non-editable Name is the name of a parameter set. The parameters in each set are editable. Example: <ul style="list-style-type: none"> • Inq: Native |

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 rollover between digits. (See Table 3-4)

Example:

`Qualstar TLS-412360`

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 | Side | Face | Type/Story | Digit | Digit |
|-------|--------|------|-----------------------------|-------|-------|
| p | L or R | 1-6 | A, B, C, D, E, H, I, S 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 <i>physical</i> space. Characters a-e indicate logical libraries a-e element address space. |
| Side | L for Left or R for Right. Defines which side of the library the location is on. This is needed for all tape drives and magazine locations. A decimal appears when this character is not needed. |
| Face | Describes on which face of the carousel the desired magazine is located. A decimal point appears when this character is not needed. |
| Type/Story | When describing a magazine location, the story (A, B, C, D or E) is defined here. Besides magazine location, there are four other location types defined by this character: H for Handler, I for I/O Port, S for Shuttle 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 |
|---------|-----------------------------------------------------------------------------------------------|
| pL.H.. | The left Handler |
| pR.H.. | The right Handler |
| p..S.. | The Shuttle (runs between the two handlers) |
| p..I.. | The I/O Port |
| pL1A01 | The first magazine storage location: Left Side Carousel, Face 1, Story A, Slot 01 |
| pL1A10 | The last storage location in the first magazine: Left Side Carousel, Face 1, Story A, Slot 10 |
| pR6E10 | The last magazine storage location: Right Side Carousel, Face 6, Story E, Slot 10 |
| pL.T1. | The topmost tape drive on the left side. |
| pR.T6. | The bottommost tape drive on the right side. |
| p..... | An unassigned location |

Table 3-3 Location Designator Examples

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 the CAS LEFT Initiators or CAS RIGHT Initiators range from 0 to 15. The range of some valid values may change with a system's particular configuration.

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 “ASCII” 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, B, C, D or E** Magazine Locations
(stories D and E not found on 412180/360 models)
- H** Handler
- I** I/O Slot
- L or R** Left or Right side
- S** Shuttle
- T** Tape Drive Locations

Refer to Chapter 3 in the TLS-412xxx Installation and Operation Manual (Qualstar document number 501300) 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, 3L1B10 to 4L1A01, or 4R2A01 to 3R2B10

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-412xxx Installation and Operation Manual (Qualstar document number [501300](#)).

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-412xxx Installation and Operation Manual (Qualstar document number [501300](#)).

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. Diagrams showing the entire structure of the Maintenance menu system are shown in Figure 4-1.

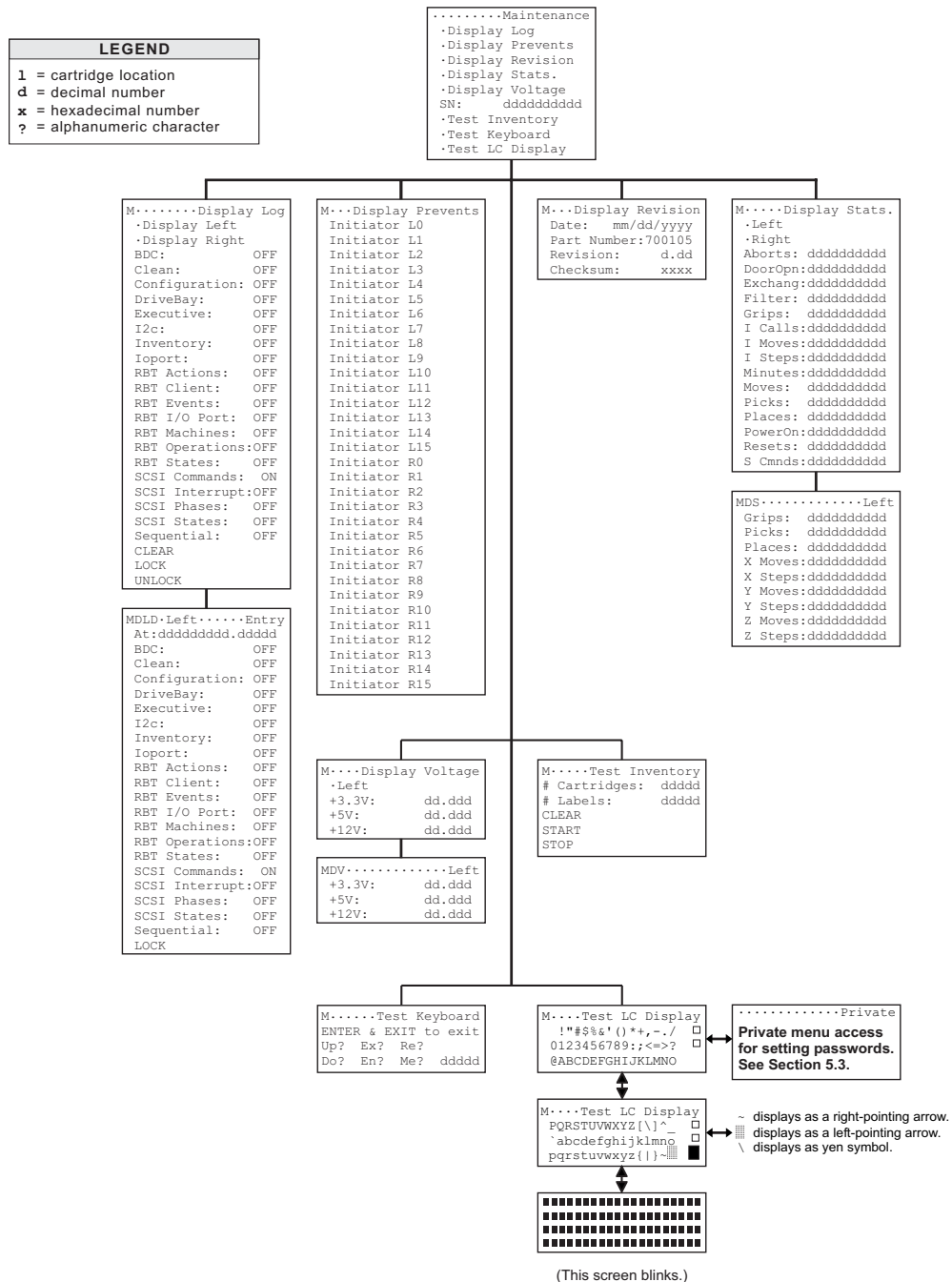


Figure 4-1 Maintenance Menu

NOTE

The menus in this chapter reflect revision 2.24 of the Executive PCBA EPROM software. If an earlier revision of the software is being used, some menu items may not appear in the menus.

4.1 Maintenance Menu

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

NOTE

A Display Reservs submenu can only be entered when a host has reserved the unit or elements within the unit.

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 Left
·Display Right
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
```

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-412xxx Installation and Operation Manual. Qualstar document number [501300](#)). The Display Log 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.

4.2.1 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-412xxx Installation and Operation Manual (Qualstar document number 501300) for details.

4.2.1.1 Maintenance\Display Log\CLEAR Command

CAUTION

Invoking the CLEAR command clears the entire data log.

4.2.1.2 Maintenance\Display Log\LOCK Command

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

4.2.1.3 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 (Left or Right)\Entry Menu

```
MDLD Left.....Entry
At:ddddddddd.dddd
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
```

These are two identical menus for displaying the logged TLS activities. Only the left display text is shown. The right text is quite similar.

CAUTION

The information in the data log is frozen when the user enters the Entry menu. No events are logged while the Left or Right 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 Left or Right Entry menu, press the ENTER key while the Maintenance\Display Status screen is displayed. The Display Log\ (Left or Right) Entry menu is the same as the Display Log menu, except that the At item has 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-412xxx Installation and Operation Manual (Qualstar document number 501300) for details.

The user can also use the Display Log\ (Left or Right) 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 the Display Status screen, and remains suspended while the Display Log\ (Left or Right) 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 L0
Initiator L1
Initiator L2
Initiator L3
Initiator L4
Initiator L5
Initiator L6
Initiator L7
Initiator L8
Initiator L9
Initiator L10
Initiator L11
Initiator L12
Initiator L13
Initiator L14
Initiator L15
Initiator R0
Initiator R1
Initiator R2
Initiator R3
Initiator R4
Initiator R5
Initiator R6
Initiator R7
Initiator R8
Initiator R9
Initiator R10
Initiator R11
Initiator R12
Initiator R13
Initiator R14
Initiator R15
```

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 its 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 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.
·Left
·Right
Aborts: ddddddddd
DoorOpn:dddddddd
Exchang:dddddddd
Filter: ddddddddd
Grips: ddddddddd
I Calls:dddddddd
I Moves:dddddddd
I Steps:dddddddd
Minutes:dddddddd
Moves: ddddddddd
Picks: ddddddddd
Places: ddddddddd
PowerOn:dddddddd
Resets: ddddddddd
S Cmnds:dddddddd
```

The Display Statistics status screen displays a summary of events that have occurred since the TLS was built. 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 door.

-
- **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 \square (Daisy) + MENU key have been pressed to activate the I/O Port.
 - **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.
 - **Z Moves**
This value is the number of Z-Axis (in/out) cartridge Handler movements.

4.7 Maintenance\Display Stats. (Left or Right) Status Screen

```
MDS.....Left
Grips:  ddddddddd
Picks:  ddddddddd
Places: ddddddddd
X Moves: ddddddddd
X Steps: ddddddddd
Y Moves: ddddddddd
Y Steps: ddddddddd
Z Moves: ddddddddd
Z Steps: ddddddddd
```

These are two identical menus for displaying a summary of left or right side specific events that have occurred since the TLS was built. Only the left display text is shown. The right text is quite similar. All values are decimal counts of the number of times an event has occurred. Displayed values include:

- Grips
This value is the number of times that the cartridge Gripper solenoid has been actuated.
- 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.
- X Moves
This value is the number of carousel movements.
- X Steps
This value is the number of X-Axis (carousel) motor steps (3200 steps/revolution).
- 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).

4.8 Maintenance\Display Voltage Status Screen

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

The Display Voltage status screen displays the three power supply voltages on the right side Executive circuit board. Select the `Left` sub-menu to see the voltages on the left Executive circuit board.

The +12V supply is the output from the left or right Handler power supply. The +5V and +3.3V supplies are the output of voltage regulators on each Executive PCBA. The presence (but not the value) of all three supplies are indicated by LEDs on each Executive PCBA.

4.9 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.

4.10 Maintenance\Test Keyboard Status Screen

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

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.

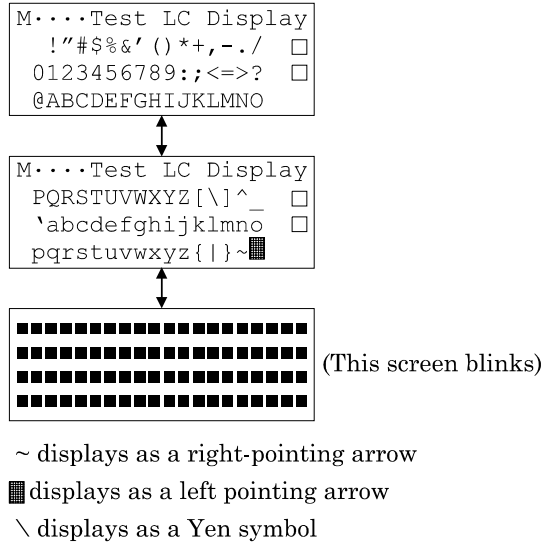
If one control key is pressed and held down, and then a second control key is pressed and held down without releasing the first key, the blinking asterisk appears next to the second key's abbreviation (as mentioned above). Then, if the first key is released, its abbreviation and the blinking asterisk 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.

4.11 Maintenance\Test LC Display Status Screen



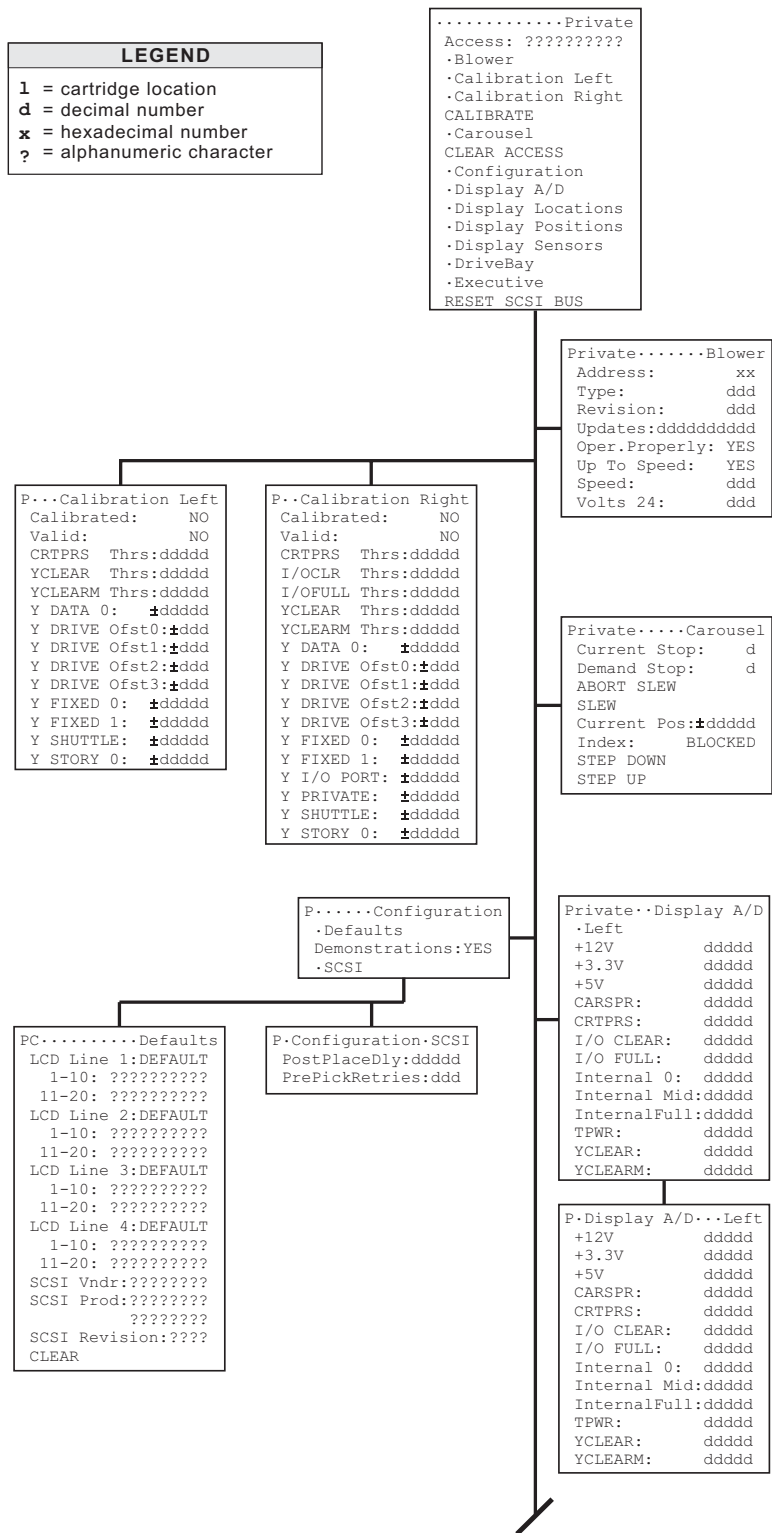
The TLS uses a four-line Liquid Crystal Display that displays 20 characters per line. This status screen uses three different test screens to check the operation of the display. After selecting the Maintenance\Test LC Display screen, use either the ▲ (UP) or ▼ (DOWN) key to select any one of the three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



Continued in Figure 5-2

Figure 5-1 The Private Menu (Part 1)

Continued from Figure 5-1

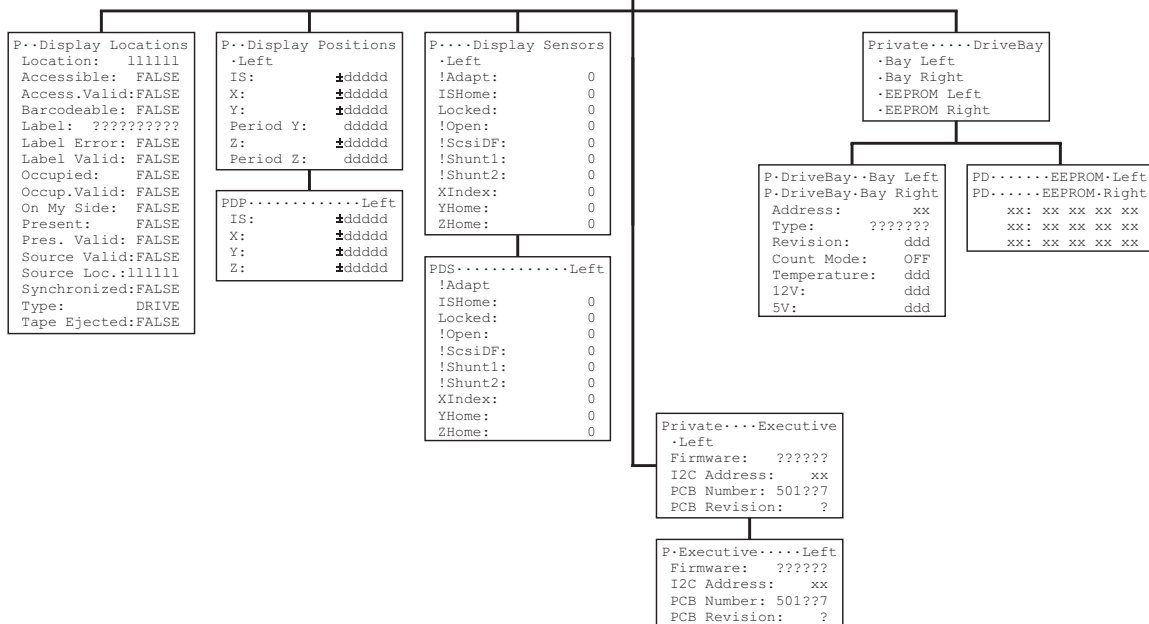


Figure 5-2 The Private Menu (Part 2)

NOTE

The menus in this chapter reflect revision 2.24 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 is the root menu for the protected service menus. It 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 Defeating 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. Open is OFF.

Refer to the TLS-412xxx Installation and Operation Manual (Qualstar document number [501300](#)) 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-412xxx Installation and Operation Manual (Qualstar document number [501300](#)) 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 Left: dd
  SCSI ID Right: 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 at all times.

5.3.1 Access

Access is a text string used to set a password, which will unlock 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, then a password exists.

- **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.

```

.....Private
→Access: ??????????
•Blower
•Calibration Left
•Calibration Right
CALIBRATE
•Carousel
•Configuration
•Display A/D
•Display Locations
•Display Positions
•Display Sensors
•DriveBay
•Executive
RESET SCSI BUS

```

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

11. If necessary, use the ▲ (UP) or ▼ (DOWN) key to move the pointer to Access.
12. Press the ENTER key to begin 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 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 EXIT key to 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) positions of the magazines.**
- **Calculate the drive positions.**
- **Verify that a Carriage can sense its Vertical (Y-Axis) home position (bottom of vertical travel), using the Vertical Axis Home Sensor.**
- **Verify that a Handler can sense its Insertion (Z-Axis) home position (Gripper fully retracted), using the Insertion Axis Home Sensor.**
- **Verify that a Carousel can sense its home position using the Carousel Position Sensors.**
- **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 Left
•Calibration Right
→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 empty magazines at L1A01 and R1A01, press the ENTER key. Use the ▼ (DOWN) key to read the whole message.

The calibration process takes about 3 and a half minutes to complete. If the calibration process does not succeed, an Alert message indicating that a fault occurred during calibration is displayed.

The Calibration Left and Right menus display the calibration data. See Section 5.4.4.

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.

CAUTION

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 ▼ (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. Follow 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 (Left or Right) Status Screens

```
P...Calibration Left
Calibrated:   YES
Valid:       YES
CRTPRS  Thrs: dddd
YCLEAR  Thrs: dddd
YCLEARM Thrs: dddd
Y DATA 0:  ±dddd
Y DRIVE Ofst0:±ddd
Y DRIVE Ofst1:±ddd
Y DRIVE Ofst2:±ddd
Y DRIVE Ofst3:±ddd
Y FIXED 0:  ±dddd
Y FIXED 1:  ±dddd
Y SHUTTLE:  ±dddd
Y STORY 0:  ±dddd
```

```
P..Calibration Right
Calibrated:   YES
Valid:       YES
CRTPRS  Thrs: dddd
I/OCLR  Thrs: dddd
I/OFULL Thrs: dddd
YCLEAR  Thrs: dddd
YCLEARM Thrs: dddd
Y DATA 0:  ±dddd
Y DRIVE Ofst0:±ddd
Y DRIVE Ofst1:±ddd
Y DRIVE Ofst2:±ddd
Y DRIVE Ofst3:±ddd
Y FIXED 0:  ±dddd
Y FIXED 1:  ±dddd
Y I/O PORT: ±dddd
Y PRIVATE:  ±dddd
Y SHUTTLE:  ±dddd
Y STORY 0:  ±dddd
```

The Calibration Data Status screens display the calibration data determined by the CALIBRATE command. The Calibration Left and Right screens show the data for the respective sides of the library. Note that the I/O Port data only appears in the Calibration Right screen. 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 values and the Valid values 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. The left side always indicates yes.
- **Valid (YES/NO)**
This value shows whether or not the calibration data has been initialized. The left side always indicates yes.
- **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.
Appears only in the Calibration Right screen.
- **I/OFULL**
This value is the threshold for the I/O Port Full sensor's optical detector.
Appears only in the Calibration Right screen.
- **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-412xxx 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 and Y FIXED 1**
This item appears in the menu, but it is not used for TLS-412xxx libraries.
- **Y I/O PORT**
This value is the location of the I/O Port Slot.
Appears only in the Calibration Right screen.
- **Y PRIVATE**
This item appears in the menu, but it is not used for TLS-412xxx libraries.
- **Y SHUTTLE**
This value is the location of the Shuttle.
- **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

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

Each Carousel is moved by a four-phase, DC stepper motor. There are 200 steps per motor shaft revolution. There are 3200 steps per carousel rotation. 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 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 500617-02-2). 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.

Figure 5-3 shows the relationship between the carousel face Stop numbers and the corresponding carousel faces. 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).

| STOP | Face Number | Nominal Position |
|------|-------------|------------------|
| 8 | X | 2888 |
| 7 | 2 | 2667 |
| 6 | X | 2400 |
| 5 | 3 | 2133 |
| 4 | 4 | 1600 |
| 3 | 5 | 1067 |
| 2 | X | 800 |
| 1 | 6 | 533 |
| 0 | 1 | 0 |

Figure 5-3 Carousel Rotation Information

The Carousel menu contains the following values:

- **Current Stop**
This value is the current Stop number (Figure 5-3). 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 (Figure 5-3). 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 motor one step in the clockwise direction. The Current Pos value will decrease by one. There are 3200 motor steps per carousel revolution.
- **STEP UP**
Execute this command to rotate the carousel motor one step in the counterclockwise direction. The Current Pos value will decrease by one. There are 3200 motor steps per carousel revolution.

5.4.6 The Private\Configuration Menu

```
P.....Configuration
·Defaults
Demonstrations:YES
·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\Configuration\Defaults Menu

```
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
```

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 operating display for a TLS-412360 is Qualstar TLS-412360. 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-412360) 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-412360).
- **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:dddd 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 (Left or Right) Status Screen

```

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

There are two nearly identical menus for displaying the current analog to digital converter output values from the left and right side Executive boards. Only the right display text is shown above. The left side is identical with the omission of the `Left` menu item. All outputs are displayed in millivolts (0 to 5000 mV). The analog inputs are described below in Table 5-1.

| Input Signals | Description |
|---------------|-----------------------------------------------------------------------------------------|
| +12V | The Handler Power Supply 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 |
| I/O CLEAR | I/O Port M-Clear Opto-Sensor |
| I/O FULL | I/O Port M-Full Opto-Sensor |
| 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 |
| YCLEARM | Not used on this model library |

Table 5-1 A/D Converter Inputs

5.4.10 The Private\Display Locations Menu

```
P..Display Locations
Location: 111111
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.:111111
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 database. 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 | A TRUE value means the selected location is on the right side of the library. |
| 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 | Data | 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 5-2 Private\Display Locations Data

5.4.11 The Private\Display Positions (Left or Right) Status Screen

```
P..Display Positions
.Left
IS:          ±dddd
X:           ±dddd
Y:           ±dddd
Period Y:    dddd
Z:           ±dddd
Period Z:    dddd
```

These are two nearly identical menus for displaying the current position of the four motor-driven positioners. Only the initial or right side display text is shown above. The left side Positions are visible by selecting .LEFT and pressing the ENTER key.

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 (I/O Port or Shuttle)
On the right side, this value indicates the current I/O Port carrier position. A value of zero means that the I/O Port Slot is at its home position (fully retracted). On the left side, it indicates the value of the Shuttle position. The Shuttle position will be negative when at its left, home position.
- 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 (Left or Right) Status Screen

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

These are two nearly identical menus for displaying the current logical state (1 or 0) of the control inputs. Only the initial or right side display text is shown above. The left side Sensors are visible by selecting ·LEFT and pressing the ENTER key.

