Sun™
Enterprise Tape Library™
7 / 3500 Field Service Manual

THE NETWORK IS THE COMPUTER™

Sun Microsystems Computer Company
A Sun Microsystems, Inc. Business
2550 Garcia Avenue
Mountain View, CA 94043 USA
415 960-1300 fax 415 969-9131

Part No.: 805-1038-10
Revision A, July 1997

Please
Recycle

Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Sun Microsystems product.

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Symbols

The following symbols may appear in this book:

Caution – There is risk of personal injury and equipment damage. Follow the instructions.

Caution – Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.

Caution – Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

On – Applies AC power to the system.

Depending on the type of power switch your device has, one of the following symbols may be used:

Off – Removes AC power from the system.

Standby – The On/Standby switch is in the *standby* position.

Modifications to Equipment

Do not make mechanical or electrical modifications to the equipment. Sun Microsystems is not responsible for regulatory compliance of a modified Sun product.

Placement of a Sun Product

Caution – Do not block or cover the openings of your Sun product. Never place a Sun product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Sun product.

SELV Compliance

Safety status of I/O connections comply to SELV requirements.

European Ergonomics

In order to conform with the German ZH1/618 ergonomic standard, an antiglare treatment to the CRT has been provided. For text processing applications, a positive mode display (black characters on a white background) is required.

Power Cord Connection

Caution – Sun products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electric shock, do not plug Sun products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.

Caution – Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Sun product.

Caution – Your Sun product is shipped with a grounding type (three-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.

The following caution applies only to devices with a **Standby** power switch:

Caution – The power switch of this product functions as a standby type device only. The power cord serves as the primary disconnect device for the system. Be sure to plug the power cord into a grounded power outlet that is nearby the system and is readily accessible. Do not connect the power cord when the power supply has been removed from the system chassis.

Lithium Battery

Caution – On Sun CPU boards, there is a lithium battery molded into the real-time clock, SGS No. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, or MK48T08. Batteries are not customer replaceable parts. They may explode if mishandled. Do not dispose of the battery in fire. Do not disassemble it or attempt to recharge it.

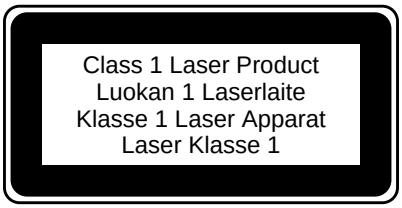
System Unit Cover

You must remove the cover of your Sun computer system unit in order to add cards, memory, or internal storage devices. Be sure to replace the top cover before powering up your computer system.

Caution – Do not operate Sun products without the top cover in place. Failure to take this precaution may result in personal injury and system damage.

Laser Compliance Notice

Sun products that use laser technology comply with Class 1 laser requirements.



CD-ROM

Caution – Use of controls, adjustments, or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

Einhaltung sicherheitsbehördlicher Vorschriften

Auf dieser Seite werden Sicherheitsrichtlinien beschrieben, die bei der Installation von Sun-Produkten zu beachten sind.

Sicherheitsvorkehrungen

Treffen Sie zu Ihrem eigenen Schutz die folgenden Sicherheitsvorkehrungen, wenn Sie Ihr Gerät installieren:

- Beachten Sie alle auf den Geräten angebrachten Warnhinweise und Anweisungen.
- Vergewissern Sie sich, daß Spannung und Frequenz Ihrer Stromquelle mit der Spannung und Frequenz übereinstimmen, die auf dem Etikett mit den elektrischen Nennwerten des Geräts angegeben sind.
- Stecken Sie auf keinen Fall irgendwelche Gegenstände in Öffnungen in den Geräten. Leitfähige Gegenstände könnten aufgrund der möglicherweise vorliegenden gefährlichen Spannungen einen Kurzschluß verursachen, der einen Brand, Stromschlag oder Geräteschaden herbeiführen kann.

Symbole

Die Symbole in diesem Handbuch haben folgende Bedeutung:

Achtung – Gefahr von Verletzung und Geräteschaden. Befolgen Sie die Anweisungen.

Achtung – Hohe Temperatur. Nicht berühren, da Verletzungsgefahr durch heiße Oberfläche besteht.

Achtung – Gefährliche Spannungen. Anweisungen befolgen, um Stromschläge und Verletzungen zu vermeiden.

Ein – Setzt das System unter Wechselstrom.

Je nach Netzschaltertyp an Ihrem Gerät kann eines der folgenden Symbole benutzt werden:

Aus – Unterbricht die Wechselstromzufuhr zum Gerät.

Wartezustand (Stand-by-Position) - Der Ein-/Wartezustand-Schalter steht auf Wartezustand. Änderungen an Sun-Geräten.

Nehmen Sie keine mechanischen oder elektrischen Änderungen an den Geräten vor. Sun Microsystems, übernimmt bei einem Sun-Produkt, das geändert wurde, keine Verantwortung für die Einhaltung behördlicher Vorschriften

Aufstellung von Sun-Geräten

Achtung – Um den zuverlässigen Betrieb Ihres Sun-Geräts zu gewährleisten und es vor Überhitzung zu schützen, dürfen die Öffnungen im Gerät nicht blockiert oder verdeckt werden. Sun-Produkte sollten niemals in der Nähe von Heizkörpern oder Heizluftklappen aufgestellt werden.

Einhaltung der SELV-Richtlinien

Die Sicherung der I/O-Verbindungen entspricht den Anforderungen der SELV-Spezifikation.

Ergonomie-Richtlinien

Um den Anforderungen der in Deutschland geltenden Ergonomie-Richtlinie ZH1/618 zu entsprechen, wurde der Bildschirm entspiegelt. Für Textverarbeitungsanwendungen wird ein positiver Anzeigemodus (schwarze Zeichen auf weißem Hintergrund) empfohlen.

Anschluß des Netzkabels

Achtung – Sun-Produkte sind für den Betrieb an Einphasen-Stromnetzen mit geerdetem Nulleiter vorgesehen. Um die Stromschlaggefahr zu reduzieren, schließen Sie Sun-Produkte nicht an andere Stromquellen an. Ihr Betriebsleiter oder ein qualifizierter Elektriker kann Ihnen die Daten zur Stromversorgung in Ihrem Gebäude geben.

Achtung – Nicht alle Netzkabel haben die gleichen Nennwerte. Herkömmliche, im Haushalt verwendete Verlängerungskabel besitzen keinen Überlastungsschutz und sind daher für Computersysteme nicht geeignet.

Achtung – Ihr Sun-Gerät wird mit einem dreiadrigen Netzkabel für geerdete Netzsteckdosen geliefert. Um die Gefahr eines Stromschlags zu reduzieren, schließen Sie das Kabel nur an eine fachgerecht verlegte, geerdete Steckdose an.

Die folgende Warnung gilt nur für Geräte mit Wartezustand-Netzschalter:

Achtung – Der Ein/Aus-Schalter dieses Geräts schaltet nur auf Wartezustand (Stand-By-Modus). Um die Stromzufuhr zum Gerät vollständig zu unterbrechen, müssen Sie das Netzkabel von der Steckdose abziehen. Schließen Sie den Stecker des Netzkabels an eine in der Nähe befindliche, frei zugängliche, geerdete Netzsteckdose an. Schließen Sie das Netzkabel nicht an, wenn das Netzteil aus der Systemeinheit entfernt wurde.

Lithiumbatterie

Achtung – CPU-Karten von Sun verfügen über eine Echtzeituhr mit integrierter Lithiumbatterie (Teile-Nr. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, oder MK48T08). Diese Batterie darf nur von einem qualifizierten Servicetechniker ausgewechselt werden, da sie bei falscher Handhabung explodieren kann. Werfen Sie die Batterie nicht ins Feuer. Versuchen Sie auf keinen Fall, die Batterie auszubauen oder wiederaufzuladen.

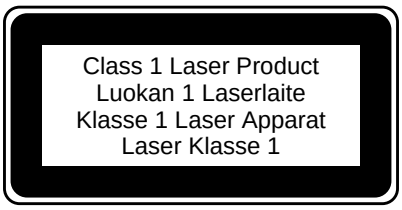
Gehäuseabdeckung

Sie müssen die obere Abdeckung Ihres Sun-Systems entfernen, um interne Komponenten wie Karten, Speicherchips oder Massenspeicher hinzuzufügen. Bringen Sie die obere Gehäuseabdeckung wieder an, bevor Sie Ihr System einschalten.

Achtung – Bei Betrieb des Systems ohne obere Abdeckung besteht die Gefahr von Stromschlag und Systemschäden.

Einhaltung der Richtlinien für Laser

Sun-Produkte, die mit Laser-Technologie arbeiten, entsprechen den Anforderungen der Laser Klasse 1.



CD-ROM

Warnung – Die Verwendung von anderen Steuerungen und Einstellungen oder die Durchfhrung von Prozeduren, die von den hier beschriebenen abweichen, knnen gefhrliche Strahlungen zur Folge haben.

Conformité aux normes de sécurité

Ce texte traite des mesures de sécurité qu'il convient de prendre pour l'installation d'un produit Sun Microsystems.

Mesures de sécurité

Pour votre protection, veuillez prendre les précautions suivantes pendant l'installation du matériel :

- Suivre tous les avertissements et toutes les instructions inscrites sur le matériel.
- Vérifier que la tension et la fréquence de la source d'alimentation électrique correspondent à la tension et à la fréquence indiquées sur l'étiquette de classification de l'appareil.
- Ne jamais introduire d'objets quels qu'ils soient dans une des ouvertures de l'appareil. Vous pourriez vous trouver en présence de hautes tensions dangereuses. Tout objet conducteur introduit de la sorte pourrait produire un court-circuit qui entraînerait des flammes, des risques d'électrocution ou des dégâts matériels.

Symboles

Vous trouverez ci-dessous la signification des différents symboles utilisés :

Attention : risques de blessures corporelles et de dégâts matériels. Veuillez suivre les instructions.

Attention : surface à température élevée. Evitez le contact. La température des surfaces est élevée et leur contact peut provoquer des blessures corporelles.

Attention : présence de tensions dangereuses. Pour éviter les risques d'électrocution et de danger pour la santé physique, veuillez suivre les instructions.

MARCHE – Votre système est sous tension (courant alternatif).

Un des symboles suivants sera peut-être utilisé en fonction du type d'interrupteur de votre système:

ARRET – Votre système est hors tension (courant alternatif).

VEILLEUSE – L'interrupteur Marche/Veilleuse est en position « Veilleuse ».

Modification du matériel

Ne pas apporter de modification mécanique ou électrique au matériel. Sun Microsystems n'est pas responsable de la conformité réglementaire d'un produit Sun qui a été modifié.

Positionnement d'un produit Sun

Attention : pour assurer le bon fonctionnement de votre produit Sun et pour l'empêcher de surchauffer, il convient de ne pas obstruer ni recouvrir les ouvertures prévues dans l'appareil. Un produit Sun ne doit jamais être placé à proximité d'un radiateur ou d'une source de chaleur.

Conformité SELV

Sécurité : les raccordements E/S sont conformes aux normes SELV.

Ergonomie européenne

Conformément à la norme d'ergonomie allemande ZH1/618, le CRT a été soumis à un traitement antireflets. Pour le traitement de texte, un affichage en mode positif (c'est-à-dire des caractères noirs sur fond blanc) est nécessaire.

Connexion du cordon d'alimentation

Attention : les produits Sun sont conçus pour fonctionner avec des alimentations monophasées munies d'un conducteur neutre mis à la terre. Pour écarter les risques d'électrocution, ne pas brancher de produit Sun dans un autre type d'alimentation secteur. En cas de doute quant au type d'alimentation électrique du local, veuillez vous adresser au directeur de l'exploitation ou à un électricien qualifié.

Attention : tous les cordons d'alimentation n'ont pas forcément la même puissance nominale en matière de courant. Les rallonges d'usage domestique n'offrent pas de protection contre les surcharges et ne sont pas prévues pour les systèmes d'ordinateurs. Ne pas utiliser de rallonge d'usage domestique avec votre produit Sun.

Attention : votre produit Sun a été livré équipé d'un cordon d'alimentation à trois fils (avec prise de terre). Pour écarter tout risque d'électrocution, branchez toujours ce cordon dans une prise mise à la terre.

L'avertissement suivant s'applique uniquement aux systèmes équipés d'un interrupteur VEILLEUSE:

Attention : le commutateur d'alimentation de ce produit fonctionne comme un dispositif de mise en veille uniquement. C'est la prise d'alimentation qui sert à mettre le produit hors tension. Veillez donc à installer le produit à proximité d'une prise murale facilement accessible. Ne connectez pas la prise d'alimentation lorsque le châssis du système n'est plus alimenté.

Batterie au lithium

Attention : sur les cartes CPU Sun, une batterie au lithium (référence MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, ou MK48T08.) a été moulée dans l'horloge temps réel SGS. Les batteries ne sont pas des pièces remplaçables par le client. Elles risquent d'exploser en cas de mauvais traitement. Ne pas jeter la batterie au feu. Ne pas la démonter ni tenter de la recharger.

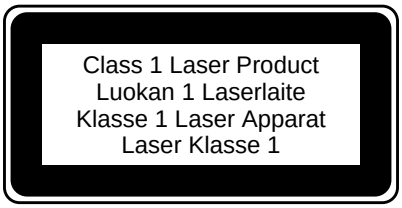
Couvercle

Pour ajouter des cartes, de la mémoire, ou des unités de stockage internes, vous devrez démonter le couvercle de l'unité système Sun. Ne pas oublier de remettre ce couvercle en place avant de mettre le système sous tension.

Attention : il est dangereux de faire fonctionner un produit Sun sans le couvercle en place. Si l'on néglige cette précaution, on encourt des risques de blessures corporelles et de dégâts matériels.

Conformité aux certifications Laser

Les produits Sun qui font appel aux technologies lasers sont conformes aux normes de la classe 1 en la matière.



CD-ROM

Attention – L'utilisation de contrôles, de réglages ou de performances de procédures autre que celle spécifiée dans le présent document peut provoquer une exposition à des radiations dangereuses.

Normativas de seguridad

El siguiente texto incluye las medidas de seguridad que se deben seguir cuando se instale algún producto de Sun Microsystems.

Precauciones de seguridad

Para su protección observe las siguientes medidas de seguridad cuando manipule su equipo:

- Siga todas los avisos e instrucciones marcados en el equipo.
- Asegúrese de que el voltaje y la frecuencia de la red eléctrica concuerdan con las descritas en las etiquetas de especificaciones eléctricas del equipo.
- No introduzca nunca objetos de ningún tipo a través de los orificios del equipo. Pueden haber voltajes peligrosos. Los objetos extraños conductores de la electricidad pueden producir cortocircuitos que provoquen un incendio, descargas eléctricas o daños en el equipo.

Símbolos

En este libro aparecen los siguientes símbolos:

Precaución – Existe el riesgo de lesiones personales y daños al equipo. Siga las instrucciones.

Precaución – Superficie caliente. Evite el contacto. Las superficies están calientes y pueden causar daños personales si se tocan.

Precaución – Voltaje peligroso presente. Para reducir el riesgo de descarga y daños para la salud siga las instrucciones.

Encendido – Aplica la alimentación de CA al sistema.

Según el tipo de interruptor de encendido que su equipo tenga, es posible que se utilice uno de los siguientes símbolos:

Apagado – Elimina la alimentación de CA del sistema.

En espera – El interruptor de Encendido/En espera se ha colocado en la posición de *En espera*.

Modificaciones en el equipo

No realice modificaciones de tipo mecánico o eléctrico en el equipo. Sun Microsystems no se hace responsable del cumplimiento de las normativas de seguridad en los equipos Sun modificados.

Ubicación de un producto Sun

Precaución – Para asegurar la fiabilidad de funcionamiento de su producto Sun y para protegerlo de sobrecalentamien-tos no deben obstruirse o taparse las rejillas del equipo. Los productos Sun nunca deben situarse cerca de radiadores o de fuentes de calor.

Cumplimiento de la normativa SELV

El estado de la seguridad de las conexiones de entrada/salida cumple los requisitos de la normativa SELV.

Normativa ergonómica europea

Para cumplir con el estándar de ergonomía alemán ZH1/618, se ha dotado a la pantalla con un tratamiento antireflectante. Para las aplicaciones de tratamiento de textos, se precisa un modo de visualización positivo (carácteres negros sobre fondo blanco).

Conexión del cable de alimentación eléctrica

Precaución – Los productos Sun están diseñados para
trabajar en una red eléctrica monofásica con toma de tierra. Para reducir el riesgo de descarga eléctrica, no conecte los productos Sun a otro tipo de sistema de alimentación eléctrica. Póngase en contacto con el responsable de mantenimiento o con un electricista cualificado si no está seguro del sistema de alimentación eléctrica del que se dispone en su edificio.

Precaución – No todos los cables de alimentación eléctrica tienen la misma capacidad. Los cables de tipo doméstico no están provistos de protecciones contra sobrecargas y por tanto no son apropiados para su uso con computadores. No utilice alargadores de tipo doméstico para conectar sus productos Sun.

Precaución – Con el producto Sun se proporciona un cable de alimentación con toma de tierra. Para reducir el riesgo de descargas eléctricas conéctelo siempre a un enchufe con toma de tierra.

La siguiente advertencia se aplica solamente a equipos con un interruptor de encendido que tenga una posición "En espera":

Precaución – El interruptor de encendido de este producto funciona exclusivamente como un dispositivo de puesta en espera. El enchufe de la fuente de alimentación está diseñado para ser el elemento primario de desconexión del equipo. El equipo debe instalarse cerca del enchufe de forma que este último pueda ser fácil y rápidamente accesible. No conecte el cable de alimentación cuando se ha retirado la fuente de alimentación del chasis del sistema.

Batería de litio

Precaución – En las placas de CPU Sun hay una batería de litio insertada en el reloj de tiempo real, tipo SGS Núm. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, o MK48T08. Las baterías no son elementos reemplazables por el propio cliente. Pueden explotar si se manipulan de forma errónea. No arroje las baterías al fuego. No las abra o intente recargarlas.

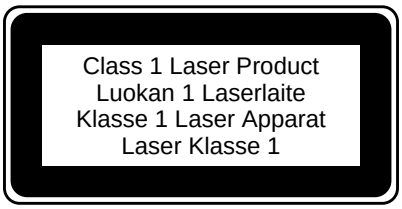
Tapa de la unidad del sistema

Debe quitar la tapa del sistema cuando sea necesario añadir tarjetas, memoria o dispositivos de almacenamiento internos. Asegúrese de cerrar la tapa superior antes de volver a encender el equipo.

Precaución – Es peligroso hacer funcionar los productos Sun sin la tapa superior colocada. El hecho de no tener en cuenta esta precaución puede ocasionar daños personales o perjudicar el funcionamiento del equipo.

Aviso de cumplimiento con requisitos de láser

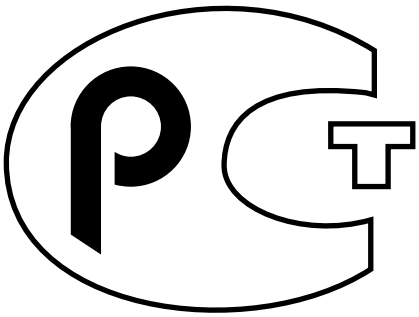
Los productos Sun que utilizan la tecnología de láser cumplen con los requisitos de láser de Clase 1.



CD-ROM

Precaución – El manejo de los controles, los ajustes o la ejecución de procedimientos distintos a los aquí especificados pueden exponer al usuario a radiaciones peligrosas.

