

**TL81X Automated Tape Library  
for DLT™ Cartridges**

# **Field Service Manual**

**EK-TL810-SV**

**Revision B01**



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### **FCC STATEMENT**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

Operation of this equipment in a residential area may cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### **INDUSTRY CANADA (DIGITAL APARATUS) Interference-Causing Equipment Standard ICES-003 Issue 2**

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cer appareil numerique de la classe A respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

### **CISPR-22 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.

### **ACHTUNG!**

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmassnahmen verantwortlich ist.

### **ATTENTION!**

Ceci est un produit de classe A. Dans un environnement domestique, ce produit peut causer des interférences radio lectriques. Il appartient alors a l'utilisateur de prendre les mesures appropriées.

### **NOTICE FOR USA AND CANADA ONLY**

If shipped to USA, use the UL LISTED power cord specified below for 100-120 V operation. If shipped to CANADA, use the CSA CERTIFIED power cord specified below for 100-120V operation.

Plug Cap	Parallel blade with ground pin (NEMA 5-15P Configuration)
Cord	Type: SJT, three 16 or 18 AWG wires
Length	Maximum 15 feet
Rating	Minimum 10 A, 125 V

## REMARQUE

CETTE REMARQUE NE CONCERNE QUE LES ÉTATS-UNIS ET LE CANADA.

En cas d'envoi aux États-Unis, utiliser le cordon d'alimentation certifié UL et convenant pour 100-120 V.

En cas d'envoi au CANADA, utiliser le cordon d'alimentation CERTIFIÉ CSA et convenant pour 100-120 V.

Fiche	Broches paralléus avec une broche de mise à la terre (configuration NEMA 5-15P)
Cordon	Type: SJT, trifilaire 16 ou 18 AWG
Longeur	Maximum 15 pieds
Capacité	Minimum 10 A, 125 V

## ZU IHRER SICHERHEIT

### Vorsicht

Um Feuergefahr und die Gefahr eines elektrischen Schlages zu vermeiden, darf das Gerät weder Regen noch Feuchtigkeit ausgesetzt werden.

Um einen elektrischen Schlag zu vermeiden, darf das Gehäuse nicht geöffnet werden. Überlassen Sie Wartungsarbeiten stets nur einem Fachmann.

### Achtung

Da der interne Laserstrahl in Ihre Augen eindringen und Verletzungen verursachen kann, darf das Gehäuse nicht selbst geöffnet werden. Überlassen Sie Wartungsarbeiten stets nur einem Fachmann.

Die Verwendung von Brillen, Kontaktlinsen usw. vergrößert die Gefahr.

### Zur besonderen Beachtung

#### Zur Sicherheit

Sollte ein fester Gegenstand oder Flüssigkeit in das Geräteinnere gelangen, trennen Sie das Gerät von der Wandsteckdose ab und lassen Sie es von einem Fachmann überprüfen, bevor Sie es weiter verwenden.

Zum Abziehen des Kabels fassen Sie stets am Stecker und niemals am Kabel selbst an.

#### Zur Aufstellung

Stellen Sie das Gerät weder auf einer weichen Unterlage (z. B. Decke, Teppich) noch in der Nähe von Vorhängen, Tapeten usw. auf, da hierdurch die Ventilationsöffnungen blockiert werden können.

#### Zur Reinigung

Verwenden Sie zur Reinigung des Gehäuses, des Bedienungspultes und der Bedienelemente ein trockenes, weiches Tuch oder ein weiches, leicht mit mildem Haushaltsreiniger angefeuchtetes Tuch. Lösemittel wie Alkohol oder Benzin dürfen nicht verwendet werden, da diese die Gehäuseoberfläche ungreifen.

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# ***Introduction***

# **1**

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## Purpose

This document was written for field service engineers (FSEs) who service the TL810 or TL812 Automated Tape Library. It provides a descriptive overview of the library components as well as preventive maintenance, fault isolation, and removal/replacement procedures. This document is divided into the following sections:

- Chapter 1, “Introduction,” describes the purpose of this manual, provides a list of its contents and a list of related documentation.
- Chapter 2, “Library Overview,” provides a general overview of the library and descriptions of the components comprising the library.
- Chapter 3, “Preventive Maintenance,” provides guidelines and procedures for aligning, adjusting, cleaning and lubricating specific components of the library.
- Chapter 4, “Troubleshooting & Fault Isolation,” contains troubleshooting flow diagrams that are based on the software error codes returned to the Control Panel Status Display Area (SDA) and/or to the host. You can use the flow diagrams to isolate malfunctions in the library.
- Chapter 5, “FRU Removal & Replacement Procedures,” contains a list of all Field Replaceable Units (FRUs) and the procedures for removing/replacing faulty FRUs.
- Appendix A, “Control Panel Menus,” explains how to access control panel menus. These menus enable you to configure, calibrate, test, clean, and control library components.
- Appendix B, “Sense Data Values,” lists message information that can be sent from the library to the host computer.

## Conventions Used in this Guide



### **WARNING**

*When the warning icon accompanies text, it indicates that a potential hazard to your personal safety exists and is included to help prevent injuries.*



### **CAUTION**

*When the caution icon accompanies text, it indicates that a potential hazard to equipment or data exists and is included to help prevent damage.*

## Related Documentation

Table 1 is a list of all manuals associated with the TL810 and TL812 Automated Tape Libraries. To obtain further information or copies of documentation on this product, contact:

US Software Supply Business  
Digital Equipment Corporation  
10 Cotton Road  
Nashua, New Hampshire 03063-1260

The part number of each document will be required at the time of order.

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Table 1: Related Documentation

Document Number	Document Title	Document Description
EK-TL810-IG	TL81X Facilities Planning and Installation Guide	This guide describes facility preparation and provides the procedures for first-time installation of the library.
EK-TL810-OP	TL81X Operator's Guide	This guide describes the operator accessible components of the library and provides both operating and troubleshooting procedures.
EK-TL810-UM	TL81X Diagnostic Software User's Manual	This manual provides procedures for installing and using the TL810 diagnostic software.
EK-TL810-SG	TL81X Software Interface Guide	This guide is for software engineers developing the application and hierarchical mass storage software that accesses the TL810 or TL812.
EK-OTZ87-OM (For TL810 Tape Library)	TZ87N Series Cartridge Tape Subsystem Owner's Manual	This document describes the TZ87N tape drive and provides operating instructions and troubleshooting procedures.
EK-TZ88X-OM (For TL812 Tape Library)	TZ88N Series Cartridge Tape Subsystem Owner's Manual	This document describes the TZ88N tape drive and provides operating instructions and troubleshooting procedures.

# *Library Overview* **2**

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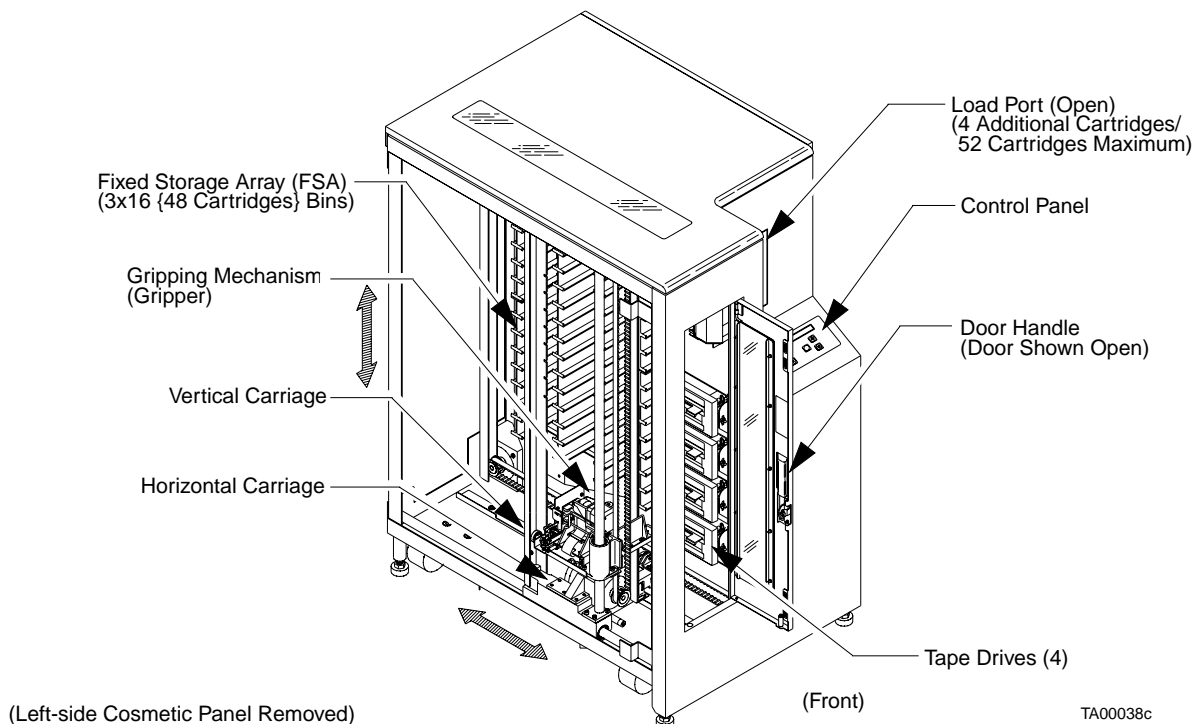
## Chapter Overview

This chapter provides a general overview of the library and descriptions of the components comprising the library.

## Library Description

The TL810 or TL812 library (Figure 1) is the automated storage and retrieval component of an automated tape library system. The TL810 series contains four TZ87N series tape drives and the TL812 contains four TZ88N series tape drives. Otherwise, the two models are identical. Both are capable of storing 48 digital linear tape (DLT™) cartridges in a fixed storage array (FSA). An operator-accessible load port at the front of the cabinet can hold an additional four tapes for a total of 52. A host computer communicates with the library through a SCSI interface using the SCSI-2 medium changer command set. In a typical operation, the host commands the robotics to transfer tapes between storage bins (in the FSA), tape drives, and the load port. Each time a tape cartridge is transferred, a gripping mechanism moves to the location of the tape cartridge where it “picks” the cartridge, then moves to the new location where it “places” the cartridge.

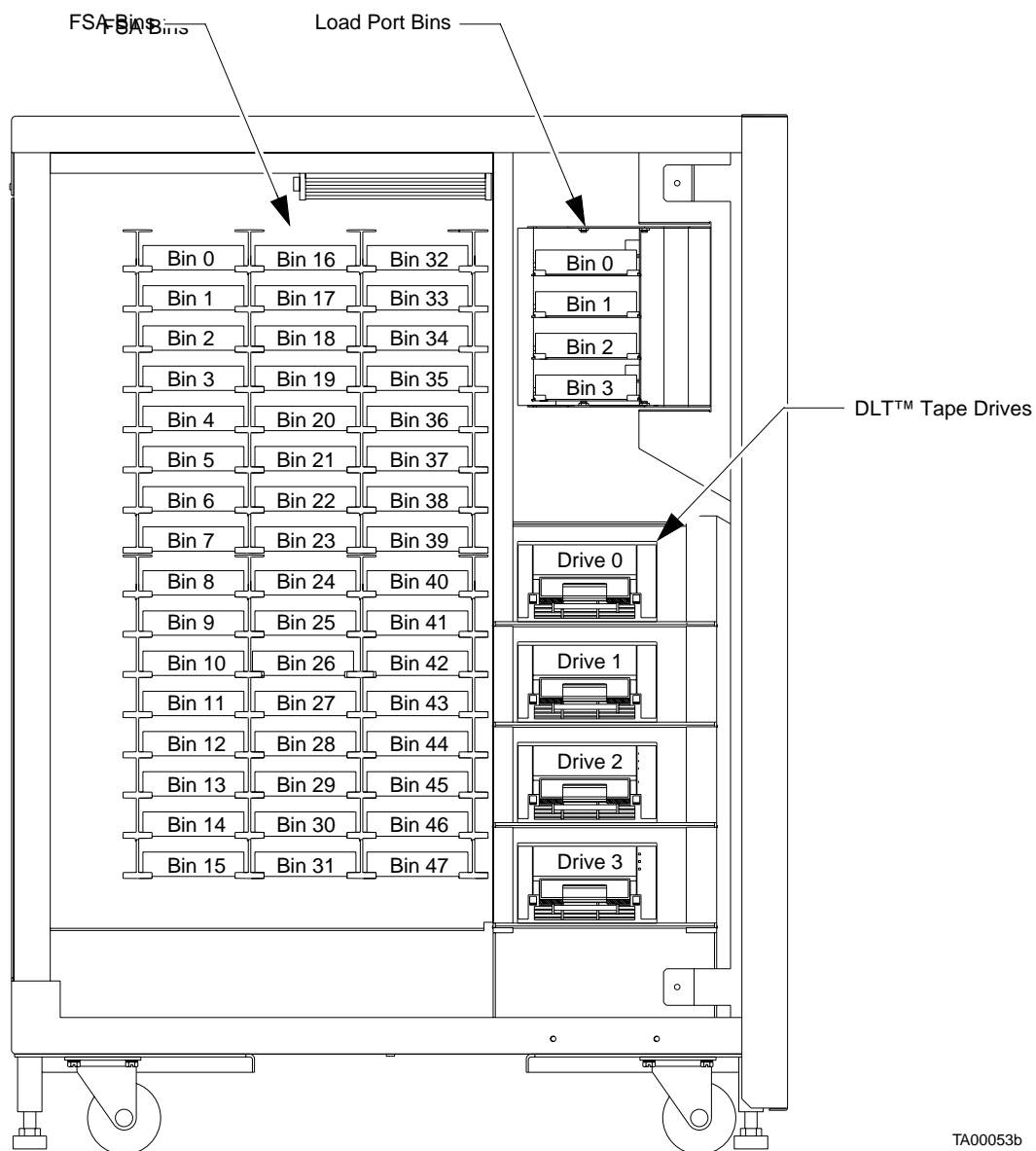
Figure 1: TL810 or  
TL812 Library



## Library Numbering Conventions

Figure 2 presents a view from the left side of the library (with the cosmetic panel removed). Figure 2 depicts the numbering convention for the library's FSA bins, load port bins, and tape drives. This numbering convention is used in the diagnostic software and the library menu model.

Figure 2: Library Numbering Conventions



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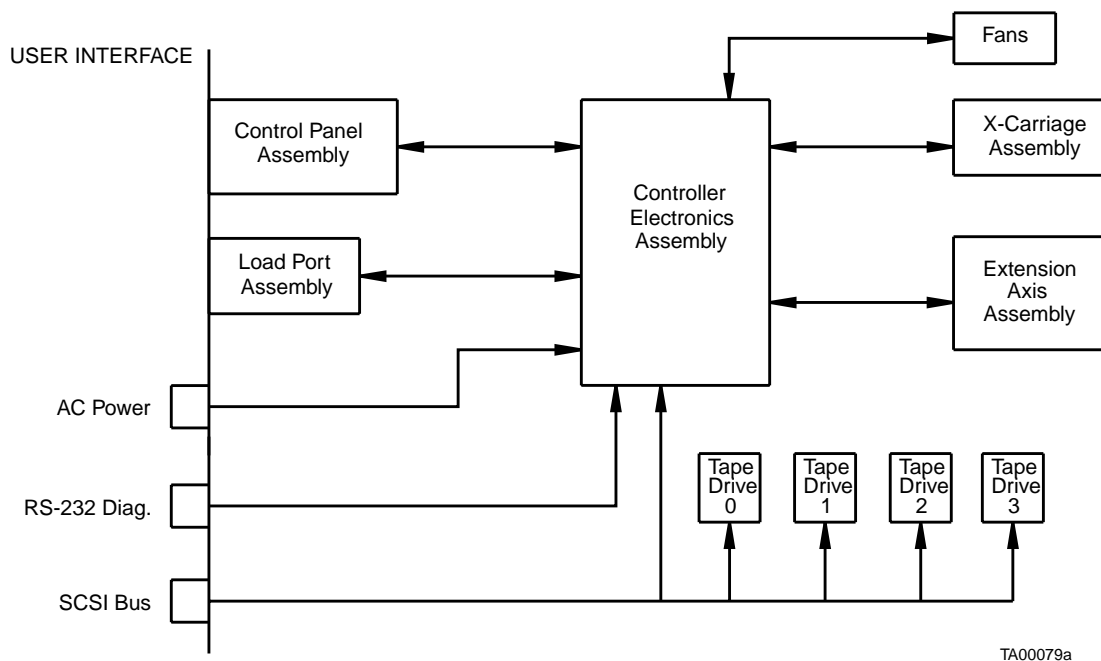


## Library Components

Figure 3 shows the simplified block diagram of the library. The major assemblies and components of the library are listed here and discussed below.

- Controller electronics assembly (CEA)
- Extension axis assembly (EAA)
- X-carriage assembly (XCA)
- Control panel assembly (CPA)
- Load port assembly (LPA)
- Control panel functions (TDAs)
- Fans

Figure 3: Simplified Block Diagram



## Controller Electronics Assembly

The CEA consists of the robotics controller (RC) PWA, the actuator driver (AD) PWA, and three power supplies. Figure 4 shows the location of the components and Figure 5 on page 2-7 shows the simplified block diagram. The individual components are discussed in the following paragraphs.

Figure 4: CEA Physical Location

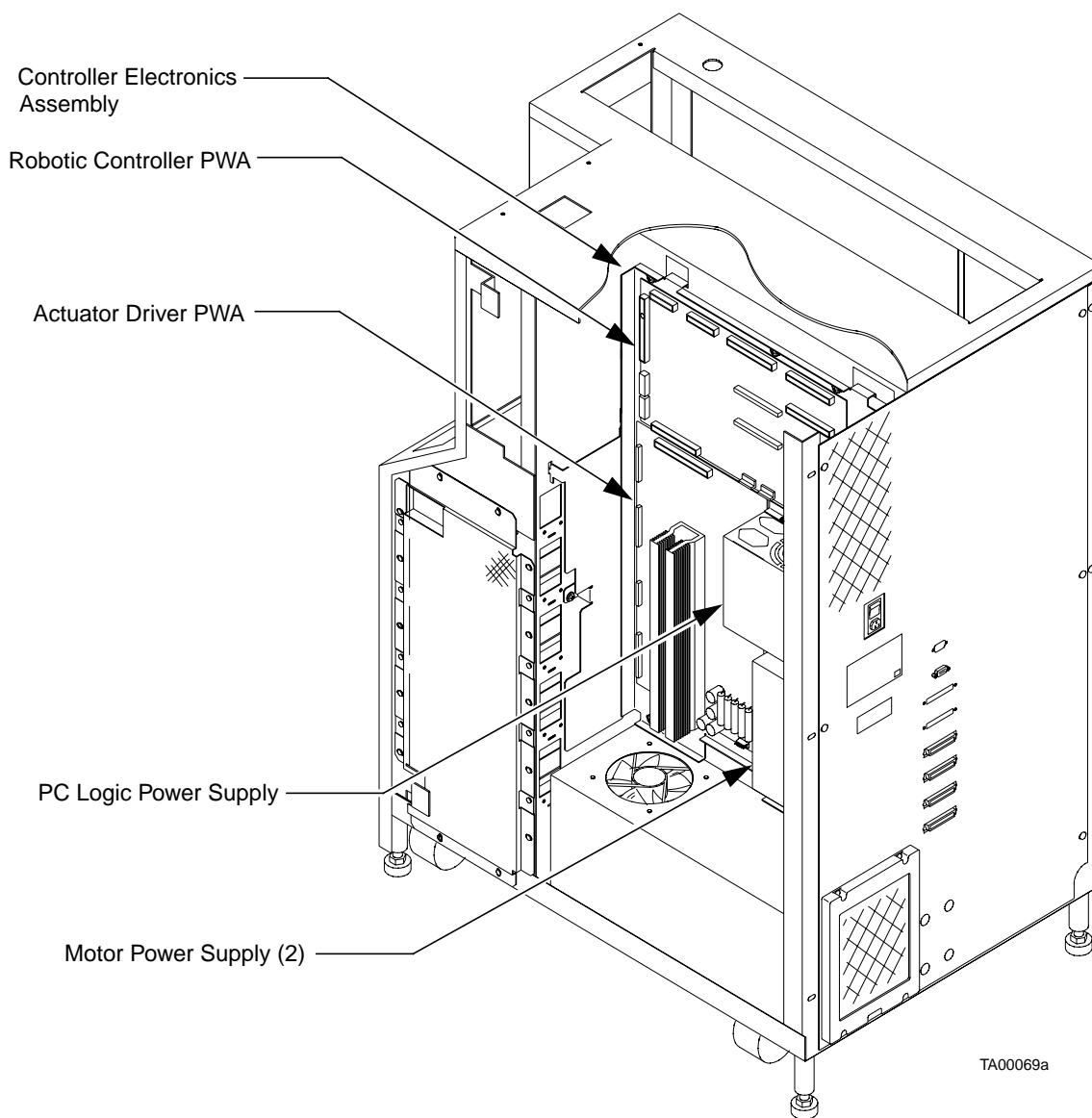
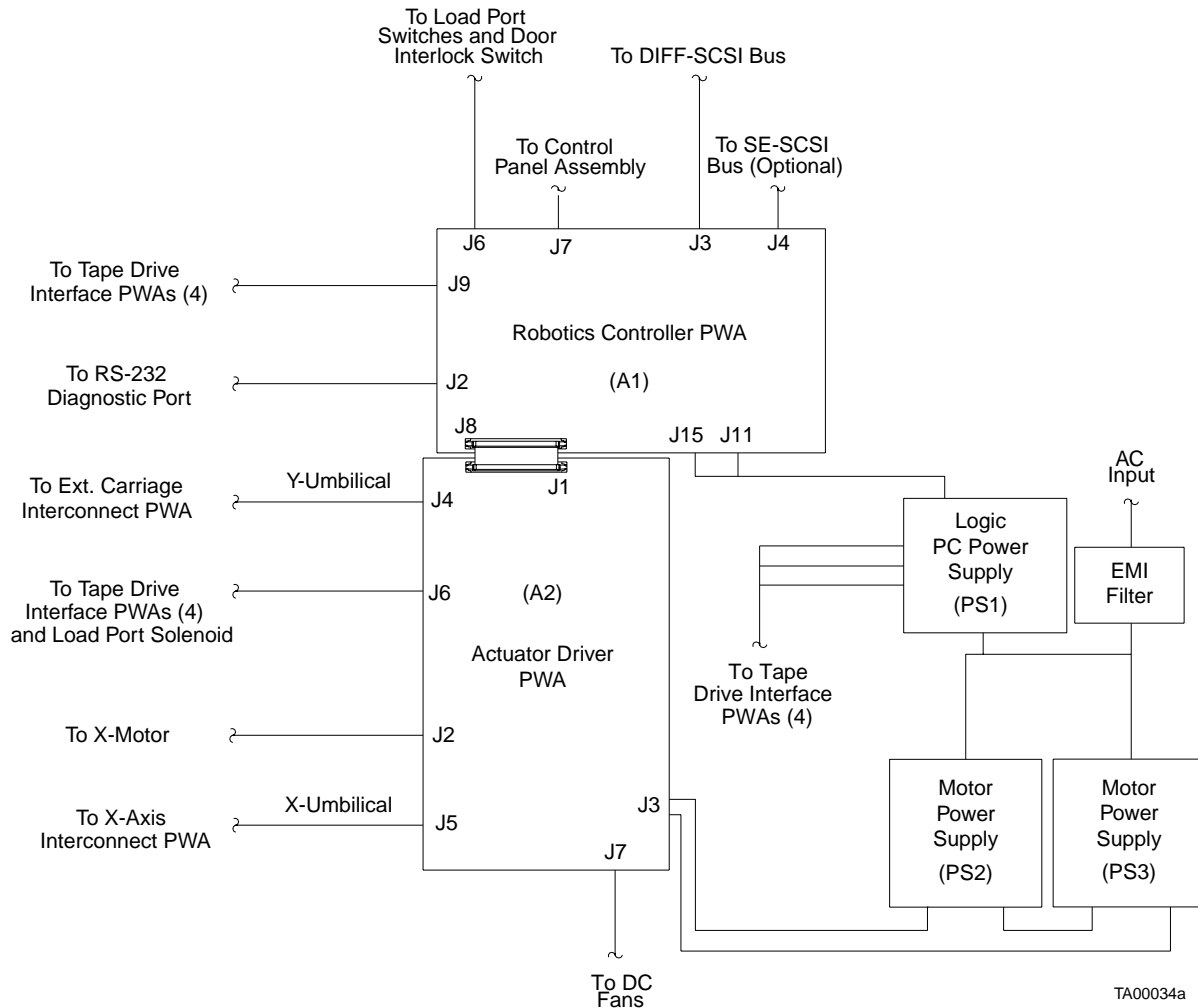


Figure 5: CEA Block Diagram



## Robotics Controller PWA (A1)

This PWA provides the interface between the library and the host computer. Using the SCSI-2 medium changer command set, the host passes commands to this PWA to control the library robotic equipment. This board tracks and controls all of the actuators in the library; monitors the status of switches, sensors, the control panel, and the tape drives; and, when required, transmits this status information back to the host. Another function of the RC PWA is to provide the RS-232 interface to the diagnostic PC for troubleshooting and maintenance.

## Actuator Driver PWA (A2)

The actuator driver PWA drives the library robotic mechanisms by using low-level signal commands. This PWA provides the following functions:

- Shunt over voltage protection (OVP) regulator
- X-axis motor interface
- Y-axis motor interface
- Extension motor interface
- Tape drive handle motor interface
- Load port lockout solenoid interface

### Shunt OVP

The shunt OVP regulator on the actuator driver board serves two functions:

- Over voltage protection of the motor power supply.
- Rapid discharge of +48 VDC and +24 VDC in the event of a fault condition.

The OVP regulator “shunts” to ground any regenerated current that create a voltage fluctuation above 51.5 VDC. Therefore, the +48 VDC supply line is regulated to below +51.5 VDC. A fault condition results in the rapid discharge of the motor bus. For example, a fault condition will occur when the door is opened, the STOP switch is pressed, the microprocessor watchdog times out, or when the +5V or +12V is out of regulation. A fault condition immediately shuts down all actuators and rapidly discharges the motor bus voltages within 100 milliseconds.

### X-Axis Motor Interface

The x-axis motor interface on the actuator driver PWA receives open-loop, low-level step, direction, and current commands from the robotic controller. This PWA amplifies and synthesizes the command signal to provide a high-current, two-phase, micro-stepping drive signal to the x-axis stepper motor.

### Y-Axis Motor Interface

The y-axis motor interface on the actuator driver PWA receives open-loop, low-level step, direction, and current commands from the robotic controller. The PWA amplifies and synthesizes the command signal to provide a high-current, two-phase, micro-stepping drive signal to the y-axis stepper motor.

### **Extension Motor Interface**

The extension motor interface on the actuator driver PWA receives closed-loop, low-level analog current control commands from the robotic controller. This PWA amplifies the command signal to provide a moderate-current drive signal to the extension brush motor.

### **Load Port Lockout Solenoid Interface**

The load port lockout solenoid interface on the actuator driver PWA receives a low-level enable control command from the robotic controller and, in turn, provides an open loop pull-in and hold current to the load port solenoid.

### **Tape Drive Stepper Motor Interface**

The tape drive stepper motor interface on the actuator driver PWA receives open-loop, low-level, full-stepping current control commands from the robotic controller and amplifies the command signal to provide a moderate-current, two-phase drive signal to operate the tape drive handle. The tape drive stepper motor drives are multiplexed; therefore, only one motor can be driven at any one time.

## **Power Supplies**

The library utilizes two different power supplies types which are located on the CEA.

### **Logic Power Supply (PS1)**

The logic power supply produces 300 watts with automatic ranging to a 115 VAC or 230 VAC input at 50/60 hertz. Outputs of +5 VDC and 12 VDC are used to provide logic power for the library PWAs and the tape drives.

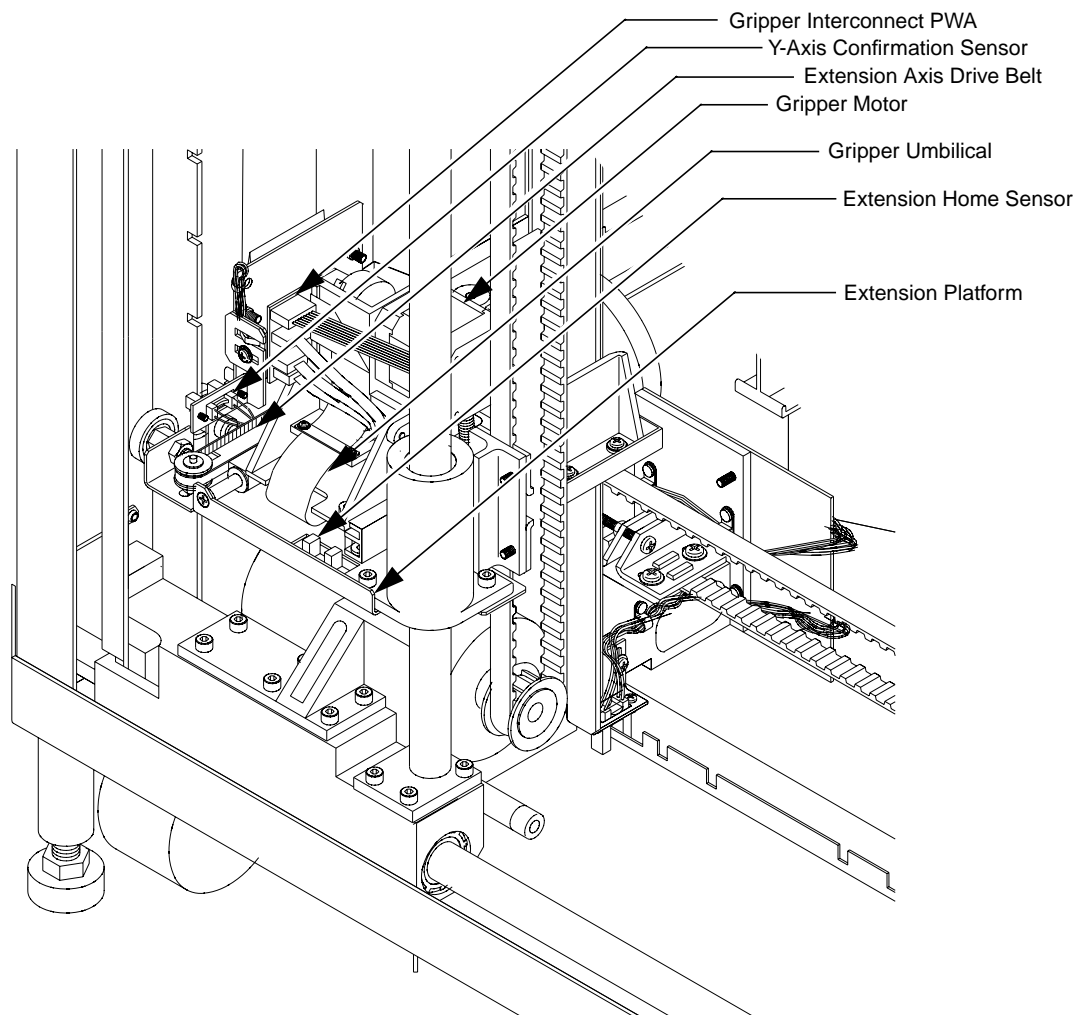
### **Motor Power Supplies (PS2/PS3)**

Each motor power supply produces 110 watts with automatic ranging to 115 VAC or 230 VAC input at 50/60 hertz. The outputs of each power supply are connected in series to provide +24 VDC and +48 VDC motor busses for the actuator driver PWA (A2).

## Extension Axis Assembly

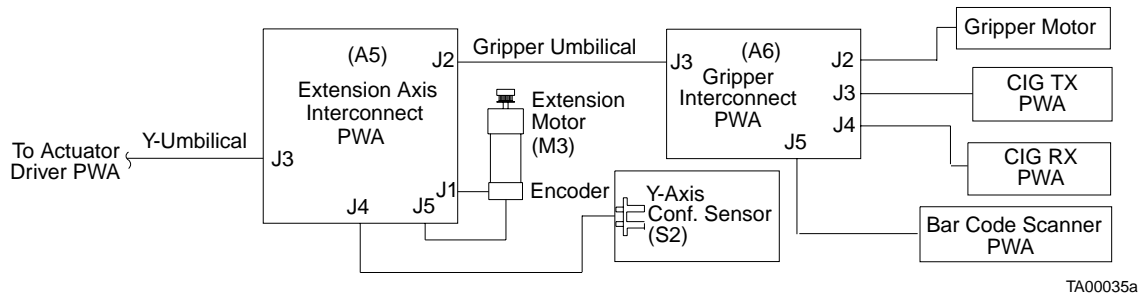
The EAA is located on the left-hand side of the library. The EAA consists of the extension axis assembly and the gripper assembly mounted on the extension platform. Figure 6 shows the location of the components and Figure 7 on page 2-11 shows the simplified block diagram. The individual components are discussed in the following paragraphs.

Figure 6: EAA Physical Location



TA00050b

Figure 7: EAA Block Diagram



## Extension Motor/Encoder and Belt

The extension motor is located at the front of the extension axis assembly. The extension belt is located along the left edge of the extension axis assembly. The +24 VDC/2 Amp brush motor engages the belt, while the belt drives the cartridge gripper assembly forward and backward on the extension rail of the extension axis assembly.

The extension motor encoder mounts on the bottom of the extension brush motor. The encoder is a 100-line-per-revolution, two-channel encoder, which gives position feedback to the robotic controller.

## Extension Carriage Interconnect PWA

The extension carriage interconnect PWA is located on the bottom of the extension axis assembly. The extension home sensor is mounted to the extension carriage interconnect PWA. This PWA receives low-level signals from the extension motor encoder, cassette-in-gripper (CIG) sensors, bar code scanner, gripper sensors, extension home and y-axis sensors. The low-level signals are buffered and driven down the y-umbilical to the actuator driver where they are eventually received at the robotic controller. This PWA also acts as a distribution/interconnection point for gripper and extension motor drives from the actuator driver through the y-umbilical.

## Gripper Interconnect PWA

The gripper interconnect PWA acts as a distribution/interconnection point for signals from the gripper motor, CIG transmitter PWA, CIG receiver PWA, and bar code scanner PWA to the gripper umbilical. The gripper open and closed sensors are mounted to the Gripper interconnect PWA and also are routed to the gripper umbilical. The gripper umbilical plugs into the extension carriage interconnect PWA which buffers the low-level signals and routes all signals down the Y-umbilical.

## **Gripper Motor (M4)**

The gripper motor raises and lowers the upper gripper jaw. The gripper motor is a two-phase stepper motor with 1.8 degrees (.005 inches) per step resolution.

## **Cassette-In-Gripper Receiver PWA**

The cassette-in-gripper (CIG) receiver PWA contains two synchronous photo-detectors located at the front and back of the lower gripper jaw. These photo-detectors determine for the robotics controller PWA whether a tape cartridge is fully gripped.

The outputs of each of the CIG receivers are ORed together to drive a red LED transmitter as part of synchronous break-beam detection system. The pulsed light from the CIG transmitter shines across both CIG receiver sensors on the lower gripper jaw. If the front CIG receiver is occluded only, the cartridge is partially gripped. If the front and rear CIG receivers are occluded, the cartridge is fully gripped.

## **Cassette-In-Gripper Transmitter PWA**

The CIG transmitter PWA contains one red LED driven by the CIG Receiver PWA as part of synchronous break-beam detection system. The light from the CIG transmitter shines across both CIG receiver sensors located at the front and back of the lower gripper jaw.



## **Bar Code Scanner PWA**

The bar code scanner PWA is built inside the gripper assembly. This PWA detects and transmits bar codes between the upper and lower gripper jaws.

The bar code scanner uses an IR (IR viewing scope is required to see the light) or red LED focused to reflect off the bar code label surface and converge through receiver optics on a photo-detector. The output of the photo-detector is amplified and conditioned to produce a digital signal. The digital signal is decoded on the robotic controller PWA for bar coding or calibration.

The bar code scanner utilizes reflective targets on each bin column and reflective features on each tape drive bezel to determine x and y positions for calibration.

During an inventory, the scanner reads the bar code labels on the cartridges and sends a digital signal that is decoded as a bar code on the robotic controller.

## **Y-Axis Confirmation Sensor (S2)**

The y-axis confirmation sensor is located on the extension axis assembly. The y-axis sensor provides feedback to the robotic controller for confirmation of position and allows the vertical axis to home based on slots in the vertical rail.

## **X-Carriage Assembly**

The x-carriage assembly consists of the x-carriage, the x-axis interconnect PWA, and the y-axis motor assembly. Figure 8 on page 2-16 shows the location of the components. The individual components are discussed in the following paragraphs.

The x-carriage assembly rides on the lower horizontal rail and provides mounts for the vertical rail. It also contains the y-axis motor and the x-carriage interconnect PWA that provides an attachment point and strain relief for the x-umbilical.

### **X-Carriage**

The x-carriage is a structure that rides on the lower horizontal rail and provides the mounts for the vertical rail. The x-carriage also mounts the y-axis motor and mounts the x-carriage interconnect PWA.

### **X-Axis Interconnect PWA (A4)**

The x-axis interconnect PWA is located on the rear of the x-carriage assembly as viewed from the left side of the system. The x-carriage interconnect PWA provides an attachment point and strain relief for the x-umbilical. Signals from the x-axis confirmation sensor and drive for the y-axis motor are delivered to the x-axis interconnect through the x-umbilical.

The x-axis interconnect PWA receives a signal from the x-axis confirmation sensor, buffers it, and drives it down the x-umbilical to the actuator driver where it is received at the robotic controller. The x-axis interconnect PWA acts as an distribution/interconnection point for the y-axis motor from the actuator driver through the y-umbilical.

### **X-Axis Confirmation Sensor**

The x-axis confirmation sensor is located on the x-carriage assembly. The sensor confirms bin and tape drive column position to the robotic controller PWA. The sensor allows the horizontal axis to home using slots in the x-axis sensor rail mounted on the bottom of the library frame.

### **Y-Axis Motor (M1)**

The y-axis motor, mounted in the x-carriage assembly, is a two-phase stepper motor which has 1.8 degrees (.005 inch) per step resolution. One end of the motor shaft holds a flanged pulley that engages the vertical drive belt. The opposite end is an idler pulley. The y-axis motor is micro-stepped to provide accurate open loop position control. The position loop is closed through the y-axis confirmation sensor and flags.

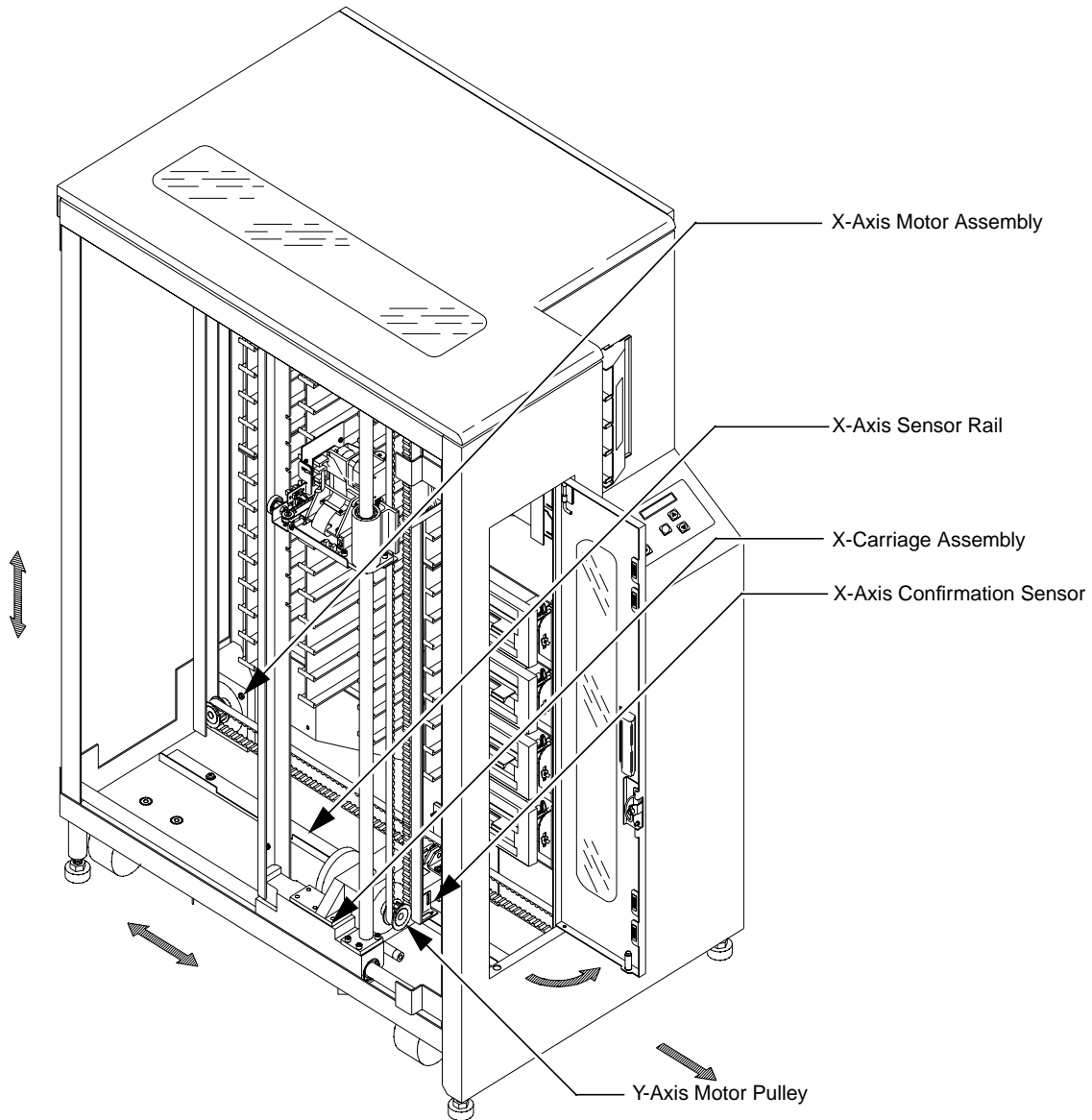
The vertical drive belt, an open-ended belt (as opposed to a continuous loop), is driven by the y-axis motor to propel the vertical carriage up and down the vertical rails. The y-axis is held at each position, without the need for a counterweight, by the stepper motor.

### **X-Axis Motor (M2)**

The x-axis motor, mounted to the rear of the library, is a two-phase stepper motor which has 1.8 degrees (.005 inch) per step resolution. One end of the motor shaft holds a flanged pulley that engages the horizontal drive belt. The opposite end is an idler pulley. The x-axis motor is micro-stepped to provide accurate open loop position control. The position loop is closed through the x-axis confirmation sensor and flags.

The horizontal drive belt, an open-ended belt (as opposed to a continuous loop), is driven by the x-axis motor to propel the x-carriage assembly along the horizontal rail.

Figure 8: XCA Physical Location



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## Control Panel Assembly

The control panel assembly (CPA) consists of the control panel PWA, the keypad PWA, and the LCD display. Figure 9 on page 2-19 shows the location of the components. The individual components are discussed in the following paragraphs.

The CPA, located at an angle on the front panel assembly, provides the user with system status, control, and diagnostics. System functions are queried through the keypad PWA and viewed through the LCD display. The robotic controller communicate with the CPA over a synchronous serial interface.

### Control Panel PWA (A3)

The control panel PWA contains the LCD display and is mounted to the keypad PWA. The robotics controller PWA communicates with the control panel PWA through a synchronous serial interface over a ribbon cable.

The control panel PWA converts the control and status information from serial to parallel format. This parallel I/O data is used to:

- Control the LCD display
- Collect system temperature status from the on-board temperature sensor
- Control LCD contrast
- Activate on-line and load port request status LEDs on the keypad PWA
- Receive control button inputs (on-line, load port open request, load port close request, menu select and scroll) from the keypad PWA

The control panel PWA also provides interfacing for the stop button and the microprocessor fault LED that come directly from the robotic controller in a non-serial format.

Motor power is shut down when the stop button is pressed.

## Keypad PWA (A15)

The keypad PWA is mounted to the front panel assembly. The control panel PWA/LCD display is mounted to the keypad assembly. The keypad PWA contains status indicator LEDs and control panel buttons to query system status, control, and diagnostic functions.

The LEDs on the keypad PWA are for on-line, load port request status, and microprocessor fault status. The control panel buttons on the keypad PWA are:

- **STOP.** This button stops all robotics.
- **STANDBY.** This button switches the library between on-line and off-line (standby) status.
- **OPEN.** This button opens the load port door so that tapes can be inserted or removed.
- **CLOSE.** This button readies the library so you can close the load port door.
- **SELECT.** When the library is in off-line (standby) mode, this button activates system menus and selects menu items.
- **UP ARROW/DOWN ARROW.** These buttons allow you to scroll through menu choices.

All control panel buttons are momentary/dome type. For more information about these buttons, refer to Table 2 on page 2-22.

To use the library menus, refer to Appendix A: “Control Panel Menu Modes.”

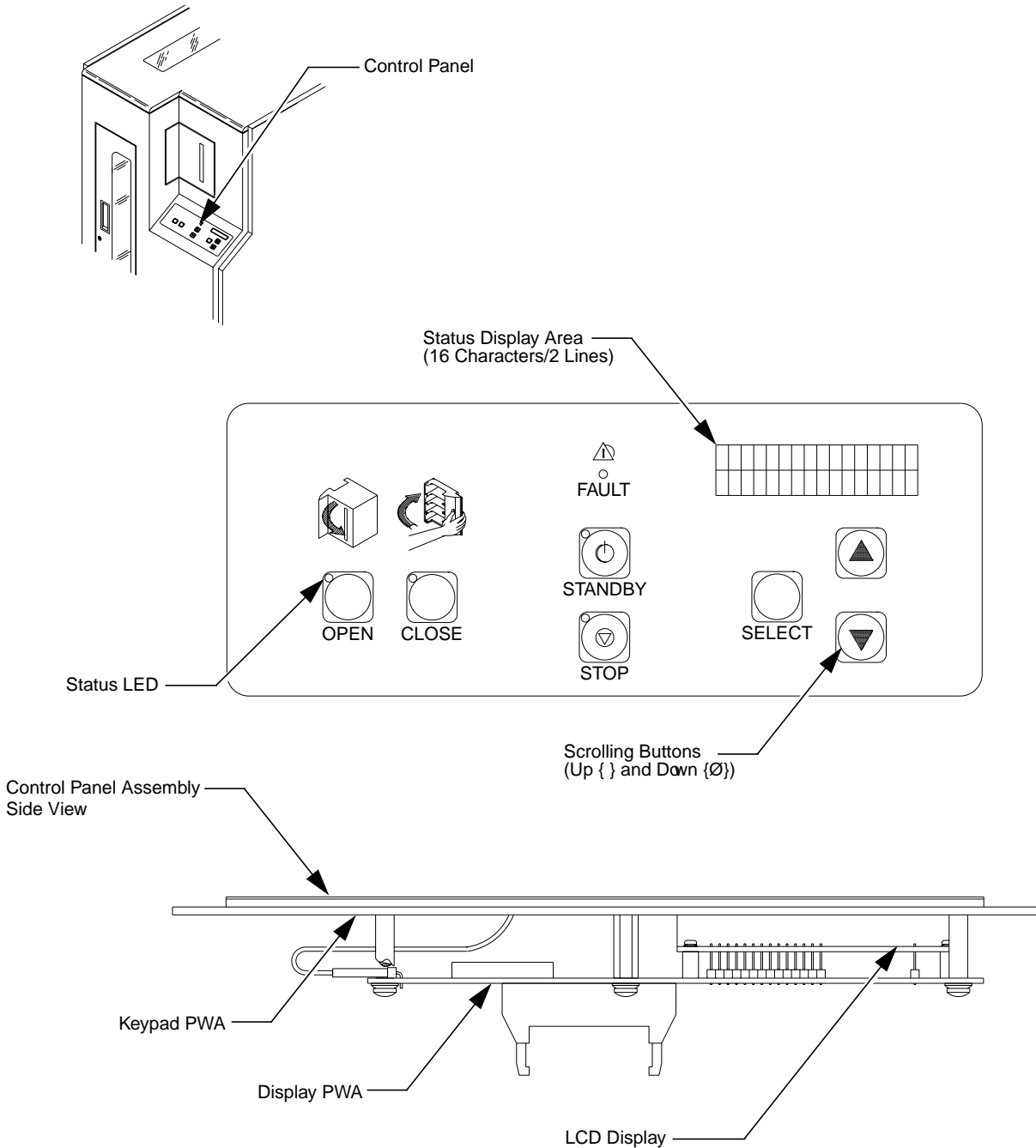
## LCD Display

The LCD is mounted to the control panel PWA and viewed through the keypad PWA. The LCD display allows a user to view system status, control, and diagnostics functions.

The LCD display dimensions are 2 lines by 16 characters. The LCD display is a self-contained unit with built-in character ROM, display drivers, and LED backlights.

The LCD display contrast can be adjusted for the optimum viewing angle and ambient lighting conditions. This adjustment is accessible through the configuration menu on the control panel. (See Appendix A: “Control Panel Menu Modes.”)

Figure 9: CPA Physical Location



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## Load Port Assembly

The load port, located at the front of the library above the control panel (Figure 10 on page 2-21), allows the operator to insert or remove up to four tape cartridges at a time. (See Table 2 on page 2-22 for a description of the load port buttons.)

For a load operation, press the load port **OPEN** button. When the indicator stops blinking, the load port door automatically opens (and locks in the open position) allowing the operator to insert tape cartridges.

After the operator presses the **CLOSE** button and closes the door, the tape cartridges are available for use by the library.



### **CAUTION**

*You must release the **CLOSE** button before pushing the load port door closed.*

For an unload operation, the gripper places tape cartridges in the load port bins. Looking through the view port, the operator can decide if an unload operation is necessary. Pressing the **OPEN** button automatically opens the door allowing the operator to remove the tape cartridges.

### **Load Port Switch 1 (SW1)**

Load port switch 1 is a lever-operated mechanical micro-switch located on the bottom left side of the load port assembly (looking at the library from the left). When actuated, this switch indicates that the load port door is open.

### **Load Port Switch 2 (SW2)**

Load port switch 2 is a lever-operated mechanical micro-switch located on the bottom right side of the load port assembly (looking at the library from the left). When actuated, this switch indicates that the load port door is closed.

### **Front Door Interlock Switch (S1)**

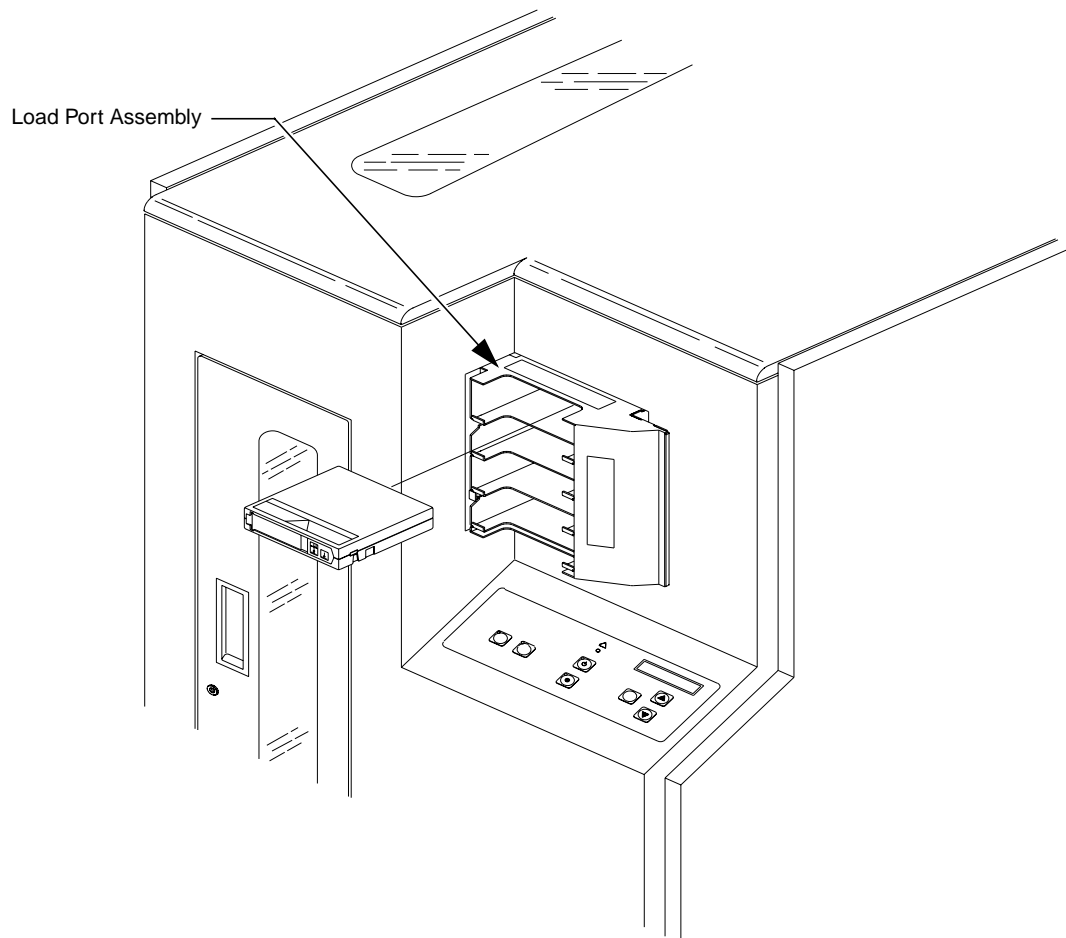
The front door interlock is a magnetic read switch located at the bottom of the front door. As its name implies, this switch consists of a magnet (attached to the front door) and a read relay (attached to the front panel assembly). When the magnet is within 0.5 inch of the read relay, the switch contact closes. Motor power is shut down when the front door is opened.



## Load Port Lockout Solenoid (SOL1)

The load port lockout solenoid is located on top of the load port assembly. When the load port lockout solenoid is actuated, the solenoid plunger is raised, unlocking the load port mechanism which allows the load port mechanism to slide open or closed. The robotics controller disengages the load port solenoid immediately after the load port mechanism moves off either limit switch, allowing the solenoid plunger to fall back into a lockout point when the load port reaches the open or closed position.