- !Adapt
A 0 indicates that a adapter is installed on the Executive PCBA.
- ISHome (I/O Port or Shuttle Home)
On the right side, a 1 indicates the I/O Port carrier is fully retracted. On the left side, a 1 indicates the Shuttle is home, left position.
- 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-412xxx libraries.
- !Shunt2
The Shunt2 value is not currently used on TLS-412xxx 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 Left
·Bay Right
·EEPROM Left
·EEPROM Right
```

The Private\DriveBay menus show the status of the Drive Bay circuit boards and the EEPROMs on the circuit boards. The Bay Left and Bay Right sub-menus refer to the left side and right side Drive Bay boards respectively. EEPROM Left and EEPROM Right refer to the contents of the EEPROMs found on the left and right Drive Bay boards. The meaning of the EEPROM data is beyond the scope of this document.

5.4.13.1 The Private\DriveBay\? Menu

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

- Address
This value indicates the I2C bus address and is 0 for the left side and 1 for the right side.
- 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 (Left or Right) Menu

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

These are two nearly identical menus for displaying Executive board information. Only the initial or right side display text is shown above. The left side menu is visible by selecting `.LEFT` and pressing the ENTER key.

- **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.

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| | |
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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 turned off. This sequence causes an audible click, which can be an aid in finding the problem.

Possible causes:

1. A Handler power supply module has failed.
2. There is a short in one of 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. A Handler power supply module is not connected to the Executive PCBA.
8. A Handler power supply module has failed.
9. There is a short in one of 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. An Executive PCBA has failed.
2. An Executive PCBA has never been factory-initialized.

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

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 Handlers move 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 Handlers move 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 Handlers move 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 modules. If the library is configured for a bar code reader, but this communication fails, this error results.

Possible causes:

1. A 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 an Executive PCBA to the Carriage PCBA is damaged, or not properly connected.
4. A Barcode Reader has failed.
5. A Carriage PCBA has failed
6. An Executive PCBA has failed.

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

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

Possible causes:

1. An object is preventing a Carriage from reaching the bottom of its travel.
2. The Vertical Axis is jammed, or not running freely.
3. A Carriage cable is damaged, or not properly connected.
4. A 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 Carriages reach the bottom of their 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 detect the carriages. This error results if this process fails.

Possible causes:

-
1. A Vertical Axis Home Sensor has failed.
 2. A Carriage cable is damaged, or not properly connected.
 3. A Vertical Axis Home Sensor Probe (see Figure 2-6) is missing or damaged.
 4. A Vertical Axis motor is not properly connected.
 5. A 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 is driven back to its home position. 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 is driven back to its home position. 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 a Carousel motor does not rotate or make any noise.

When the power is turned on in a library, one of the things that happens is the carousels attempt to home themselves. This means each carousel attempts to find the small slots in its 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 one of the motors is not being driven.

Possible causes:

1. The cable from an Executive PCBA to the Carousel PCBA is damaged or disconnected.
2. A Carousel motor cable is damaged or disconnected.
3. The unit is configured to be a carousel model and no carousel is installed.
4. An Executive PCBA has failed.
5. A Carousel motor has failed.

6.1.15 When the power is turned on, the alerts Carousel Jammed appears on the control panel display. Also, a 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, one of the things that happens is the carousels attempt to home themselves. This means each carousel attempts to find the small slots in its 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 makes a loud buzzing noise during this process, this indicates that a motor is being driven, but the carousel is not free to rotate, or the motor is not operating properly.

Possible causes:

-
1. A 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 an Executive PCBA to the Carousel PCBA is damaged, or not properly seated.
 3. A Carousel motor cable is not properly seated in the Carousel PCBA.
 4. The internal SCSI cable is caught on a carousel.
 5. A carousels 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 grippers (Z Axis) all the way toward the door, then verifies that the Z home sensor detects the gripper assemblies. This error results if this process fails.

Possible causes:

1. One of the Z Axis Home Sensor pair is bent or damaged.
2. A 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 grippers (Z Axis) all the way toward the door, then verifies that the Z home sensor detects the gripper assemblies. This error results if this process fails. If one or both grippers are 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. An Insertion Axis (Z Axis) is jammed or binding.
2. An Insertion Axis motor is not turning freely
3. An 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 a Sentry Beam (also known as the “Y Clear”) is unexpectedly obstructed. A 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 carriages and the cartridges. Its function is to detect possible collisions between the carriages 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 a 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 a Y-Clear Sensor's (Inventory Sentry Beam's) optical path. Possibly a cartridge lying in the bottom of the library.
6. A 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 A 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 a 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 A Barcode Reader does not read bar code labels reliably.

The library uses the Code 3 of 9 (also known 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 a 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 readers, 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 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.
2. 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 a Handler's gripper.

This is typically the result of a 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. A Handler's gripper solenoid mechanism has malfunctioned.
7. A Handler's gripper solenoid is out of adjustment.
8. A Handler's gripper spring has failed.
9. The calibration data is corrupt and the library needs to be recalibrated.
10. A Cartridge Presence sensor is obscured, by a foreign object, or by dust on the optics.
11. A 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 a 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. A cartridge present sensor has become dirty or failed.
5. The retaining spring in 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. An Insertion Axis is binding.
2. An Insertion Axis is jammed against a stop.
3. An Insertion Axis motor is unplugged.
4. If the location is a tape drive, the drive is configured to the wrong type.
5. The right Insertion Axis has a tape jammed against the I/O Slot.
6. An 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 a carriage attempts to move vertically but is unable.

Possible causes:

1. A 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 a carriage.
3. A cartridge is hanging off a carriage and is colliding with a magazine or tape drive.
4. The I/O Port is interfering with the right carriage.
5. A Vertical Axis motor system has failed.
6. A Vertical (Y) Axis leadscrew is binding.
7. A 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 a Sentry Beam (also known as the “Y Clear”) is unexpectedly obstructed. A 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 carriages and the cartridges. Its function is to detect possible collisions between the carriages 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 a 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 a Y-Clear Sensor's (Inventory Sentry Beam's) optical path. Possibly a cartridge lying in the bottom of the library.
 6. A 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 right 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 beams, and reads the sensor output level to determine proper operation, and to calculate a threshold for detecting a blocked condition. This fault indicates that a sensor or emitter is not functioning correctly.

Possible causes:

1. An emitter assembly at the bottom of the cabinet is not properly connected to the Power Distribution PCBA.
2. A 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 a Y-Clear Sensor's (Inventory Sentry Beam's) optical path.
5. A Y-Clear Sensor's (Inventory Sentry Beam's) emitters do not work.
6. A 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 IO 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 beams, and reads the sensor output level to determine proper operation, and to calculate a threshold for detecting a blocked condition. This fault indicates that a sensor or emitter is not functioning correctly.

Possible causes:

1. A Cartridge Presence Sensor's emitter or detector is not properly connected. There are small connectors on the PCBA on the bottom of each carriage that

carry the signals to the emitter and detector. These may come unplugged during service or other activities.

2. A Cartridge Presence Sensor's emitter or detector has failed.
3. There is an object blocking a Cartridge Presence Sensor's optical path.
4. A Cartridge Presence Sensor's emitter or detector has dust or debris on its lens.
5. An 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 Left or Right menu, try to maximize the signal. Retighten 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. An 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. An 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)

DANGER

TO AVOID THE RISK OF PERSONAL INJURY:

TURN OFF ALL POWER TO THE TAPE LIBRARY SYSTEM, THEN REMOVE THE POWER CORD, BEFORE ATTEMPTING ANY OF THE PROCEDURES IN THIS CHAPTER.

NEVER OPERATE THE LIBRARY WHILE THE DOOR IS OPEN, OR WITH THE TOP PANEL OR SIDE PANELS REMOVED.

GEFAHR

UM VERLETZUNGEN ZU VERHINDERN:

SCHALTEN SIE ALLE STROMSCHALTER AN DER TLS AUS UND ENTFERNEN SIE DAS STROMKABEL, BEVOR SIE MIT DER SERVICE-ARBEIT BEGINNEN.

BENUTZEN SIE DIE TLS NIE WENN DIE TUERE OFFEN IST, ODER DIE DECK-, BZW. SEITENPLATTE ENTFERNT SIND.

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)

Figure 7-1 lists all of the FRUs available from Qualstar for the TLS-412xxx libraries.

| Field Replaceable Unit Description | FRU Part Number | Section | Page | Time Min. |
|-------------------------------------------------|----------------------------|---------|------|-----------|
| Carriage Assembly (TLS-412180/360) | 500650-01-5 | 7.5 | 7-9 | 30 |
| Carriage Assembly (TLS-412300/600) | 500650-02-3 | 7.5 | 7-9 | 30 |