GOST-R Certification Mark



Z001

Nordic Lithium Battery Cautions

Norge

A D V A R S E L – Litiumbatteri — Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Sverige

VARNING – Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Danmark

ADVARSEL! – Litiumbatteri — Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Suomi

VAROITUS – Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Contents

Figures

Tables

Preface

This book explains how to operate the Sun™ Enterprise Tape Library™ 7/3500. It assumes that the library has already been unpacked and installed using instructions found in the *Enterprise Tape Library 7/3500 Unpacking Instructions* and the *Enterprise Tape Library 7/3500 Facilities Planning and Installation Guide.*

First read the “Safety Agency Compliance” section at the beginning of this document. Then refer to the specific chapters to find the information you need.

Who Should Use This Book

This book is designed to aid nontechnical users in the operation of the tape library system. It begins with a general description of library components and continues with detailed descriptions of control panel menu functions and specific operating procedures. It also contains basic troubleshooting information.

This book does not address highly technical issues and procedures, such as hardware maintenance, diagnostic software operation, or library software development. To obtain this information, authorized field service engineers and system programmers should refer to the following documents:

- Sun *Enterprise Tape Library 7/3500 Diagnostic Software User’s Manual*
- *Sun Enterprise Tape Library 7/3500 Software Interface Guide*

How This Book Is Organized

This document is divided into the following sections:

- Chapter 1, “Library Overview,” provides a general overview of the library and descriptions of the components comprising the library.
- Chapter 2, “Preventive Maintenance,” provides guidelines and procedures for aligning, adjusting, cleaning, and lubricating specific components of the library.
- Chapter 3, “Troubleshooting and Fault Isolation,” provides the troubleshooting and fault isolation procedures for the ETL 7/3500 library.
- Chapter 4, “FRU Removal and Replacement,” contains a list of all field replaceable units (FRUs) of the ATL 7100 Series Library and the procedures for removing and replacing them.
- Appendix A, “Control Panel Menus,” provides an overview of the control panel menus.
- Appendix B, “Sense Data Values,” lists message information that can be sent from the ETL 7/3500 library to the host computer.

CHAPTER 1

Library Overview

This chapter provides a general overview of the ETL 7/3500 Library and descriptions of the components comprising the library.

Library Description

The ETL 7/3500 Library (FIGURE 1-1) is the automated storage and retrieval component of an automated tape library system. It contains up to seven DLT™7000 tape drives and can store a maximum of 96 Digital Linear Tape cartridges in a fixed storage array (FSA). An operator-accessible load port at the front of the library can hold an additional four tape cartridges for a maximum total of 100.

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 tape cartridges between storage bins (in the FSA), tape drives, or the load port. Each time a tape cartridge is transferred, a gripping mechanism is moved to the tape cartridge location where it “picks” the tape cartridge, moves it to the designated (new) location, and then “places” it.

Supported Tape Drives and Cartridges

The ETL 7/3500 Library is capable of supporting up to seven DLT™7000 tape drives. The library is also capable of supporting the CompacTape III and CompacTape IV cartridges, which are dark gray and black, respectively.

Caution – DO NOT USE CompacTape I, CompacTape II or CompacTape IIIXT tape cartridges in this library.

ETL 7/3500 Library Numbering Conventions

FIGURE 1-2 shows the numbering convention for the 100-cartridge library's fixed storage array bins, load port bins, and tape drives. This numbering convention is used in the diagnostic software and the library menu mode, which is viewed in the status display area of the control panel.

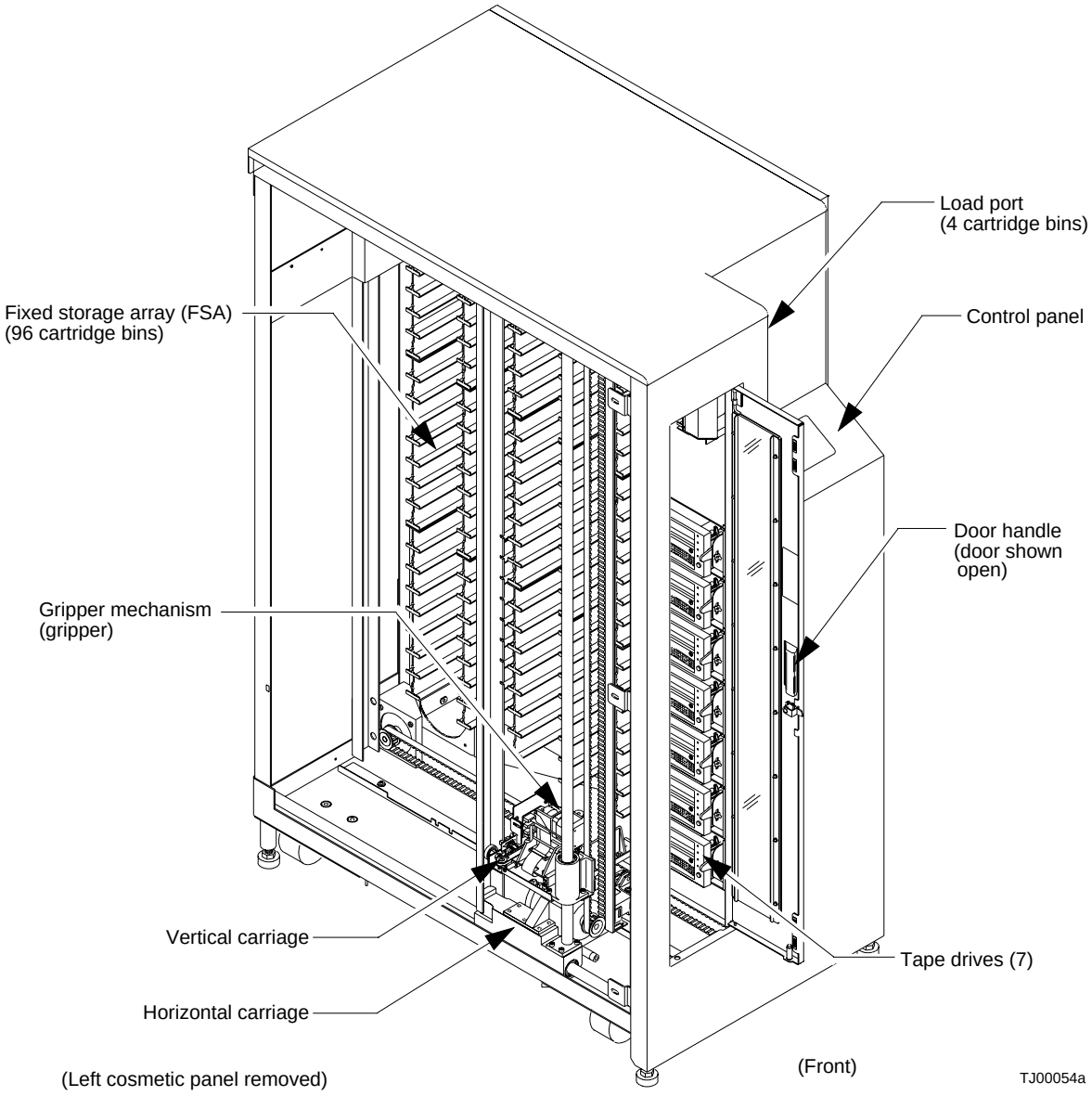


FIGURE 1-1 ETL 7 / 3500 Library

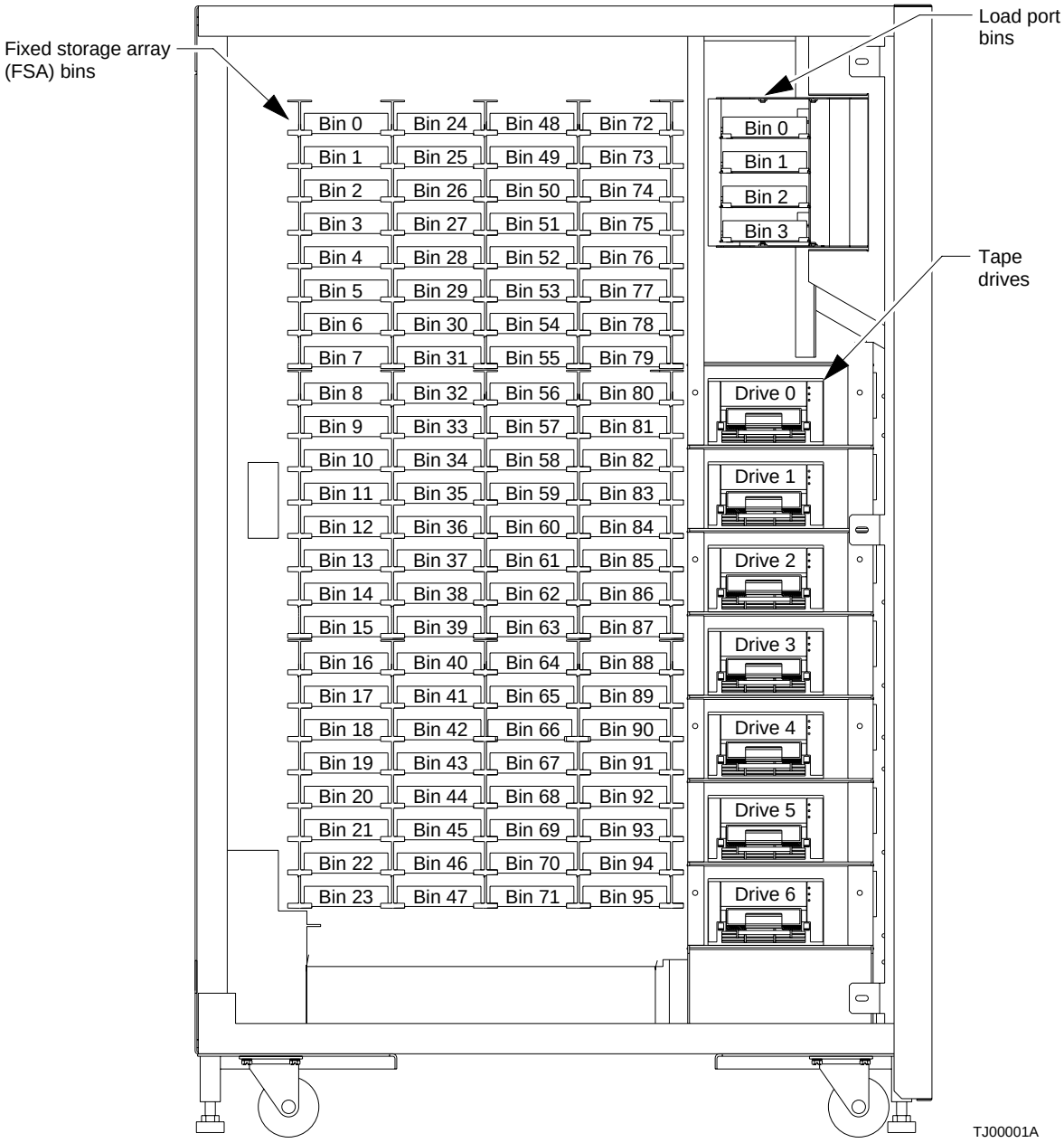


FIGURE 1-2 Library Numbering Conventions—100 Cartridge Model, Left-Side View

Library Components

FIGURE 1-3 shows the simplified block diagram of the library. The major assemblies and components of the library are listed here and discussed below in the sections that follow.

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

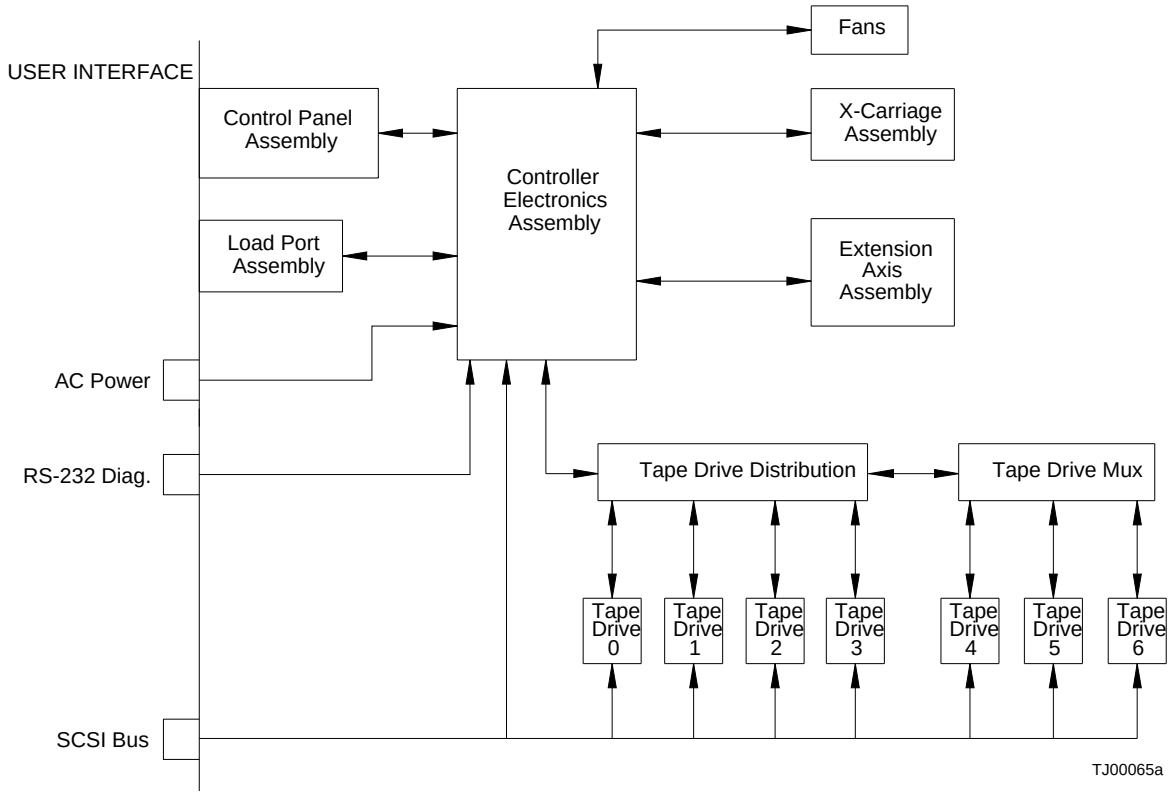


FIGURE 1-3 Simplified Block Diagram—Library Components

Controller Electronics Assembly

The controller electronics assembly (CEA) consists of the robotics controller PWA, the actuator driver PWA, and four power supplies. FIGURE 1-4 shows the location of the components and FIGURE 1-5 shows the simplified block diagram. The individual components are discussed in the paragraphs that follow.

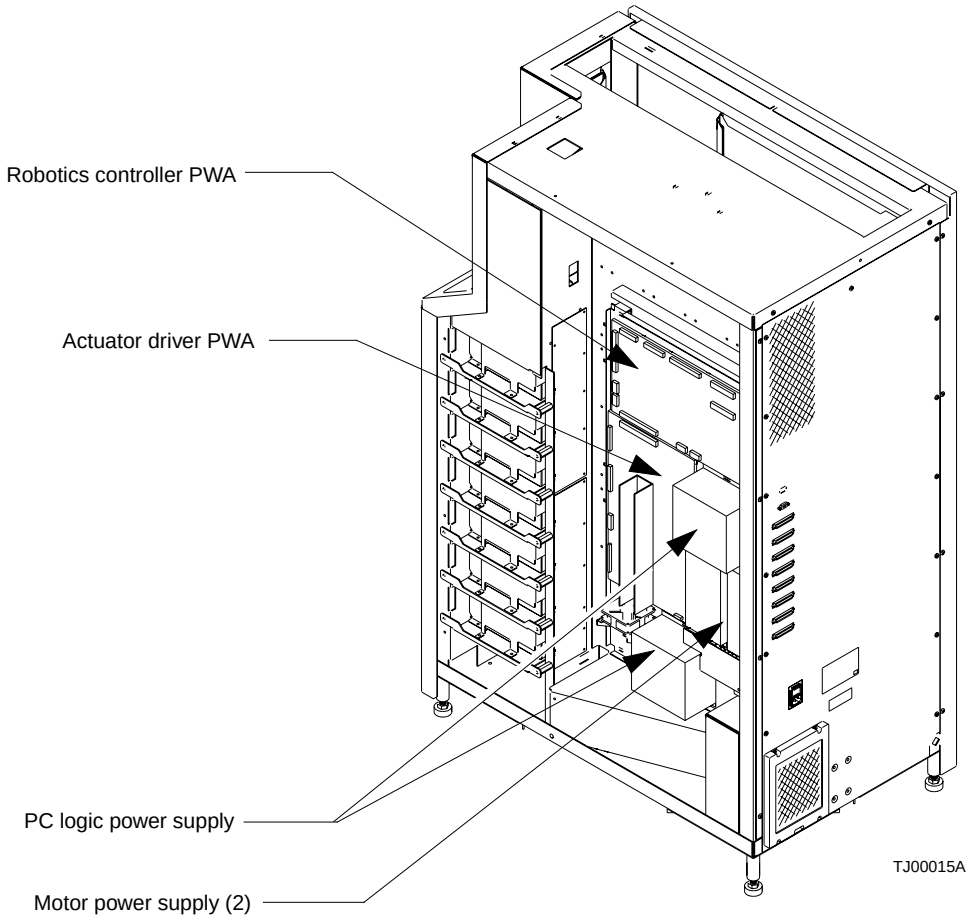


FIGURE 1-4 Controller Electronics Assembly

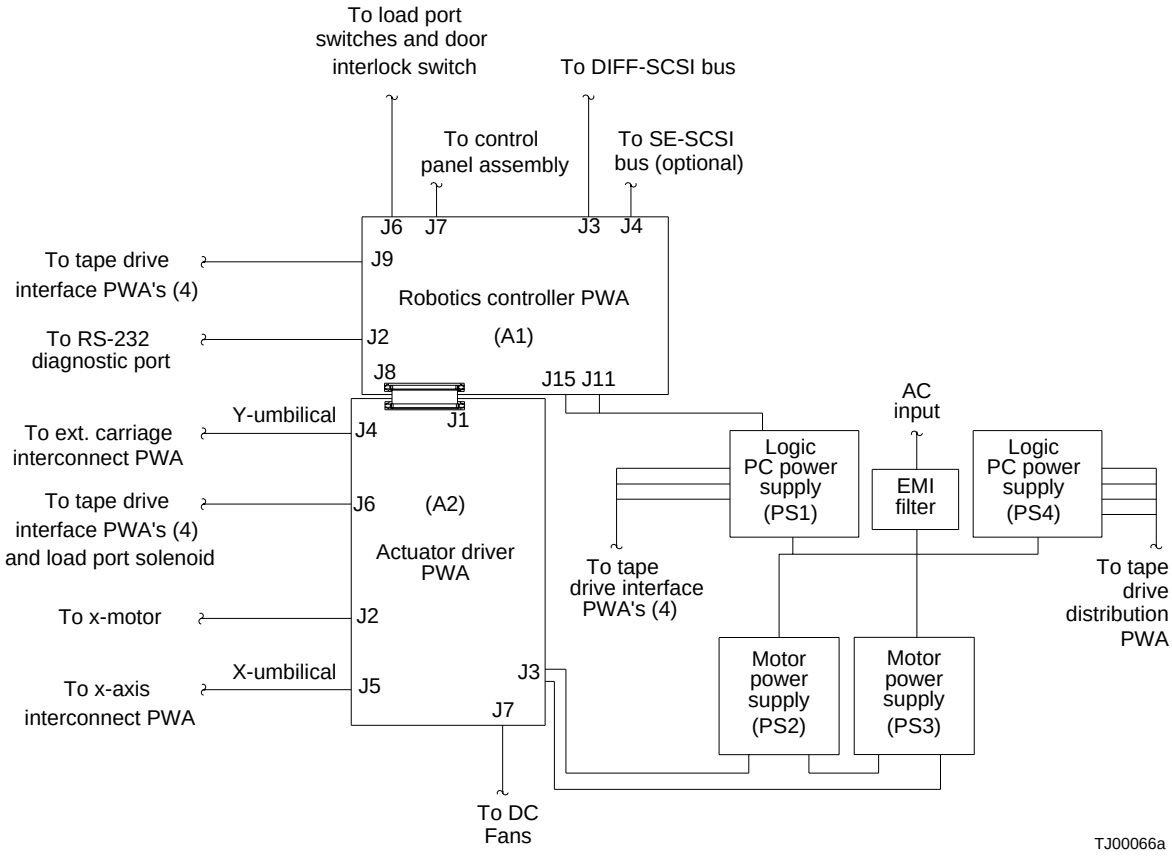


FIGURE 1-5 Controller Electronics Assembly Block Diagram

Robotics Controller PWA (A1)

The robotics controller PWA provides the interface between the library and the host computer. Using the SCSI II 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 and is responsible for monitoring the status of switches, sensors, the control panel, and the tape drives and, when required, transmitting this status information back to the host. Another function of the RC PWA is to provide the RS-232 interface to the diagnostic computer 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 occurs 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 robotics controller. This PWA amplifies and synthesizes the command signal to provide a high current two-phase microstepping 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 robotics controller. The PWA amplifies and synthesizes the command signal to provide a high current two-phase microstepping 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 robotics 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 robotics controller and, in turn, provides an open loop pull-in and hold current to the load port solenoid.