Figure 10: Load Port  
Physical Location



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Table 2: Control Panel  
 Button Functions

Feature	Function
(load port)  <b>OPEN</b> (button/ indicator)	The (load port) <b>OPEN</b> button is used to unlock the load port door for the purpose of inserting or removing tape cartridges. Pressing the <b>OPEN</b> button causes the library to: <ul style="list-style-type: none"> <li>• Park the robotics (the green indicator blinks until the robotics are parked)</li> <li>• Unlock and open the load port door (the indicator is steadily lit)</li> <li>• Re-lock the load port door in the open position (the indicator is off)</li> </ul> (Once the door is opened, you can insert tape cartridges into the four bins or remove tape cartridges from the bins).
(load port)  <b>CLOSE</b> (button/ indicator)	When the load port door is in the open position, the (load port) <b>CLOSE</b> button is used to unlock the door before closing it. Pressing the <b>CLOSE</b> button causes the library to: <ul style="list-style-type: none"> <li>• Park the robotics (the red indicator blinks until the robotics are parked)</li> <li>• Unlock the door (the indicator is steadily lit)</li> </ul> (Once the indicator is steadily lit, you can close the door. The library will lock it in the closed position.)
<b>STANDBY</b> (button/ indicator)	You can set the state of the library (on-line or off-line) with this button. With the library in the on-line mode, pressing this button toggles the library to the off-line state (indicator on). While in <b>STANDBY</b> , host communications are disabled, the control panel menus are available, and the diagnostic port on the rear panel ( <b>DIAG</b> ) is active. Pressing the button again toggles the library to the on-line state. The indicator functions as follows: <ul style="list-style-type: none"> <li>• Off (solid) - <b>STANDBY</b> is not selected. The library is on-line.</li> <li>• On (solid) - <b>STANDBY</b> is selected. The library is off-line.</li> <li>• Blinking - Waiting for the current on-line operation to complete.</li> </ul>
<b>STOP</b> (button/ indicator)	You can stop the robotic equipment by pressing the <b>STOP</b> button. When pressed, it removes power to the robotic equipment and illuminates the (red) indicator. Pressing the button again restores the power to the robotics and extinguishes the indicator.
<b>SELECT</b> ↑ (scroll-up), and ↓ (scroll-down) (buttons)	With the library in the <b>STANDBY</b> state, pressing the <b>SELECT</b> button activates menu mode. While in menu mode, <b>SELECT</b> allows you to choose menus and options, shown in the second line of the status display area (SDA), for execution. The ↑ and ↓ buttons are used in conjunction with the <b>SELECT</b> button. While in menu mode, these buttons are used for navigating through the menu options. (For detailed procedures on using menu mode, see Chapter 3, “Operating Procedures.”)
<b>FAULT</b> (indicator)	When illuminated (red), it indicates the library is in an error condition. Observe the SDA for a specific message. (For a listing and detailed description of all status messages shown in the SDA, see Chapter 4, “Operator Troubleshooting.”)
Status Display Area	This is a 16-character (5x7 dot-matrix LCD)/2-line display. It shows status messages that describe the operating state of the library. It is also used for displaying menu options while the library is in menu mode.

## Tape Drive Assemblies

### Tape Drives (A11/A12/A13/A14)

The four SCSI tape drives are located in the front of the library just below the load port assembly. On the rear of each tape drive is a tape drive interface PWA.

### Stepper Motor Assemblies (A7/A8/A9/A10)

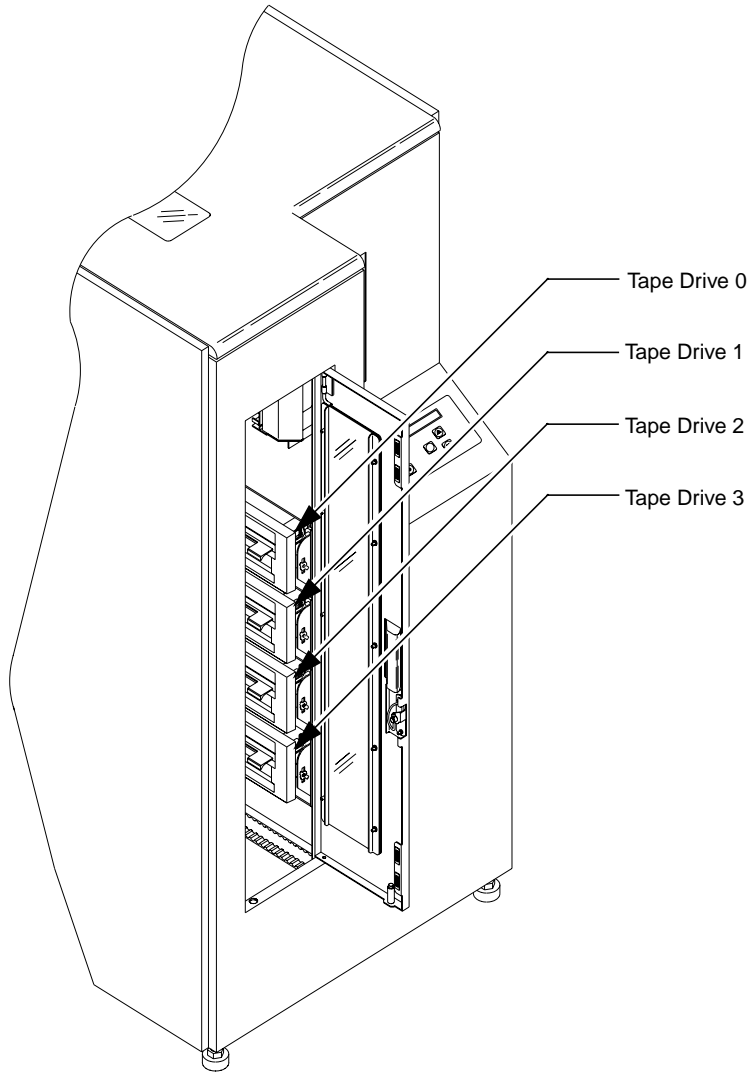
Mounted on the right side of each tape drive is a two-phase stepper motor assembly used to open and close the tape drive door electromechanically. The stepper motor provides 0.68 degree per step resolution at the tape drive door.

### Tape Drive Interface PWA (A16/A17/A18/A19)

The tape drive interface PWA plugs into the rear of each tape drive. It acts as an interconnect/distribution point for RS-422 control/status information, SCSI ID settings from the robotic controller, +5V and +12V from the logic power supply, tape drive handle door closed sensor inputs to the robotic controller, and handle stepper motor drive control from the actuator driver. This aids in minimizing cabling to each tape drive.

The tape drive interface PWA allows for convenient busing and configuration of the tape drives to external SCSI hosts. Each tape drive can be installed on the same or a different bus by using jumper cables between the PWAs.

Figure 11: Tape Drive  
Physical Locations

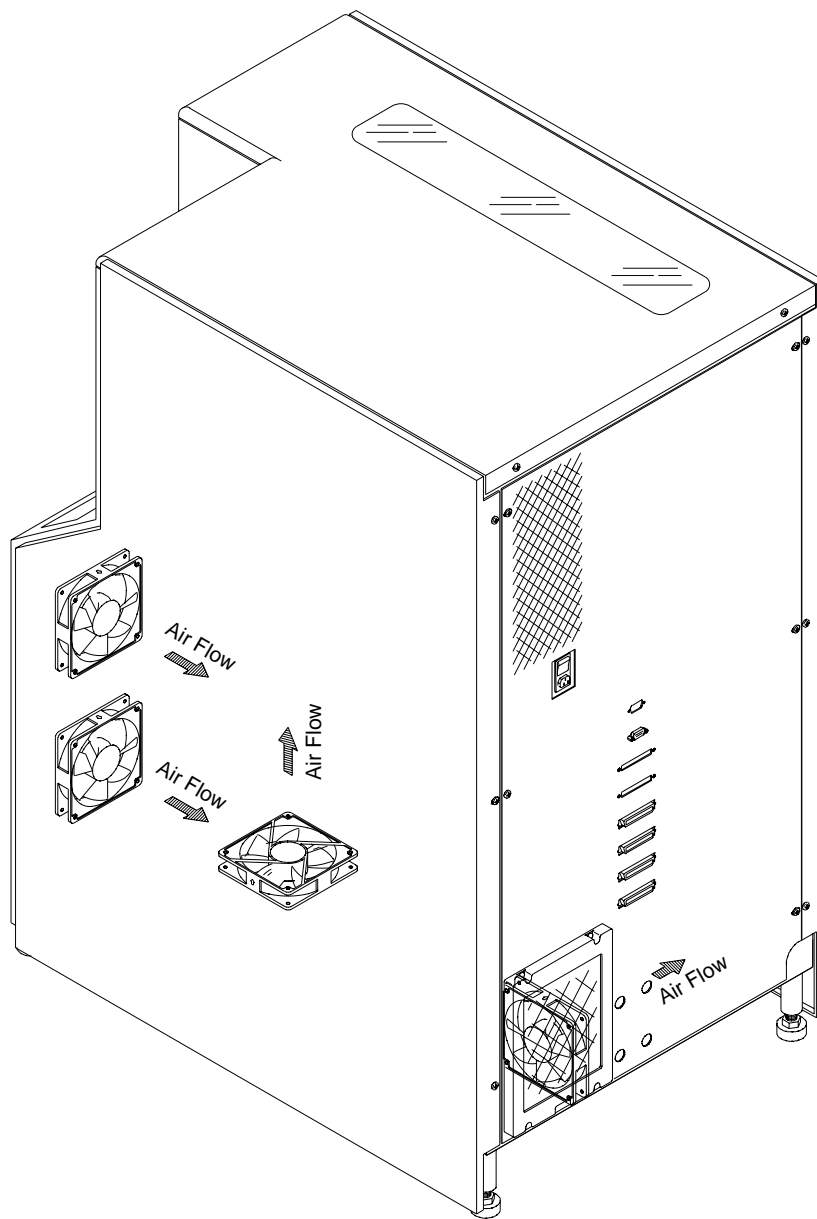


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## Fans

There are four DC fans located inside the library. Figure 12 shows their locations. A filter on the rear of the library is part of the fan assembly and requires scheduled routine maintenance.

Figure 12: Fan Physical Locations



TA00077c



# ***Preventive Maintenance***

# **3**

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## Chapter Overview

This section provides guidelines and procedures for aligning, adjusting, cleaning, and lubricating specific library components.

## Preventive Maintenance Schedule

Preventive maintenance for the TL810 or TL812 library should only be performed by an authorized field service engineer (FSE). Table 3 lists the types of preventive maintenance required for the library and specifies the recommended maintenance interval.

Table 4 lists required tools and materials for maintenance procedures.

---

Table 3: Preventive Maintenance Guidelines

Preventive Maintenance Required	Recommended Interval
Cleaning/Lubricating the rails and rollers	every 12 months
Cleaning/Lubricating the gripper assembly	every 12 months
Checking/Adjusting belt tensions and rollers	every 12 months
Cleaning the fan filter	every 12 months
Cleaning the tape drives	every 12 months

**Note** *The first preventive maintenance is performed during initial installation of the library.*


 **CAUTION** *Failure to perform maintenance tasks within the recommended interval may permanently damage the library or cause it to operate improperly.*

Table 4: Required Tools  
and Materials for  
Maintenance Tasks

Quantity	Item Description
1	Phillips screwdriver, #1
1	Phillips screwdriver, #2
1	Flat-blade screwdriver
1	Flat-blade screwdriver, thin blade
1	Torque wrench (with Phillips head), min. 40 inch/pounds
1	Force gauge, 32-ounce Wagner FDK-32 (29-31944-01)
1	Force gauge, 4-ounce Wagner FDK-4 (29-31945-01)
1	Preventive Maintenance (PM) Kit (29-32767-01) <ul style="list-style-type: none"><li>• 1 container of permeable lubricant</li><li>• 2 packages of swabs</li><li>• 1 package of lint-free cloths</li></ul>
1	Bottle of isopropyl alcohol
1	Vacuum, small
1	Can of compressed air
1	Anti-static wrist strap


**Note** *You must supply all required tools. Tools with a corresponding part number can be ordered directly from DEC.*

## Preventive Maintenance Procedures


The remainder of this chapter explains how to perform the maintenance tasks listed in the schedule in Table 3.

### Preparing for Preventive Maintenance

1. Turn off the library but leave the library plugged into the facility power source.

 **CAUTION** *DO NOT disconnect the power cord from facility power or the library. While plugged in, the power cord grounds the chassis and helps to prevent Electrostatic Discharge (ESD) damage.*

2. Remove the top and left-side cosmetic panels as shown in “Removing the Cosmetic Panels” on page 5-4.
3. Connect your anti-static wrist strap to the closest grounding socket on the frame of the library.

 **CAUTION** *The following procedures must be performed by an authorized FSE.*

### Cleaning

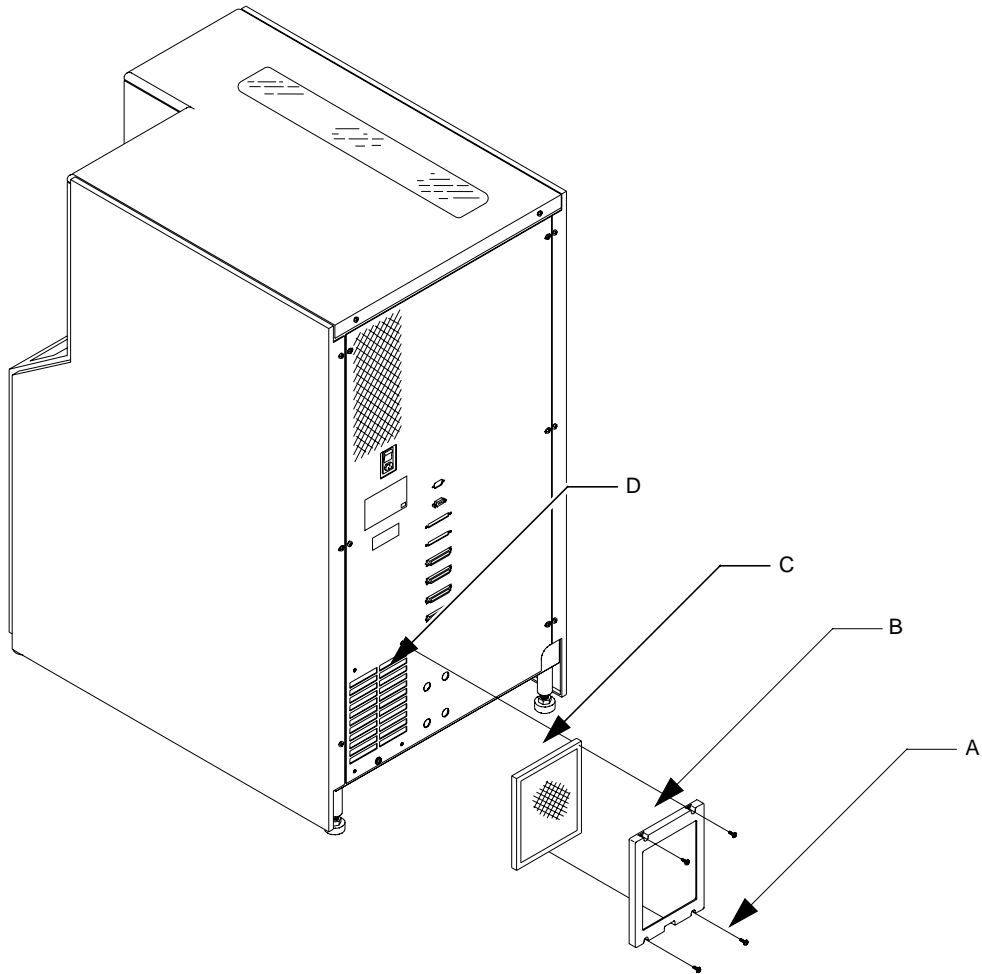
Cleaning the fan filter and the moving mechanical components of the library is the first step in preventive maintenance. Inspect each library component outlined below for dust, debris, damage, or wear.

#### Fan Filters

To clean the fan filters:

1. From the rear of the library (Figure 13), remove the four Phillips screws (A) retaining the fan filter cover (B).
2. Remove the fan filter cover (B) and the fan filter (C).
3. Clean the filter and fan louvers (D) with a vacuum.
4. Reinstall the fan filter and frame.

Figure 13: Cleaning the  
Fan Filters

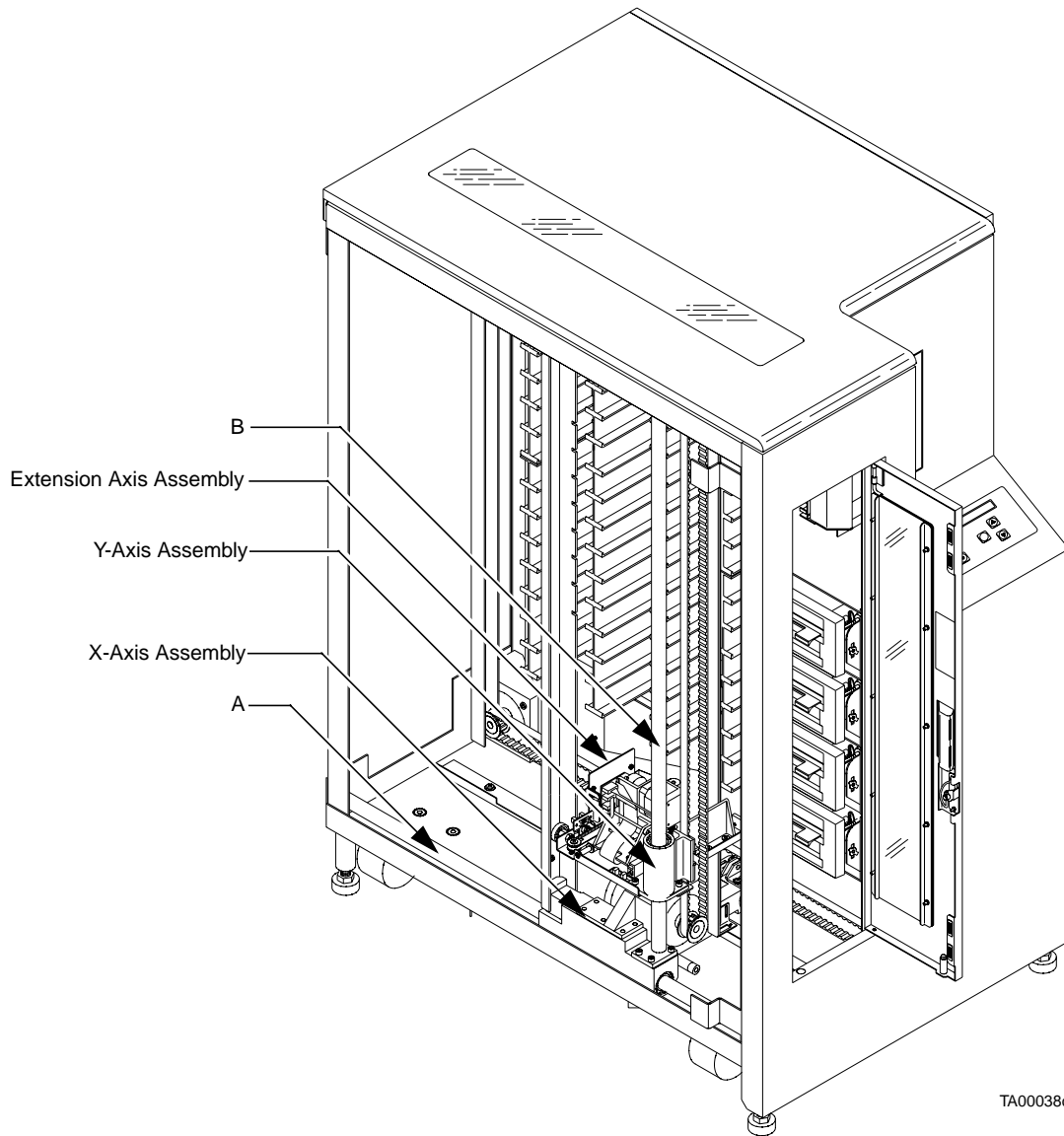


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## Rails

To clean the library rails, lightly dampen a cloth (from the PM kit) with isopropyl alcohol and rub the length of the x-axis rail (Figure 14, A) and the y-axis rail (Figure 14, B) to remove all dust and debris. Repeat if necessary.

Figure 14: Cleaning the  
X- and Y-Axis Rails



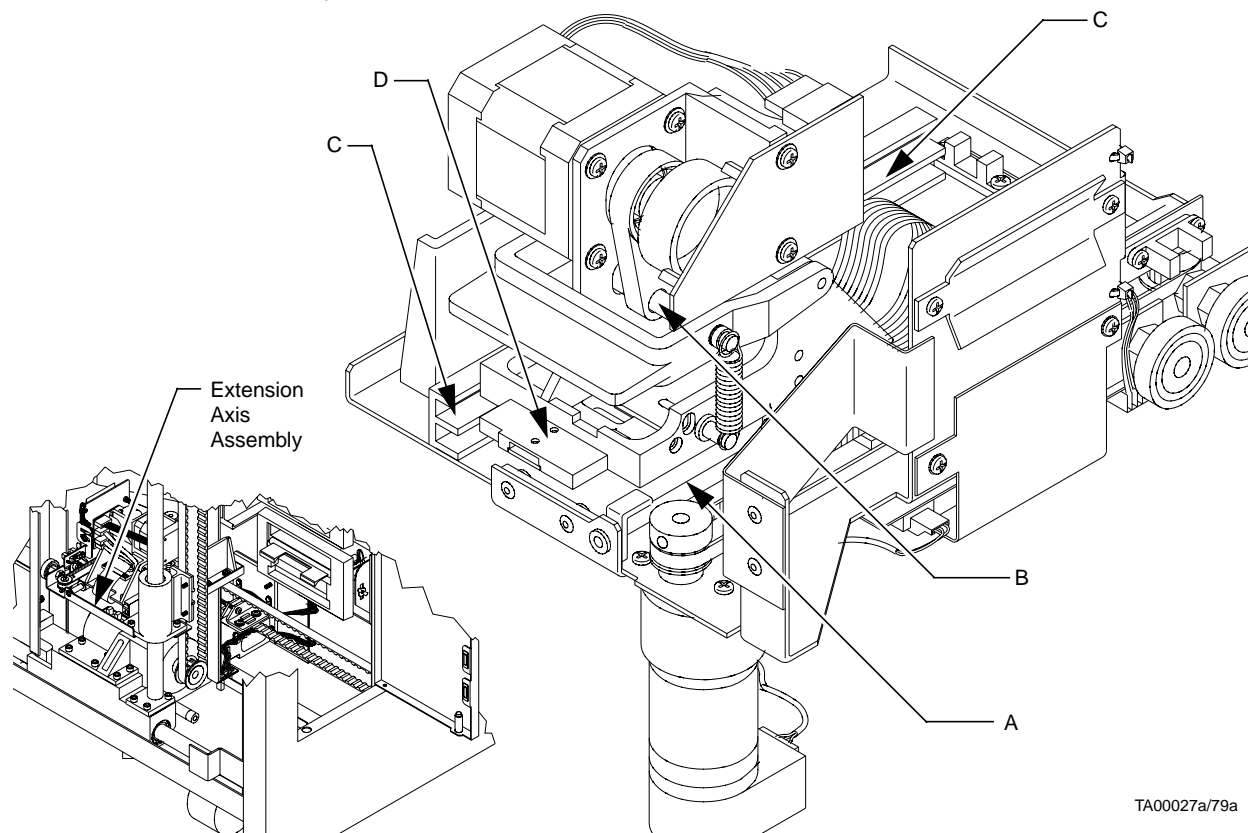
## Extension Axis

To clean the extension axis assembly components:

1. With Figure 15 as a guide, use a cloth (from the PM kit) lightly dampened with isopropyl alcohol to remove all dust and debris from the:
  - a. Extension axis rail (A)
  - b. Gripper cross shaft (B)
  - c. Extension axis follower on the wear surface (C)
2. Use a can of compressed air to blow dust out of the CIG receivers.
3. Repeat steps 1 and 2 if necessary.

**CAUTION** Do NOT apply lubricant to the extension axis follower rail. Doing so will damage the follower rail.

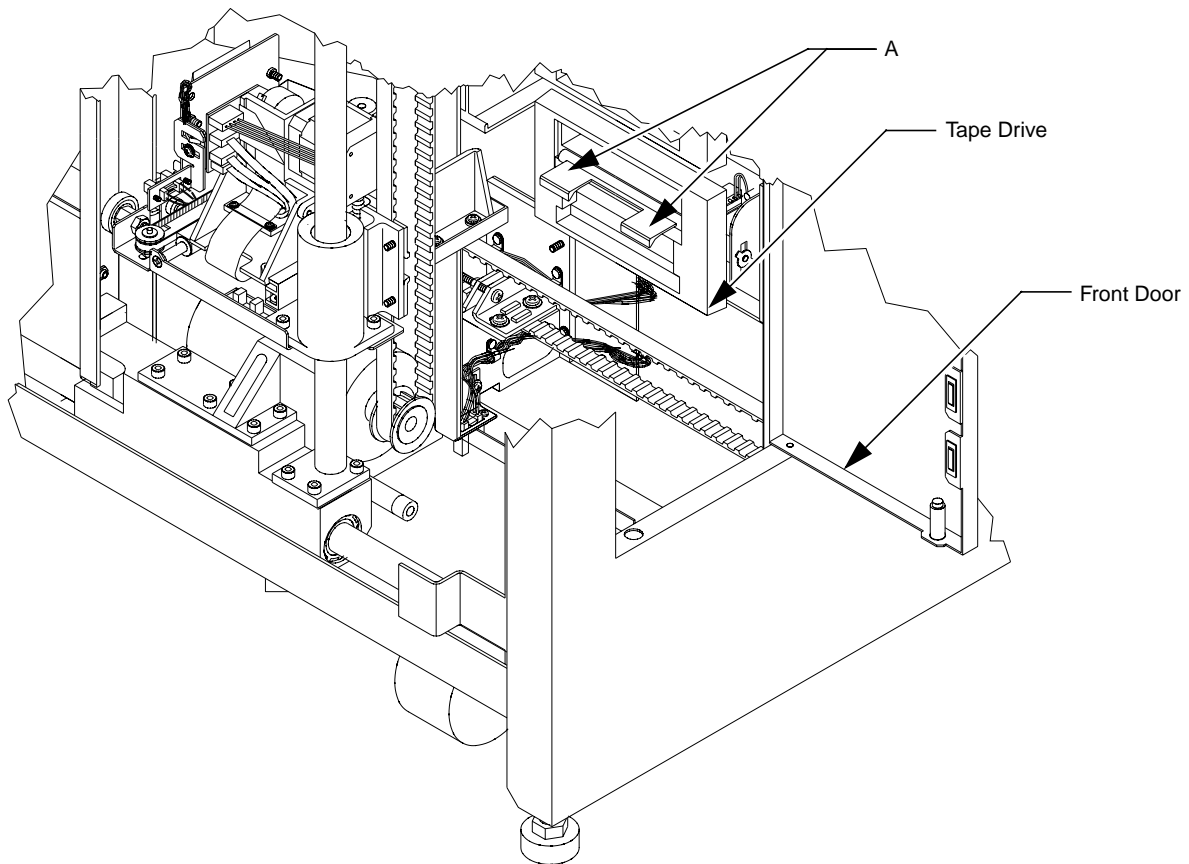
Figure 15: Cleaning the Extension Axis Assembly



## Tape drives

To clean the tape drives, remove all dust and debris from the tape drive receiver (Figure 16, A) using a cloth (from the PM kit) lightly dampened with isopropyl alcohol.

Figure 16: Cleaning the  
Tape Drives

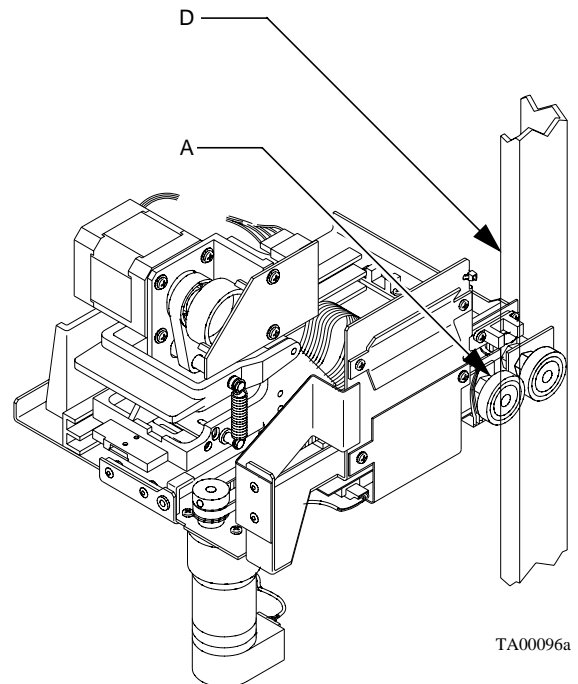
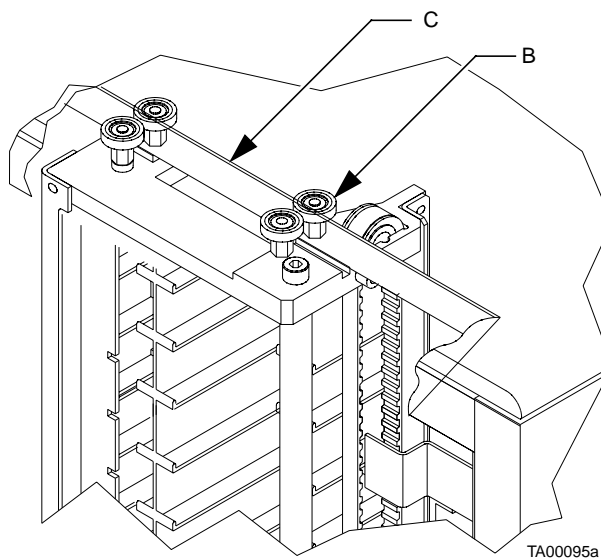


## Rollers

To clean the 6 library rollers:

1. Using Figure 17 as a guide, wipe the following components with a cloth (from the PM kit) lightly dampened with isopropyl alcohol:
  - a. two rollers on the y-axis assembly (A)
  - b. four rollers on the x-axis assembly (B)
2. Remove dust and debris from the running surfaces of the:
  - a. x-axis guide (C) (part of the library frame)
  - b. y-axis rail (D) (part of the x-axis assembly)

Figure 17: Cleaning the Rollers





## Checking/Adjusting

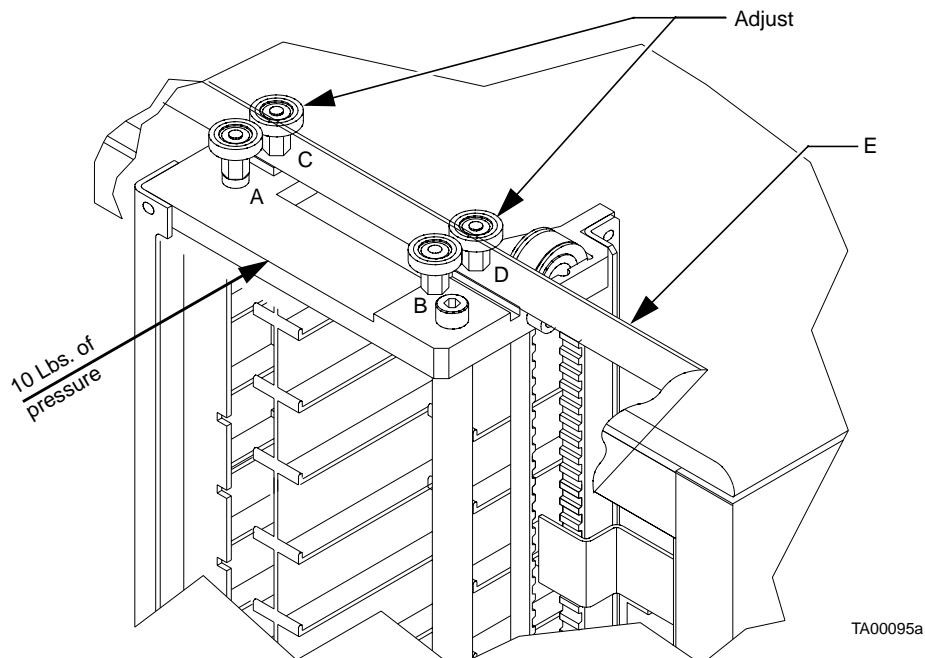
There are several library components that may require adjustments. Use the following procedures and the appropriate figures to check each component and adjust if necessary.

### X-Axis Rollers

To check the x-axis assembly rollers, use the following procedure with Figure 18.

1. Visually inspect the x-axis assembly rollers (A) as you manually move the x-axis (front to rear) through its entire travel length.
  - a. Look for positive roller contact through out its travel.
2. To adjust the x-axis assembly rollers:
  - a. Press the left side of the x-axis assembly hidden rollers (A & B) towards the right-hand side of the library using 10 pounds of pressure.
  - b. Loosen the nuts that retain the outside rollers (C & D).
  - c. Adjust the inside rollers (C & D) to within 0.000–0.005 inch of the travel surface (E) and retighten.

Figure 18: Checking/  
Adjusting the X-Axis  
Rollers



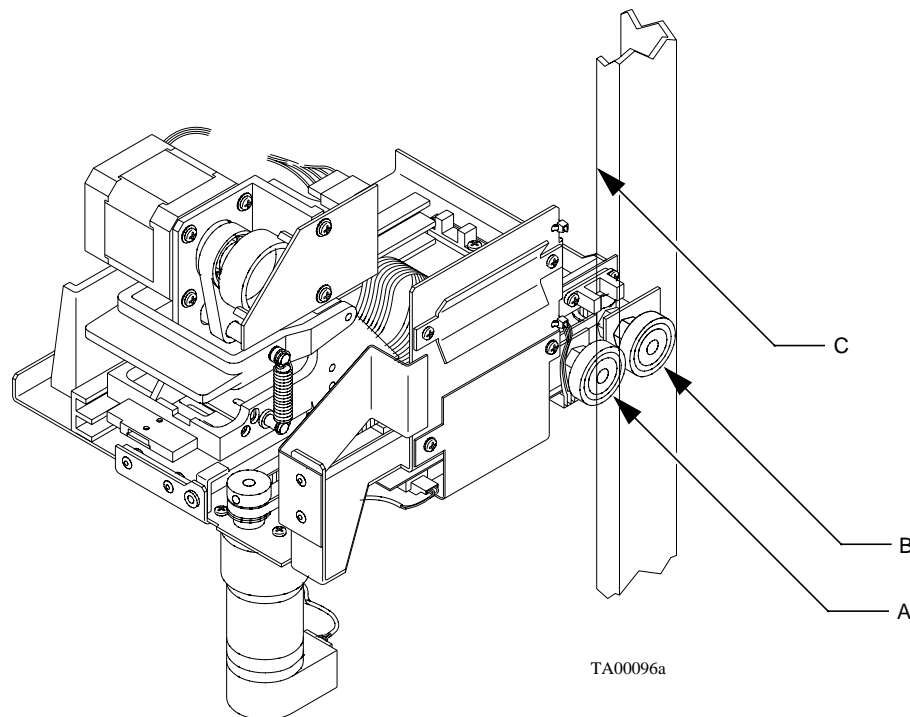
## Y-Axis Rollers

To check the y-axis assembly rollers, use the following procedure with Figure 19.

1. Visually inspect the y-axis assembly rollers (A & B) as you manually move the x-axis (up and down) through its entire travel length (C).
  - a. Look for positive roller contact throughout its travel.
2. To adjust the y-axis assembly rollers:
  - a. Loosen the nut that retains the outside roller (B).
  - b. Squeeze both rollers (A & B) together using finger pressure.
  - c. Retighten the retaining nut.

---

Figure 19: Checking/  
Adjusting the Y-Axis  
Rollers



## Y-Axis Belt

To check the y-axis belt, use the procedure below with Figure 20.

1. Make sure the extension assembly is resting at the bottom of the vertical axis.
2. Locate the middle point of the y-axis belt (A).
3. Using a force gauge (P/N:29-31944-01), pull the inside of the belt outward 0.54 inch.

**Note** *The smooth side of the belt is the outside. The gear side of the belt is the inside.*

4. The force gauge reading should be  $19.5 \pm 3.0$  ounces (468-638 g).

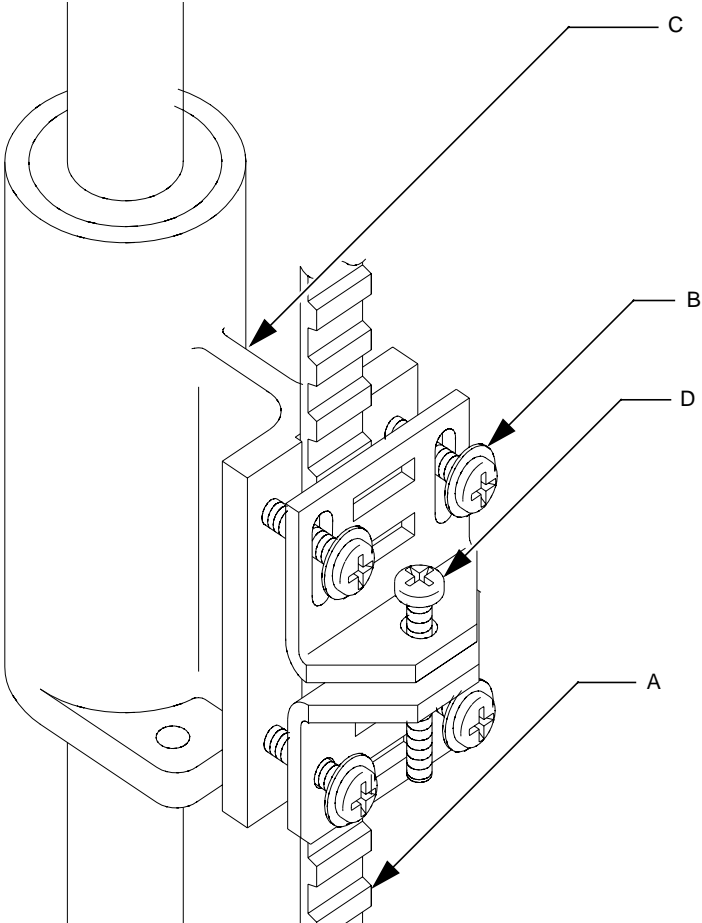
If belt tension requires adjustment, use the following procedure with Figure 20.

5. Loosen the belt clamp screws (B) holding the belt (A) onto the ball bushing housing (C).
6. Loosen the screws one-half revolution:
  - a. If the measured force was greater than 22.5 ounces (638 g), turn the adjustment screw (D) counterclockwise (as viewed from above) and recheck the tension.
  - b. If the measured force was less than 16.5 ounces (468 g), turn the adjustment screw clockwise.

**Note** *The adjustment screw will not normally need to be turned more than two revolutions.*

- c. Tighten the belt clamp screws to 30 inch pounds (3.39 N-m) and then recheck belt tension.

Figure 20: Y-Axis Belt Adjustment



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## X-Axis Belt

To check the x-axis belt, use the procedure below with Figure 21.

1. With a force gauge (P/N:29-31944-01), pull the inside of the belt (A) outward 0.44 inch.
2. The force gauge reading should be  $19.5 \pm 3.0$  ounces (468-638 g).

If belt tension is within this range, no adjustment is needed.

If belt tension requires adjustment, use the following procedure with Figure 21.

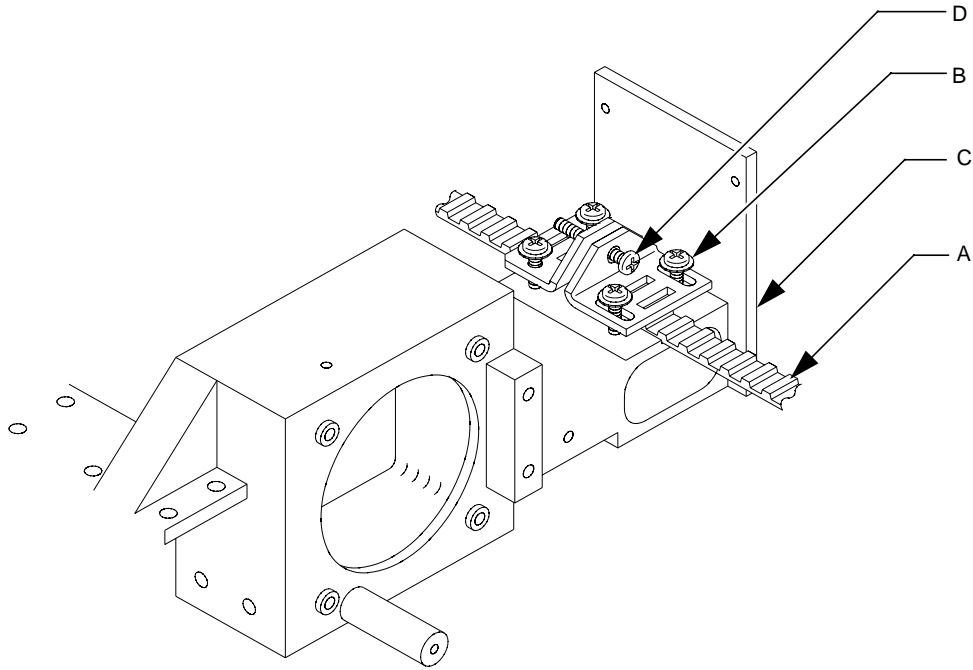
**Note** *The smooth side of the belt is the outside. The gear side of the belt is the inside.*

3. Loosen the belt clamp screws (B) holding the belt (A) onto the motor mounting vertical bracket (C).
4. Loosen the screws one-half revolution:
  - a. If the measured force was greater than 22.5 ounces (638 g), turn the adjustment screw (D) counterclockwise (as viewed from above) and recheck the tension.
  - b. If the measured force was less than 16.5 ounces (468 g), turn the adjustment screw clockwise.

**Note** *The adjustment screw will not normally need to be turned more than two revolutions.*

5. Tighten the belt clamp screws (B) to 30 inch pounds (3.39 N-m) and recheck belt tension.

Figure 21: X-Axis Belt Adjustment



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## Extension Axis Belt

To check the extension axis belt, use the procedure below with Figure 22.

1. Remove the clamp (1) that loops the umbilical cable (2) and the clamp (3) that retains the umbilical to the extension axis (4).
2. Move the gripper assembly all the way forward on the extension axis.
3. Make the measurement at the midpoint of the belt (A) through the access hole (B) on the extension axis (3).

**Note** *The smooth side of the belt is the outside. The gear side of the belt is the inside.*

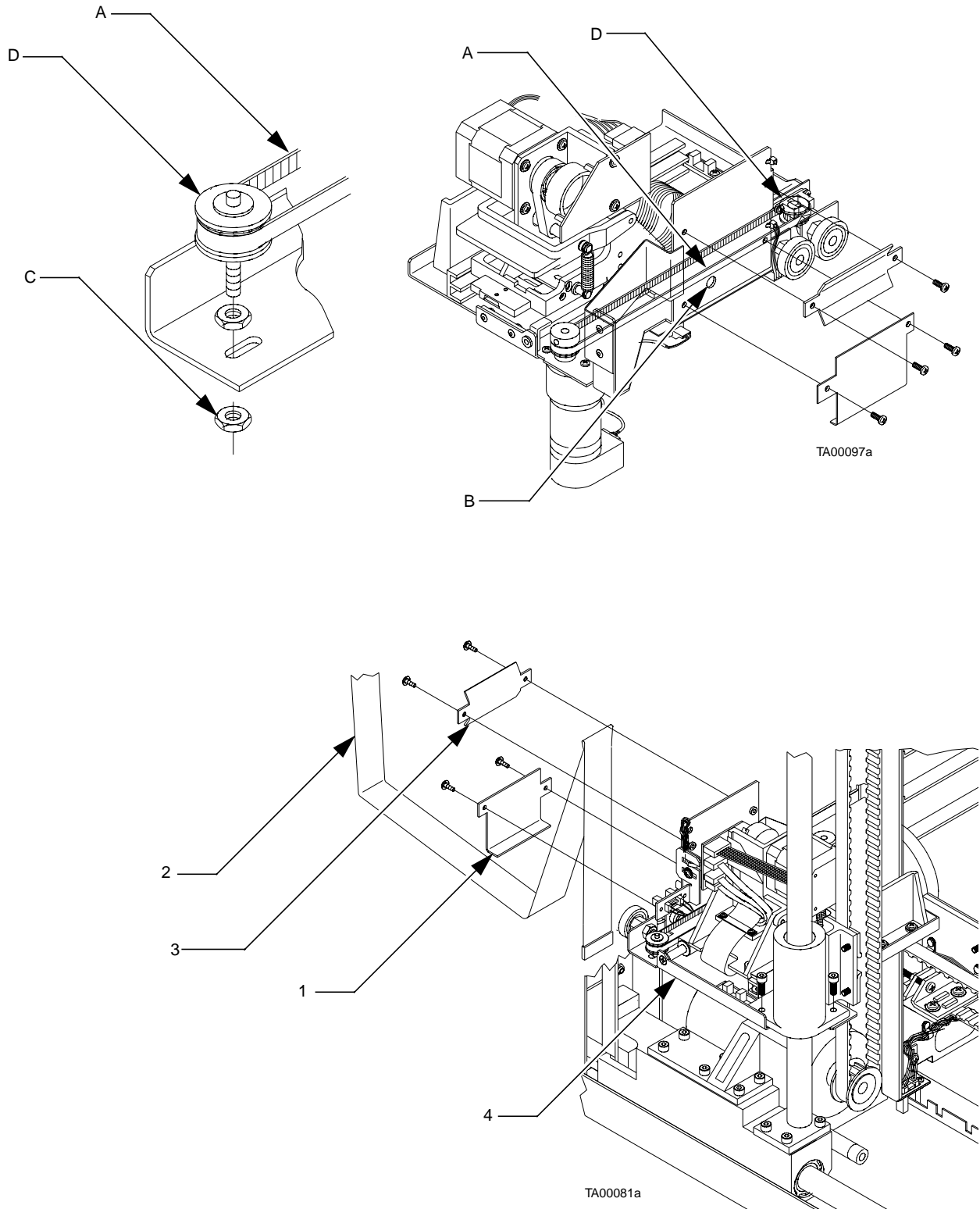
4. With a force gauge deflect the outside span of the belt inward 0.11 inch.
5. The force gauge reading should be  $2.75 \pm .25$  ounces (70-85 g).

If belt tension is within this range, no adjustment is needed.

If belt tension requires adjustment, use the following procedure with Figure 22.

6. Loosen the pulley idler mounting nut (C) one revolution.
7. Grasp the pulley idler by looping one finger over the sheet metal of the platform, and applying a light, steady force to tighten the belt. Snug the pulley idler mounting nut while holding the pulley idler.
8. Recheck belt tension and readjust if necessary.

Figure 22: Extension  
Axis Belt





## Lubricating Library Components

There are several library components that require lubrication. Use the following procedures and the appropriate figures to lubricate each identified component.

### X-Axis/Y-Axis Rails


To lubricate the library rails, use the procedure below with Figure 14.


1. Apply a very thin coating of permeable lubricant (supplied in PM kit) to the length of the x-axis rail (A) and the y-axis rail (B).
2. Move the x-axis and y-axis assemblies through their complete range of travel to distribute the lubrication.
3. Remove any excess lubrication. A light coating of the lubricant should be present on the x-axis rail (A) and the y-axis rail (B).

### Extension Axis Components

To lubricate the extension axis assembly components, use the procedure below with Figure 15.

1. Apply a very thin coating of permeable lubricant (supplied in PM kit) to the length of the extension axis rail (A).
2. Apply a small amount of lubricant to the gripper cross shaft (B) at its 3 contact points with the driver link and upper jam jaw.

 **CAUTION** *Excess lubricant on the gripper cross shaft could result in debris falling onto the bar code scanner.*

 **CAUTION** *Do NOT apply lubricant to the extension axis follower rail. Applying any lubricant to the extension axis follower rail will damage it.*

3. Remove any excess lubrication. A light coating of lubricant should be present on the extension axis rail (A) and the gripper cross shaft (B).

## Replacing the Light Bulb

The library comes with an interior, low-voltage lighting fixture. The procedure in this section explains how to replace the 9-watt light bulb inside the lighting fixture.

Figure 23 illustrates this procedure and gives the location of the lighting fixture within the library cabinet.

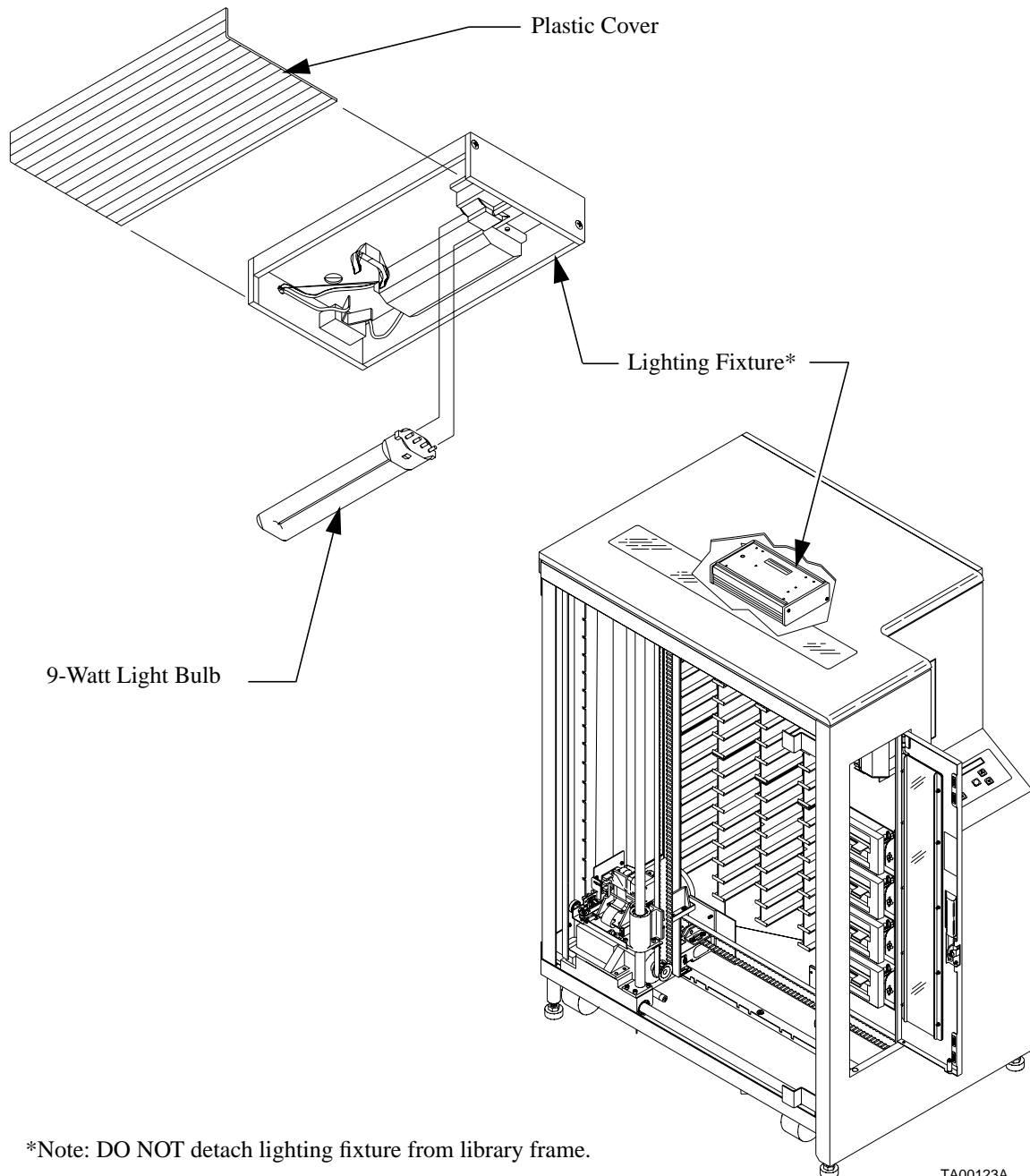
**Note** *The lighting fixture is not a field-replaceable unit (FRU). Do not detach the lighting fixture from the library frame.*

1. Locate the lighting fixture and remove the plastic cover as follows:
  - a. Using your thumbs, press the front part of the cover at the corners to release the front edge.
  - b. Push the front of the cover down and then pull the cover toward you to remove it. Set the cover aside.
2. Gently press down on the tip of the light bulb to unseat it from the plastic retaining clip.

**Note** *The retaining clip may come loose as you are removing the light bulb. If this happens, remove the light bulb completely (step 3) and then reattach the clip to the inside of the lighting fixture.*

3. Remove the light bulb from its socket and dispose of it properly.
4. Carefully insert a new light bulb into the socket. Make sure the bulb is firmly seated.
5. Push up on the light bulb to seat it in the retaining clip.
6. Replace the plastic cover as follows:
  - a. Line up the sides of the cover with the sides of the lighting fixture.
  - b. Insert the rear edge of the cover into the slot along the back of the lighting fixture's frame.
  - c. Lift the front part of the cover so it rests against the lighting fixture.
  - d. Using your thumbs, press the front part of the cover at the corners until it snaps onto the lighting fixture.

Figure 23: Replacing the  
Light Bulb



## Returning the Library to Operation

After aligning, adjusting, cleaning, and lubricating its internal components, the library must be reassembled and recalibrated before it can be returned to operation.

### Replacing the Cosmetic Panels

1. Remove the anti-static wrist strap and set it aside.
2. Replace the top and left-side cosmetic panels as shown in “Replacing the Cosmetic Panels” on page 5-54.
3. Turn on the library.

### Automatic Calibration

It is important to recalibrate the library after any scheduled or major maintenance procedure.



**CAUTION**

*Neglecting to calibrate the library after performing maintenance may damage the library.*

For the calibration procedure, refer to Appendix A: “Calibration Menu Functions” on page A-11.

# ***Troubleshooting & Fault Isolation***

# **4**

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## Maintenance Analysis Procedures (MAPs)

This section contains Maintenance Analysis Procedures (MAPs) for troubleshooting library malfunctions. These procedures appear as flow charts, each with its own descriptive heading.