| Carriage PCBA | 500627-01-3 | 7.6 | 7-20 | 40 |
| Barcode Reader Assembly | 500983-01-0 | 7.7 | 7-22 | 10 |
| Air Filters | 500584-01-6 | 7.8 | 7-25 | 5 |
| Fan Assembly | 500700-02-6 | 7.8 | 7-25 | 30 |
| Blower Assembly | 500469-01-0 | 7.8 | 7-25 | 30 |
| I/O Port Assembly | 500750-03-9 | 7.9 | 7-33 | 20 |
| I/O Port PCBA | 500607-01-5 | 7.10 | 7-35 | 30 |
| Switch Bracket Assembly (Front Panel / Display) | 500815-01-4 | 7.11 | 7-37 | 15 |
| Handler Power Supply (150W) | 500826-05-2 or 500826-09-4 | 7.12 | 7-40 | 15 |
| Handler Power Supply (160W) | 500826-13-6 | 7.12 | 7-40 | 15 |
| Tape Drive Power Supply (Standard) | 500826-03-7 or 500826-06-0 | 7.13 | 7-45 | 20 |
| Tape Drive Power Supply (PFC) | 500826-12-8 | 7.13 | 7-45 | 20 |
| Blower Power Supply | 500826-08-6 | 7.14 | 7-47 | 20 |
| Executive II PCBA | 501137-01-2 | 7.15 | 7-49 | 10 |
| Executive III PCBA | 501387-01-3 | 7.15 | 7-49 | 10 |
| Executive IV PCBA | 501447-01-5 | 7.15 | 7-49 | 10 |
| Drive Bay PCBA | 501357-01-6 | 7.16 | 7-59 | 30 |
| Carousel PCBA | 500617-02-2 | 7.17 | 7-61 | 10 |
| Carousel Motor (TLS-412180/360) | 500822-68-9 | 7.18 | 7-64 | 35 |
| Carousel Motor (TLS-412300/600) | 500822-53-1 | 7.18 | 7-64 | 35 |
| SCSI HVD Adapter PCBA | 501407-01-9 | 7.19 | 7-66 | 10 |
| Q-Link | 501657-01-9 | 7.20 | 7-68 | 10 |
| Shuttle Assembly | 500189-01-4 | 7.21 | 7-70 | 20 |
| Shuttle PCBAs | 501317-01-2 & 501427-01-7 | 7.22 | 7-73 | 10 |
| Y-Clear Detector PCBA | 501307-01-1 | 7.23 | 7-76 | 10 |

Figure 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

Figure 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 L-shape wrench required. |
| 9/64-inch Allen (Hex) Wrench |
| 1/4-inch Hex Nutdriver or open-end Wrench Standard and Stubby/Short length nutdrivers are required. |
| Number 1 Phillips Screwdriver |
| Number 2 Phillips Screwdriver Standard and Stubby/Short length screwdrivers are required. |
| Flat Blade Screwdriver |
| Torque Wrench capable of at least 50 in-pounds |
| Diagonal Wire Cutters |
| Small Mirror (optional) |
| Small Flashlight (optional) |

Figure 7-2 Required Tools

The materials listed in Figure 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 Threadlocker |
| Leadscrew Lubricant Qualstar P/N 732-0003-2 |
| Latex Glove |
| IMPORTANT: Leadscrew lubricant and a latex glove are required during Carriage Assembly replacement. |

Figure 7-3 Replacement Materials

7.4 Top and Side Panels

Tools Required:

- Number 2 Phillips Screwdriver
- 1/4-inch Hex Nutdriver or Wrench

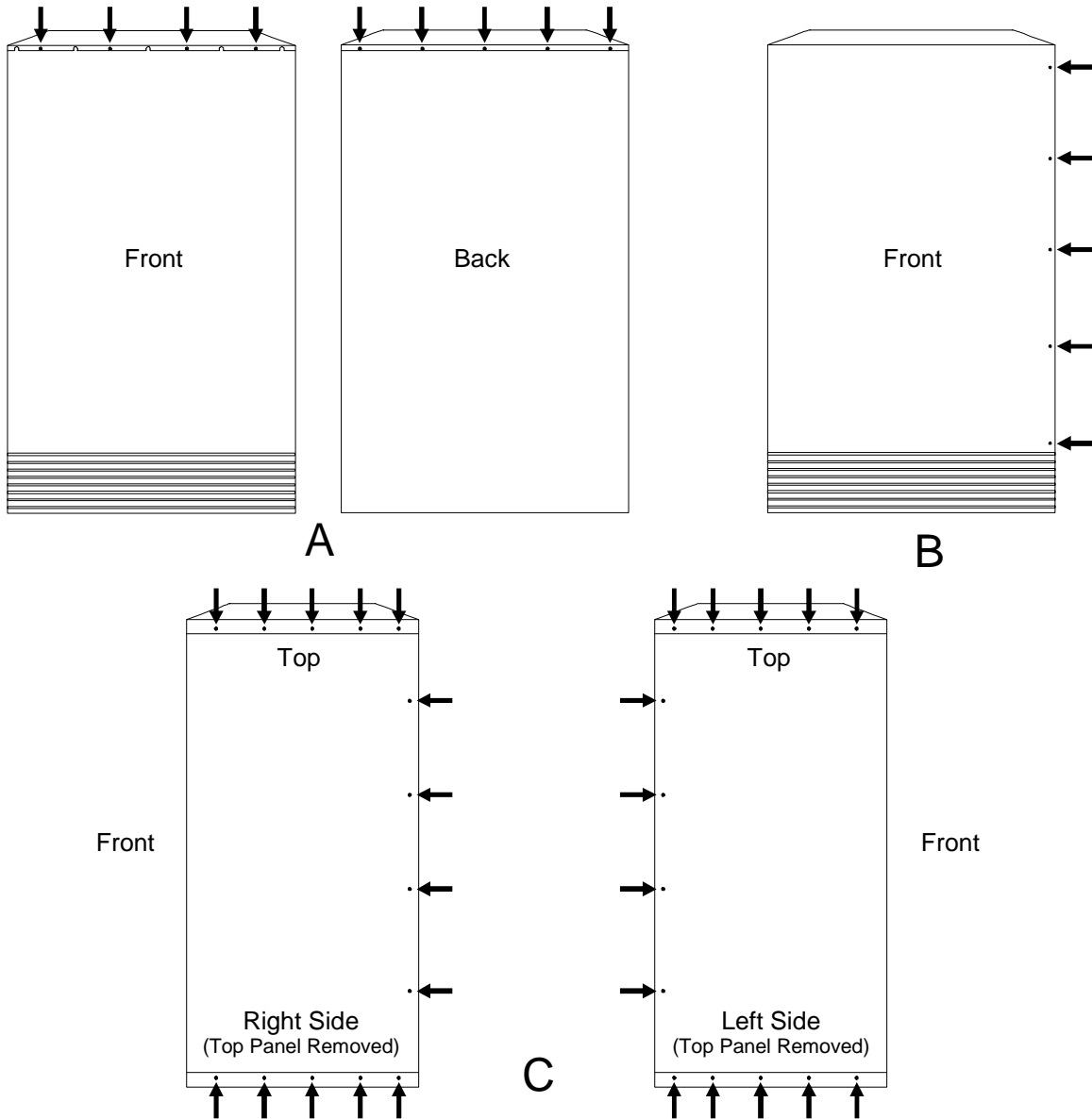


Figure 7-4 TLS-412180/360 Library Top and Side Panels

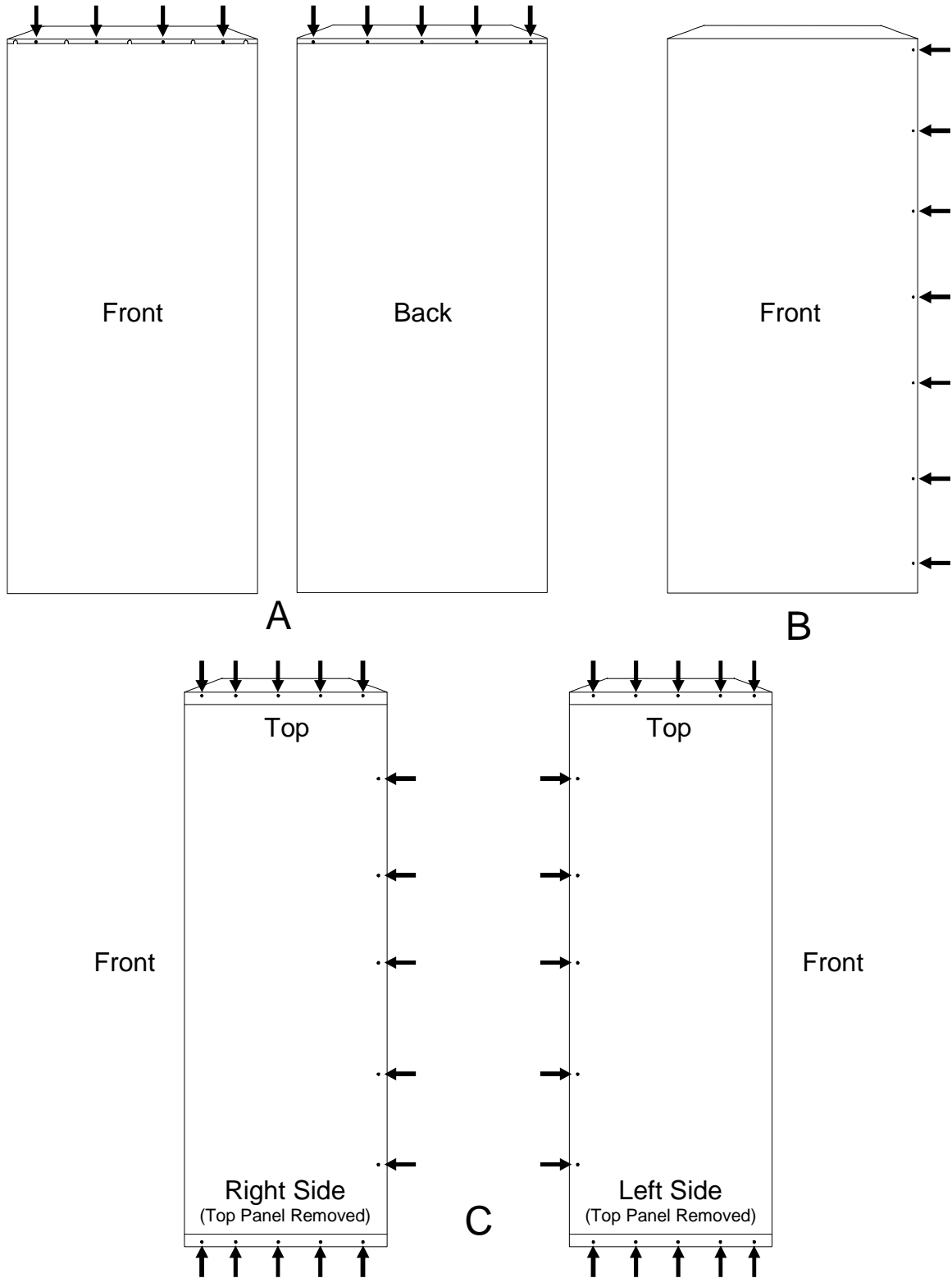


Figure 7-5 TLS-412300/600 Library Top and Side Panels

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 7-4A or Figure 7-5A).
4. Remove the screws from the back of the Top Panel (Figure 7-4A or Figure 7-5A).
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 7-4A or Figure 7-5A).
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 7-4B or Figure 7-5B).

NOTE

The left side Panel does not have front mounting screws, as shown for the right side Panel in Figure 7-4B and Figure 7-5B.

5. When removing the left side Panel, use a wrench to remove the three or four (model specific) 1/4-inch nuts from the side panel, which are located inside the front opening (Figure 7-6 or Figure 7-7).

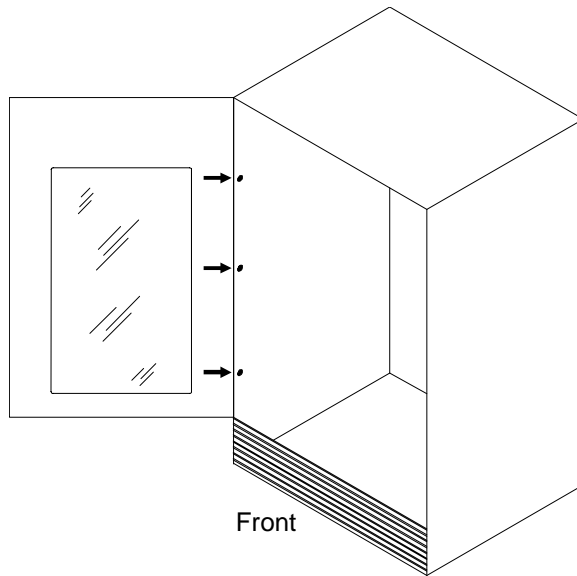


Figure 7-6 TLS-412180/360 Left Side Panel Nuts

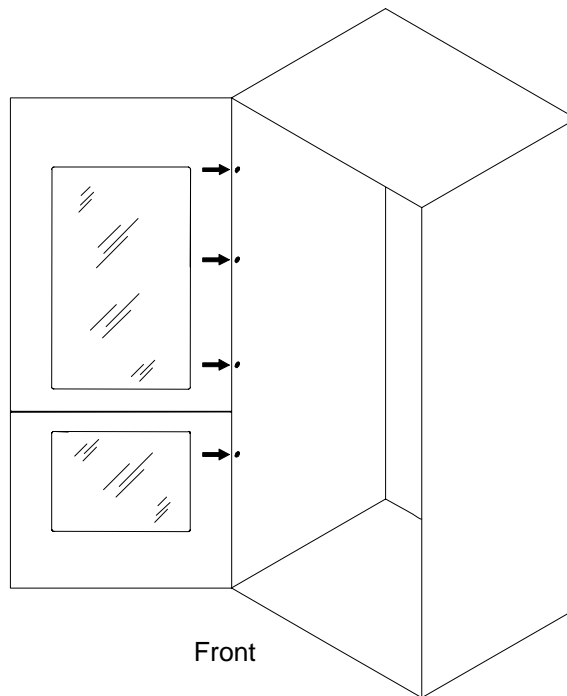


Figure 7-7 TLS-412300/600 Left Side Panel Nuts

6. For either Side Panel, remove the screws from the top, bottom and back edges of the Side Panel (Figure 7-4C or Figure 7-5C).
7. Lift the Side Panel off of the TLS.

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. If you are replacing the left side Panel, replace the three or four (model specific) 1/4-inch nuts removed in Section 7.4.3, step 5.
6. For either Side Panel, replace the screws removed in Section 7.4.3, step 6.
7. Replace the Top Panel (Section 7.4.2).
8. Close the cabinet door.

7.5 Carriage Assemblies

TLS-412180/360 P/N 500650-01-5

TLS-412300/600 P/N 500650-02-3

The TLS-412xxx models contain two identical Carriage Assemblies referred to as the left and right Carriage Assemblies when viewed from the front of the TLS. Note that TLS-412300/600 carriage assemblies have three guide shafts and the TLS-412180/360 models contain two. The replacement procedure that follows will apply to replacing Carriage Assemblies from either the TLS-412180/360 or TLS-412300/600 models, making note of specific operations when required.

Each Carriage Assembly contains a Gripper Assembly (for grasping the tape cartridges), a Carriage PCBA, a Cartridge Presence Sensor, a Vertical Axis Home Sensor and a Barcode Reader. 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 a Vertical (Y) Axis Home sensor while removing a Carriage Assembly. There is very little clearance between the sensors (underneath and to the rear of the Carriage Assemblies) and the Vertical (Y) Axis Home Sensor Probes (Figure 7-8), which are 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**
L-shape wrench required
- **Torque Wrench**
(Capable of at least 50 in-pounds)
- **Small Mirror (optional)**
- **Small Flashlight (optional)**

Material Required:

- **Loctite 242 Threadlocker**

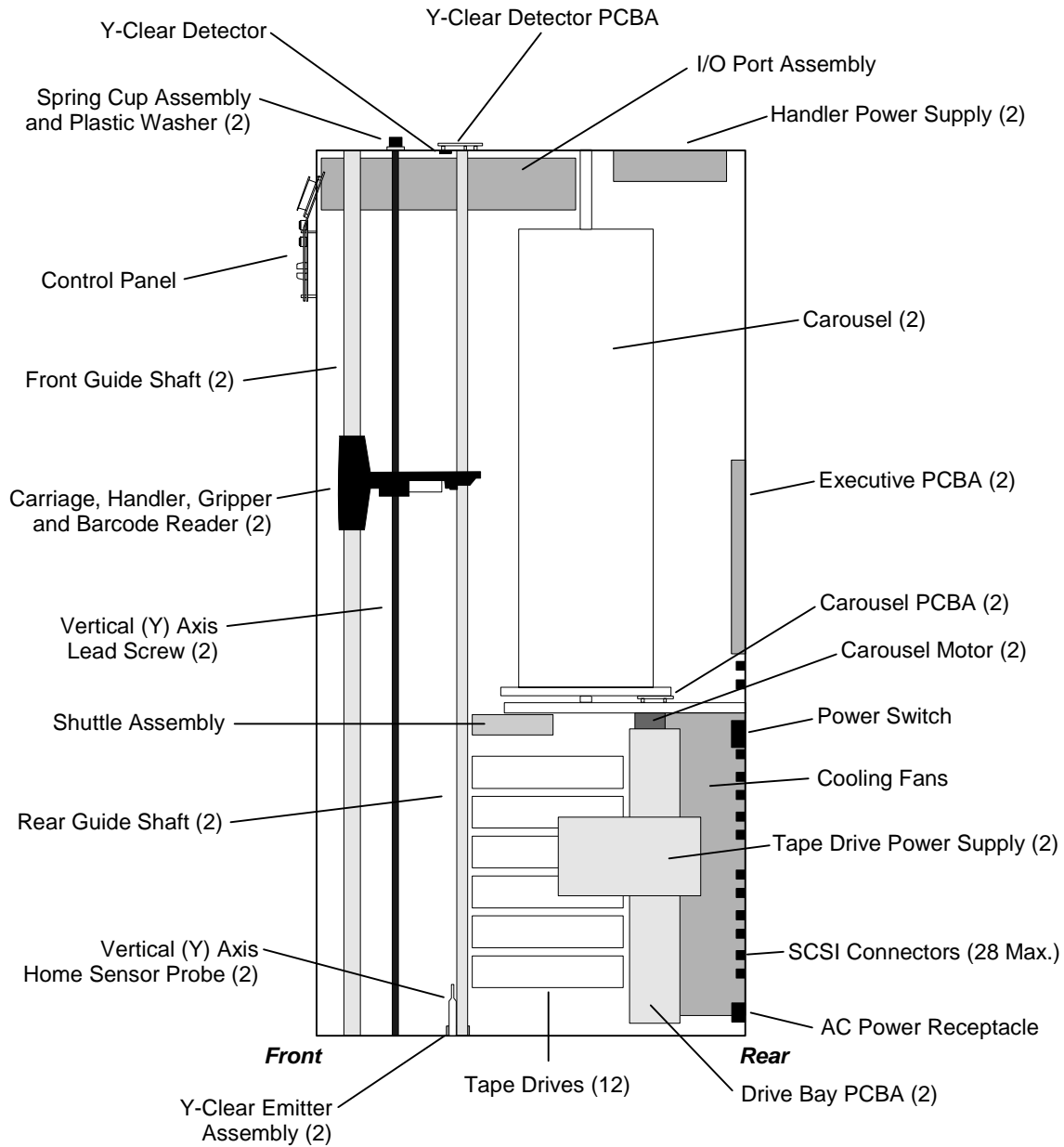


Figure 7-8 TLS-412180/360 Side View

7.5.1 Carriage Assembly Removal

1. Turn off the TLS power and remove the power cord.
2. Use a 7/64-inch Allen wrench to remove both socket-head Carriage Cable Clamp mounting screws (Figure 7-9).
3. Manually raise the Carriage Assembly up sufficiently to expose the ribbon cable connector on the underside.

4. Disconnect the Carriage Assembly's double ribbon cable connector by pushing outwards on both ejectors (located on the end of the connector). Set the cable on the bottom plate.

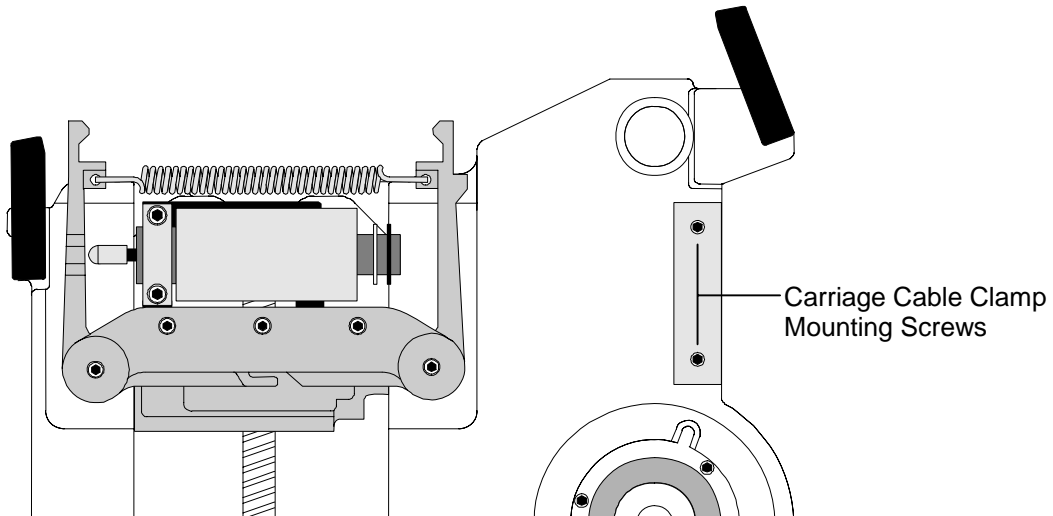


Figure 7-9 The Carriage Assembly – TLS-412180/360 Model Top View Shown

5. Using a small mirror and a small flashlight if needed, locate the bottom Leadscrew retaining screw, corresponding to the carriage you wish to remove, on the bottom of the TLS (Figure 7-10).

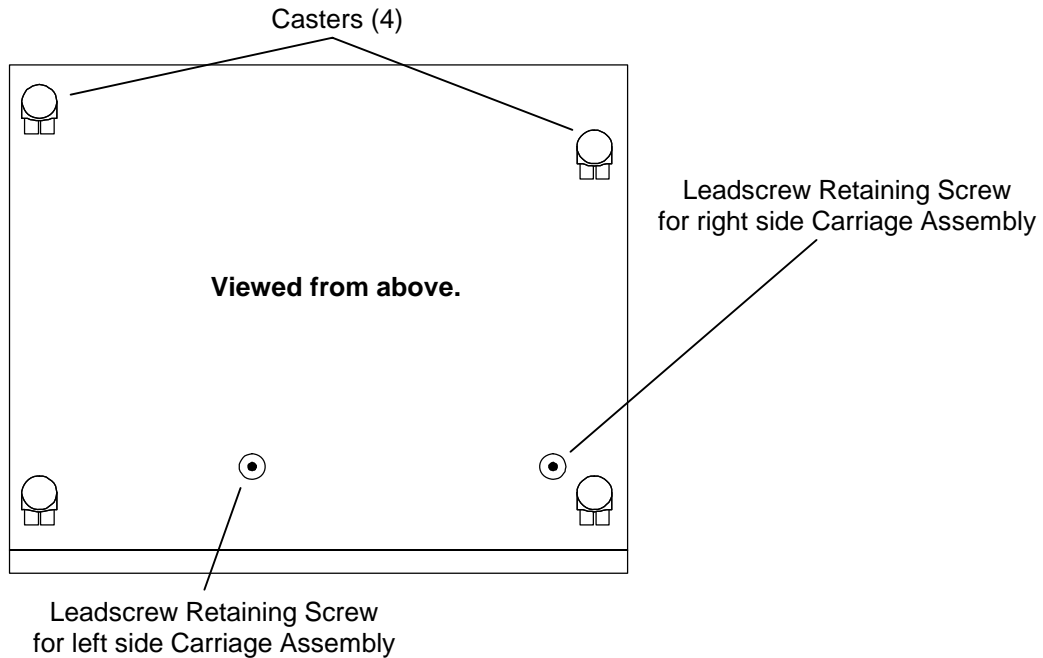


Figure 7-10 Location of Bottom Leadscrew Retaining Screws

-
6. Use a 1/8-inch L-shaped Allen wrench to remove the Leadscrew retaining screw (Figure 7-10).

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 7-8).

7. Remove the Top Panel as described in Section 7.4.1.
8. 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.

9. 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 7-11). 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.
10. Carefully lower the Carriage Assembly back down onto the bottom plate.
11. There are two Guide Shaft Strike Plates mounted on the top plate for each of the front and rear Guide Shafts of each Carriage Assembly. Note that on TLS-412300/600 models the supporting Guide Shaft does not have to be removed when removing a Carriage Assembly. When removing the two for the right side Carriage Assembly gently move the Switch Bracket ribbon cable out of the way. For either the right or left side Carriage Assembly, remove all four Guide Shaft Strike Plate mounting screws, then remove both Guide Shaft Strike Plates (Figure 7-13).
12. 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 7-8) when you move the Carriage Assembly.

13. 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.

14. 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.

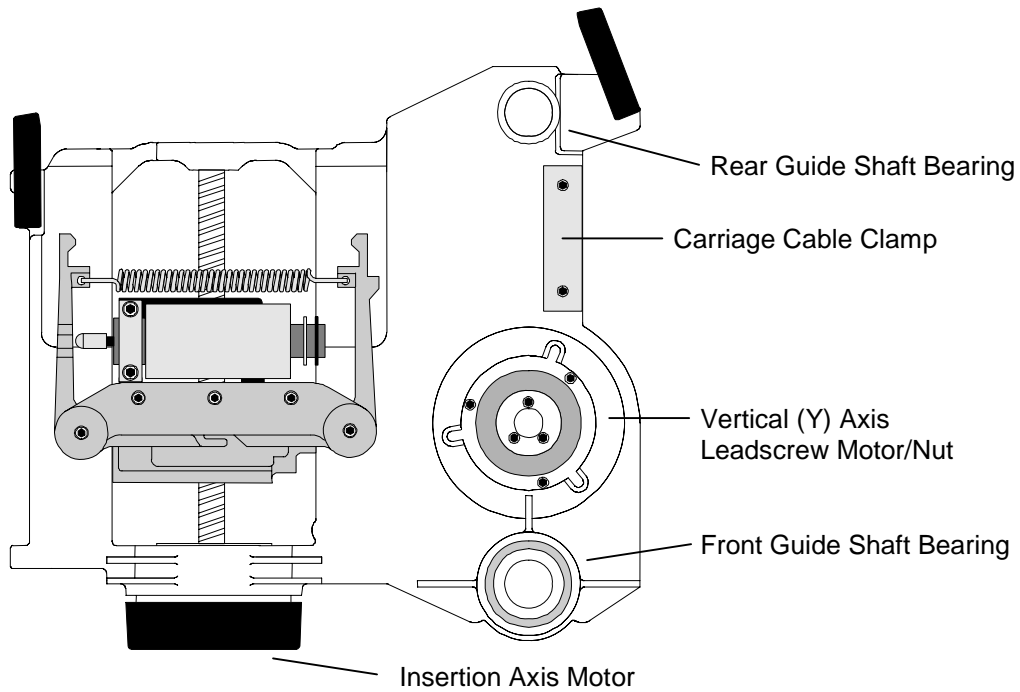


Figure 7-11 The TLS-412180/360 Carriage Assembly (P/N 500650-01-5)

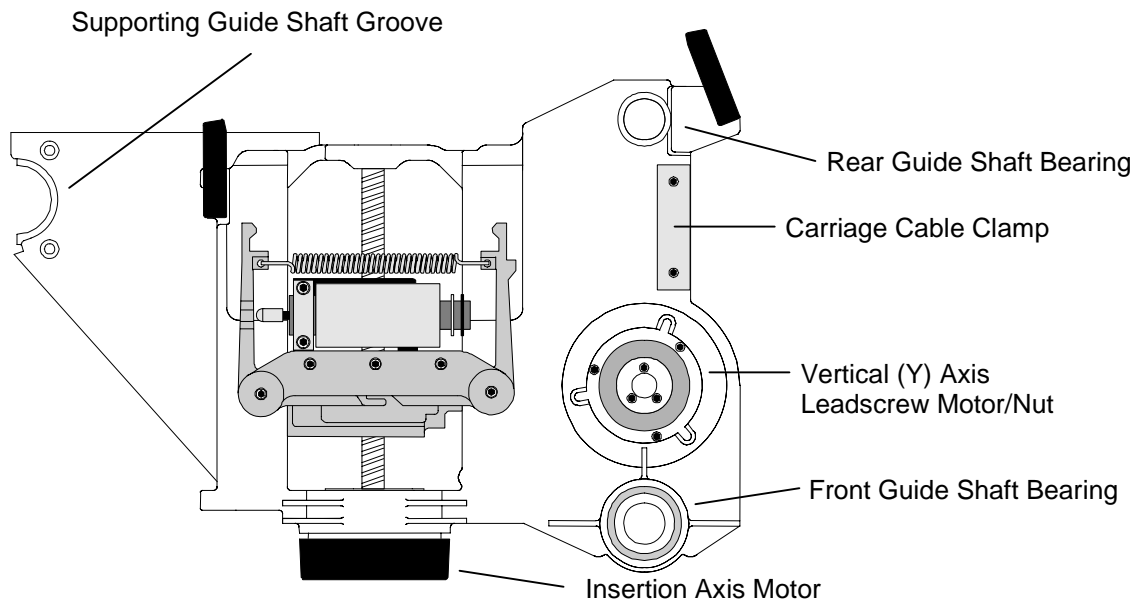


Figure 7-12 The TLS-412300/600 Carriage Assembly (P/N 500650-02-3)

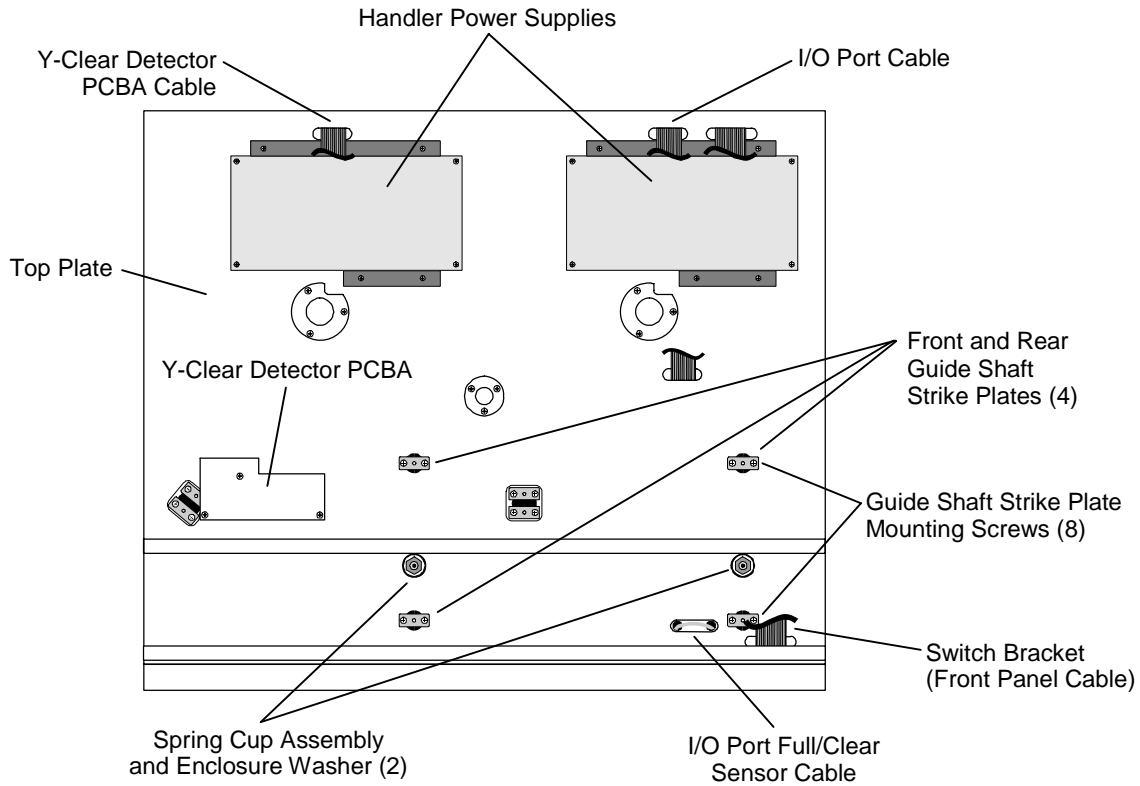


Figure 7-13 The TLS Cabinet – Top View of a TLS-412300/600 (Top Panel Removed)

7.5.2 Carriage Assembly Replacement

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

CAUTION

Recalibrate the TLS after replacing a Carriage Assembly.

Be very careful not to damage a Vertical Axis Home sensor while removing a Carriage Assembly. There is very little clearance between the sensors (underneath and to the rear of the Carriage Assemblies) and the Vertical Axis Home Sensor Probes (Figure 7-8), which are mounted on the floor of the cabinet.

1. Locate both the front and rear 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 7-8), 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. For TLS-412300/600 models only, position the carriage assembly so that the supporting guide shaft is aligned in the supporting guide shaft groove of the Carriage Assembly (Figure 7-12). Slide the Front Guide Shaft through the Front Guide Shaft Bearing. 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 7-8) fits into the hole in the Carriage PCBA (Figure 7-16), 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 7-8) 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 7-14) 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 7-11).

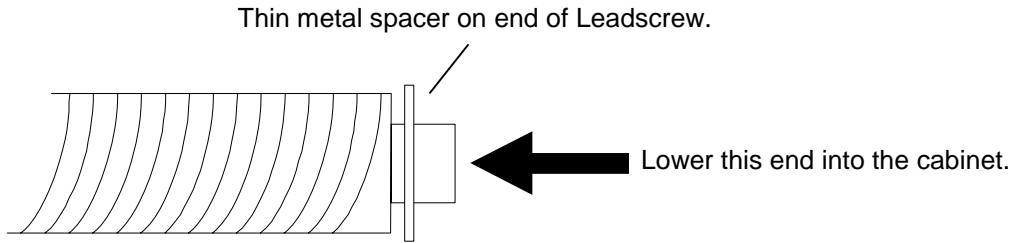


Figure 7-14 The Carriage Assembly Leadscrew

10. Make sure that the thin metal spacer is positioned on the end of the Leadscrew. See Figure 7-14.
11. Gently 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. Using a small mirror and a small flashlight if needed, locate the bottom Leadscrew retaining screw hole on the bottom of the TLS (Figure 7-10).
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 L-shaped Allen wrench.

NOTE

If you do not apply Loctite 242 to the leadscrew retaining screw before reinstalling it, the leadscrew may 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.

NOTE

Make sure that the white spacer on the top end of each Guide Shaft is visible. *If one of the white spacers is not visible, the corresponding Guide Shaft may be upside down.*

15. Place a Guide Shaft strike plate over each of the two Guide Shaft holes on the top plate (Figure 7-13).
16. If replacing the right side Carriage Assembly gently move the Switch Bracket ribbon cable out of the way. For either the right or left side Carriage Assembly insert all four Guide Shaft Strike Plate mounting screws (6-32 x 3/8 pan head screws with integral lockwashers) into the Guide Shaft Strike Plate mounting holes (Figure 7-13). 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 23. If the Spring Cup *was* removed from the Leadscrew during disassembly, go to step 16.

Refer to Figure 7-15 for the remaining steps of this procedure.

17. Place the Polyurethane Enclosure Spacer over the Leadscrew mounting hole in the top plate.
18. 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 7-15.

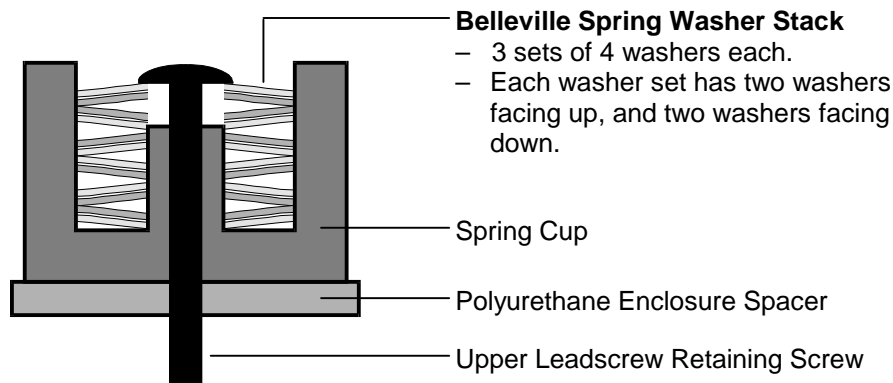


Figure 7-15 The Spring Cup Assembly and Enclosure Spacer

19. 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.

-
20. Use a 1/8-inch Allen wrench to install the upper Leadscrew retaining screw.
 21. 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.
 22. 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.
 23. Finally, loosen the upper Leadscrew retaining screw exactly one complete turn (360°). No Carriage Assembly adjustments are necessary.
 24. 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.
 25. 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.
 26. Insert the Carriage Cable Clamp into the mating recess on the upper surface of the Carriage casting (Figure 7-9).
 27. 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 7-9), then firmly tighten the screws with a 7/64-inch Allen wrench.
 28. 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 re-lubrication every two years, or after approximately 200,000 Y-Axis moves (whichever comes first), or whenever the Carriage Assembly (P/N 500650-01-5 or 500650-02-3) 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 equipment), but it is still wise to use a latex glove on the hand that applies the lubricant. If the lubricant contacts your skin, wash with soap and water.