Tape Drive Handle Motor Interface

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

Power Supplies

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

Logic PC Power Supplies

Each logic PC power supply produces 326 watts with automatic ranging to a 115 VAC or 230 VAC input at 50/60 Hz. Outputs of +5 VDC and ±12 VDC are used to provide logic power for the library PWAs and the tape drives.

Motor Bus Power Supplies

Each motor bus power supply produces 110 watts with automatic ranging to 115 VAC or 230 VAC input at 50/60 Hz. 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 extension axis assembly (EAA) is located on the left side of the library. The EAA consists of the extension axis assembly and the gripper assembly mounted on the extension platform. FIGURE 1-6 shows the location of the components and FIGURE 1-7 shows the simplified block diagram. The individual components are discussed in the paragraphs that follow.

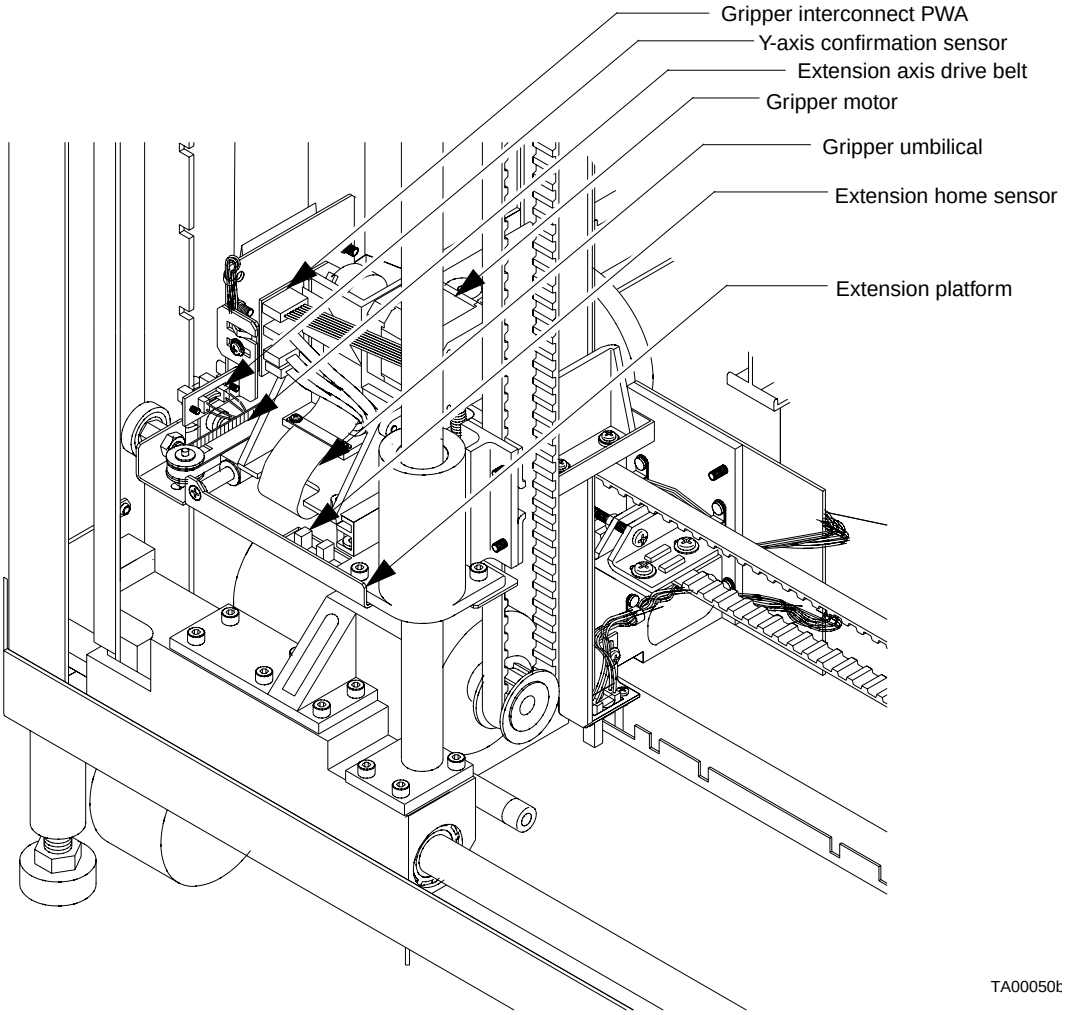


FIGURE 1-6 Extension Axis Assembly

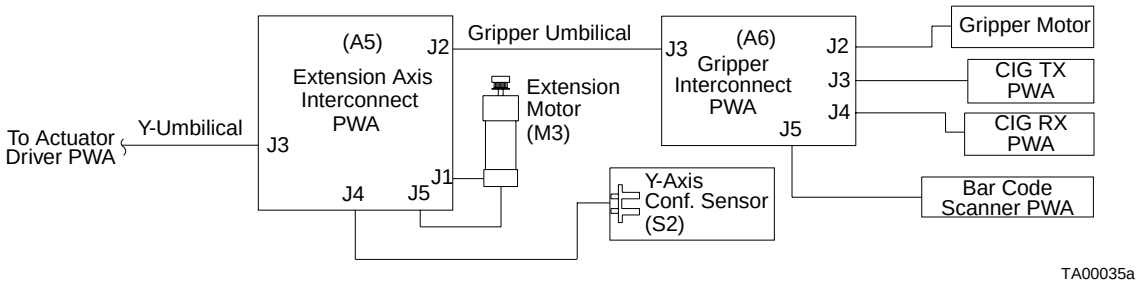


FIGURE 1-7 Extension Axis Assembly Block Diagram

Extension Drive Motor and Belt

The extension drive 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 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.

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, 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 were they are eventually received at the robotics controller. This PWA also acts as an distribution/interconnection point for gripper and extension motor drives from the actuator driver through the Y-umbilical.

Extension Motor (M3) and Encoder

The extension motor is a +24 VDC/2A brush motor with a 10:1 gearhead. The motor drives the extension belt, which in turn, 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 lines per revolution, two channel encoder, which gives position feedback to the robotics controller.

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

The gripper motor raises and lowers the upper gripper jaw. The gripper motor is a 2-phase stepper motor with 1.8 degrees (0.005 inches) per step resolution.

Cartridge-In-Gripper Receiver PWA

The cartridge-in-gripper (CIG) receiver PWA contains two synchronous photo-detectors located at the front and back of the lower jaw. The CIG receivers are positioned to enable the robotics controller PWA to determine if a tape cartridge is fully gripped. If the front CIG receiver only is occluded, the cartridge is partially gripped. If the front and rear CIG receivers are occluded, the 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.

Cartridge-In-Gripper Transmitter PWA

The CIG transmitter PWA contains one red LED that is 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, which are 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 and detects 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 that is focused to reflect off the bar code label surface and converge through receiver optics on a photodetector. The output of the photodetector is amplified and conditioned to produce a digital signal. The digital signal is decoded on the robotics controller PWA as bar codes or for calibration.

The bar code scanner uses reflective targets on each bin column and reflective features on each tape drive bezel to determine X andY positions during calibration.

During an inventory, the bar code scanner reads the bar code labels on the cartridges and sends a digital signal that is decoded as a bar code on the robotics 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 robotics controller for confirmation on position and allows the vertical axis to home base 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 1-8 on page 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, provides and 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

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 and drives it down the x-umbilical to the actuator driver were it is received at the robotics 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 cable.

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 robotics controller PWA. The sensor enables the horizontal axis to home using slots in the x-axis sensor rail mounted on the bottom of the library frame.

Y-Axis Motor

The y-axis motor, mounted in the x-carriage assembly, is a two-phase stepper motor which has 1.8 degrees (0.005 inches) 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 (not 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

The x-axis motor, mounted to the rear of the library, is a two-phase stepper motor which has 1.8 degrees (0.005 inches) 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 (not a continuous loop), is driven by the x-axis motor to propel the x-carriage assembly along the horizontal rail.

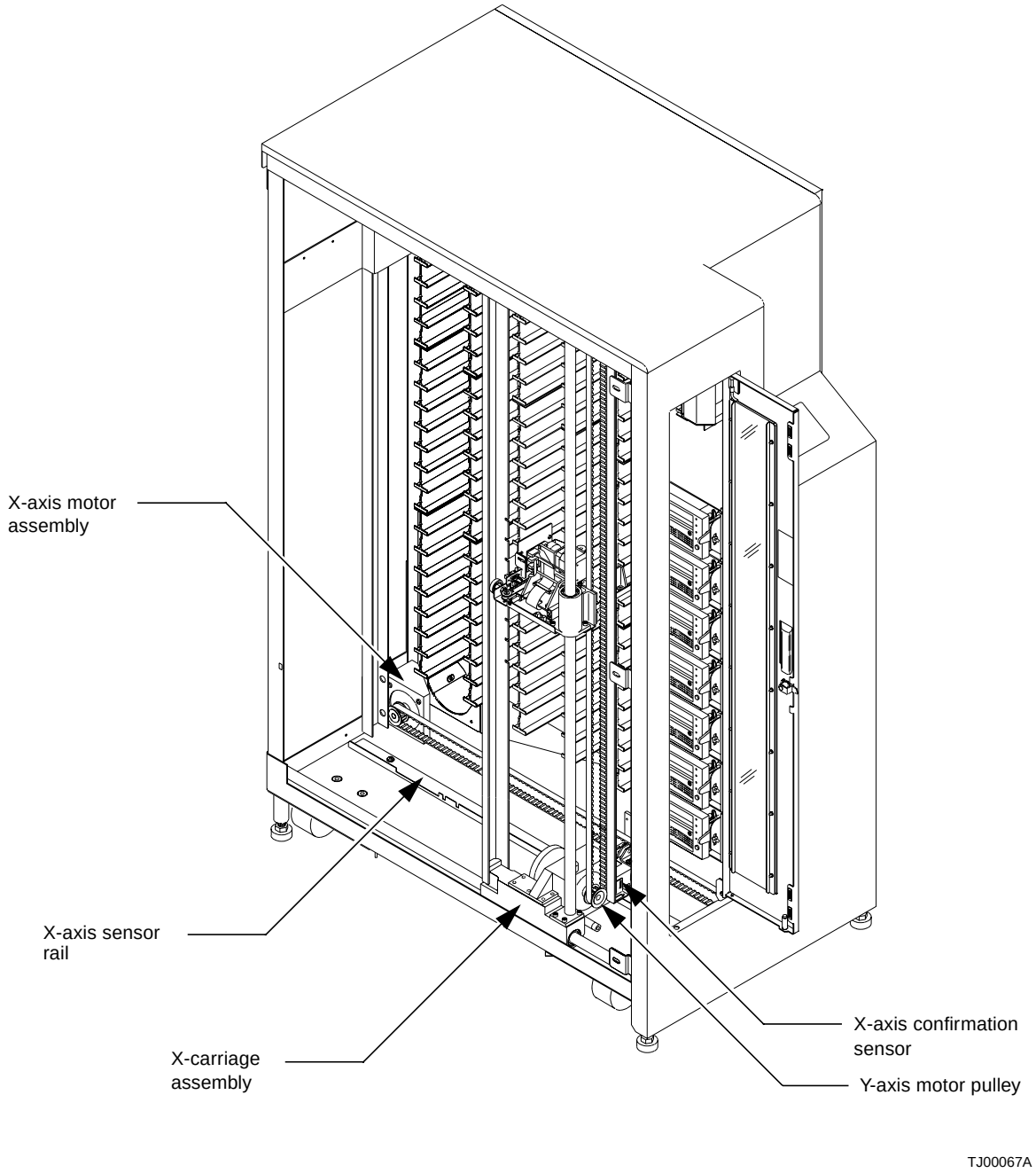


FIGURE 1-8 X-Carriage Assembly

Control Panel Assembly

The control panel (FIGURE 1-9) is located at the front of the library to the right of the front door.

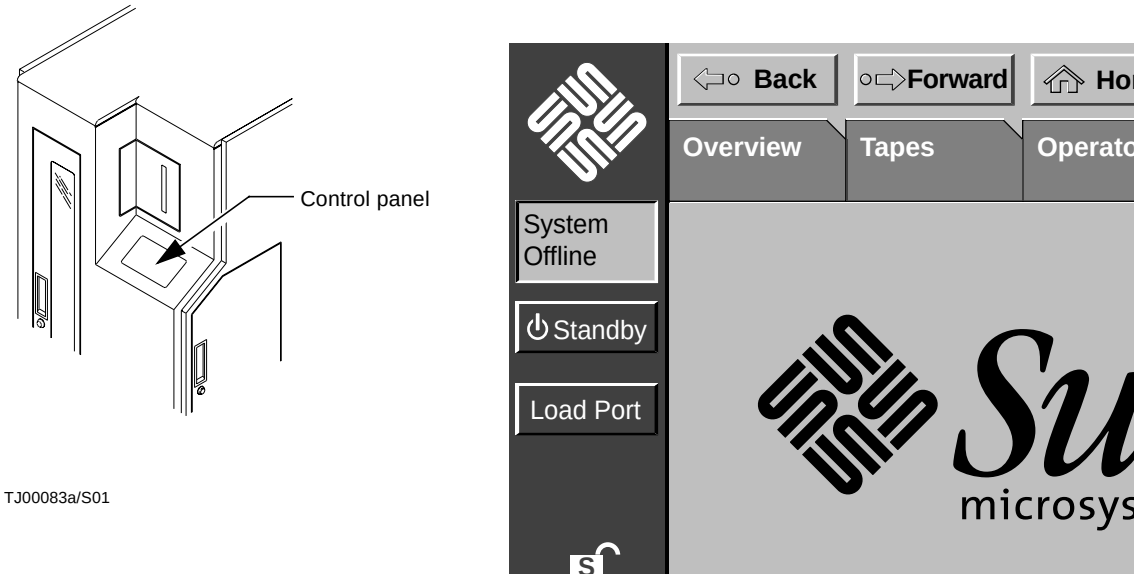


FIGURE 1-9 Control Panel

The control panel assembly, 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 and viewed through the display. The robotic controller communicates with the control panel assembly over a synchronous serial interface.

For a description of how to use the library menus accessed through the control panel, refer to Appendix A, “Control Panel Menus.” For a description of how to use the control panel to operate the library, refer to the *Sun ETL 7/3500 Operator’s Guide*.

Load Port Assembly

The load port (FIGURE 1-10) is located at the front of the library above the control panel. Under library control and in conjunction with the load port OPEN and CLOSE buttons, it enables the operator to insert and/or remove up to four tape cartridges.

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) enabling the operator to insert tape cartridges.

After the operator presses the CLOSE button and closes the door, the tape cartridge(s) is (are) made available to the library.

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

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

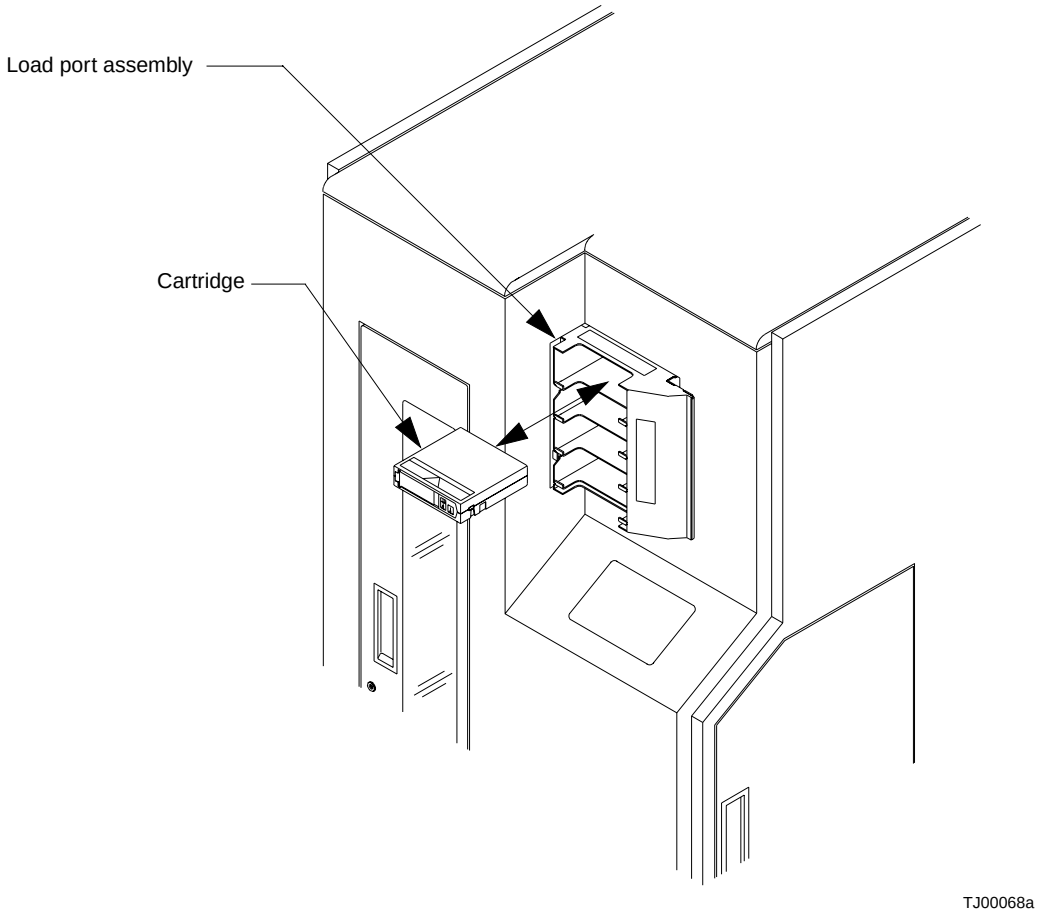


FIGURE 1-10 Load Port Assembly

Load Port Switch 1

Load port switch 1 is located on the left bottom side of the load port assembly while looking at the library from its left side. Load port switch 1 indicates that the load port door is open when actuated. The load port switch 1 is a lever operated mechanical micro-switch.