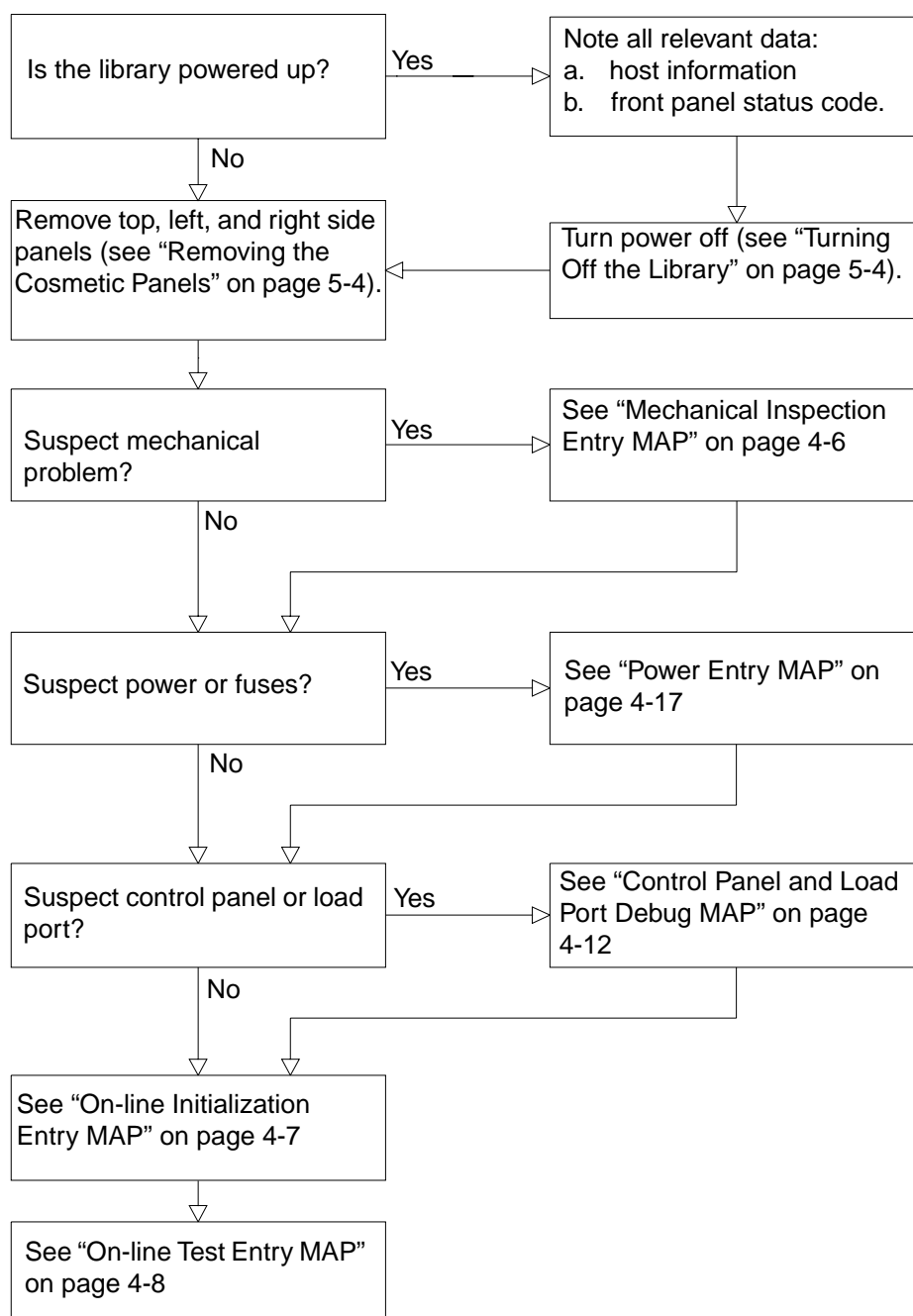
To use these procedures for troubleshooting:

1. Identify the problem as much as possible by symptom or error code. For more information about error codes, refer to Appendix B.
2. Use this chapter's contents page to locate the section in this chapter that relates to the problem you identified.
3. Begin the troubleshooting analysis with the "Fault Isolation Entry MAP" on page 4-4. This flow chart can help eliminate basic problems and direct you to other flow charts.
4. Follow the flow charts step-by-step, testing the library after each corrective action.

While troubleshooting, you may need to refer to Document EK-TL810-UM, *TL81X Diagnostic Software User's Manual* and Document EK-TL810-OP, *TL81X Operator's Guide*.

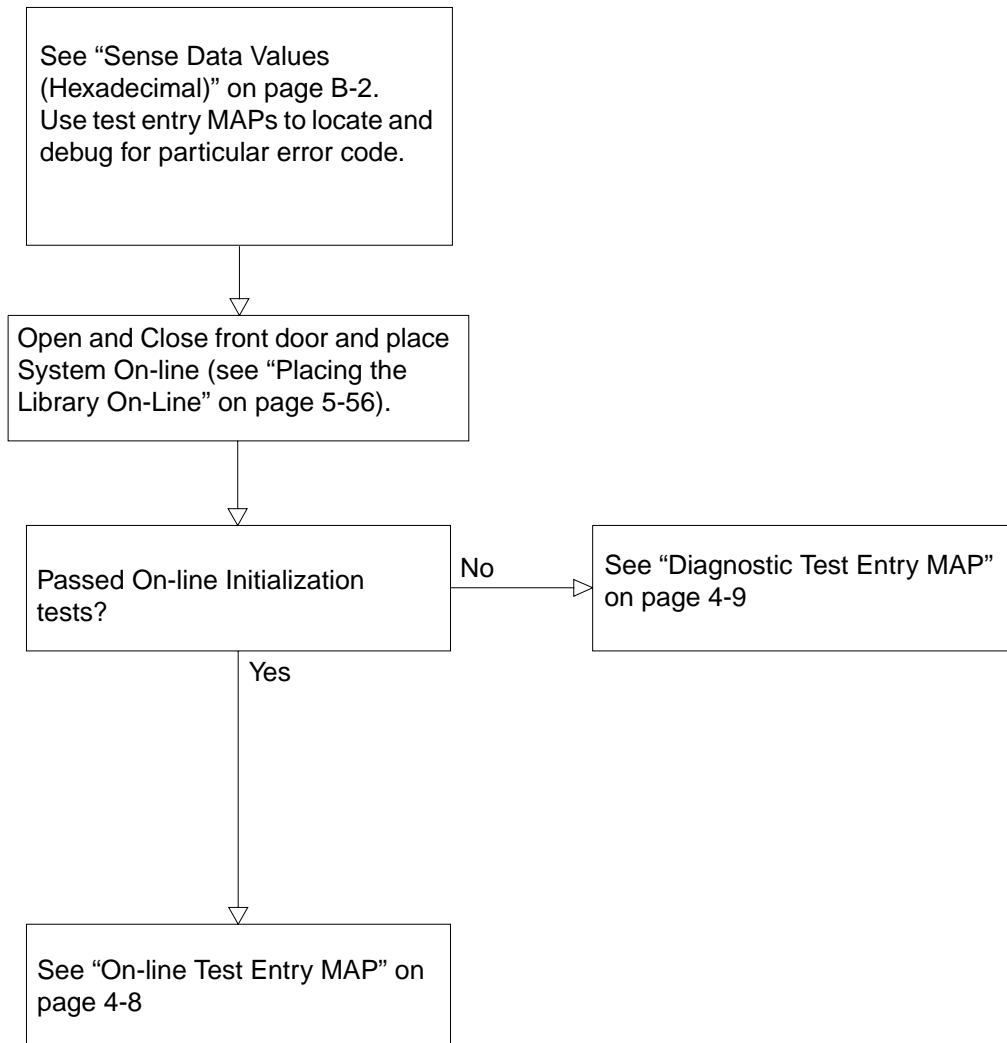
5. Stop the troubleshooting procedure when the symptom or error disappears.

## Fault Isolation Entry MAP

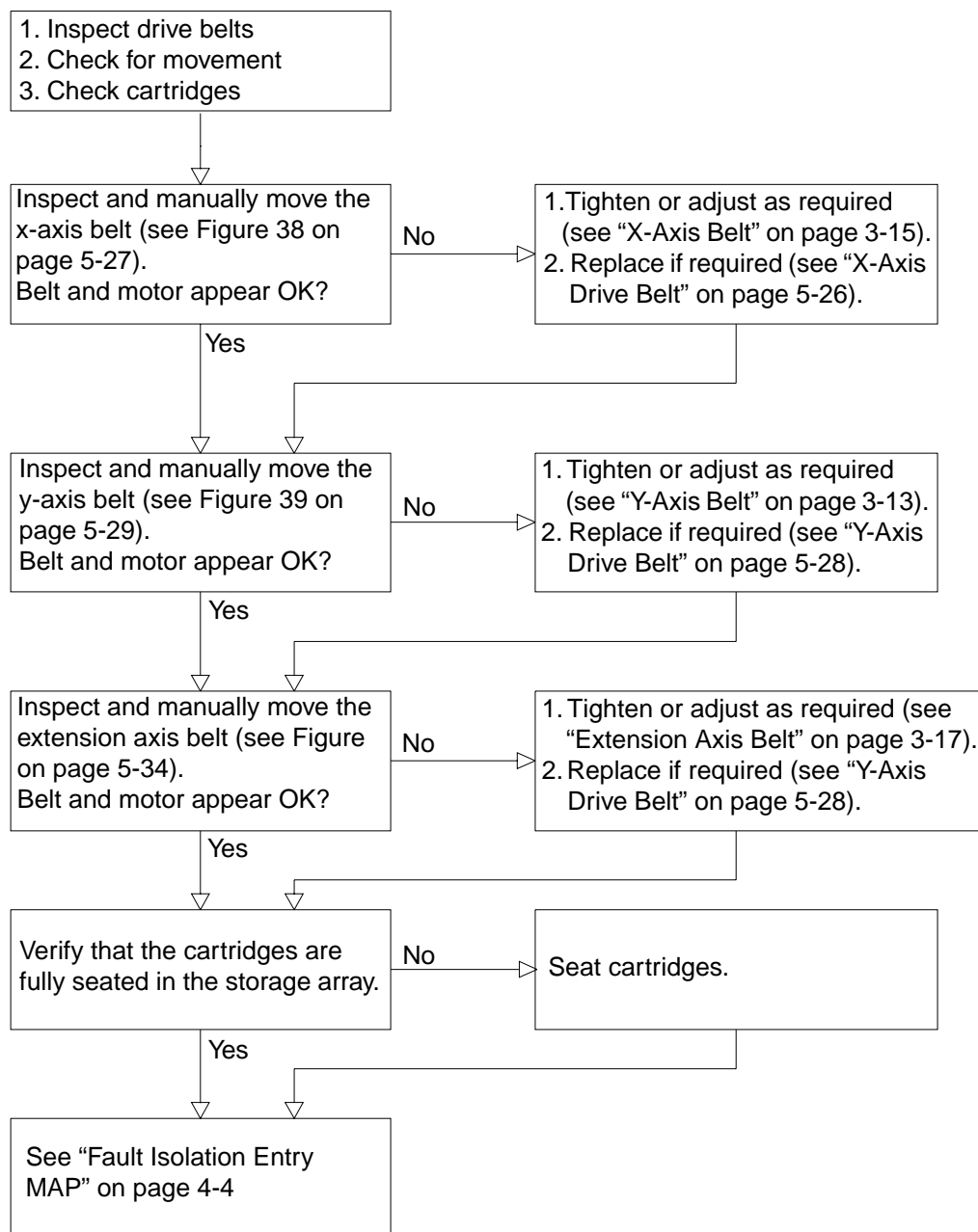




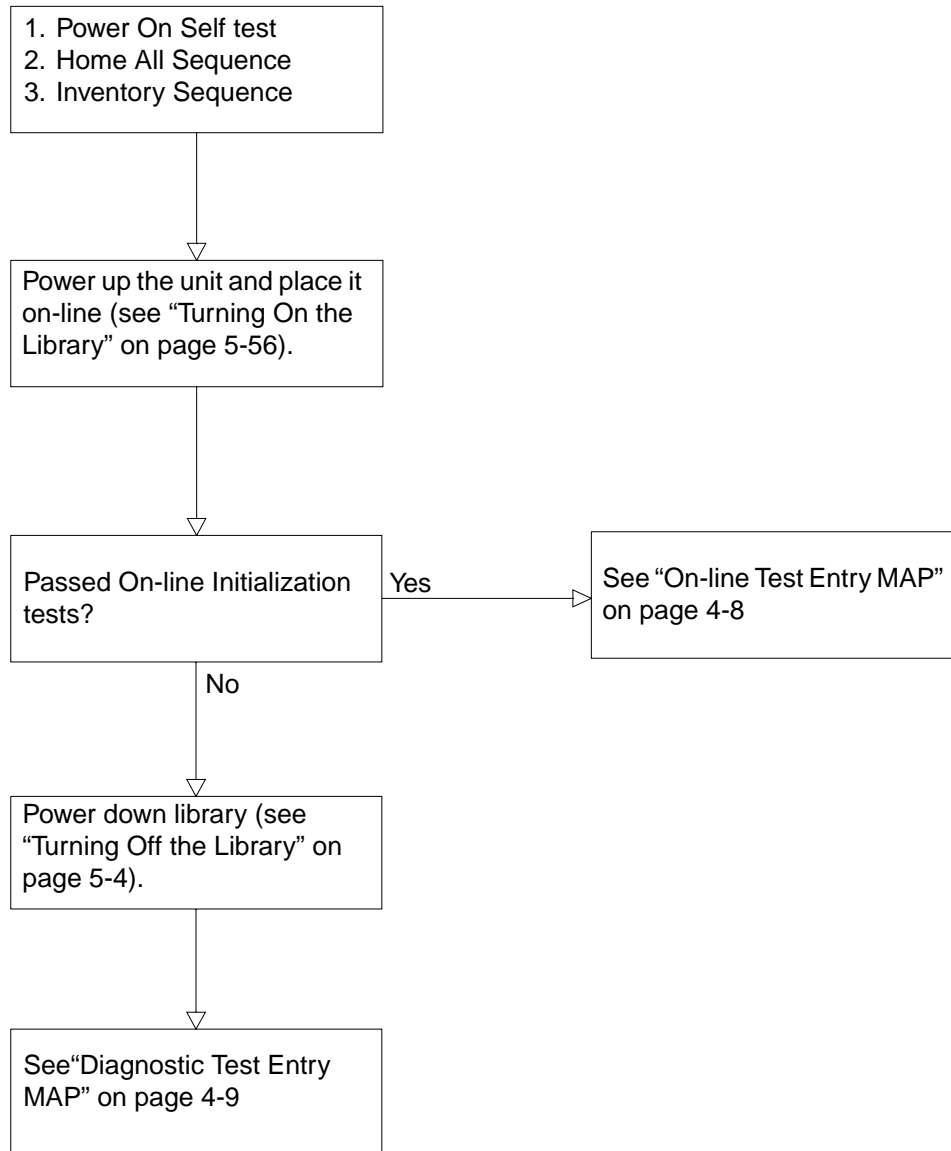
## Error Message Entry MAP



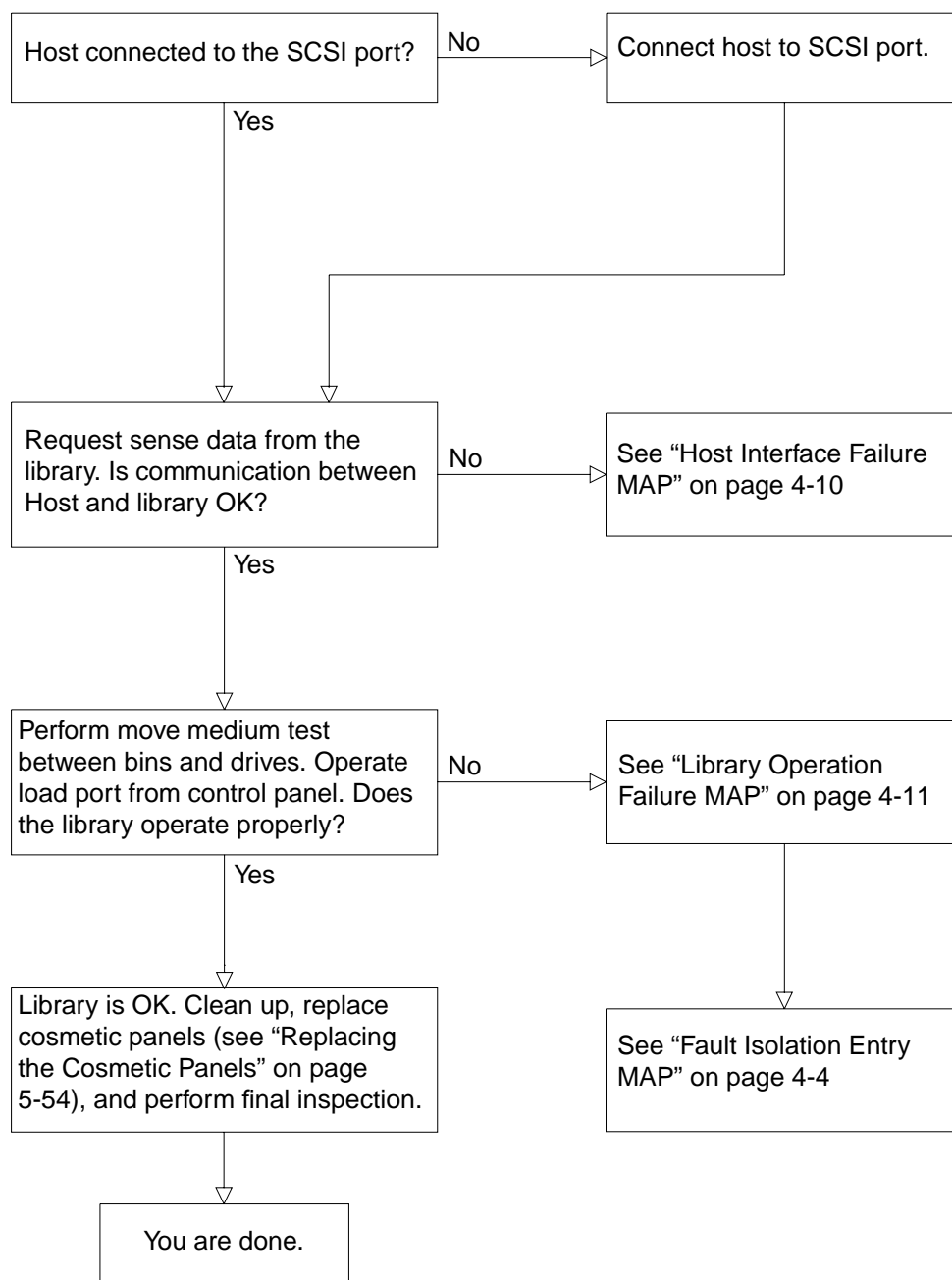
## Mechanical Inspection Entry MAP



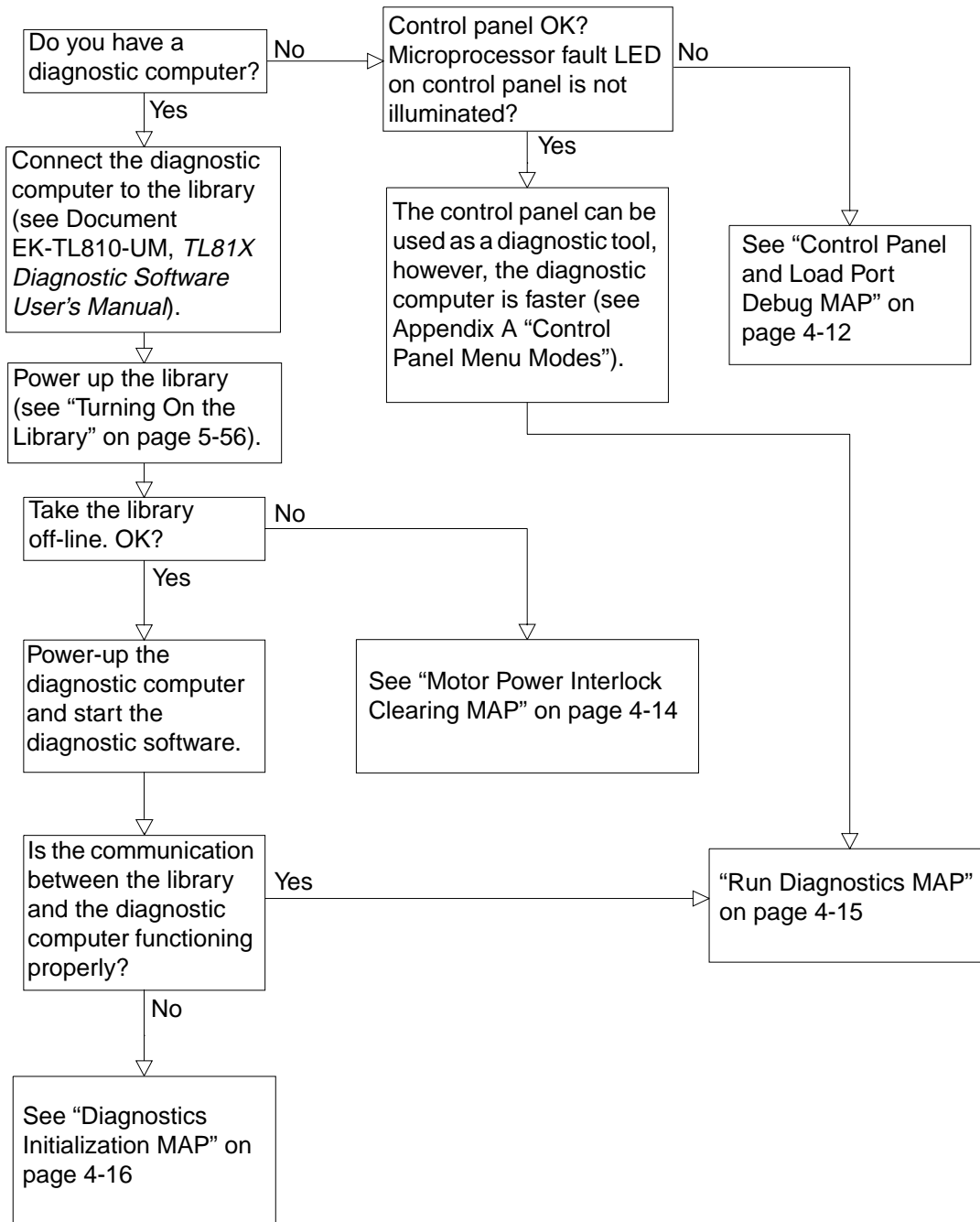
## On-line Initialization Entry MAP



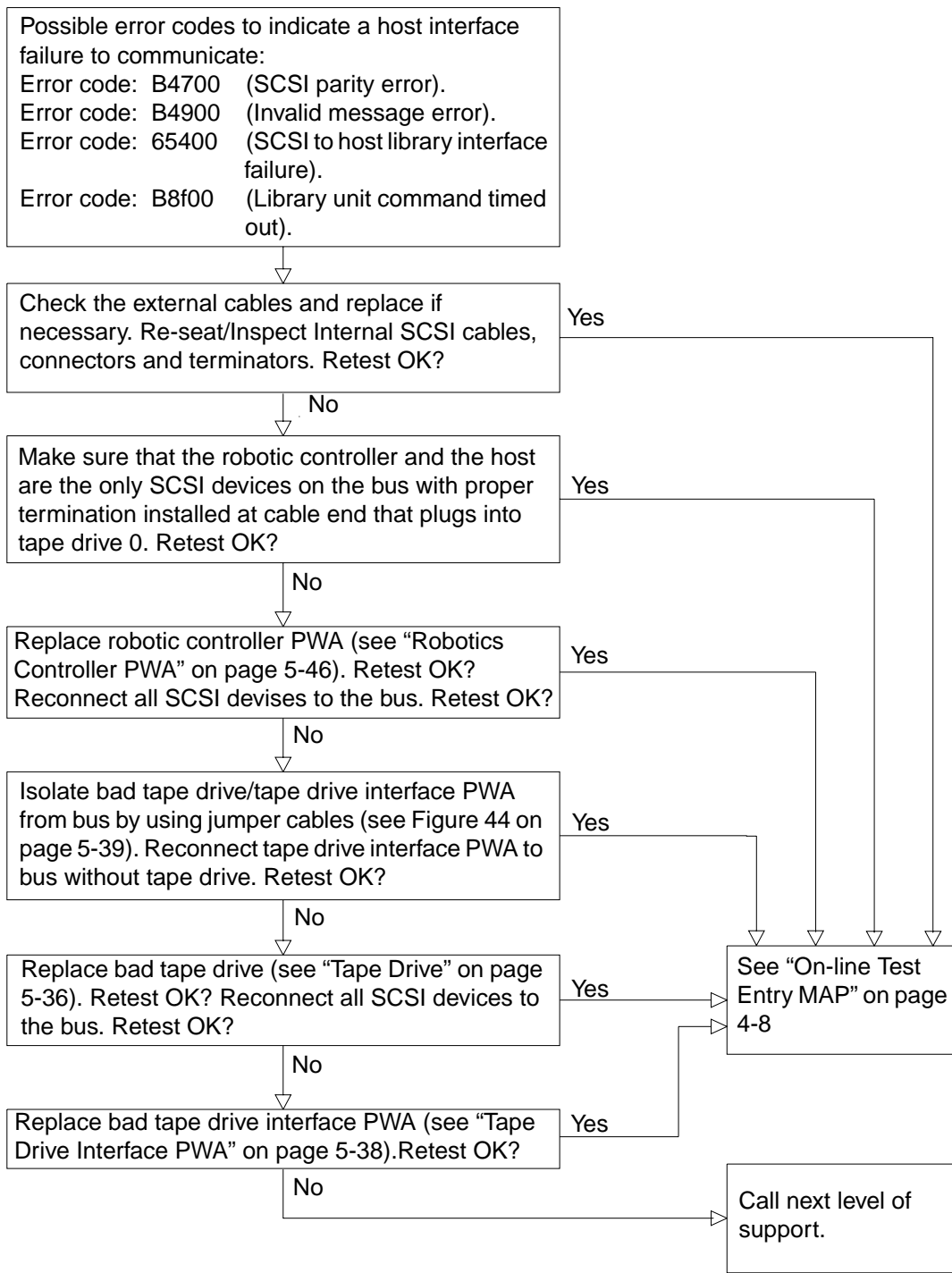
## On-line Test Entry MAP



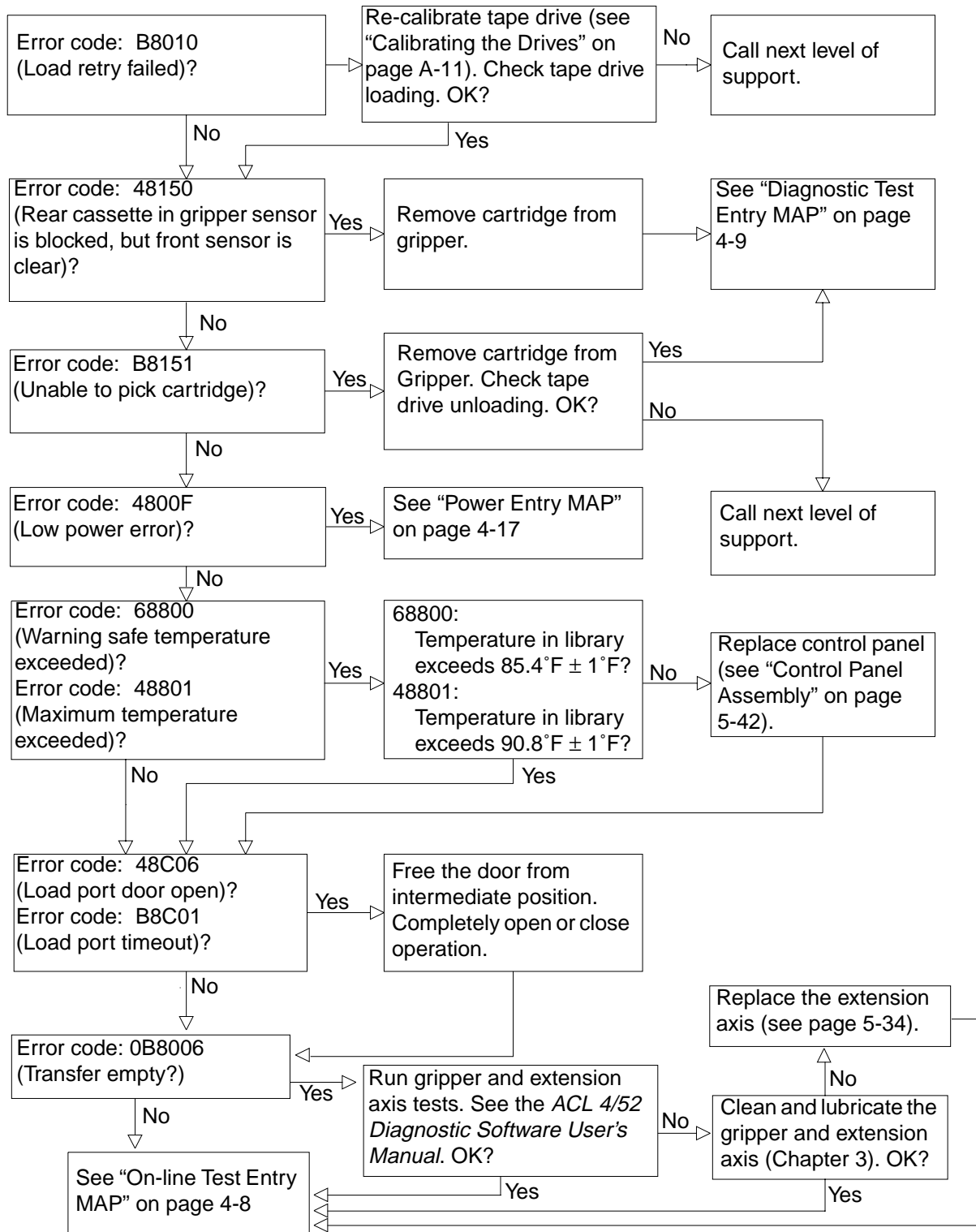
## Diagnostic Test Entry MAP



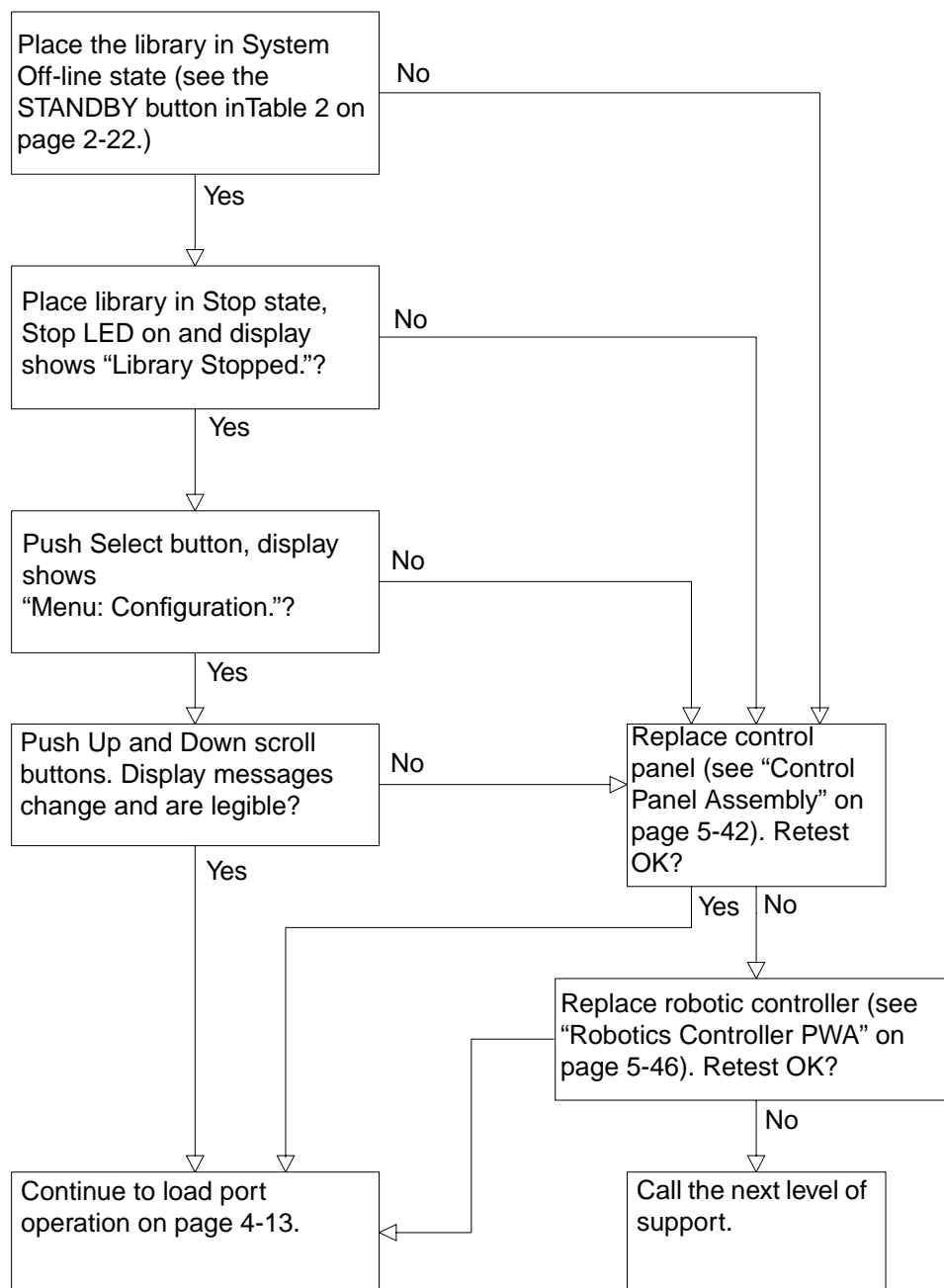
## Host Interface Failure MAP



## Library Operation Failure MAP

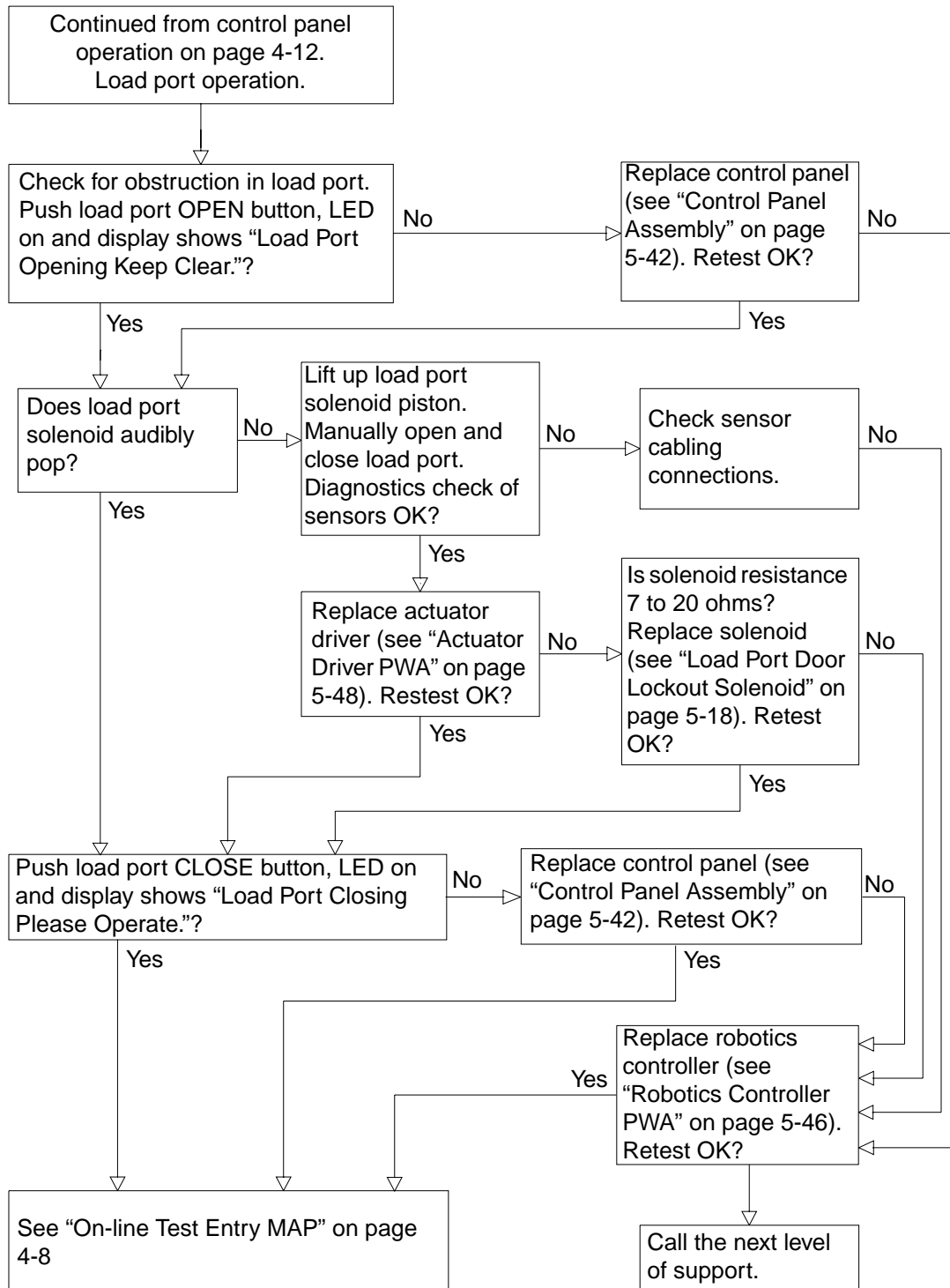


## Control Panel and Load Port Debug MAP

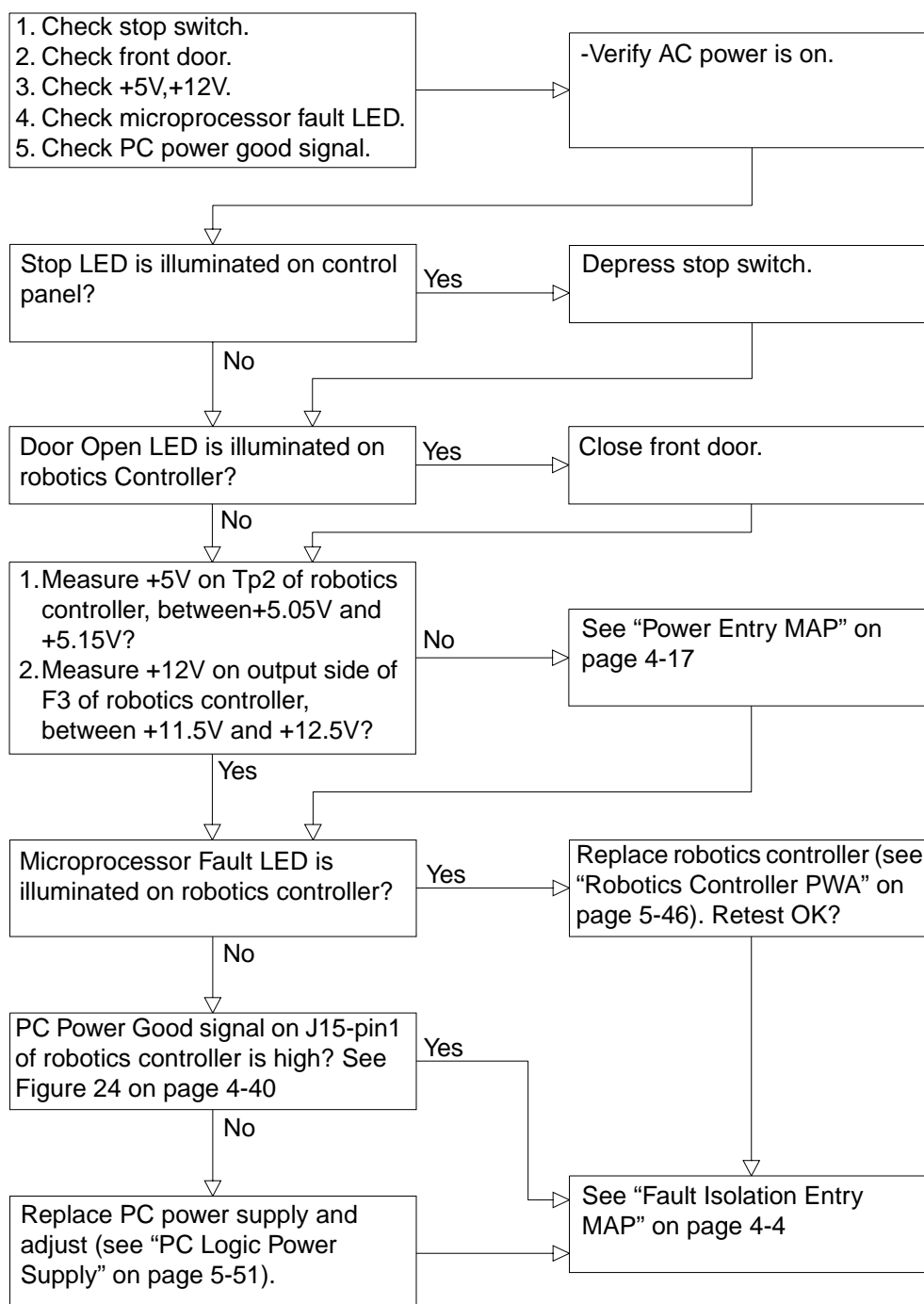




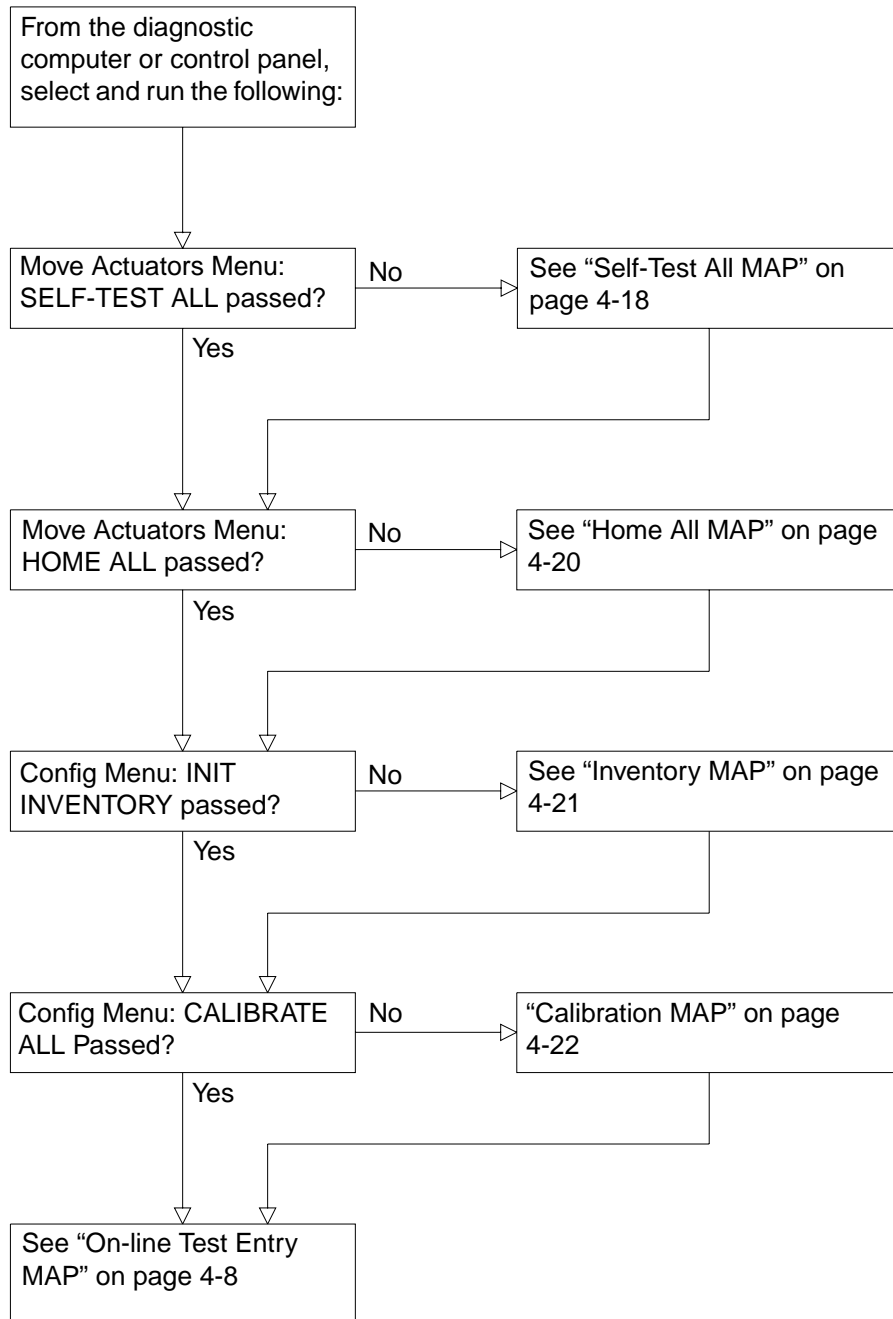
## Control Panel and Load Port Debug MAP (Cont.)