1. 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 index 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 surface 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 your hands thoroughly 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.

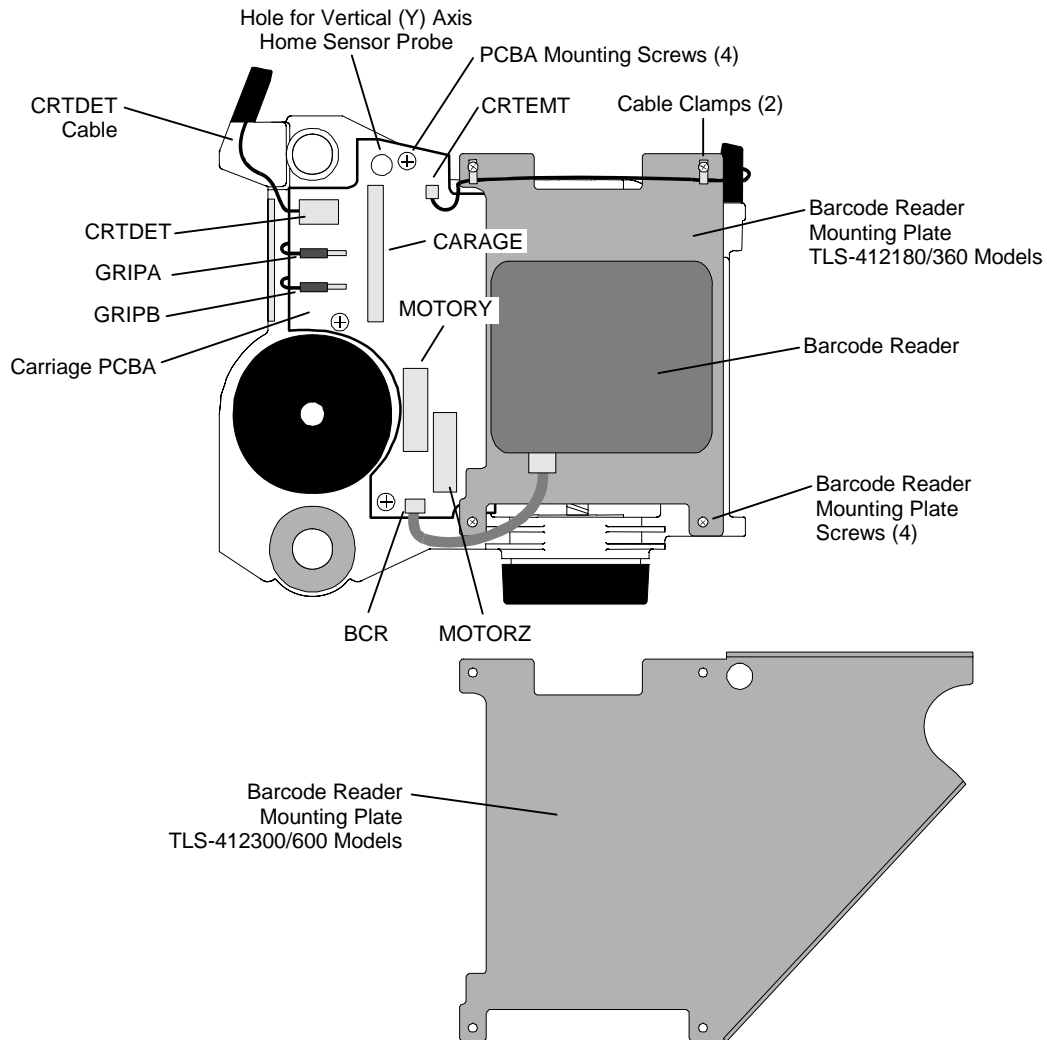


Figure 7-16 Carriage PCBA (Handler Bottom View)

7.6.1 Carriage PCBA Removal

Refer to Figure 7-16.

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. Be careful not to lose the two cable clamps.
 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 7-16.

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 gripper solenoid wires onto the GRIPA and GRIPB terminals. Either wire can be connected to either terminal.
3. Plug the two-wire CRTDET cable into the CRTDET connector. Note that the connector is keyed.
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 as shown in Figure 7-16, to retain 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

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 requires 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.

Tools Required:

- **Number 2 Phillips Screwdriver**
- **9/64-inch Allen (Hex) Wrench**

NOTE

It is not necessary to remove the Carriage Assembly from the TLS for Barcode Reader installation or removal.

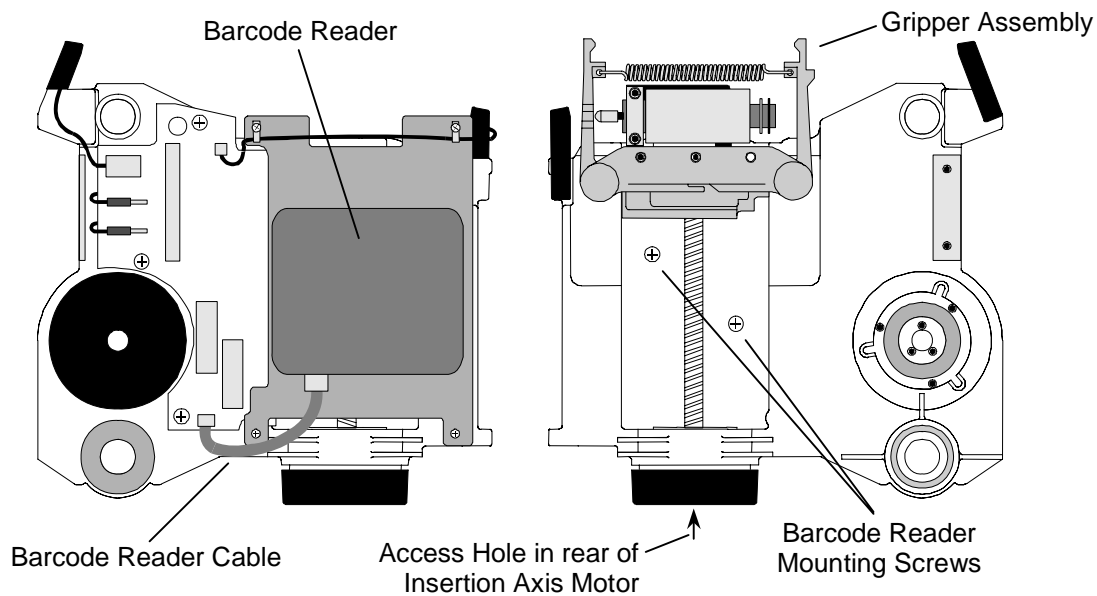


Figure 7-17 Barcode Reader (TLS-180/360 Model Shown)

Refer to **Figure 7-17**

7.7.1 Barcode Reader Removal

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 from the top of the carriage, then remove the wrench.
7. Place your hand under the Barcode Reader to support the carriage. 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 and remove the Barcode Reader from the TLS.

7.7.2 Barcode Reader Replacement

Refer to Figure 7-17

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

1. Gently turn the Allen wrench counter-clockwise to move the Gripper forward, until both Barcode Reader mounting screws are accessible from the top of the carriage, then remove the wrench.
2. 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.
3. Align the mounting screw holes in the Barcode Reader with the mounting screw holes in the Carriage Assembly.
4. Install both BCR mounting screws (6-32 x 1/4-inch Flat head screws) from the top side of the Carriage Assembly. Use a number 2 Phillips screwdriver to securely tighten both BCR mounting screws.
5. Insert a 9/64-inch Allen wrench into the Access Hole in the rear of the Insertion Axis Motor again.
6. Gently turn the Allen wrench clockwise, until the Gripper is completely retracted (towards the cabinet door), then remove the wrench.
7. Connect the Barcode Reader Cable to the jack in the back of the Barcode Reader.
8. 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.

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-412xxx Installation and Operation Manual (Qualstar document number [501300](#)), 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-412xxx Installation and Operation Manual (Qualstar document number [501300](#)) edit the `LabelCheckChar` value in the `Configuration\Advanced\Changer`.

7.8 Air Filters, Fan Assemblies and Blower Assemblies

Air Filter P/N 500584-01-6

Fan Assembly P/N 500700-02-6

Blower Assembly P/N 500469-01-0

Tools Required:

- Flat-blade Screwdriver
- Number 1 Phillips Screwdriver
- Number 2 Phillips Screwdriver
Standard and Short/Stubby length screwdrivers required
- Diagonal Wire Cutters

Material Required:

- 3-inch x 3/32-inch Cable Ties

7.8.1 Air Filter Removal/Replacement

P/N 500584-01-6

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.

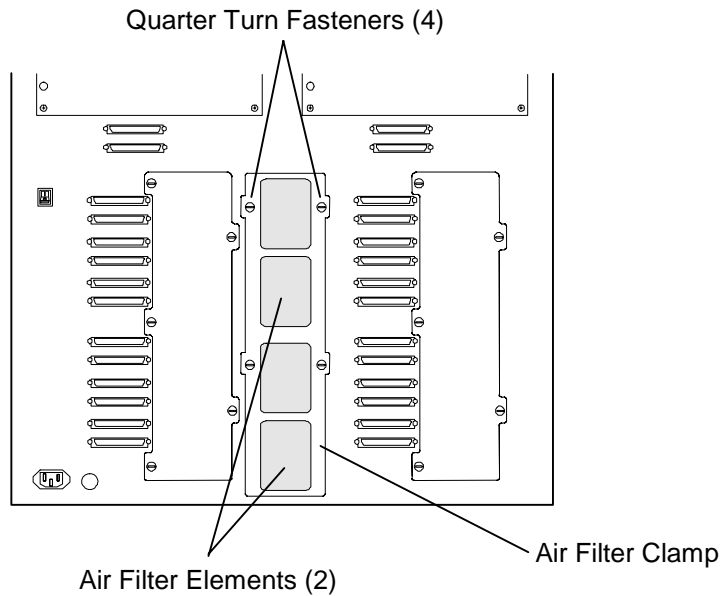


Figure 7-18 Rear View of TLS

Refer to **Figure 7-18**.

1. Use a flat blade screwdriver to turn the four quarter-turn fasteners on the Air Filter Clamp counter-clockwise.
2. Remove the Air Filter Clamp from the TLS.
3. Remove the two air filters.

a) If you only want to replace the air filters at this time, replace the old air filters with new ones, then reinstall the Air Filter Clamp.

IMPORTANT

Never try to clean and reuse an old air filter. If the old air filters are not yet dirty enough to be replaced and are being reinstalled, make sure that the sides that were facing the inside of the library are placed in the same direction as they were when they were removed. Reversing the direction of an old air filter may cause dirt to be transferred into the library.

b) If you want to remove the Fan Assembly, leave the air filters and Air Filter Clamp off of the TLS and continue on to Section 7.8.2.

4. Replace the Air Filter Clamp and secure it by turning the four quarter-turn fasteners clockwise.

7.8.2 Fan Assembly Removal

P/N 500700-02-6

All TLS-412180/360 models and some 412300/600 models are cooled and pressurized by a Fan Assembly located at the rear of the library, between the drive bays.

Refer to Figure 7-18 and Figure 7-19.

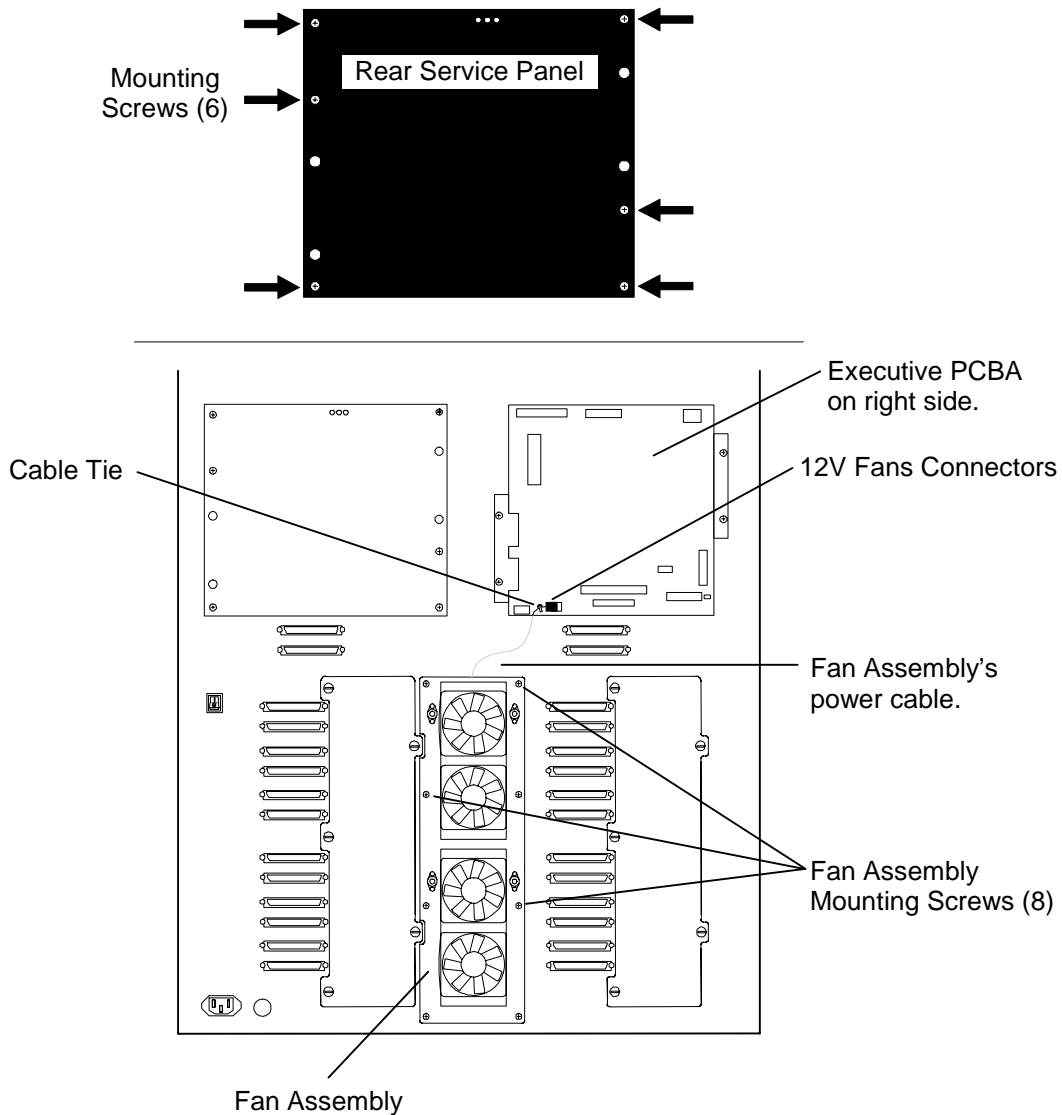


Figure 7-19 Fan Assembly at Rear of Library

1. Use a flat blade screwdriver to turn the four quarter-turn fasteners on the Air Filter Clamp counter-clockwise.
2. Remove the Air Filter Clamp from the TLS.
3. Remove the two air filters.

-
4. Use a number 2 Phillips screwdriver to remove all six mounting screws from the right side Rear Service Panel, then remove the panel.
 5. Carefully cut the Cable Tie on the Executive PCBA that is attached to the Fan Assembly's power cables.
 6. Unplug the Fan Assembly's power cables from the Executive PCBA at the 12V Fans connectors.
 7. Use a number 2 Phillips screwdriver to remove all eight Fan Assembly mounting screws.
 8. Remove the Fan Assembly from the rear of the TLS while carefully guiding the power cable connector through the opening in the Midplate.

7.8.3 Fan Assembly Replacement

Refer to **Figure 7-18** and **Figure 7-19**.

1. Insert the Fan Assembly's power cable connectors through the Fan Assembly's opening in the rear of the TLS.
2. Thread the power cable connectors up through the opening in the Midplate. The opening is about 2.50 inches to the right of the right side edge of the Fan Assembly's opening.
3. Insert the Fan Assembly into the rear of the TLS while carefully guiding the power cable connectors upwards towards the Executive PCBA.
4. Align the Fan Assembly's mounting screw holes with the mounting screw holes in the TLS, then reinstall all eight Fan Assembly's mounting screws.
5. Connect the Fan Assembly's power cables to the Executive PCBA at the 12V Fans connector. Note that this connector is not polarity-sensitive or keyed.
6. Insert a Cable Tie through the hole in the Executive PCBA (Figure 7-34), then secure the Fan Assembly's power cable to the Executive PCBA.
7. Align the right side Rear Service Panels mounting screw holes with the mounting screw holes in the TLS, then reinstall all six mounting screws.
8. Reinstall the air filters (or install new ones). If the old air filters are being reinstalled, make sure that the sides that were facing the inside of the library are placed in the same direction as they were when they were removed. Reversing the direction of an old Air Filter may cause dirt to be transferred into the library.
9. Replace the Air Filter Clamp and secure it by turning the four quarter-turn fasteners clockwise. See Figure 7-18.

7.8.4 Blower Assembly Removal

P/N 500469-01-0

Some TLS-412300/600 models are cooled and pressurized by a Blower Assembly located between the drive bays.

1. Turn off the TLS power and remove the power cord.
2. Open the cabinet door.
3. Remove any tape drive assemblies that are installed in the drive bays on the right side of the library as seen from the front.
4. On the rear of the library, use a flat blade screwdriver to turn the four quarter-turn fasteners on the Air Filter Clamp counter-clockwise. See Figure 7-18.
5. Remove the Air Filter Clamp from the TLS.
6. Remove the two air filters and set them in a safe place.
7. Use a number 2 Phillips screwdriver to remove all eight Air Filter Bracket mounting screws. See Figure 7-20.
8. Remove the Air Filter Bracket from the library.

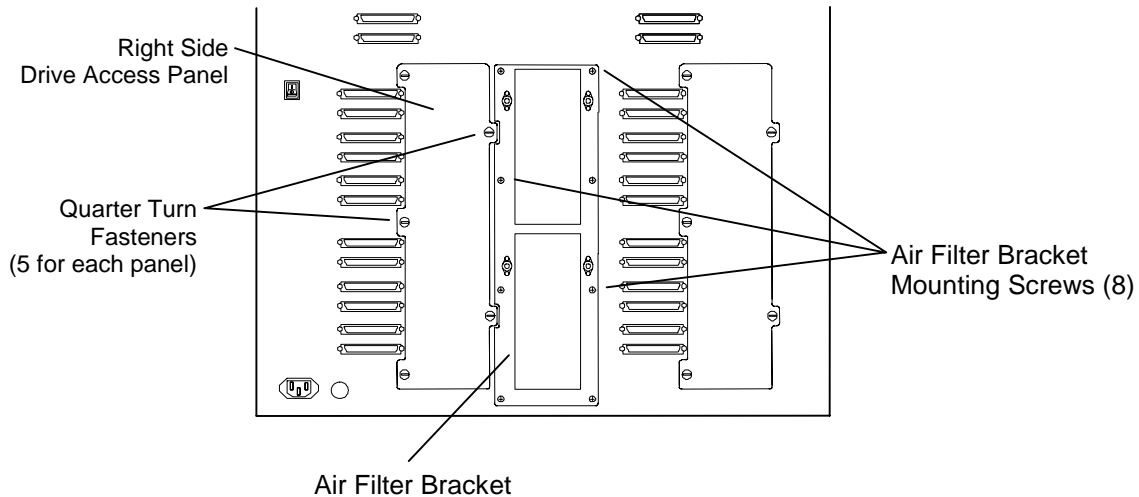


Figure 7-20 Air Filter Bracket on Rear of TLS-412300/600

9. Using a flat blade screwdriver, remove the right side (as seen from the front) Drive Access Panel by turning its five quarter-turn fasteners counter-clockwise. See Figure 7-20.

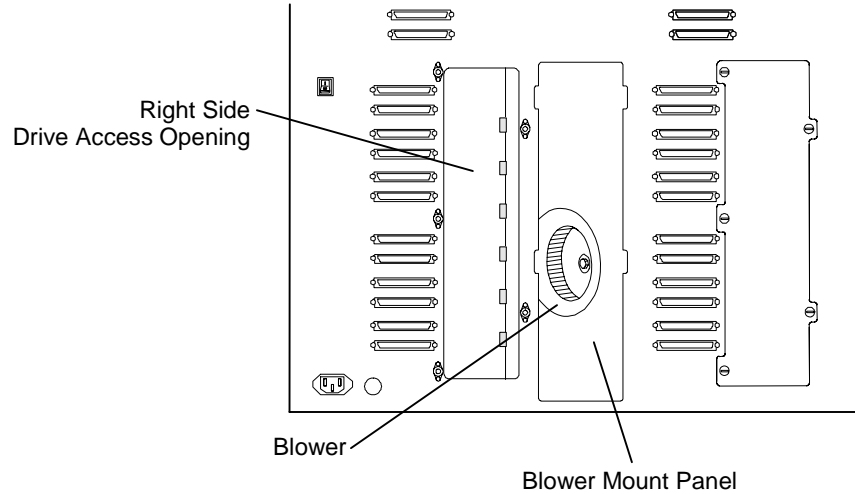


Figure 7-21 Blower Seen Through Opening in Rear of Library

10. Remove the three screws from the bottom of the Blower Mount Panel using Stubby/Short and regular length number 2 Phillips screwdrivers. The screw on the left side can be accessed by reaching into the right side drive access opening and using the screw access hole in the metal wall. See Figure 7-22.

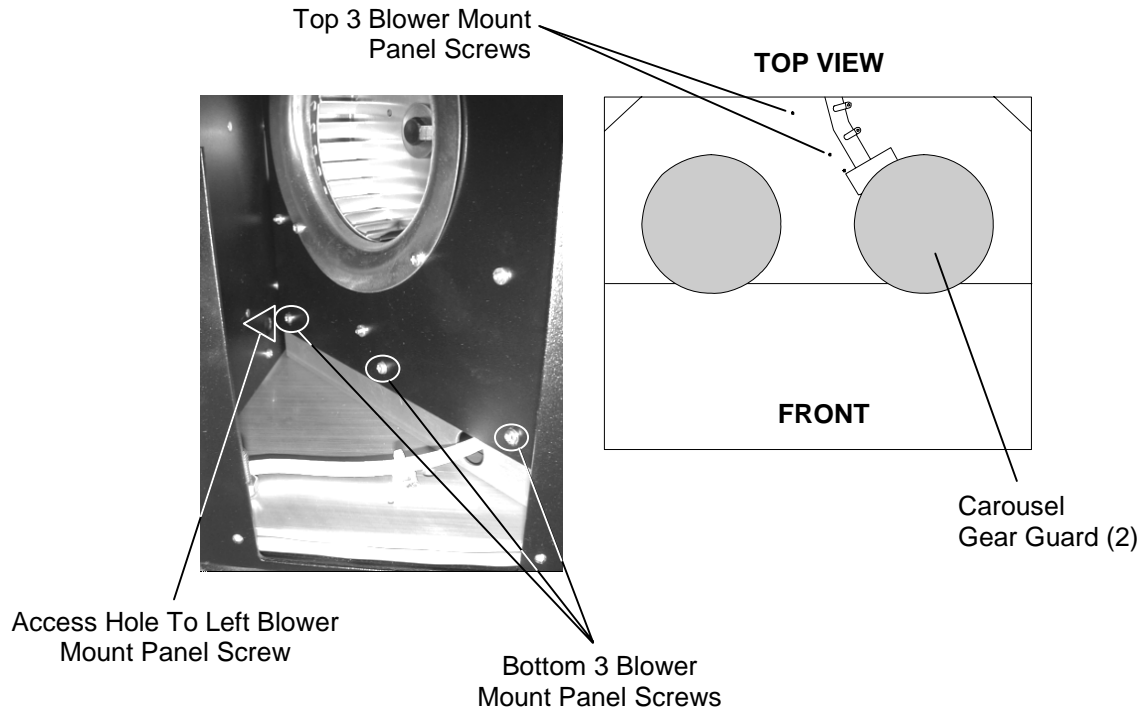


Figure 7-22 Blower Mount Panel Screw Locations

11. Reach into the library through the cabinet door and remove the three top Blower Mount Panel screws using a number 1 Phillips screwdriver. See Figure 7-22 for the screw locations.
12. The Blower Mount Panel will now be loose. Reach into the center opening in the rear of the library and turn the Blower Mount Panel to access the cables attached to the Blower.

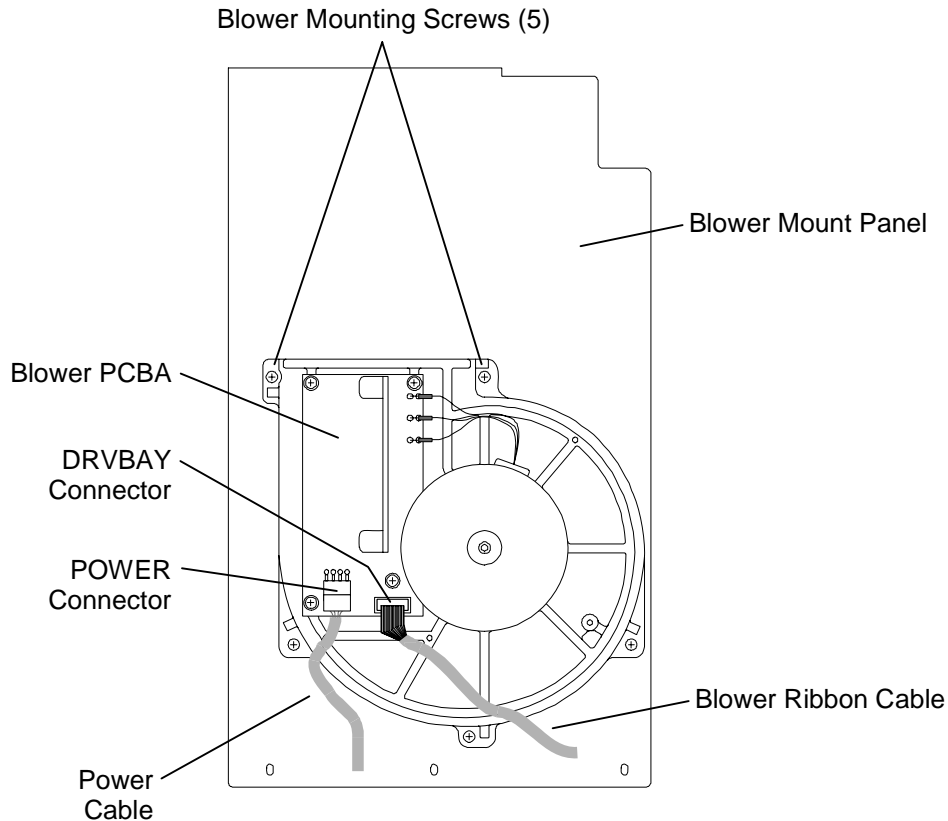


Figure 7-23 Blower Assembly Attached to the Blower Mount Panel

13. Disconnect the Power cable from the POWER connector on the Blower PCBA. See Figure 7-23.
14. Disconnect the Blower ribbon cable from the DRVBAY connector on the Blower PCBA. See Figure 7-23.
15. Carefully guide the Blower Assembly and the attached Blower Mount Panel out through the opening in the rear of the library.
16. Using a number 2 Phillips screwdriver, remove all five of the Blower mounting screws.
17. Remove the Blower Assembly from the Blower Mount Panel.

7.8.5 Blower Assembly Replacement

1. Align the five Blower Assembly's mounting screw holes with the corresponding holes in the Blower Mount Panel.
2. Using a number 2 Phillips screwdriver, reinstall the five Blower mounting screws that were removed earlier.
3. Carefully guide the Blower Assembly and the attached Blower Mount Panel into the rear opening of the library. Position it so the connectors on the Blower PCBA can be reached.
4. Plug the Blower ribbon cable into the DRV BAY connector on the Blower PCBA. See Figure 7-23. Note that the connector is keyed.
5. Plug the Power cable into the POWER connector on the Blower PCBA. See Figure 7-23.
6. Carefully position the Blower Assembly and the attached Blower Mount Panel so that the three screw holes on the bottom of the Blower Mount Panel are aligned with their corresponding holes in the library. See Figure 7-22.
7. Replace the three screws that were removed from the bottom of the Blower Mount Panel using Stubby/Short and regular length number 2 Phillips screwdrivers.
8. Align the top of the Blower Mount Panel with the three top Blower Mount Panel screw holes.
9. Reach into the library through the cabinet door and replace the three top Blower Mount Panel screws using a number 1 Phillips screwdriver. See Figure 7-22.
10. Align the Air Filter Bracket mounting screw holes with their corresponding holes on the rear panel of the library. See Figure 7-20.
11. Using a number 2 Phillips screwdriver, reinstall the eight Air Filter Bracket mounting screws that were removed earlier.
12. Reinstall the air filters (or install new ones). If the old air filters are being reinstalled, make sure that the sides that were facing the inside of the library are placed in the same direction as they were when they were removed. Reversing the direction of an old Air Filter may cause dirt to be transferred into the library.