Load Port Switch 2

Load port switch 2 is located on the right bottom side of the load port assembly while looking at the library from its left side. Load port switch 2 indicates that the load port door is closed when actuated. The load port switch 2 is a lever operated mechanical micro-switch.

Front Door Interlock Switch

The front door interlock switch is located at the bottom of the front door. This switch is a magnetic reed switch that comprises a magnet (attached to the front door) and a read relay (attached to the front panel assembly). When the magnet is within 0.5 inches of the read relay the switch contact closes. Motor power is shut down when the front door is opened.

Drive Access Door Interlock Switch

The drive access door interlock switch is located on the right panel. This switch is a magnetic reed switch that comprises a magnet (attached to the front door) and a read relay (attached to the front panel assembly). When the magnet is within 0.5 inches of the read relay the switch contact closes. Motor power is shut down when the front door is opened.

Storage Array Door Interlock Switch

The storage array door interlock switch is located on the left panel. This switch is a magnetic reed switch that comprises a magnet (attached to the front door) and a read relay (attached to the front panel assembly). When the magnet is within 0.5 inches of the read relay the switch contact closes. Motor power is shut down when the front door is opened.

Load Port Lockout Solenoid

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, enabling the load port to slide freely open or closed. The load port solenoid is immediately disengaged by the robotics controller, after the load port mechanism moves off either limit switch, to enable the load port solenoid plunger to fall back into a lockout point when the load port mechanism reaches an open or closed position.

Tape Drive Assembly

A tape drive assembly consists of a tape drive, handle drive assembly (including the stepper motor), and tape drive interface PWA mounted on a tape drive tray. There can be up to seven tape drive assemblies in a library.

Tape Drives

When viewed from the left-side of the library, up to seven 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.

Handle Drive Assembly

A stepper motor assembly is mounted on the right side of each tape drive that is used to electromechanically open and close the tape drive door. The handle stepper motor is a two-phase stepper motor, which has 0.68 degrees per step resolution at the tape drive door.

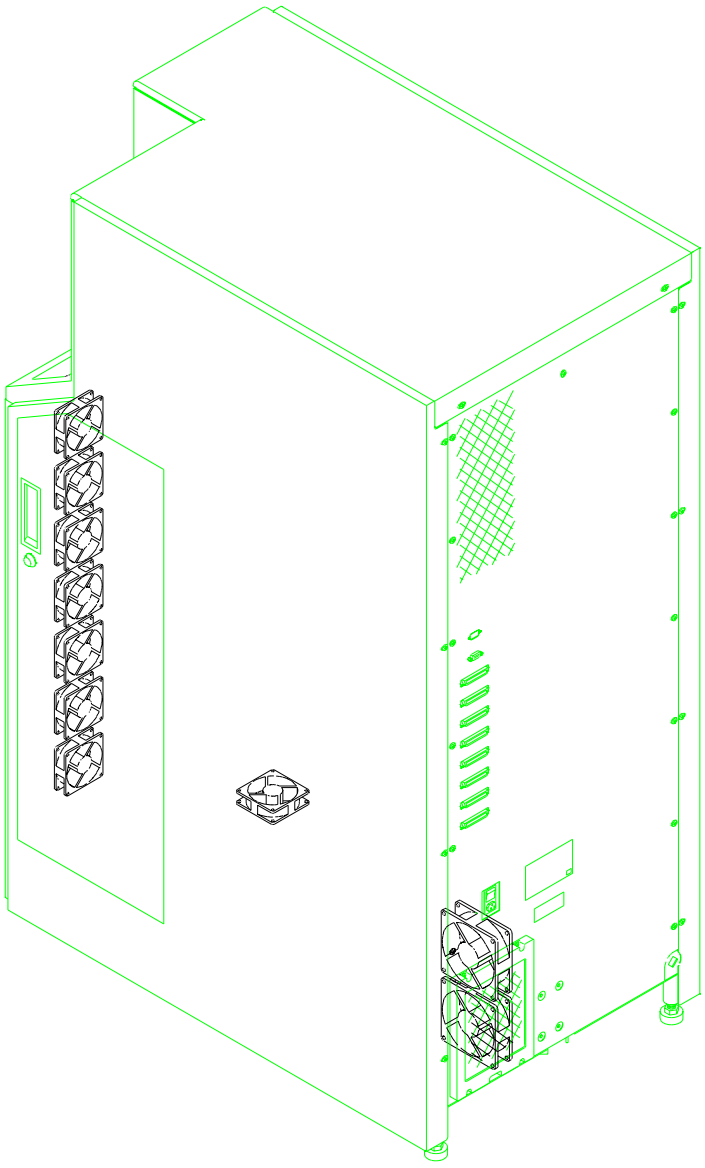
Tape Drive Interface PWA

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 and SCSI ID settings from the robotics controller, +5V and +12V from the logic power supply, tape drive handle door closed sensor inputs to the robotics controller, and handle stepper motor drives from the actuator driver. This aids in minimizing cabling to each tape drive.

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

Fans

The library uses up to ten DC fans for cooling. FIGURE 1-11 shows their location. A filter on the rear of the library is part of the fan assembly and requires scheduled routine maintenance.



TJ00016a

FIGURE 1-11 Fan Locations

CHAPTER 2

Preventive Maintenance

This chapter provides guidelines and procedures for aligning, adjusting, cleaning, and lubricating specific components of the library.

Caution – All preventative maintenance procedures must be performed by an authorized field service engineer (FSE).

Preventive Maintenance Schedule

Preventive maintenance (PM) for the library should only be performed by an authorized field service engineer (FSE). TABLE 2-1 lists the type of PM required by the library and specifies the maximum time frame between preventive maintenance.

TABLE 2-1 Preventive Maintenance Guidelines

PM Required	Maximum Time Frame
Cleaning and lubricating the rails and rollers	every 12 months
Cleaning and lubricating the gripper assembly	every 12 months
Checking and 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 FSE PM is performed during initial installation.

Required Tools and Supplies

The following tools are required to perform preventative maintenance:

- Phillips screwdrivers, #1 and #2
- Flat-bladed screwdrivers, assorted sizes

The following items from the ETL Servoce Kit are required to perform preventtive maintenance:

- 1 container permeable lubricant
- 1 package swabs
- 1 package lint-free cloths
- X-Y axis belt tension gauge
- Extension axis belt tension gauge

▼ To Prepare for Preventive Maintenance

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Remove the top and left cosmetic panels as shown in “Removing the Cosmetic Panels” on page 90.**
3. **Connect your ESD wrist grounding strap to the closest grounding socket on the frame of the library.**

Cleaning Procedures

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

▼ To Clean the Fan Filter

See FIGURE 2-1.

1. **Remove the four Phillips screws retaining the fan filter cover, located in the rear of the library.**
2. **Remove the fan filter cover and the fan filter from the library.**
3. **Clean the filter and fan louvers on the rear of the library with a vacuum.**
4. **Reinstall fan filter and frame to the rear of the library.**

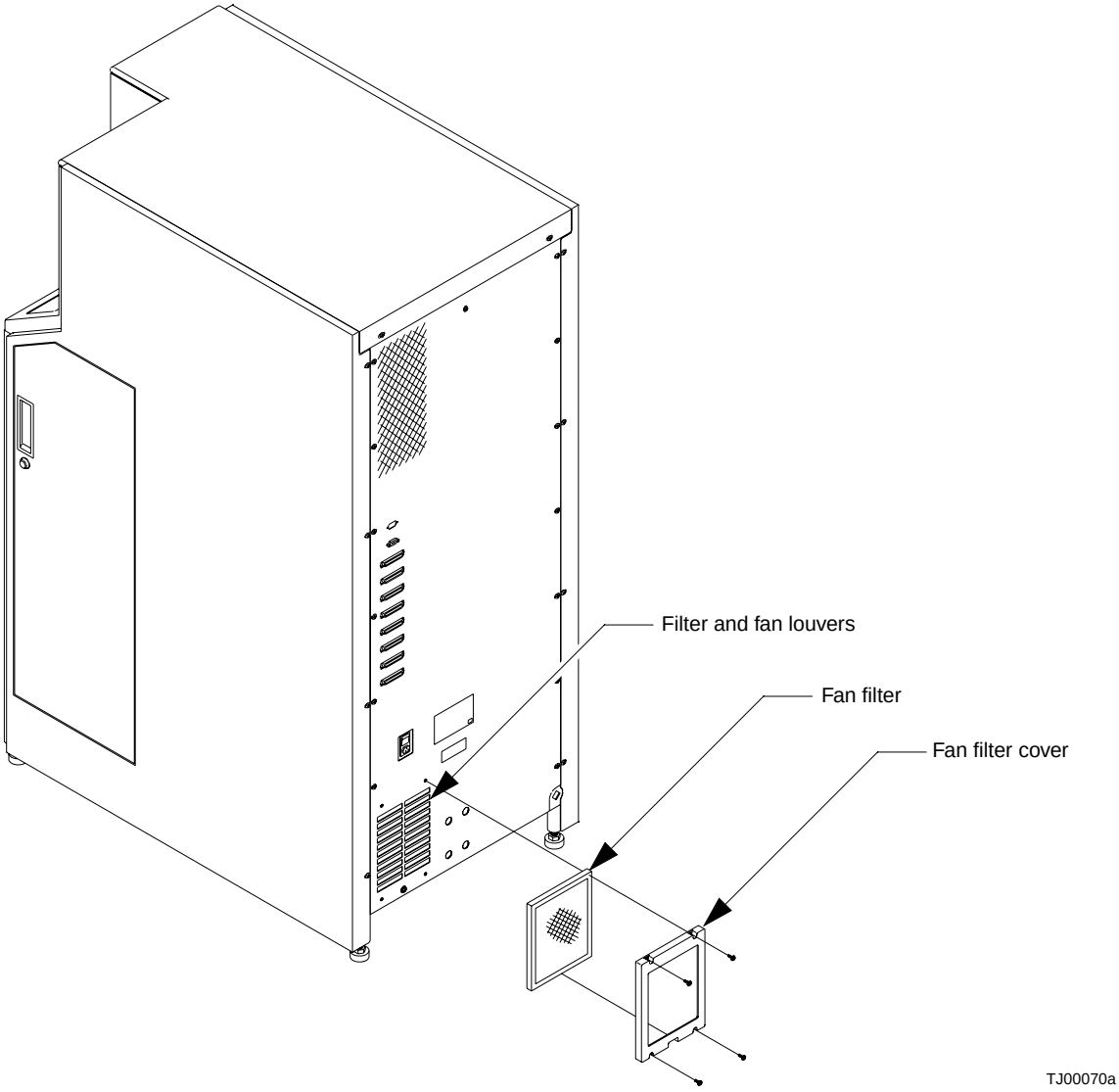


FIGURE 2-1 Fan Filter

▼ To Clean the Rails

See FIGURE 2-2.

1. **Lightly dampen a cloth (supplied in PM kit) with isopropyl alcohol and rub the length of the x-axis rail and the y-axis rail to remove all dust and debris.**
2. **Repeat if necessary.**

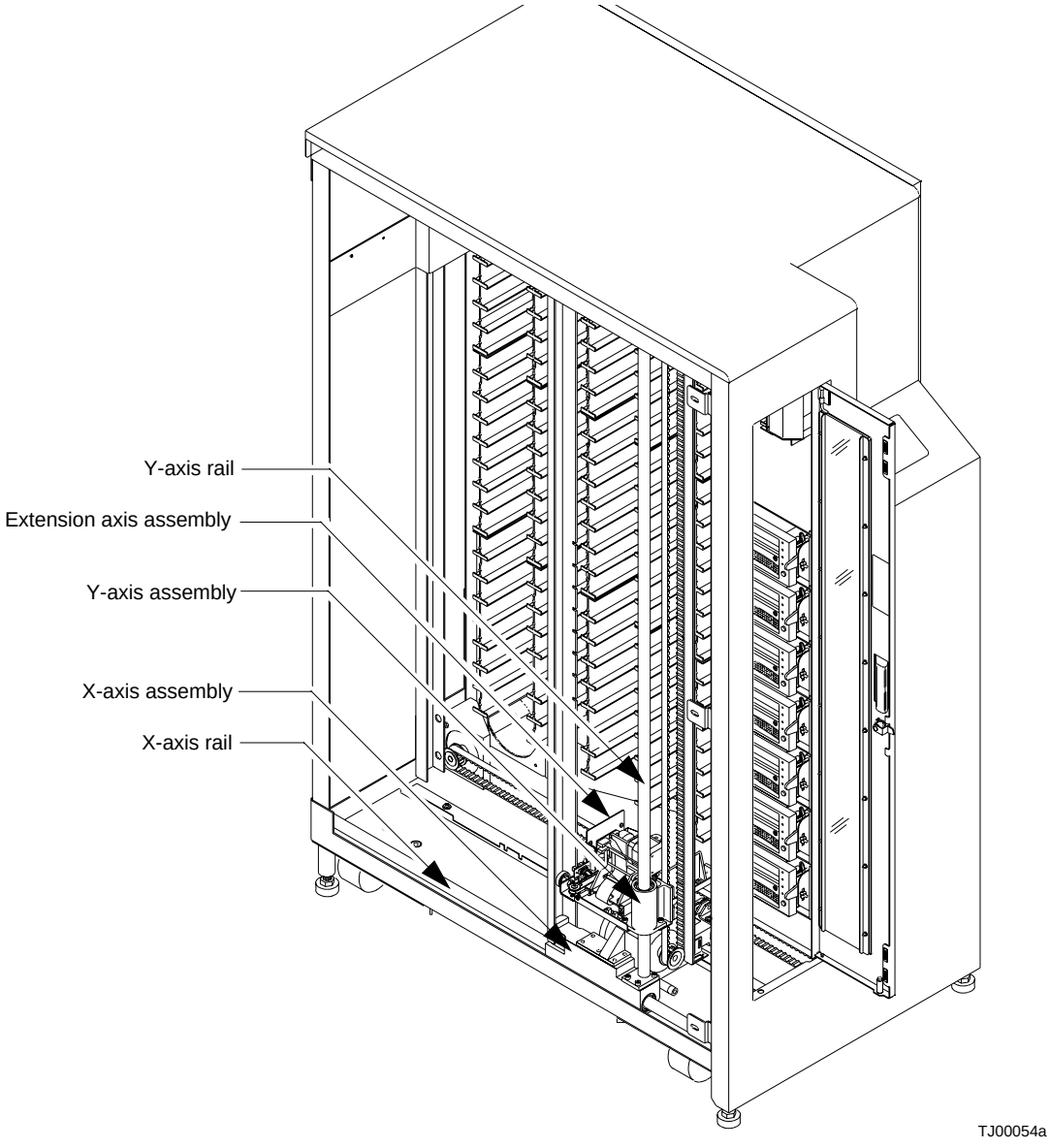


FIGURE 2-2 X-Axis and Y-Axis Rails

▼ To Clean the Extension Axis

See FIGURE 2-3.

1. **Remove the ESD cover.**
2. **Lightly dampen a cloth (supplied in PM kit) with isopropyl alcohol.**
3. **Remove all dust and debris from the**:
   - Extension axis rail
   - Gripper cross shaft
   - Extension axis follower rail on the wear surface

Caution – Do NOT apply lubricant to the extension axis follower rail. Applying lubricant to the extension axis follower rail damages it.

   - Gripper jaw inner surfaces

Note – Use a can of compressed air to blow dust off of the CIG receivers.

4. **Repeat if necessary.**

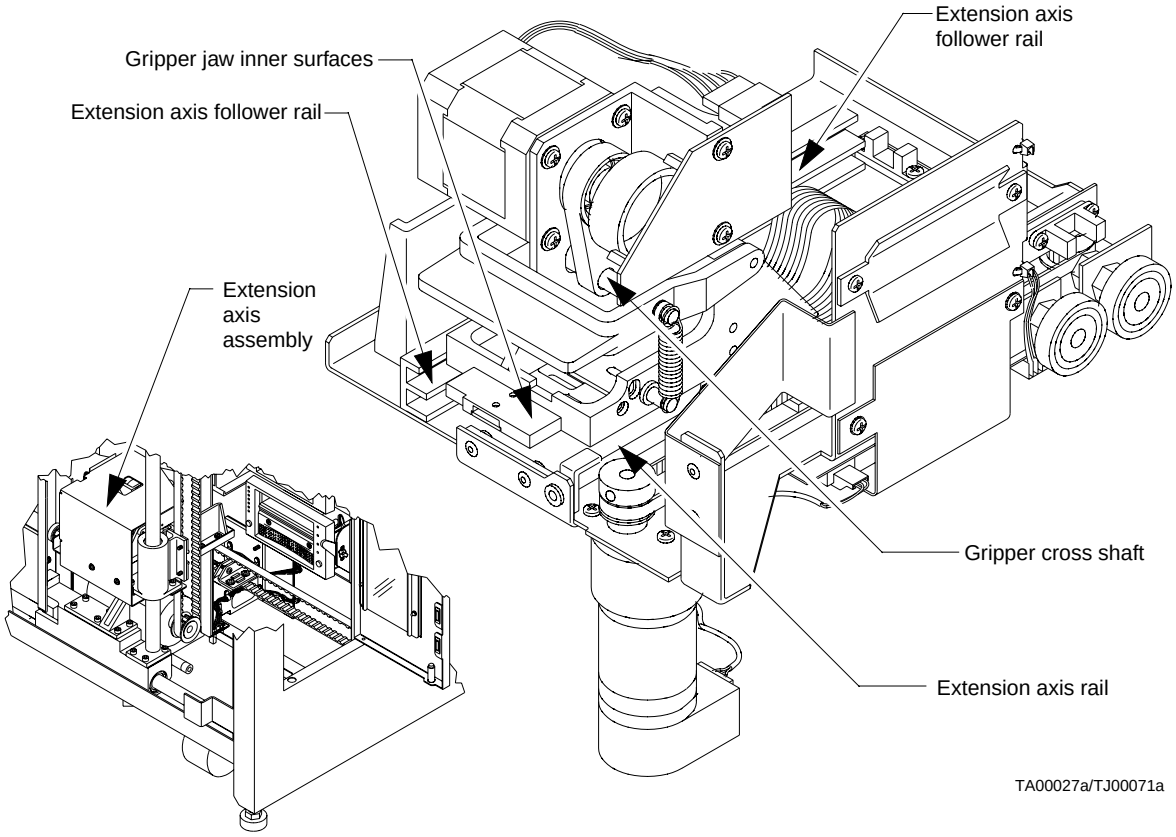


FIGURE 2-3 Extension Axis Assembly

▼ To Clean the Tape Drives

See FIGURE 2-4.