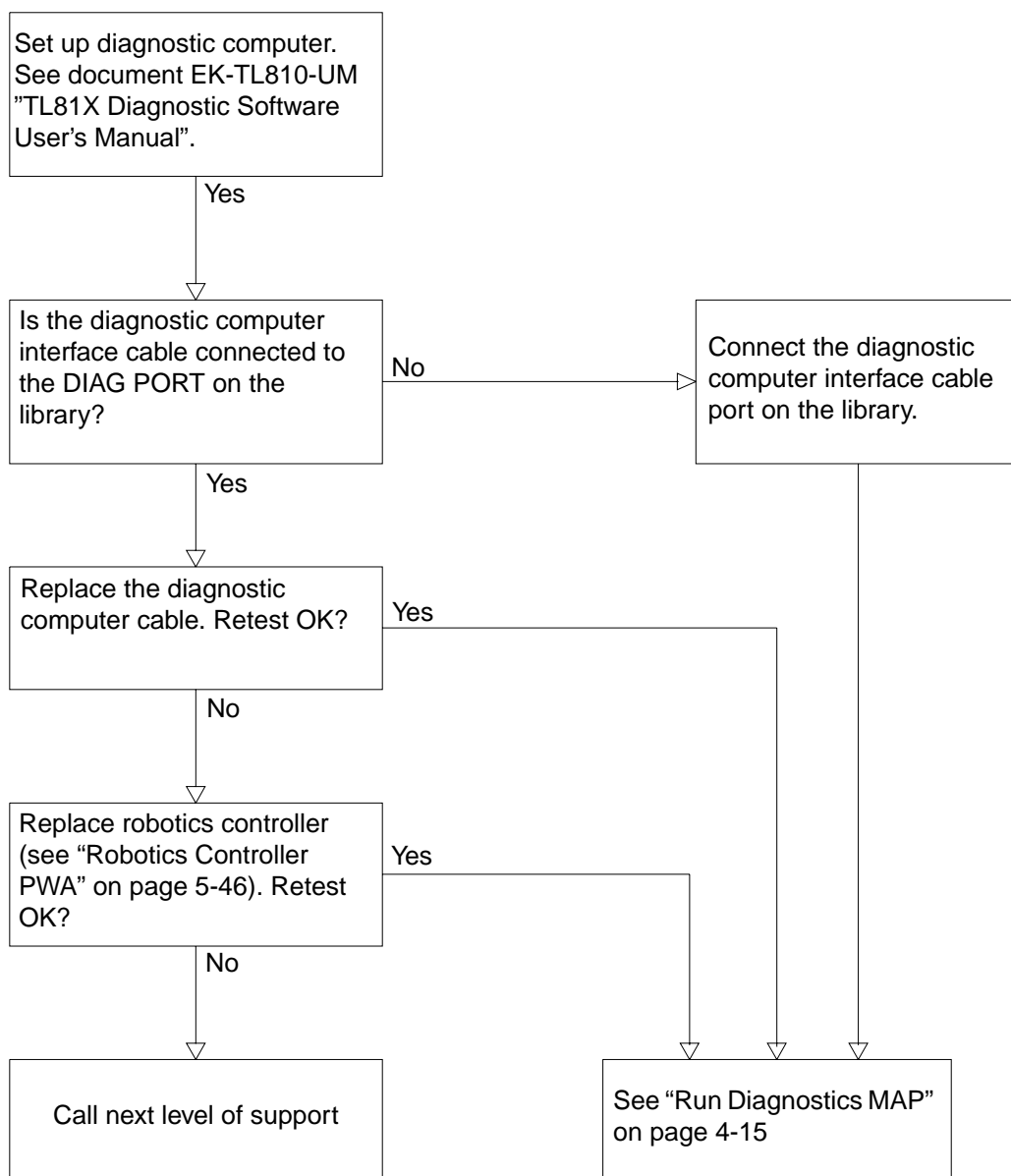
## Motor Power Interlock Clearing MAP



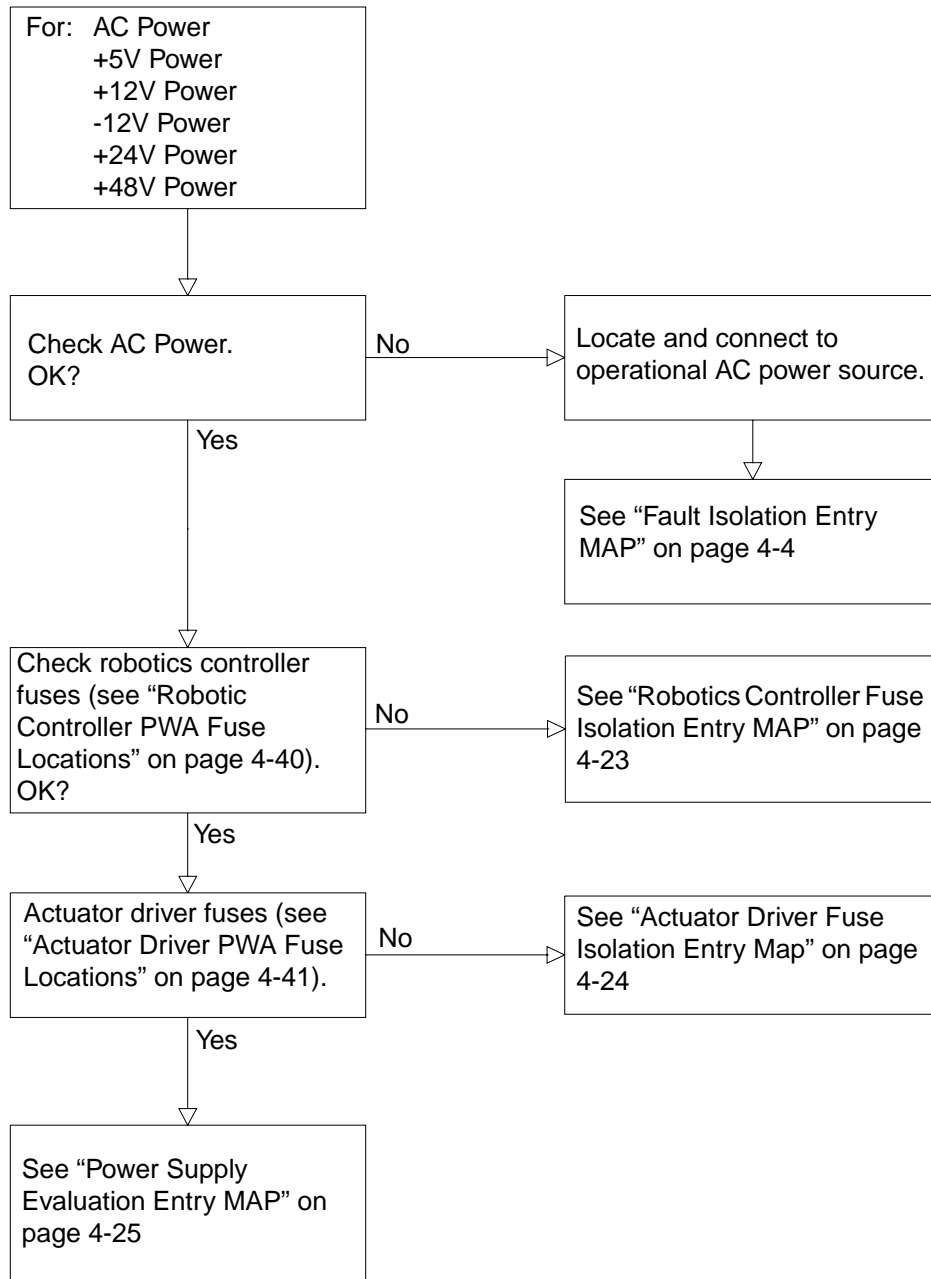
## Run Diagnostics MAP



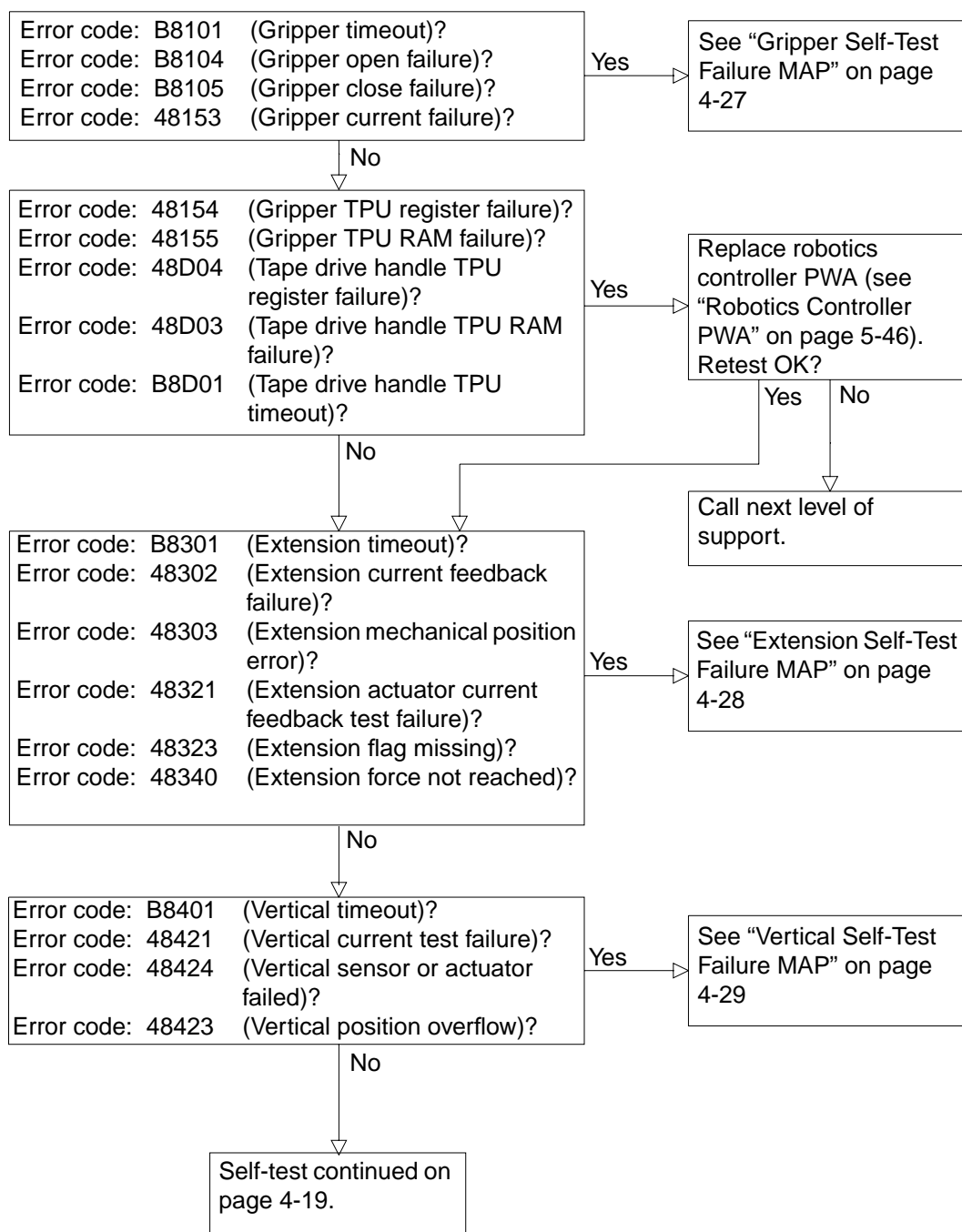
## Diagnostics Initialization MAP



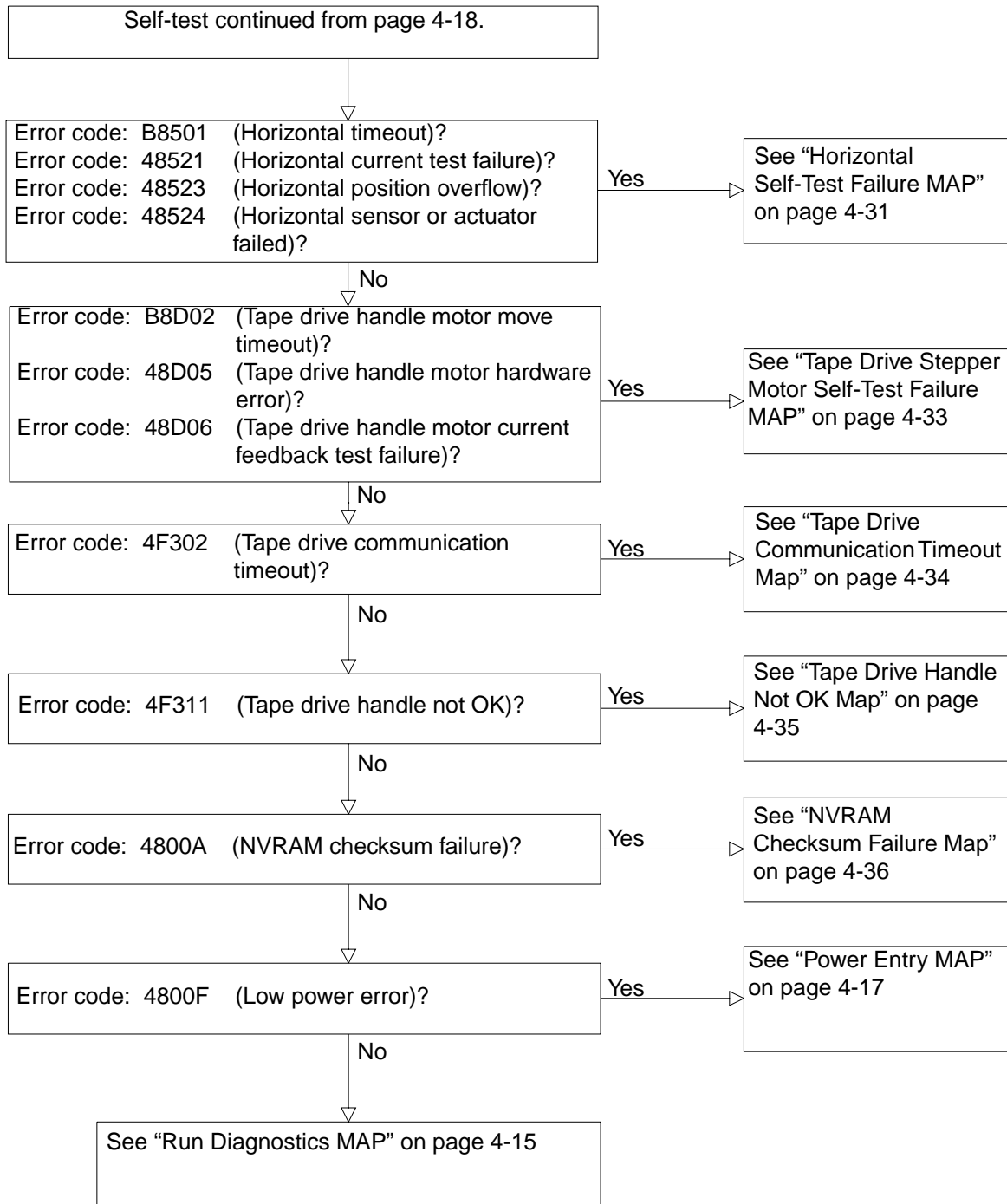
## Power Entry MAP



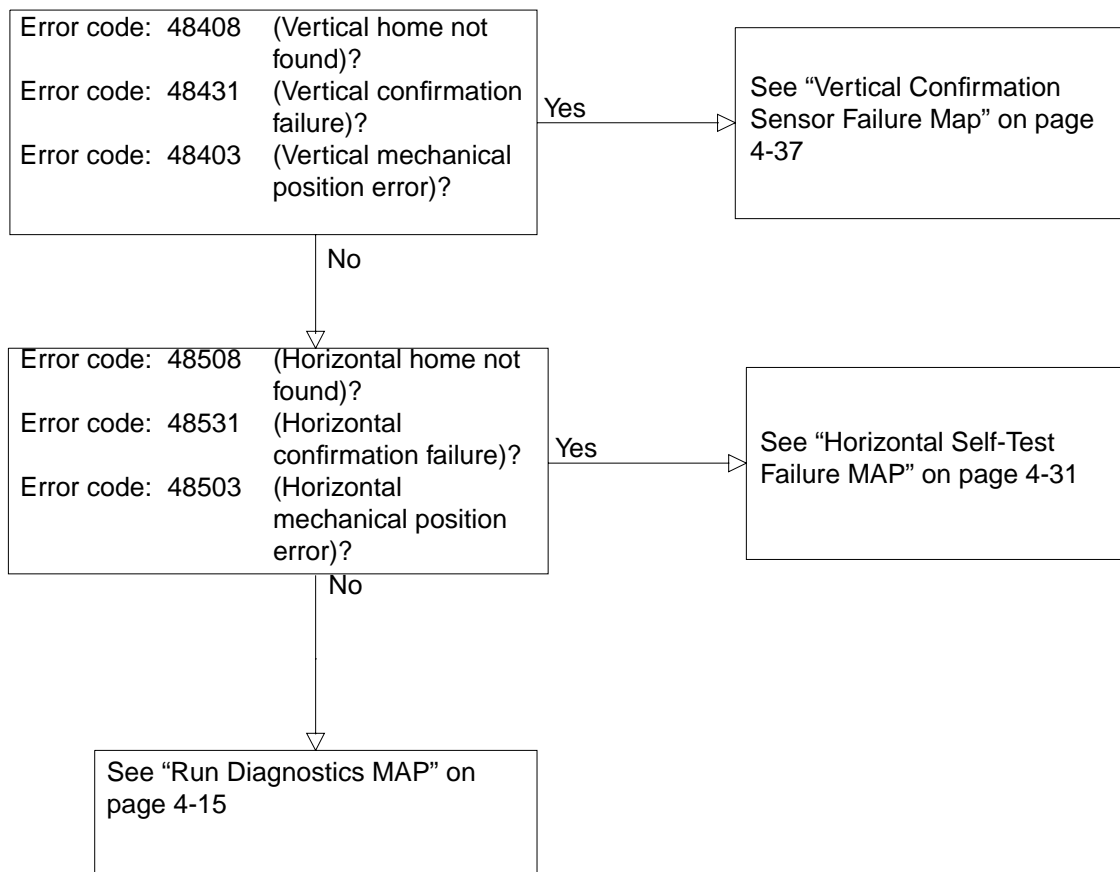
## Self-Test All MAP



## Self-Test All MAP (Cont.)

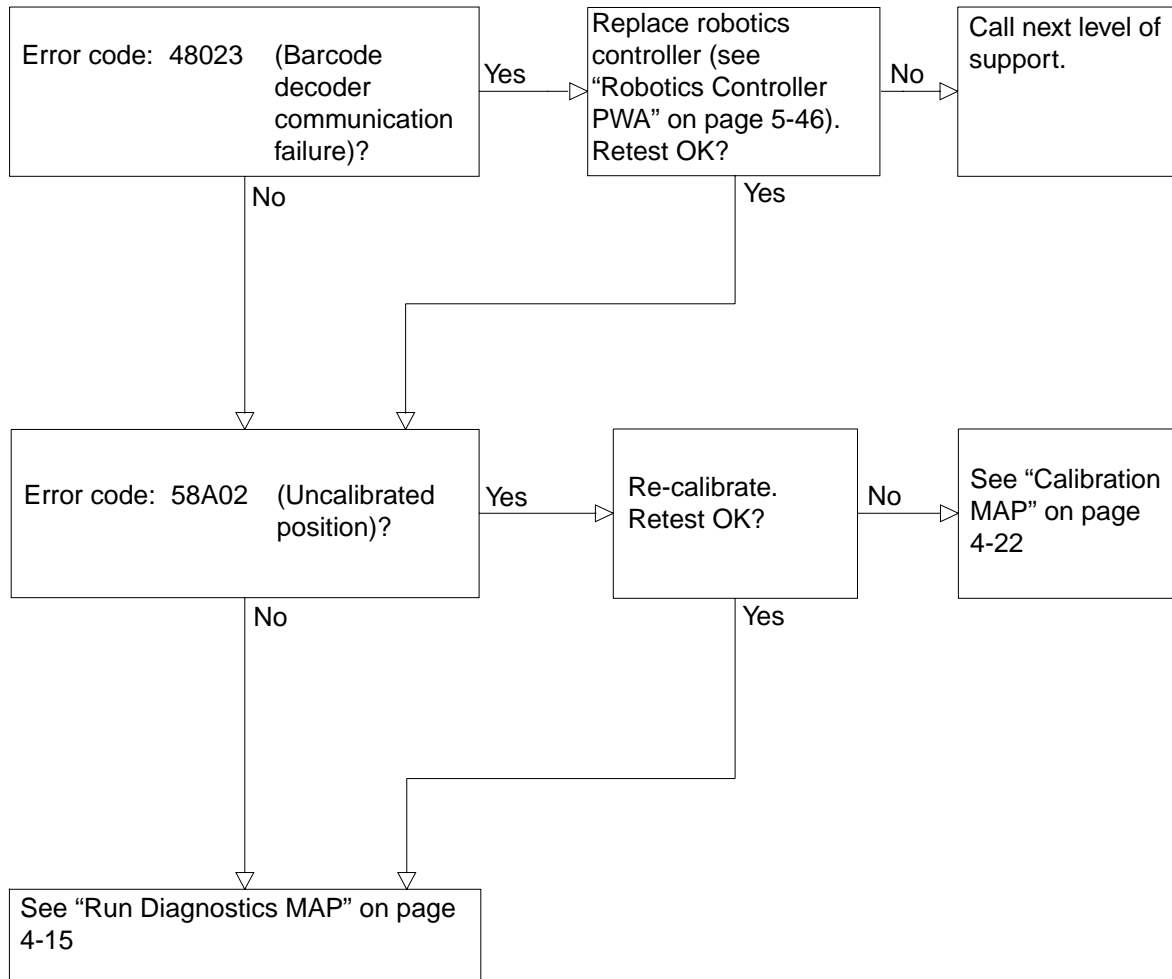


## Home All MAP

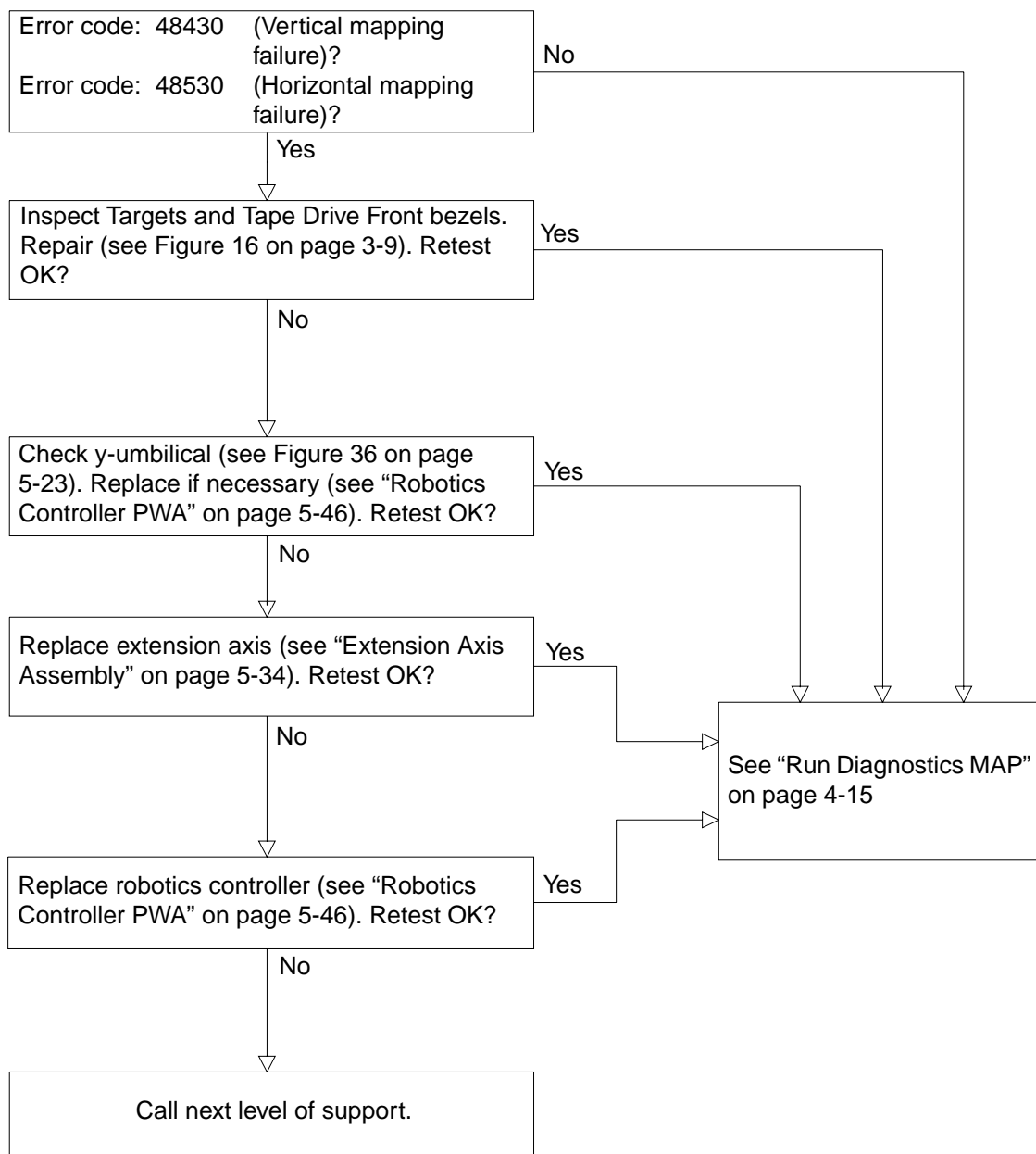




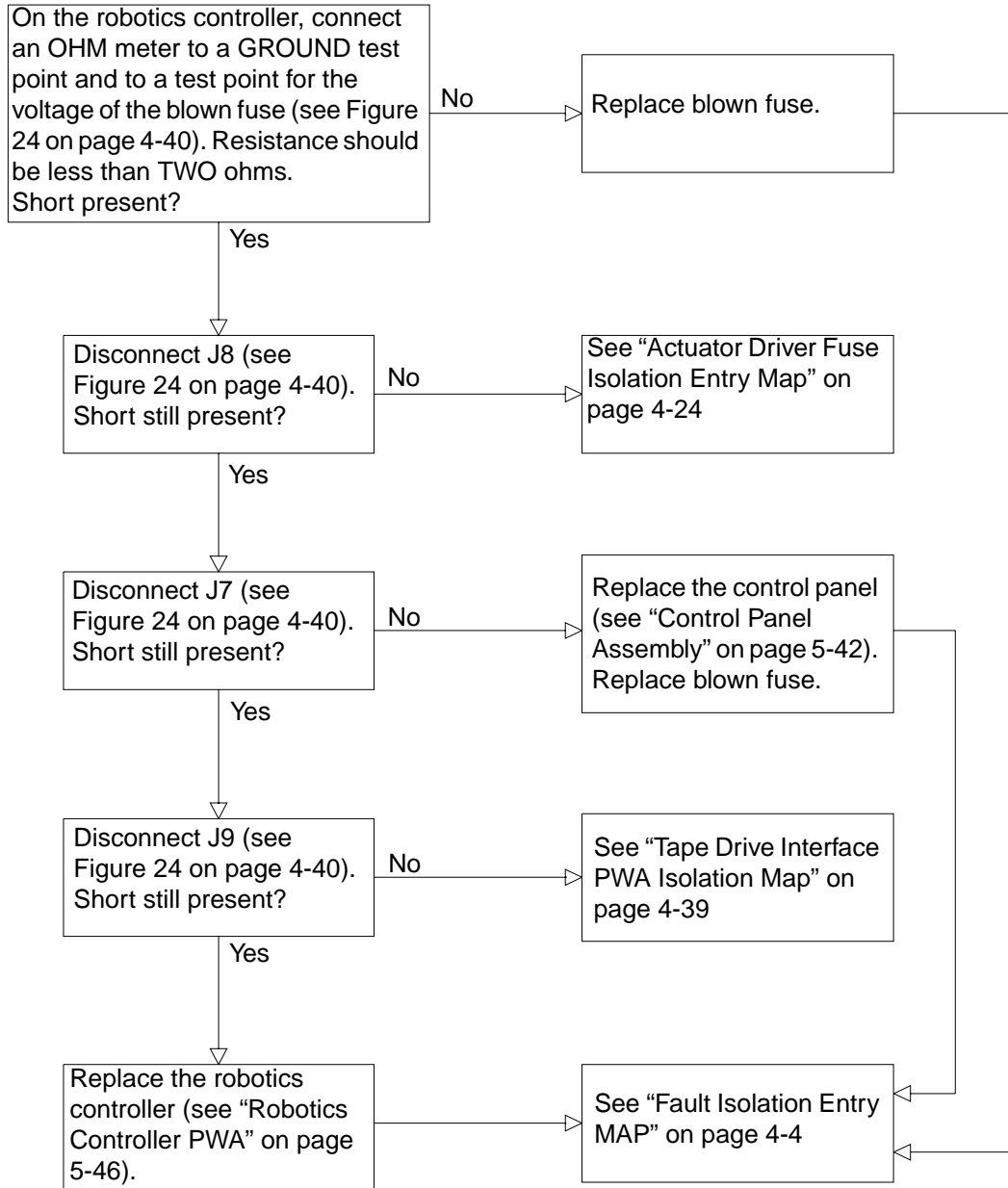
## Inventory MAP



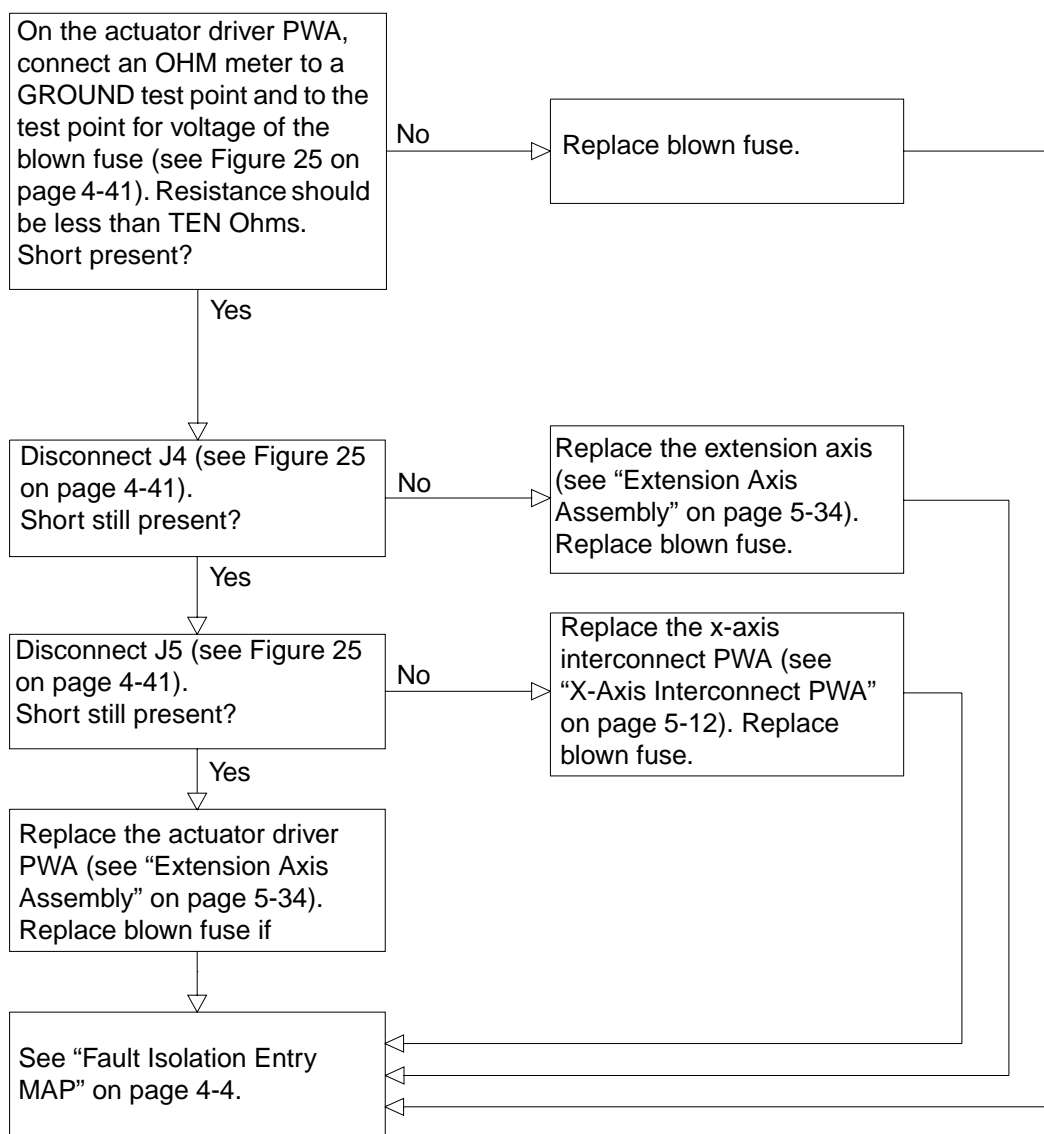
## Calibration MAP



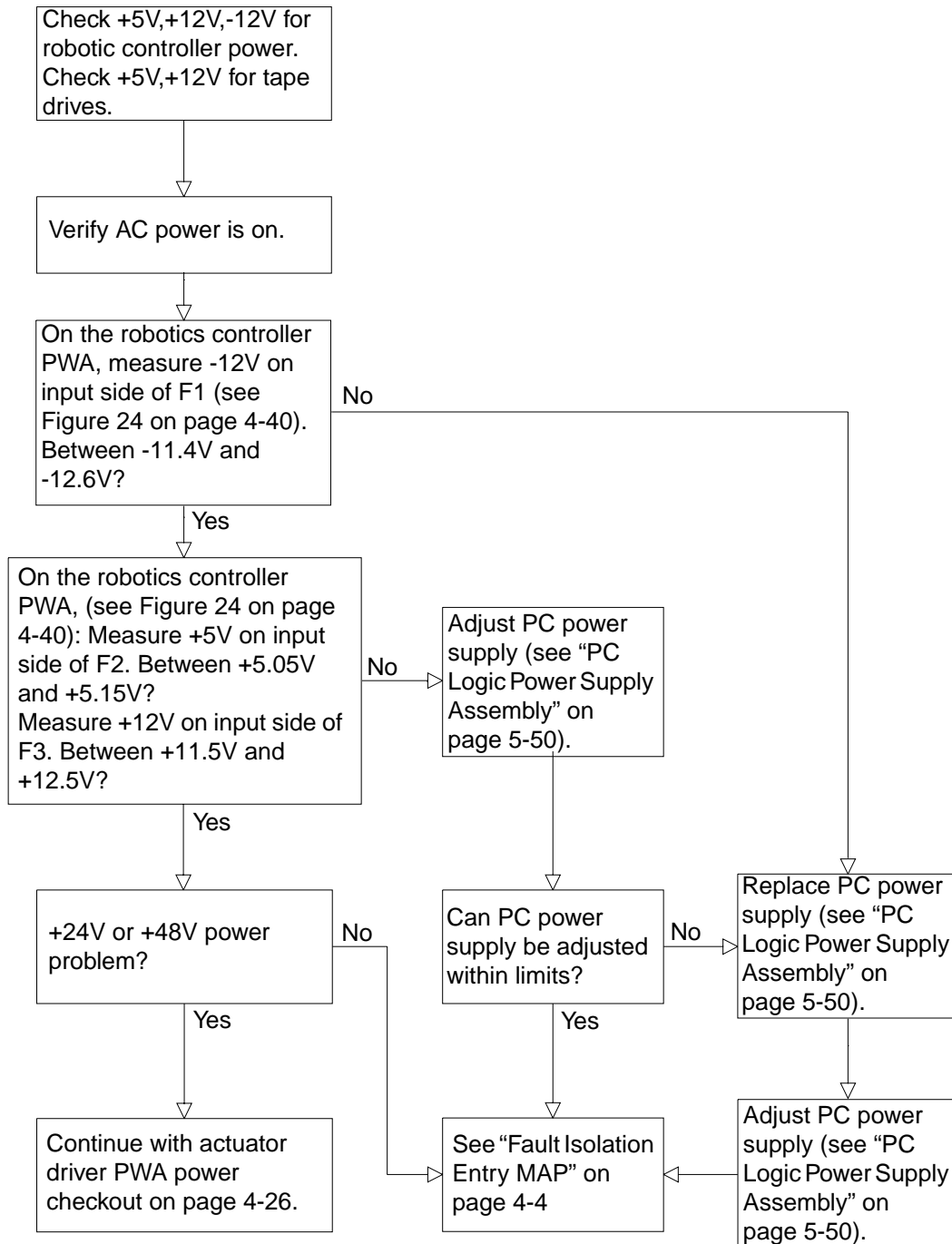
## Robotics Controller Fuse Isolation Entry MAP



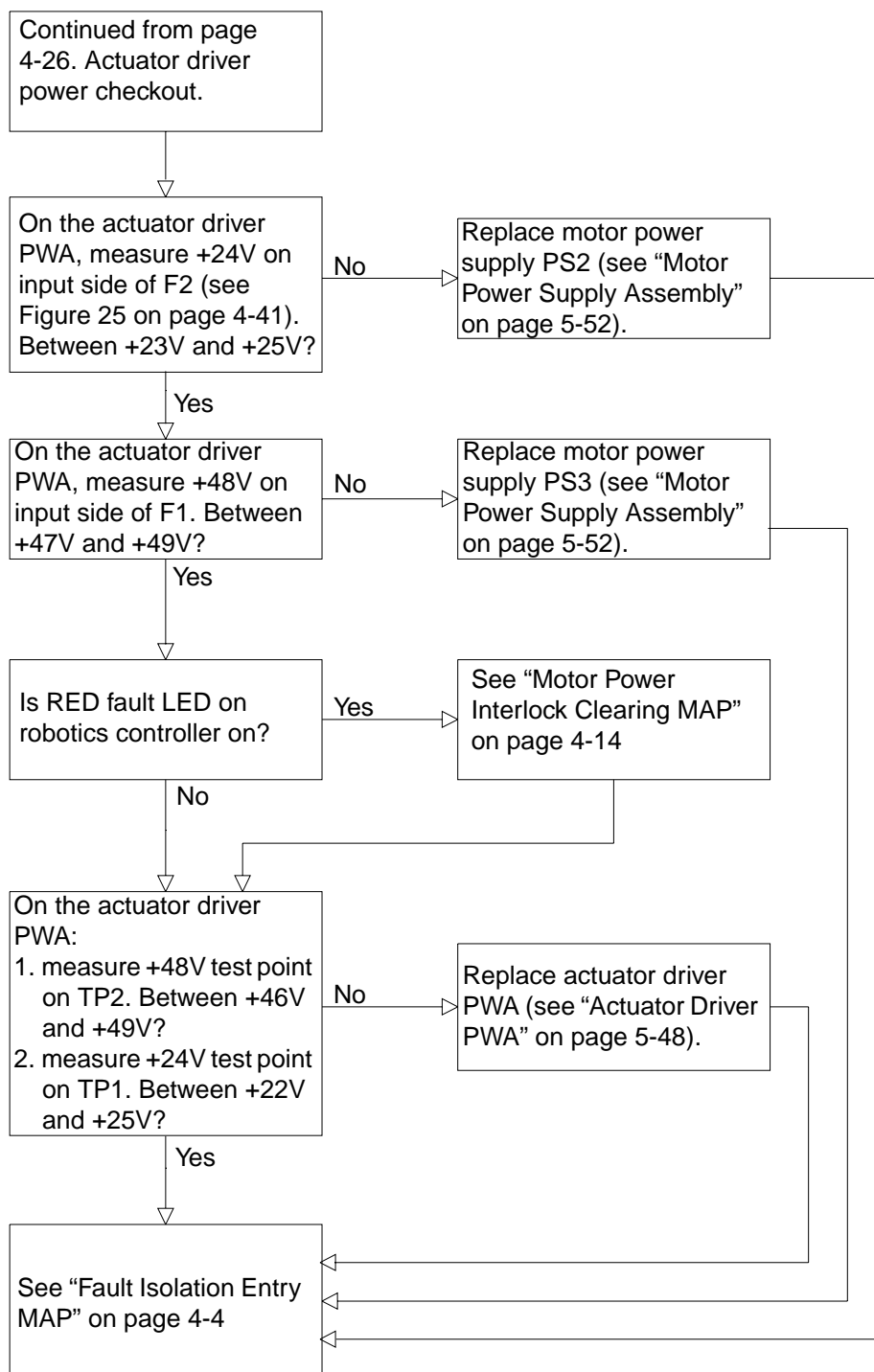
## Actuator Driver Fuse Isolation Entry Map



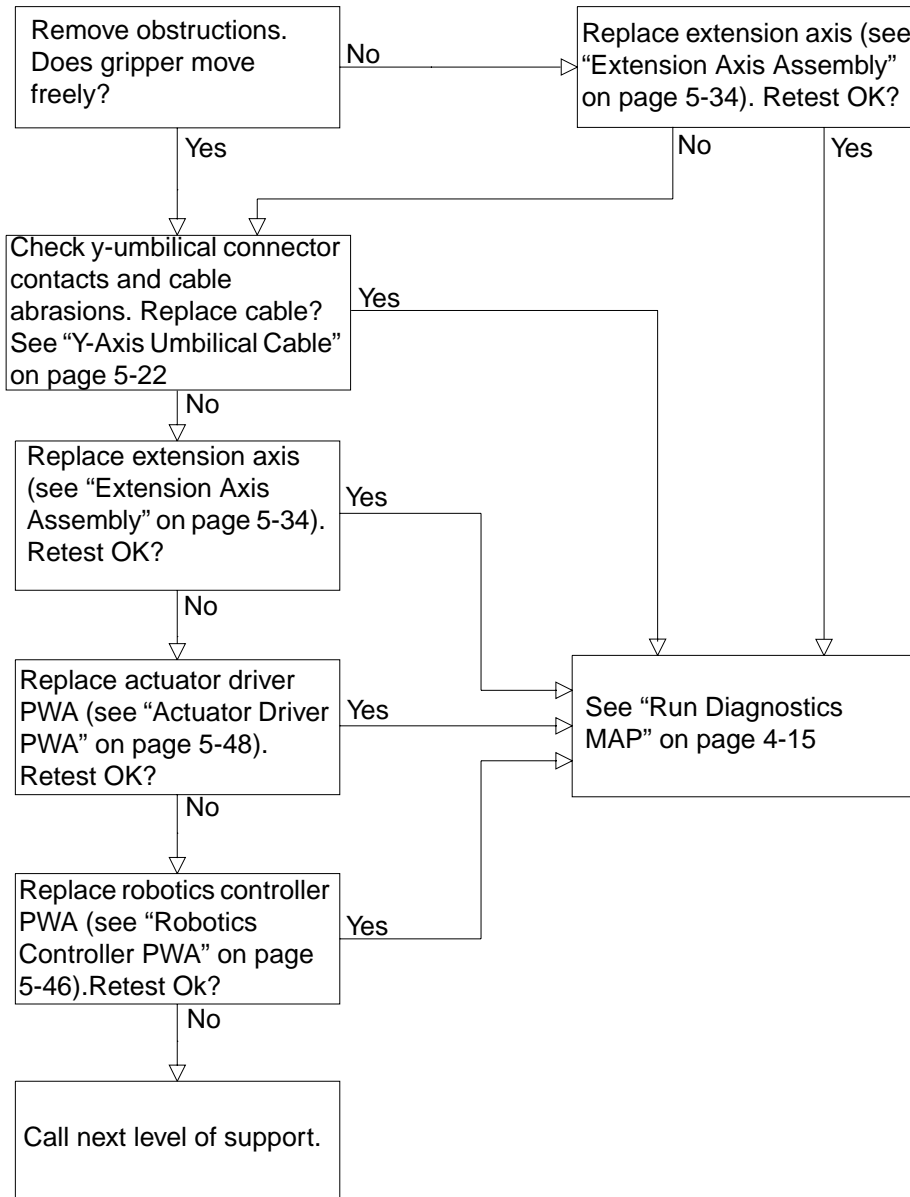
## Power Supply Evaluation Entry MAP



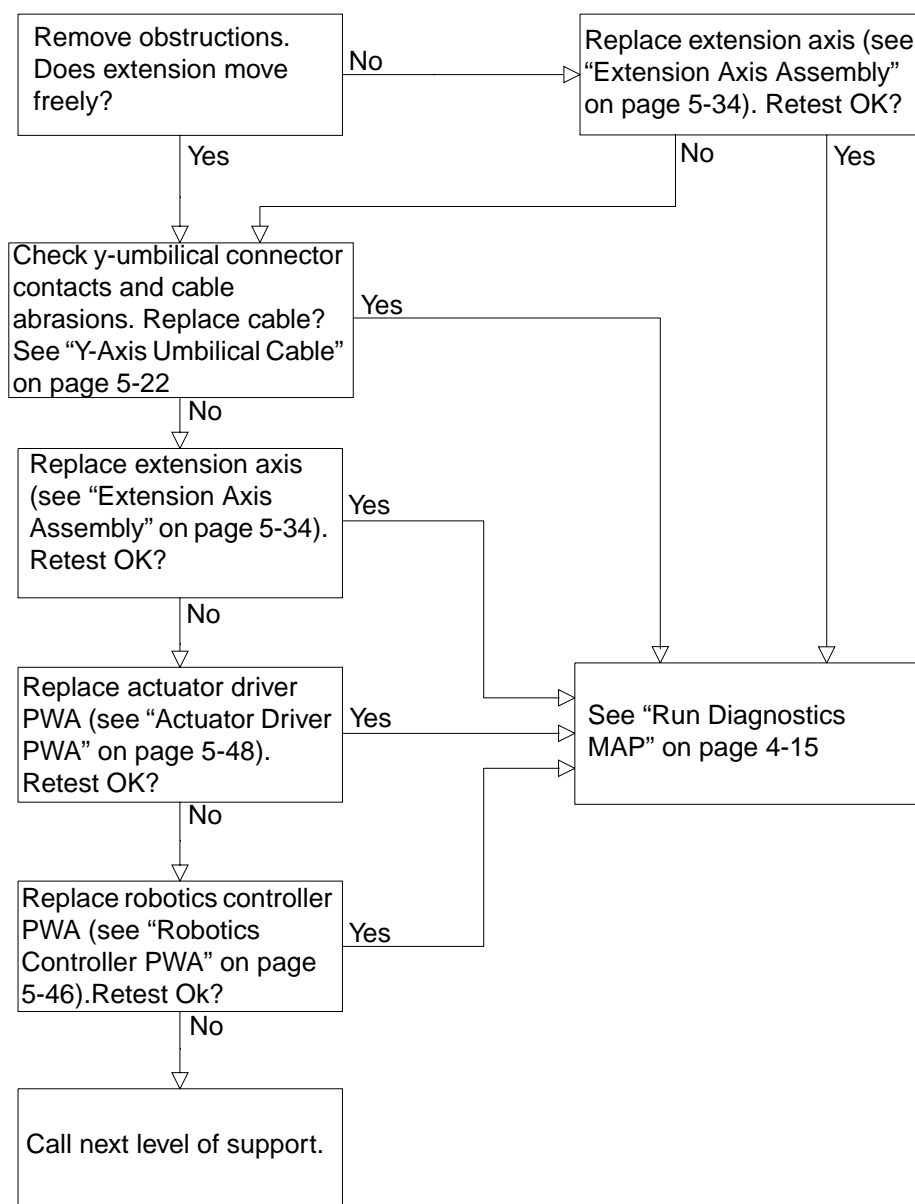
## Power Supply Evaluation Entry MAP (Cont.)



## Gripper Self-Test Failure MAP

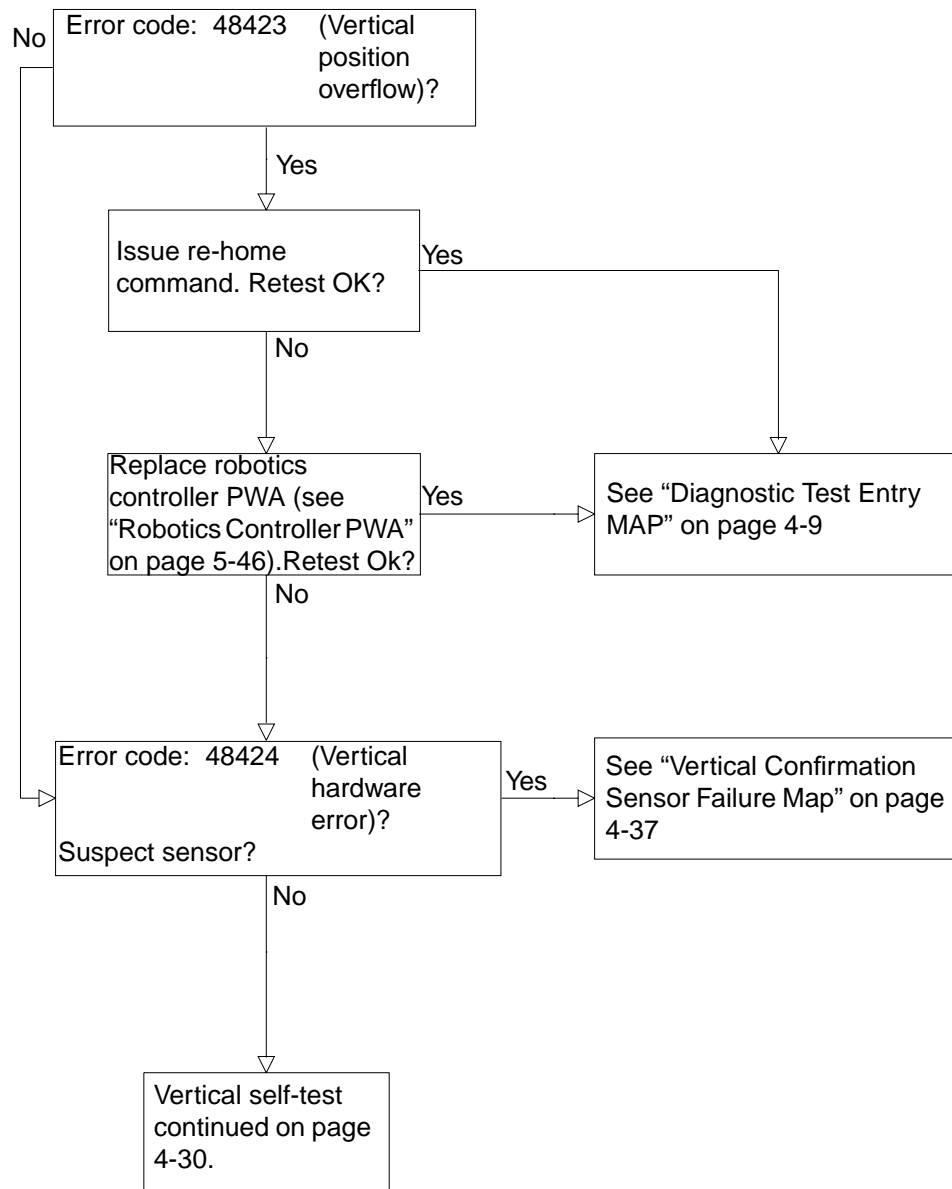


## Extension Self-Test Failure MAP

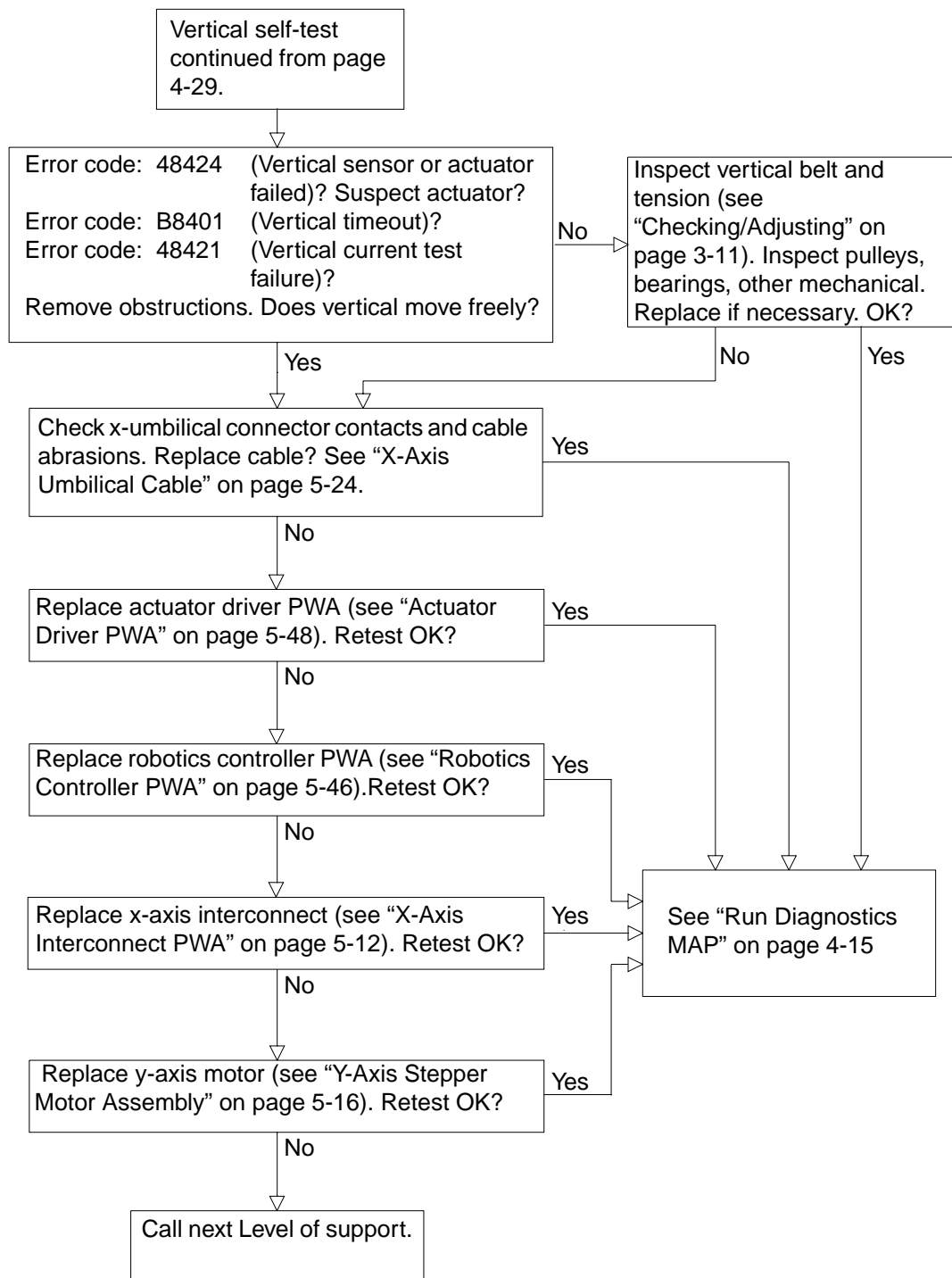




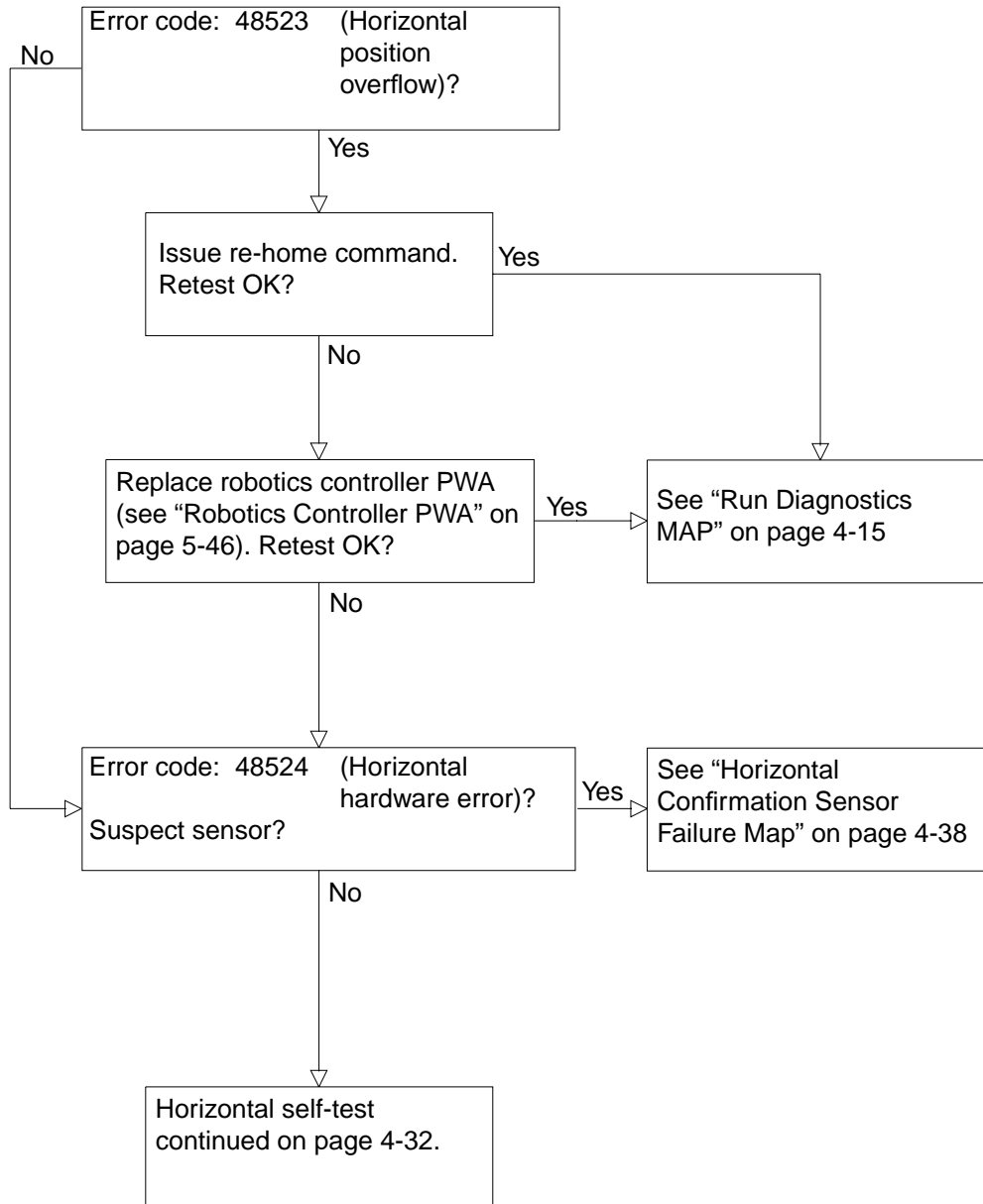
## Vertical Self-Test Failure MAP



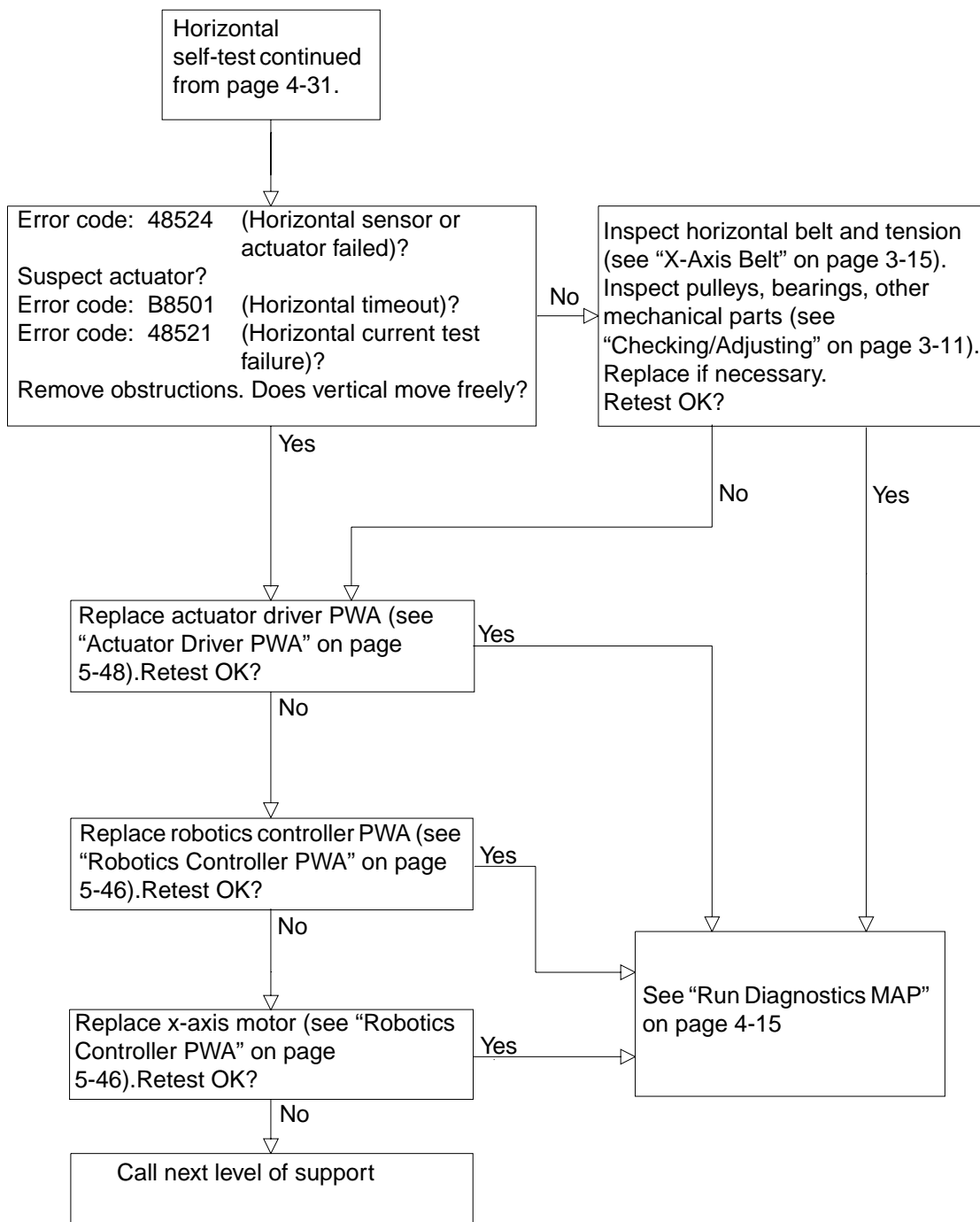
## Vertical Self-Test Failure MAP (Cont.)