13. Replace the Air Filter Clamp and secure it by turning the four quarter-turn fasteners clockwise. See Figure 7-18.
14. Replace any tape drive assemblies that were removed from the drive bays on the right side of the library.
15. Align the right side Drive Access Panels five quarter-turn fasteners with the corresponding receptacles on the rear panel, then fasten it by turning the quarter-turn clockwise. See Figure 7-20.

7.9 I/O Port Assembly

P/N 500750-03-9

Tools Required:

- Number 2 Phillips Screwdriver

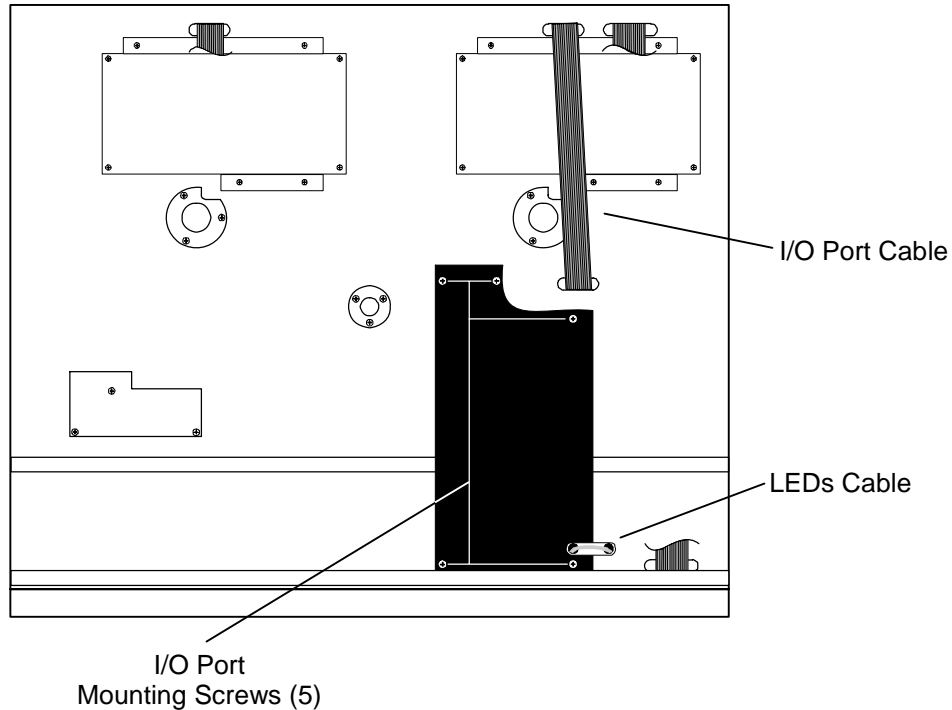


Figure 7-24 Top View of TLS

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 the Right 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.

Removing any magazines that are mounted on the top row of the right side carousel will also allow for easier access to the I/O Port Assembly.

-
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 IOPORT 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 7-25).
 6. Gently pull on the CALL switch button to remove it (Figure 2-6).
 7. Support the I/O Port Assembly from the inside of the TLS with one hand, then remove all five I/O Port mounting screws from the top of the TLS (Figure 7-24).
 8. Gently move the I/O Port Assembly back 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 you remove the Right 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.

Removing any magazines that are mounted on the top row of the right side carousel will also allow for easier access to the I/O Port Assembly.

1. Turn off the TLS power and remove the power cord.
2. 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 upper Magazine when the assembly is installed in the library (Figure 7-25).
3. Set the I/O Port Assembly in position by inserting it 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 7-24).
5. Support the I/O Port Assembly with one hand from inside the TLS, while installing all five mounting screws from above (Figure 7-24).
6. Plug the I/O Port ribbon cable into the IOPORT connector on the PCBA (Figure 7-25).
7. Gently press the CALL switch button back onto the CALL switch.
8. If you removed the Right side Panel, reinstall it (Section 7.4.4).

9. 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 recalibrated 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).

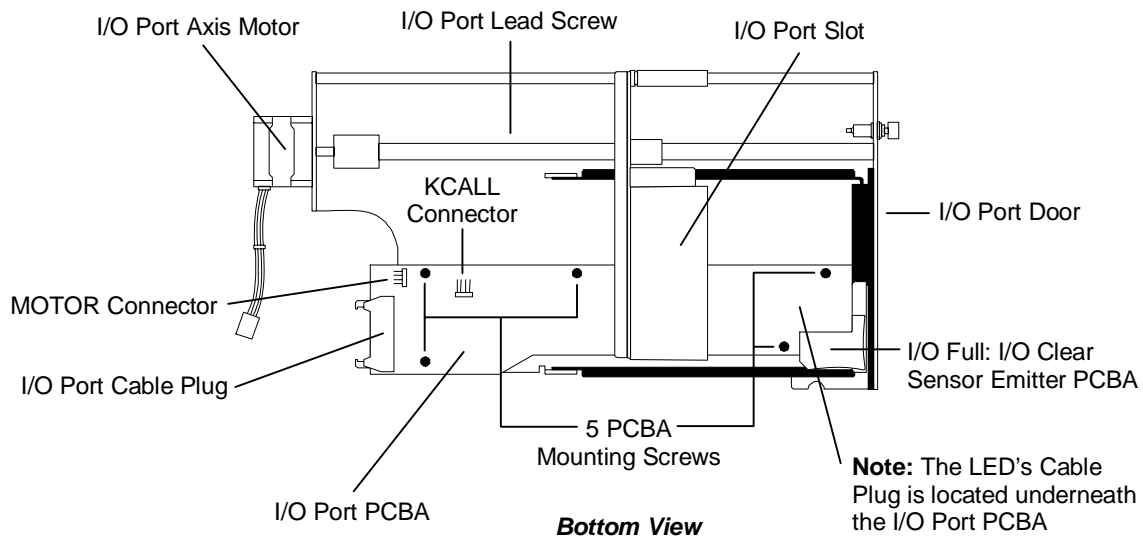


Figure 7-25 I/O Port Assembly

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 7-25).
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 7-25).
 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 7-25).
2. Lower the I/O Port PCBA into the I/O Port Assembly and install all five PCBA mounting screws (Figure 7-25).
3. Connect the Motor cable at the MOTOR connector on the I/O Port PCBA (Figure 7-25). 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 7-25). 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

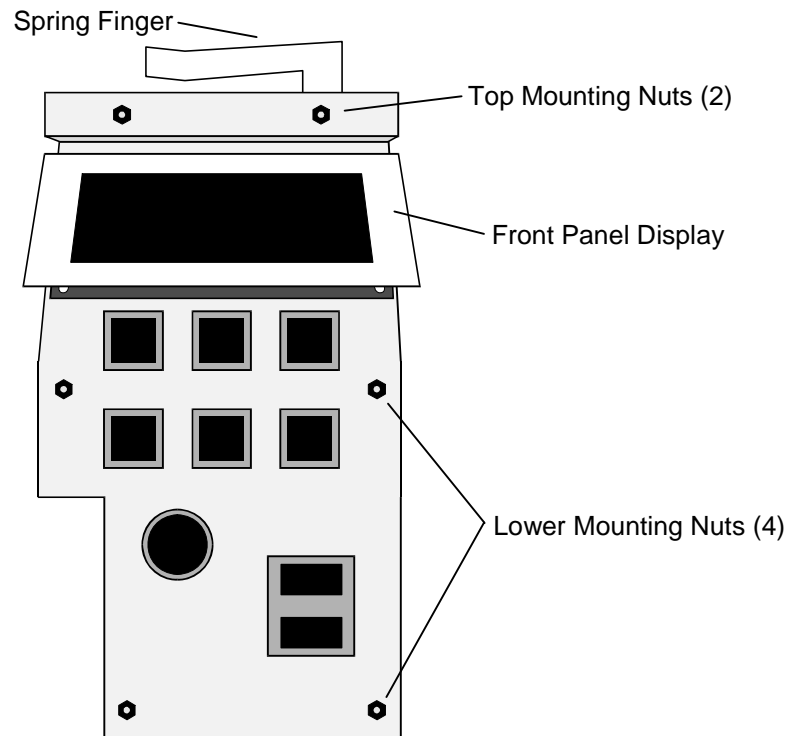


Figure 7-26 The Switch Bracket Assembly (Front Panel)

7.11.1 Switch Bracket Assembly Removal

1. Turn off the TLS power and remove the power cord.
2. Open the cabinet door.

NOTE

In the next step, the spacers behind the Switch Bracket Assembly come loose when the mounting nuts are removed.

3. Remove all six mounting nuts from the Switch Bracket Assembly mounting studs using a 1/4-inch nutdriver (Figure 7-26).

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 7-27), then remove them completely.
7. Unplug the ribbon cable from the FRONT connector on the Front Panel PCBA (Figure 7-27).

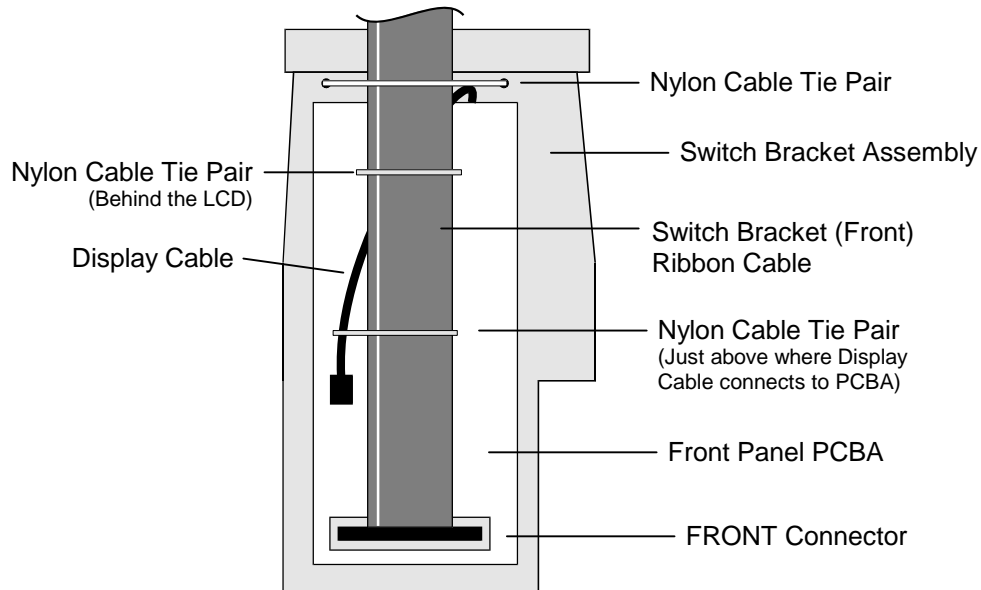


Figure 7-27 Switch Bracket Assembly (Rear View)

7.11.2 Switch Bracket Assembly Replacement

1. Plug the Switch Bracket Ribbon Cable into the FRONT connector on the Front Panel PCBA (Figure 7-27). 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 7-27).
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 7-27).
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 7-27).
 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 7-27).
 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 7-26).
 13. If the spacers and the Spring Finger were removed, mount the Spring Finger onto the top two mounting studs, then place two spacers onto the top two mounting studs. Place the four remaining spacers onto the four lower mounting Studs (Figure 7-26).
 14. Slide the Switch Bracket Assembly onto the mounting studs (Figure 7-26).
 15. Thread all six mounting nuts onto the mounting studs, then use a 1/4-inch nut-driver to tighten the mounting nuts until they are snug (Figure 7-26).
 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

DANGER

TO AVOID THE RISK OF PERSONAL INJURY, ALWAYS WAIT ABOUT ONE MINUTE AFTER THE POWER IS TURNED OFF AND THE POWER CORD IS DISCONNECTED, BEFORE TOUCHING THE HANDLER POWER SUPPLY OR THE TAPE DRIVE POWER SUPPLY.

GEFAHR

UM VERLETZUNGEN ZU VERHINDERN WARTEN SIE BITTE 1 MINUTE NACHDEM SIE DEN STROM AUSGESCHALTET HABEN UND DAS STROMKABEL ENTFERNT HABEN, BEVOR SIE DAS HANDLER-NETZTEIL SOWIE DAS TAPE-DRIVE-NETZTEIL BERUEHREN.

150W P/N 500826-05-2 or 500826-09-4

160W P/N 500826-13-6

The TLS-412xxx models contain two Handler Power Supplies referred to as the left and right Handler Power Supplies when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either Handler Power Supply, making note of specific left or right side operations when required.

Tools Required:

- **Number 2 Phillips Screwdriver**

7.12.1 Handler Power Supply Removal

NOTE

To determine which model of Handler power supplies are installed in the library, remove the top panel and then read the Handler Power Supply Label located on the power supply being replaced. See Figure 7-30. 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). If removing the right side Handler Power Supply, remove the right side Panel (Section 7.4.3) to gain access to the cables at the rear of the TLS.
3. This step only applies when removing the right side Handler Power Supply. Use a number 2 Phillips screwdriver to remove all six Rear Service Panel mounting screws (Figure 7-29), then remove the Rear Service Panel on the left side of the TLS when viewed from the rear.

- This step only applies when removing the right side Handler Power Supply. Disconnect the Switch Bracket (Front) Cable and the IOPORT Cable from the Executive PCBA (Figure 7-34), then lift the cables up to provide enough slack to remove the power supply.

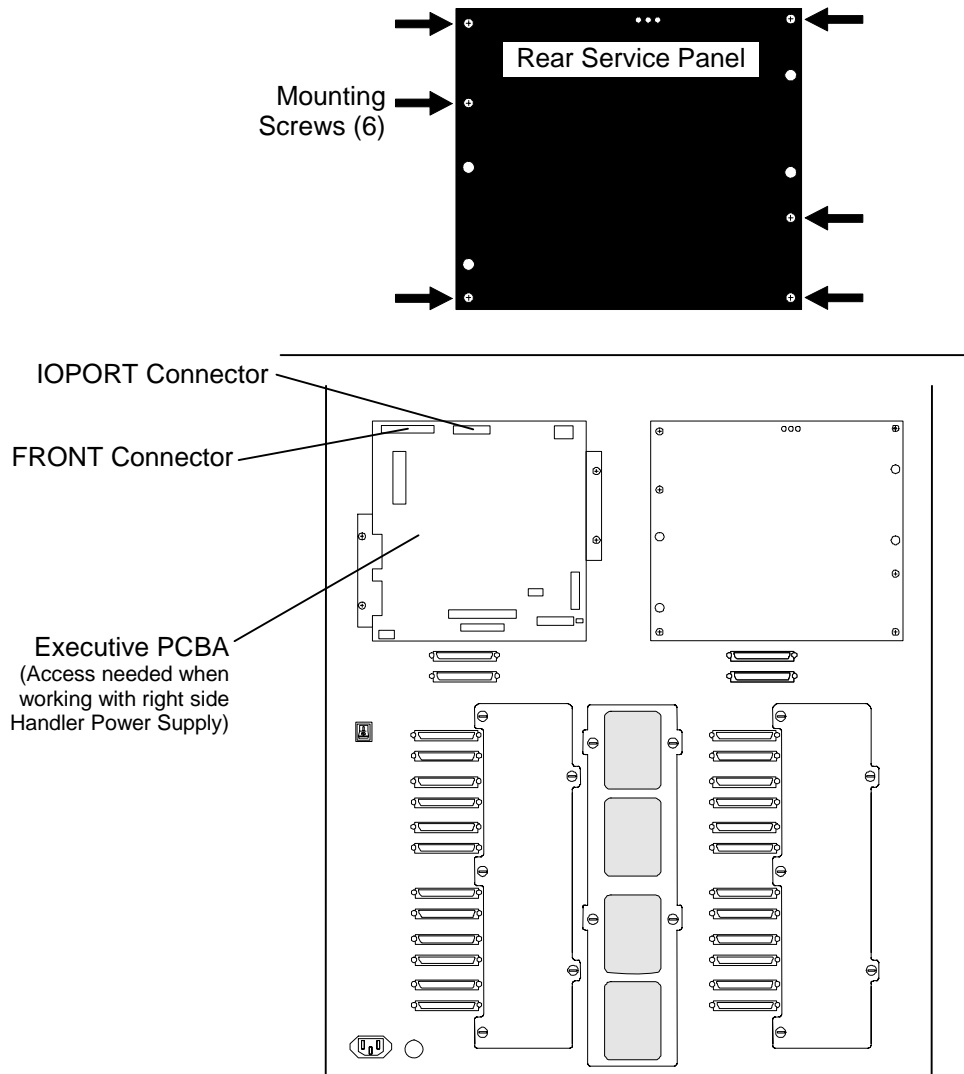


Figure 7-28 TLS Rear View

- This step only applies when removing the left side Handler Power Supply. Use a number 2 Phillips screwdriver to loosen the screw attached to the clip holding the Y-Clear Detector Cable in place on top of the TLS. Move the cable out of the way of the power supply. See (Figure 7-29).

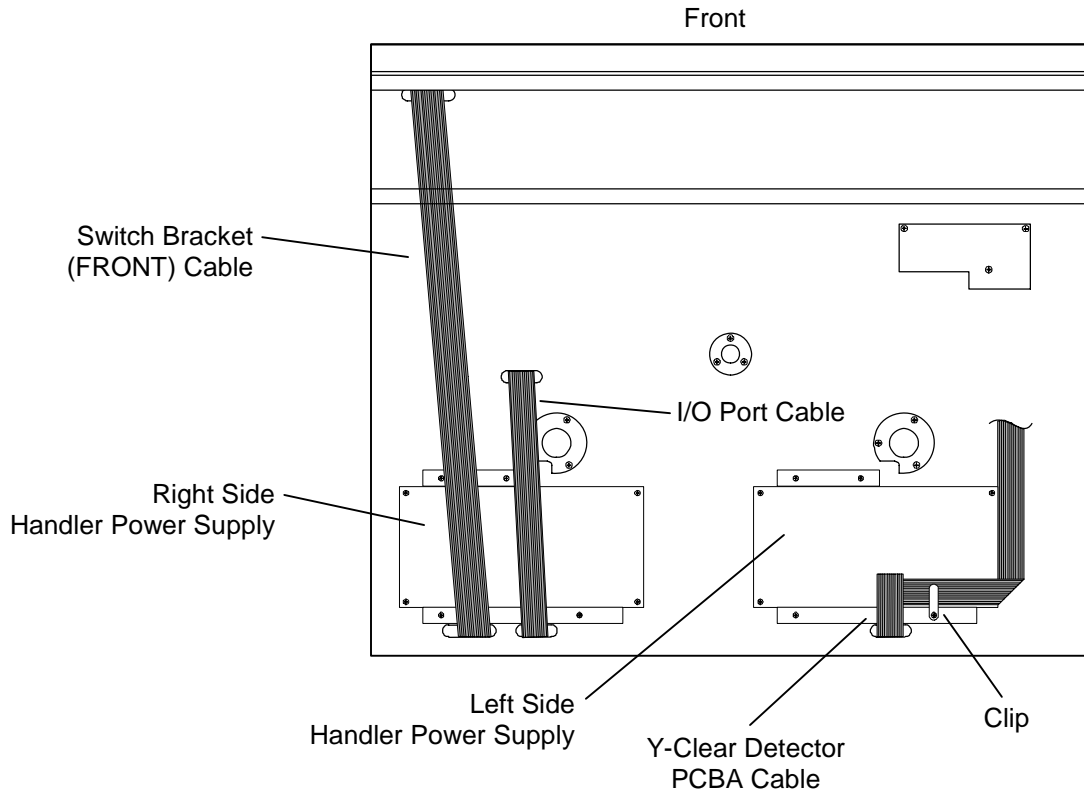


Figure 7-29 Top View of Handler Power Supplies (As seen from the back of the TLS)

6. Remove all four protective Screen mounting screws, then lift the Screen off of the TLS (Figure 7-30).
7. Disconnect the 2-Wire Cable connector from the Power Supply PCBA (Figure 7-30).

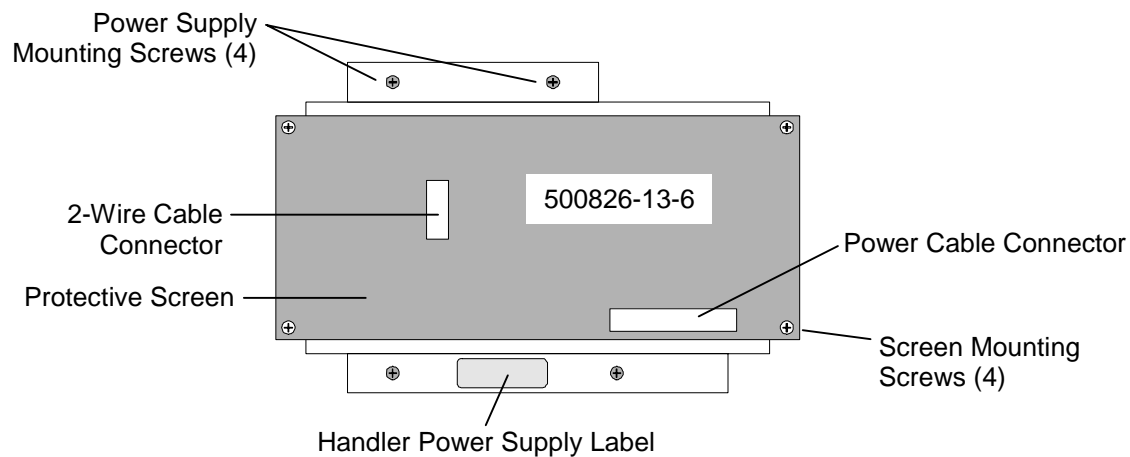
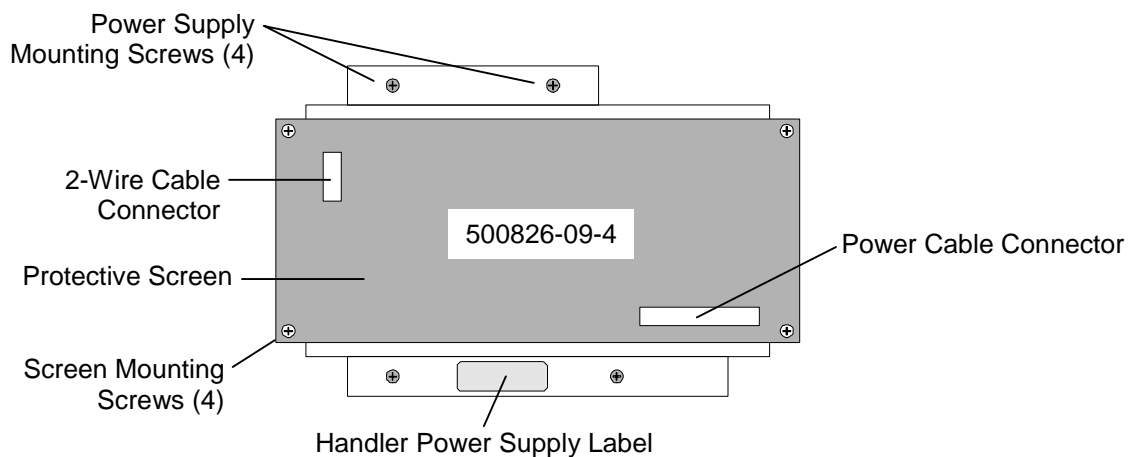
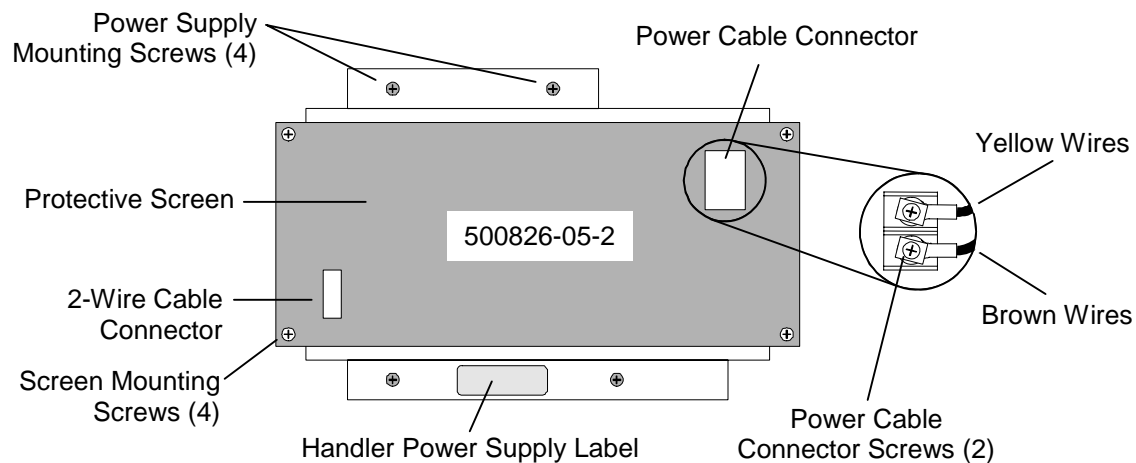


Figure 7-30 Handler Power Supplies (Top View, as seen from the back of the TLS.)

8. For P/N 500826-05-2 Power Supplies only, use a Phillips or flat screwdriver to remove the two power cable ring lug screws and lift the wires clear of the terminals.

-
9. For P/N 500826-09-4 and 500826-13-6 Power Supplies only, disconnect the Power Cable connector from the Power Supply PCBA.
 10. Remove all four power supply mounting screws (Figure 7-30).
 11. Lift the power supply up and out of the TLS.

7.12.2 Handler Power Supply Replacement

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 connectors on its PCBA are shown as seen in Figure 7-30, as seen from the back of the TLS.

2. Install all four Power Supply mounting screws (Figure 7-30).
3. Reconnect the 2-Wire Cable connector to the Power Supply PCBA (Figure 7-30).
4. For P/N 500826-05-2 Power Supplies only, position the power cable ring lugs wires over the terminals with the yellow wires at the top position and the brown wires at the bottom. See Figure 7-30. Use a Phillips or flat screwdriver to replace the two screws removed earlier.
5. For P/N 500826-09-4 and 500826-13-6 Power Supplies only, reconnect the Power Cable connector to the Power Supply PCBA (Figure 7-30).
6. Place the protective Screen on top of the Power Supply, then install all four Screen mounting screws (Figure 7-30). Make sure that no cables are pinched by the Screen.
7. This step only applies if the right side Handler Power Supply was removed. Reconnect the Switch Bracket (FRONT) Cable and the I/OPORT Cable to the Executive PCBA (Figure 7-34). Make sure that the connectors are fully inserted, until the locking tabs of the mating connectors are fully closed.
8. This step only applies if the right side Handler Power Supply was removed. 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 7-29).
9. This step only applies if the left side Handler Power Supply was removed. Position the Y-clear detector cable as seen in Figure 7-29 and slide it under the clip. If the clip is too tight use a number 2 Phillips screwdriver to loosen the screw attached to the clip and retighten it after the cable is in place.
10. 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 MINUTE AFTER THE POWER IS TURNED OFF AND THE POWER CORD IS DISCONNECTED, BEFORE TOUCHING THE HANDLER POWER SUPPLY OR THE TAPE DRIVE POWER SUPPLY.

GEFAHR

UM VERLETZUNGEN ZU VERHINDERN WARTEN SIE BITTE 1 MINUTE NACHDEM SIE DEN STROM AUSGESCHALTET HABEN UND DAS STROMKABEL ENTFERNT HABEN, BEVOR SIE DAS HANDLER-NETZTEIL SOWIE DAS TAPE-DRIVE-NETZTEIL BERUEHREN.

| | |
|------------------------------|---------------------------------------|
| Standard Power Supply | P/N 500826-03-7 or 500826-06-0 |
| PFC Power Supply | P/N 500826-12-8 |

The TLS-412xxx models contain two Tape Drive Power Supplies referred to as the left and right Tape Drive Power Supplies when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either Tape Drive Power Supply, making note of specific left or right side operations when required.

Tools Required:

- **Number 2 Phillips Screwdriver**

7.13.1 Tape Drive Power Supply Removal

NOTE

To determine which model of Tape Drive power supplies are installed in the library, remove the top panel and the right or left side panel then read the Tape Drive Power Supply Label located on the power supply being replaced. See Figure 7-32. 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 or left side Panel, as seen from the front of the TLS depending on which power supply is being removed (Section 7.4.3).

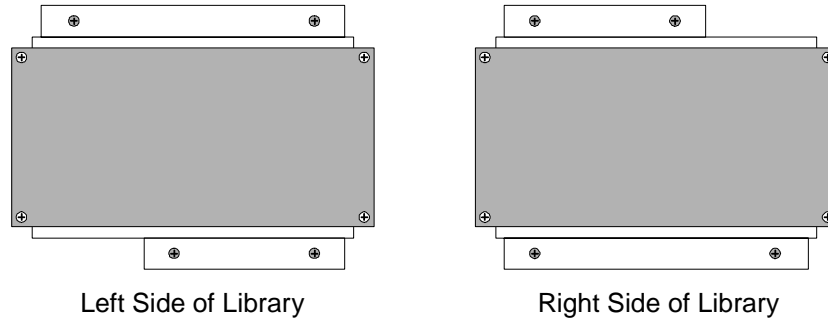


Figure 7-31 Orientation of the Tape Drive Power Supplies

4. Remove all four protective Screen mounting screws (Figure 7-32).
5. Disconnect the Power Cable and the 2-Wire Cable connectors from the Power Supply PCBA (Figure 7-32).
6. Remove all four Power Supply mounting screws (Figure 7-32).

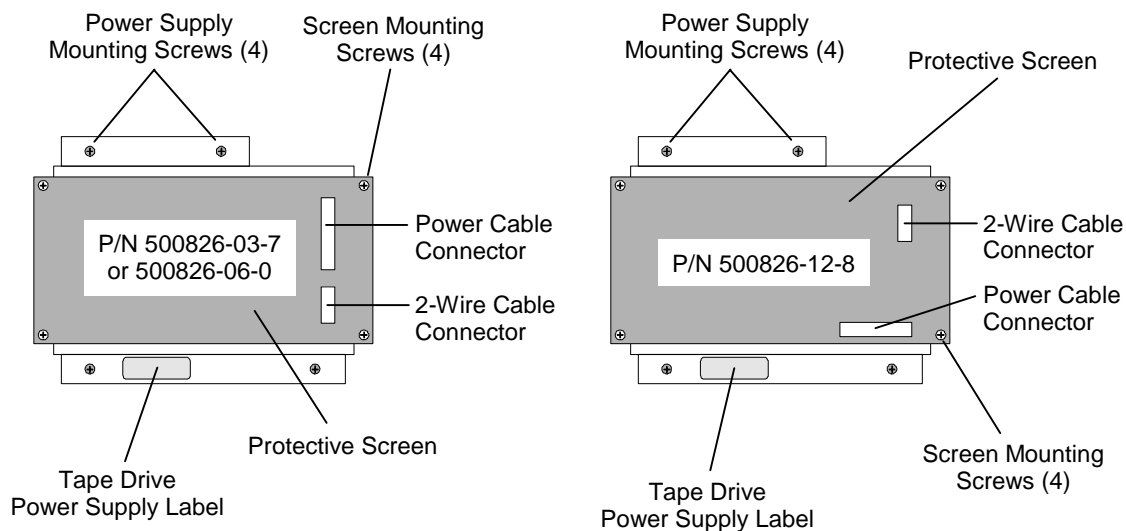


Figure 7-32 Detail of Tape Drive Power Supplies (Right side Power Supplies Shown)

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 connectors towards the rear of the TLS.
2. Install all four Power Supply mounting screws (Figure 7-32).
3. Reconnect the Power Cable and the 2-Wire Cable connectors to the Power Supply PCBA (Figure 7-32).

-
4. Place the protective Screen on top of the Power Supply and install all four Screen mounting screws (Figure 7-32).
 5. Replace the right or left side Panel (Section 7.4.4).
 6. Replace the Top Panel (Section 7.4.2).