1. **Lightly dampen a cloth (supplied in PM kit) with isopropyl alcohol.**
2. **Remove all dust and debris from the tape drive receiver.**

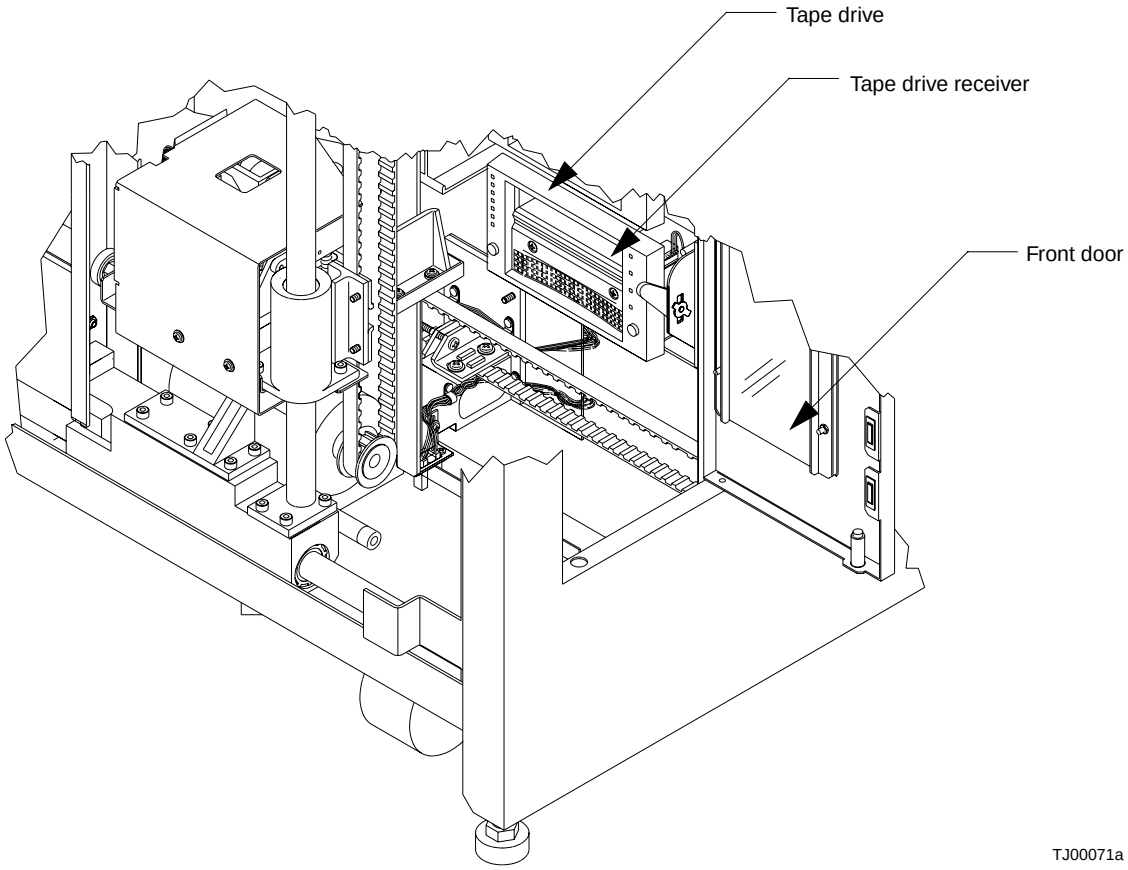


FIGURE 2-4 Tape Drive

▼ To Clean the Rollers

See FIGURE 2-5.

1. **Lightly dampen a cloth (supplied in PM kit) with isopropyl alcohol.**
2. **Remove all dust and debris from the**:
   - Two rollers on the y-axis assembly
   - Four rollers on the x-axis assembly
3. **Remove dust and debris from the running surfaces of the**:
   - X-axis guide (part of the library frame)

- Y-axis rail (part of the x-axis assembly)

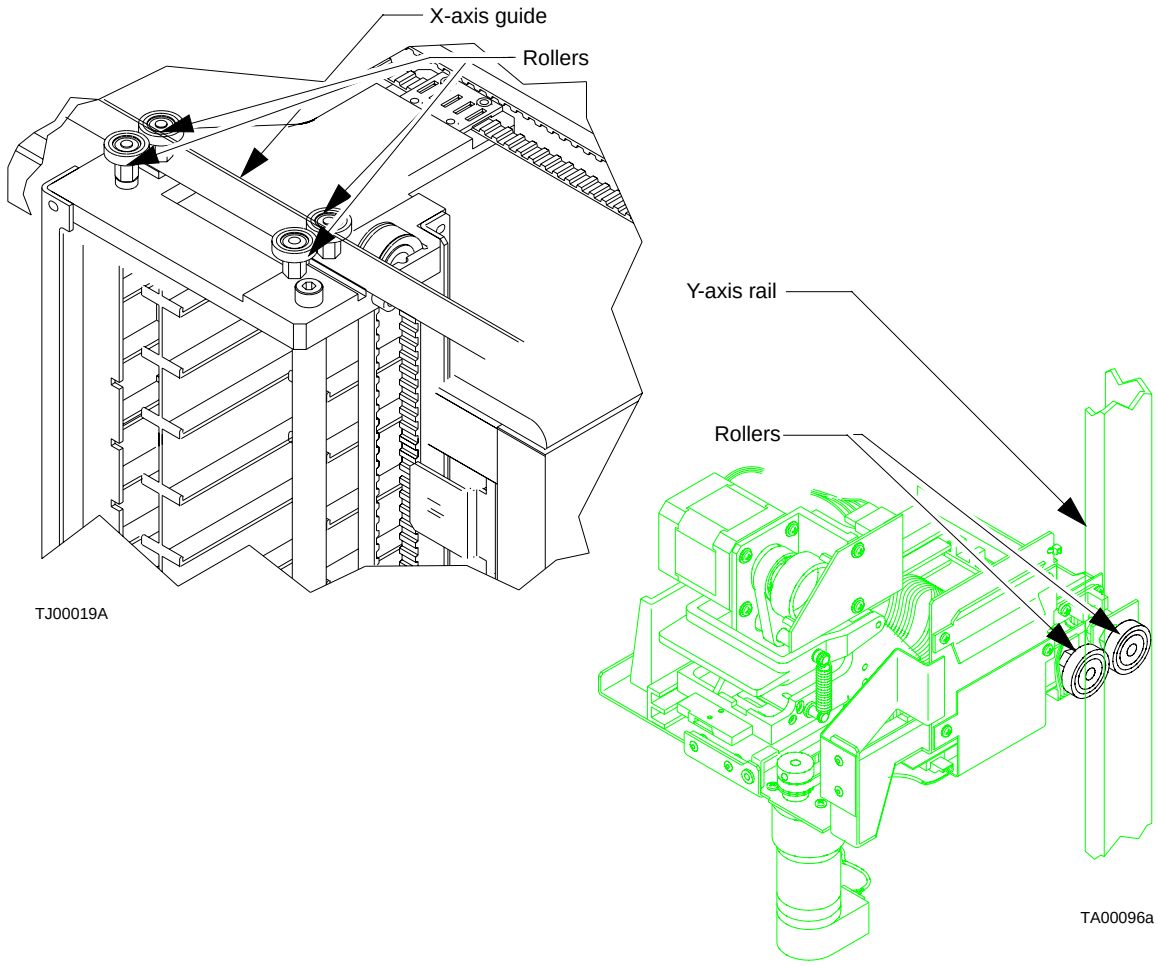


FIGURE 2-5 Rollers

Adjustments

Several library components 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

See FIGURE 2-6.

1. **Visually inspect the x-axis assembly rollers as you manually move the x-axis (front to rear) through its entire travel length.**
2. **Look for positive roller contact through out its travel.**

▼ To Adjust the X-Axis Assembly Rollers

1. **Press the left side of the x-axis assembly hidden rollers towards the right side of the library.**
2. **Loosen the nuts that retain the outside rollers.**
3. **Adjust the inside rollers to within 0.000 inches –0.005 inches of the travel surface and retighten.**

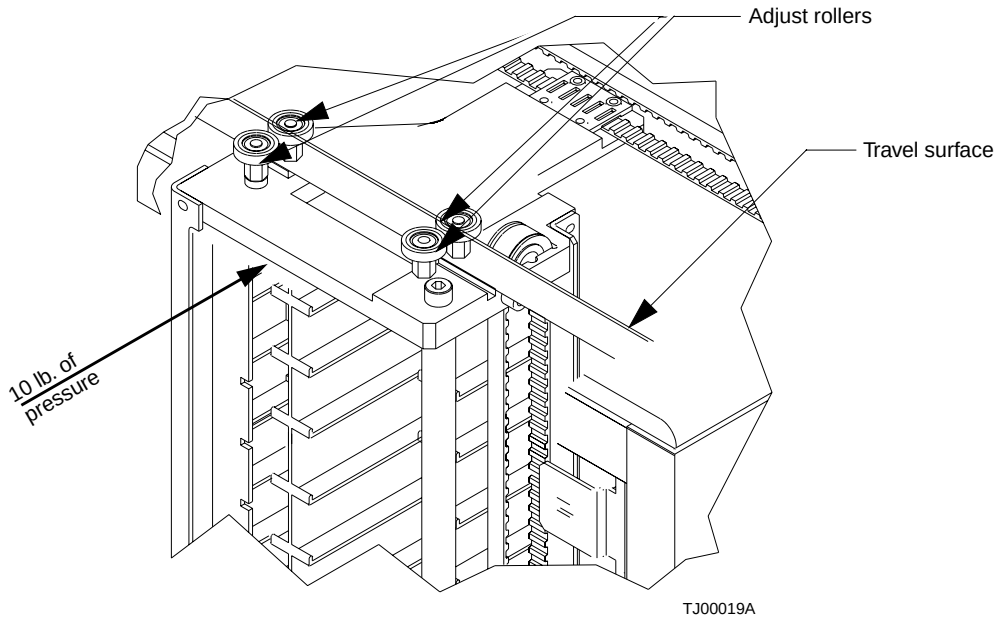


FIGURE 2-6 X-Axis Rollers

Y-Axis Rollers

▼ To Check the Y-Axis Assembly Rollers

See FIGURE 2-7.

1. **Visually inspect the y-axis assembly rollers as you manually move the x-axis (up and down) through its entire travel length.**
2. **Look for positive roller contact throughout its travel.**

▼ To Adjust the Y-Axis Assembly Rollers

1. **Loosen the nut that retains the outside roller.**
2. **Squeeze both rollers together using finger pressure.**
3. **Retighten retaining nut.**

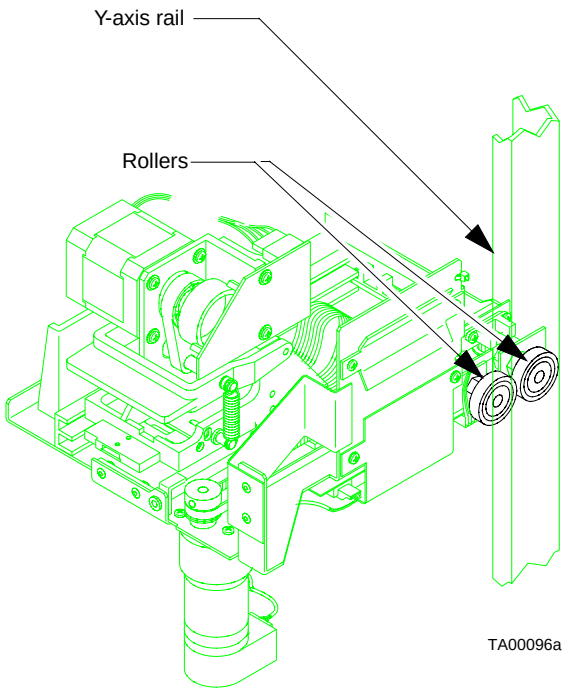


FIGURE 2-7 Y-Axis Rollers

Y-Axis Belt

▼ To Check the Y-Axis Belt Tension

See FIGURE 2-8 and FIGURE 2-9.

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.**
3. **With the force gauge supplied in the service kit, pull the inside of the belt outward 0.54 inches.**

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 ± 3.0 ounces (468-638 g).**

▼ To Adjust the Y-Axis Belt Tension

See FIGURE 2-8 and FIGURE 2-9.

1. **Loosen the belt clamp screws holding the belt onto the ball bushing housing.**
2. **Turn the screws one-half revolution**:
   - If the measured force is greater than 22.5 ounces (638 g), turn the adjustment screw counterclockwise (as viewed from above) and recheck the tension.
   - If the measured force is less than 16.5 ounces (468 g), turn the adjustment screw clockwise.

Note – The adjustment screw does not normally need to be turned more than two revolutions.

---

3. **Tighten the belt clamp screws to 30 in. lb. (3.39 N-m).**
4. **Recheck the belt tension.**

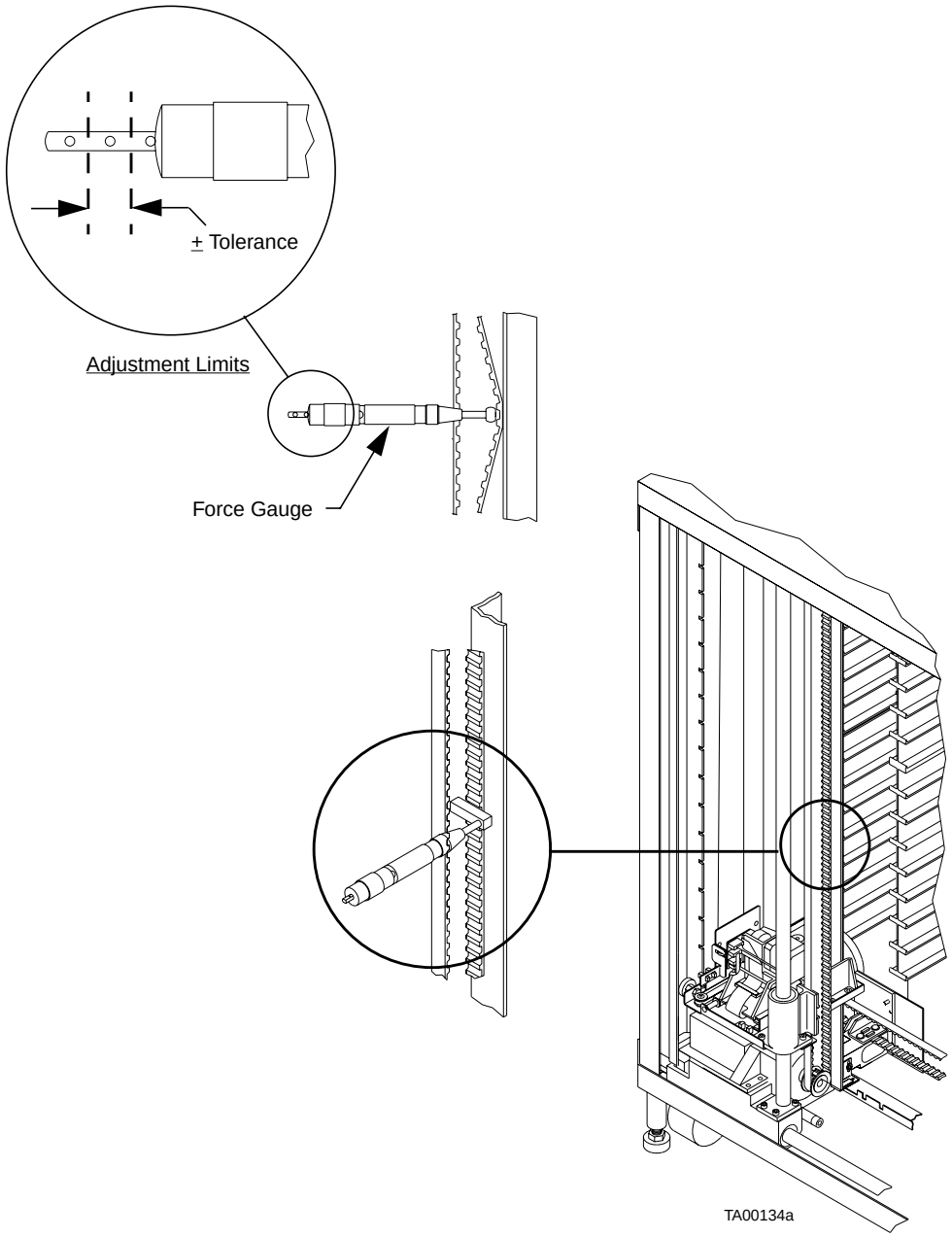


FIGURE 2-8 Checking Y-Axis Belt Tension

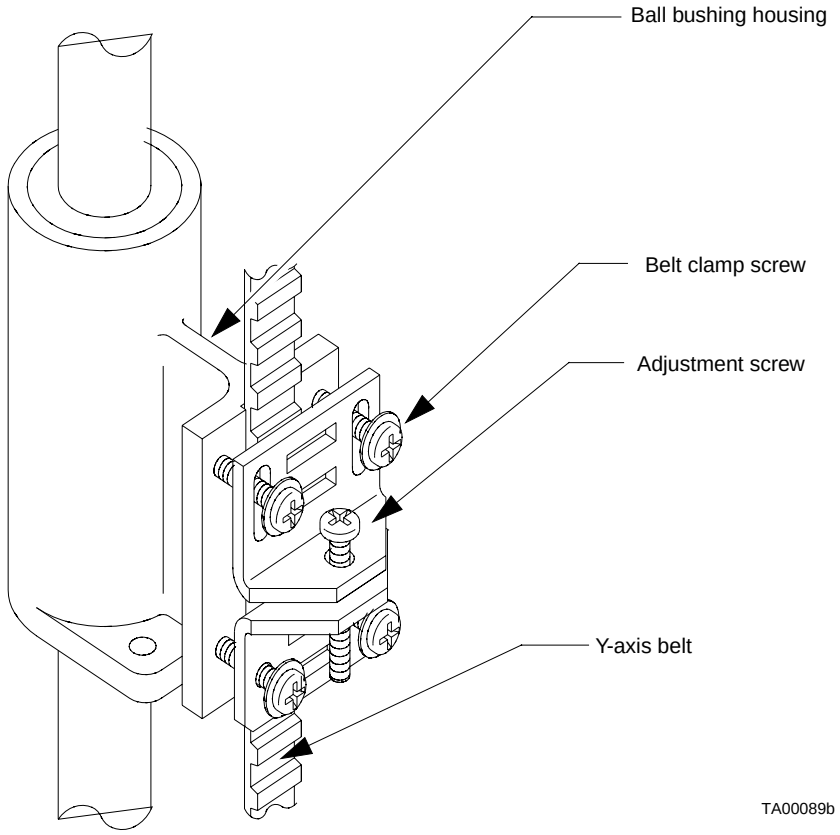


FIGURE 2-9 Y-Axis Belt

X-Axis Belt

▼ To Check the X-Axis Belt Tension

See FIGURE 2-10 and FIGURE 2-11.

1. **With the force gauge supplied in the service kit, pull the inside of the belt outward 0.44 inches.**
2. **The force gauge reading should be 19.5 ± 3.0 ounces (468-638 g).**

▼ To Adjust the X-Axis Belt Tension

See FIGURE 2-10 and FIGURE 2-11.

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

---

1. **Loosen the belt clamp screws holding the belt onto the motor mounting vertical bracket.**
2. **Turn the screws one-half revolution**:
   - If the measured force was greater than 22.5 ounces (638 g), turn the adjustment screw counterclockwise (as viewed from above) and recheck the tension.
   - If the measured force was less than 16.5 ounces (468 g), turn the adjustment screw clockwise.

Note – The adjustment screw does not normally need to be turned more than two revolutions.