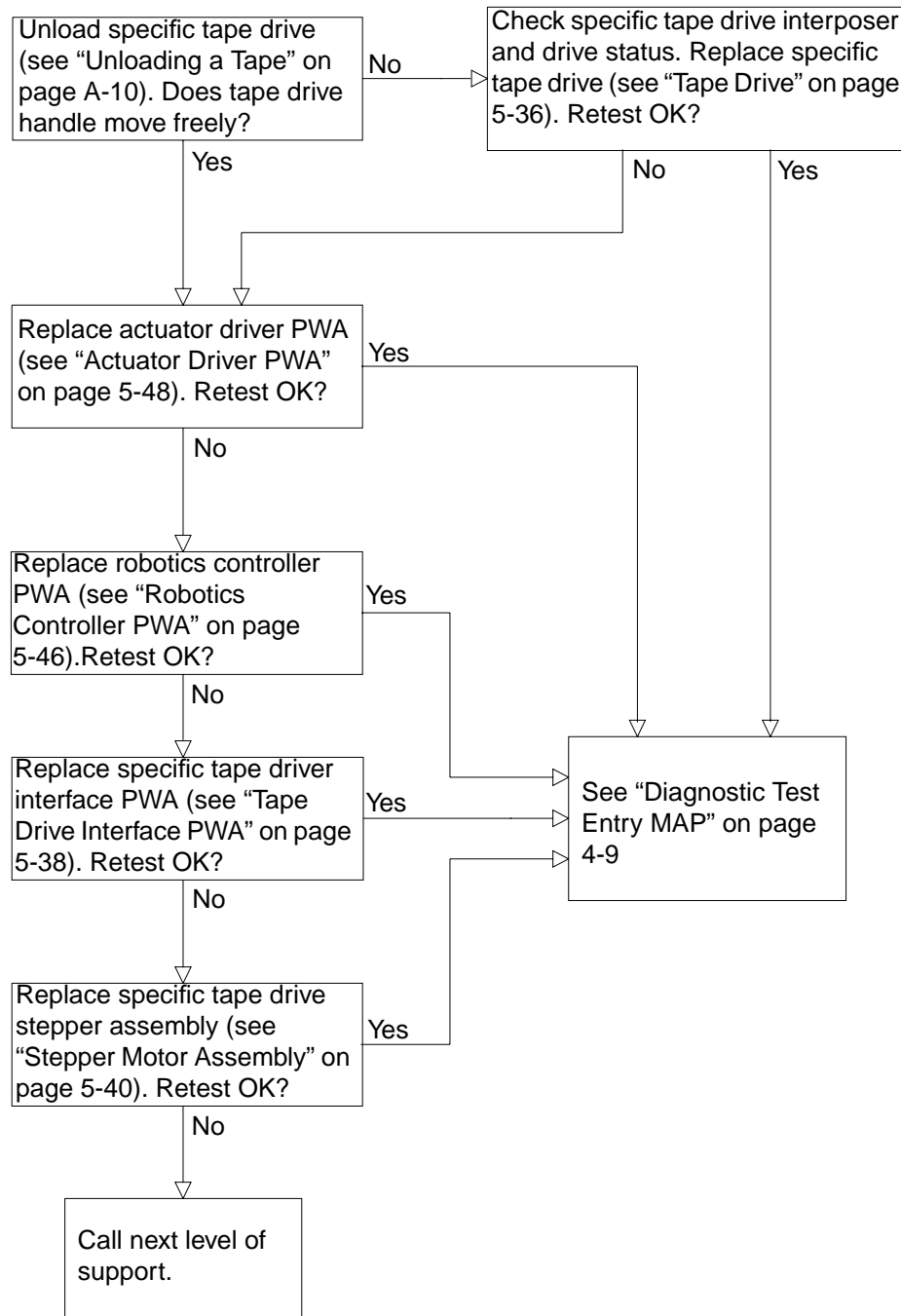
## Horizontal Self-Test Failure MAP



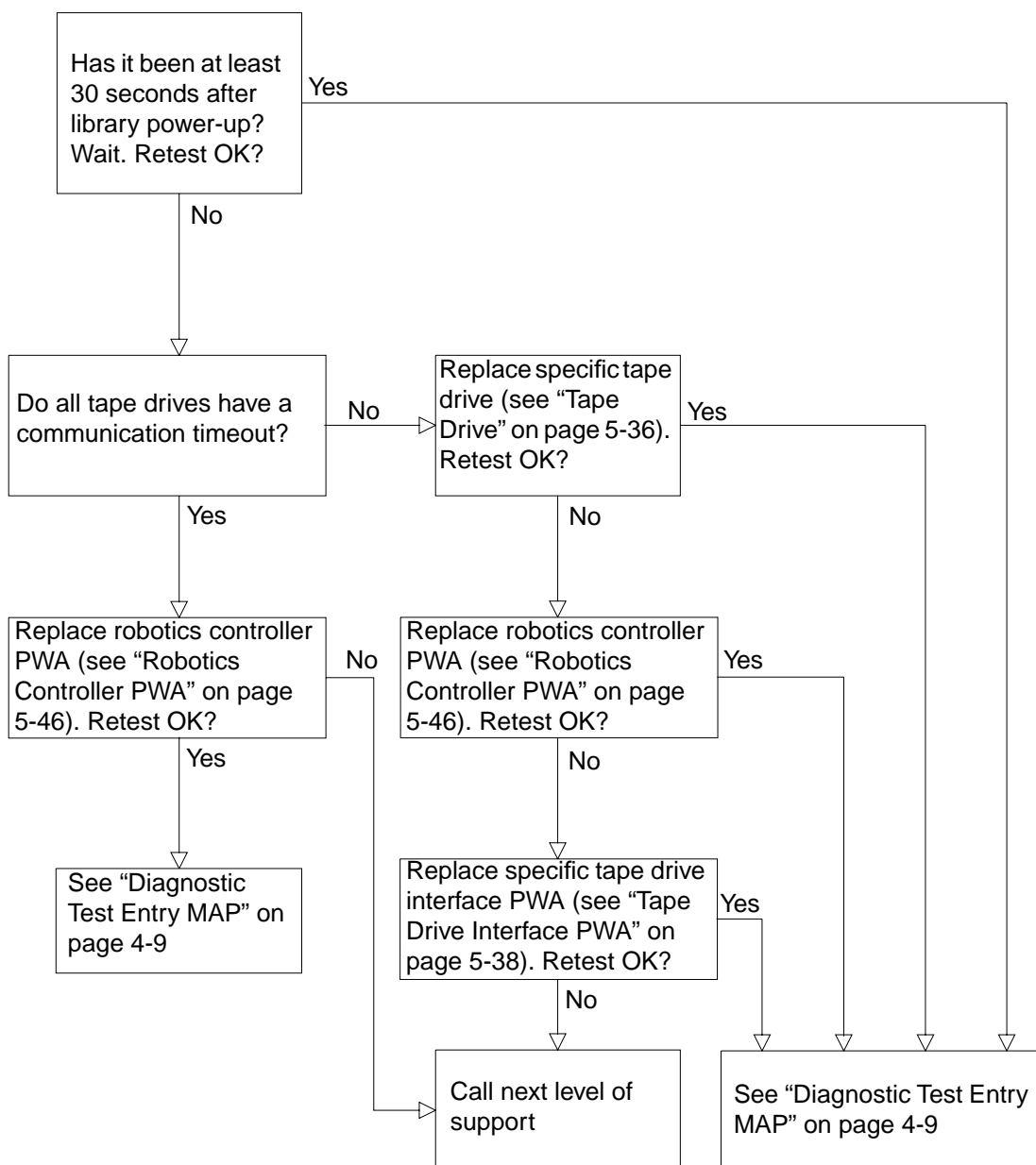
## Horizontal Self-Test Failure MAP (Cont.)



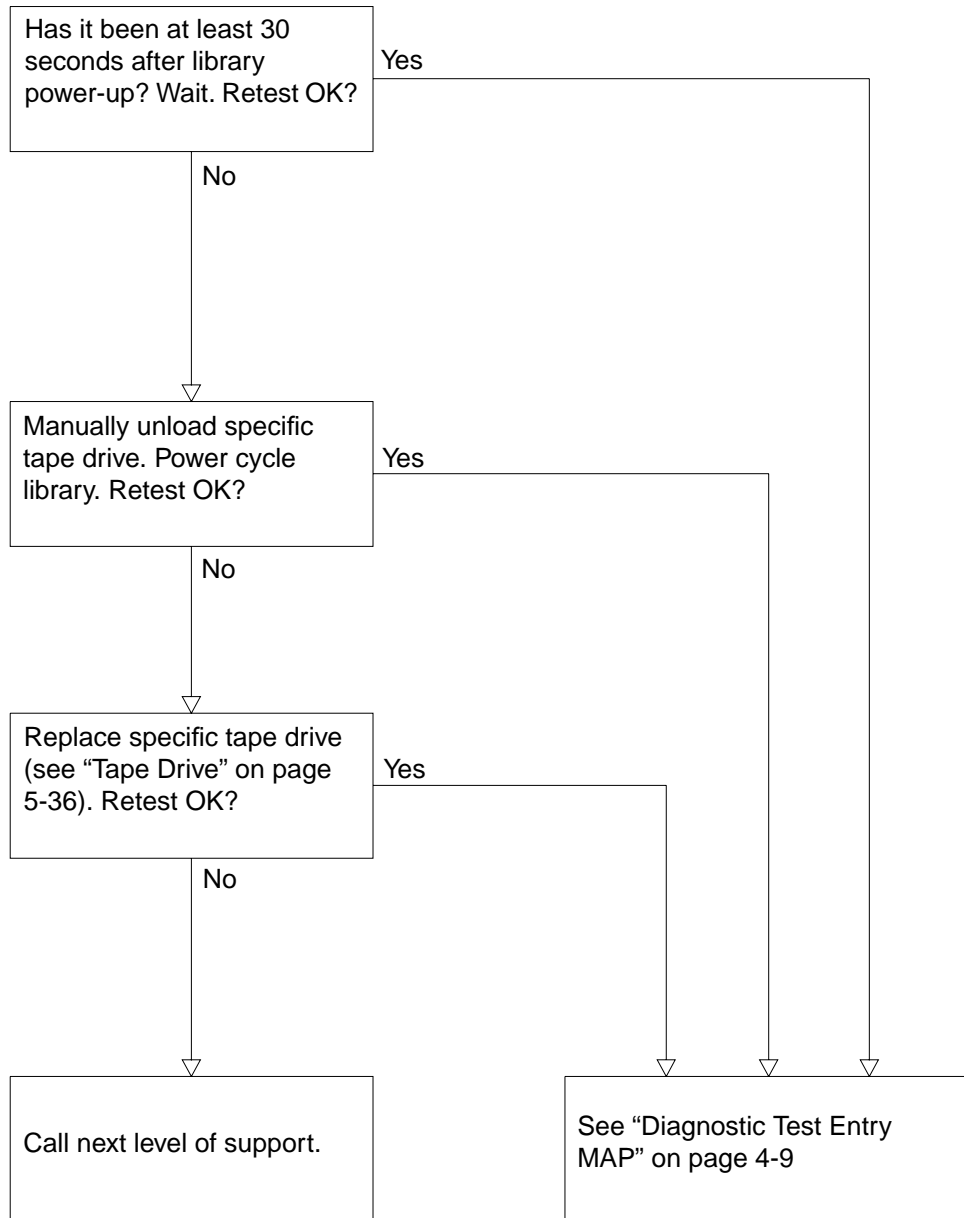
## Tape Drive Stepper Motor Self-Test Failure MAP



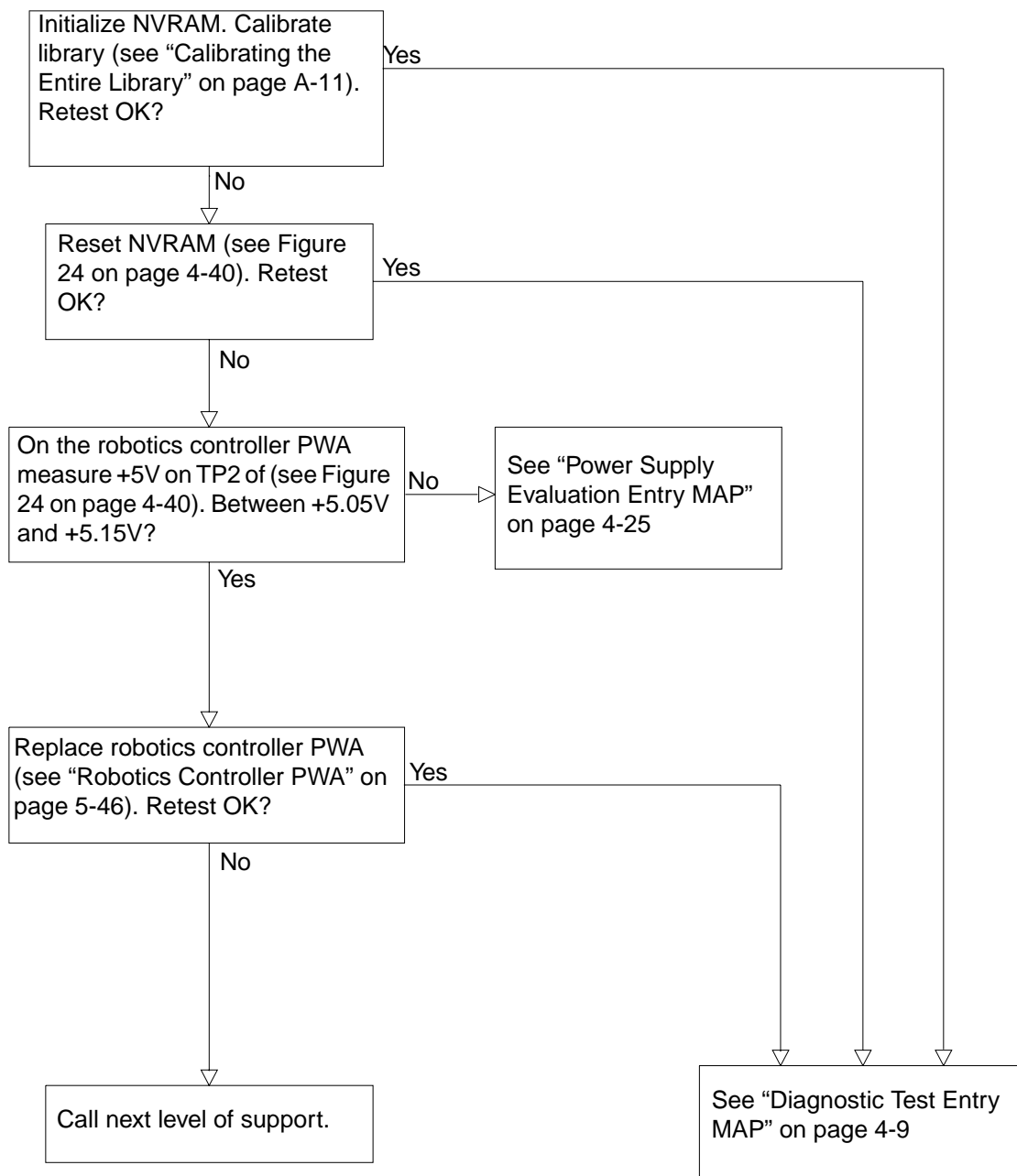
## Tape Drive Communication Timeout Map



## Tape Drive Handle Not OK Map

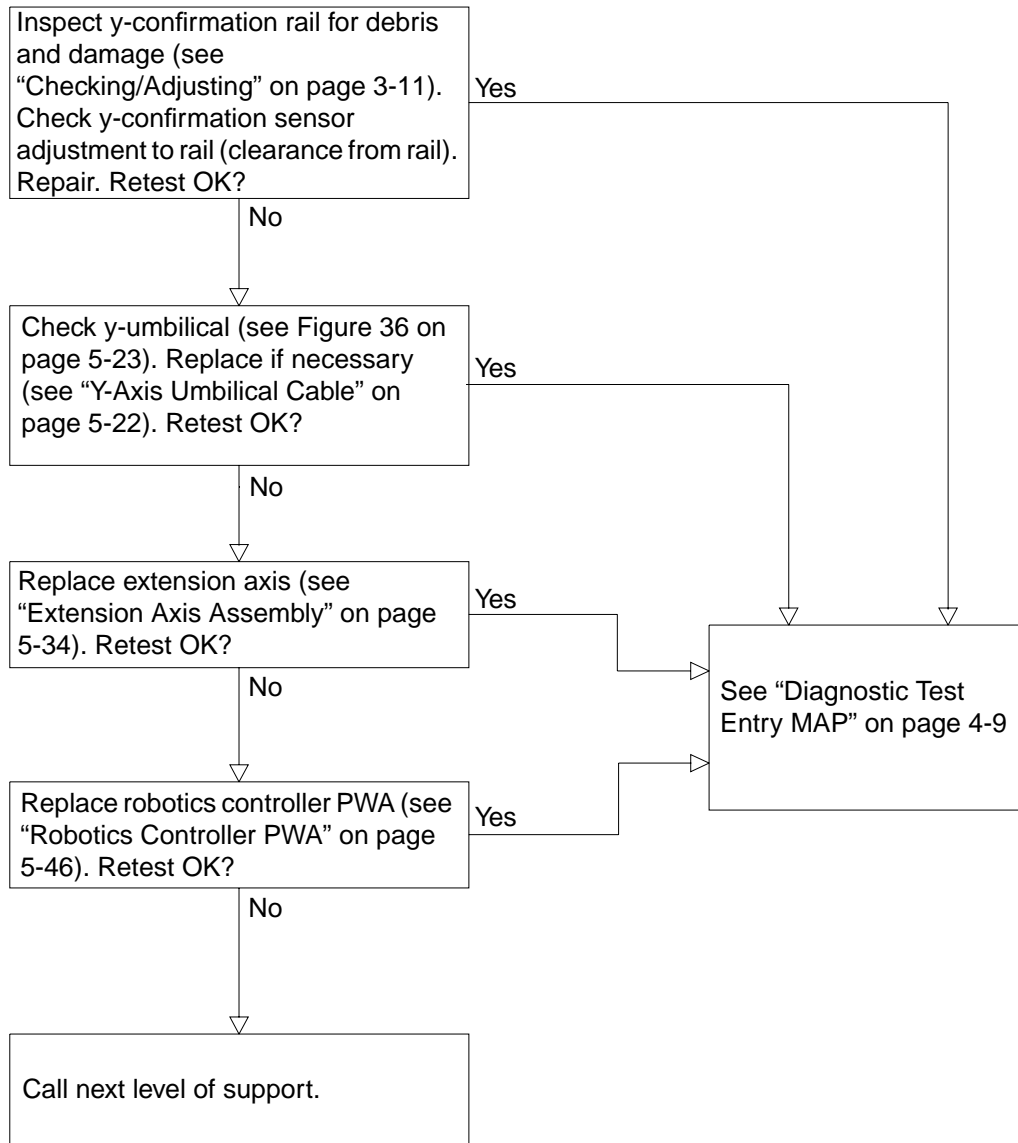


## NVRAM Checksum Failure Map

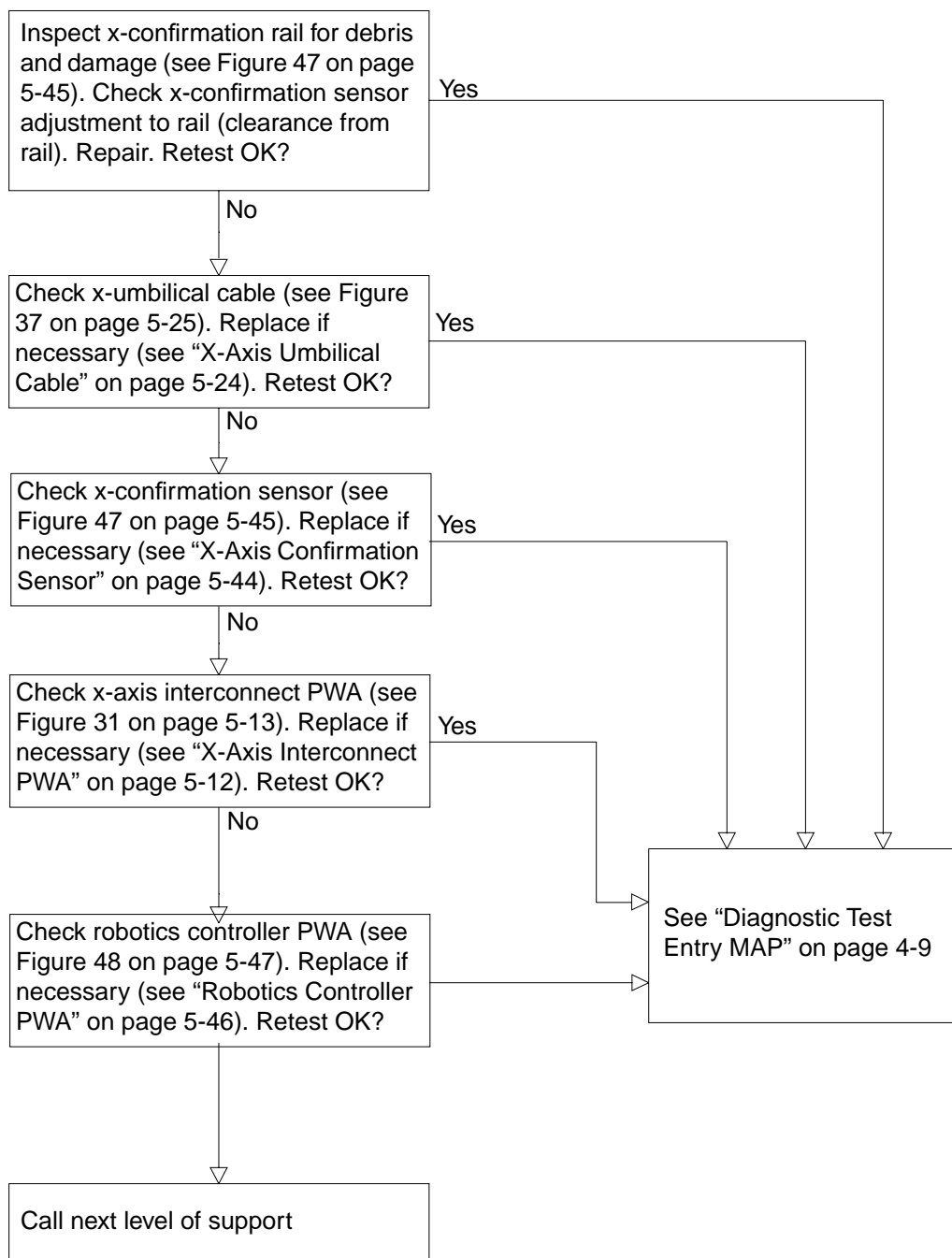




## Vertical Confirmation Sensor Failure Map



## Horizontal Confirmation Sensor Failure Map



## Tape Drive Interface PWA Isolation Map

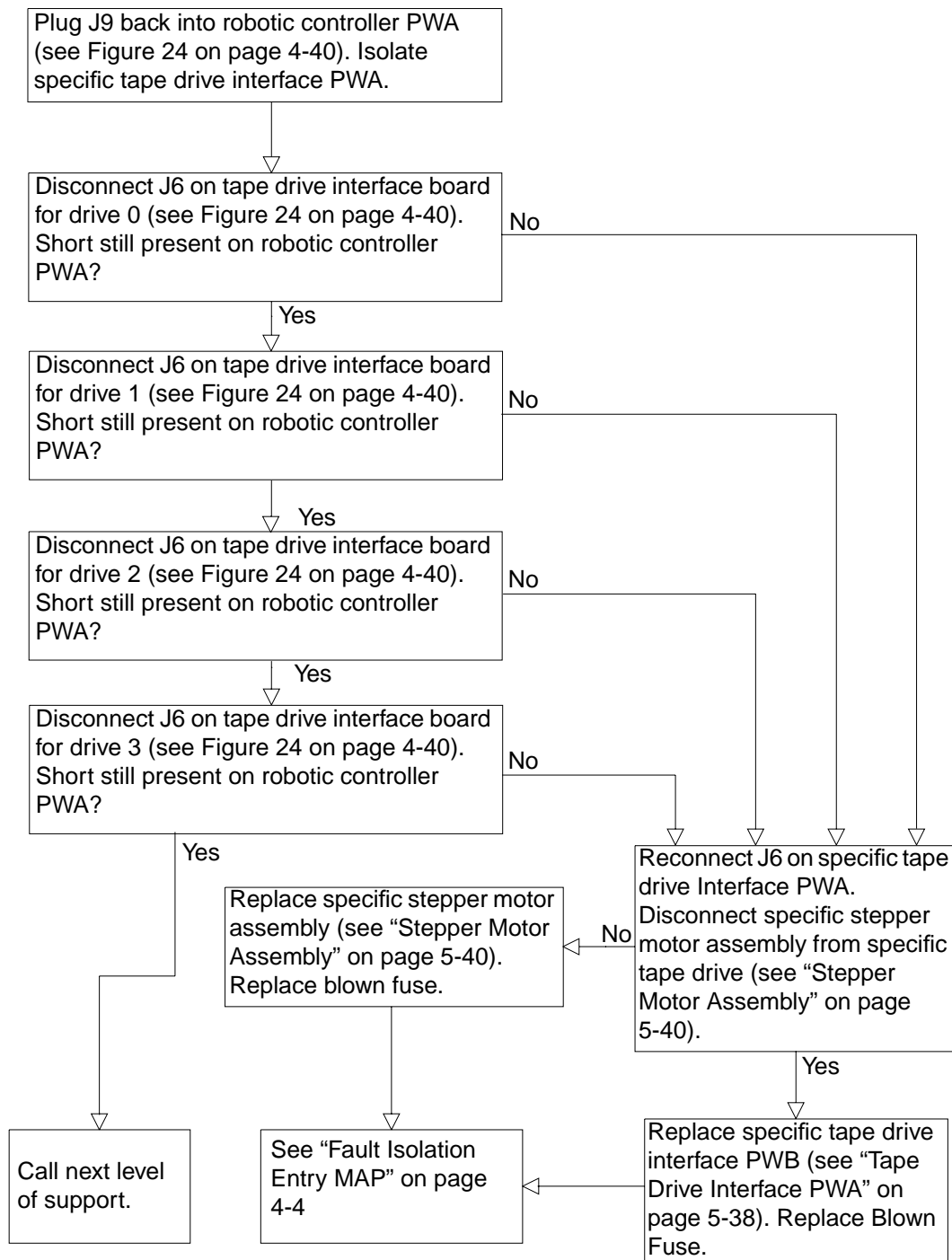
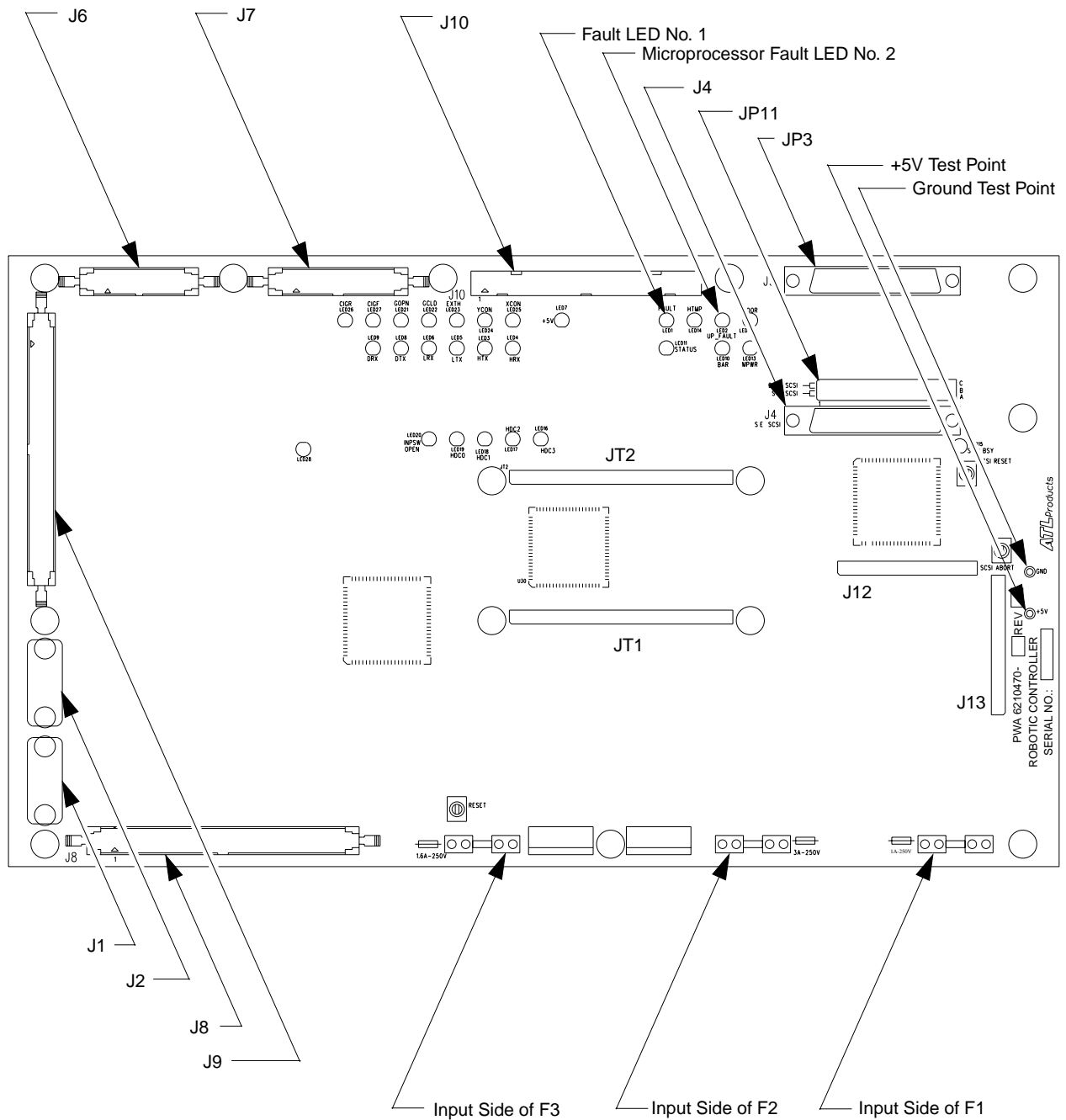
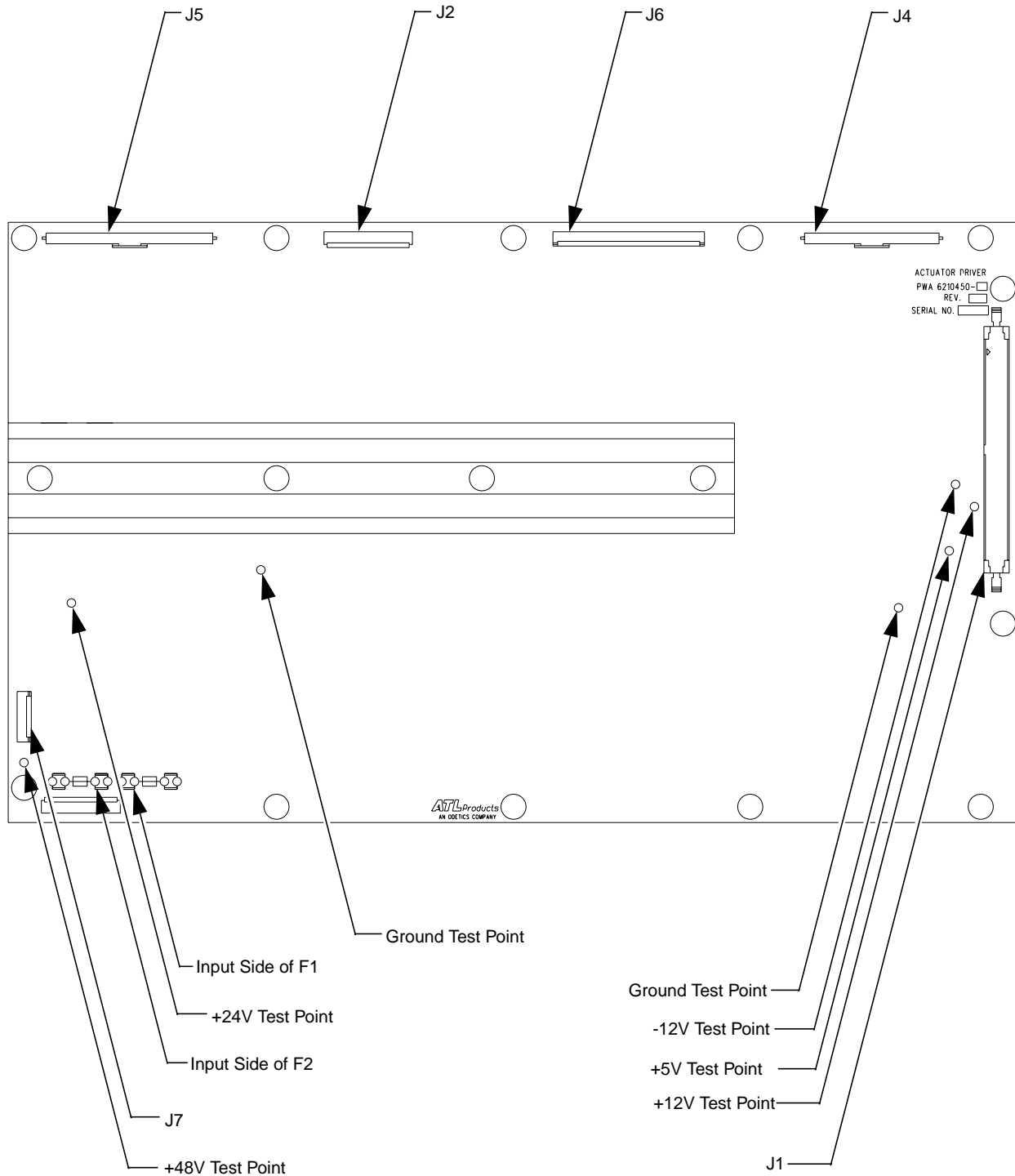


Figure 24: Robotic Controller PWA Fuse Locations



TA00108a

Figure 25: Actuator Driver  
 PWA Fuse Locations



TA00107a

Figure 26: Tape Drive  
Interface PWA

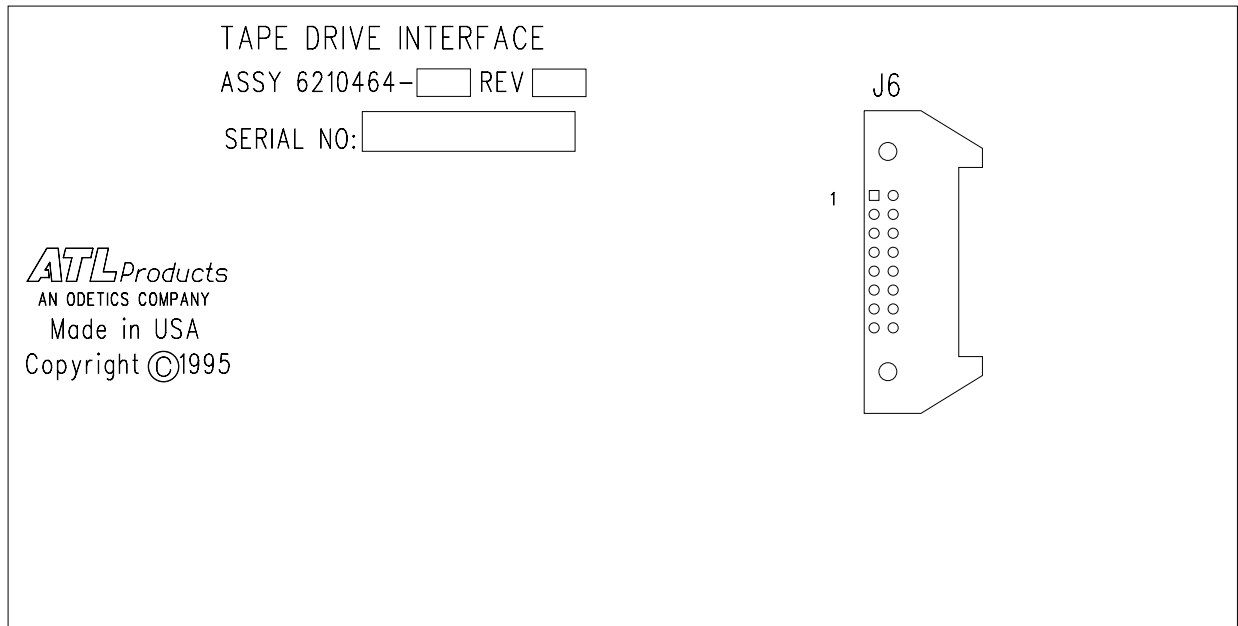
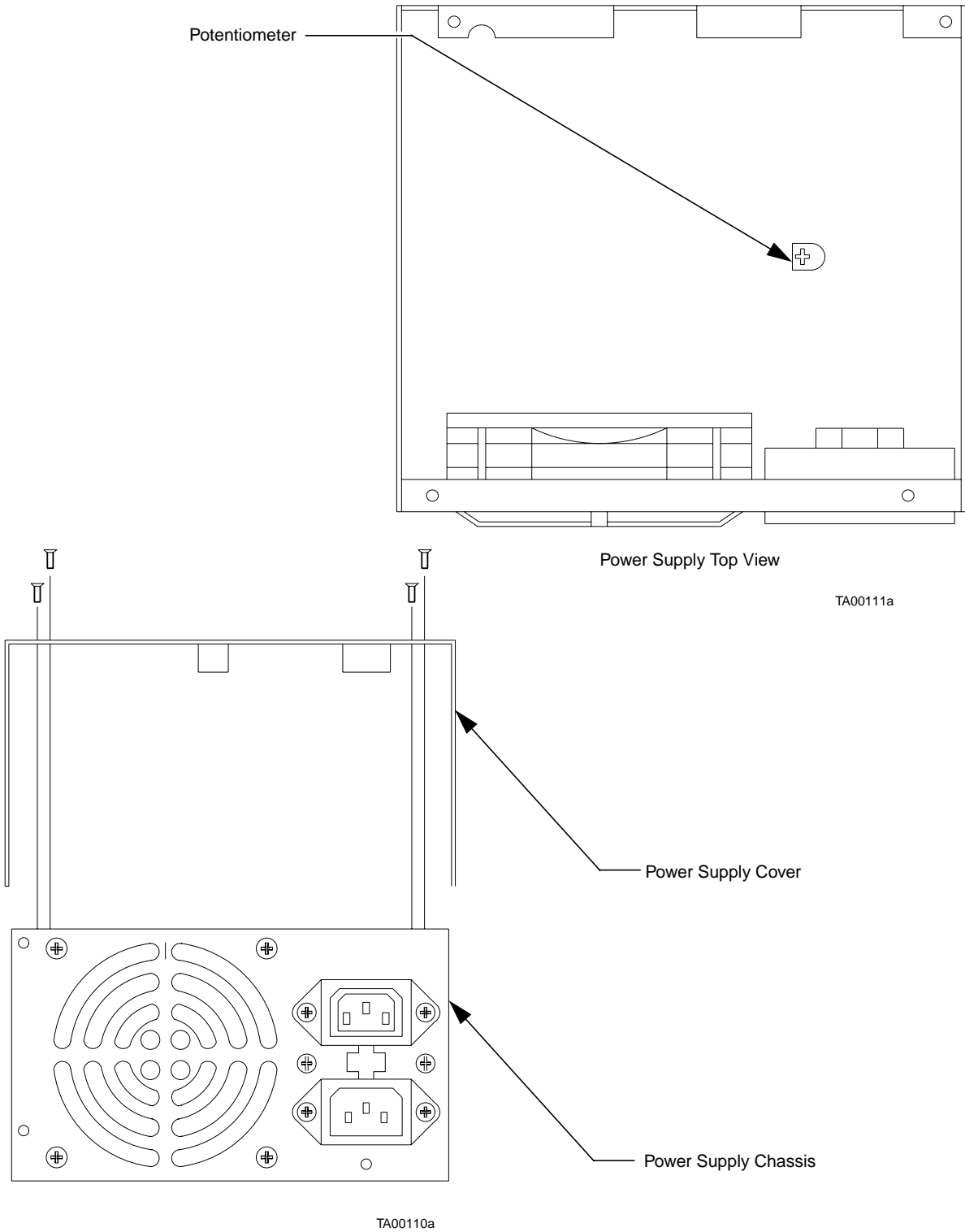


Figure 27: Logic Power Supply







# ***FRU Removal & Replacement Procedures***

# **5**

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## Chapter Overview

This chapter identifies all Field Replaceable Units (FRUs) for the TL810 and TL812 libraries and explains how to replace these items.

---

Table 5: Required Tools  
for FRU Replacement


Quantity	Item Description
1	Phillips screwdriver
1	Phillips screwdriver, short-handle
1	Flat-blade screwdriver
1	Flat-blade screwdriver, thin blade
1	5/32 Allen (hex) wrench
1	11/32 hex nut driver
1	Crescent wrench
1	Wrench, small
1	Punch, small
1	Snap ring pliers with angled tips
1	Wire cutters
1	Flashlight
1	Anti-static wrist strap

**Note** *You must supply all required tools.*

## Preparing for Maintenance

Before cleaning the library or replacing any FRU, you need to prepare the library for maintenance. This includes turning off the library and removing some or all of the cosmetic panels. In some cases, it may also include removing the controller electronics assembly.


### Turning Off the Library

 **CAUTION** *Although you are turning off the library, you must also keep the library plugged into a grounded electrical outlet. This grounds the chassis and prevents damage from electrostatic discharge (ESD).*

1. Press the control panel STANDBY button and verify System Off-line is displayed in the status display area (SDA).
2. At the rear panel, set the POWER switch to the “0” (off) position.

### Removing the Cosmetic Panels

Before you can perform any FRU replacement procedure, you must remove the top, left-side, and right-side cosmetic panels as explained in this section. In addition, before performing the DC fan or control panel assembly replacement, you must also remove the front panel.

 **CAUTION** *Make sure to turn off the library before following these procedures. (DO NOT disconnect the power cord.) In addition, put on the anti-static wrist strap and attach it to the library frame as soon as possible after removing the covers.*

#### Top Panel

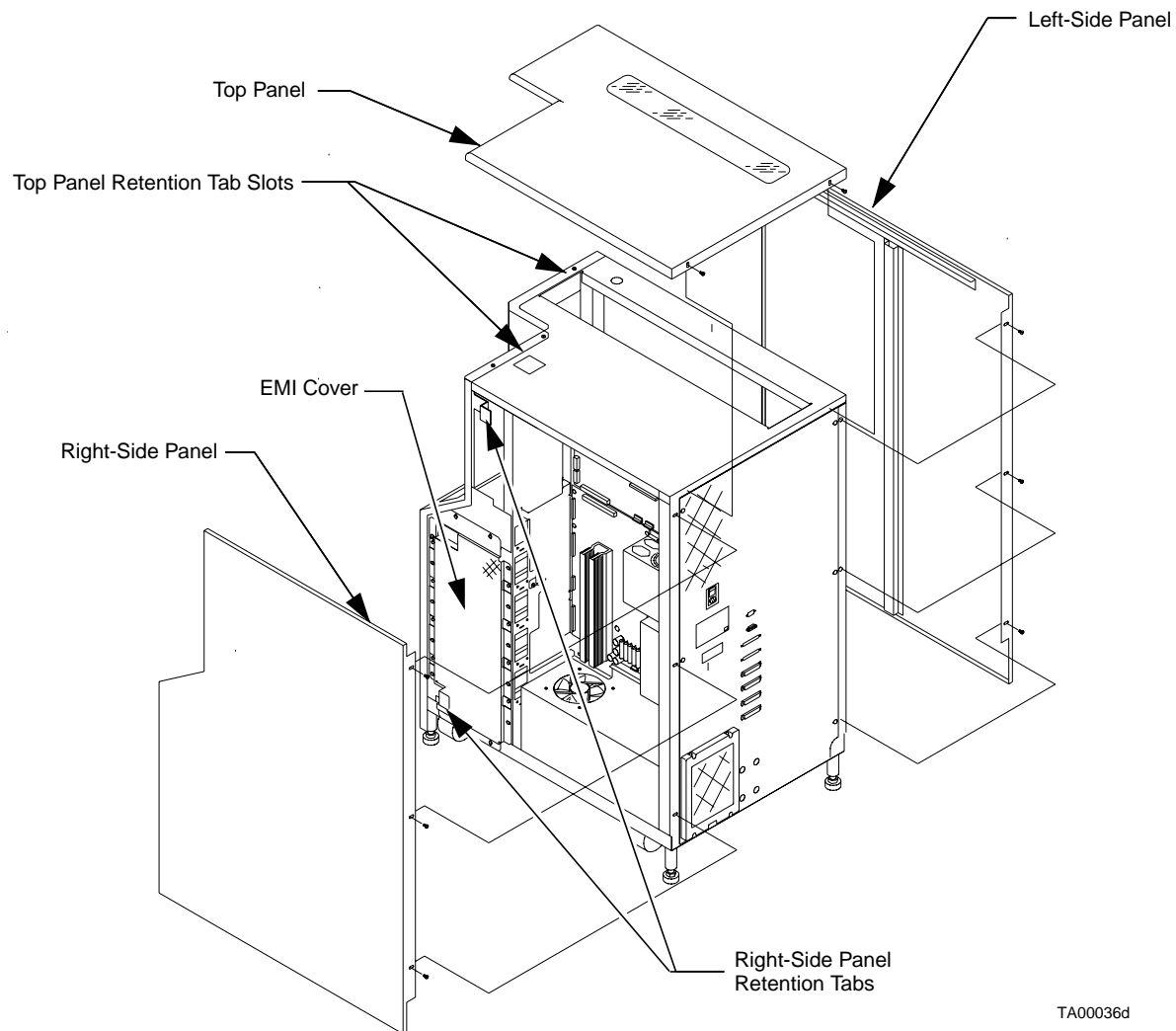
1. At the rear of the library, remove the two screws that secure the top panel to the rear of the library frame (Figure 28).
2. Pull the top panel towards the rear of the library (to disengage the retention tabs from the frame top) and then up and off of the library frame. Set the panel aside.

## Left-Side Panel

**CAUTION** *You must remove the top panel before removing the left-side panel.*


1. At the rear of the library, remove the three screws that secure the left-side panel to the rear of the library frame (Figure 28).
2. Pull the left-rear panel towards the rear of the library (to disengage the retention tabs attached to the left-side of the frame) and then away from the library frame. Set the panel aside.

Figure 28: Removing the Top, Right-Side, and Left-Side Panels




**Note:** The EMI cover has been discontinued in newer models; if it is present, it may be permanently removed.

## Right-Side Panel

 **CAUTION** *You must remove the top panel before removing the right-side panel.*

1. At the rear of the library, remove the three screws that secure the right-side panel to the rear of the library frame (Figure 28).
2. Pull the right-side panel towards the rear of the library (to disengage the retention tabs attached to the right-side of the frame) and then away from the library frame. Set the panel aside.

## Front Panel

 **CAUTION** *You must remove the top, left-side, and right-side panels before removing the front panel.*

1. From behind the load port, detach the load port spring which spans between the load port and the frame (Figure 29).

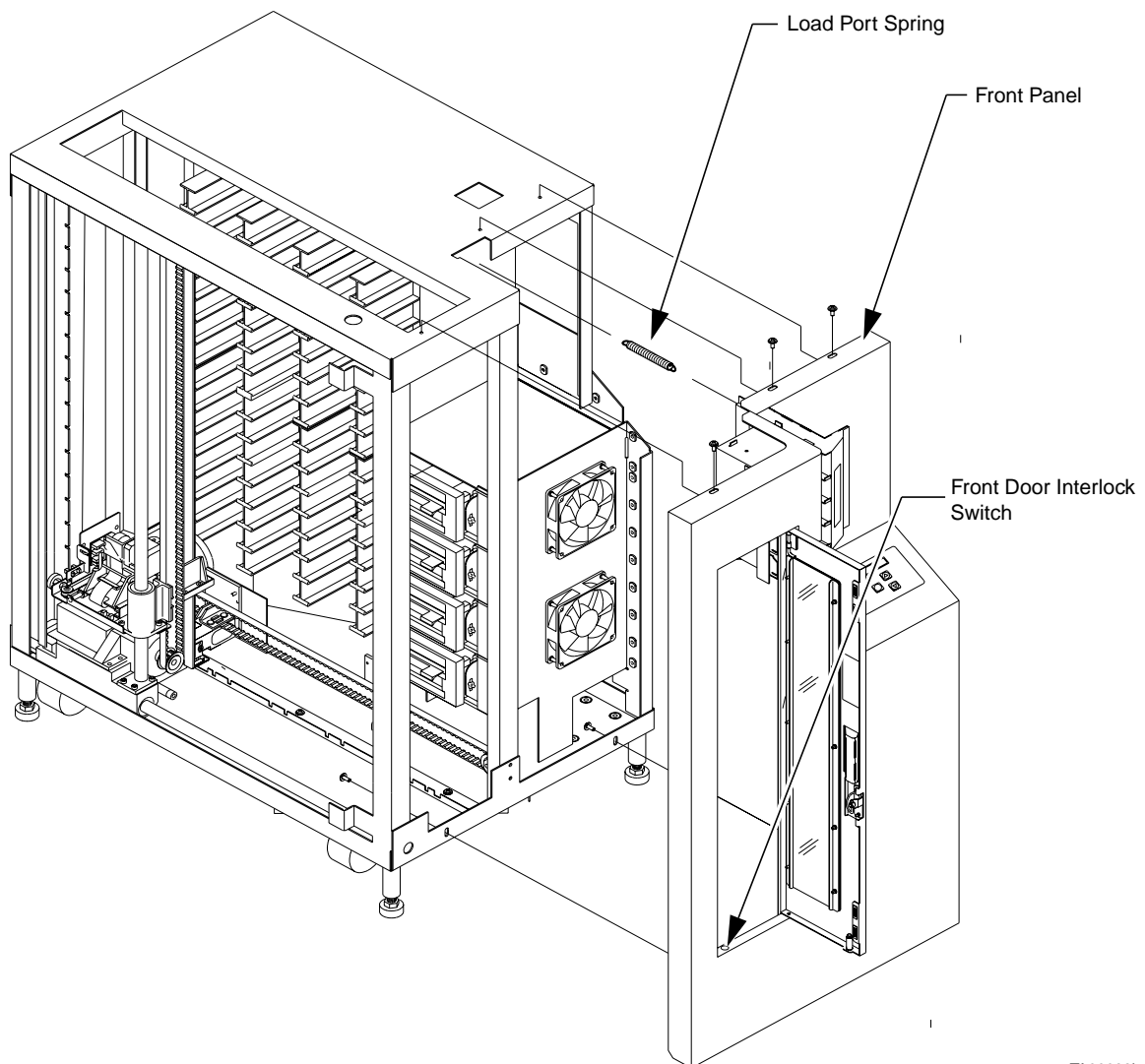
**Note** *With the load port open, access the spring from the left-hand side of the library. With the load port closed, access the spring from the right-hand side.*

2. From the right side of the library, remove the 13 screws that mount the EMI cover to the library frame. Pull away the EMI cover.
3. From the front top of the library, remove the three screws that secure the upper mounting lip of the front panel to the library frame.
4. From the lower front inside of the library, locate the two screws (one on the left and one on the right) that hold the lower mounting lip of the front panel to the library frame. Remove each of these screws.
5. Disconnect load port solenoid in-line connector SOL\_J1.
6. Carefully slide the front panel (from the top) away from the library frame.
7. Disconnect the front door interlock switch in-line connector SW2\_J1.
8. Disconnect blade connectors from the load port switches SW1 and SW2.

**Note** *Take care not to stress any cables connected between the front panel and the frame.*

9. Disconnect control panel ribbon connector A3\_J1.

Figure 29: Removing the Front Panel



TA00062b

## Removing the Controller Electronics Assembly

The controller electronics assembly is not an FRU, but the following four FRUs are among its components:

- Robotics controller PWA
- Actuator driver PWA
- PC logic power supply assembly
- Motor power supply assembly

You may find it easier to replace these components if you first remove the controller electronics assembly. (You are required to remove this assembly before replacing the motor power supply FRU.)

You must also remove the controller electronics assembly during the replacement procedure for the y-axis umbilical cable.

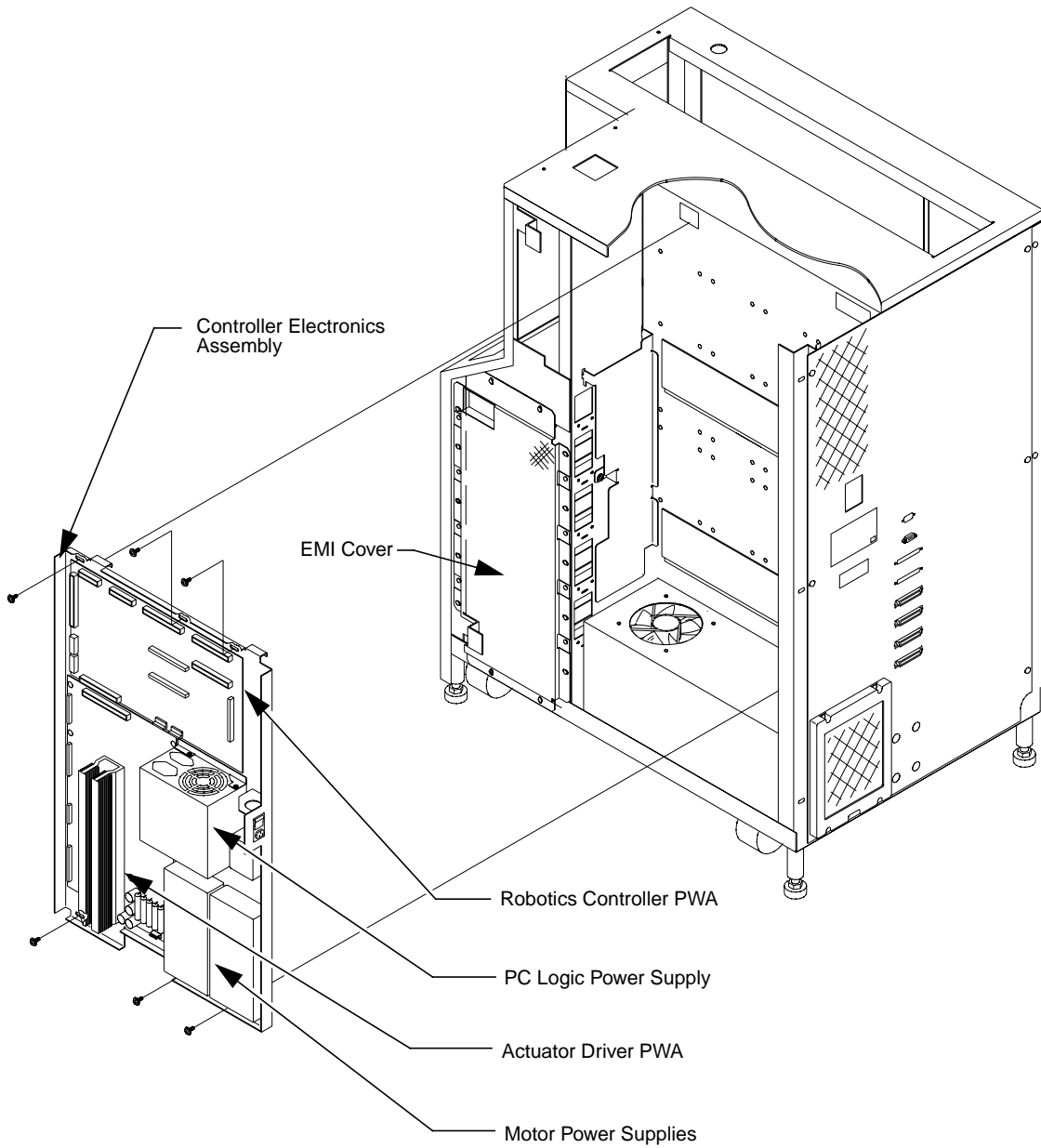
1. If you have not already done so, attach the anti-static wrist strap to a grounding point on the frame of the library.
2. From the right side of the library, locate the controller electronics assembly and disconnect robotics controller PWA connectors P2, P3, P6, P7 and P9 (Figure 30).
3. Disconnect actuator driver PWA connectors P2, P4, P5, P6 and P7.
4. Disconnect the five connectors coming from the logic power supply.