7.14 Blower Power Supply

DANGER

TO AVOID THE RISK OF PERSONAL INJURY, ALWAYS WAIT ABOUT ONE MINUTE AFTER THE POWER IS TURNED OFF AND THE POWER CORD IS DISCONNECTED, BEFORE TOUCHING THE BLOWER POWER SUPPLY OR THE TAPE DRIVE POWER SUPPLY.

GEFAHR

UM VERLETZUNGEN ZU VERHINDERN WARTEN SIE BITTE 1 MINUTE NACHDEM SIE DEN STROM AUSGESCHALTET HABEN UND DAS STROMKABEL ENTFERNT HABEN, BEVOR SIE DAS GEBLAESE-NETZTEIL SOWIE DAS TAPE-DRIVE-NETZTEIL BERUEHREN.

P/N 500826-08-6

TLS-412300/600 models that have a Blower Assembly will contain a power supply for the Blower Assembly.

Tools Required:

- **Number 2 Phillips Screwdriver**

7.14.1 Blower Power Supply Removal

Refer to Figure 7-33.

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, then lift the Protective Screen off of the TLS.

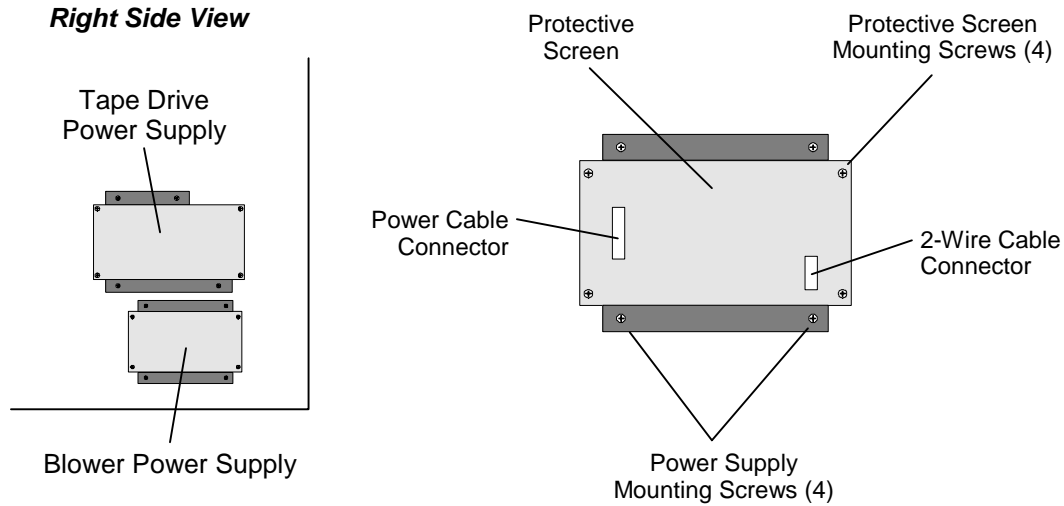


Figure 7-33 Blower Power Supply

5. Disconnect the Power Cable and the 2-Wire Cable connectors from the Blower Power Supply PCBA.
6. Remove all four Power Supply mounting screws.
7. Lift the Power Supply out of the TLS.

7.14.2 Blower Power Supply Replacement

1. Position the Power Supply into place in the side of the TLS. Make sure that the Power Cable connector is on the left and the 2 Wire Cable connector is on the right. See Figure 7-33.
2. Install all four Power Supply mounting screws.
3. Reconnect the Power Cable and 2-Wire Cable connectors to the Power Supply PCBA.
4. Place the Protective Screen over the Power Supply, then install all four Screen mounting screws. Make sure that neither power cable is pinched by the Screen.
5. Replace the right side Panel (Section 7.4.4).
6. Replace the Top Panel (Section 7.4.2).

7.15 Executive PCBA

P/N 501137-01-2, 501387-01-3 or 501447-01-5

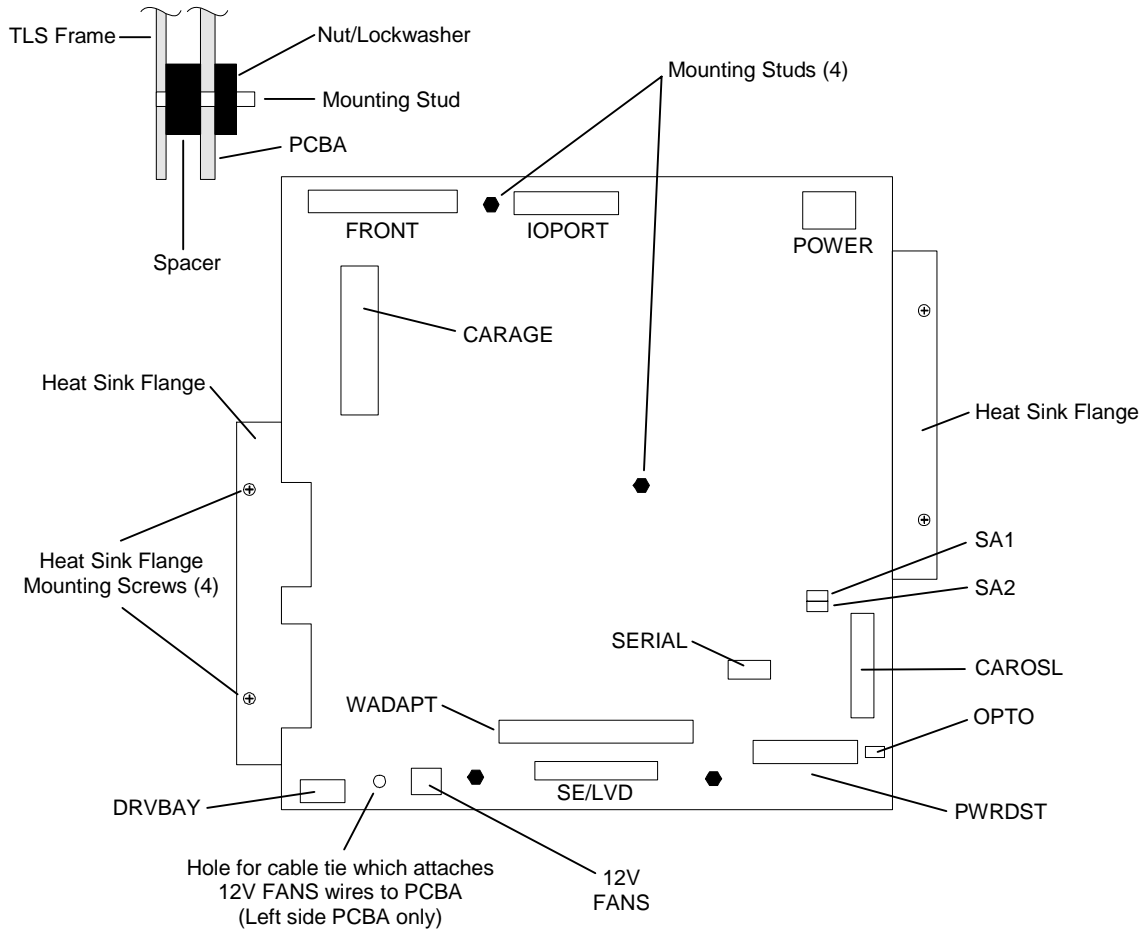


Figure 7-34 Executive II and III PCBA's

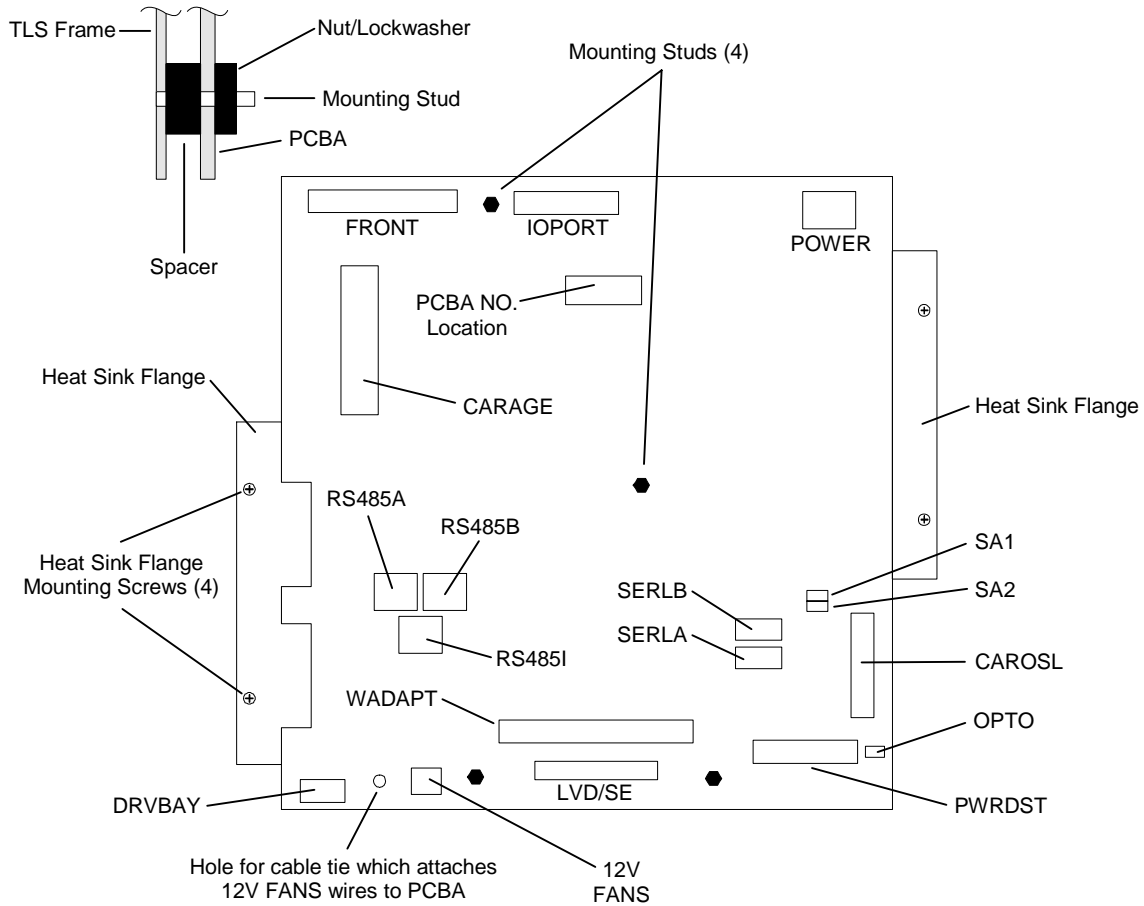


Figure 7-35 Executive IV PCBA

7.15.1 Executive PCBA Removal

Refer to **Figure 7-34** or **Figure 7-35**.

The TLS-412xxx models contain two Executive PCBAs referred to as the left and right Executive PCBAs when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either Executive PCBA, making note of specific left or right side operations when required.

Refer to Table 7-1 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 7-1 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 settings, 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 Executive board is installed (Section 7.15.2).

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 mounting screws, then remove the Rear Service Panel (Figure 7-36).

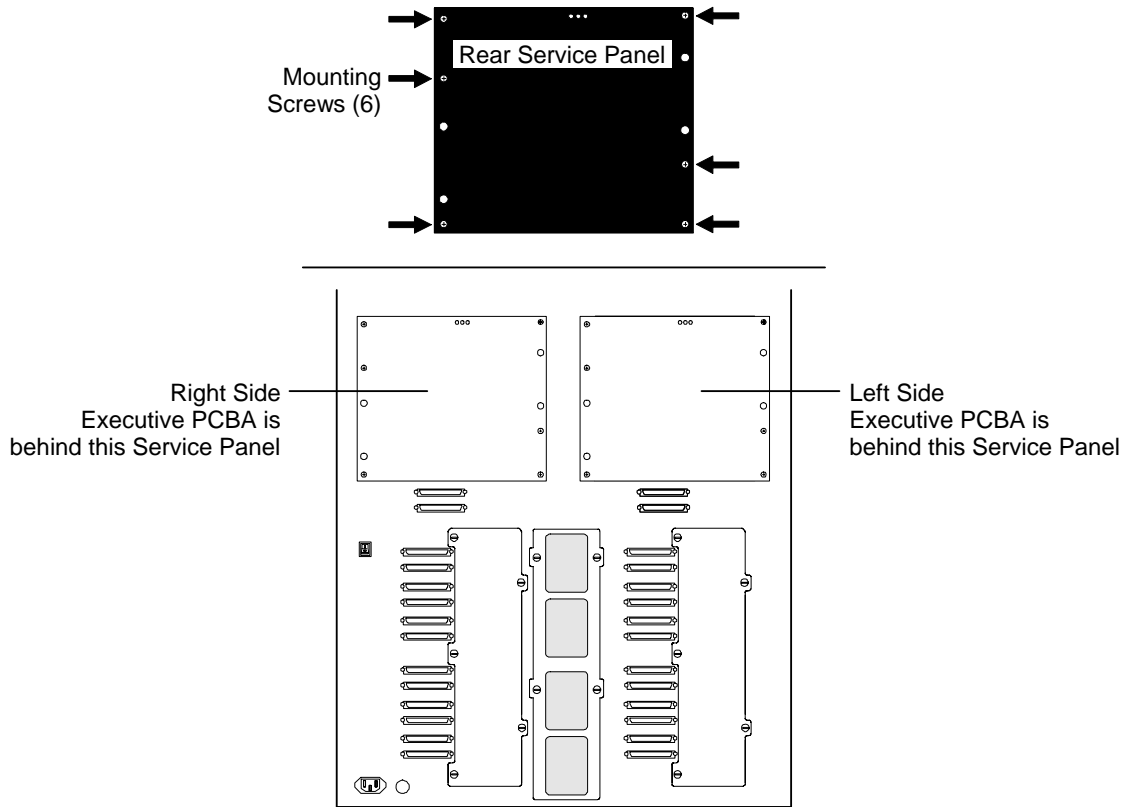


Figure 7-36 View of Rear Service Panels

3. Disconnect all of the cable connectors from the Executive PCBA. (There are at least 6 cables. The 12V FANS, 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 7.19 to remove it and mount it onto the replacement Executive PCBA (Figure 7-45).
5. Remove and save the jumpers from the pins at SA1 and SA2 (side specific). They will need to be attached to the replacement Executive PCBA. On the left side Executive PCBA a jumper is attached to SA1. On the right side Executive PCBA jumpers are attached to both SA1 and SA2.
6. 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.

-
7. Use 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.
 8. Lift the Executive PCBA off of the PCBA mounting studs and out of the TLS.
 9. Reinstall all four PCBA mounting nuts onto the PCBA mounting studs, to keep the PCBA spacers in place.

7.15.2 Executive PCBA Replacement

Refer to Figure 7-34 or Figure 7-35.

7.15.2.1 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 7.15.3). *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, BEFORE APPLYING POWER after the Executive PCBA is replaced, MAKE SURE THE CABINET DOOR IS OPEN.

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, BEFORE any TLS motors are allowed to operate. See Section 7.15.3.

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 change two things at once, it can cause problems.

7.15.2.2 Replacing the Executive PCBA

1. Using the jumpers that were removed earlier from the Executive PCBA, attach a jumper to the pins at SA1 for a left side Executive PCBA and attach jumpers to the pins at both SA1 and SA2 for a right side 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.

2. 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.
3. Set the top of the Executive PCBA into the rear panel opening, but do not place it onto the mounting studs.
4. On the right side Executive PCBA only, press the Front cable firmly into the FRONT connector, until both locking tabs on the FRONT connector close over the Front cable's connector.
5. 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.
6. If a ground lug exists, plug in onto the FRAME terminal.
7. Plug the Power Cable onto the POWER connector.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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)**
- **PWRDST**
- **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 7-45).

 - 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 7-45). See Section 7.19 for details about connecting the SCSI Differential Adapter PCBA.
- **12VFANS**

This connector only attaches to the left side Executive PCBA of 412180/360 models. 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 7-34), then secure the Fan Assembly's power cable to the Executive PCBA.

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.

- **RS485A, RS485 or RS485I**

These connectors are keyed.
 - **CARAGE (Carriage)**
 - **OPTO**

This connector is keyed.
 - **DRVBAY (Drive Bay)**
13. Reinstall the Rear Service Panel, then use a number 2 Phillips screwdriver to re-install all six Rear Service Panel mounting screws (Figure 7-36).
 14. Open the cabinet door.

7.15.3 Reconfiguring the TLS

CAUTION

*To prevent possible injury or equipment damage, **BEFORE APPLYING POWER** after the Executive PCBA is replaced, **MAKE SURE THE CABINET DOOR IS OPEN**.*

*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, **BEFORE** any TLS motors are allowed to operate.*

1. *Make sure that the cabinet door is open*, 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 Carriages to determine their revision levels (e.g., Carriage: B). See Figure 7-37.
4. If a Barcode Reader or Readers are installed, inspect the labels to determine model numbers (e.g., WA3700/B-2221). See Figure 7-37.

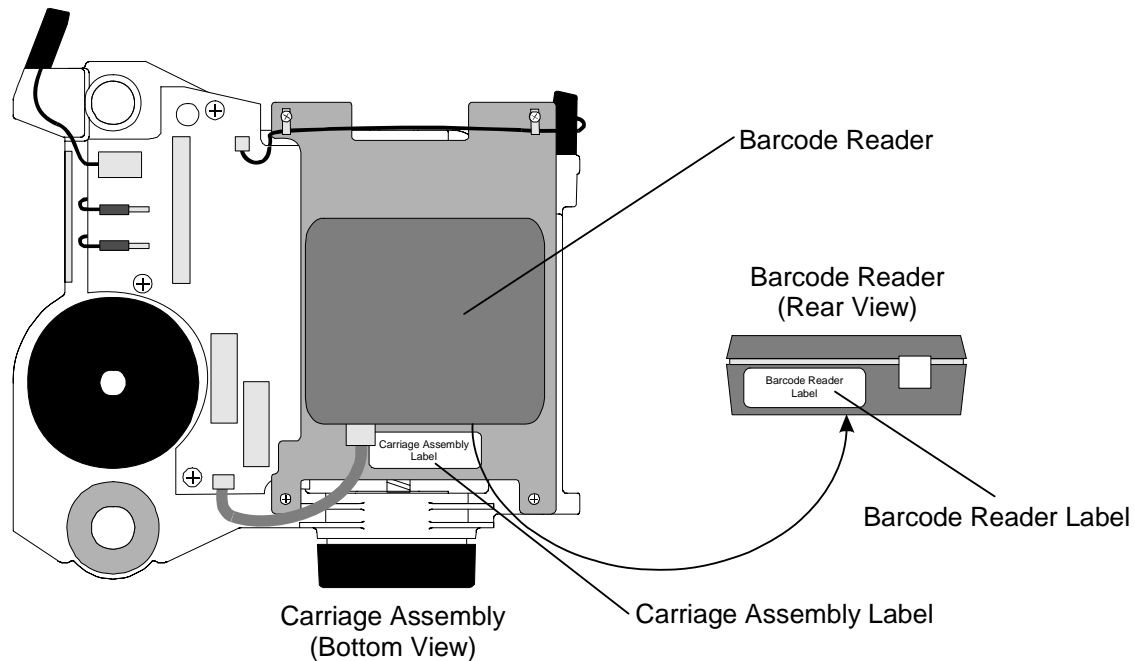


Figure 7-37 Carriage Assembly and Barcode Reader Labels

5. Inspect the label on the I/O Port Assembly to determine its revision level (e.g., I/O Port : A). See Figure 7-38.

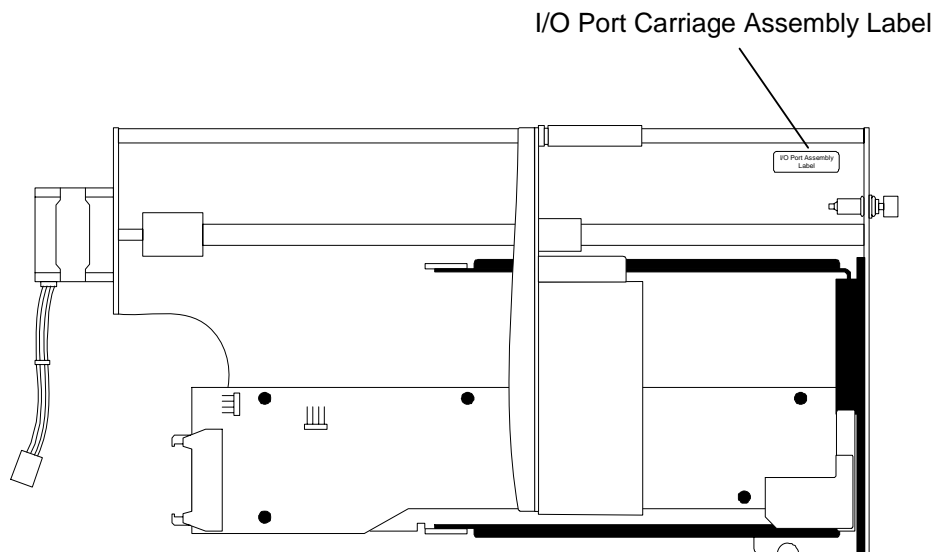


Figure 7-38 I/O Port Assembly Label

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 7.15.1), 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 7.15.4). 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.

7.15.4 Recalibrating the TLS

1. After making sure that the unit is properly configured (see Section 7.15.3), close the cabinet door.
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.

7.16 Drive Bay PCBA

P/N 501357-01-6

The TLS-412xxx models contain two Drive Bay PCBAs referred to as the left and right Drive Bay PCBA when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either Drive Bay PCBA, making note of specific left or right side operations when required.

Tools Required:

- **Flat-blade Screwdriver**
- **Number 2 Phillips Screwdriver**
- **1/4-inch Hex Nutdriver**
Short/Stubby length nutdriver recommended

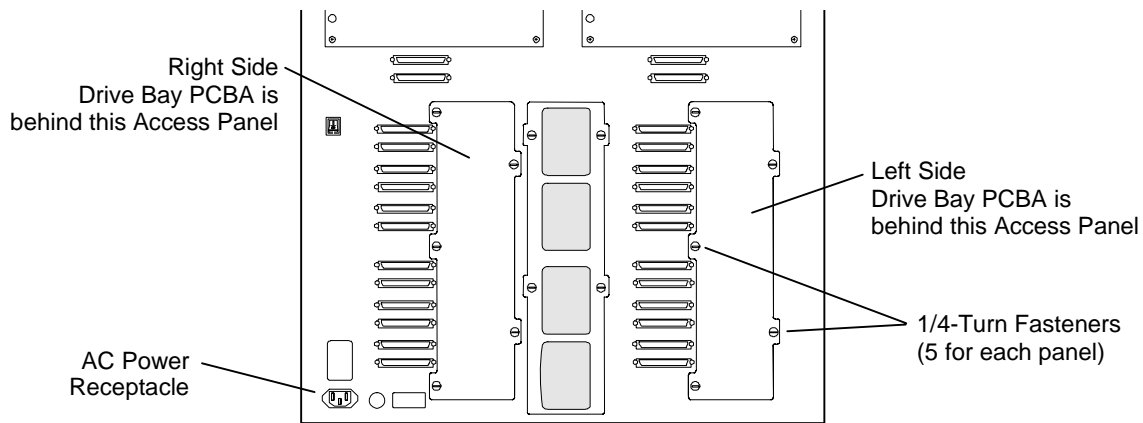


Figure 7-39 Drive Access Panels

7.16.1 Drive Bay PCBA Removal

1. Turn off the TLS power and remove the power cord.
2. Using a flat-blade screwdriver, remove the appropriate Drive Access Panel at the rear of the TLS by turning its five quarter-turn fasteners counter-clockwise (Figure 7-39).
3. Disconnect all the cables from the Drive Bay PCBA (Figure 7-40).

NOTE

In the next step, the spacers behind the Drive Bay PCBA come loose when the PCBA mounting nuts are removed.

4. Using a stubby/short 1/4-inch nutdriver, remove all six Drive Bay PCBA mounting nuts (Figure 7-40).

5. Lift the Drive Bay PCBA out of the TLS.
6. Reinstall all six PCBA mounting nuts onto the PCBA mounting studs to keep the PCBA spacers in place.

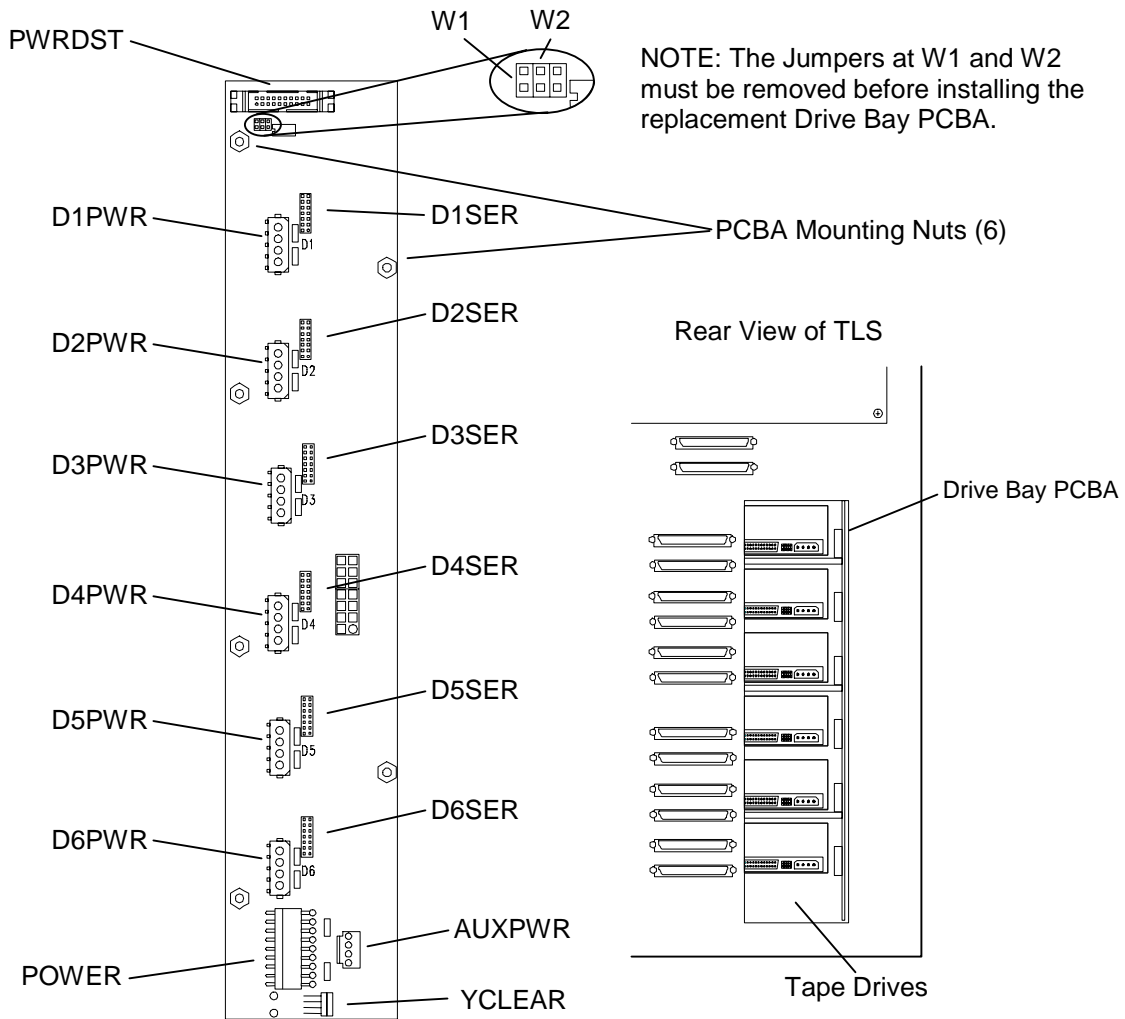


Figure 7-40 The Drive Bay PCBA

7.16.2 Drive Bay PCBA Replacement

1. Remove the jumpers at W1 and W2 on the Drive Bay PCBA (Figure 7-40).

NOTE

In the next step, the spacers behind the mounting nuts on the PCBA mounting studs come loose when the nuts are removed.

2. Remove all six nuts from the PCBA mounting studs, then make sure that all six PCBA spacers are in place on the PCBA mounting studs.
3. Insert the Drive Bay PCBA into the TLS and align its mounting stud holes with the mounting studs in the TLS' frame, then install the PCBA onto the studs.
4. Reinstall all six PCBA mounting nuts onto the mounting studs, then use a stubby/short 1/4-inch nutdriver to tighten the mounting nuts firmly against the Drive Bay PCBA.
5. Reconnect all the cables to the Drive Bay PCBA (Figure 7-40).
6. Align the Drive Access Panels five quarter-turn fasteners with the corresponding receptacles on the rear panel, then fasten it by turning the quarter-turn fasteners clockwise (Figure 7-39).

7.17 Carousel PCBA

P/N 500617-02-2

The TLS-412xxx models contain two Carousels which each utilize a Carousel PCBA. They are referred to as the left and right Carousel PCBAs when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either Carousel PCBA, making note of specific left or right side operations when required.

NOTICE

There are two versions of the Carousel Printed Circuit Board Assembly: PCBA 500617-01-4 and PCBA 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-412xxx models require the -02 version with the right-angle CAROSL connector.

Tools Required:

- **Number 2 Phillips Screwdriver**

7.17.1 Carousel PCBA Removal

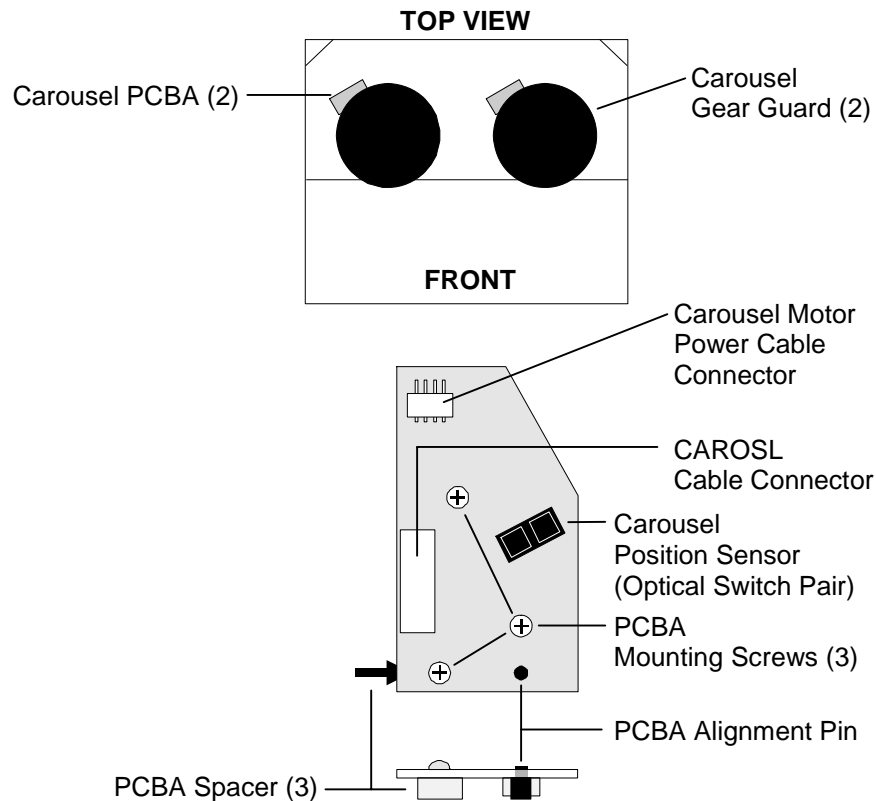


Figure 7-41 The Carousel PCBA (3 Views)

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. Remove the right or left side Panel, as seen from the front of the TLS depending on which Carousel PCBA is being removed (Section 7.4.3).
5. Reach in through the cabinet door or an opening in the side of the TLS' frame and disconnect the CAROSL Cable and the Carousel Motor Power Cable from the Carousel PCBA (Figure 7-41).

NOTE

If necessary, rotate the carousel slightly by hand to reach each PCBA mounting screw (Figure 7-41).

6. Use a number 2 Phillips screwdriver to remove all three PCBA mounting screws and PCBA spacers (Figure 7-41).

CAUTION

In the next step, be careful not to damage the Carousel Position Sensor on the Carousel Gear Guard Figure 7-41), as you remove the Carousel PCBA.

7. Lift the Carousel PCBA slightly to clear the PCBA Alignment Pin, then gently slide the PCBA along the Carousel Gear Guard toward the front 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 7-41).

7.17.2 Carousel PCBA Replacement

CAUTION

In the next steps, be careful not to damage the Carousel Position Sensor on the Carousel Gear Guard (Figure 7-41), as you install the Carousel PCBA.

Make sure that the Carousel PCBA is replaced with the 500617-02-2 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 7-41).
4. Align the Carousel PCBA spacers under the PCBA with the PCBA mounting screw holes (Figure 7-41).
5. Use a Phillips screwdriver to install all 3 PCBA mounting screws, then tighten the screws until they are snug (Figure 7-41). If necessary, rotate the carousel slightly by hand to reach each PCBA mounting screw.
6. Reach in through the cabinet door or an opening in the side of the TLS' frame and connect the CAROSL Cable and the Carousel Motor Power Cable to the Carousel PCBA (Figure 7-41). The connectors are keyed to fit only one way.