---

3. **Tighten the belt clamp screws to 30 in. lb. (3.39 N-m).**
4. **Recheck the belt tension.**

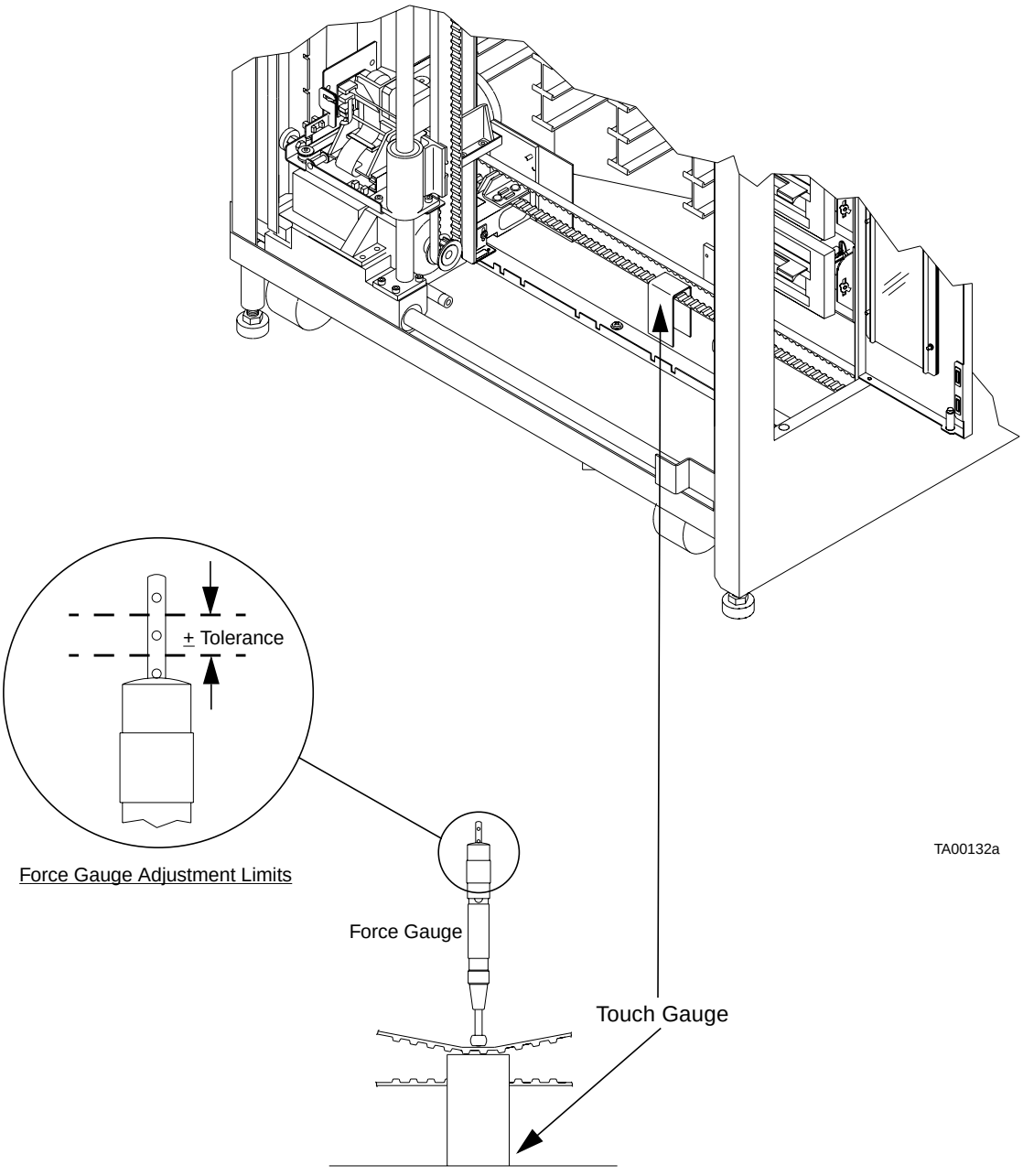


FIGURE 2-10 Checking the X-Axis Belt Tension

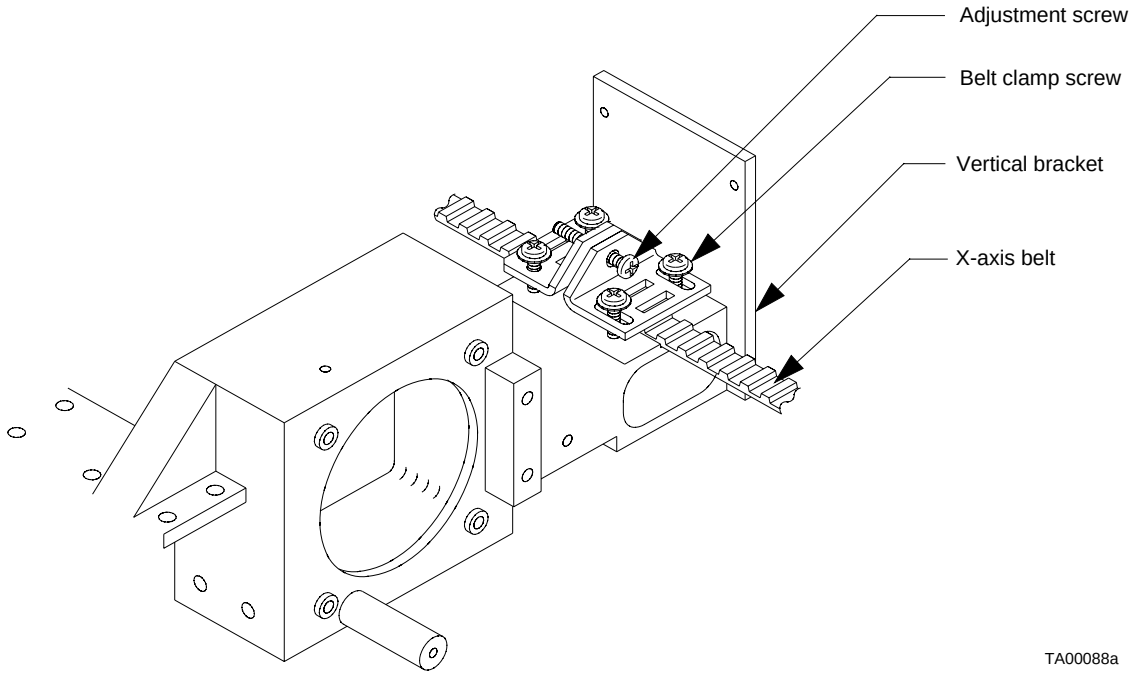


FIGURE 2-11 X-Axis Belt

Extension Axis Belt

▼ To Check the Extension Axis Belt Tension

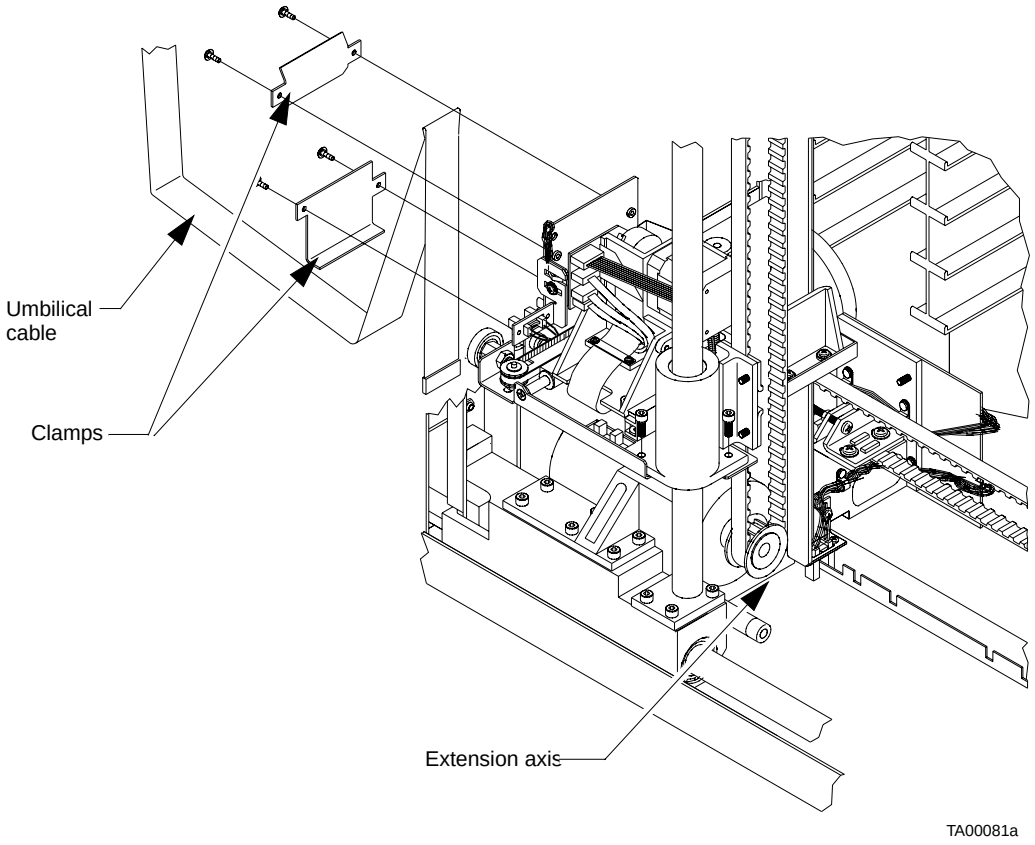


FIGURE 2-12 Removing the Umbilical Cable and Clamps

See FIGURE 2-12.

1. **Remove the ESD cover.**
2. **Remove the clamp that loops the umbilical cable and the clamp that retains the umbilical to the extension axis.**
3. **Move the gripper assembly all the way forward on the extension axis.**

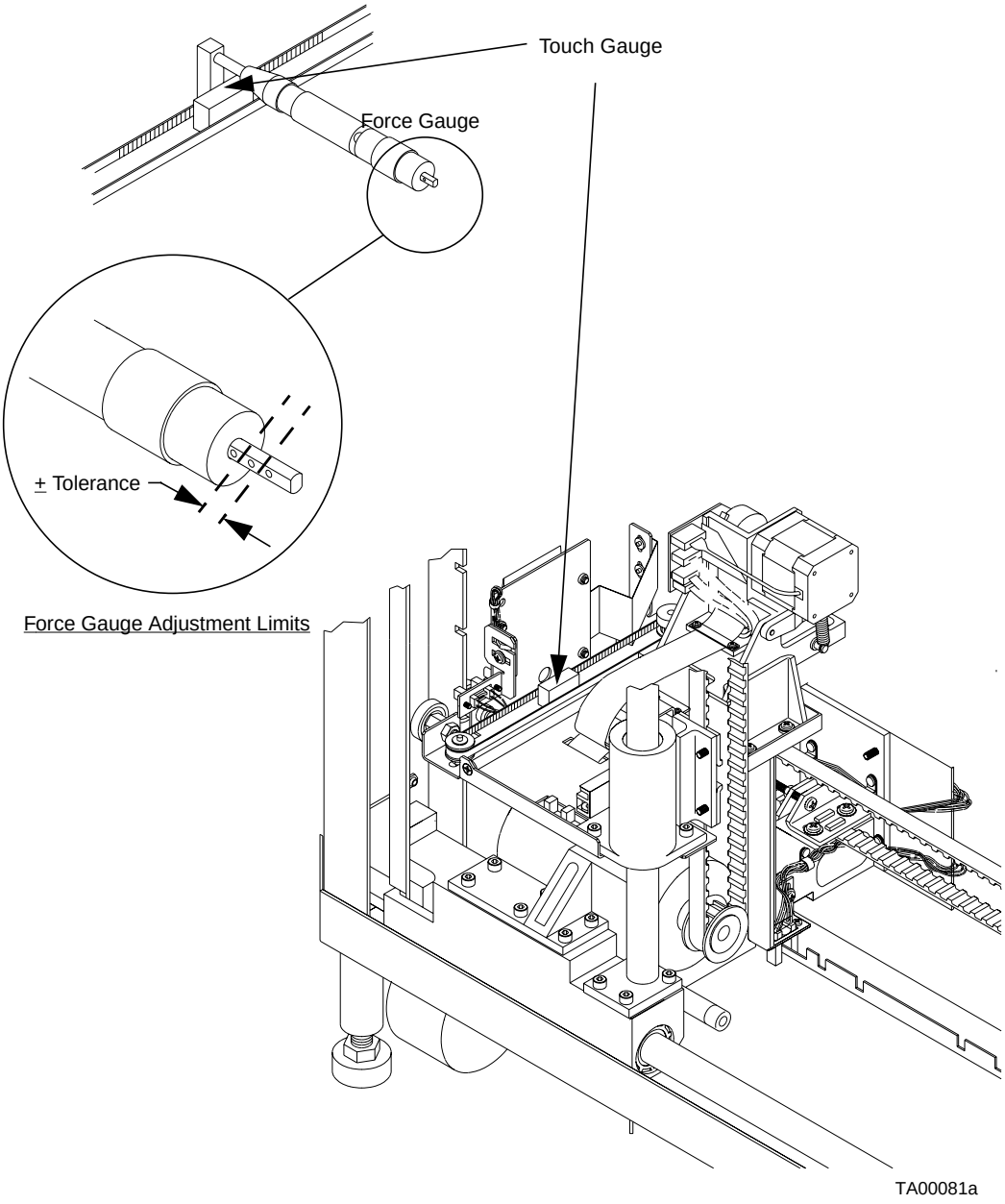


FIGURE 2-13 Measruing the Extension Axis Belt Tension

See FIGURE 2-13.

4. **Make the measurement at the midpoint of the belt through the access hole on the extension axis.**

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

---

5. **With the force gauge supplied in the service kit, deflect the outside span of the belt inward**
   0.11 inches.

6. **The force gauge reading should be 2.75 ± 0.25 ounces (70-85 g).**

▼ To Adjust the Extension Axis Belt Tension

See FIGURE 2-14.

1. **Loosen the pulley idler mounting nut one revolution.**

2. **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.**

3. **Recheck the belt tension and readjust, if necessary**

.

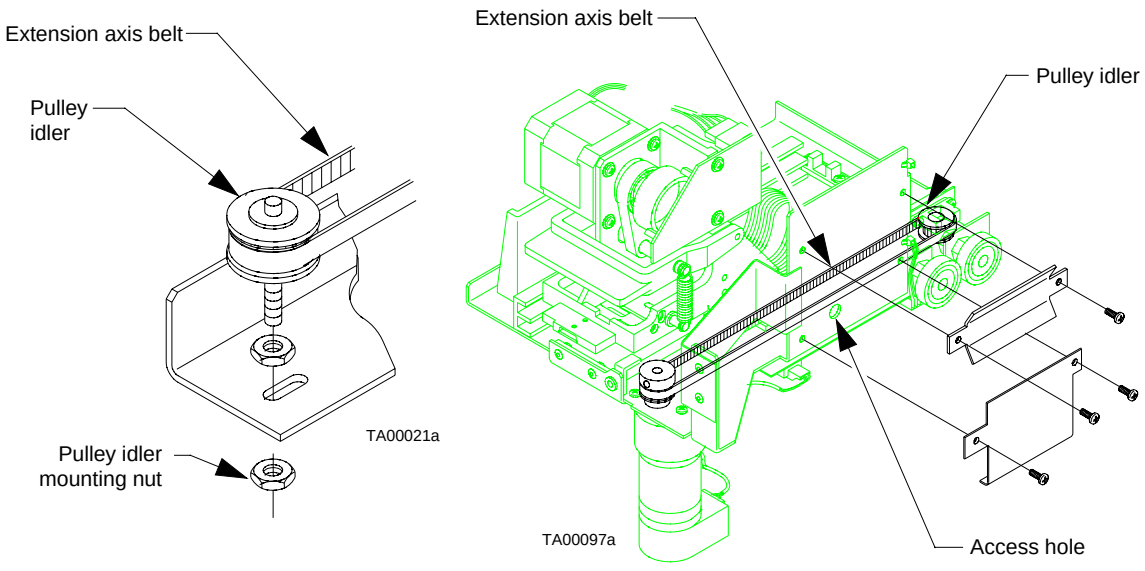


FIGURE 2-14 Extension Axis Belt

Lubrication

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

▼ To Lubricate the X-Axis and Y-Axis Rails

See FIGURE 2-2 on page 28.

1. **Lightly apply a very thin coating of permeable lubricant (supplied in PM kit) to the length of the x-axis rail and the y-axis rail.**

2. **Move the x-axis and y-axis assemblies through their complete range of travel to distribute lubrication.**

3. **A light coating of lubricant should be present on the x-axis rail and the y-axis rail. Remove excess lubricant.**

▼ To Lubricate the Extension Axis Rail and Gripper Cross-Shaft

See FIGURE 2-3 on page 30.

1. **Lightly apply a very thin coating of permeable lubricant (supplied in PM kit) to the length of the extension axis rail.**

2. **Apply a small amount of lubricant to the gripper cross-shaft at its three contact points with the driver link and upper jam jaw.**

Caution – Excess lubricant on the gripper cross-shaft may result in debris falling onto the bar code scanner.

Caution – Do NOT apply lubricant to the extension axis follower rail. Applying lubricant to the extension axis follower rail damages it.

3. **A light coating of lubricant should be present on the extension axis rail and the gripper cross-shaft. Remove excess lubricant.**

Returning the Library to Operation

▼ To Return the Library to Operation

1. **Replace the top and left cosmetic panels as described in “Removing the Cosmetic Panels” on page 90.**
2. **Restore power to the library.**
3. **Calibrate the library as described in** “To Calibrate Library Elements” on page 175**.**

   After cleaning, adjusting, and lubricating internal components, the library must be re-calibrated.

Caution – Neglecting to calibrate the library after performing maintenance may cause damage to the library.

CHAPTER 3

Troubleshooting and Fault Isolation

This chapter provides the troubleshooting and fault isolation procedures for the ETL 7/3500 library.

Maintenance Analysis Procedures (MAPs)

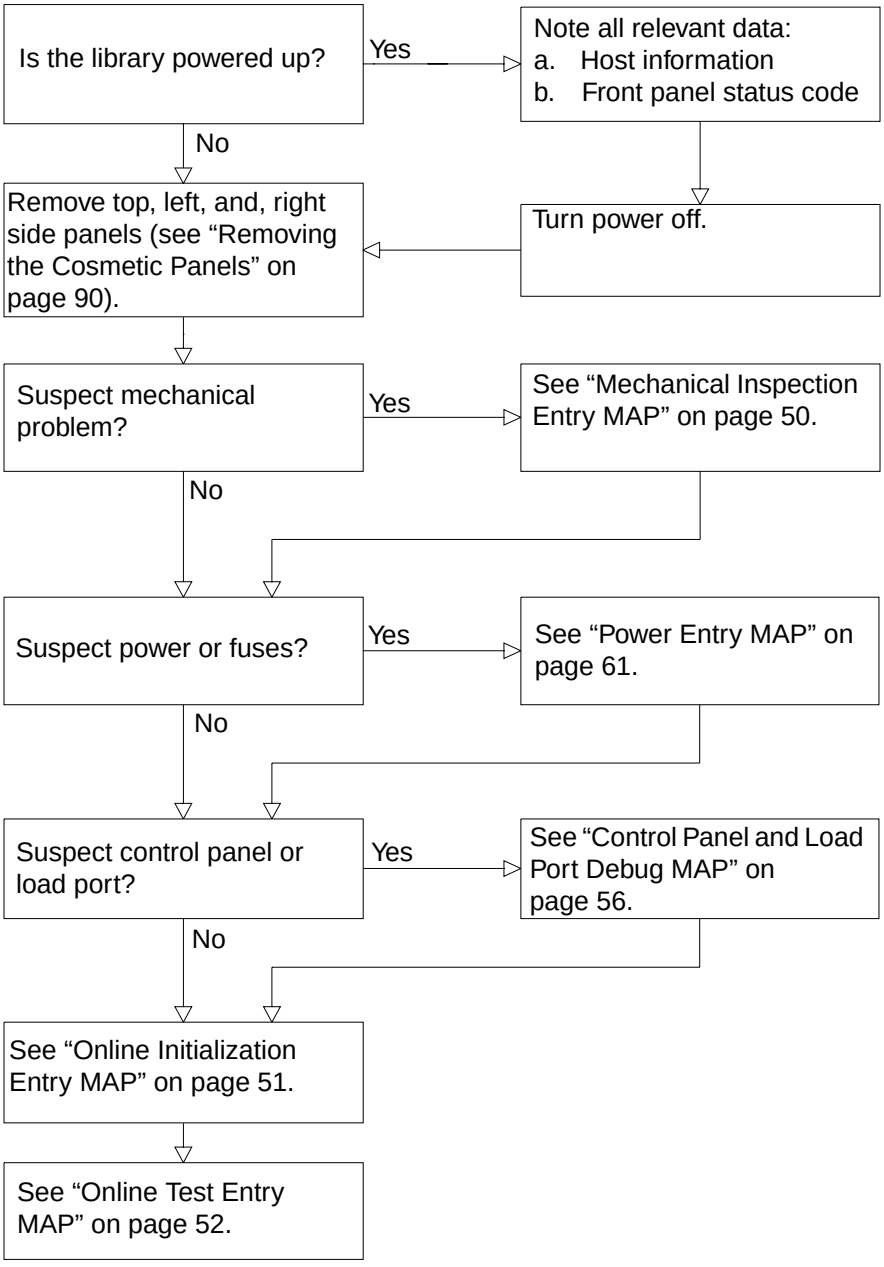
This section contains Maintenance Analysis Procedures (MAPs) for troubleshooting library malfunctions. These procedures appear as flow charts, each with its own descriptive heading.