**Note** *To prevent the loss of screws, cover the fan opening directly below the controller electronics assembly.*

5. Remove six Philips screws (three on the top, and three on the bottom) that retain the controller electronics assembly to the library frame.
6. Slide the controller electronics assembly towards the front of the library, then lift up and out.



Figure 30: Controller Electronics Assembly




**Note:** The EMI cover has been discontinued in newer models; if it is present, it may be permanently removed.

TA00031d

## FRU Removal/Replacement Procedures

This section provides the procedures to be used to remove or replace a TL81X FRU. These procedures are written for authorized field service engineers (FSEs) only; they should not be performed by operators or other unauthorized personnel.

 **CAUTION** *Do not attempt to field-repair FRUs. Although the FRUs specified in this section are field replaceable, they must be repaired at the factory.*

 **CAUTION** *During all removal/replacement procedures, take appropriate measures to protect the library from ESD damage. Appropriate measures include: grounding the library, wearing anti-static apparel, maintaining a static-free environment, and so on.*


 **WARNING** *All removal/replacement procedures should be performed with the library turned off BUT plugged into a grounded power outlet. Failure to turn off and properly ground the library could result in personal injury or damage to the equipment.*

Table 6 on page 5-11 contains a list of all FRUs for the TL81X library.

Table 6: FRU List

<b>DEC Part No.</b>	<b>ATL Products/ OSN Part No.</b>	<b>FRU Name</b>	<b>Page No.</b>
29-32753-01	6210480-01	X-Axis Interconnect PWA	5-12
29-32755-01	6210511-01	X-Axis Stepper Motor Assembly	5-14
29-32754-01	6210510-01	Y-Axis Stepper Motor Assembly	5-16
29-32756-01	6210512-01	Load Port Door Lockout Solenoid	5-18
29-32758-01	6210516-01	Front Door Interlock Switch	5-20
29-32760-01	6210518-01	Y-Axis Umbilical Cable	5-22
29-32759-01	6210520-01	X-Axis Umbilical Cable	5-24
29-32671-01	0645083	X-Axis Drive Belt (Belt .375P .50W)	5-26
29-32671-01	0645083	Y-Axis Drive Belt (Belt .375P .50W)	5-28
29-32761-01	6210537-01	DC Fan Assembly (F1-F4)	5-30
29-32762-01	6210720-01	Extension Axis Assembly	5-34
TZ87N-AV	6203296-22	Tape Drive	5-36
29-32751-01	6210464-01	Tape Drive Interface PWA	5-38
29-32748-01	0815032	Stepper Motor Assembly	5-40
29-32749-01	6210440-01	Control Panel Assembly	5-42
29-32757-01	6210515-01	X-Axis Confirmation Sensor	5-44
29-32752-01	6210470-01	Robotics Controller PWA	5-46
29-32750-01	6210450-01	Actuator Driver PWA	5-48
29-32746-01	0355036	PC Logic Power Supply Assembly	5-50
29-32747-01	0355038	Motor Power Supply Assembly	5-52

## X-Axis Interconnect PWA


### Preparation

1. Have on hand a Phillips screwdriver, an anti-static wrist strap, and a flashlight.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Move the horizontal axis (Figure 31, A) to the front of the library and position the gripper directly under the tape drives.

**Note** *The PWA is accessed through the service port directly under the tape drives. Use the flashlight as necessary to help locate screws and connectors.*

### Removal

1. From the right side of the library, remove the 13 Phillips screws that mount the EMI cover to the library frame. Pull away the EMI cover.
2. From the access port (Figure 31, B) directly under the tape drives (C) on the right side of the library, remove the two Phillips screws (D) securing the strain relief bracket to the PWA (E) and disconnect the x-axis umbilical cable (connector A4\_J1).

 **CAUTION** *Pay attention to the orientation of connector Px when removed. Reinstalling connector A4\_J4 incorrectly will cause the library robotics to malfunction and may cause damage to the library.*

3. Disconnect the horizontal home sensor (connector A4\_J4).
4. Disconnect the y-axis motor (connector A4\_K3).
5. Remove the remaining two Phillips screws that secure the PWA to the horizontal frame.
6. Carefully lift the PWA out of the library through the service port.

### Replacement

Follow the removal instructions in reverse order.

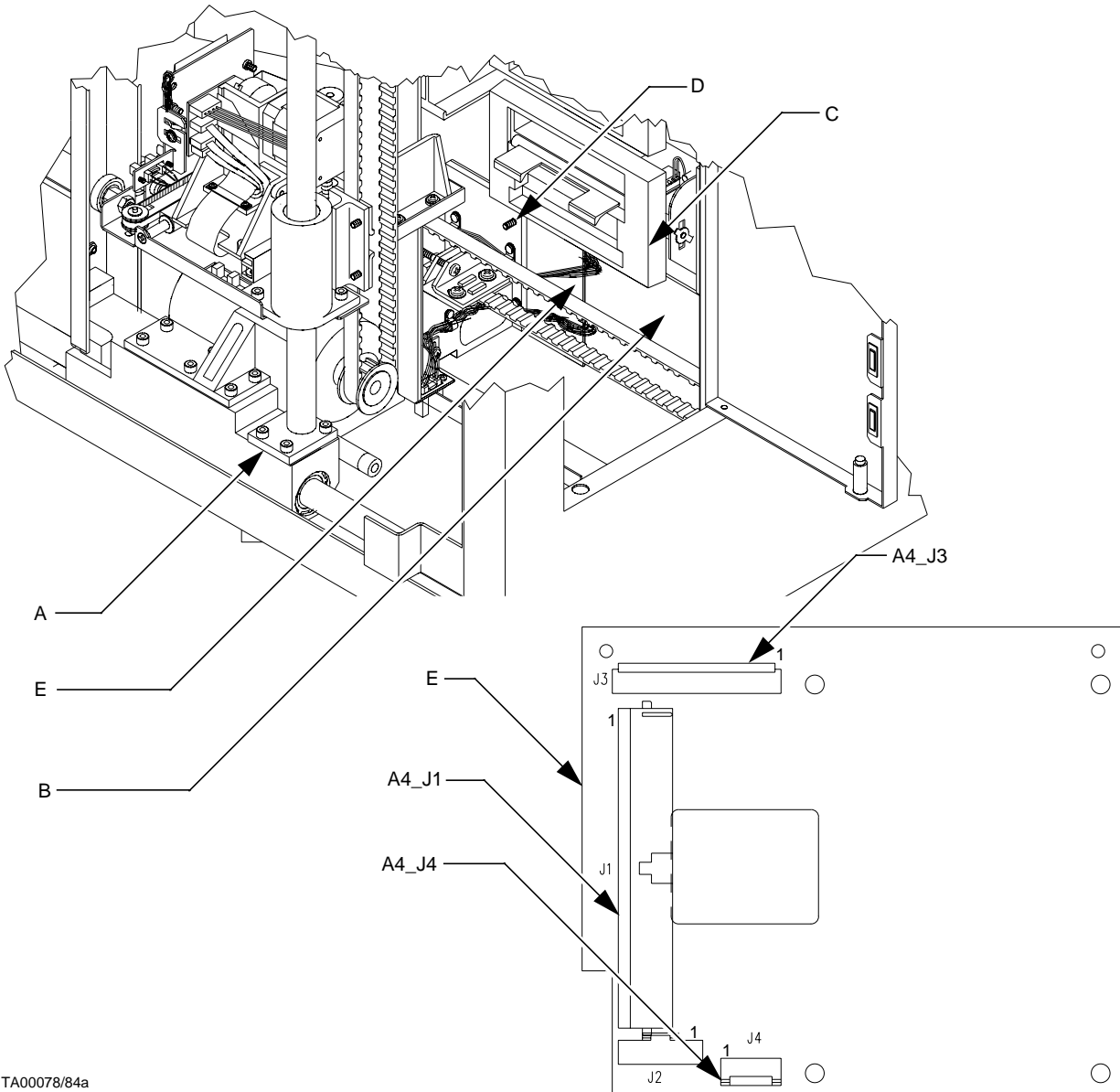
### Adjustments

None.

## Troubleshooting

If the library malfunctions, check the orientation of the horizontal home sensor connector A4\_J4 and reset it if necessary.

Figure 31: X-Axis  
Interconnect PWA



TA00078/84a

## X-Axis Stepper Motor Assembly

### Preparation

1. Have on hand a Phillips screwdriver, a pair of wire cutters, an anti-static wrist strap, and a 5/32 Allen wrench.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Position the horizontal axis toward the front of the library.

### Removal

1. From the left-side rear of the library, locate the x-axis stepper motor assembly. See Figure 32 on page 5-15.
2. Disconnect the x-axis stepper motor in-line connector J1 which is plugged into connector M2\_J2.
3. Using the wire cutters, cut the tie wraps that secure the x-axis stepper motor cable.
4. Loosen the horizontal belt (A) at the horizontal belt tensioner. For details about this procedure, go to “X-Axis Belt” on page 3-15.
5. Remove the four Phillips screws (B) that secure the x-axis stepper motor mounting bracket (C) to the frame (D).
6. Using the Allen wrench, remove the four hex screws (E) that secure the x-axis stepper motor (F) to its mounting bracket (C).

### Replacement

Follow the removal instructions in reverse order.

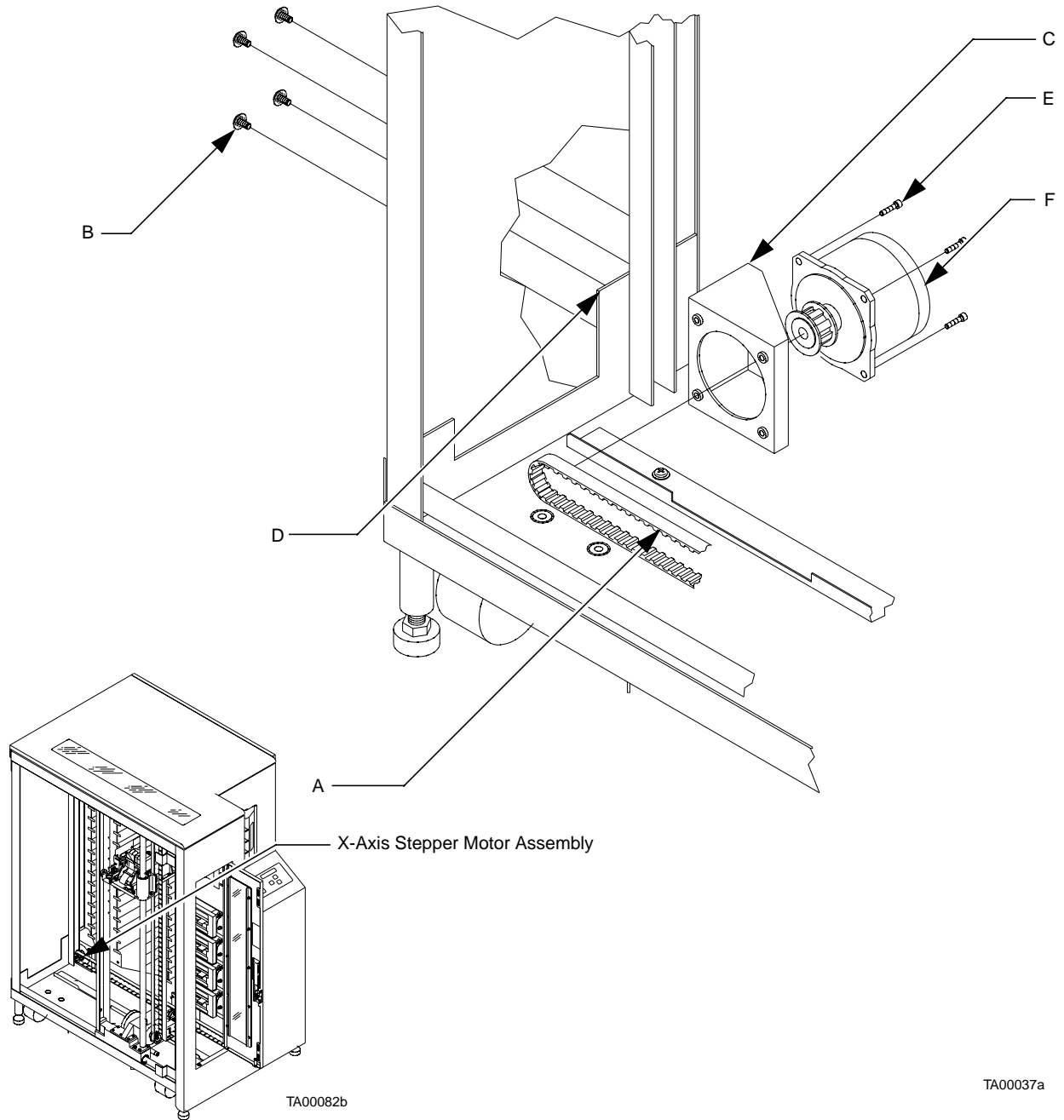
### Adjustments

1. Complete horizontal belt tension adjustment using “X-Axis Belt” on page 3-15.
2. Auto calibrate all.

### Troubleshooting

A loose horizontal belt will produce an unusual amount of noise when the horizontal axis moves.

Figure 32: X-Axis Stepper Motor Assembly



## Y-Axis Stepper Motor Assembly

### Preparation

1. Have on hand a flat-blade screwdriver, a 5/32 Allen wrench, an 11/32 hex nut driver, and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Move the horizontal carriage toward the front of the library.
5. Secure the extension axis up and out of the way using a tie wrap around the y-axis rail. Wrap the tie wrap around the y-axis rail using one of the conformation sensor slots.



#### **WARNING**

*Failure to securely fix the position of the vertical axis assembly during this operation could cause injury.*

### Removal

1. From the left-side of the library, loosen the vertical belt (Figure 33, A) using the belt tensioner. For details, see “Rollers” on page 3-10.
2. Using the flat-blade screwdriver and nut driver, remove the three cable clamps (B, C, & D) to free the stepper motor connector cable.
3. Disconnect the y-axis stepper motor connector P1 and remove the cable clamps holding the harness to the back of the PWA.

**Note** *Pay attention to routing of harness before removal.*

4. Using the Allen wrench, remove the four screws (E) securing the y-axis stepper motor (F) to the x-axis carriage assembly (G) and lift it out.

### Replacement

Follow the removal instructions in reverse order.

### Adjustments

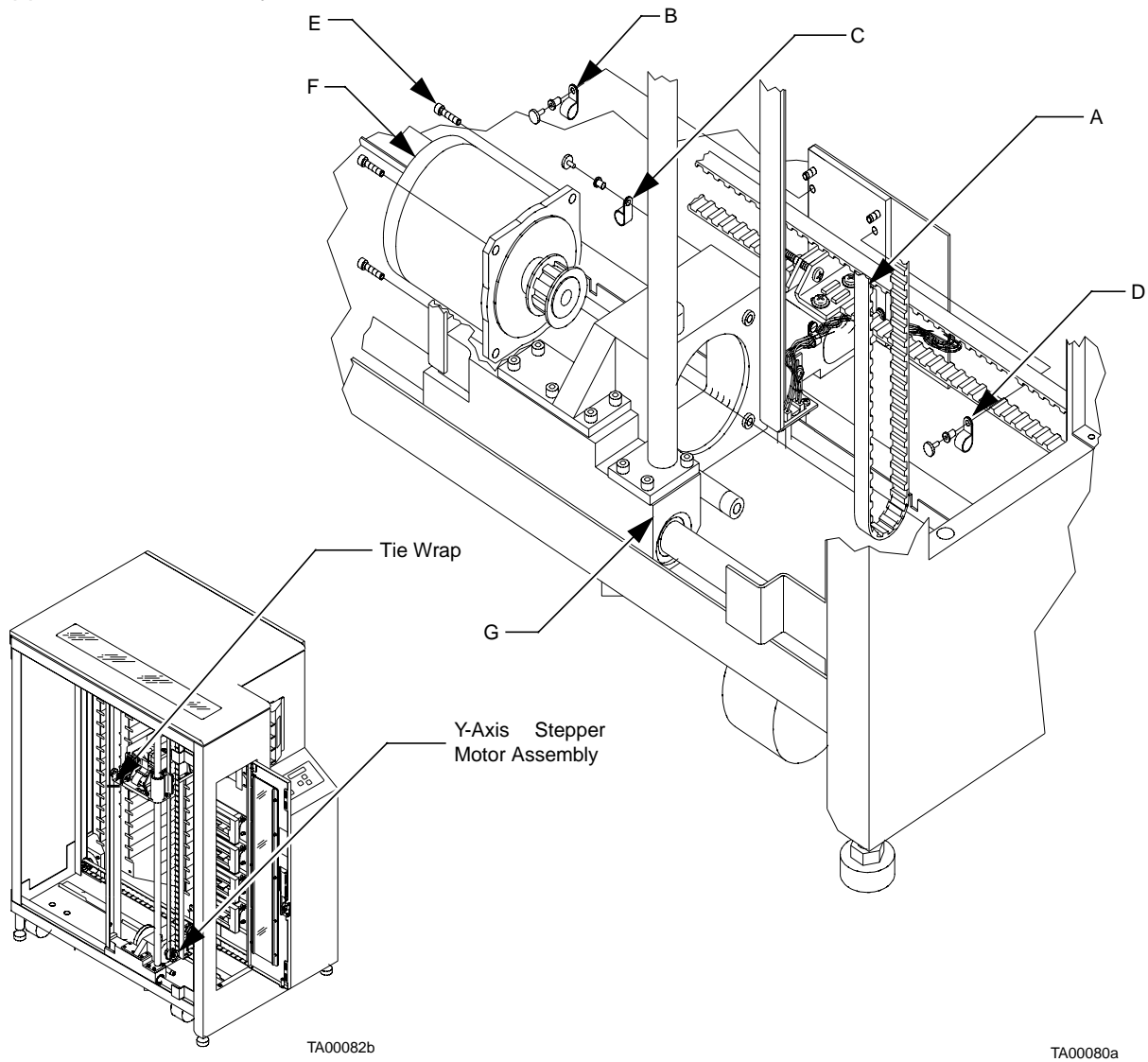
1. Adjust vertical belt tension. See “Y-Axis Belt” on page 3-13.
2. Adjust horizontal belt tension. See “X-Axis Belt” on page 3-15.
3. Auto calibrate all.



## Troubleshooting

None.

Figure 33: Y-Axis  
Stepper Motor Assembly



## Load Port Door Lockout Solenoid

### Preparation

1. Have on hand a Phillips screwdriver, a crescent wrench, an anti-static wrist strap, and a small punch.
2. Turn off the library and remove the top, left-side, right-side, and front cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. With the front panel removed, locate the load port door lockout solenoid from inside the front panel. See Figure 34 on page 5-19.
2. Disconnect the in-line solenoid connector J1 plugged into SOL\_J1.
3. Remove the two self-locking nuts (A) that retain the load port upper pivot block (B) to the front panel (C).
4. Remove pivot block (B) from front panel (C).
5. Invert pivot block (B) and lift out load port locking lever assembly (C).
6. Remove the solenoid (D) from its mounting bracket (E).

**Note** *Take note of the wire and connector orientation exiting the solenoid before disassembling.*

7. Remove the solenoid from the solenoid mounting bracket by removing the solenoid retaining nut and lock washer (F).
8. With the solenoid plunger (G) on a firm surface, press out the pivot pin (H).

### Replacement

Follow the removal instructions in reverse order.

**Note** *Special attention should be paid to the coil orientation of the pin when reinstalling.*

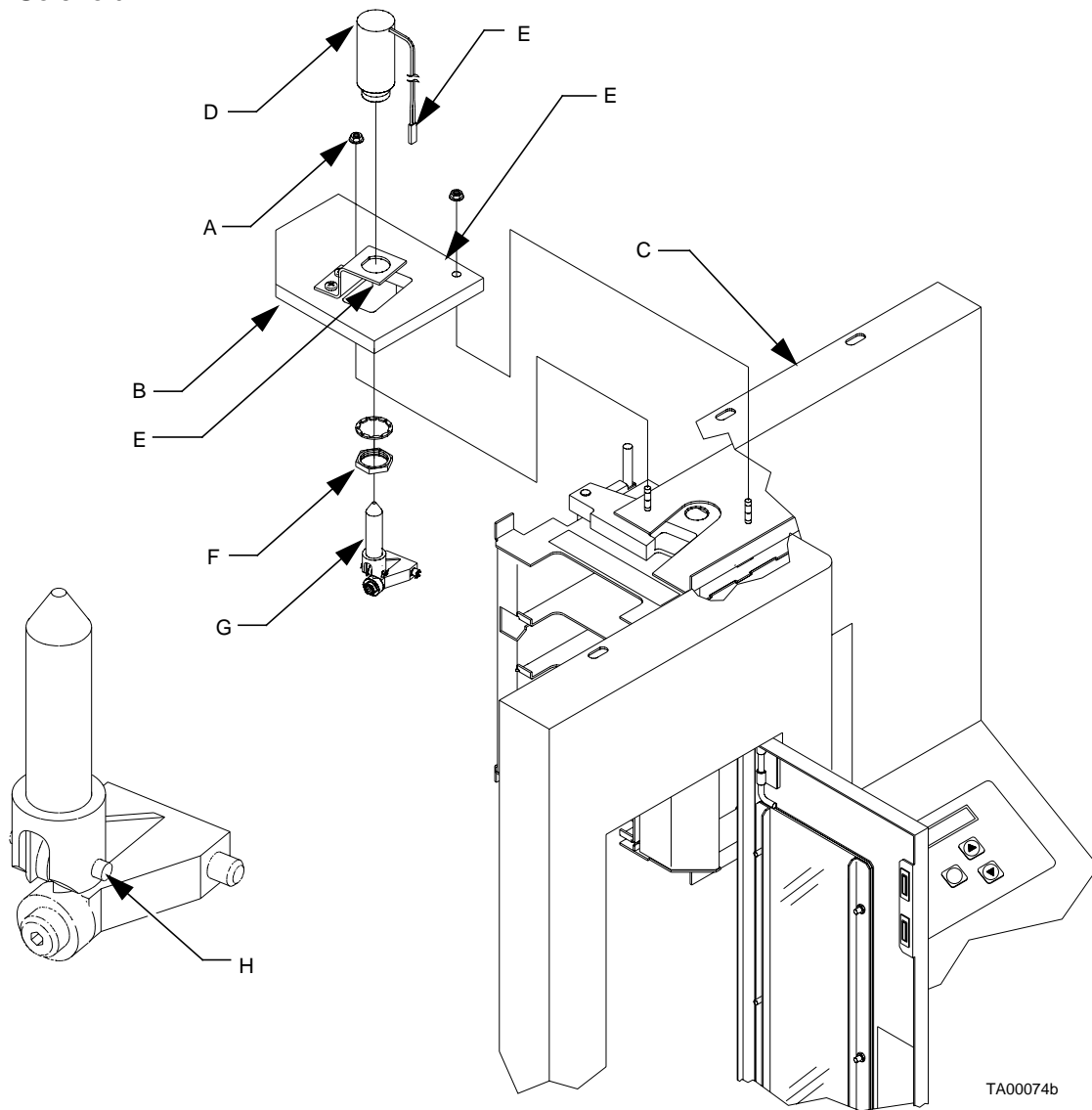
### Adjustments

Auto calibrate the load port.

### Troubleshooting

None.

Figure 34: Load Port Door  
Interlock Solenoid



TA00074b

## Front Door Interlock Switch

### Preparation

1. Have on hand a pair of snap ring pliers and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Open the front door.

### Removal

1. From the left lower side of the library, disconnect the front door interlock switch which is plugged into SW2\_J1 connector. See Figure 35 on page 5-21.
2. Using the snap ring pliers, remove the snap ring (A) which holds the interlock switch (B) in place.
3. Lift the interlock switch (B) and its cable up through the hole.

### Replacement

Follow the removal instructions in reverse order.

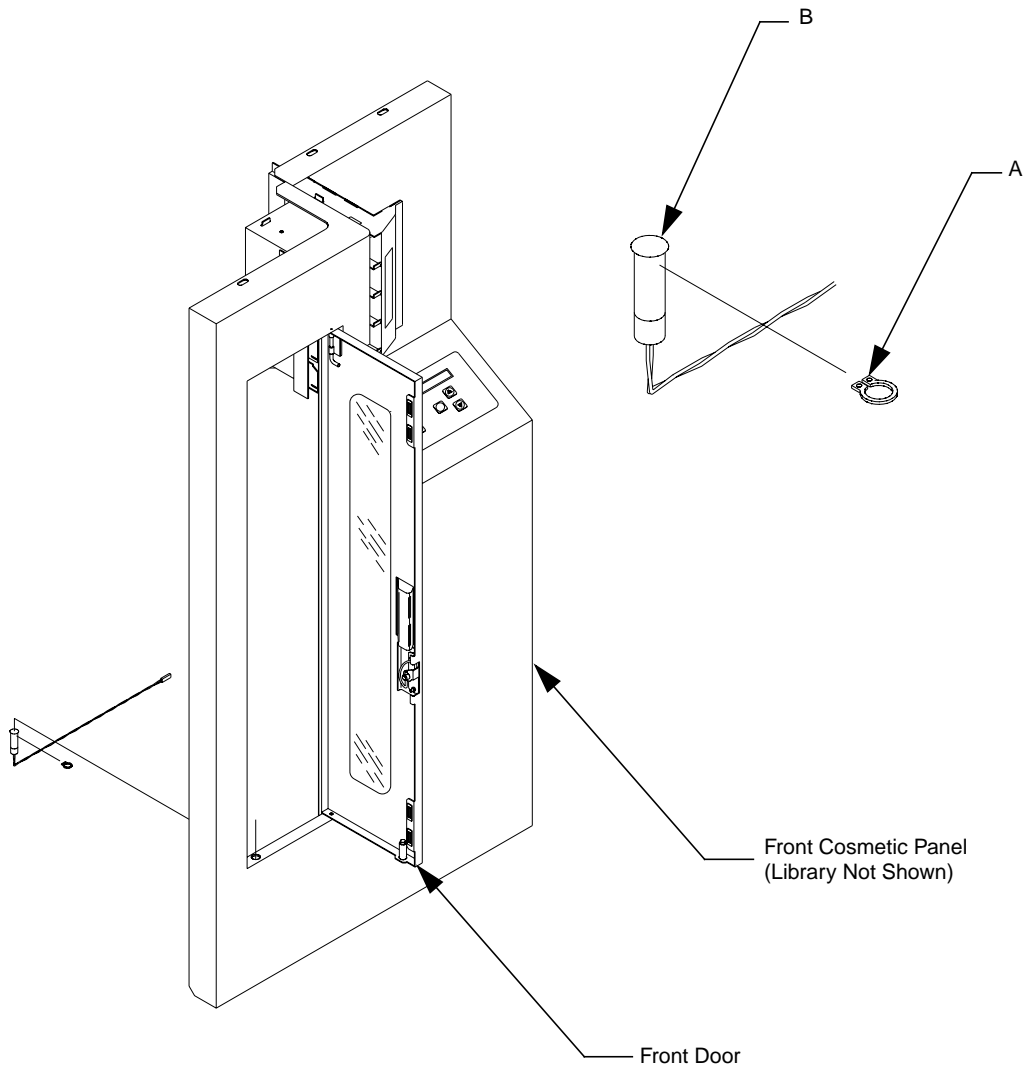
### Adjustments

None.

### Troubleshooting

None.

Figure 35: Front Door  
Interlock Switch



TA00057b

## Y-Axis Umbilical Cable

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Move the x-axis carriage assembly to the front of the library.

### Removal

1. From the left-side of the library, locate the y-axis stepper motor assembly and remove the top and bottom cable strain reliefs (A) by removing the four Phillips screws (B). See Figure 36 on page 5-23.
2. Disconnect A5\_J3 and free the cable (C) from the extension carriage PWA (not shown).
3. From the upper inside back wall of library, locate and remove the cable strain relief (E) by removing two Phillips screws (F).
4. From the right side of the library, locate and remove connector A2\_J4 from the actuator driver PWA.
5. Remove the controller electronics assembly. See “Removing the Controller Electronics Assembly” on page 5-8 for removal instructions.
6. Lift the cable out.

### Replacement

1. Use the removed cable as a template to introduce folds into the replacement cable.
2. Follow the removal instructions in reverse order.

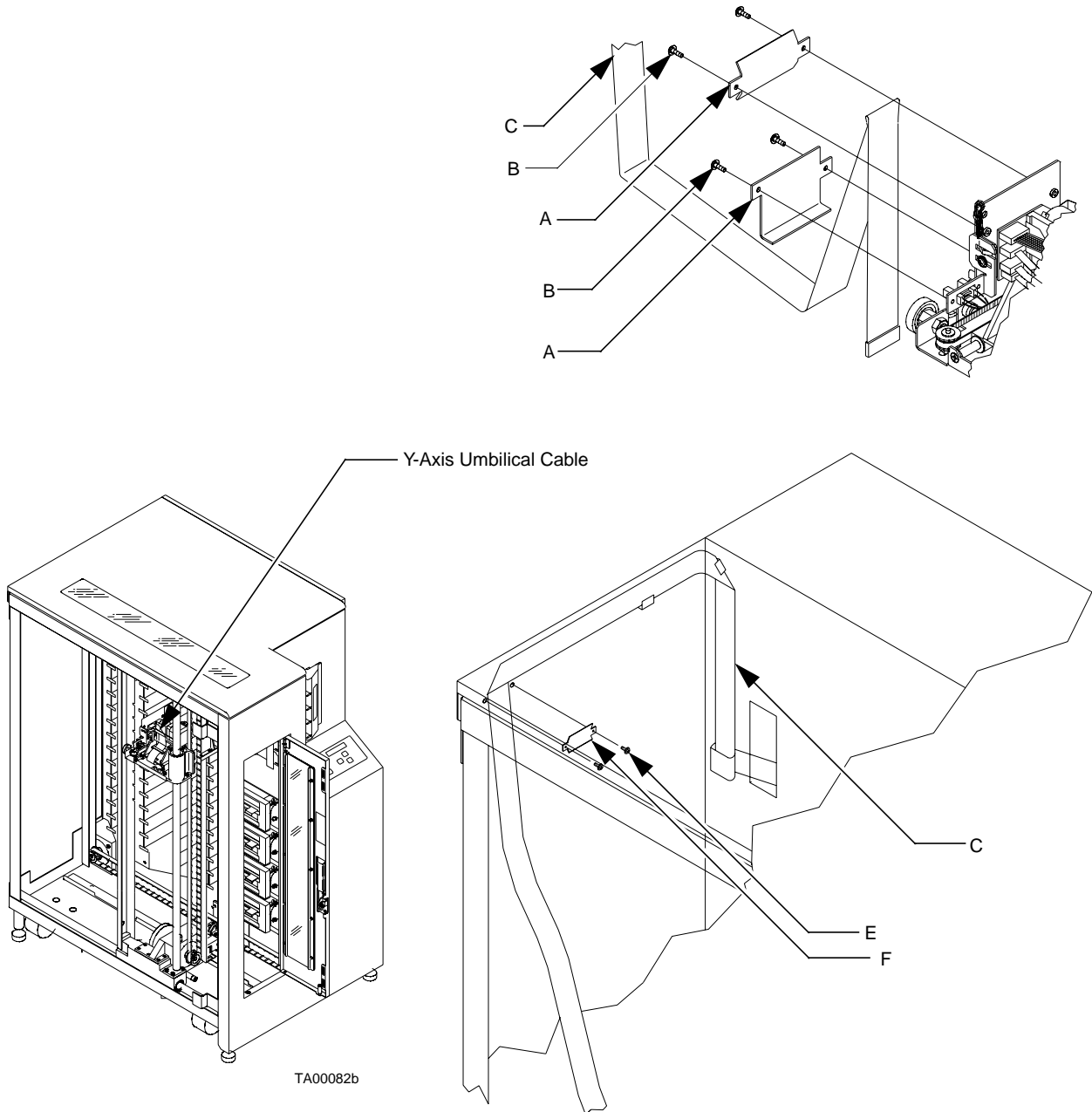
### Adjustments

None.

### Troubleshooting

None.

Figure 36: Y-Axis  
Umbilical Cable



## X-Axis Umbilical Cable

### Preparation

1. Have on hand a pair of snap ring pliers and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Position the horizontal carriage to the front of the library directly under the tape drives.

### Removal

1. From the right side of the library, remove the x-axis umbilical cable connector A4\_J1 using removal steps 1 and 2 from the procedure in “X-Axis Interconnect PWA” on page 5-12.
2. From the left side of the library, move the horizontal carriage (A) to the rear of the library. See Figure 37 on page 5-25.
3. Remove the two screws (B) retaining the strain relief (C) which secures the x-axis umbilical cable (D) to the library frame.
4. Lift the cable out of the library chassis.

### Replacement

1. Use the removed cable as a template to introduce folds into the replacement cable.
2. Follow the removal instructions in reverse order.

### Adjustments

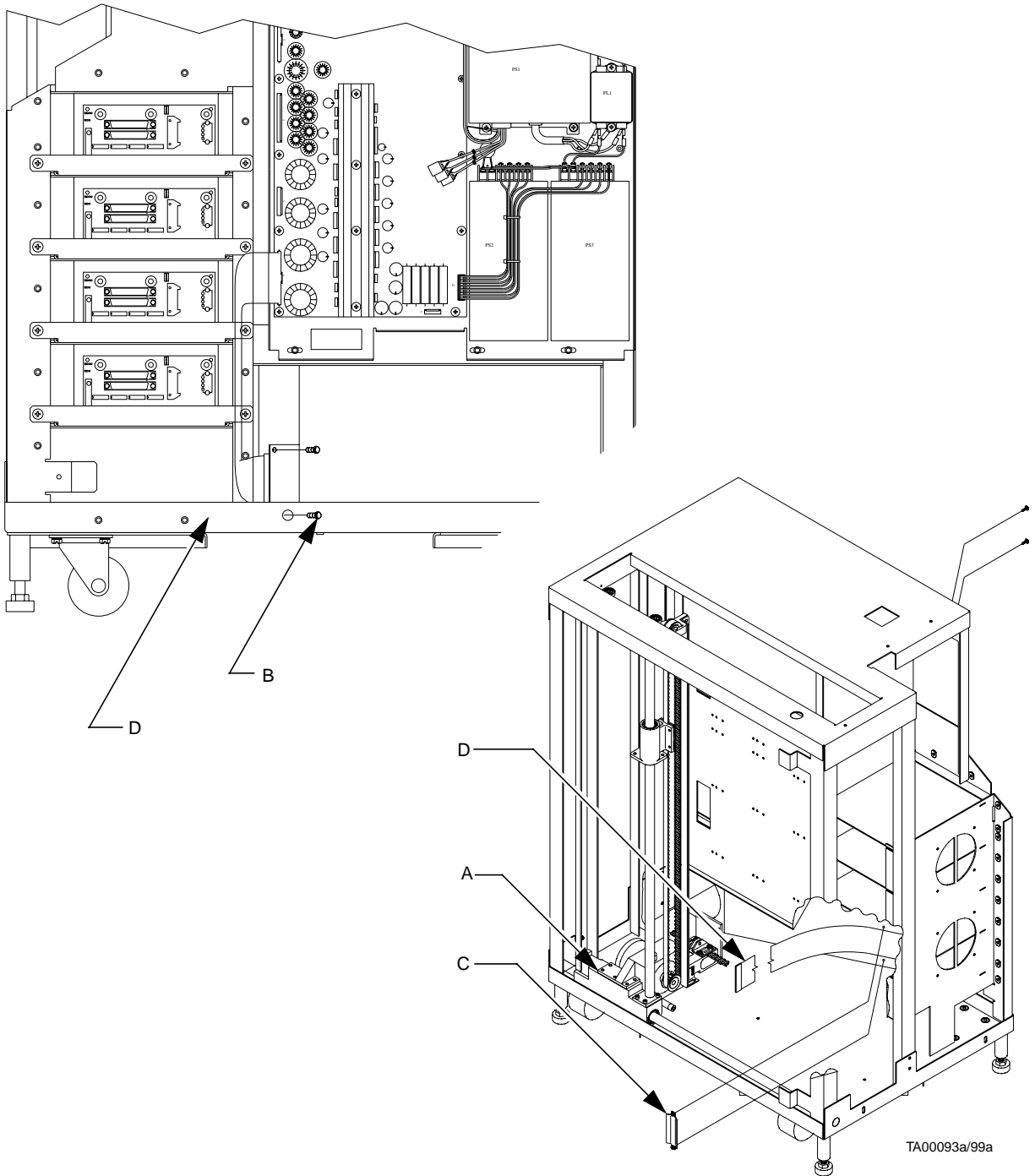
None.

### Troubleshooting

None.



Figure 37: X-Axis  
Umbilical Cable



## X-Axis Drive Belt

### Preparation

1. Have on hand a short-handled Phillips screwdriver, a small wrench, and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Move the horizontal axis to the middle of the library.

### Removal

1. From the left side of the library, on the x-axis assembly, loosen (to near removal) the two Phillips screws (A) on the fixed half of the belt tensioner (B). See Figure 38 on page 5-27.
2. Loosen (to near removal) the two Phillips screws (C) on the adjustable half of the belt tensioner (D). The belt (E) should fall away.
3. Loosen the adjustment screw (F) on belt tensioner by loosening the jam nut (G) and unscrewing it to its fullest extension.

### Replacement

Follow the removal instructions in reverse order.

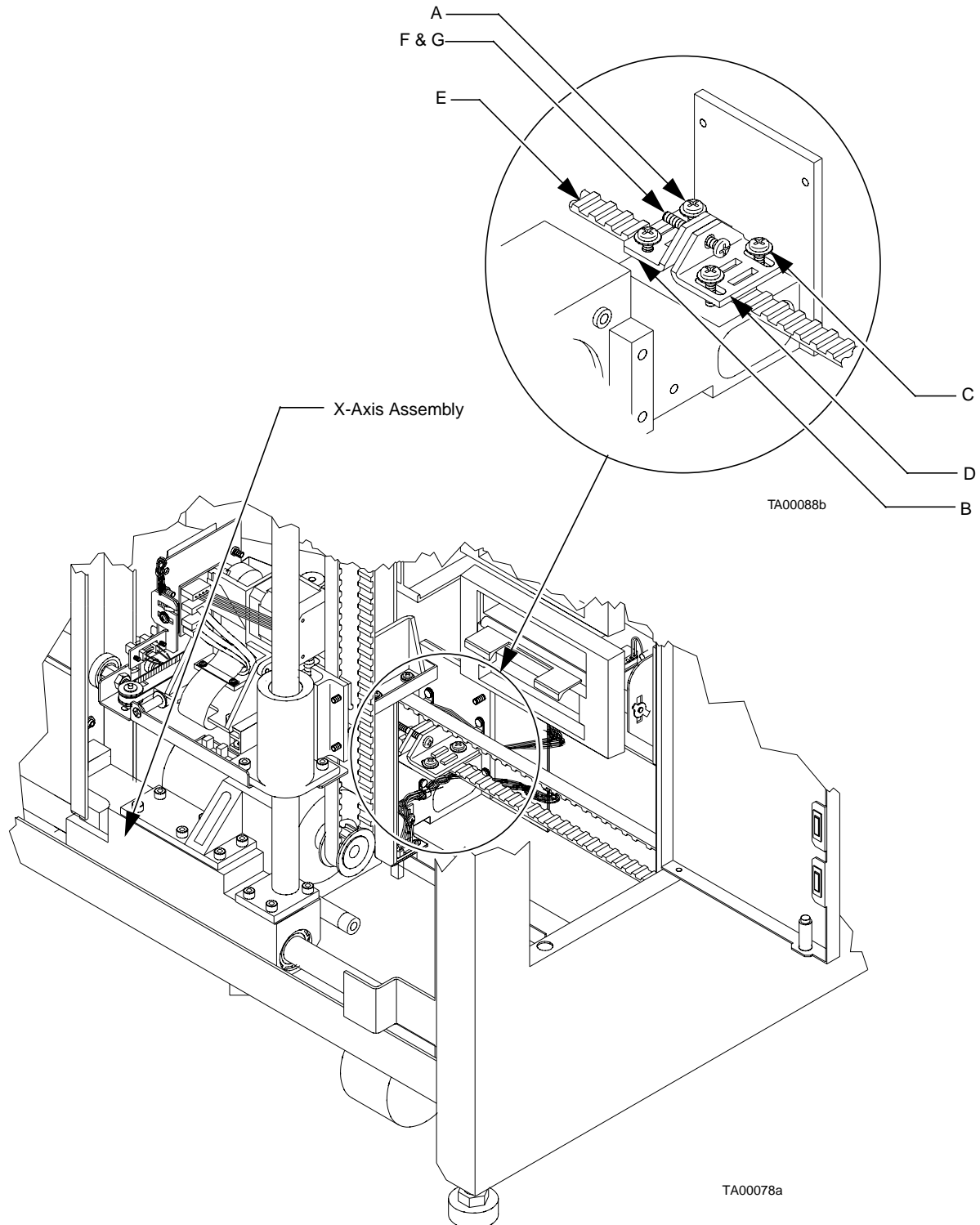
### Adjustments

Complete the horizontal belt tension adjustment using “X-Axis Belt” on page 3-15.

### Troubleshooting

A loose horizontal belt will produce an unusual amount of noise when the horizontal axis moves.

Figure 38: X-Axis Drive Belt



## Y-Axis Drive Belt

### Preparation

1. Have on hand a short-handled Phillips screwdriver, a small wrench, and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. Move the horizontal axis to the rear of the library and secure the extension axis assembly midway up the y-axis.

### Removal

1. From the left side of the library, on the y-axis assembly (A), loosen the belt tensioning adjustment screw (B) by loosening the jam nut (C) and unscrewing to its fullest extension. See Figure 39 on page 5-29.
2. Loosen (to near removal) the four Phillips screws (D & E) in both halves of belt tensioner (F & G) and the belt (H) should fall away.

**Note** *The top pulley is held in place by the belt and gravity. Use care not to dislodge the top pulley when removing the belt.*

### Replacement

1. Thread the belt over the top pulley (tooth side in).
2. Thread the inner side of the belt under the bottom pulley (J) and place the last two teeth into the tooth slots (K) of the tensioner fixed half (G). Hold the tensioner fixed half (G) and belt (H) tightly while securing the two lower screws.
3. Working with the outer side of the belt, place the last two teeth into the tooth slots in the tensioner adjustable half (F). Hold the tensioner adjustable half (F) and belt (H) tightly while reinstalling the two upper screws.

**Note** *The y-axis drive belt may need trimming.*

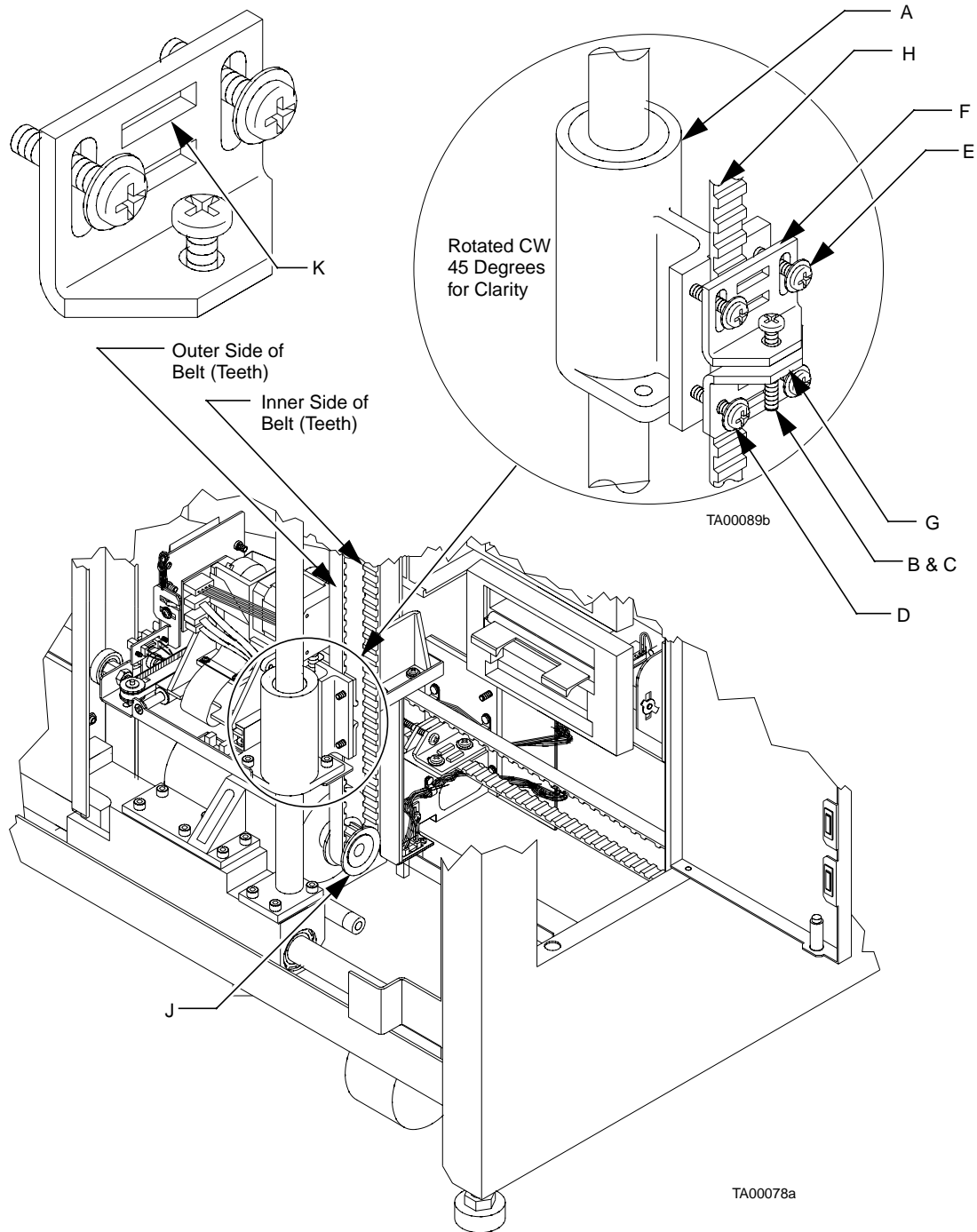
### Adjustments

Complete the vertical-belt tension adjustments using “Y-Axis Belt” on page 3-13.

### Troubleshooting

None.

Figure 39: Y-Axis Drive Belt



## DC Fan Assembly (F1-F4)

Four DC fans cool the TL81X library. Two of these fans are located in front while the remaining two are located towards the rear. The steps to remove and replace the fans have been broken down into two procedures (one procedure for the front fans and another procedure for the rear fans).

### Preparation

1. Have on hand a Phillips screwdriver, a thin-blade screwdriver, a pair of wire cutters, a flashlight, and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, right-side, and front cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal of a Front Fan (F3 or F4)

1. From the front of the library, disconnect the appropriate fan flying connector (FAN3\_J1 or FAN4\_J1). See Figure 40 on page 5-31.
2. From the right side of the library, on the left side of drive bays 1 and 2 or 3 and 4 (see “Library Numbering Conventions” on page 2-4), locate the 4 plastic reusable pop-rivets (A) that secure the fans (B and C) to the library frame.
3. Remove the rivets by sliding a thin blade screwdriver under the rivet head and lift until it pops up. Repeat four times for each fan. Remove the fan(s).

### Replacement

Follow the removal instructions in reverse order.

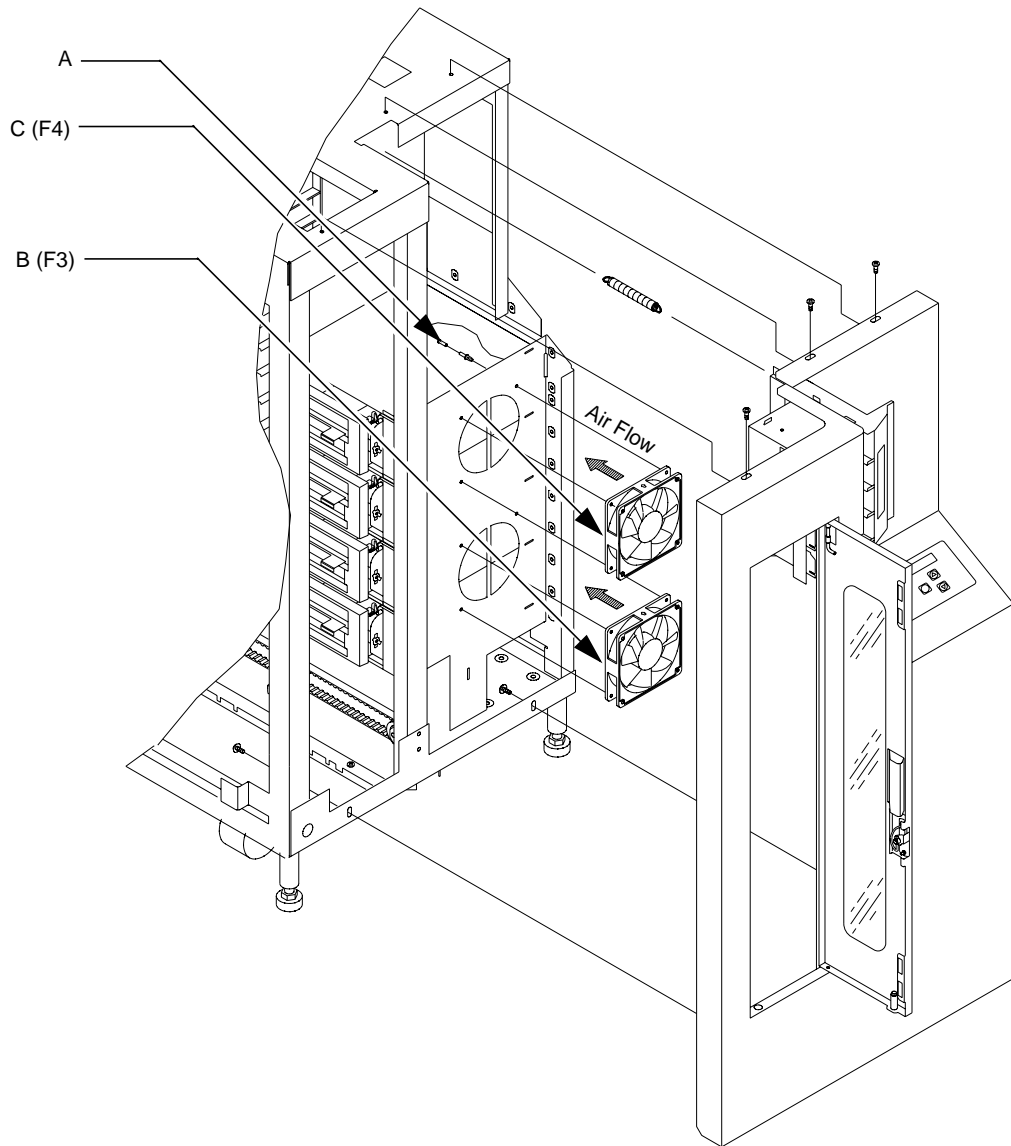
### Adjustments

Auto calibrate load port.

### Troubleshooting

None.

Figure 40: Front Fan  
Assemblies (F3 & F4)



TA00054c

## Removal of a Rear Fan (F1 or F2)

1. From the right side of the library, free the ribbon cable harnesses from the ribbon cable clamps on the left-hand side of the Fixed Storage Array. See Figure 41 on page 5-33.
2. Remove the male/female standoffs that retain the connectors to the rear panel (A).
3. Remove the 7 screws (B) that retain the rear panel (A) and remove the rear panel (A) from the library.
4. To remove F1:
  - a. From the rear of the library, inside the cooling ducting, disconnect flying fan connectors FAN1\_J1.
  - b. From the left side of the library, locate fan F1 (C) behind the x-axis motor.
  - c. Slide a thin blade screwdriver under the rivet head (D) and lift until it pops up. Repeat four times.
5. To remove F2:
  - a. From the rear of the library, inside the cooling ducting, disconnect flying fan connectors FAN2\_J1.
  - b. From the right side of the library, below the control electronics assembly, locate fan F2 (E).
  - c. Slide a thin blade screwdriver under the rivet head (F) and lift until it pops up. Repeat four times.

## Replacement

Follow the removal instructions in reverse order.