7. Replace the right or left side Panel (Section 7.4.4).
8. Replace the Top Panel (Section 7.4.2).
9. Close the cabinet door.

7.18 Carousel Motor

TLS-412180/360 P/N 500822-68-9
TLS-412300/600 P/N 500822-53-1

The TLS-412xxx models contain two Carousels, each utilizes a separate Carousel Motor. They are referred to as the left and right Carousel Motors when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either Carousel Motor, making note of specific left or right side operations when required.

Tools Required:

- **Number 2 Phillips Screwdriver**
- **Flat Blade Screwdriver**
- **9/64-inch Allen (Hex) Wrench**

7.18.1 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 or left side Panel, as seen from the front of the TLS depending on which Carousel Motor is being removed (Section 7.4.3).
4. Open the cabinet door.
5. Reach in through the cabinet door or an opening in the side of the TLS' frame and disconnect the Carousel Motor Power Cable from the Carousel PCBA (Figure 7-41 and Figure 7-42).
6. Push the Carousel Motor Power Cable down through the hole in the Midplate.

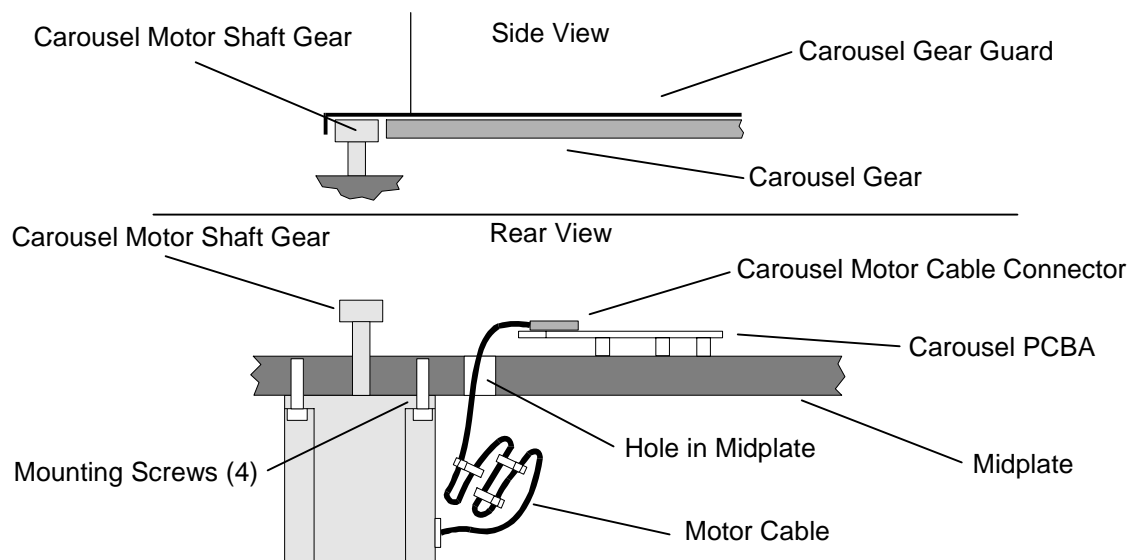


Figure 7-42 Carousel Motor

- Using a flat-blade screwdriver, remove the appropriate Access Panel at the rear of the TLS by turning its five quarter-turn fasteners counter-clockwise (Figure 7-43).

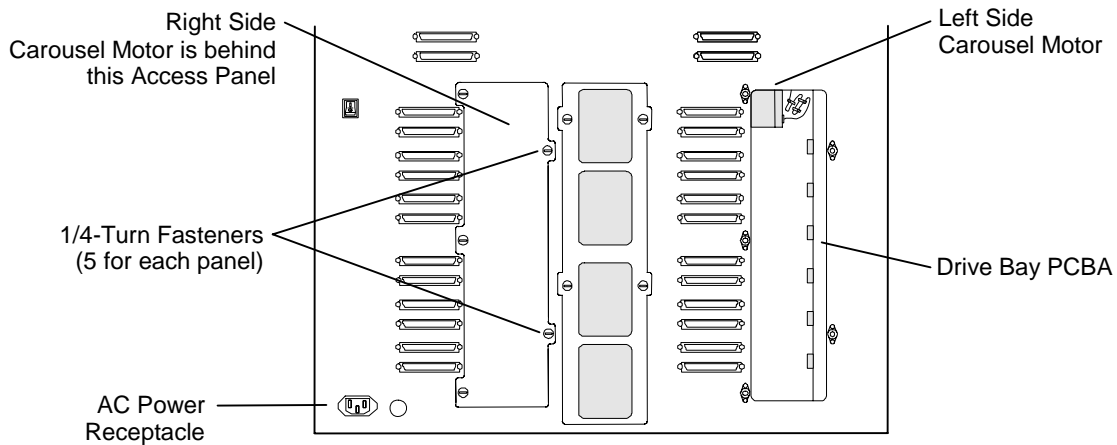


Figure 7-43 Carousel Motor Behind Access Panel

- Use a 9/64-inch Allen wrench to remove all four Carousel Motor mounting screws (Figure 7-42).
- Remove the Carousel Motor from the cabinet through the Access Panel opening (Figure 7-43).

7.18.2 Carousel Motor Replacement

- Align the mounting holes in the Carousel Motor with the corresponding mounting holes in the TLS' frame, so that the motor's cable faces the right side of the TLS when viewed from the rear. The Carousel assembly may need to be rotated slightly to allow the gears on the Carousel Motor's shaft to mesh with those of the Carousel (Figure 7-42).
- Use a 9/64-inch Allen wrench to install and securely tighten all four Carousel Motor mounting screws.
- Guide the Carousel Motor cable through the hole in the TLS' Midplate and reconnect it to the Carousel PCBA (Figure 7-41 and Figure 7-42).
- Align the Access Panels five quarter-turn fasteners with the corresponding receptacles on the rear panel, then fasten it by turning the quarter-turn fasteners clockwise (Figure 7-43).
- Replace the right or left side Panel (Section 7.4.4).
- Replace the Top Panel (Section 7.4.2).
- Close the cabinet door.

7.19 SCSI High Voltage Differential Adapter PCBA

P/N 501407-01-9

The TLS-412xxx models contain two Executive PCBAs. A SCSI HVD Adapter PCBA may be attached to one or both of these Executive PCBAs. If there is one attached to each Executive board, they are referred to as the left and right HVD Adapter PCBAs when viewed from the front of the TLS. The replacement procedure that follows will apply to replacing either HVD Adapter PCBA, making note of specific left or right side operations when required.

Tools Required:

- **Number 2 Phillips Screwdriver**

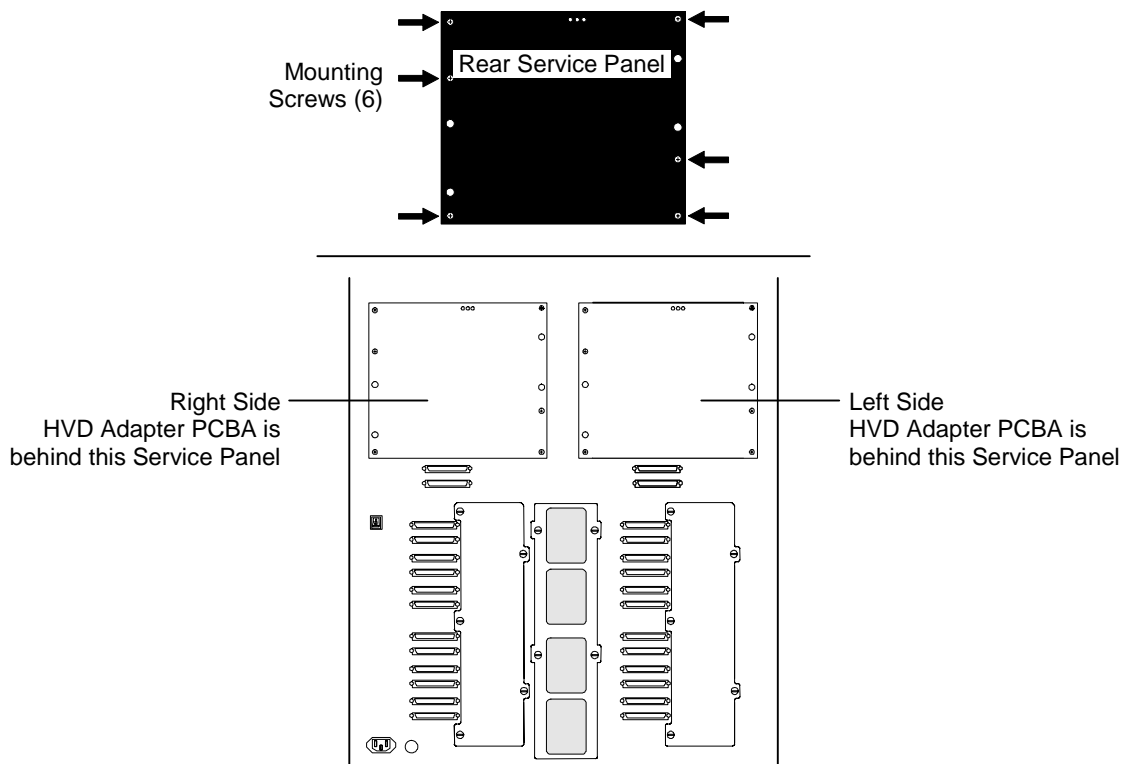


Figure 7-44 Rear View of Service Panels

7.19.1 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 7-44), then remove the panel.
3. Disconnect the SCSI cable from connector SCSIID on the HVD Adapter PCBA (Figure 7-45).

4. Gently pull the HVD Adapter PCBA away from the Executive PCBA (Figure 7-45).

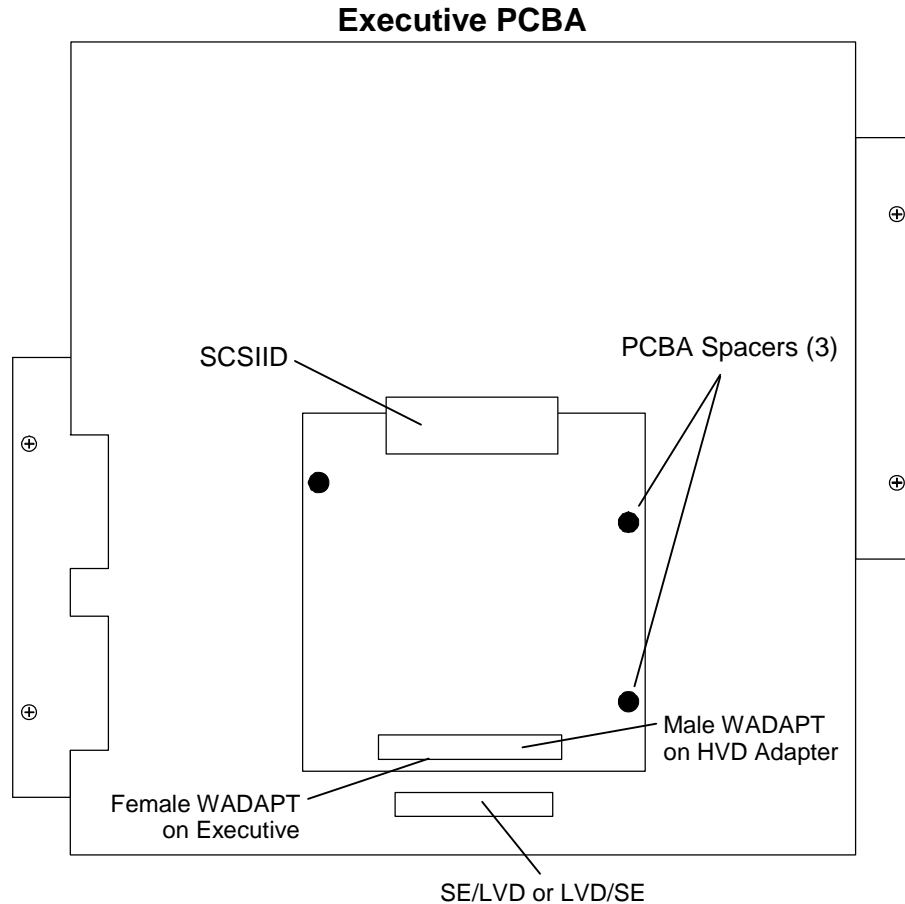


Figure 7-45 HVD Adapter PCBA

7.19.2 SCSI High Voltage Differential Adapter PCBA Replacement

This procedure assumes that the PCBA was removed in Section 7.19.1.

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 7-45.
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 7-45).
4. 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 7-44).

7.20 Q-Link

P/N 501657-01-9

Tools Required:

- Number 2 Phillips Screwdriver

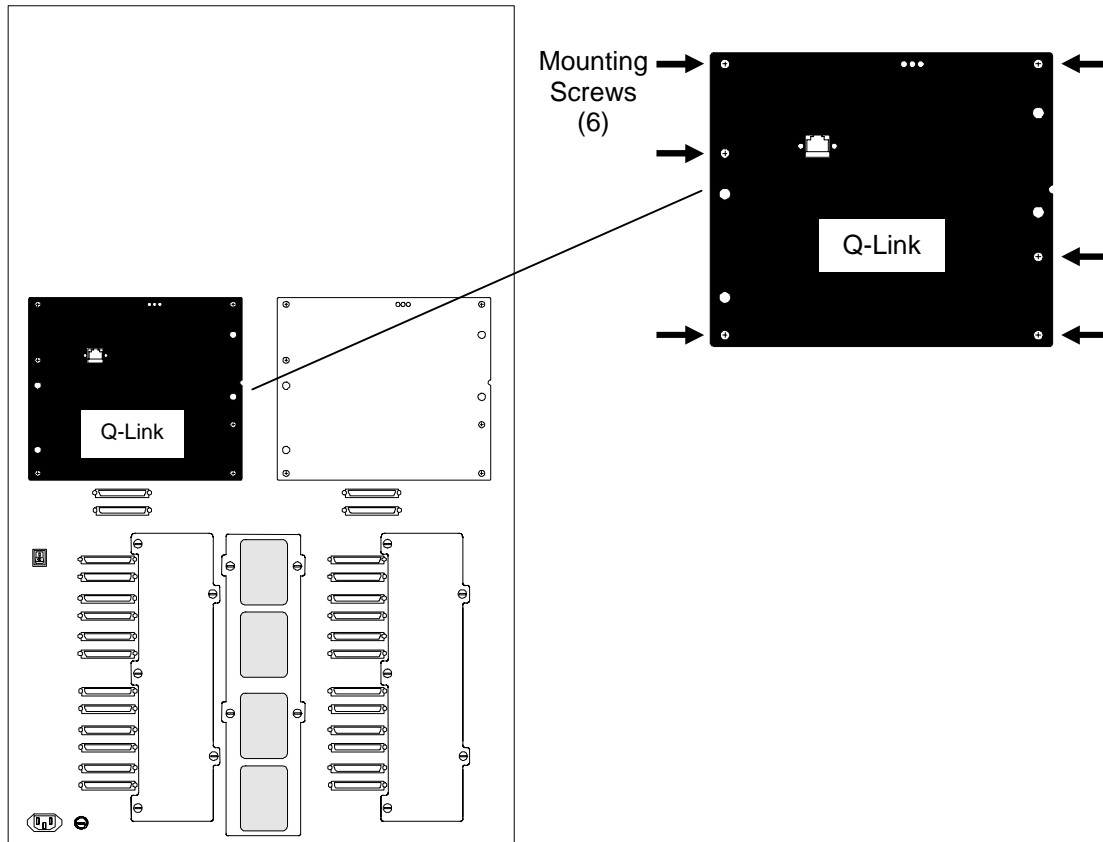


Figure 7-46 Q-Link on Rear of TLS

7.20.1 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 7-46), 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 7-47.
4. Disconnect the SERIAL ribbon cable from the SERIAL connector on the Q-Link PCBA as shown in Figure 7-47.

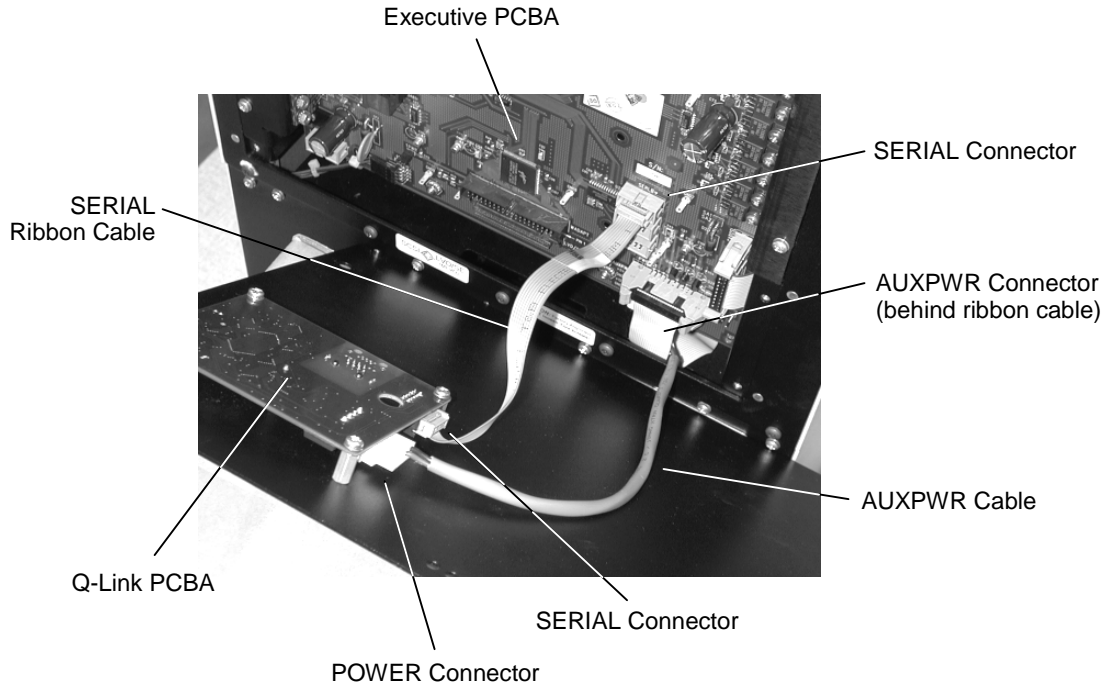


Figure 7-47 Detail of AUXPWR and SERIAL Cable Connections on Q-Link PCBA

7.20.2 Q-Link Replacement

This procedure assumes that the PCBA was removed in Section 7.20.1.

1. Connect the AUPWR cable to the POWER connector on the Q-Link PCBA as shown in Figure 7-47.
2. Connect the SERIAL ribbon cable to the SERIAL connector on the Q-Link PCBA as shown in Figure 7-47. 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 7-46.

7.21 Shuttle Assembly

P/N 500189-01-4

Tools Required:

- Flat Blade Screwdriver
- Number 2 Phillips Screwdriver

7.21.1 Shuttle Assembly Removal

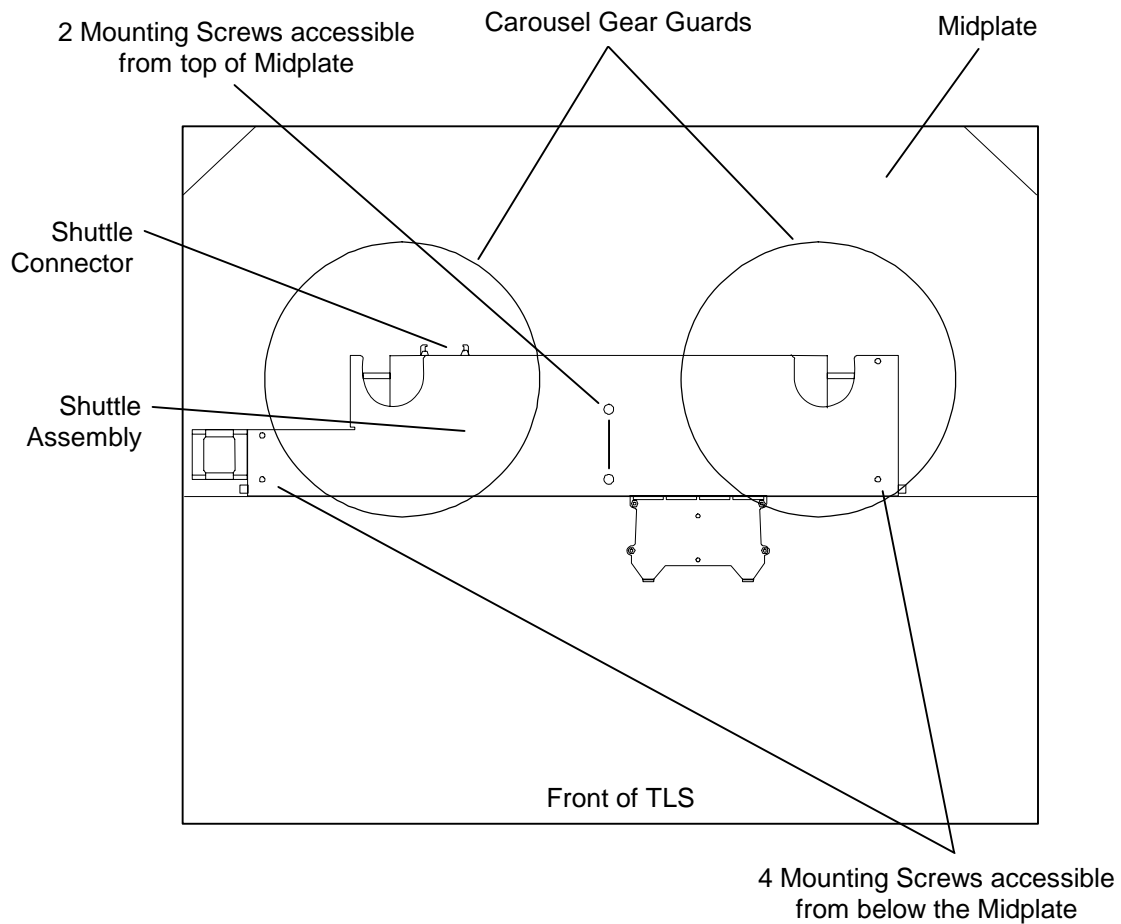


Figure 7-48 Top View of Shuttle Assembly

1. Turn off the TLS power and remove the power cord.
2. Open the cabinet door.
3. Disconnect and remove any tape drives in the TLS necessary to allow access to the Shuttle Assembly's mounting screws.

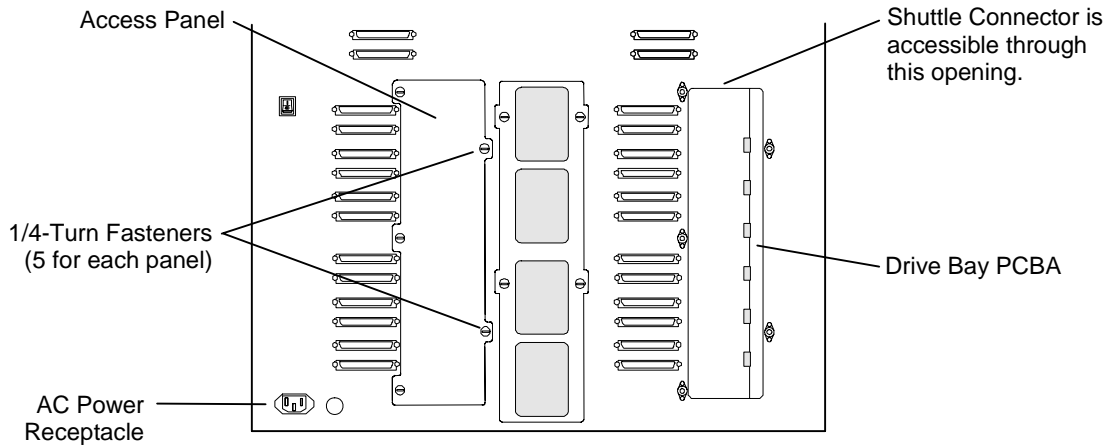


Figure 7-49 Rear of TLS with Access Panel Removed

4. As viewed from the rear, use a flat-blade screwdriver to remove the Access Panel on the right side of the TLS by turning its five quarter-turn fasteners counter-clockwise (Figure 7-49).
5. Reach into the TLS through the right side Access Panel opening and disconnect the ribbon cable from the SHUTTLE connector on the PCBA, which is attached to the Shuttle Assembly.
6. From the front of the TLS, use a number 2 Phillips screwdriver to remove the four Shuttle Assembly mounting screws, which are accessible underneath the Midplate (Figure 7-48).
7. While supporting the Shuttle Assembly with one hand, remove the remaining two mounting screws, which are accessible from the top of the Midplate (Figure 7-48).

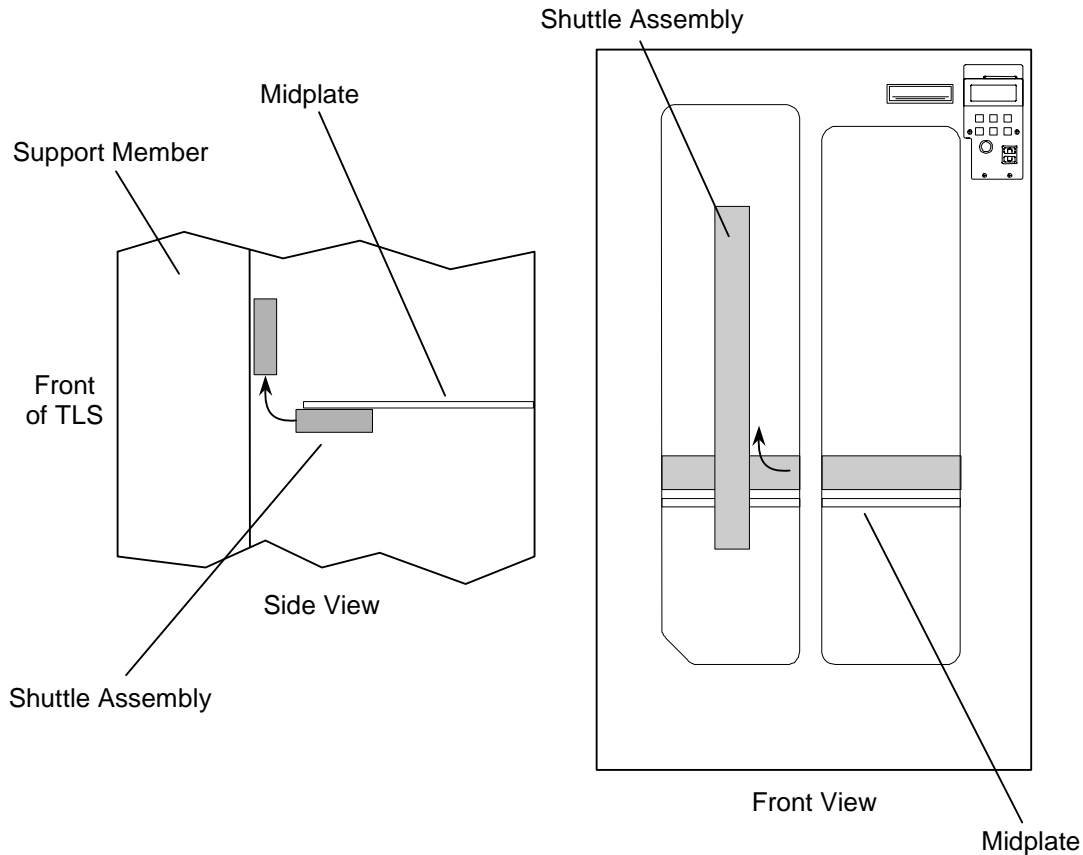


Figure 7-50 Two Views of Shuttle Assembly Removal from TLS

8. Using both hands pull the Shuttle Assembly towards the front of the TLS while tilting it upwards to clear the Midplate and the support member in the center of the front opening (Figure 7-50).
9. When the Shuttle Assembly has cleared the Midplate and the support member, rotate it 90 degrees to vertical and remove it through the front of the TLS (Figure 7-50).

7.21.2 Shuttle Assembly Replacement

1. Hold the Shuttle Assembly in a vertical position with the circuit boards and wiring facing inward and insert it through the front of the TLS. When clear of the support member, rotate the Shuttle Assembly 90 degrees to horizontal (Figure 7-50). Note that when oriented correctly the motor will be facing the left side of the TLS.
2. Rotate the Shuttle Assembly downward to clear the support member while positioning it under the Midplate. Align the Shuttle Assembly with the mounting screw holes in the bottom of the Midplate (Figure 7-48).
3. While supporting the Shuttle Assembly with one hand, replace the two mounting screws, which are accessible from the top of the Midplate (Figure 7-48).

4. Replace the four remaining mounting screws, which are accessible from underneath the Midplate (Figure 7-48).
5. Reach into the through the right side Access Panel opening and reconnect the ribbon cable to SHUTTLE connector on the PCBA (Figure 7-48).
6. Align the Drive Access Panels five quarter-turn fasteners with the corresponding receptacles on the rear panel, then fasten it by turning the quarter-turn fasteners clockwise (Figure 7-49).
7. Reinstall and reconnect any tape drives that were removed to access the Shuttle Assemblies mounting screws.
8. Recalibrate the TLS (see Section 5.3.2 for details.)

7.22 Shuttle PCBAs

P/N 501317-01-2 & 501427-01-7

The Shuttle Assembly must be removed before replacing either of the Shuttle PCBAs. There are two circuit boards on the Shuttle Assembly.

Tools Required:

- 1/4-inch Hex Nutdriver
- Diagonal Wire Cutters

Material Required:

- 3-inch x 3/32-inch Cable Ties

7.22.1 Shuttle PCBA Removal

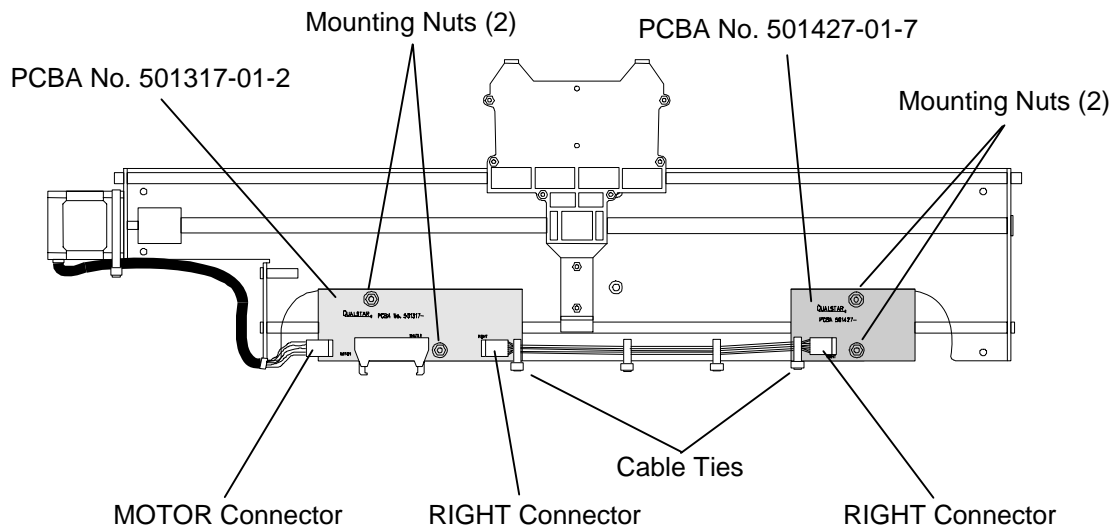


Figure 7-51 Shuttle PCBAs (Shuttle Assembly Bottom View)

-
1. Remove the Shuttle Assembly (see Section 7.21.1 for details).

NOTE

In steps two and four below, the spacers under the PCBAs' come loose when the PCBA mounting nuts are removed.

2. To remove PCBA No. 501317-01-2, carefully cut the cable tie which attaches the RIGHT connector wires to the PCBA then disconnect the RIGHT connector. Disconnect the MOTOR connector. Using a 1/4-inch nutdriver, remove the two mounting nuts which secure the PCBA to the Shuttle Assembly and lift the PCBA off of the mounting studs (Figure 7-51).
3. Reinstall the two PCBA mounting nuts onto the PCBA mounting studs to keep the PCBA spacers in place.
4. To remove PCBA No. 501427-01-7, carefully cut the cable tie which attaches the RIGHT connector wires to the PCBA then disconnect the RIGHT connector. Using a 1/4-inch nutdriver, remove the two mounting nuts which secure the PCBA to the Shuttle Assembly and lift the PCBA off of the mounting studs (Figure 7-51).
5. Reinstall the two PCBA mounting nuts onto the PCBA mounting studs to keep the PCBA spacers in place.

7.22.2 Shuttle PCBA Replacement

1. To replace PCBA No. 501317-01-2, remove the two nuts from the PCBA mounting studs, then make sure that the two PCBA spacers are in place on the PCBA mounting studs.
2. Align the PCBA with the two mounting studs, then install the PCBA onto the studs. Reinstall the two mounting nuts onto the mounting studs, then use a 1/4-inch nutdriver to tighten the mounting nuts firmly against the PCBA. Reconnect the MOTOR connector. Reconnect the RIGHT connector and replace the cable tie that was removed earlier (Figure 7-51).
3. To replace PCBA No. 501427-01-7, remove the two nuts from the PCBA mounting studs, then make sure that the two PCBA spacers are in place on the PCBA mounting studs.
4. Align the PCBA with the two mounting studs, then install the PCBA onto the studs. Reinstall the two mounting nuts onto the mounting studs, then use a 1/4-inch nutdriver to tighten the mounting nuts firmly against the PCBA. Reconnect the RIGHT connector and replace the cable tie that was removed earlier (Figure 7-51).
5. Reinstall the Shuttle Assembly (see Section 7.21.2 for details).
6. Recalibrate the TLS (see Section 5.3.2 for details.)

7.23 Y-Clear Detector PCBA

P/N 501307-01-1

Tools Required:

- Number 2 Phillips Screwdriver

7.23.1 Y-Clear Detector PCBA Removal

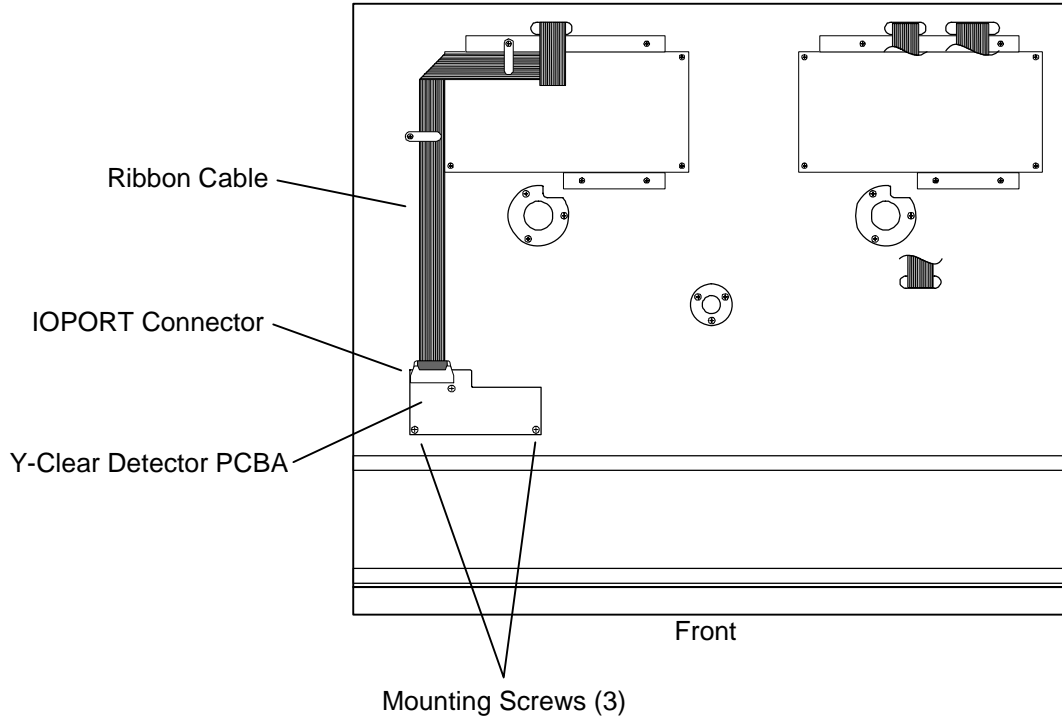


Figure 7-52 Y-Clear PCBA on Top of TLS

1. Turn off the TLS power and remove the power cord.
2. Remove the Top Panel (Section 7.4.1).
3. Disconnect the ribbon cable at the IOPORT Connector (Figure 7-52).

NOTE

In this next step, the spacers under the Y-Clear Detector PCBA come loose when the PCBA mounting nuts are removed.

4. Using a number 2 Phillips screwdriver, remove the three mounting screws which secure the Y-Clear Detector PCBA to the top of the TLS (Figure 7-52).
5. Remove the Y-Clear Detector PCBA from the top of the TLS.

6. Reinstall the three PCBA mounting nuts onto the PCBA mounting studs to keep the PCBA spacers in place.

7.23.2 Y-Clear Detector PCBA Replacement

1. Note the jumpers on connectors W1 and W2 on the Y-Clear Detector PCBA that was removed. Make sure that the jumpers are in the same location on the replacement PCBA before it is installed. See Figure 7-53.

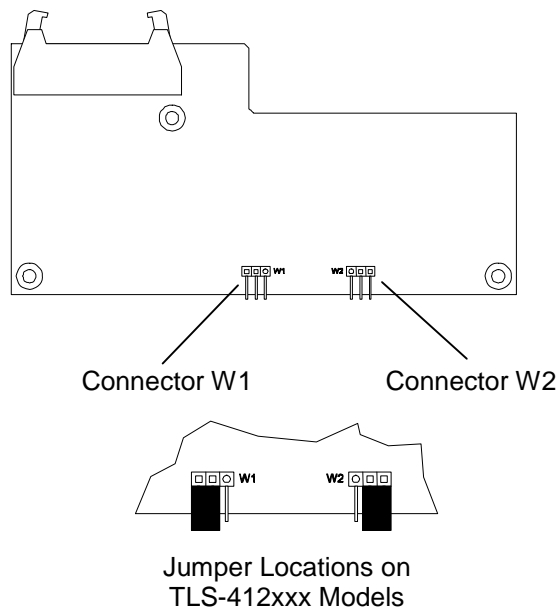


Figure 7-53 Location of Connectors W1 and W2 on Y-Clear Detector PCBA

2. Remove the three nuts from the PCBA mounting studs, then make sure that the three PCBA spacers are in place on the PCBA mounting studs.