▼ To Use These Procedures for Troubleshooting

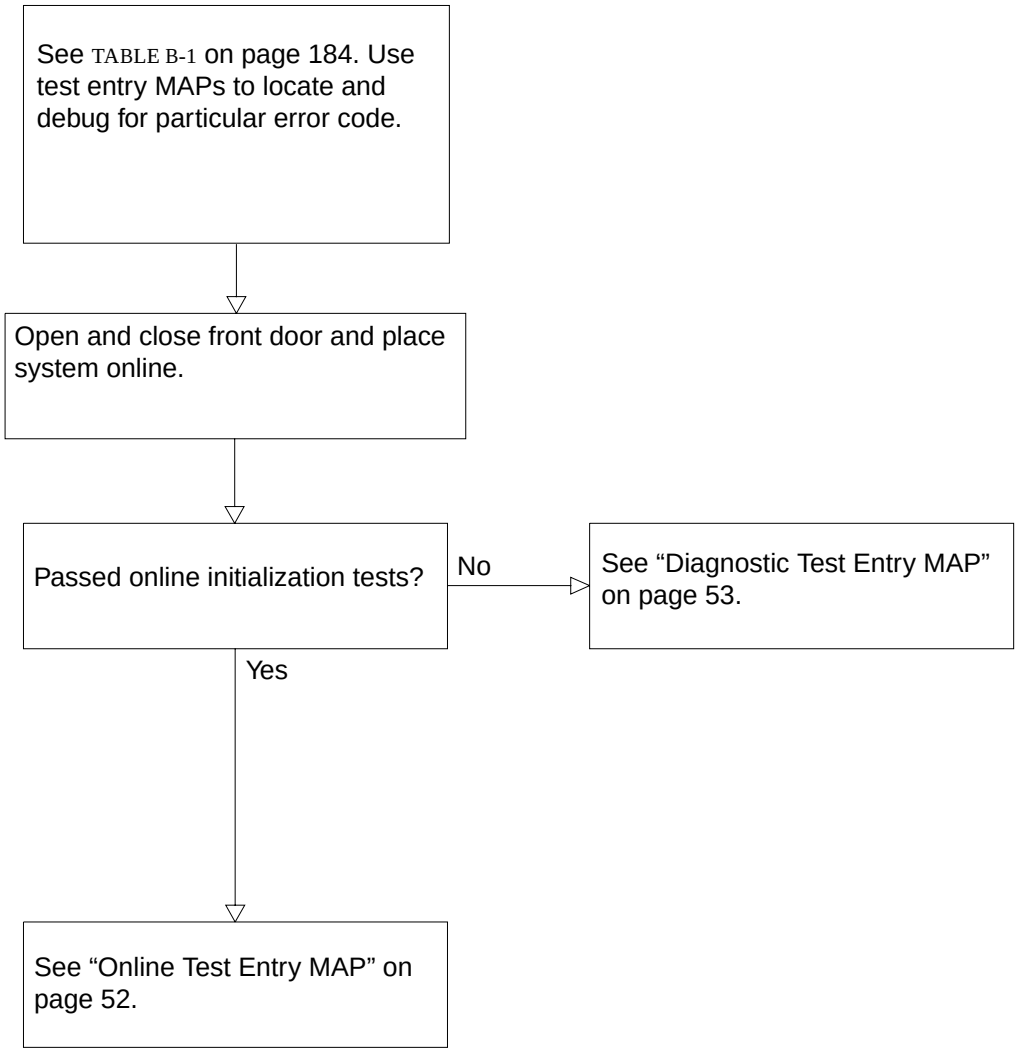
1. **Identify the problem as much as possible by symptom or error code. For more information about error codes, see Appendix B, "Sense Data Values."**
2. **Use the Contents page for this chapter to locate the section in this chapter that relates to the problem you identified.**
3. **Begin the troubleshooting analysis with the "Fault Isolation Entry MAP" on page 48. 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 can also refer to the *Sun ETL 7/3500 Diagnostic Software User's Manual* and *Sun ETL 7/3500 Operator's Guide*.
5. **Stop the troubleshooting procedure when the symptom or error disappears.**