## Adjustments

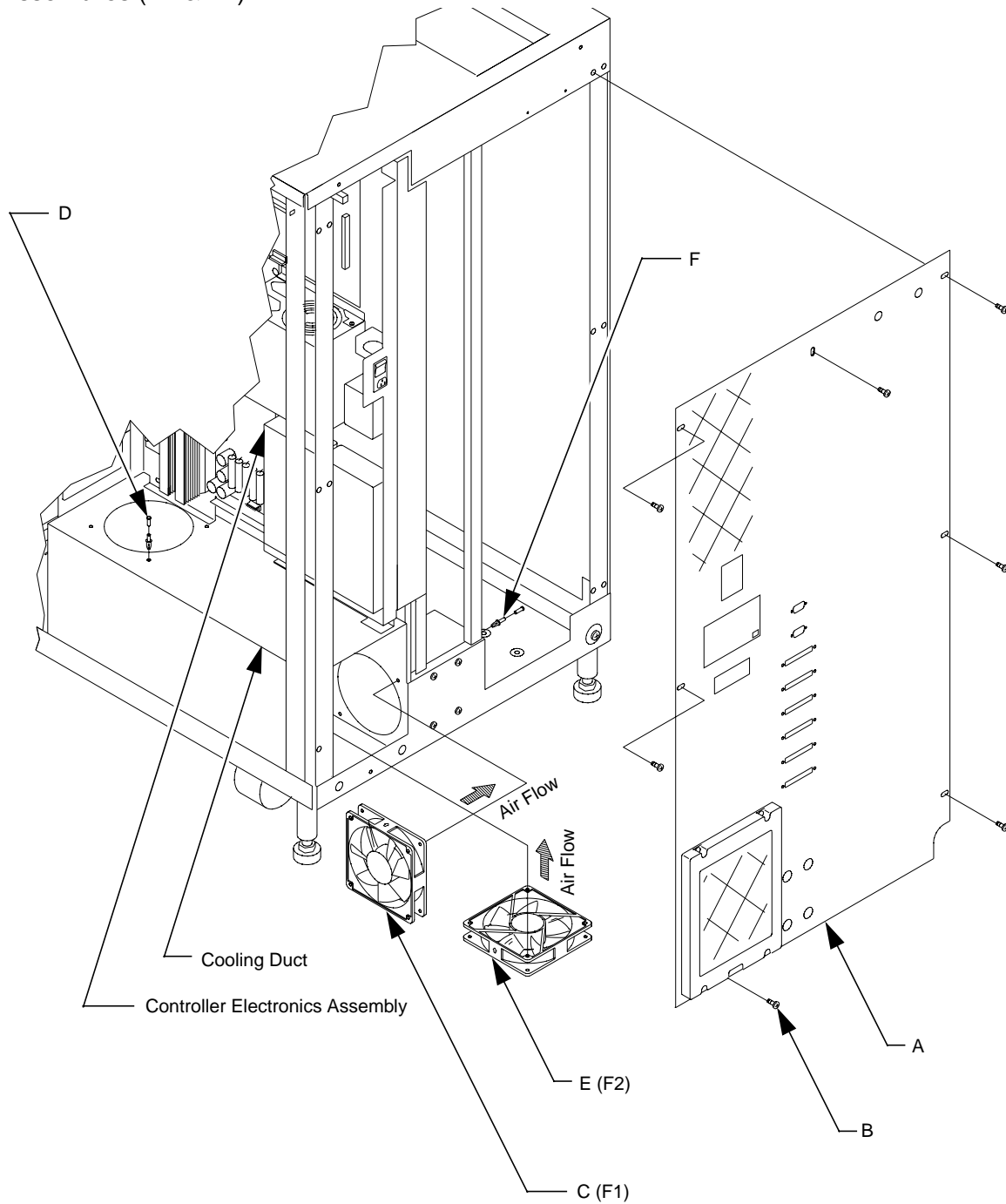
None.

## Troubleshooting

None.



Figure 41: Rear Fan Assemblies (F1 & F2)



TA00055b

## Extension Axis Assembly

### Preparation

1. Have on hand a Phillips screwdriver, a 5/32 Allen wrench, and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. From the left side of the library, locate the y-axis stepper motor assembly and remove the top and bottom cable strain reliefs (A) by removing the four Phillips screws (B). See Figure on page 5-34.
2. Disconnect A5\_J3 and free the cable (C) from the extension carriage PWA (not shown).
3. Remove the 3 mounting screws (E) that secure the extension axis (F) to the linear bearing (G) on the vertical rail.

**Note** *Hold the extension axis assembly securely when removing the last mounting screw.*

4. Gently turn the extension axis assembly clockwise and remove it from between rails towards you.

### Replacement

Follow the removal instructions in reverse order.

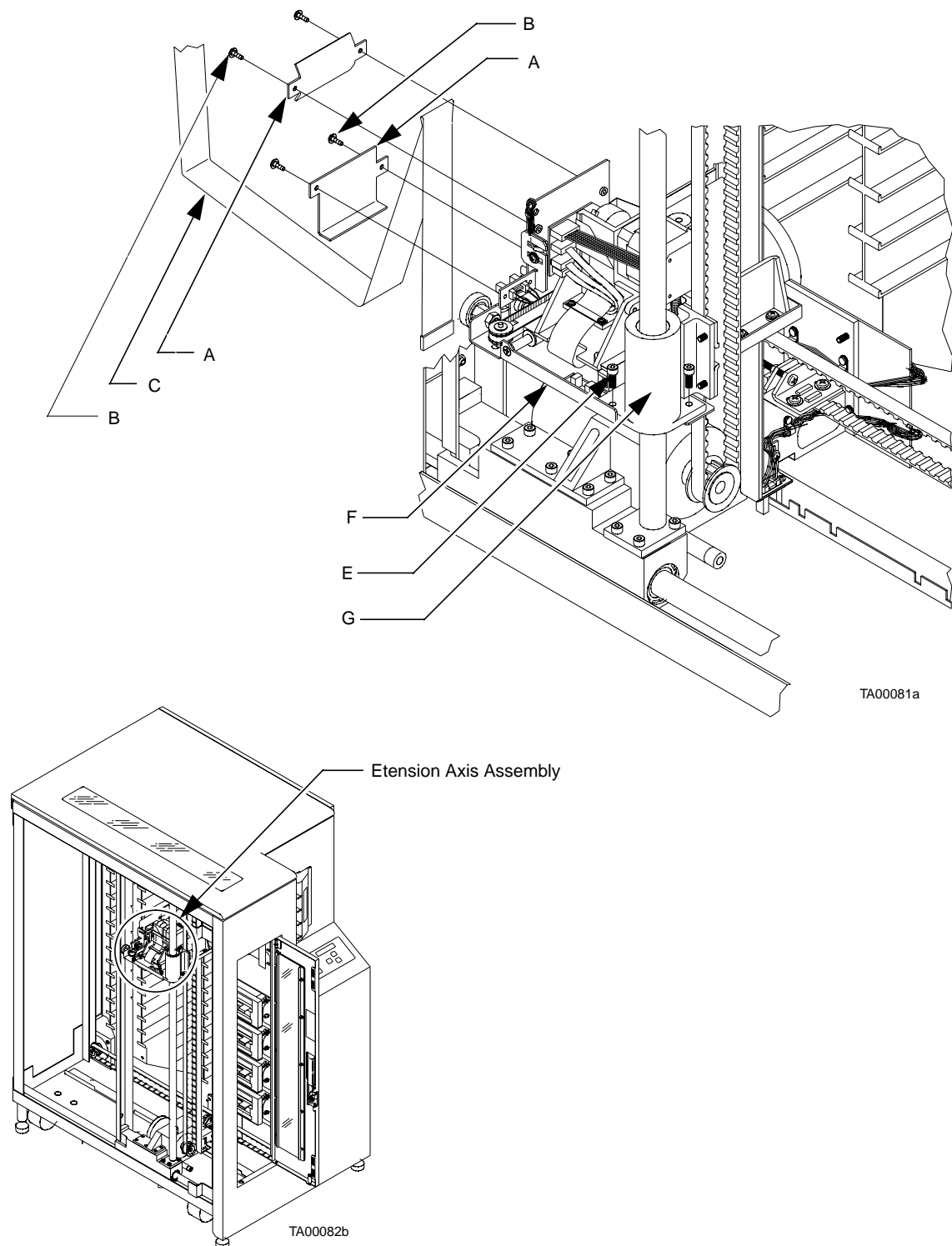
### Adjustments

Auto calibrate all.

### Troubleshooting

None.

Figure 42: Extension  
Axis Assembly



## Tape Drive

There can be up to four drives in a library. The following procedure applies to all four drives.

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. From the right-front side of the library, remove the 14 philips screws (A) securing the EMI cover (B). Lift the EMI cover off. See Figure 43 on page 5-37.

**Note** *The EMI cover has been discontinued in newer models of TL81X library. If this cover is present, it may be permanently removed. If it is not present, skip step 1 and go on with step 2.*

2. Disconnect the 2 SCSI, 1 power, and 2 data connectors (connector numbers will vary with each drive) from the tape drive interface PWA (C).
3. Remove two screws (D) that secure the tape drive mounting plate (E) to the frame (F) and slide the plate and drive out.
4. Remove the 4 screws (G) securing the tape drive (H) to the mounting plate (E).
5. Remove the tape drive interface PWA (C) as follows:
  - a. Disconnect the 3 and 4 pin connectors (connector numbers will vary with each drive) coming from the stepper motor assembly (L) to the tape drive interface PWA (C).
  - b. Remove the 3 Phillips screws securing the tape drive interface PWA (C) to the PWA mounting bracket (K).
6. From the left side of the tape drive (H), remove the two Phillips screws (J) securing the tape drive interface PWA mounting bracket (K) and lift away the bracket.
7. Remove the stepper motor assembly (L) from the drive (H). See “Stepper Motor Assembly” on page 5-40 for removal instructions.

## Replacement

Follow the removal instructions in reverse order.

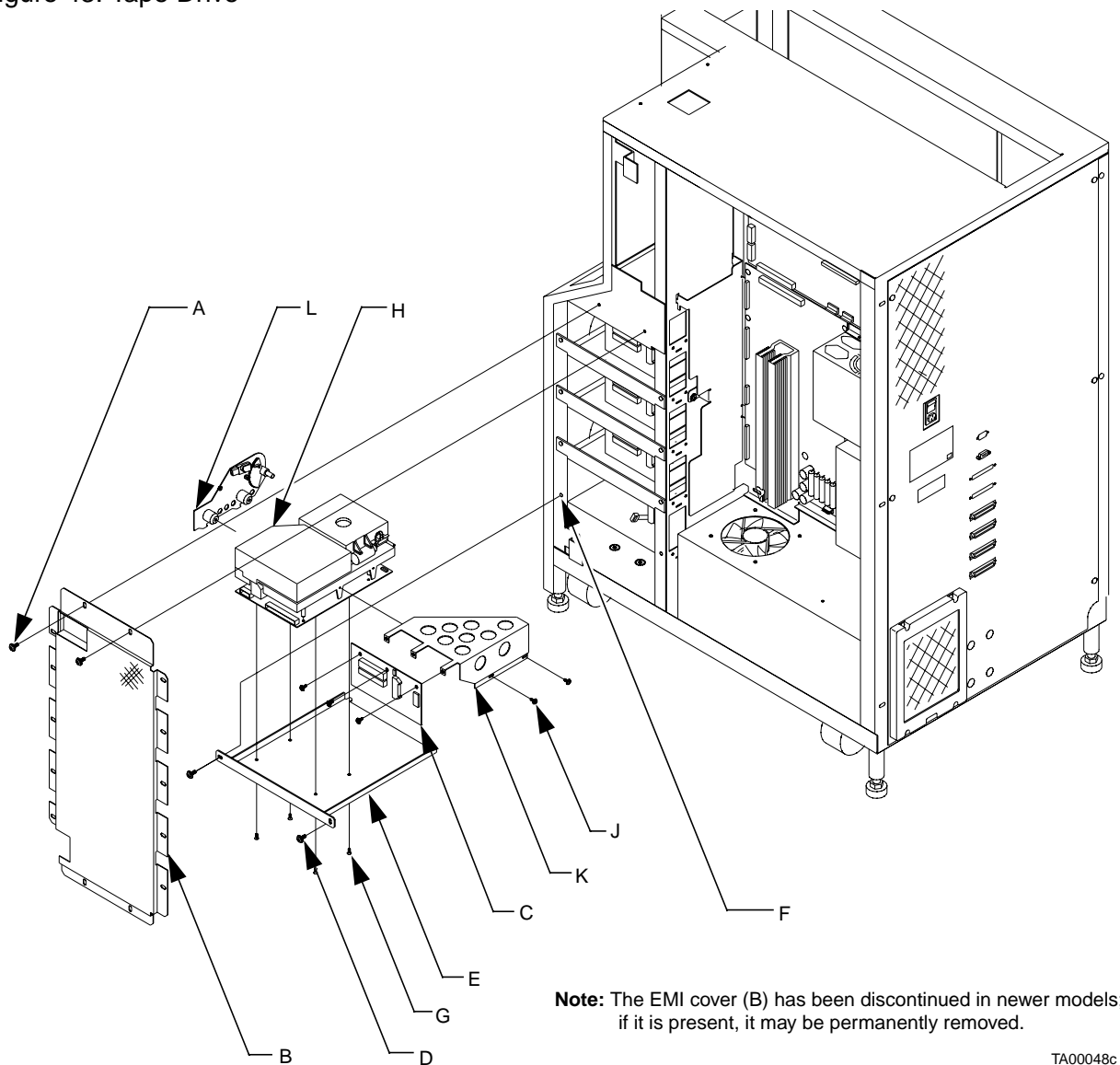
## Adjustments

Auto calibrate the drives.

## Troubleshooting

None.

Figure 43: Tape Drive



TA00048c

## Tape Drive Interface PWA

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. From the right-front side of the library, remove the 14 Phillips screws (A) securing the EMI cover (B). Lift the EMI cover off. See Figure 44 on page 5-39.

**Note** *The EMI cover has been discontinued in newer models of TL81X library. If this cover is present, it may be permanently removed. If it is not present, skip step 1 and go on with step 2.*

2. Disconnect the 2 SCSI, 1 power and 2 data connectors (connector numbers will vary with each drive) from the tape drive interface PWA (C).
3. Disconnect the 3 and 4 pin connectors (connector numbers will vary with each drive) coming from the stepper motor assembly (D) to the tape drive interface PWA (C).
4. Remove the 3 Phillips screws (E) securing the tape drive interface PWA (C) to the PWA mounting bracket (F).
5. Gently pull the tape drive interface PWA (C) towards you until the connectors come free of the tape drive (G). Pull the tape drive interface PWA (C) from the library.

### Replacement

Follow the removal instructions in reverse order.

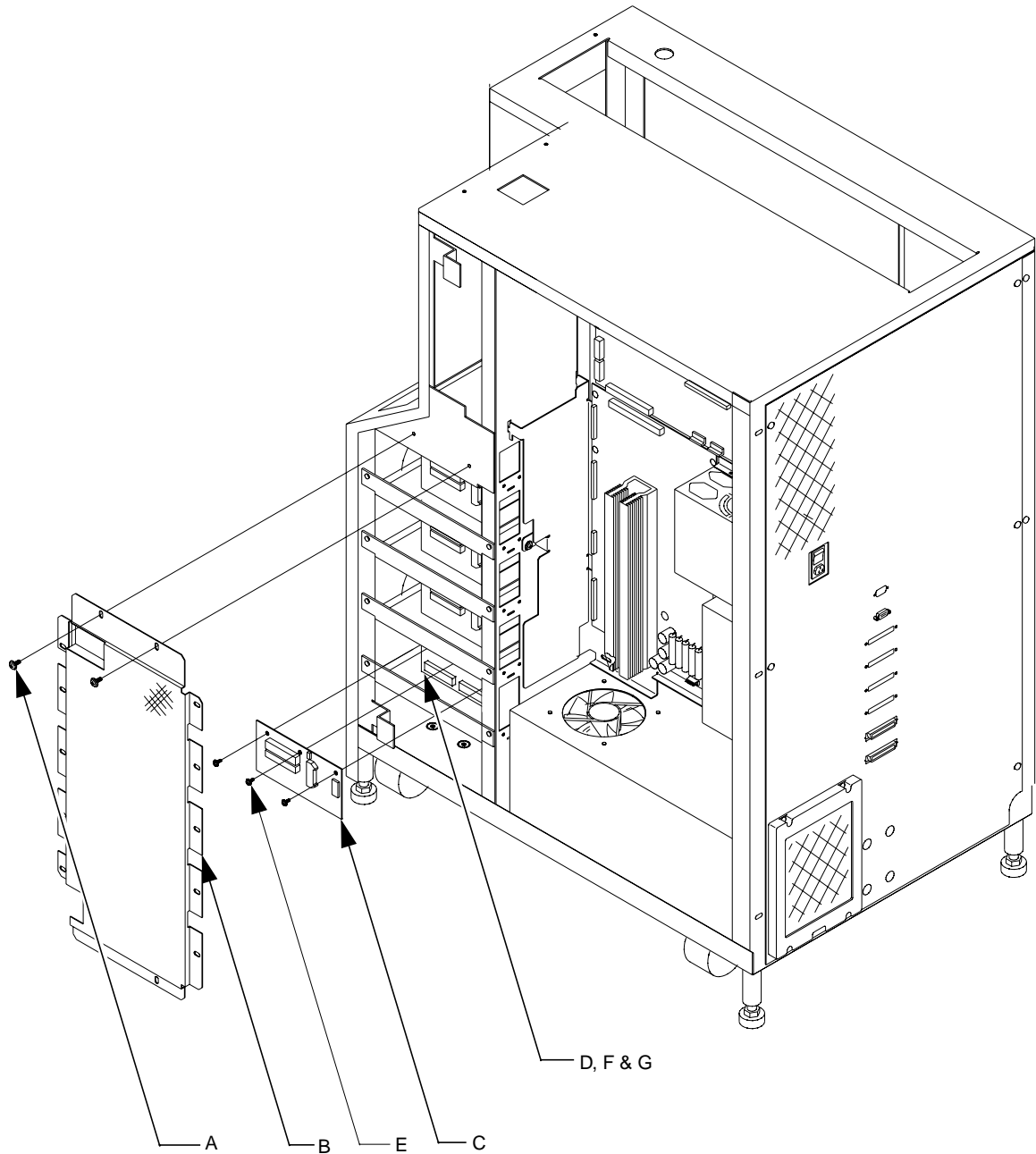
### Adjustments

None.

### Troubleshooting

None.

Figure 44: Tape Drive  
Interface PWA



**Note:** The EMI cover (B) has been discontinued in newer models;  
if it is present, it may be permanently removed.

TA00059A

## Stepper Motor Assembly

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. Remove the tape drive from the library. See “Tape Drive” on page 5-36 for removal instructions.
2. Disconnect the 3 and 4 pin connectors (connector numbers will vary with each drive) coming from the stepper motor assembly (A) to the tape drive interface PWA (B). See Figure 45 on page 5-41.
3. Loosen the two captive screws (C) attaching the stepper motor assembly (A) to the tape drive (D). Lift counterclockwise and pull the stepper motor assembly (A) off the tape drive (D).

### Replacement

Follow the removal instructions in reverse order.

### Adjustments

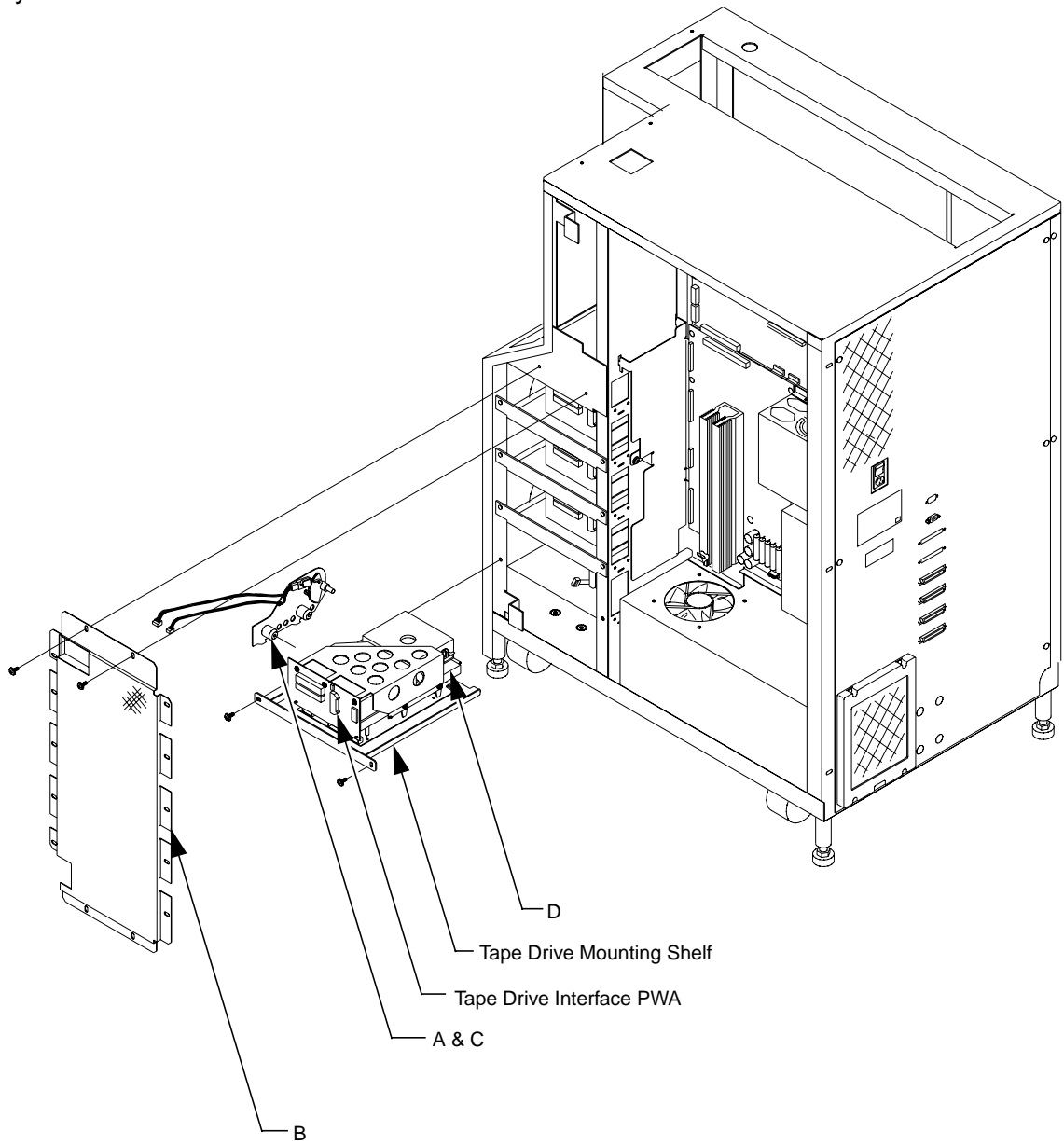
Auto calibrate the drives.

### Troubleshooting

None.



Figure 45: Stepper Motor Assembly



**Note:** The EMI cover (B) has been discontinued in newer models; if it is present, it may be permanently removed.

TA00049C

## Control Panel Assembly

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, right-side, and front cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. With the front panel removed, locate the control panel assembly from within the front panel. See Figure 46 on page 5-43.
2. Remove connector A3\_J1 from the control panel assembly (A).
3. Remove the eight self-locking nuts (B) that retain the control panel assembly (A).
4. Pull the control panel assembly (A) down and out to remove.

### Replacement

Follow the removal instructions in reverse order.

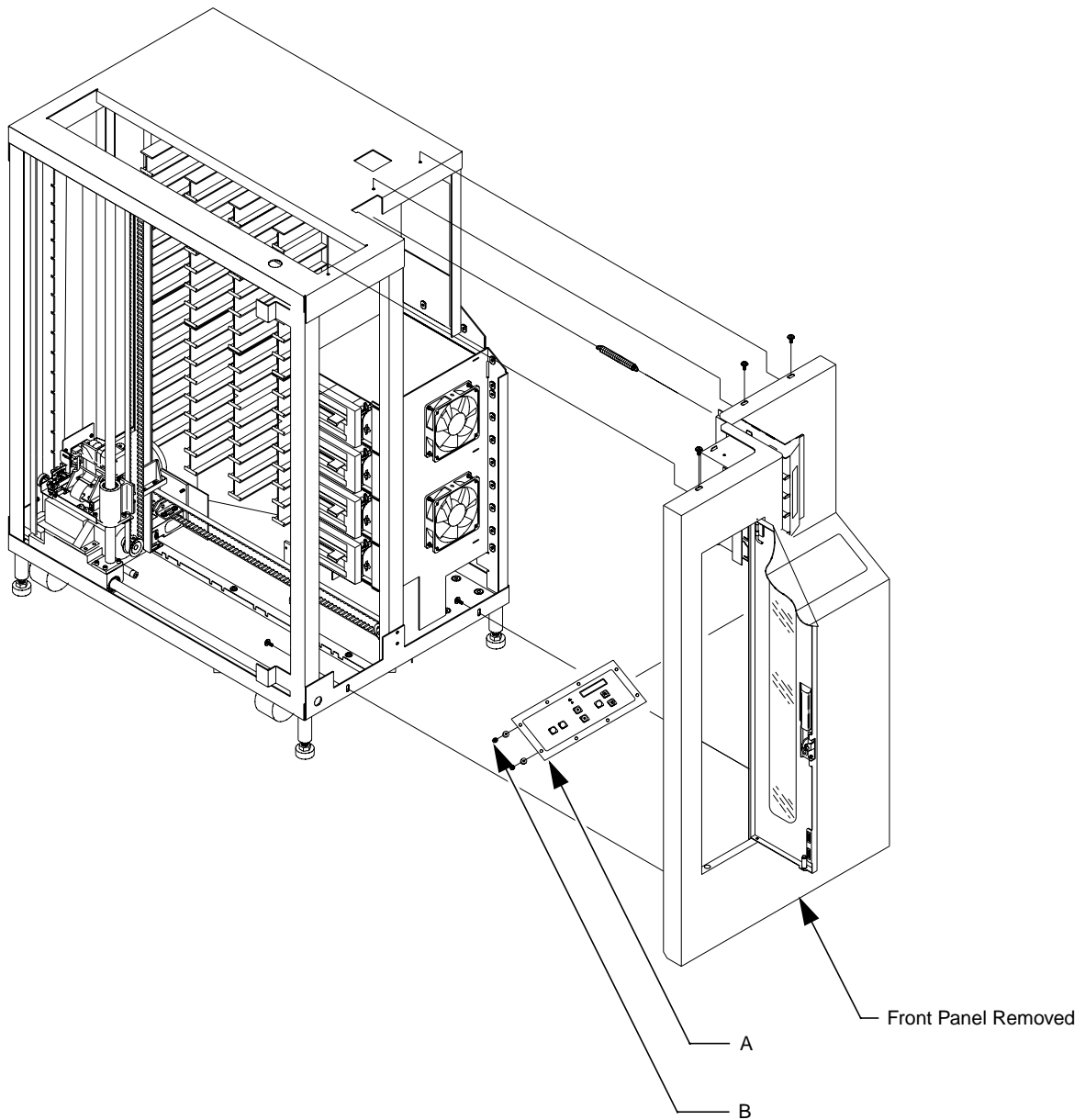
### Adjustments

Auto calibrate the load port.

### Troubleshooting

None.

Figure 46: Control Panel  
Assembly



TA00051d

## X-Axis Confirmation Sensor

### Preparation

1. Have on hand a Phillips screwdriver, a thin-blade screwdriver, and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.

### Removal

1. From the right-bottom side of the library, locate the x-axis interconnect PWA (A) and disconnect connector A4\_J4 from the back on the x-axis interconnect PWA (A).

**Note** *Take careful note of the cable routing.*

2. Using the thin-blade screwdriver, remove the cable clamp (B) retaining the x-axis interruptive sensor cable (C). See Figure 47 on page 5-45.
3. Remove 2 screws (D) securing the x-axis confirmation sensor (E) to its mounting bracket (F) on the horizontal axis (G).
4. Remove the x-axis confirmation sensor (E).

### Replacement

Follow the removal instructions in reverse order.

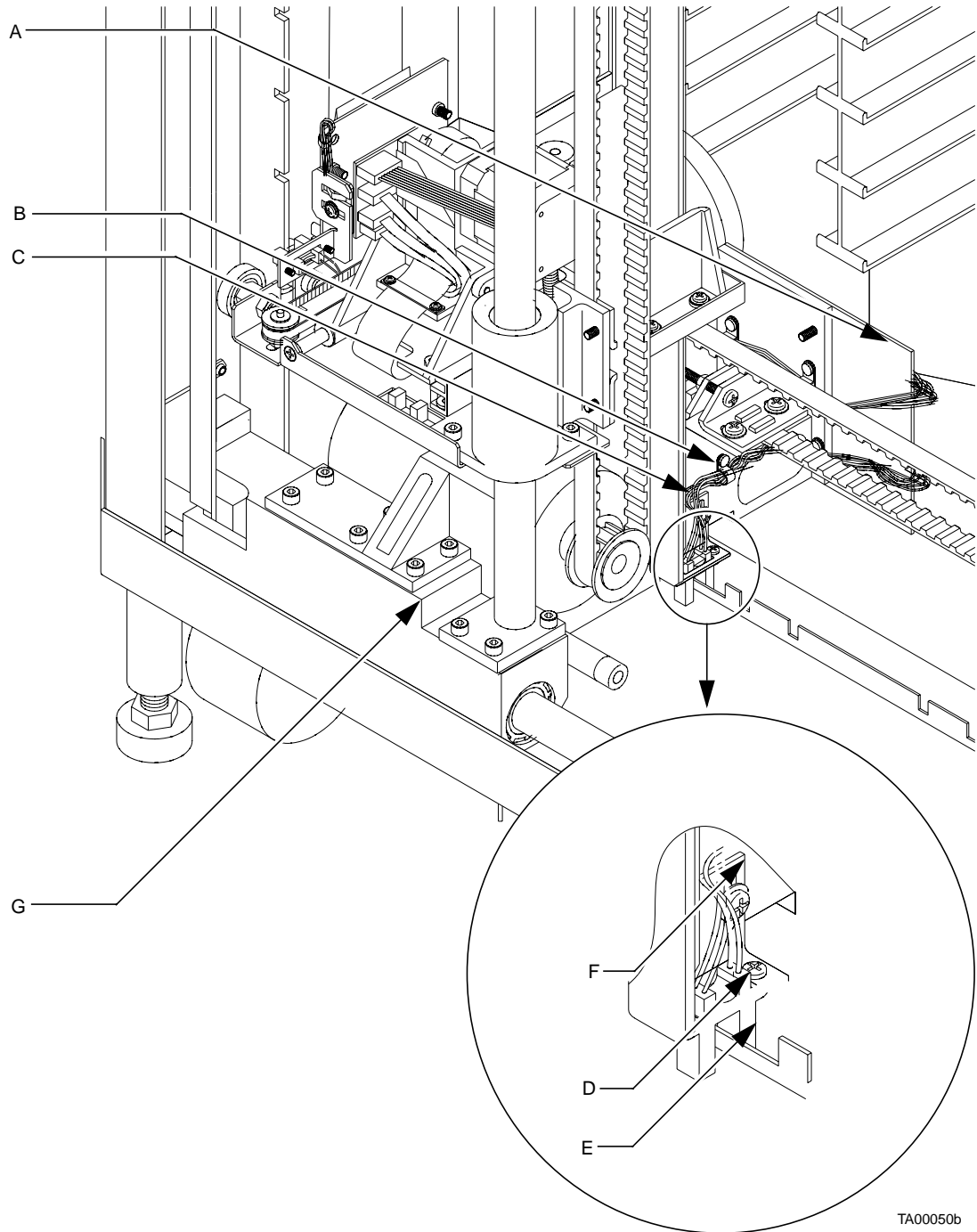
### Adjustments

Auto calibrate all.

### Troubleshooting

None.

Figure 47: X-Axis  
Confirmation Sensor



TA00050b

## Robotics Controller PWA

### Preparation

1. If possible, record the contents of the NVRAM (U38) (calibration values, statistics, and so on).
2. Have on hand a Phillips screwdriver and an anti-static wrist strap.
3. Turn off the library and remove the top, left-side, right-side, and front cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
4. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
5. To keep screws and other small components from falling into the fan directly below the controller electronics assembly, cover the fan opening.

### Removal

1. From the right side of the library, locate the robotics controller PWA (A) on the upper half of the controller electronics assembly (B). See Figure 47 on page 5-45.
2. Disconnect connectors A1\_J1, A1\_J3, A1\_J6, A1\_J7, A1\_J8, A1\_J9, A1\_J11, and A1\_J15.
3. Remove 15 screws (C) (11 from the perimeter and 4 from the center) retaining the robotics controller PWA (A) and lift it out.

**Note** *Hold the robotics controller PWA securely when removing the last mounting screw.*

### Replacement

**Note** *If possible, swap NVRAM (U38) from the removed robotics controller PWA to the replacement PWA to retain the configuration and statistics data of the library.*

Follow the removal instructions in reverse order.

### Adjustments

1. Using the diagnostic software program (DSP), perform a system info (see the TL81X Diagnostic Software User’s Manual). Determine if the firmware level of the replacement PWA is the same or higher than the replaced PWA.
2. If the firmware level of the replacement PWA is not the same or higher than the replaced PWA, follow the firmware flash download procedure.

**Note** *The calibration values are kept in NVRAM on the robotics controller PWA. It is recommended that NVRAM be initialized before performing the calibration procedures.*

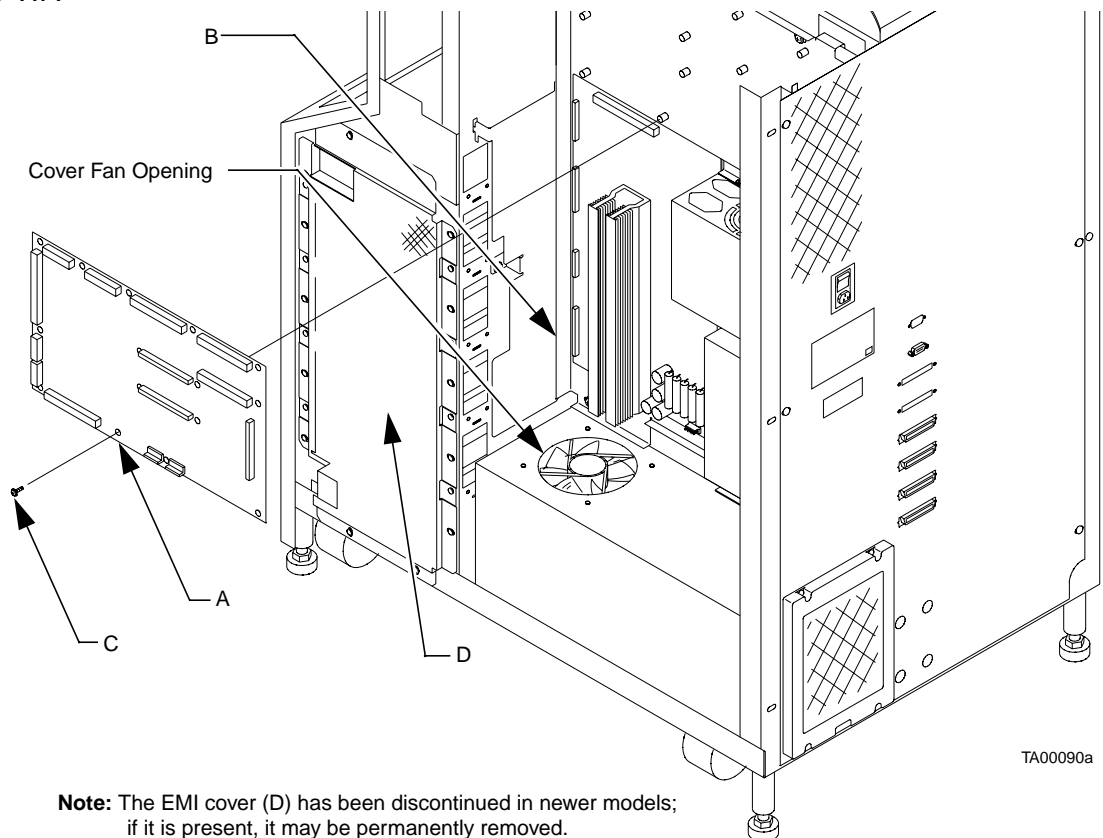
3. If the NVRAM (U38) cannot be swapped, launch the DSP and choose the Init Nov-Vol RAM command from the configuration menu.
4. While still in the DSP, choose the Cal All command from the Calibration submenu within the Library menu.

**Note** *If the NVRAM was not salvageable, you should note in your records that the statistics data in the NVRAM has been lost.*

## Troubleshooting

None.

Figure 48: Robotics Controller PWA



**Note:** The EMI cover (D) has been discontinued in newer models; if it is present, it may be permanently removed.

## Actuator Driver PWA

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. To keep screws and other small components from falling into the fan directly below the controller electronics assembly, cover the fan opening.

### Removal

1. From the right side of the library, locate the actuator driver PWA (A) on the lower half of the controller electronics assembly (B). See Figure 49 on page 5-49.
2. Disconnect the A2\_J1, A2\_J2, A2\_J4, A2\_J5, A2\_J6, and A2\_J7 connectors from the actuator driver PWA (A).
3. Remove 12 screws (C) from perimeter of the actuator driver PWA (A).

**Note** *Hold the actuator driver PWA securely when removing the last mounting screw.*

4. Remove four screws (D) from inside the heatsink channel (E) on the actuator driver PWA (A) and lift out.

**Note** *The 4 screws removed from the heatsink are longer than those removed from the perimeter of the actuator driver in step 3.*

### Replacement

1. Follow the removal instructions in reverse order.
2. Take note of longer screws used to mount the actuator driver PWA through the heatsink.

### Adjustments

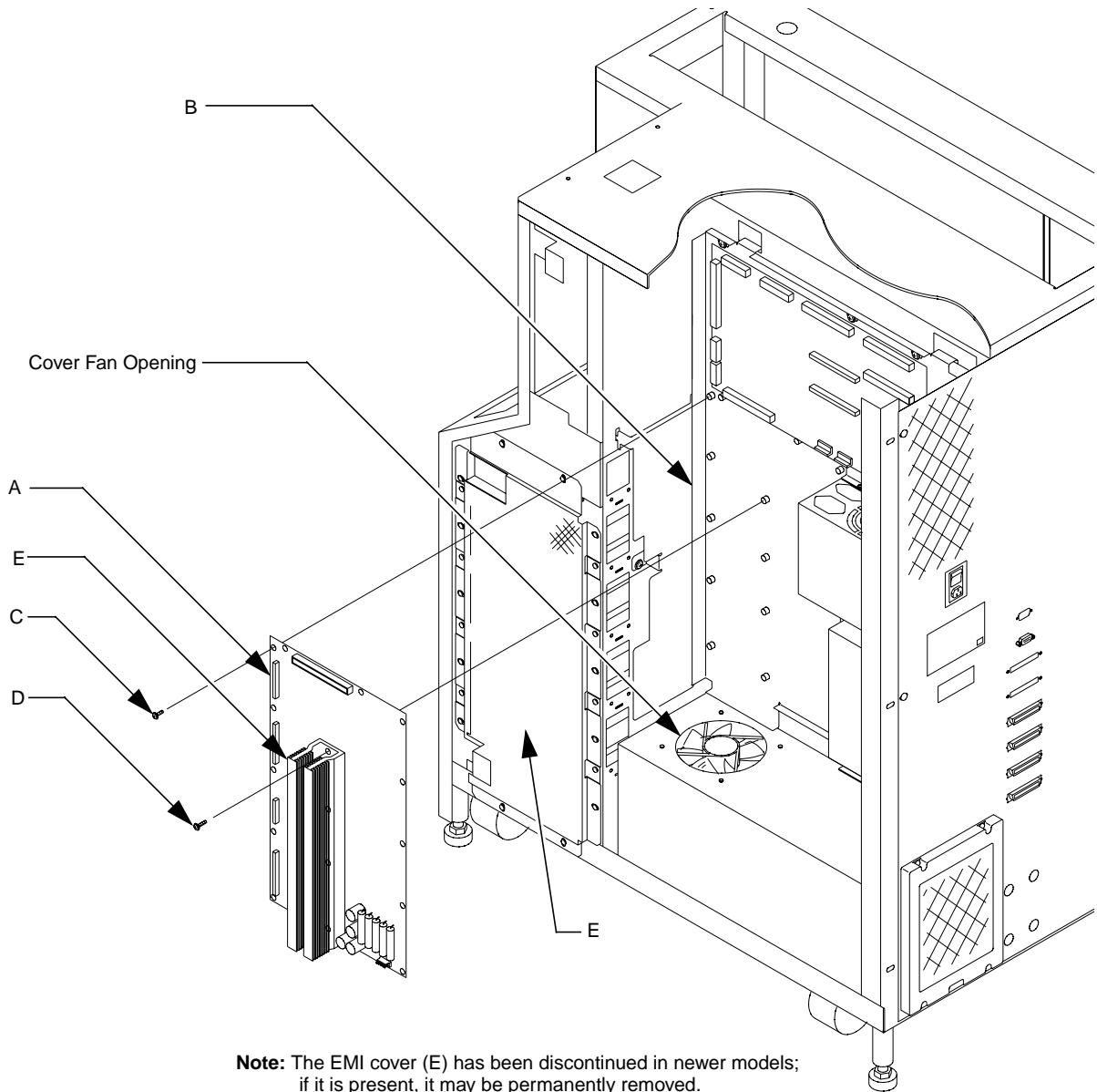
None.

### Troubleshooting

None.



Figure 49: Actuator Driver  
PWA




TA00091a

## PC Logic Power Supply Assembly

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library.

 **CAUTION** *DO NOT disconnect the power cord. The power cord is the only means of grounding the chassis and helping to prevent Electrostatic Discharge (ESD) damage.*

3. Remove the top, left and right-side cosmetic panels as shown in “Removing the Cosmetic Panels” on page 5-4.
4. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
5. To keep screws and other small components from falling into the fan directly below the controller electronics assembly, cover the fan opening.

### Removal

1. From the right side of the library, locate the pc logic power supply (A) on the lower right half of the controller electronics assembly. See Figure 50 on page 5-51.
2. Disconnect A1\_J11 and A1\_J15 from the robotics controller PWA.
3. Disconnect connectors P1\_J3, P1\_J4 and P1\_J5 from the pc logic power supply (A).
4. Remove the 4 screws (B) securing the PC logic power supply (A) and brackets to the controller electronics assembly.

**Note** *Hold the pc logic power supply assembly securely when removing the last mounting screw.*

5. Detach the mounting bracket (C) from power supply by removing the 2 screws (D).

### Replacement

Follow the removal instructions in reverse order.

### Adjustments

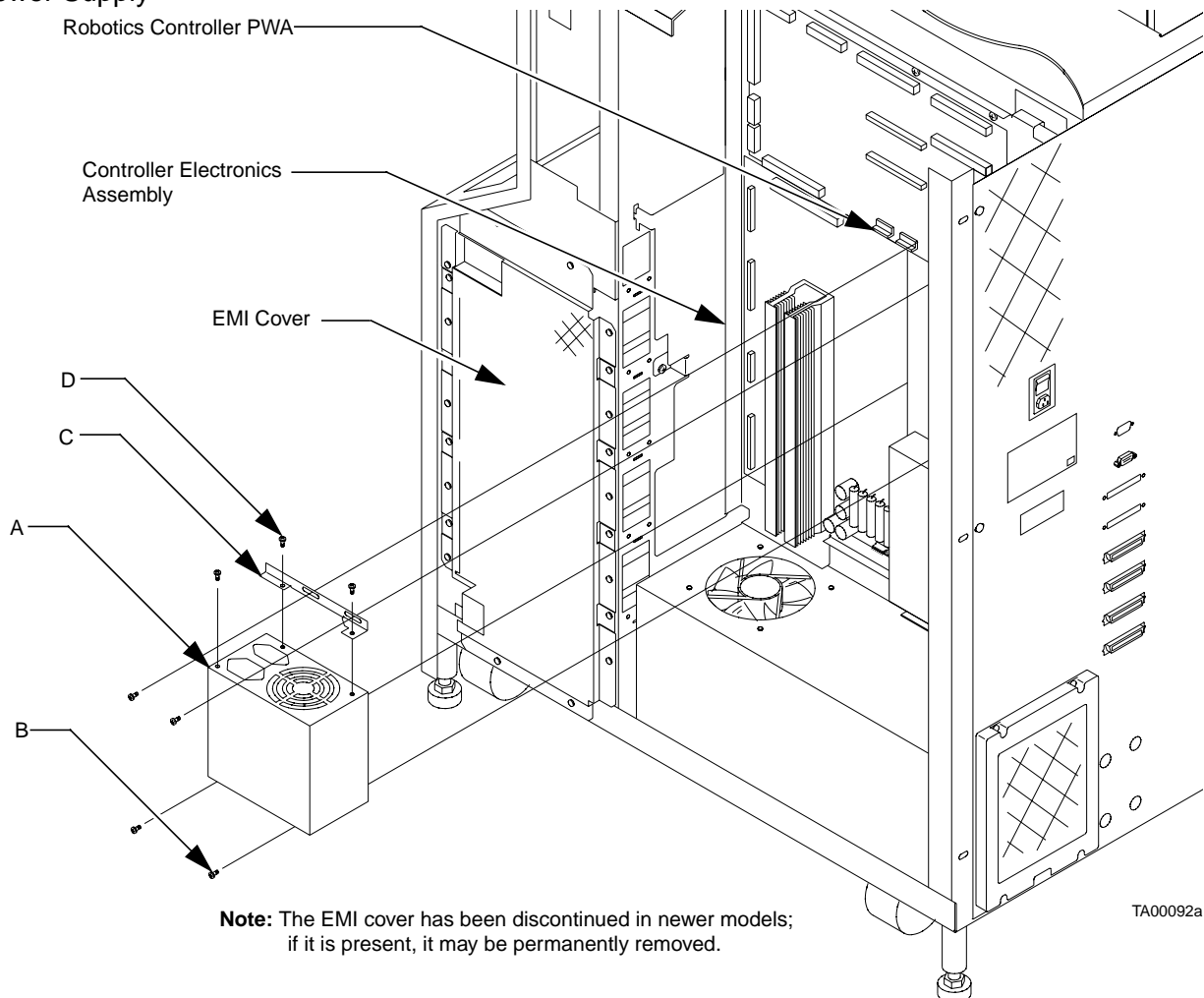
1. Turn off the AC power and remove the power supply cover (remove the 4 screws on top of the power supply).
2. Verify the +5V, +12V, and -12V fuses are replaced and no shorts exist.

3. Hook the DVM up to the +5V and GND test points on the robotics controller.
4. Turn on AC power.
5. Locate the potentiometer on the PC power supply main board.
6. Adjust +5V to between +5.05V and +5.15VDC. Also, verify that +12V is between +11.5V and +12.5V. If not, adjust +12V within limits and reverify that the +5V is within limits.
7. If power cannot be adjusted, replace the power supply and repeat the procedure.

## Troubleshooting

Make sure the connectors on the robotics controller PWA are seated properly.

Figure 50: PC Logic Power Supply



## Motor Power Supply Assembly

There are two motor power supplies in each library. The following procedure applies for each power supply assembly.

### Preparation

1. Have on hand a Phillips screwdriver and an anti-static wrist strap.
2. Turn off the library and remove the top, left-side, and right-side cosmetic panels as explained in “Preparing for Maintenance” on page 5-4.
3. Put on the anti-static wrist strap and clip it to the closest grounding point on the library frame. Use other anti-static precautions if possible.
4. To keep screws and other small components from falling into the fan directly below the controller electronics assembly, cover the fan opening.

### Removal

1. From the right side of the library, locate the motor power supply (PS2 and/or PS3) on the lower right side of the controller electronics assembly. See Figure 51 on page 5-53.
2. On the selected motor power supply, loosen all of the terminals (A) on the power supply barrier strip (B) and remove the wires.

**Note** *Make note of each wire and its connection point.*

3. Remove the controller electronics assembly. See “Removing the Controller Electronics Assembly” on page 5-8 for removal instructions.
4. From the back of the controller electronics assembly, remove the lower mounting screw (C) from the motor power supply (PS2, PS3).

**Note** *If you are replacing PS2, also remove the over voltage protector (D).*

5. Loosen the upper mounting screw (E) and lift out the motor power supply.

### Replacement

Follow the removal instructions in reverse order.

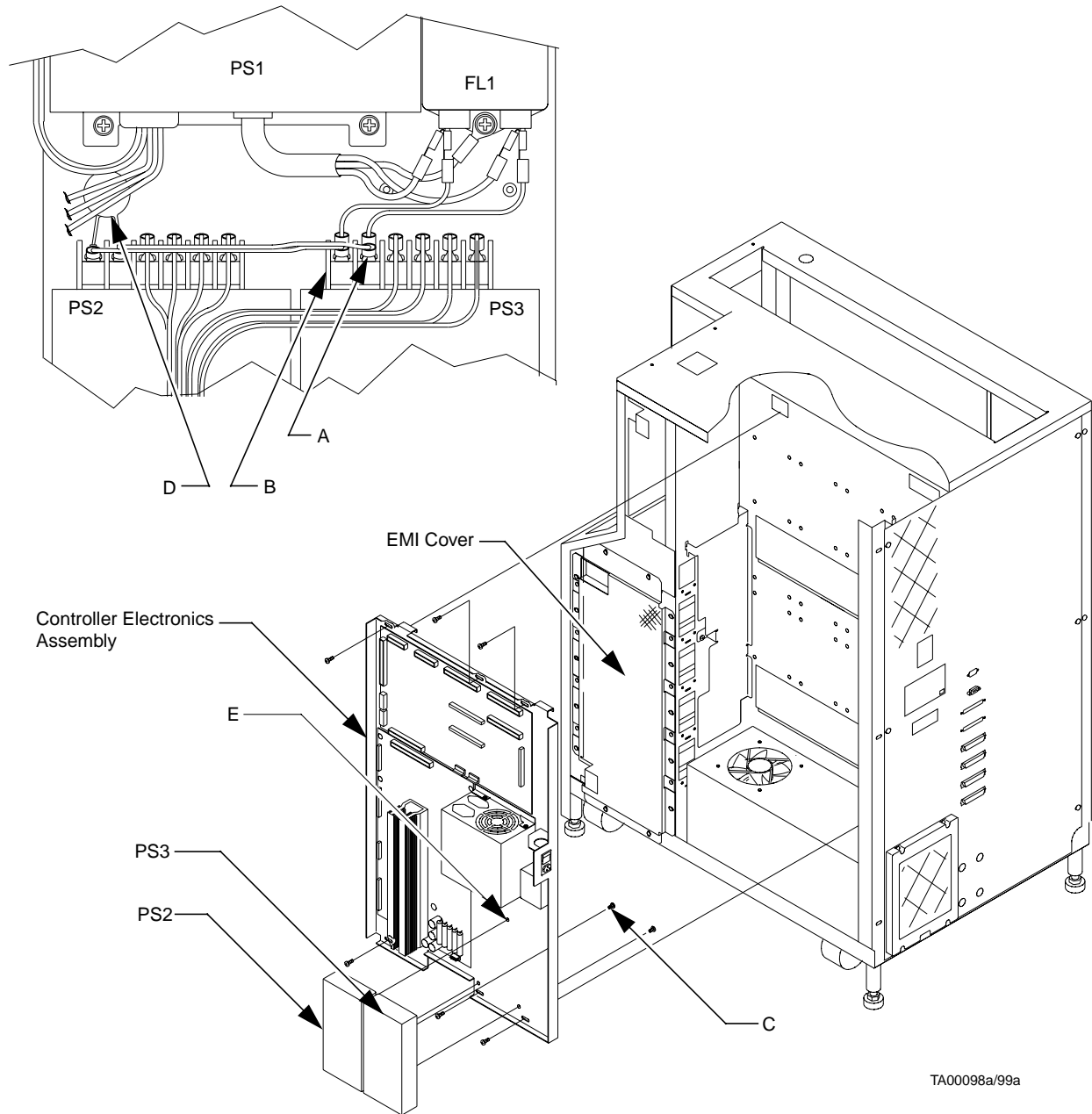
### Adjustments

None.

### Troubleshooting

Check the barrier strip terminal connections of the power supply.

Figure 51: Motor Power Supply Assembly



**Note:** The EMI cover has been discontinued in newer models; if it is present, it may be permanently removed.

## Reassembling the Library

After performing maintenance tasks, the library must be reassembled, turned on, and brought back on-line.

### Replacing the Cosmetic Panels

Use the procedures below to replace the cosmetic panels. Cosmetic panels must be reinstalled in the following order: front panel, side panels, and then top panel.

**Note** *If the rear panel was removed (for example, to replace a rear fan assembly), it should have been reinstalled as part of the FRU's replacement procedure.*

#### General Preparations

1. Complete all maintenance tasks and install all replacement parts.
2. Reinstall the controller electronics assembly, if necessary, by reversing the removal procedure found on page 5-8.
3. Remove the anti-static wrist strap from the library frame.

#### Front Panel

1. Position the front panel at the front of the library.
2. Reconnect the control panel ribbon cable at connector A3\_J1.
3. Pick up the front panel and reconnect it to the library frame from bottom to top.
4. Reconnect the remaining miscellaneous sensor cable assembly connectors as follows:
  - a. Attach the SW1 blade lug black wire to the bottom (common) spade of the SW1 connector.
  - b. Attach the SW1 blade lug white wire to the top (N.C.) spade of the SW1 connector.
  - c. Attach the SW2 blade lug black wire to the bottom (common) spade of the SW2 connector.
  - d. Attach the SW2 blade lug white wire to the top (N.C.) spade of the SW2 connector.
  - e. Reconnect the front door interlock switch in-line connector SW2\_J1.
  - f. Reconnect the load port solenoid in-line connector SOL\_J1.

5. Reinstall the five mounting screws that secure the front panel to the library frame.
6. From the right side of the library, reinstall the EMI cover.
7. From the left side of the library, reinstall the load port spring.

### **Left-Side Panel**

1. Align the left-side panel to the library frame so that panel is offset to the rear by about five or six inches and the top lip of the panel rests on top of the frame.
2. Push the panel forward so the retention tabs near the front the frame slide into metal buckles on the inside of the panel. When the panel is correctly positioned, the lip along the back end of the panel should rest against the back edge of the frame.
3. At the rear of the library, insert and tighten the screws to secure the left-side panel to the rear of the library frame.

### **Right-Side Panel**

1. Align the right-side panel to the library frame so that panel is offset to the rear by about five or six inches and the top lip of the panel rests on top of the frame.
2. Push the panel forward so the retention tabs near the front the frame slide into metal buckles on the inside of the panel. When the panel is correctly positioned, the lip along the back end of the panel should rest against the back edge of the frame.
3. At the rear of the library, insert and tighten three screws to secure the left-side panel to the rear of the library frame.

### **Top Panel**

1. Align the panel on top of the library so that it is even with the sides of the library but offset to the rear about five or six inches.
2. Push the panel forward, inserting panel retention tabs into the places indicated in Figure 28 on page 5-5.
3. At the rear of the library, insert and tighten two screws to secure the top panel to the library frame.

## Turning On the Library

Before turning on the library, you should verify the following:

- The front door and load port are closed.
- All cosmetic panels are attached to the library.
- All rear panel connections are secured.
- The power cord is connected between the library and a grounded wall outlet.

To turn on the library, go to the rear panel of the library and set the POWER switch to the “I” (on) position. After several seconds, verify that the SDA shows “System On-Line.”