3. Place the Y-Clear Detector PCBA on the top of the TLS and align all three mounting screw holes in the PCBA with the mounting screw holes in the TLS (Figure 7-52).
4. Install all three mounting screws and securely tighten the mounting screws using a number 2 Phillips screwdriver.
5. Reconnect the ribbon cable at the IOPORT Connector (Figure 7-52).
6. Replace the Top Panel (Section 7.4.2).
7. Recalibrate the TLS (see Section 5.3.2 for details.)

7.24 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 and 5.4.1 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.**
- **Remove and reinstall/replace the Shuttle Assembly PCBA.**
- **Remove and replace a Shuttle Assembly PCBA.**
- **Remove and replace the Y-Clear Detector 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.

The TLS-412xxx models contain two Executive PCBAs and two Drive Bay PCBAs, referred to as the left and right Executive and Drive Bay PCBAs respectively, when viewed from the front of the TLS. The replacement procedures that follows will apply to replacing both the Executive and Drive Bay PCBAs, making note of specific left or right side operations when required.

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 II | 501137-01-2 | 700105 |
| Executive III | 501387-01-3 | 700105 |
| Executive IV | 501447-01-5 | 700115 |
| Drive Bay | 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 one of the service panels from the rear of the library and reading the part number printed on an 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.

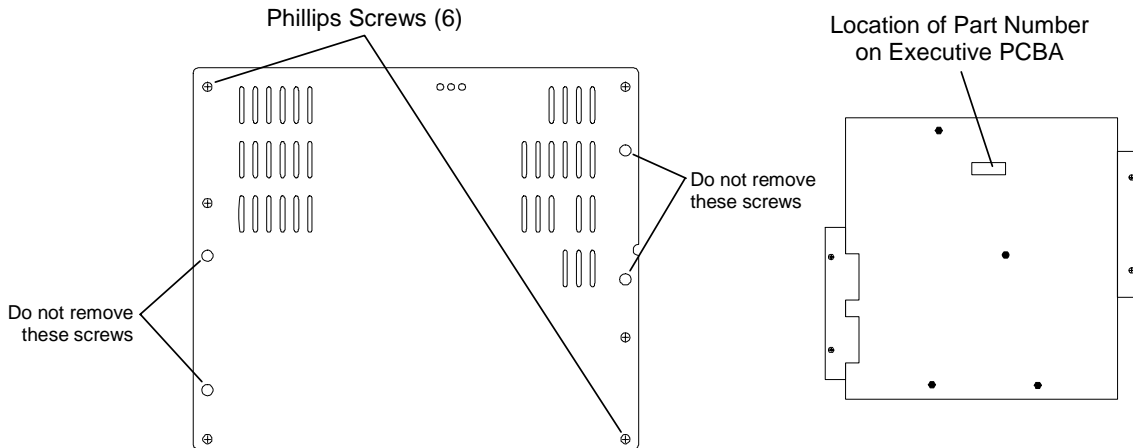


Figure 8-1 Rear Service Panel and PCBA Part Number Location

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 II | 501137-01-2 | 700105 |
| 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: xxxxxxxxxx |
| Press the MENU key to return to the top menu. | |

Table 8-3 Steps to View the Display Revision Status Screen

- In all TLS-412xxx models with Executive III or IV boards Drive Bay boards are utilized to interface the tape drives to the Executive boards. The Drive Bay boards each contain a programmed micro-controller I.C. that is also replaceable. The firmware part number is 700108 for the drive boards.

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.

- 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].
- 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`.
- 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.
- 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-412180 | 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-412180, followed by two Sony 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. Do not turn off TLS power while the update is in progress. The last packet is number 512.

- 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

- 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.
- Following the upgrade, the TLS will perform an internal initialization function followed by a scanning of the TLS inventory.
- The FIRMWARE UPGRADE message will be cleared when the process has completed.
- 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.

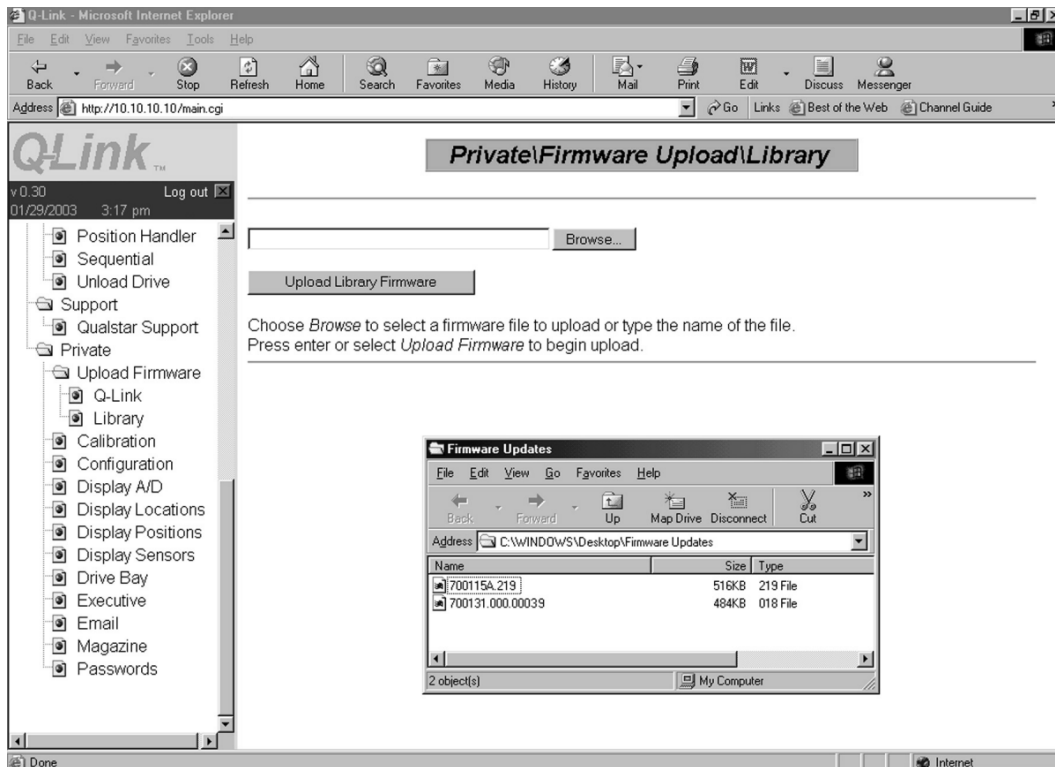


Figure 8-2 Sample of the Library Firmware Upload Screen

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

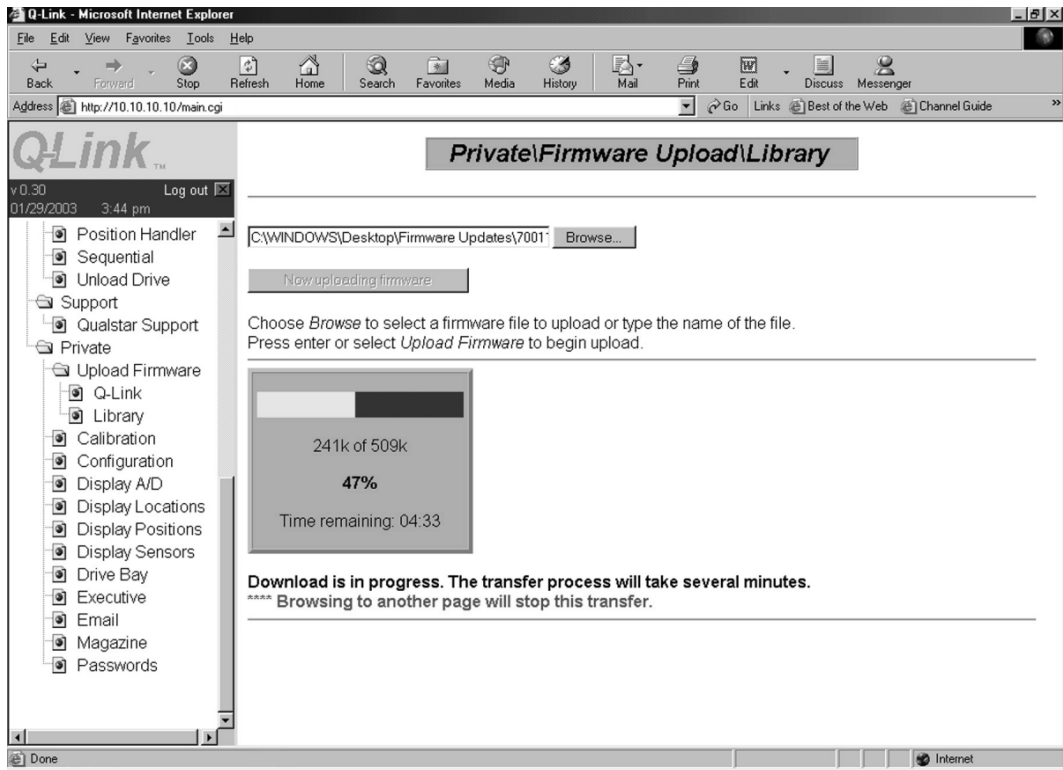


Figure 8-4 Sample of the Library Firmware Upload Progress Screen

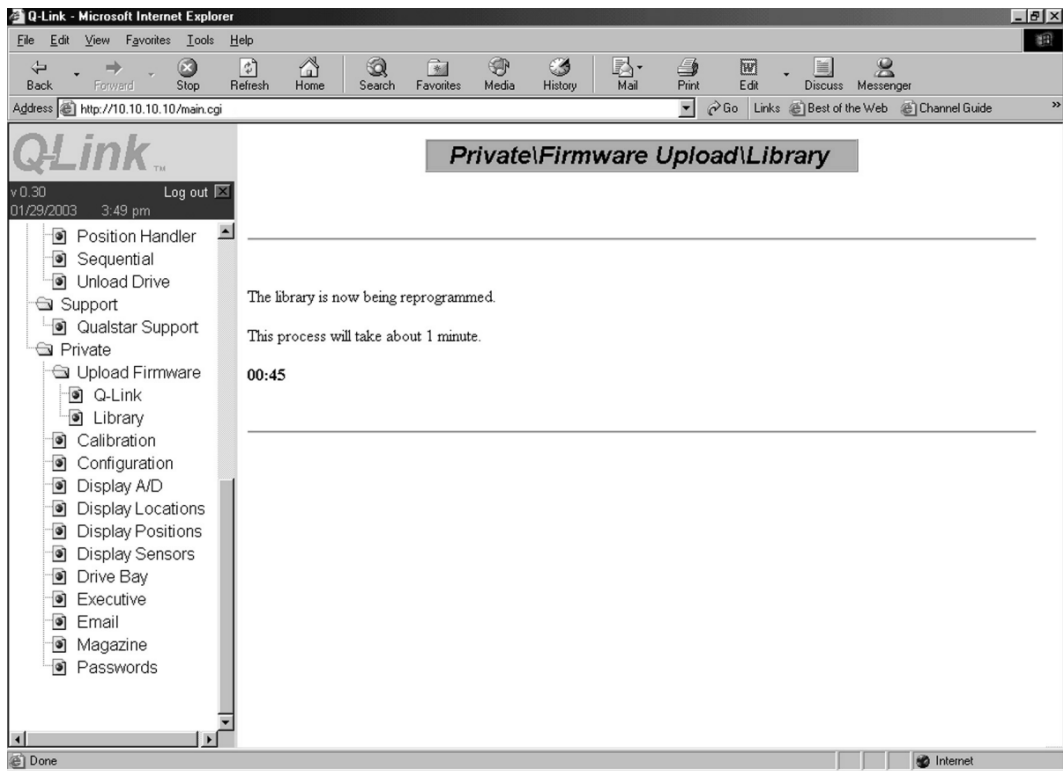


Figure 8-5 Sample of the Library Firmware Reprogramming Progress Screen

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.

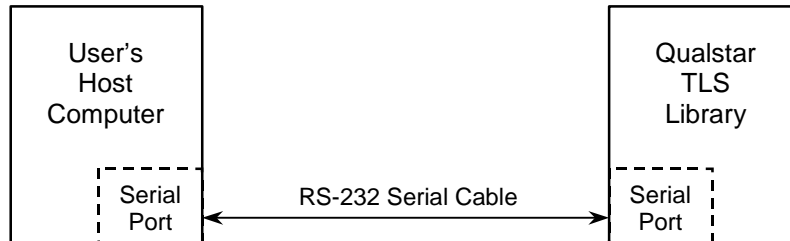


Figure 8-6 Host Computer Connected to TLS

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, HyperTerminal. Use the File\Properties menu selection to configure the application for direct communications. Select the appropriate communications port. See Figure 8-8.

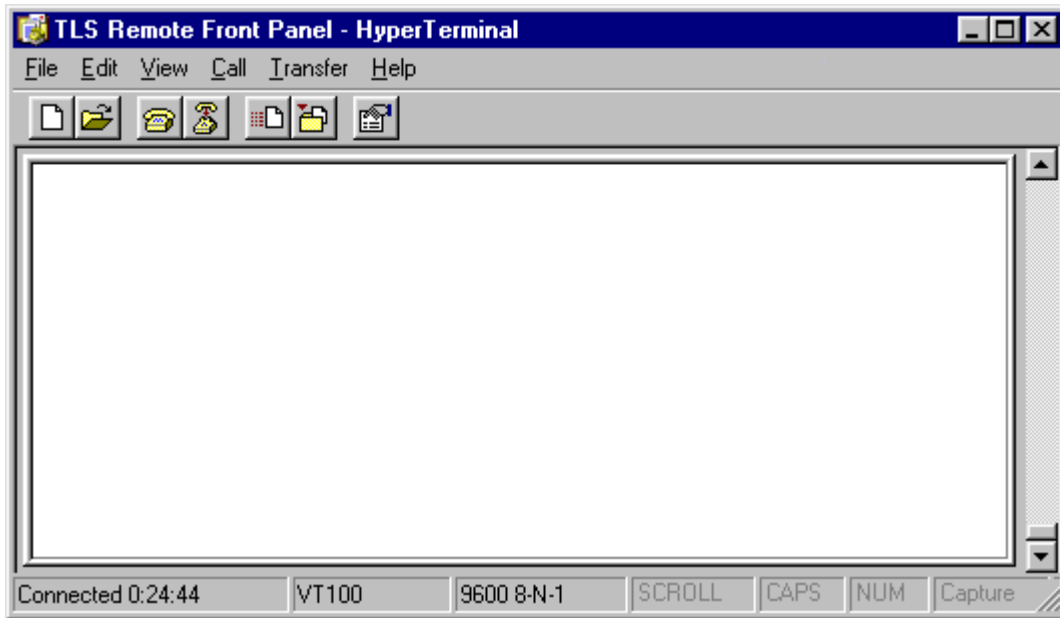


Figure 8-7 TLS Remote Front Panel Program Displayed in HyperTerminal

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.

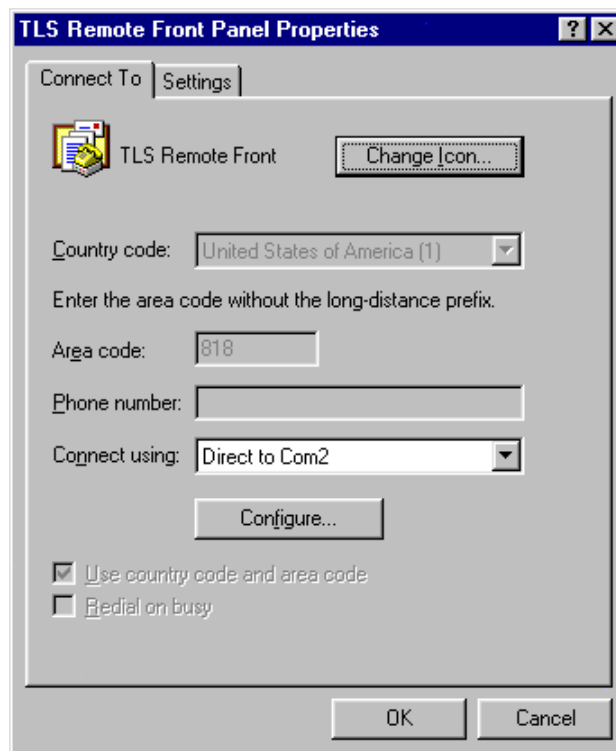


Figure 8-8 Properties Screen

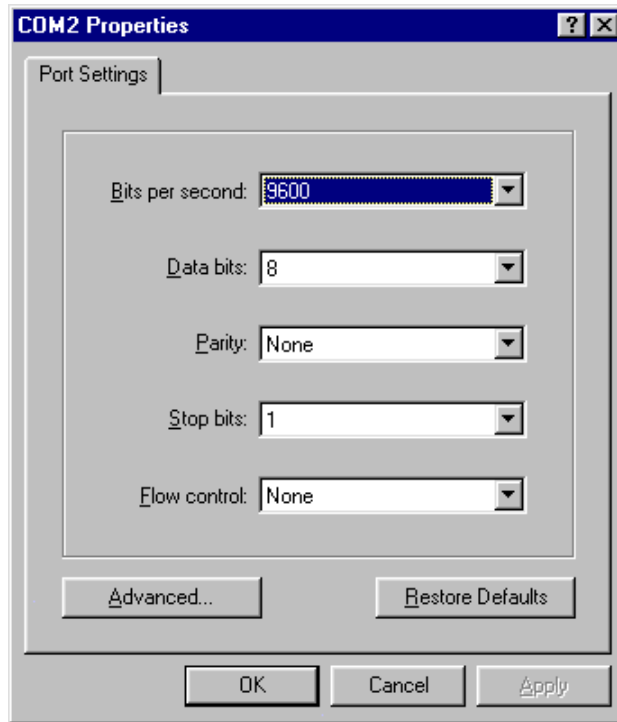


Figure 8-9 Configure Screen Under the Properties Menu

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.

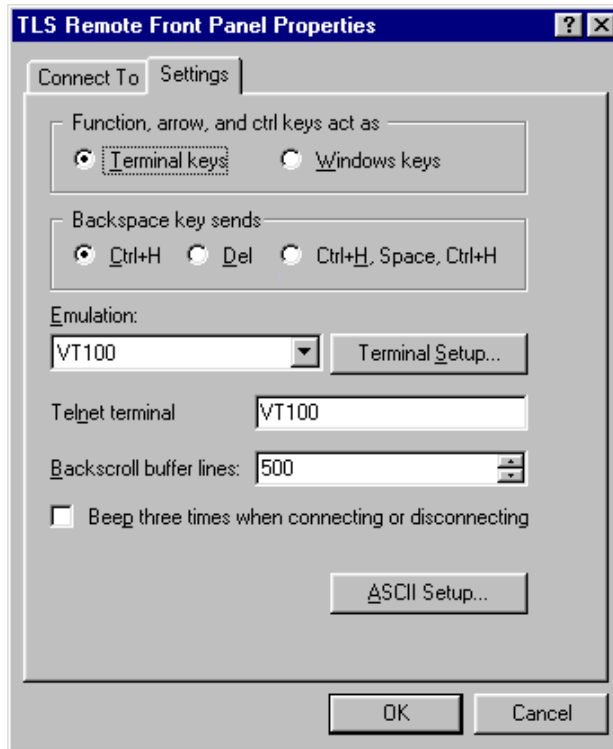


Figure 8-10 Settings Screen Under the Properties Menu

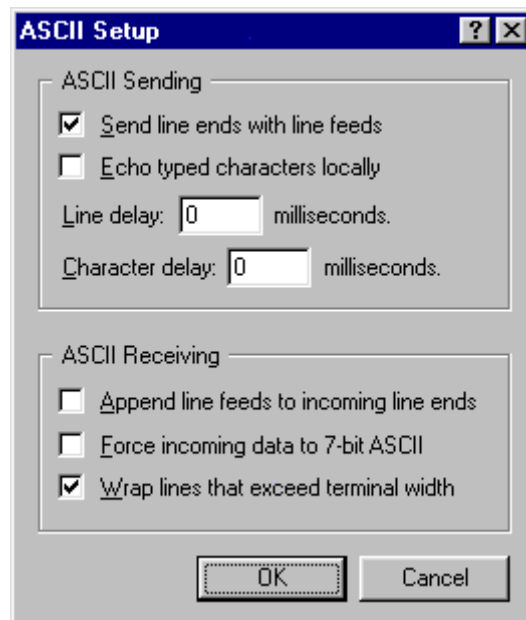


Figure 8-11 ASCII Setup Screen under Settings Screen

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.

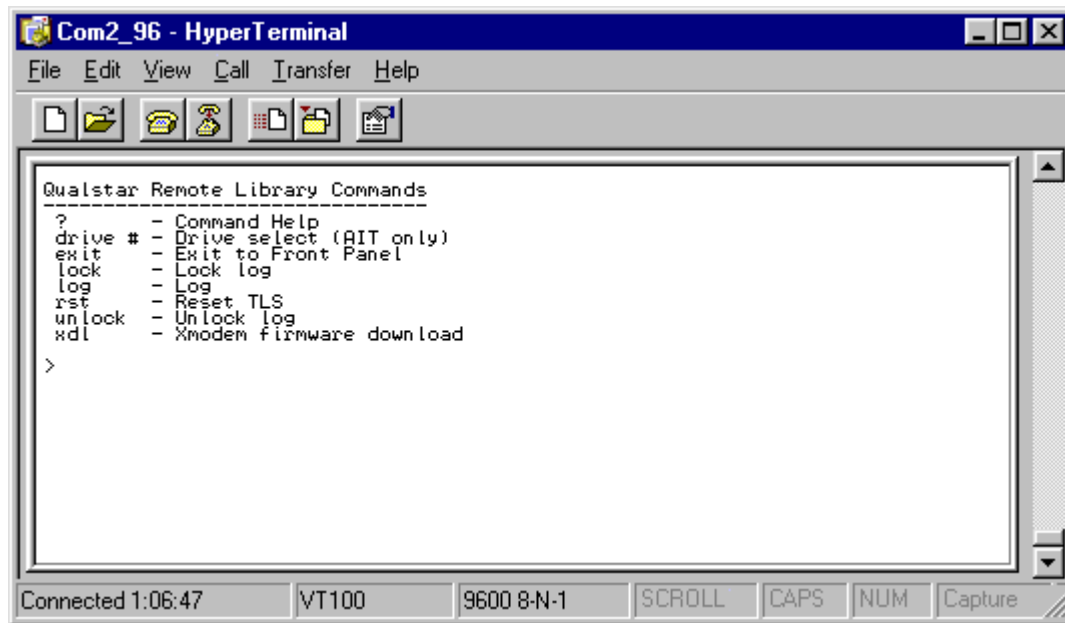


Figure 8-12 Remote Library Commands

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.

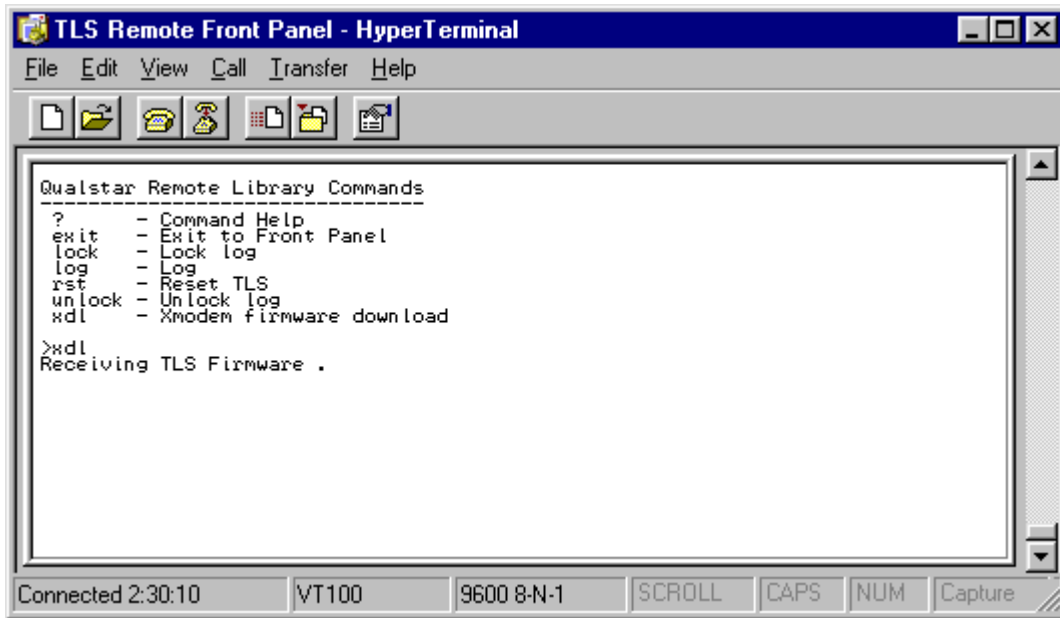


Figure 8-13 Example of Xmodem Firmware Download

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 (Version 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. Powering off the TLS Library is not necessary and can cause the TLS Library to lose its program contents.

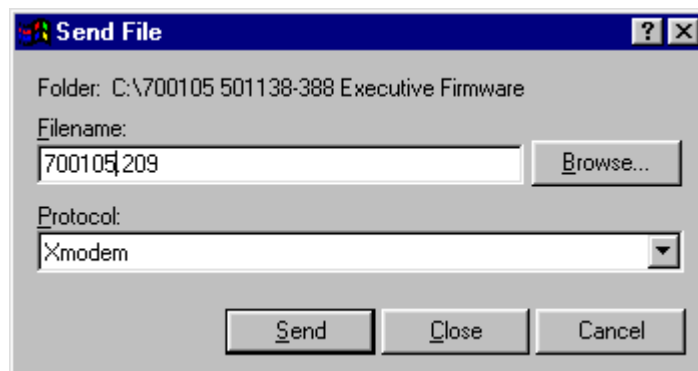


Figure 8-14 Send File Screen Under Transfer

8.4.7 Procedure for Replacing the Flash Memory I. C. on Executive II, III or IV Boards

This procedure will lead you through the process of changing the TLS operating firmware on an Executive board. It involves removing a 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. Use a number 2 Phillips screwdriver to remove all six Rear Service Panel mounting screws, then remove the Rear Service Panel (Figure 8-15).

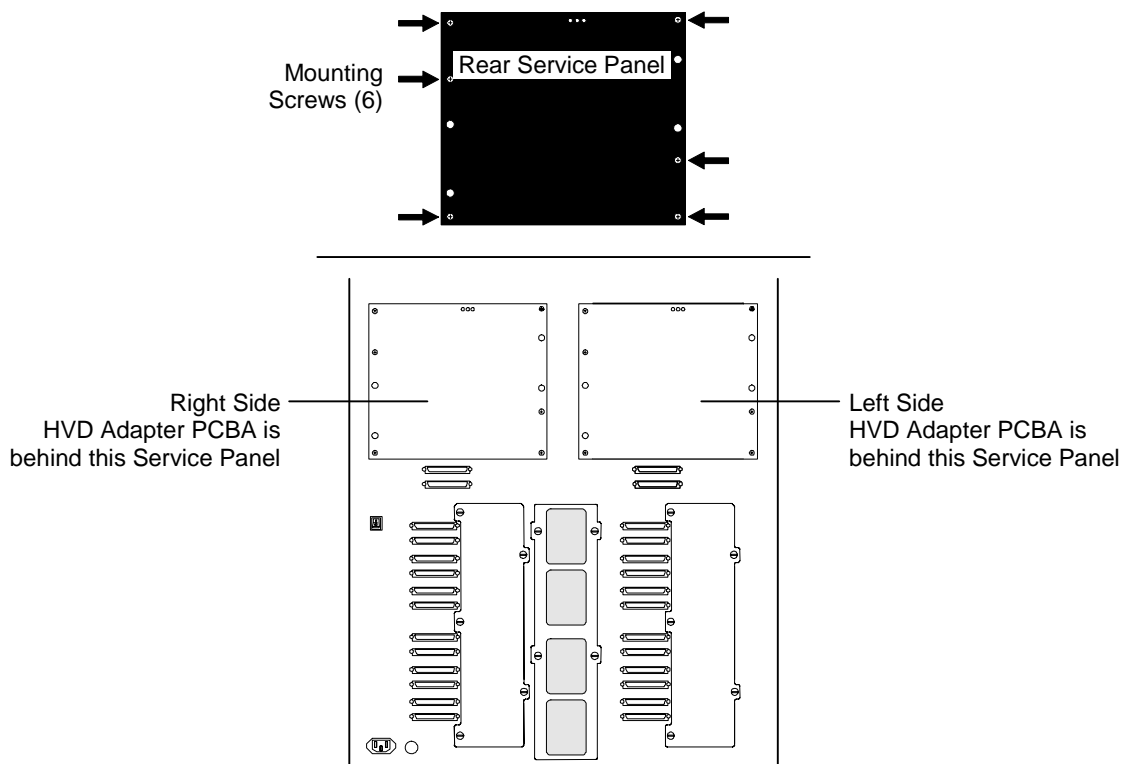


Figure 8-15 Rear Service Panels

3. Remove the Flash-Memory IC at U4 (the Part Number is 700105 or 700115) from the Executive PCBA using a flat blade screwdriver or equivalent tool. Note the IC location (U-number) is identical on Executive II, III and IV boards. Pry the IC from either end slightly and repeat for the other end. Be careful not to bend the legs of the IC. Continue this procedure until the part is loosened enough to be removed by hand. Refer to Figure 8-16 or Figure 8-17.

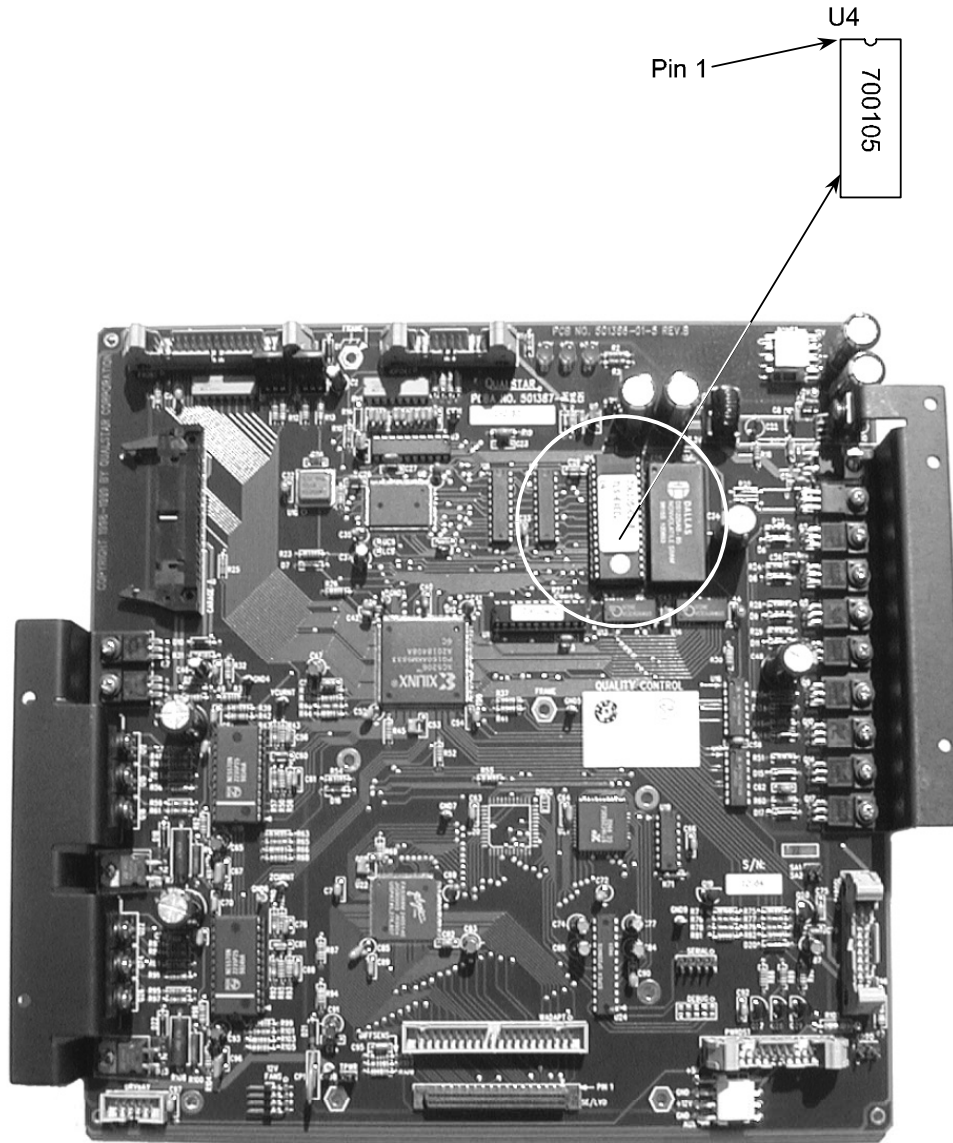


Figure 8-16 501387-01-8 Executive III PCBA

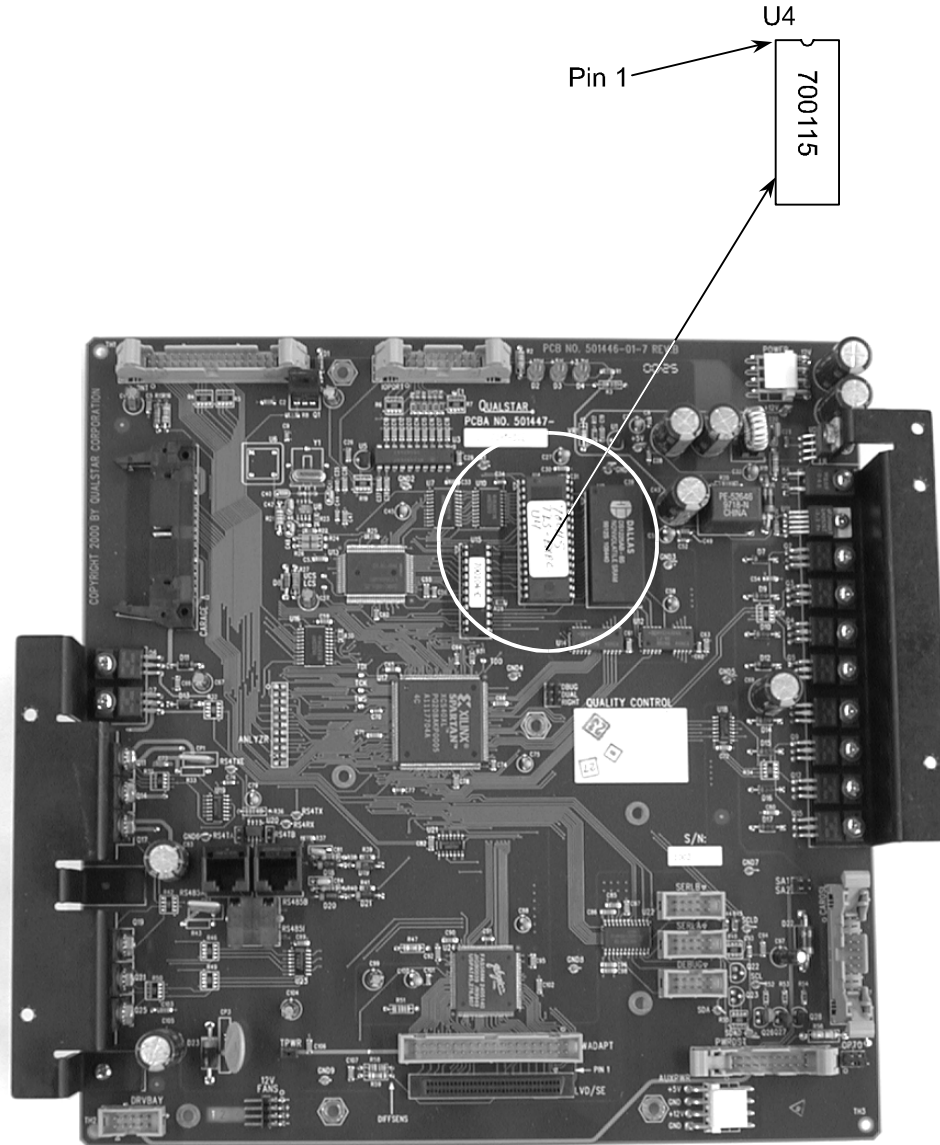


Figure 8-17 501447-01-5 Executive IV PCBA

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.

8.4.8 Procedure for Replacing the 700108 I.C. on Drive Bay Boards

1. Remove power from the TLS: first turn the power switch off and then remove the power cord.
2. Using a flat-blade screwdriver, remove the appropriate Drive Access Panel at the rear of the TLS by turning its five quarter-turn fasteners counter-clockwise (Figure 8-18).

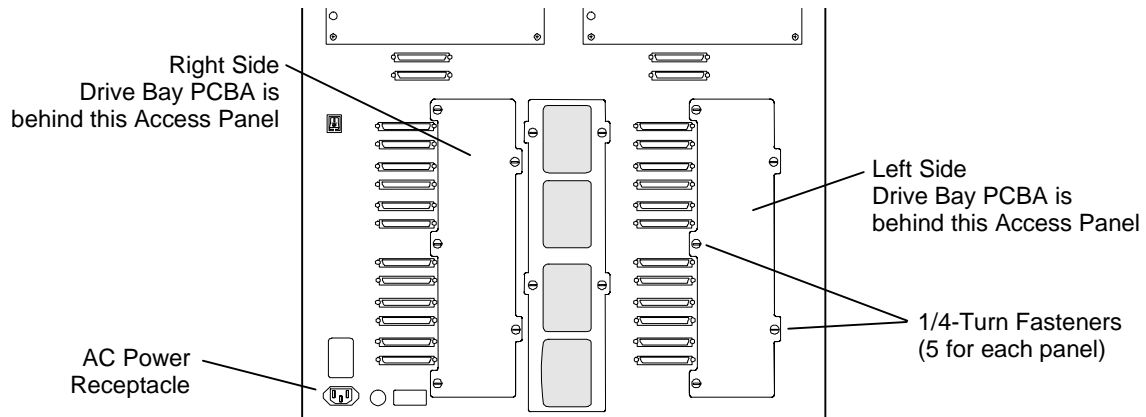


Figure 8-18 Rear View showing Access Panels

3. Locate the Drive Bay PCBA (Figure 8-19). Remove the Flash-Memory IC at U2 from the Drive Bay board (Figure 8-19) using a flat blade screwdriver or equivalent tool. Pry the IC from either end slightly and repeat for the other end. Be careful not to bend the legs of the IC. Continue this procedure until the part is loosened enough to be removed by hand.

NOTE

Disconnecting cables from the Drive Bay PCBA will allow for easier access when removing and replacing the Flash Memory IC.

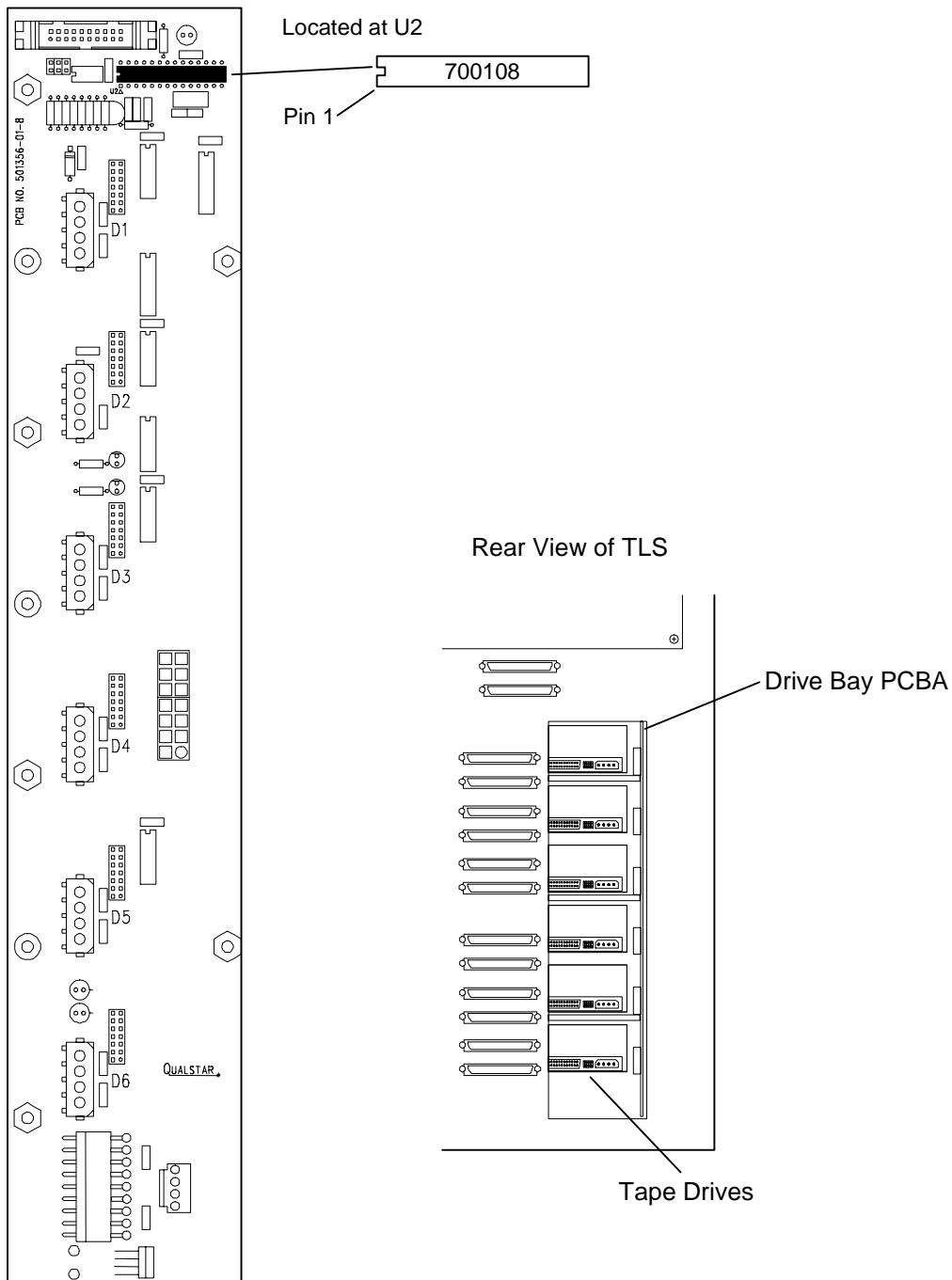


Figure 8-19 Drive Bay Board

4. Install the new Flash-Memory IC at U2 on the Drive Bay PCBA. Note the orientation of pin 1. Make certain that all pins are fully inserted into the socket. Reconnect any cables that were disconnected from the Drive Bay PCBA.
5. Align the Drive Access Panels five quarter-turn fasteners with the corresponding receptacles on the rear panel, then fasten it by turning the quarter-turn fasteners clockwise (Figure 8-18).

9.

TLS Expansions

DANGER

TO AVOID THE RISK OF PERSONAL INJURY:

TURN OFF ALL POWER TO THE TAPE LIBRARY SYSTEM, THEN REMOVE THE POWER CORD, BEFORE ATTEMPTING ANY OF THE PROCEDURES IN THIS CHAPTER.

NEVER OPERATE THE LIBRARY WHILE THE CABINET DOOR IS OPEN, OR WITH THE TOP PANEL OR SIDE PANELS REMOVED.

GEFAHR

UM VERLETZUNGEN ZU VERHINDEMN:

SCHALTEN SIE ALLE STROMSCHALTER AN DER TLS AUS UND ENTFERNEN SIE DAS STROMKABEL, BEVOR SIE MIT DER SERVICE-ARBEIT BEGINNEN.

BENUTZEN SIE DIE TLS NIE WENN DIE TUERE OFFEN IST, ODER DIE DECK-, BZW. SEITENPLATTE ENTFERNT SIND.

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.

Expansion kits are used to increase the cartridge capacity of TLS-412xxx models. Installing or removing an expansion kit changes the configuration of a unit. Therefore, after an expansion kit is installed, the unit must be reconfigured and, in some cases, recalibrated.

9.2 Model Expansions

Each kit should take less than 30 minutes to install.

| Model Upgrade | Expansion Kit P/N | Capacity Increase | Section | Page |
|------------------------|-------------------|-----------------------|---------|------|
| Model 412180 to 412360 | 500831-03-7 | 180 to 360 Cartridges | 9.2.1.1 | 9-3 |
| Model 412300 to 412600 | 500831-06-0 | 300 to 600 Cartridges | 9.2.1.2 | 9-6 |

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.

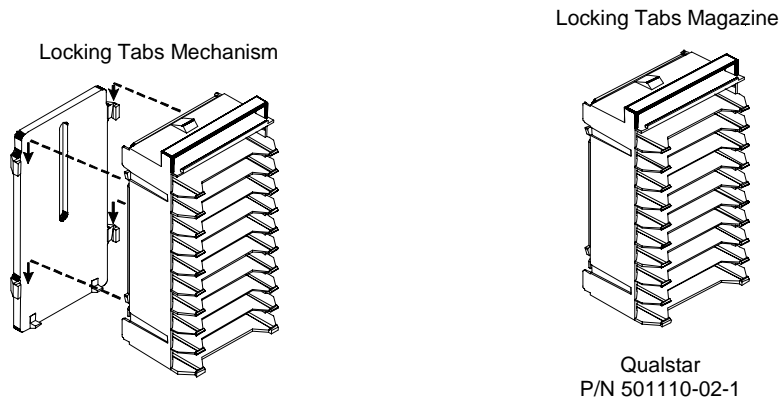


Figure 9-2 8mm Magazine Mechanism

9.2.1.1 Model 412180 to Model 412360 Expansions

This procedure adds three Receiver Assemblies to each of the three empty carousel faces on each carousel (18 Receiver Assemblies total).

Refer to **Figure 9-3** and **Figure 9-4**.

1. Turn off the TLS power and remove the power cord.
2. Open the cabinet door.
3. Reach into the cabinet and rotate the right side Carousel by hand until an empty Carousel face is facing you.
4. Use four pre-assembled screws to install a new Receiver Assembly onto the lower third of the empty Carousel face.
5. Use four pre-assembled screws to install a new Receiver Assembly onto the mid section of the empty Carousel face.
6. Use four pre-assembled screws to install a new Receiver Assembly onto the upper third of the empty Carousel face.
7. Rotate the Carousel by hand 60 degrees to access the next empty Carousel face.
8. Repeat steps 4 through 7 until three Receiver Assemblies are installed on all six Carousel faces of both Carousels.
9. Proceed to Section 9.2.2 of this chapter.

CAUTION

Do not apply power at this time.

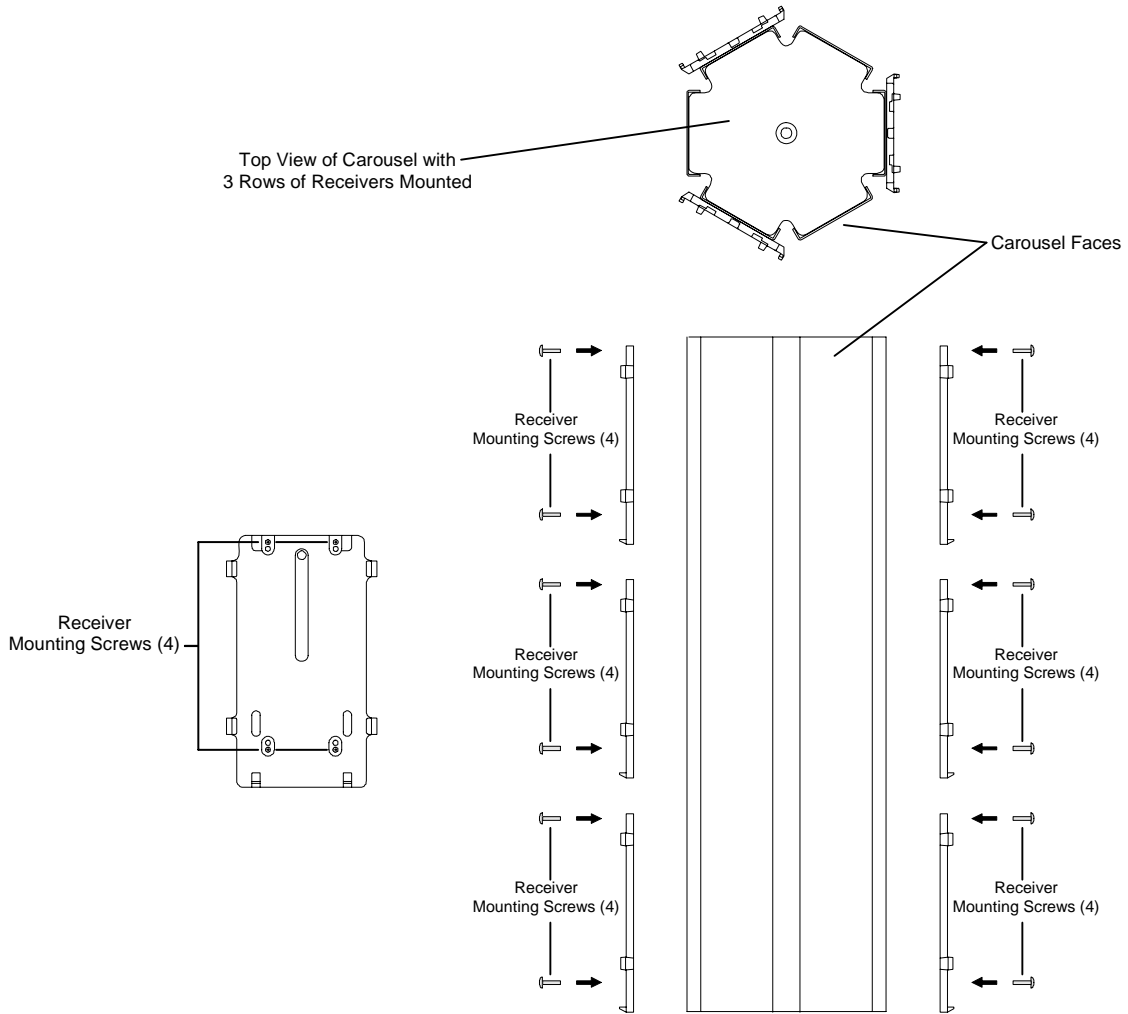


Figure 9-3 Converting a Model 412180 Library to a Model 412360 Library

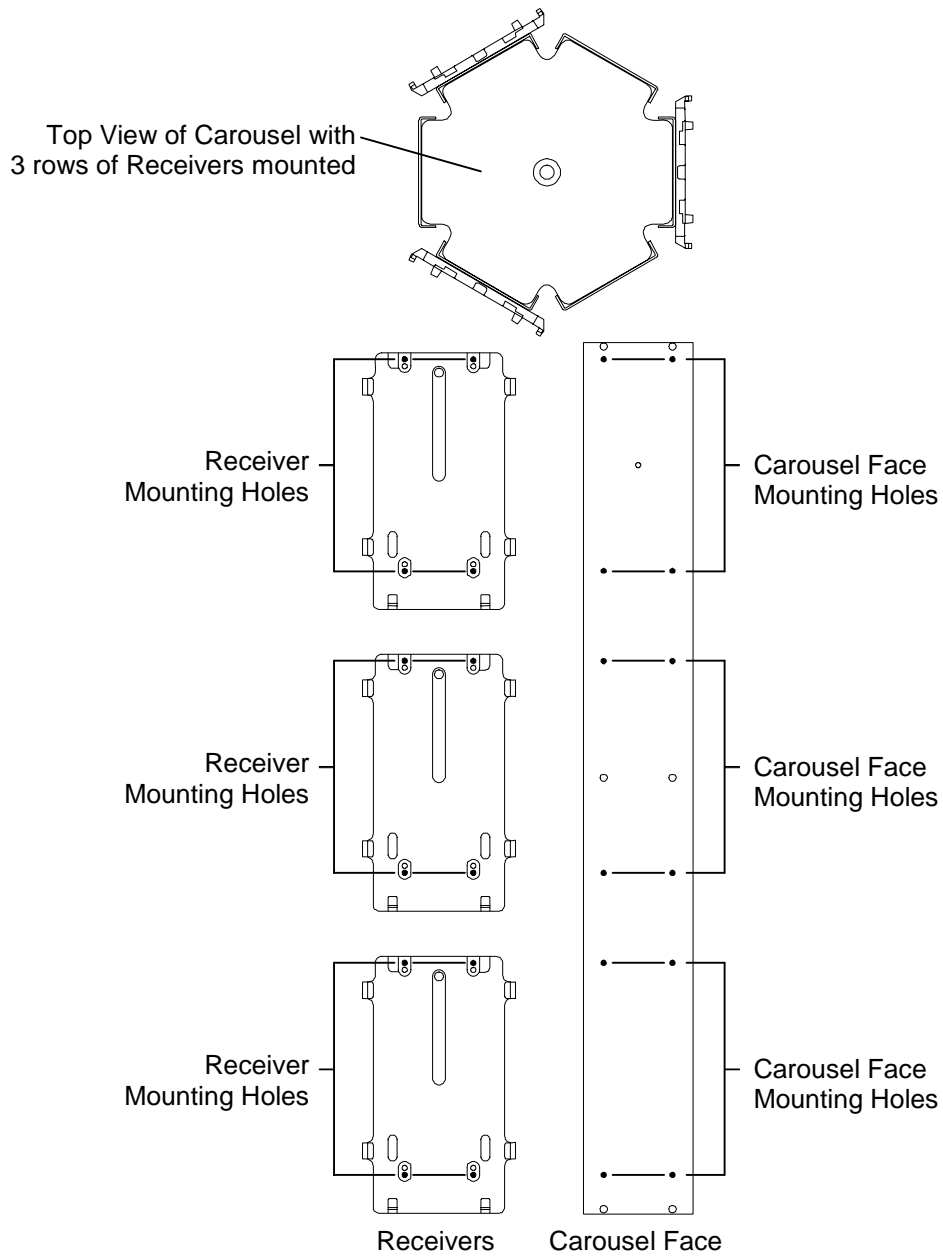


Figure 9-4 Hole Pattern for Mounting Receivers on Carousel

9.2.1.2 Model 412300 to Model 412600 Expansions

This procedure adds five Receiver Assemblies to each of the three empty carousel faces on each carousel (30 Receiver Assemblies total).

Refer to **Figure 9-5** and **Figure 9-6**.

1. Turn off the TLS power and remove the power cord.
2. Open the cabinet door.
3. Reach into the cabinet and rotate the right side Carousel by hand until an empty Carousel face is facing you.
4. Use four pre-assembled screws to install a new Receiver Assembly onto the empty Carousel face.
5. Repeat step 4 until all five Receiver Assemblies have been installed on the Carousel face.
6. Rotate the Carousel by hand 60 degrees to access the next empty Carousel face.
7. Repeat steps 4 through 7 until five Receiver Assemblies are installed on all six Carousel faces of both Carousels.
8. Proceed to Section 9.2.2 of this chapter.

CAUTION

Do not apply power at this time.

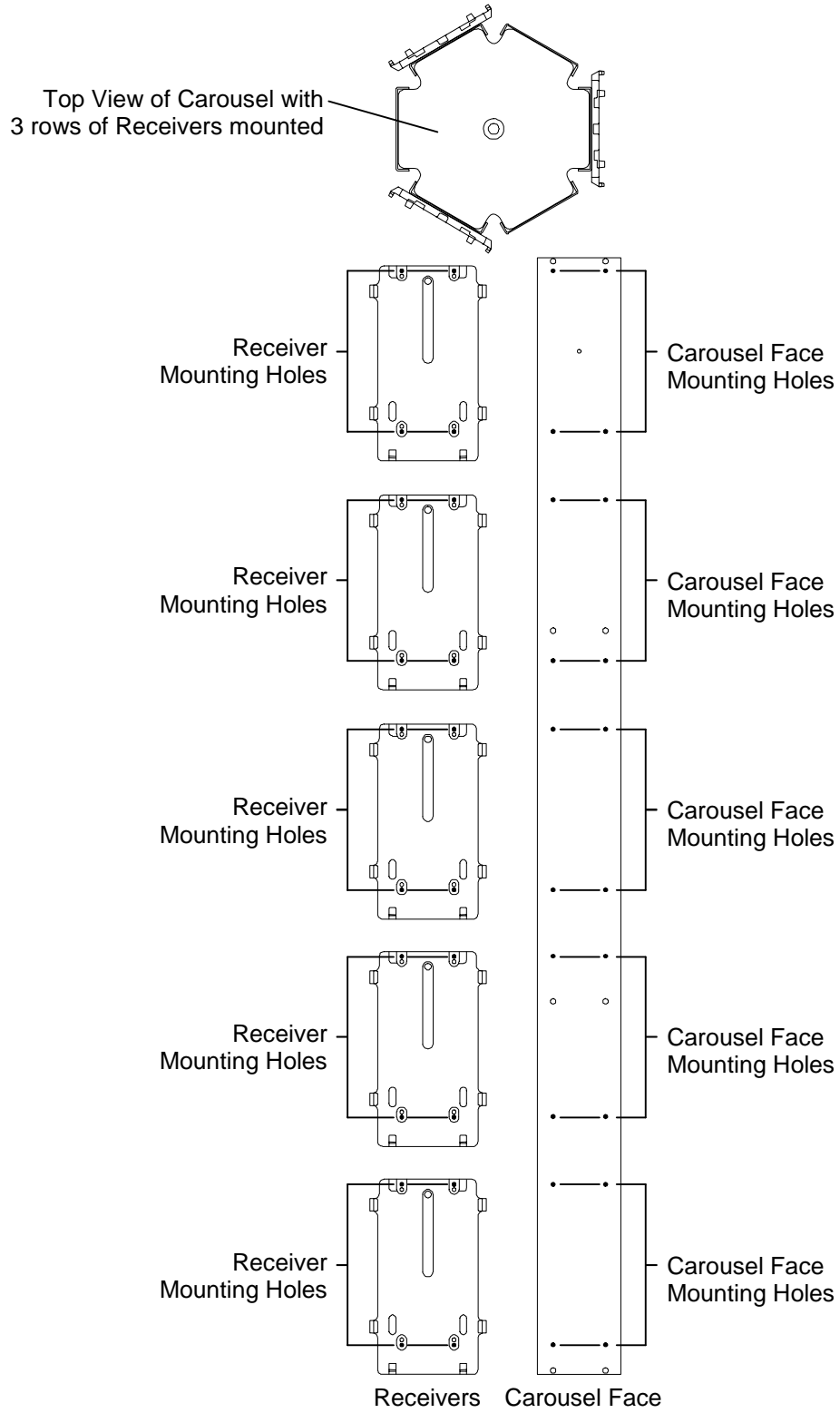


Figure 9-6 Hole Pattern for Mounting Receivers on Carousel

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 412xxx Installation and Operation Manual (Qualstar document number [501300](#)) 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-412180 to TLS-412360).
 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 5.4 to execute the `Private` menu's `CLEAR ACCESS` command, to remove the password (`Update`) and prevent unauthorized access to the `Private` menu.