**Note** *If “System Off-line (STANDBY)” appears in the display, the library must be placed on-line manually using the procedure in the following section.*

## Placing the Library On-Line

To place the library on-line, press the STANDBY button and wait for the display to indicate “System On-line.”

**Note** *You can use the STANDBY button to toggle between on-line and off-line status.*



# Appendix **A**

## **Control Panel Menu Modes**

Control Panel .....	A-3
Understanding Control Panel Menus .....	A-6
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# Control Panel

The control panel (Figure A-1) is located on the front of the library on the right-hand side. Its features are described in Table A-1 on page A-4.

Figure A-1 : Control Panel

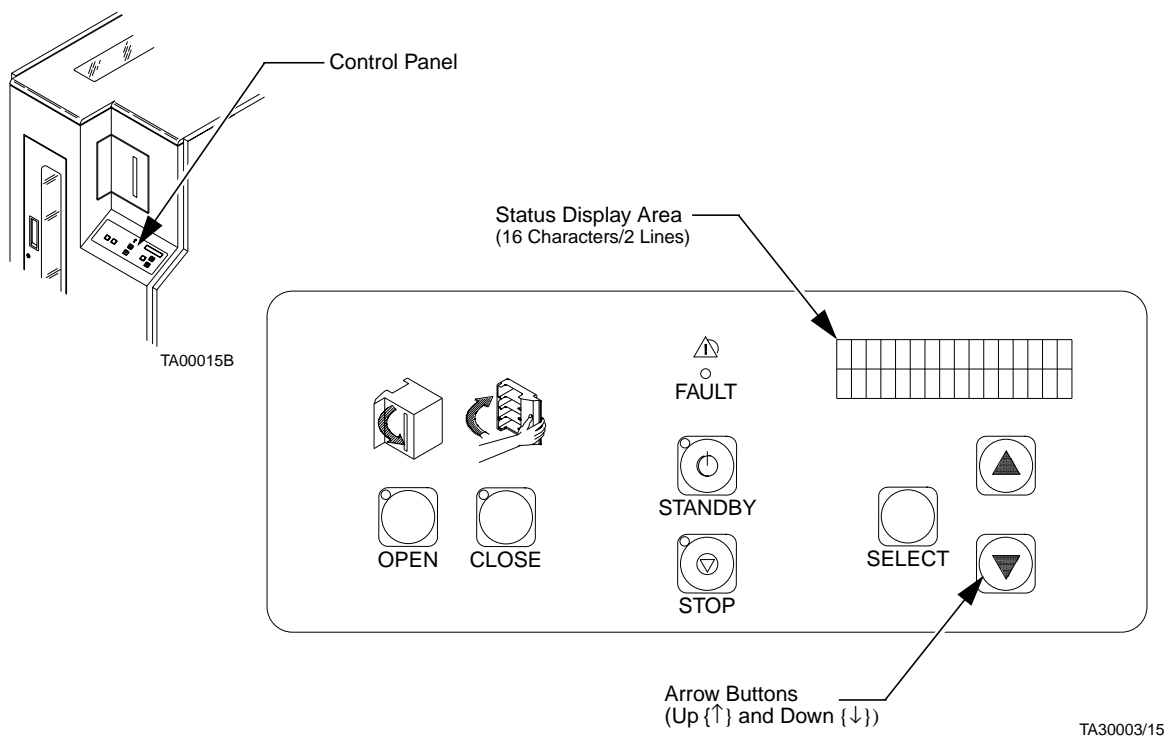
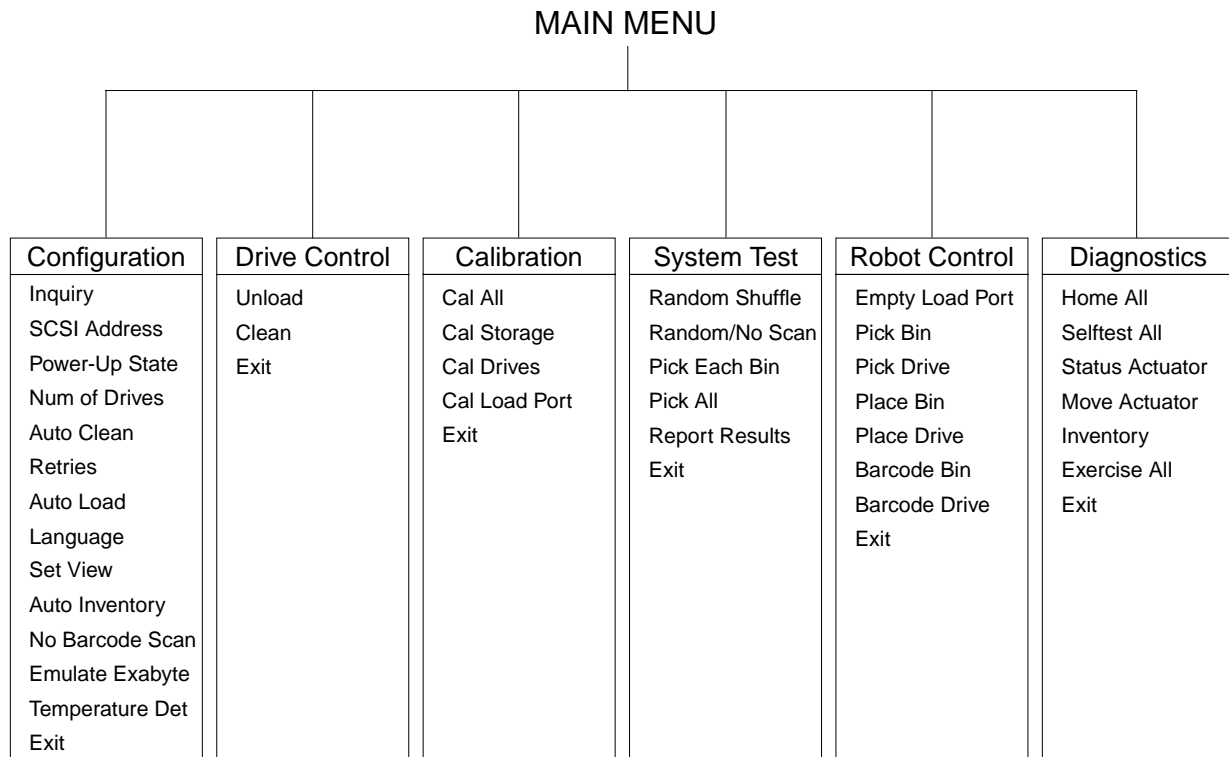


Table A-1: Control Panel Functions

Feature	Function
(load port)  <b>OPEN</b> (button/ indicator)	The (load port) <b>OPEN</b> button is used to unlock the load port door for the purpose of inserting or removing tape cartridges. Pressing the <b>OPEN</b> button causes the library to: <ul style="list-style-type: none"> <li>• Park the robotics (the green indicator blinks until the robotics are parked)</li> <li>• Unlock and open the load port door (the indicator is steadily lit)</li> <li>• Re-lock the load port door in the open position (the indicator is off)</li> </ul> Once the door is opened, you can insert or remove tape cartridges using the four bins.
(load port)  <b>CLOSE</b> (button/ indicator)	When the load port door is in the open position, the (load port) <b>CLOSE</b> button is used to unlock the door before closing it. Pressing the <b>CLOSE</b> button causes the library to: <ul style="list-style-type: none"> <li>• Park the robotics (the red indicator blinks until the robotics are parked)</li> <li>• Unlock the door (the indicator is steadily lit)</li> </ul> Once the indicator is steadily lit, you can close the door. The library will lock it in the closed position.
<b>STANDBY</b> (button/ indicator)	This button enables you to toggle between on-line or off-line status. While in <b>STANDBY</b> (off-line) mode, host communications are disabled, the control panel menu mode is available, and the diagnostic port on the rear panel ( <b>DIAG</b> ) is active. The indicator functions as follows: <ul style="list-style-type: none"> <li>• Off: <b>STANDBY</b> is not selected. The library is on-line.</li> <li>• On (solid): <b>STANDBY</b> is selected. The library is off-line.</li> <li>• Blinking: Waiting for the current on-line operation to complete.</li> </ul>
<b>STOP</b> (button/ indicator)	The <b>STOP</b> button enables you to turn off the robotics equipment. A red indicator above the button lights when the robotics are turned off. Pressing the button again restores power to the robotics and extinguishes the indicator.
<b>SELECT</b> ↑ (scroll-up), and ↓ (scroll-down) (buttons)	While the library is in <b>STANDBY</b> mode, you can use the <b>SELECT</b> button to activate control panel menus. When control panel menus become active, the main menu appears in the SDA. (The top line displays the current menu title and the bottom line displays the current menu item.) The <b>UP</b> and <b>DOWN ARROW</b> buttons allow you to navigate through menu items and the <b>SELECT</b> button selects the displayed item. (For detailed procedures on using control panel menus, see “Understanding Control Panel Menus” on page A-6.)
<b>FAULT</b> (indicator)	When illuminated (red), this indicates the library has an error condition. Watch the SDA for a specific message. (For a detailed description of all status messages shown in the SDA, see Chapter 4, "Troubleshooting & Fault Isolation.")
Status Display Area (SDA)	This is a 16-character (5x7 dot-matrix LCD) with a 2-line display. In on-line mode, it shows status messages that describe the operating state of the library. In off-line mode, it displays system menus after you press the <b>SELECT</b> button.

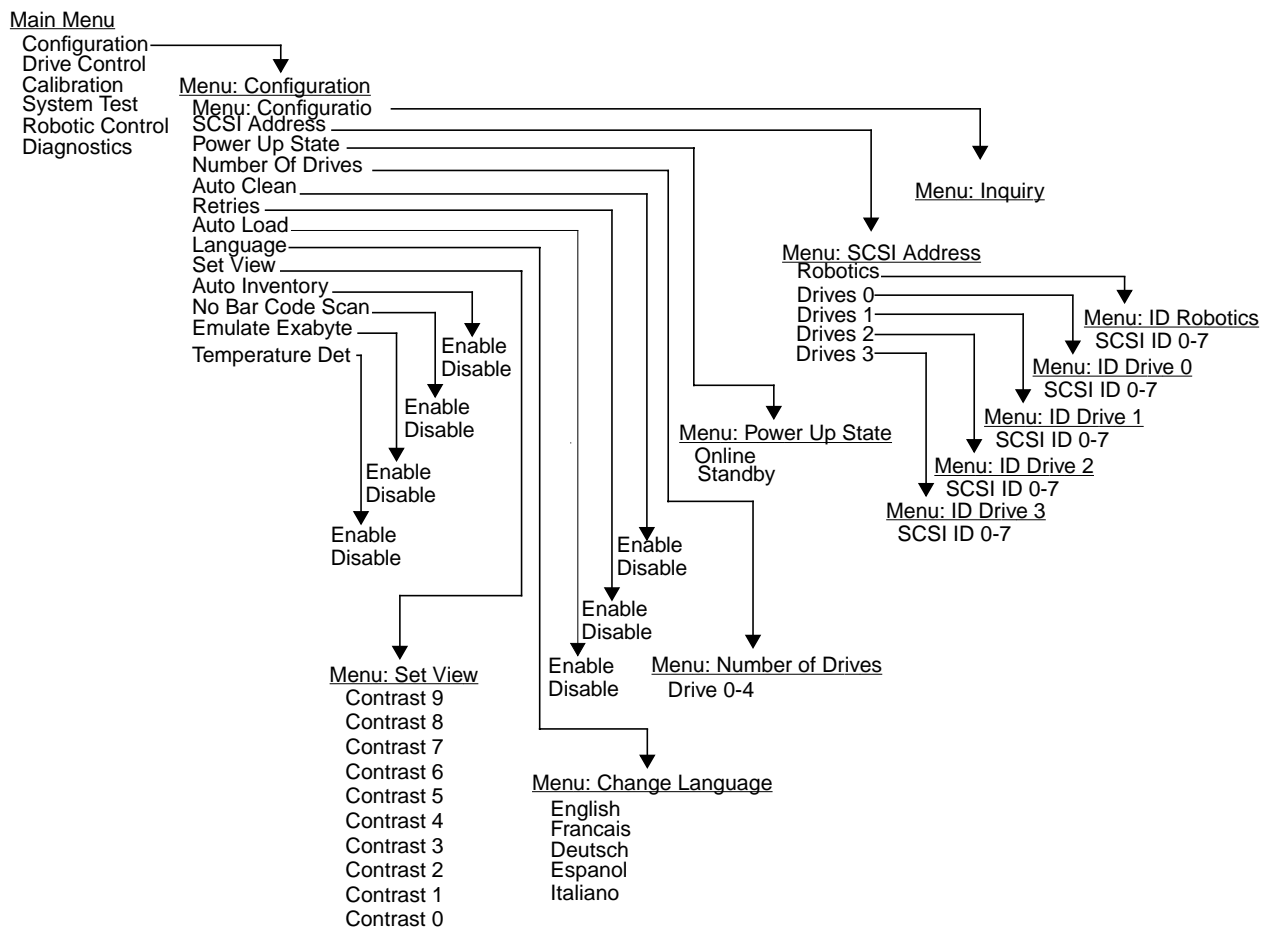
Figure A-2 : Menu Structure



# Understanding Control Panel Menus

The following paragraphs describe each function in the library's control panel menus.

Figure A-3 : Configuration Menu



## Configuration Menu Functions

The following describes each function of the Configuration menu.

### System Inquiry

The function is used to display the library system type and firmware revision. This can be done through the Inquiry submenu.

### Setting/Changing the Library's SCSI Address

**The factory default is 0.** This function is used to change the SCSI address (0...7) of the library. To change the SCSI address of the library, use the SCSI Address/Robotics submenus.

### Setting/Changing the Drive SCSI Addresses

**The factory default are drive 0:2, drive 1:3, drive 2:4, and drive 3:5.** This function is used to set the SCSI address (0...7) of each tape drive in the library. To change the SCSI address of a drive use the SCSI Address/Drive n submenus.

### Defining the Library's Power-Up State

**The factory default is On-line.** You have the option of defining the starting condition of the library, either On-line or Standby (off-line), after power-up. You can change it by using the Power-Up State submenu.

### Defining the Number of Drives

**The factory default is 4.** You have the option of defining how many drives (0...4) are in the library. To change the number of drives in the library, use the Number of Drives submenu.

## Enabling/Disabling Automatic Drive Cleaning

**The factory default is Disabled.** The automatic drive cleaning feature has two modes of drive cleaning support: Host Initiated and Fully Automatic. To change this option, use the Auto Clean submenu.

In host initiated cleaning mode, drive cleaning is performed by your System Administrator at the host computer. Although the library will internally track cleaning cartridge movement and use, the library provides no cleaning support in this mode. The host is responsible for all cleaning functions such as detecting when a drive requires cleaning, tracking and selecting cleaning cartridges, initiating media movement of the cleaning cartridge to the drive, and determining when a cleaning cartridge has been “used up.”

When automatic cleaning is enabled, the library monitors each drive’s status to determine when a drive requires cleaning and initiates action when that determination is made. In this case, the library selects an available cleaning cartridge, handles media movement of the cleaning cartridge to and from the drive and supervises the cleaning operation in the drive. The library tracks cleaning cartridges within the library, monitors cleaning cartridge use, and determines when a cleaning cartridge has been “used up.” A “used up” cleaning cartridge is exported from the library to the load port under control of the library.

## Enabling/Disabling the Retry Option

**The factory default is Enabled.** If a failure occurs during a movement command and this option is Enabled, the library will attempt to recover and retry the operation. If this option is Disabled, no retries are made and the error is reported the first time. To change this option to Disabled, use the Retries submenu.

## Enabling/Disabling the Auto Load Option

**The factory default is Disabled.** When this option is Enabled, the library automatically places any cartridge found in the load port into any empty FSA bin. Use this feature to populate the library with cartridges. To enable this option, use the Auto Load submenu.

## Setting/Changing the Library’s Language

**The factory default is English.** This function allows you to change the language displayed in the SDA. If you want to change the language, you can use the Language submenu. The options are: English, Francais, German, Espanol and Italiano.



## Setting/Adjusting the SDA Contrast

**The factory default setting is five.** This function allows you to change the contrast of the SDA for easy viewing at different angles. There are ten different contrast settings to choose from in this menu. To change the contrast, use the Set View submenu.

## Enabling/Disabling the Auto Inventory Option

**The factory default setting is Enabled.** When this option is Enabled, the library will Auto Inventory the FSA when it is powered up. When this option is Disabled, the library will not inventory the FSA. To change this option, use the Auto Inventory submenu.

## Enabling/Disabling the No Bar Code Scan Option

**The factory default for this option is Disabled.** When this option is Disabled, the library will scan bar codes during the inventory process. When this option is Enabled, the library will only use the CIGS to determine the presence of the cartridges in each drive and FSA bin and will not scan for bar codes. To change this option, use the No Bar Code Scan submenu.

## Enabling/Disabling the Emulate Exabyte Option

**The factory default for this option is Disabled.** When this option is Enabled, the library responds to Exabyte formatted commands as an Exabyte device. To enable this option, use the Emulate Exabyte submenu.

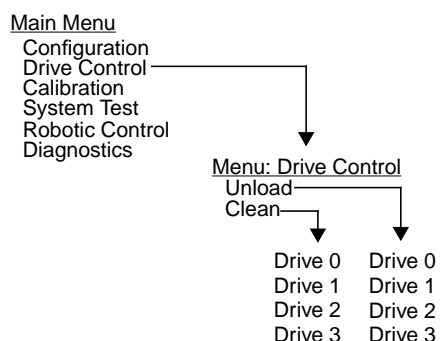
## Enabling/Disabling the Temperature Detection

**The factory default for this option is Enabled.** This option is used to enable/disable the library temperature sensor. When this option is Enabled, the library will automatically shut down after the maximum temperature is exceeded. To disable this option, use the Temperature Det submenu.

## Drive Control Menu Functions

The library has an RS422 interface to the tape drive that allows several drive control functions. The following describes each function of the Drive Control menu.

Figure A-4 : Drive Control Menu



### Unloading a Tape

This feature allows you to unload the tape (preparing to eject and remove the tape cartridge) in a drive that you specify. To perform this function, use the Unload submenu. The options are: Drive 0, Drive 1, Drive 2, Drive 3, where:

Menu Mode	Physical Location
Drive 0	= <b>Top Drive</b>
Drive 1	= <b>Second Drive</b>
Drive 2	= <b>Third Drive</b>
Drive 3	= <b>Bottom Drive</b>

### Cleaning a Drive

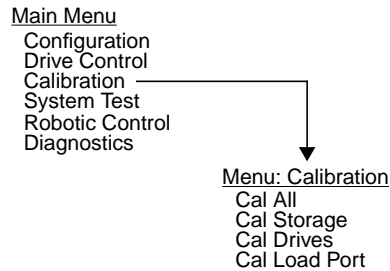
This feature allows you to send a cleaning cartridge to the tape drive you specify. To perform this function, use the Clean submenu. The options are: Drive 0, Drive 1, Drive 2, Drive 3, where:

Menu Mode	Physical Location
Drive 0	= <b>Top Drive</b>
Drive 1	= <b>Second Drive</b>
Drive 2	= <b>Third Drive</b>
Drive 3	= <b>Bottom Drive</b>

## Calibration Menu Functions

The operator has the ability to calibrate any of the elements in the library. The following describes each function of the Calibration menu.

Figure A-5 : Calibration Menu



### Calibrating the Entire Library

This function calibrates the FSA, load port, and drives. To perform this function, use the Cal All submenu.

### Calibrating the FSA

This function calibrates the Fixed Storage Array only. To perform this function, use the Cal Storage submenu.

### Calibrating the Drives

This function calibrates the tape drives only. To perform this function, use the Cal Drives submenu.

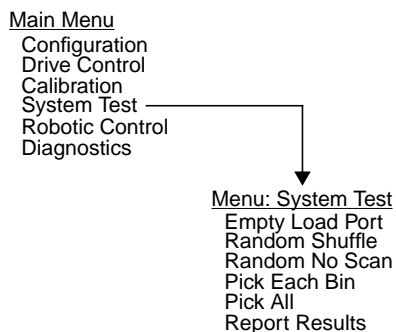
### Calibrating the Load Port

This function calibrates the load port only. To perform this function, use the Cal Load Port submenu.

## System Test Menu Functions

The library can perform several system tests. The following describes each function of the System Test menu.

Figure A-6 : System Test Menu



### Empty Load Port

This function moves cartridges from the load port to the next available bin in the FSA. To execute this function, use the Empty Load Port submenu.

### Random Shuffle

This function moves cartridges in the FSA bins to other locations within the library. This test will inventory the library if the library has not been previously inventoried. To execute this function, use the Random Shuffle submenu.

**Note** *Random Shuffle is not supported in library firmware revision 1.10 or earlier.*

### Random No Scan

This function is identical to the Random Shuffle function, except it does not scan the bar code after the place into the FSA bin.

**Note** *Random No Scan is not supported in library firmware revision 1.10 or earlier.*

### Pick Each Bin

This function starts a system test that picks and places tapes using every bin in the library's FSA. This test also uses the load port (if the load port door is closed) and scans the bar codes after performing each place. To execute this function, use the Pick Each Bin submenu.

## Pick All

This function is identical to the Pick Each Bin function except that it uses the drives as well as the FSA bins and load port.

**Note** *Pick All is not supported in library firmware revision 1.10 or earlier.*

## Report Results

This function reports the results from the most recent system test. *Report Results* reports the total number of picks and places combined and the status of the last pick or place performed.

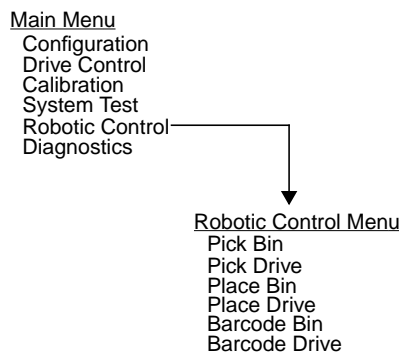
**Note** *Report Results is not supported in library firmware revision 1.10 or earlier.*

## Robotic Control Menu Functions

The library has the ability to manipulate cartridges in several ways through the Robotic Control Menu Functions. The following describes each function of the Robotic Control menu.

---

Figure A-7 : Robotic Control Menu



## Pick Bin

This function causes library robotics to pick a cartridge from a designated bin in the FSA. To execute this function, use the Pick Bin submenu.

## Pick Drive

This function causes library robotics to pick a cartridge from a designated tape drive. To execute this function, use the Pick Drive submenu.

## **Place Bin**

This function causes library robotics to place a cartridge into a designated bin in the FSA. To execute this function, use the Place Bin submenu.

## **Place Drive**

This function causes library robotics to place a cartridge into a designated tape drive. To execute this function, use the Place Drive submenu.

## **Bar Code Bin**

This function causes library robotics to read a bar code label of a cartridge in a specific bin location. To execute this function, use the Bar Code Bin submenu.

## **Bar Code Drive**

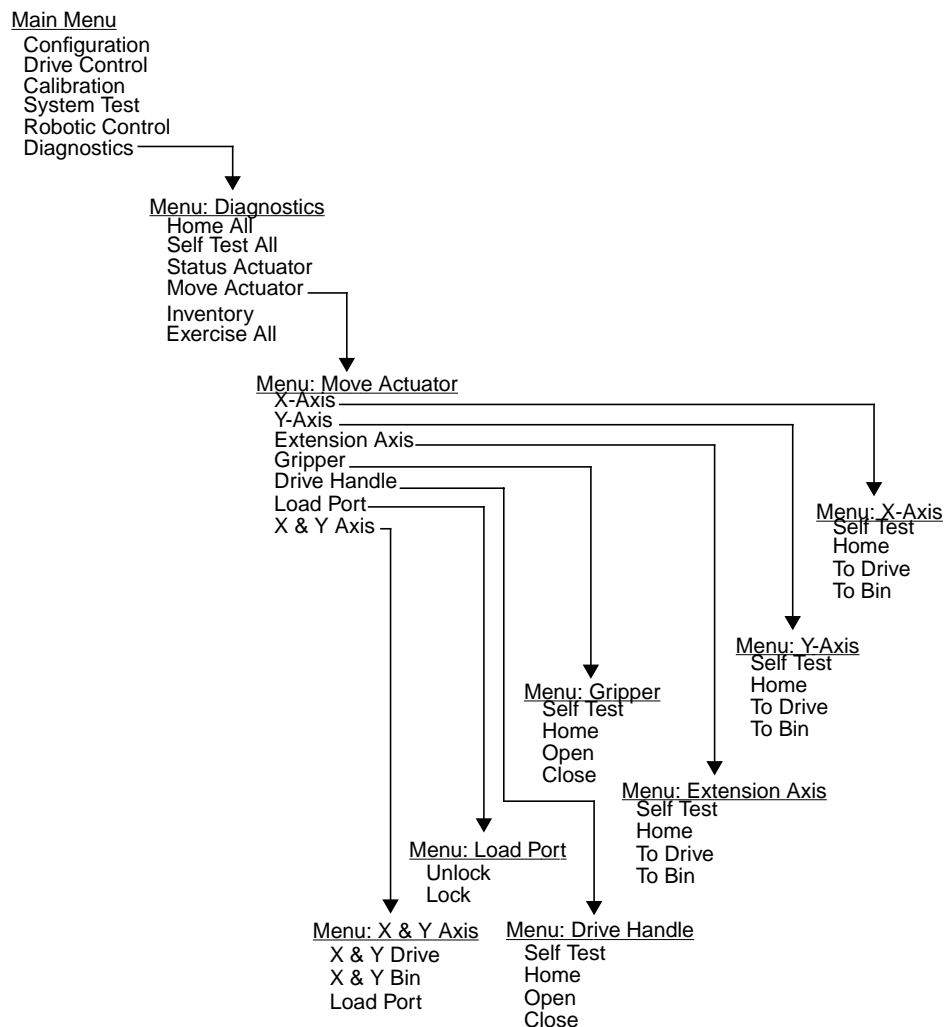
This function causes library robotics to read the bar code label of a cartridge in a tape drive. To execute this function, use the Bar Code Drive submenu.

## Diagnostics Menu Functions

You can use the Diagnostics menu to:

- Display the status of the library
- Perform an inventory of the library

Figure A-8 : Diagnostics Menu



## Positioning Robotics to Home State

This feature causes library robotics to go to a designated position in the library. To execute this function, use the Home All submenu.

## Testing the Gripper and Tape Drive Handles

This feature causes the library to check the gripper and tape drive handles to make sure they operate without error. To execute this function, use the Selftest All submenu.

## Displaying the Library's Status

This feature (Status Actuator) allows you to display the position of the four actuators (horizontal, vertical, extension, and gripper) in the library. To display this information in the SDA, use the Status Actuator submenu and the ↑ and ↓ buttons to scroll through the displayed information.

## Testing the Robotics

This feature causes the library to test the robotics in the x-axis, y-axis, and extension axis. To execute this function, use the Move Actuator submenu.

## Performing an Inventory

This feature allows you to perform an inventory of the library. The library sends the robotics to check each drive, load port bin, and FSA bin location for the presence of a tape cartridge. The robotics scans each bar code label and the inventory information is then written to nonvolatile RAM. To perform this function, use the Inventory submenu.

## Exercising the Entire Library

This feature is not currently supported.



## Menu Navigation

After placing the library in the standby mode, press the SELECT button on the control panel to activate control panel menus. The main menu appears in the SDA, the menu title in the first line and the first menu item in the second line.

To navigate through the main menu, press the UP-ARROW (↑) or DOWN-ARROW (↓) buttons. To select a menu item, wait until it is displayed in line #2 and then press the SELECT button.

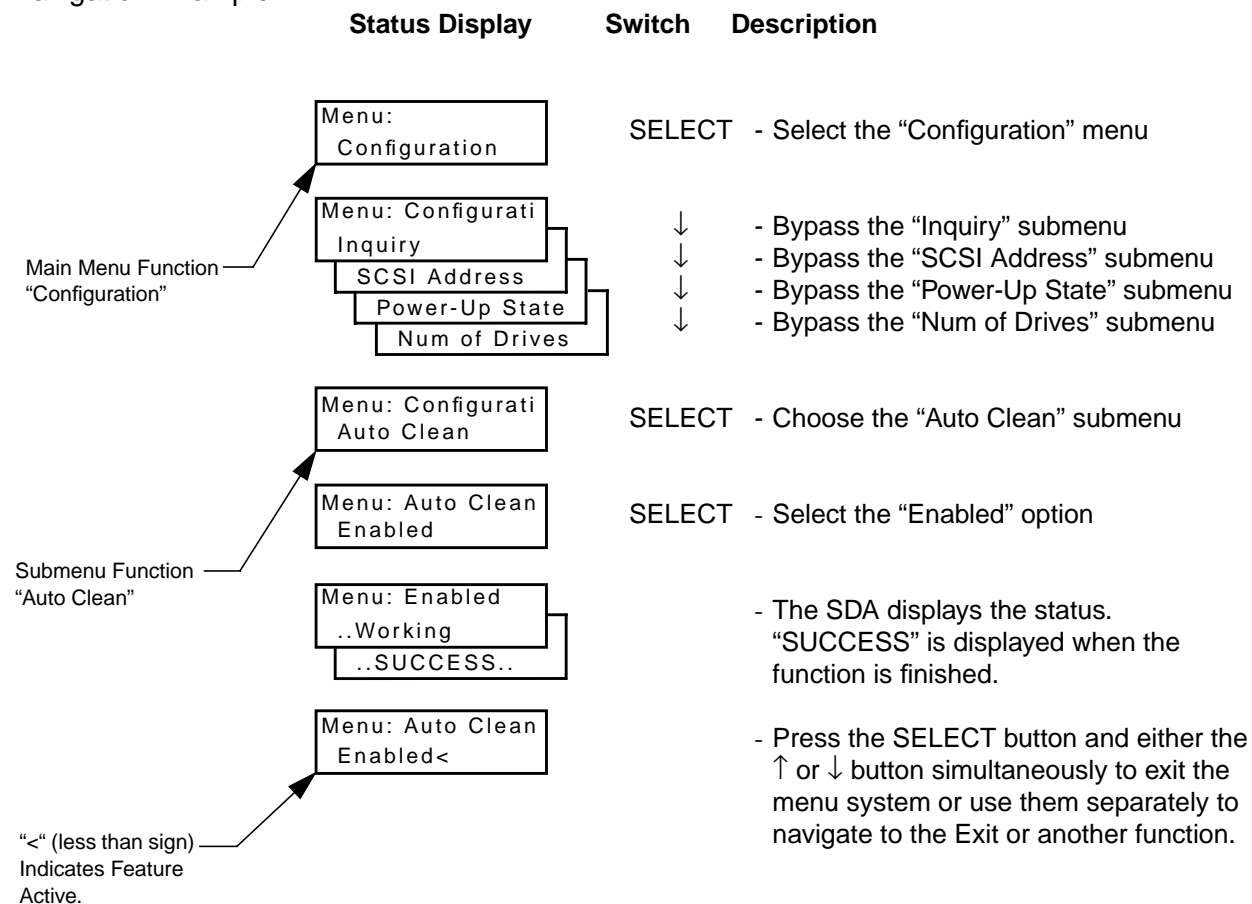
Selecting an item in the main menu brings up a submenu for that item. Line #1 in the SDA changes to the submenu title and line #2 shows the first item in the submenu. Use the ↑ or ↓ buttons and the SELECT button to select other desired items. Menu items either execute commands or open other submenus.

An Exit option is provided at the end of each menu, submenu, or option list. When you choose Exit, you are returned to the previous menu. At that point, another procedure can be performed, or the operator can scroll to the next Exit until completely exiting the menu system. (The quickest way to exit the menu mode is to press the SELECT button and either the ↑ or ↓ button simultaneously.)

**Note** *After an operation is executed, the results displayed in the SDA must be cleared before the quick method of exiting will be available. To clear the results of an operation from the SDA, press the ↑ or ↓ button.*

Figure A-9 on page A-18 is an example of menu navigation. It shows the commands and associated SDA displays involved in changing the Auto Clean option from Disabled (factory default) to Enabled.

Figure A-9 : Menu Navigation Example



## Using Control Panel Menus

Use the following procedures with Figure A-9 to navigate through the Library's menu system.

### Entering Control Panel Menu

1. Press the control panel STANDBY button and verify the SDA shows System Off-line.
2. Press the SELECT button to activate control panel menus.
3. Verify the following is displayed in the SDA:

Menu: Configuration
------------------------

### Exiting Control Panel Menu

There are two different ways to exit from menu mode: the fast method or the conventional method.

#### Fast Exit

From anywhere in the menu, press the SELECT button and the ↑ or ↓ button simultaneously. Verify that System Off-line is displayed in the SDA.

**Note** *After an operation is executed, the results displayed in the SDA must be cleared before this fast method of exiting is available. To clear the results of an operation from the SDA, press the ↑ or ↓ button.*

#### Conventional Exit

1. Use the ↑ and ↓ buttons to navigate to an Exit option, then press the SELECT button. (This method will take you one-level up in the menu each time that you perform it.)
2. Continue to perform step #1 until the following is displayed in the SDA.,

Menu: Exit
---------------

3. Press SELECT one final time to exit the menu system.



# Appendix **B**

## ***Sense Data Values***

Table B-1 lists message information that can be sent from the TL81X library to the host computer. The table lists the following information:

- Sense key
- Additional sense code (ASC)
- Additional sense code qualifier (ASCQ)
- Additional sense length (ASL) fields of the sense data block
- Message name, description and (potential) recovery action
- Valid interfaces: SCSI (host computer)
- Diag (Diagnostic port/Computer)
- Both = SCSI and Diag

**Note** *The message name and description may contain an abbreviation as follows:*

<i>LU</i>	<i>Logical Unit</i>
<i>REQ'D</i>	<i>Required</i>
<i>DEV</i>	<i>Device</i>
<i>Diag</i>	<i>Diagnostics</i>
<i>NVRAM</i>	<i>Non-Volatile RAM</i>
<i>A/D</i>	<i>Analog-to-Digital</i>

**Table B-1: Sense Data Values (Hexadecimal)**

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
0	00	00	NO ADDITIONAL SENSE INFORMATION  No recovery necessary.	Both
B	00	00	SCSI ABORT  Command aborted because host sent SCSI Abort Message.	SCSI
2	04	00	LU IS NOT READY, CAUSE NOT REPORTABLE  Check library unit power. Retry command.	Both
2	04	01	LOGICAL UNIT IN PROCESS OF BECOMING READY  Wait for library unit to complete initialization.	Both
2	04	03	LU IS NOT READY, MANUAL INTERVENTION REQ'D  Initialization failed. Determine failure type by checking any previous error code returned to host. Correct the cause of the failure and toggle STANDBY button.	Both
5	1A	00	PARAMETER LIST LENGTH ERROR  Invalid parameter list length field specified by command.	SCSI
5	20	00	INVALID COMMAND OPERATION CODE  Verify host command format using the ACL 4/52 Software Interface Guide.	SCSI
5	21	01	INVALID ELEMENT ADDRESS  Check Mode Sense data for correct element addresses.	SCSI
5	24	00	INVALID FIELD IN COMMAND DATA BLOCK  Ensure all reserve fields are set to zero.	SCSI

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
5	25	00	<p>LOGICAL UNIT IS NOT SUPPORTED</p> <p>Verify the logical unit field specified in the command contains a legitimate logical unit number. Check cabling to logical unit.</p>	SCSI
5	26	00	<p>INVALID FIELD IN PARAMETER LIST</p> <p>Verify Mode Select page fields. Verify that fields comply with the command format described in the ACL 4/52 Software Interface Guide.</p>	SCSI
5	26	02	<p>PARAMETER VALUE INVALID</p> <p>Verify Mode Select page fields. Verify that fields comply with the command format described in the ACL 4/52 Software Interface Guide.  This response will also be returned for commands issued to the “Diagnostic” interface of the library if an invalid parameter is sent.</p>	Both
6	28	01	<p>IMPORT OR EXPORT ELEMENT ACCESSED</p> <p>Load port door has been closed.</p>	Both
6	29	00	<p>POWER-ON, RESET OR BUS DEV. RESET OCCURRED</p> <p>Informational message. If power on occurs, the host user should assume the inventory may have been corrupted, and should ask the library for that information again.</p>	Both
6	2A	01	<p>MODE PERAMETERS CHANGED</p> <p>Mode parameters may have changed due to another host issuing a Mode Select command.</p>	SCSI

Sense Key	ASC	ASCQ	Message Name/Description	Interface
-none-	30	03	CLEANING CARTRIDGE INSTALLED  Indicates that the element contains a cleaning cartridge that is not “used-up.” This is returned with the element status data, which has no sense key.	SCSI
OR			OR	
5	30	03	CLEANING CARTRIDGE INSTALLED  <ul style="list-style-type: none"> <li>• A cleaning cartridge cannot be removed from a drive because it is being used in a cleaning operation.</li> <li>• A cartridge cannot be placed into the drive because the drive is being cleaned.</li> <li>• A cartridge cannot be placed into an empty storage element because it is reserved for a cleaning cartridge that is currently in use in a drive cleaning operation.</li> </ul>	Both
5	39	00	SAVING PARAMETERS NOT SUPPORTED  Verify Save Parameter field in the Mode Sense command complies with the command format described in the ACL 4/52 Software Interface Guide.	SCSI
5	3A	00	MEDIUM NOT PRESENT  The inventory indicated that a cartridge was in this bin but no cartridge was sensed by the gripper when it attempted to pick it. Retry the command. Check for proper seating of the cartridge.  It may also indicate that the tape is not ready to be picked from the drive because the tape is not fully unloaded. Retry the command. If the problem persists, check the function of the tape drive handle assembly. Manually unload the tape.	Both



Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	3B	0D	MEDIUM DESTINATION ELEMENT FULL  Destination element address already contains a cartridge. Issue a Read Element Status command and retry move command. If the problem repeats, issue an Initialize Element Status command followed by a Read Element Status command and retry move command.	Both
5	3B	0E	MEDIUM SOURCE ELEMENT EMPTY  Source element address does not contain a cartridge. Issue a Read Element Status command and retry move command. If problem repeats, issue an Initialize Element Status command followed by a Read Element Status command and retry the move command.	Both
B	43	00	SCSI MESSAGE ERROR  Detected message error in message processing on the SCSI BUS.	SCSI
B	45	00	SELECT OR RE-SELECT FAILURE  ACL 4/52 timed out trying to reselect host. Make sure host is running.	SCSI
	47	00	INITIATOR DETECTED ERROR  Initiator Detected Error Message was received from the host.	SCSI
B	48	00	INVALID MESSAGE ERROR  Received invalid message from logical unit. Check cable connections and cable length.	SCSI
B	49	00	INVALID MESSAGE ERROR  Received invalid message from logical unit. Check cable connections and cable length.	SCSI
5	4E	00	OVERLAPPED COMMANDS ATTEMPTED  Second command was sent when previous had not completed. This may also occur when executing off-line commands via the Control Panel and Diagnostic Port simultaneously.	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	53	02	<p>MEDIUM REMOVAL PREVENTED</p> <p>Prevent Medium Removal command was executed and command was received to export cartridge. Execute Allow Medium Removal command and retry move medium command.</p>	SCSI
6	54	00	<p>SCSI TO HOST SYSTEM INTERFACE FAILURE</p> <p>Possible SCSI bus time-out or premature disconnect. Check cable connections and cable length.</p>	SCSI
2	5A	01	<p>OPERATOR MEDIUM REMOVAL REQUEST</p> <ul style="list-style-type: none"> <li>• Indicates that the element contains a cleaning cartridge that is “used-up” and the system is unable to export the cleaning cartridge. Manually unload the tape.</li> <li>• The load port door is open, so import/export elements can not be accessed.</li> </ul>	Both
2	80	00	<p>DOOR IS OPENED INVENTORY MAY HAVE BEEN CORRUPTED</p> <p>Close door and retry command. If the system is ONLINE, it executes its initialization procedure.</p>	Both
6	80	00	<p>DOOR WAS OPENED INVENTORY MAY HAVE BEEN CORRUPTED</p> <p>Close door and retry command.</p>	Both
5	80	01	<p>TRANSFER FULL - COMMAND CAN NOT BE EXECUTED</p> <p>Gripper has cartridge in it. Move cartridge to empty storage element using Move Medium command. Retry command.</p>	Both
B	80	01	<p>TRANSFER FULL - AT END OF PLACE</p> <p>Gripper has cartridge in it at end of a place operation (Move Medium with a target other than the Transfer). Move cartridge to empty storage element using Move Medium command. Retry command.</p>	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
B	80	06	TRANSFER EMPTY - COMMAND ABORTED  Gripper does not contain cartridge at end of pick portion of Move Medium command.	Both
2	80	07	SYSTEM IS STOPPED (BUTTON IS CURRENTLY PUSHED)  The Control Panel STOP button was pressed. Press the STOP button.	Both
6	80	07	SYSTEM STOP BUTTON WAS PRESSED (MAY CURRENTLY BE PRESSED)  The Control Panel STOP button was pressed. Press the STOP button. Retry command.	Both
6	80	08	LOGICAL UNIT TURNED ONLINE  The library is ready to communicate with the host computer. Press the Control Panel STANDBY button to take the library off-line.	Diag
2	80	09	LOGICAL UNIT IS TURNED OFFLINE  The library is ready to communicate with the diagnostic PC. Press the Control Panel STANDBY button to place the library on-line.	SCSI
6	80	09	LOGICAL UNIT STANDBY BUTTON WAS PRESSED  Retry command.	SCSI
B	80	10	LOAD RETRY FAILED  ACL 4/52 was unable to successfully load the drive, even after retries. Check drive alignment. If problem continues, drive may need servicing.	Both
4	80	0A	NVRAM CHECKSUM FAILURE  Nonvolatile RAM contents are corrupted. Ensure nonvolatile RAM ICs are seated correctly. Use the Diagnostic Software to initialize nonvolatile RAM and calibrate system.	Both

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
B	80	0B	COMMAND ABORTED BY USER  Informational message. No action is necessary.	Both
B	80	0D	CARTRIDGE IS ONLY PARTIALLY GRIPPED (ONLY SEEN IN THE FRONT SENSOR).  Issue a Move Medium command to move the cartridge from the transfer element to an empty storage element.	Both
4	80	0F	LOW POWER ERROR  Check power connections.	Both
4	80	11	MOTOR POWER FAILURE  Indicates motor power turned off for a reason not otherwise reported. Toggle of the Stop button should clear.	Both
5	80	22	ELEMENT CONTENTS UNKNOWN  The contents of an element address are unknown. Issue a Read Element Status for the element address. If contents are still unknown issue an Initialize Element Status command.	Both
4	80	23	BARCODE DECODER COMMUNICATION FAILURE  Unable to initialize decoder. Verify that the decoder is powered on. Cycle power and/or check cable connections.	Both
B	81	01	GRIPPER TIMEOUT  Gripper did not reach desired position. Issue a Rezero Unit command.	Both
B	81	04	GRIPPER OPEN FAILURE  Gripper did not reach open position. Issue a Rezero Unit command. Check open sensor and cable connection.	Both
B	81	05	GRIPPER CLOSE FAILURE  Gripper did not reach close position. Issue a Rezero Unit command. Check closed sensor and cable connection.	Both

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
4	81	50	<p>REAR CASSETTE IN GRIPPER SENSOR IS BLOCKED, BUT FRONT SENSOR IS CLEAR</p> <p>Issue a Rezero Unit command. If condition repeats, check for a cartridge in the gripper and issue a Move Medium to an empty storage element.</p>	Both
B	81	51	<p>UNABLE TO PICK CARTRIDGE</p> <p>Cartridge was sensed in front gripper sensor, but was unable to seat cartridge in the rear gripper sensor. Check that gripper sensors are working and/or that tape was ejected far enough.</p>	Both
4	81	53	<p>GRIPPER CURRENT FAIL</p> <p>Gripper motor driver failed or operating out of specifications. Replace actuator driver board.</p>	Both
4	81	54	<p>GRIPPER TPU REGISTER FAILURE</p> <p>Replace Robotic Controller Board.</p>	Both
4	81	55	<p>GRIPPER TPU RAM FAILURE</p> <p>Replace Robotic Controller Board.</p>	Both
B	83	01	<p>EXTENSION TIMEOUT</p> <p>Extension axis did not reach desired position. Retry command. If failure repeats, use Diagnostic Software to run extension self-test.</p>	Both
4	83	02	<p>EXTENSION CURRENT FEEDBACK FAILURE</p> <p>Extension axis collided with obstruction. Determine cause of obstruction. Calibrate the system. Lubricate the rail.</p>	Both
4	83	03	<p>EXTENSION MECHANICAL POSITION ERROR</p> <p>Extension axis was unable to move to commanded position. Retry command. If failure repeats, run extension self-test.</p>	Both

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
B	83	10	EXTENSION INVALID ACTUATOR START POSITION  Extension axis position is unknown. Issue a Rezero Unit command.	Both
5	83	11	EXTENSION ACTUATOR CURRENT FEEDBACK TEST FAILURE  Unable to detect current feedback during self-test. Check motor cable connection.	Both
4	83	21	EXTENSION ACTUATOR CURRENT FEEDBACK TEST FAILURE  Unable to detect current feedback during self-test. Check motor cable connection.	Both
4	83	22	EXTENSION ACTUATOR ENCODER (OR MOTOR) TEST FAILURE  The value of the extension encoder did not change during self-test. Check motor/encoder connector.	Both
4	83	23	EXTENSION FLAG MISSING  Extension axis home sensor or electronics failure. Check for obstacles in extension path. Check cable connectors.	Both
4	83	40	EXTENSION FORCE NOT REACHED  During calibration or pushing into a drive, the extension never reached its intended force. If failure repeats, run extension self-test.	Both
4	83	41	EXTENSION FORCE OBJECT MISSING  During calibration or pushing into a drive, the extension never made contact with any object.	Both
B	84	01	VERTICAL TIMEOUT  Vertical axis did not reach desired position within the time limits. Retry command. If failure repeats, run vertical self-test.	Both

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
4	84	03	VERTICAL MECHANICAL POSITION ERROR  Vertical axis did not reach desired position. Retry command. If failure repeats, run vertical self-test.	Both
4	84	08	VERTICAL HOME NOT FOUND  Vertical axis did not reach the home position. Issue Rezero Unit and retry command. If failure repeats, run vertical self-test.	Both
B	84	10	VERTICAL INVALID ACTUATOR START POSITION  Position of vertical axis is unknown. Issue a Rezero Unit command.	Both
5	84	11	VERTICAL INVALID COMMAND  Vertical axis commanded to position out of system mechanical limits. Issue a Rezero Unit command. If problem persists, calibrate the library.	Both
4	84	20	VERTICAL TEST FAILURE  The axis crossed no confirmation flags at expected velocities during self-test. Check flag sensor and cable connection. Check for obstacles in path. Check motor cable connection.	Both
4	84	21	VERTICAL CURRENT TEST FAILURE  Unable to detect current feedback during self-test. Check motor cable connection.	Both
4	84	23	VERTICAL POSITION OVERFLOW  The position step counter overflowed. Issue a Rezero Unit command.	Both
4	84	24	VERTICAL HARDWARE ERROR  Vertical actuator or sensor has failed.	Both

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
4	84	30	VERTICAL MAPPING FAILURE  Scanner was unable to detect vertical target during calibration.	Both
4	84	31	VERTICAL CONFIRMATION FAILURE  Unable to locate all confirmation flags. Check flag sensor and cable connections. Check for obstructions on vertical rail. If failure repeats, run vertical self-test.	Both
B	85	01	HORIZONTAL TIMEOUT  Horizontal axis did not reach desired position within the time limits. Retry command. If failure repeats, use the Diagnostic Software to run horizontal self-test.	Both
4	85	03	HORIZONTAL MECHANICAL POSITION ERROR  Horizontal axis did not reach desired position. Retry command. If failure repeats, use the Diagnostic Software to run horizontal self-test.	Both
4	85	08	HORIZONTAL HOME NOT FOUND  Horizontal axis did not reach the home position. Issue Rezero Unit and retry command. If failure repeats, run horizontal self-test.	Both
B	85	10	HORIZONTAL INVALID ACTUATOR START POSITION  Position of horizontal axis is unknown. Issue a Rezero Unit command.	Both
5	85	11	HORIZONTAL INVALID COMMAND  Horizontal axis commanded to position out of system mechanical limits. Issue a Rezero Unit command. If problem persists, calibrate the library.	Both
4	85	20	HORIZONTAL TEST FAILURE  The axis crossed no confirmation flags at expected velocities during self-test. Check flag sensor and cable connection. Check for obstacles in path. Check motor cable connection.	Both



<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
4	85	21	HORIZONTAL CURRENT TEST FAILURE  Unable to detect current feedback during self-test. Check motor cable connection.	Both
4	85	23	HORIZONTAL POSITION OVERFLOW  The position step counter overflowed. Issue a Rezero Unit command.	Both
4	85	24	HORIZONTAL HARDWARE ERROR  Horizontal actuator or sensor has failed.	Both
4	85	30	HORIZONTAL MAPPING FAILURE  Scanner was unable to detect horizontal target during calibration.	Both
4	85	31	HORIZONTAL CONFIRMATION FAILURE  Unable to locate all confirmation flags. Check flag sensor and cable connections. Check for obstructions on horizontal rail. If failure repeats, run horizontal self-test.	Both
6	88	00	WARNING SAFE TEMPERATURE EXCEEDED  This is only a warning that the temperature in the library exceeds the normal operational temperature (90°F).	Both
4	88	01	MAXIMUM TEMPERATURE EXCEEDED  Library turns off and remains off until the temperature returns to an acceptable level (59-90°F).	Both
5	8A	02	UNCALIBRATED POSITION  System requires calibration.	Both
B	8C	01	LOAD PORT TIMEOUT  The door was unlocked but did not leave its current position before time-out (30 seconds). This may be due to the door being stuck, or in the case of a close operation, the operator not moving the door.	Both

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
4	8C	06	LOAD PORT DOOR OPEN  The door is stuck in an intermediate position (not opened and not closed.) Operation intervention is required.	Both
B	8D	01	DLT™ DRIVE HANDLE MOTOR TPU TIMEOUT  Replace Robotics Controller Board.	Both
B	8D	02	DLT™ DRIVE HANDLE MOTOR MOVE TIMEOUT  Retry command. If failure repeats, power cycle unit. If failure repeats, run DLT™ Drive Handle self-test.	Both
4	8D	03	DLT™ DRIVE HANDLE MOTOR CPU RAM ERROR  Replace Robotic Controller Board.	Both
4	8D	04	DLT™ DRIVE HANDLE MOTOR CPU REGISTER ERROR  Replace Robotic Controller Board.	Both
4	8D	05	DLT™ DRIVE HANDLE MOTOR HARDWARE ERROR  Stepper was unable to reach destination (open or close). Retry command. If failure repeats, run DLT™ Drive Handle self-test.	Both
4	8D	06	DLT™ DRIVE HANDLE MOTOR CURRENT FEEDBACK TEST FAILURE  Unable to sense current feedback from stepper motor controller during self-test. Check motor cable connections.	Both
4	8E	01	FLASH MEMORY UNABLE TO IDENTIFY  Flash is soldered onto the board. Replace the Robotic Controller.	Diag
4	8E	02	FLASH MEMORY UNABLE TO ERASE  Flash is soldered onto the board. Replace the Robotic Controller.	Diag

<b>Sense Key</b>	<b>ASC</b>	<b>ASCQ</b>	<b>Message Name/Description</b>	<b>Interface</b>
4	8E	03	FLASH MEMORY UNABLE TO PROGRAM  Flash is soldered onto the board. Replace the Robotic Controller.	Diag
B	8F	00	LIBRARY UNIT COMMAND TIMED OUT  Verify that communications to library still exists by issuing another command	SCSI
4	F3	02	DLT™ DRIVE COMMUNICATION TIMEOUT  The library is unable to communicate with a drive.	Both
4	F3	11	DLT™ DRIVE HANDLE NOT OK  The tape drive is reporting that the handle cannot open. (This may indicate that a DLT™ cartridge is present that has not been unloaded.)	Both



# Glossary

TL810 library	The automated storage and retrieval component of an automated tape library system used for storing and handling DLT™ cartridges. TZ87N cartridges are used with the TL810 tape library.
TL812 library	The automated storage and retrieval component of an automated tape library system used for storing and handling DLT™ cartridges. TZ88N cartridges are used with the TL812 tape library.
actuators	Robotic components that move inside the library to manipulate cartridges. These include the gripper, extension axis, and vertical and horizontal axes.
automated tape library	A robotic storage and retrieval system for DLT™ cartridges.
bar code label	The identification label on DLT™ cartridges.
bar code scanner	A device that is mounted on the extension axis that reads the cartridge bar code labels.
calibration	The software measurements and configuration required for successful operation of the library.
control panel	The panel on the front of the library that contains the status display area, as well as indicators and control switches.
DLT™	Digital linear tape
EIA/TIA-574	A serial communications cabling and protocol standard for nine-pin connectors; sometimes referred to as RS-232.
extension axis assembly	Mounted onto the vertical axis, the extension axis assembly consists of the gripper assembly and the horizontal axis on which the gripper assembly is mounted.
extension axis belt	The drive belt connecting the extension motor/gearbox to the gripper.
FCC Class A	Standard established by the U.S. Federal Communications Commission governing electromagnetic emissions.
FSE	Field service engineer
gripper assembly	The assembly that mounts on the extension axis and grips cartridges; referred to as the gripper.
horizontal belt	The drive belt connecting the horizontal motor to the horizontal axis assembly.

host	Host computer
host computer	The computer that issues SCSI commands to control the library robotics.
LCD	Liquid crystal display
Load Port	The component of the library that allows cartridges to be loaded and unloaded.
MTBP	Mean time between failures
MTTR	Mean time to repair
NVRAM	Non-volatile RAM
on-line	Ready for communications with a host.
PC	Personal computer
pick	The act of removing a cartridge from one location in preparation for placing it in another location.
place	The act of placing a cartridge in a location after it has been picked from another location.
PROM	Programmable read-only memory
RAM	Random-access memory
rear panel	The rear cosmetic panel of the library that contains the power switch and connectors for attaching external cabling to the library.
SCSI	Small computer system interface. A communications standard for attaching peripheral equipment to computers.
tape drive	The mechanism that reads and writes data from and to a tape.
UL	Underwriters Laboratories.
vertical belt	The drive belt connecting the vertical motor to the vertical axis assembly.
vertical carriage assembly	The crossbar and linear bearings mounted on a vertical rail and all components mounted on the crossbar.
ZIF connector	Zero insertion force connector

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