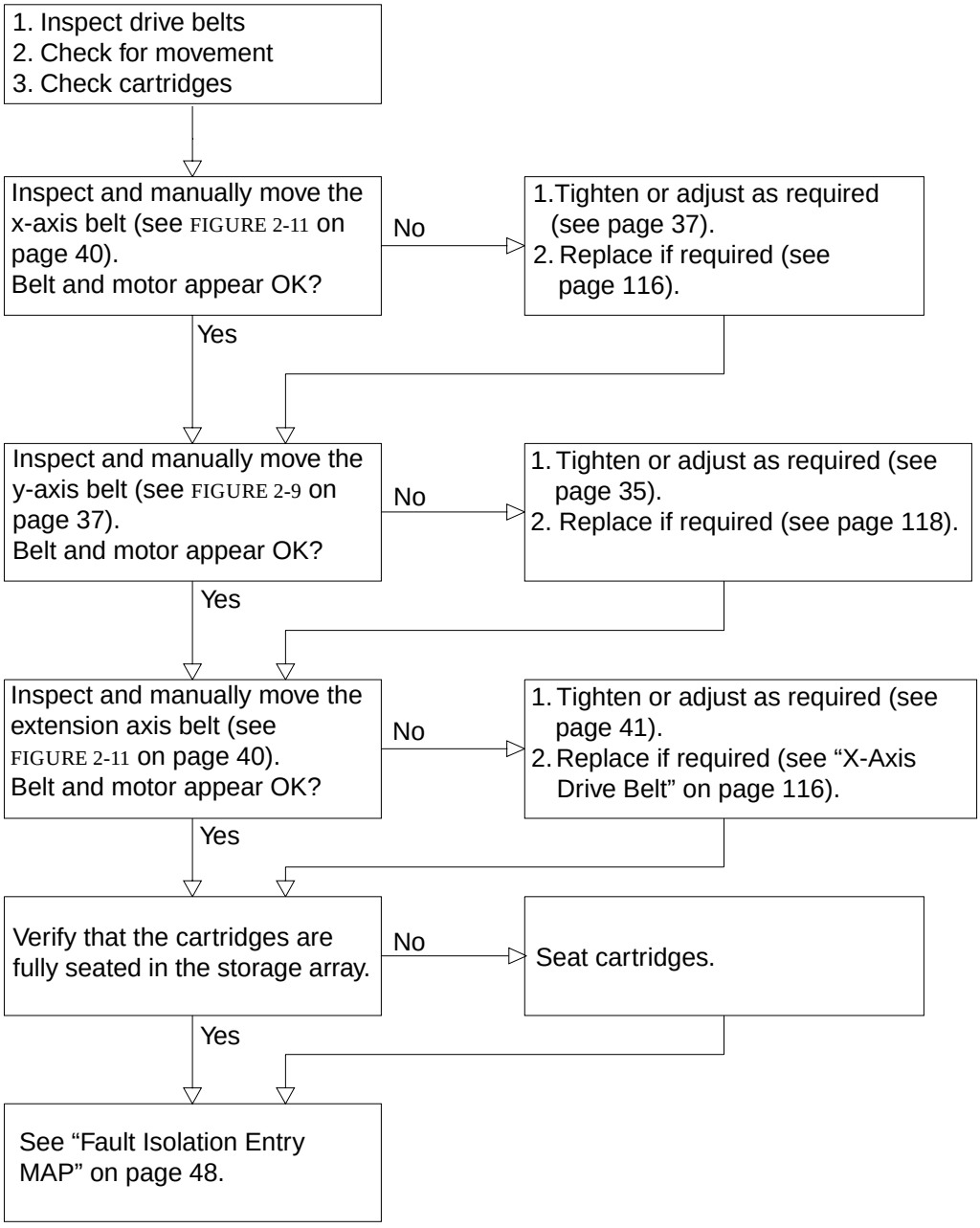
Fault Isolation Entry MAP



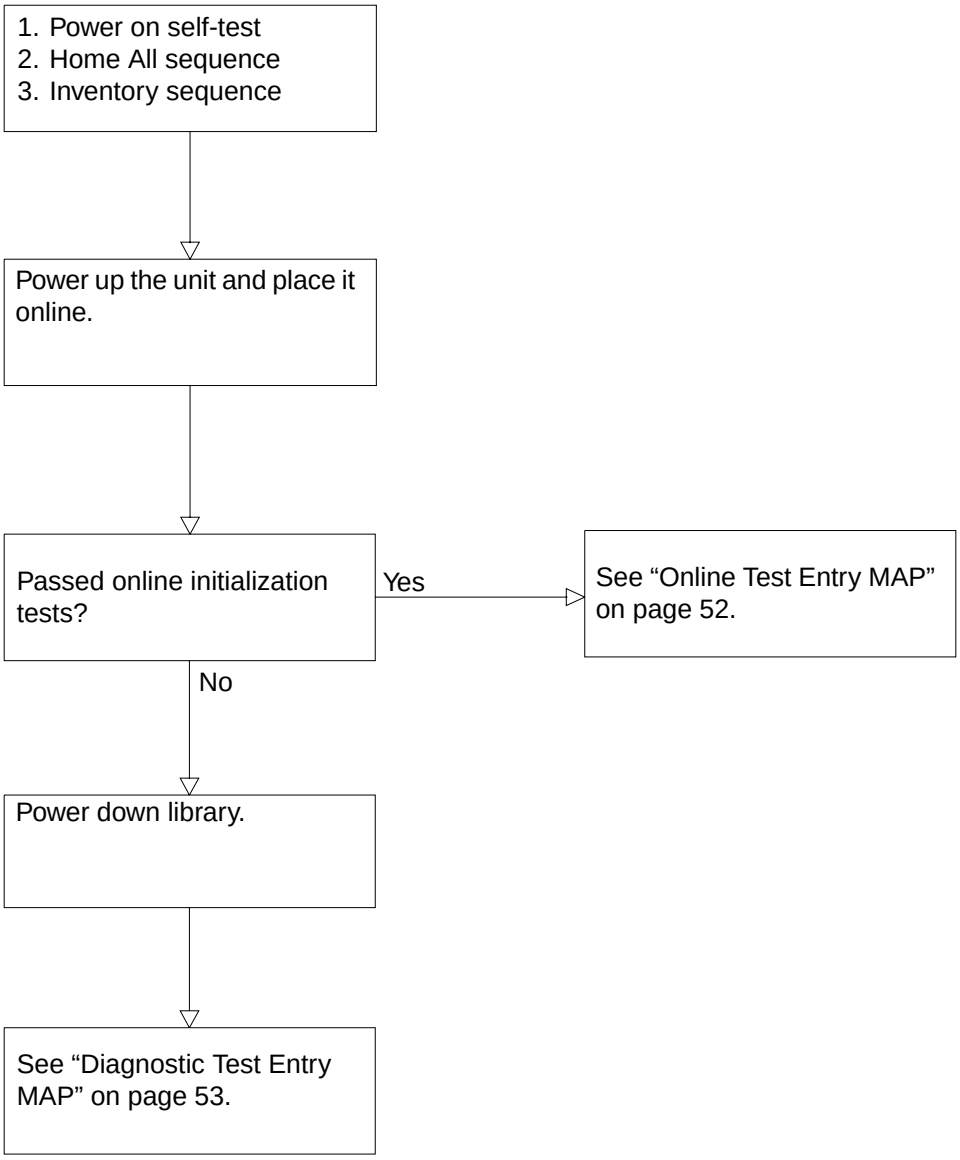
Error Message Entry MAP



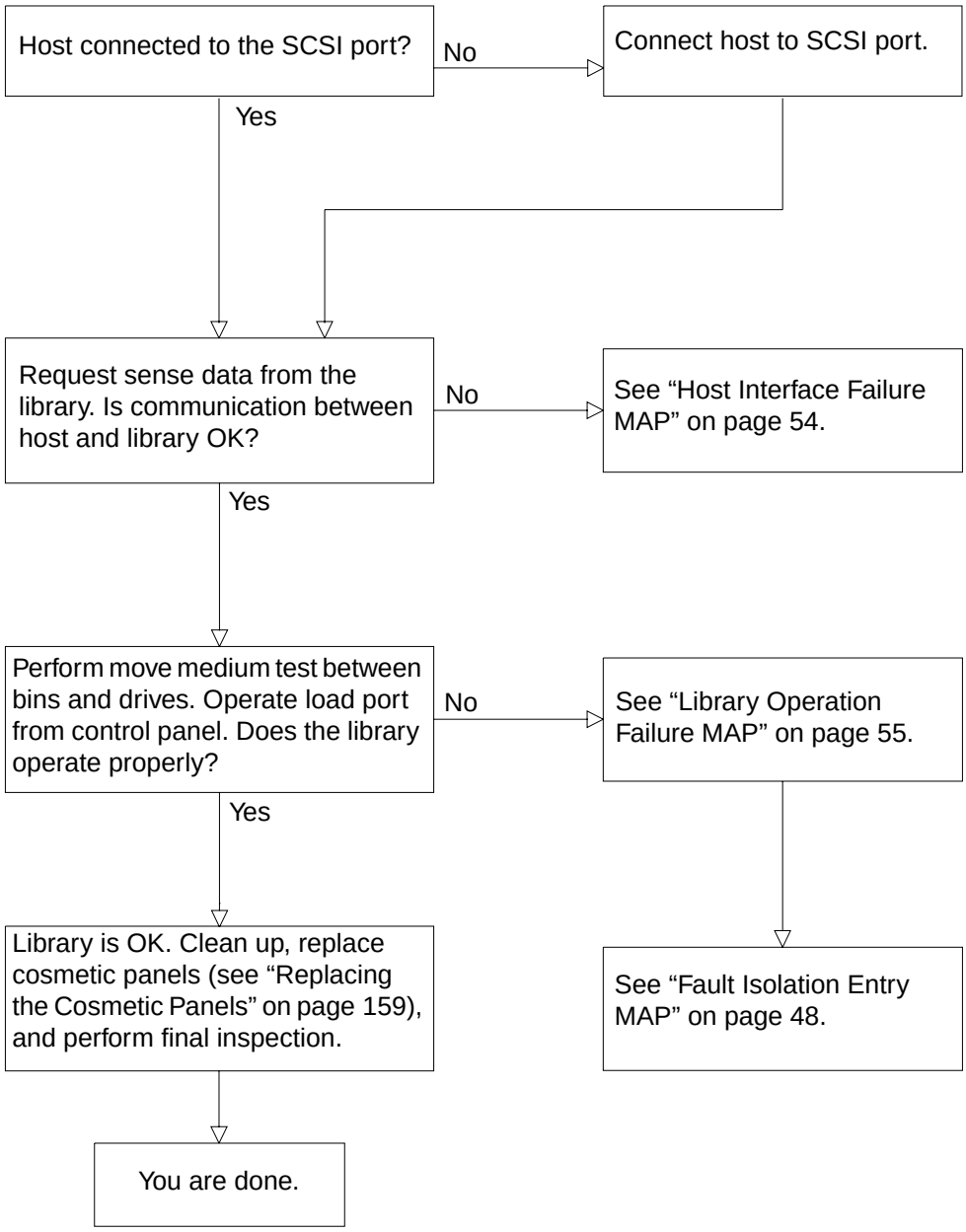
Mechanical Inspection Entry MAP



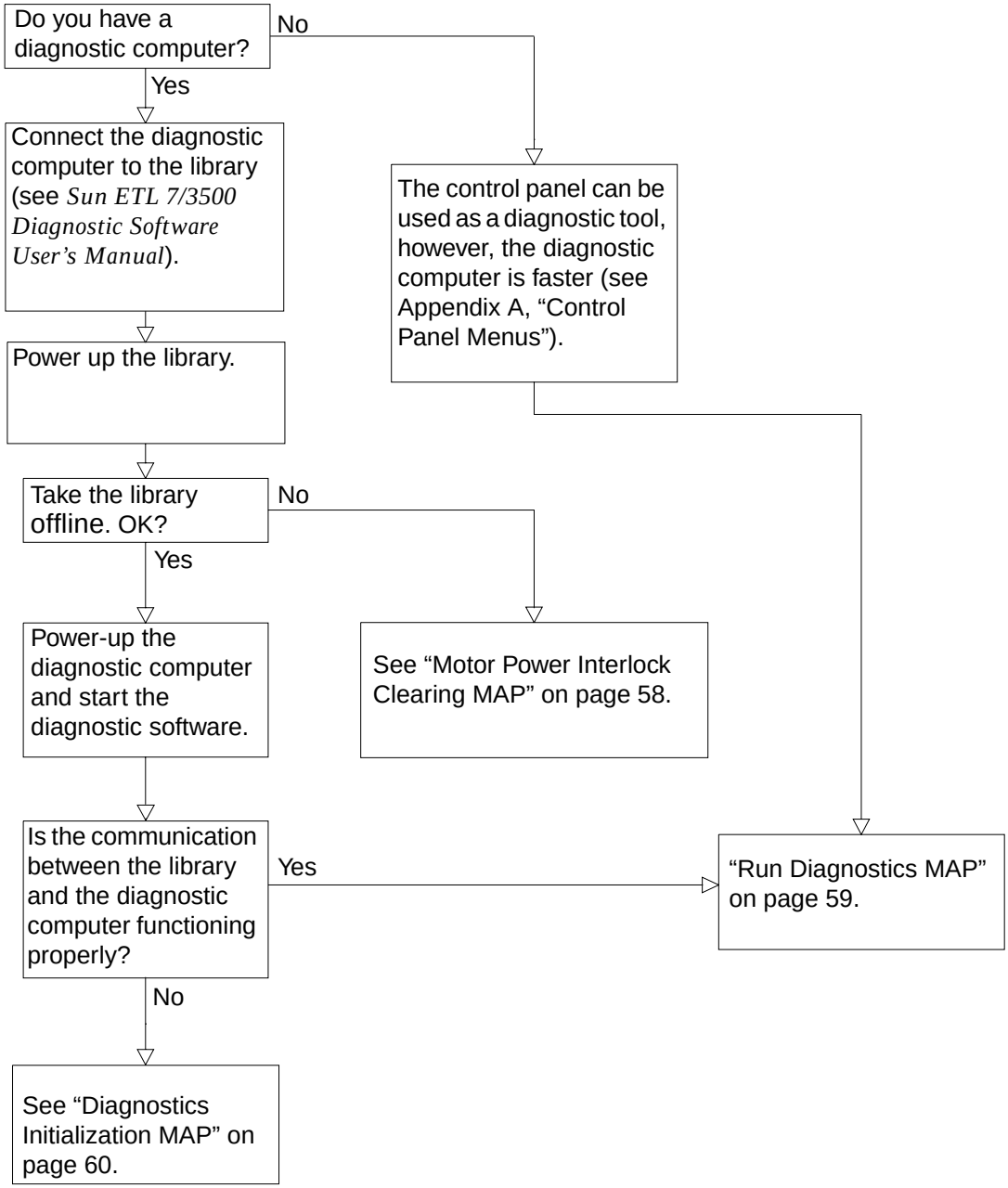
Online Initialization Entry MAP



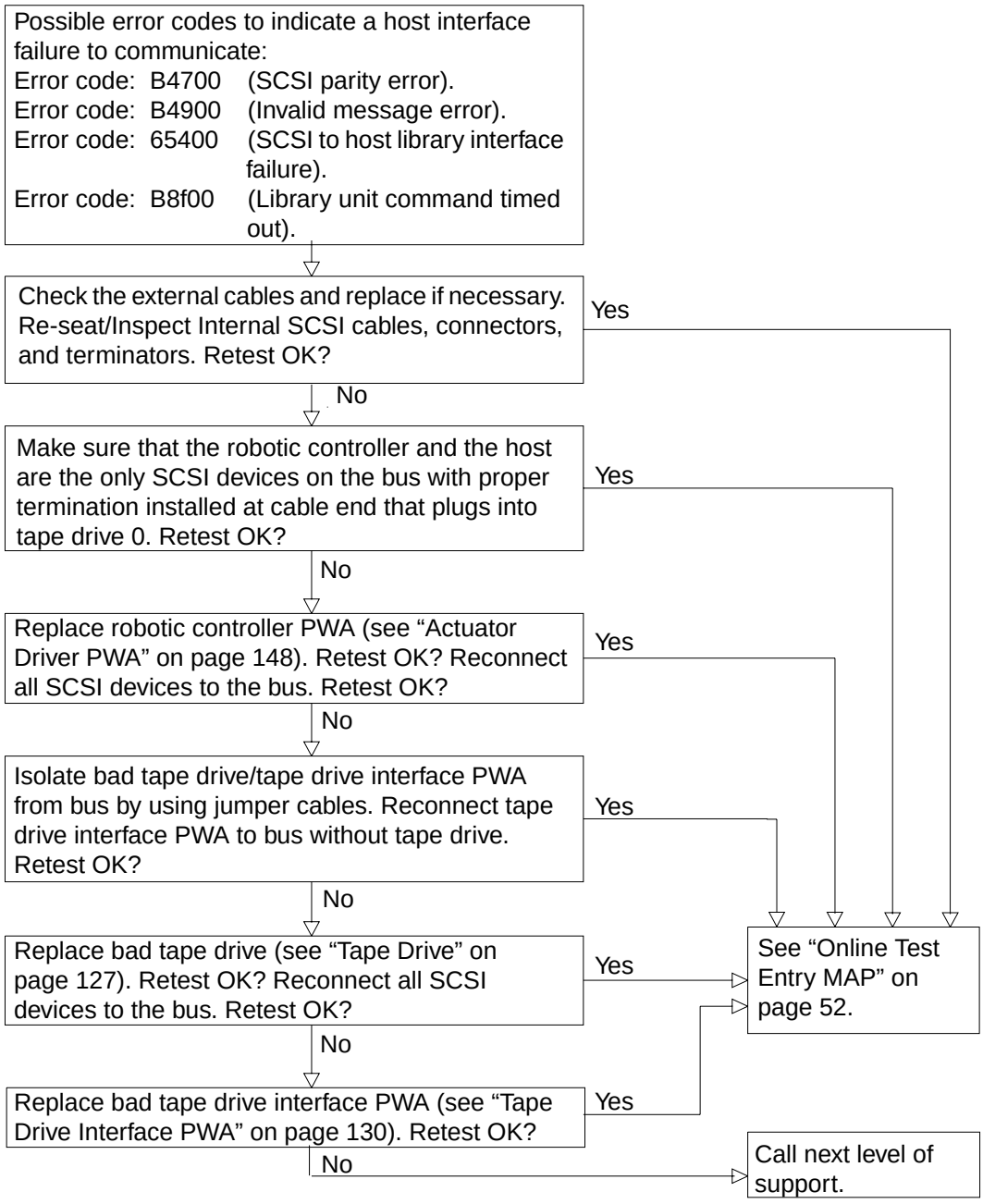
Online Test Entry MAP



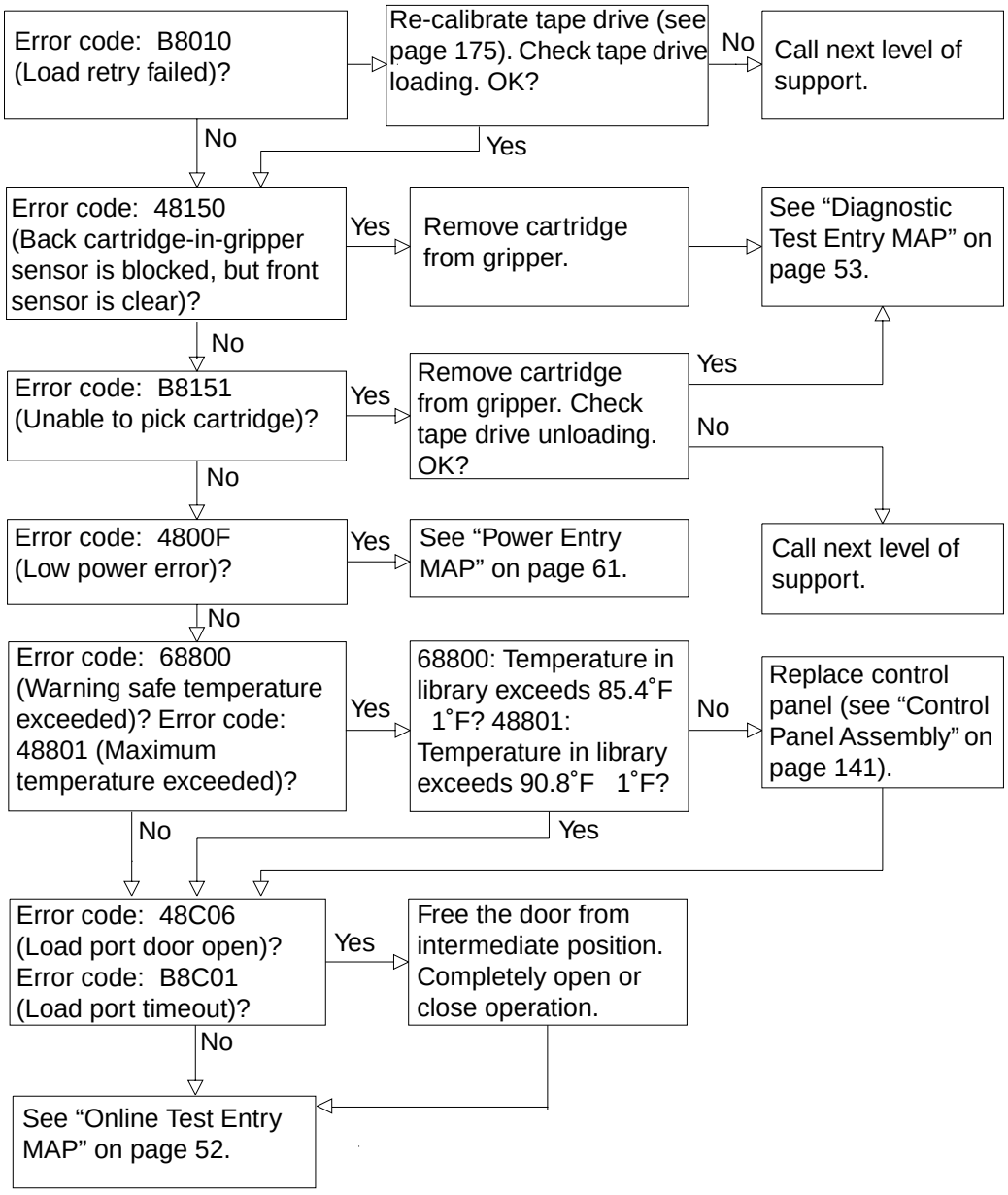
Diagnostic Test Entry MAP



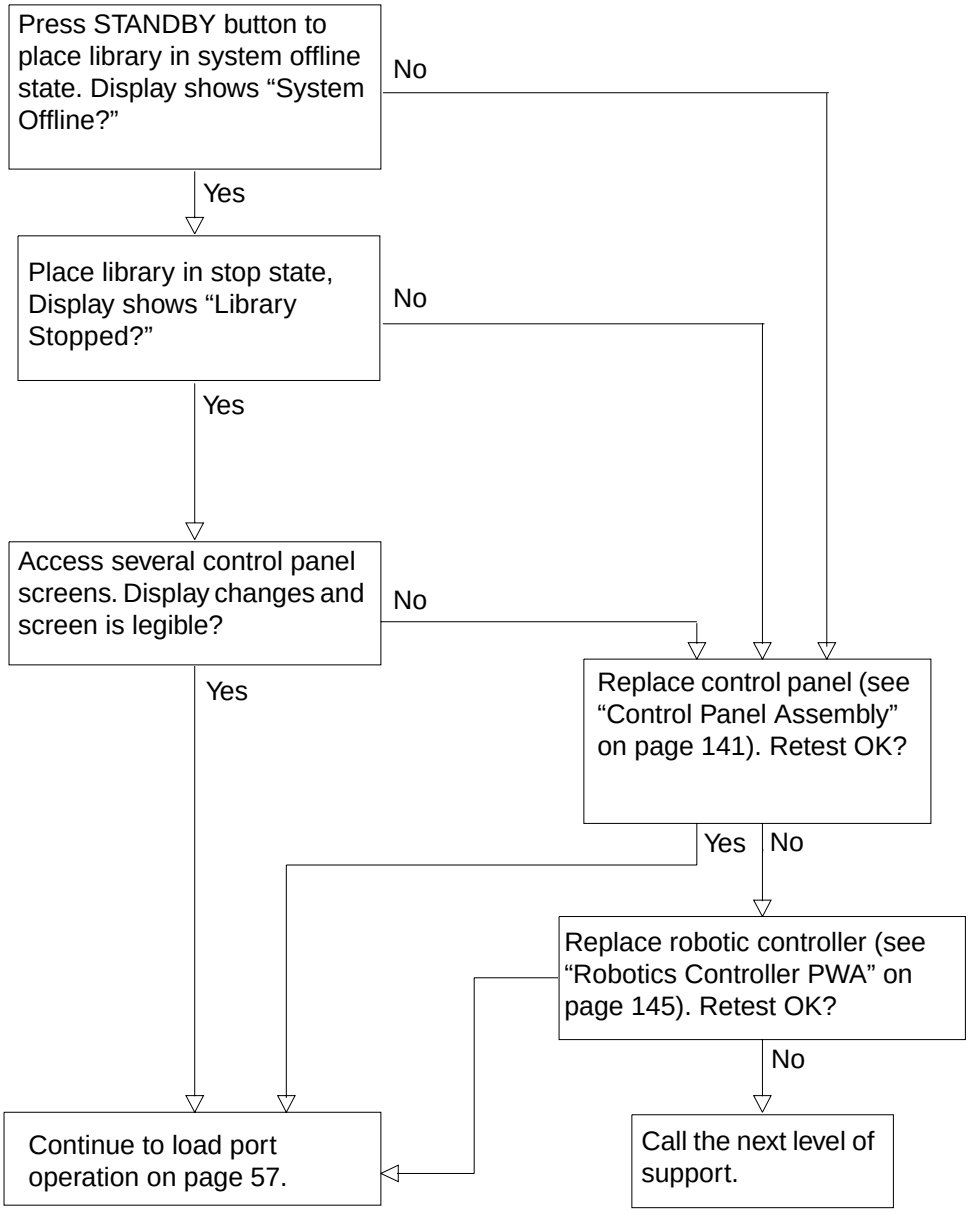
Host Interface Failure MAP



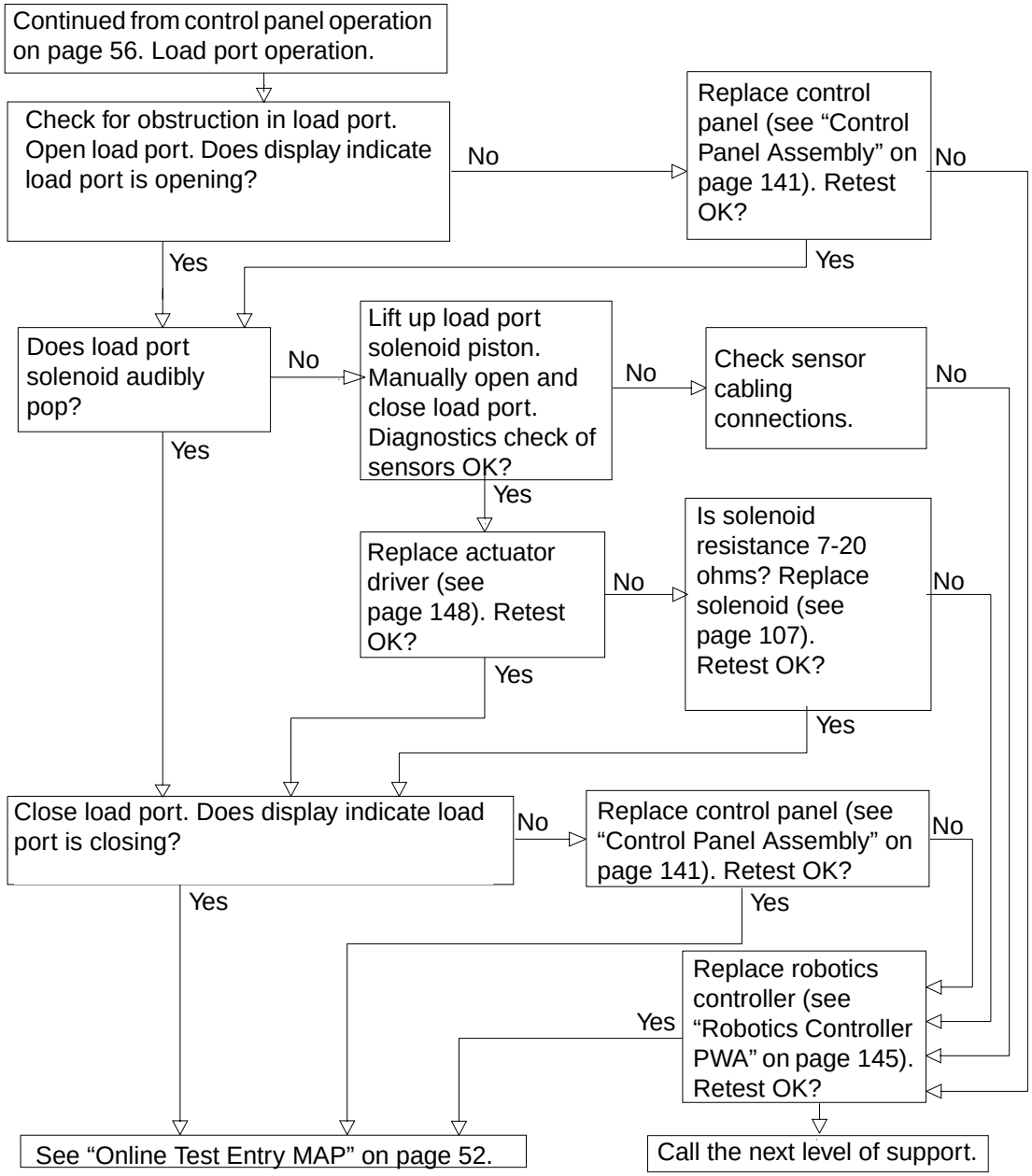
Library Operation Failure MAP



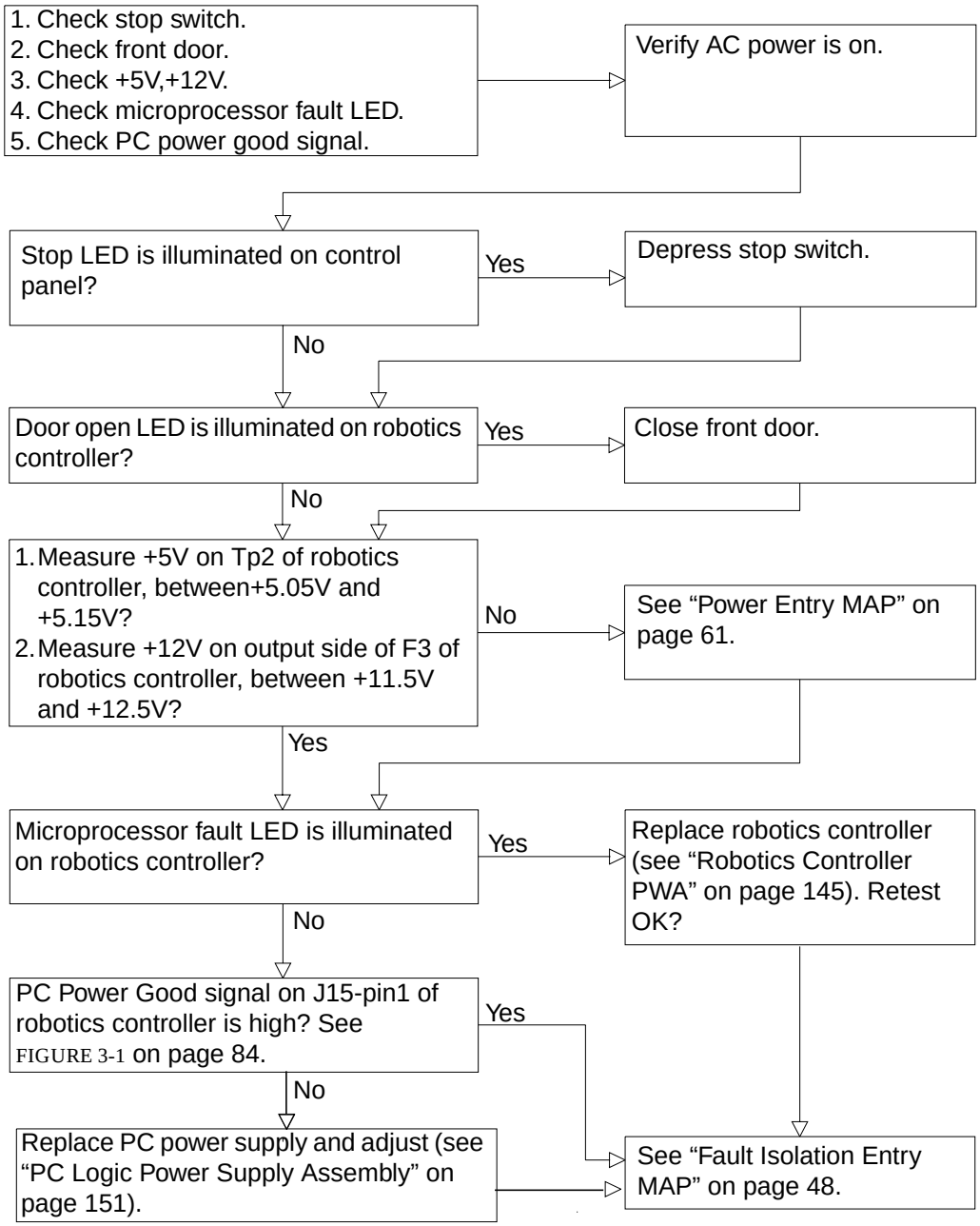
Control Panel and Load Port Debug MAP



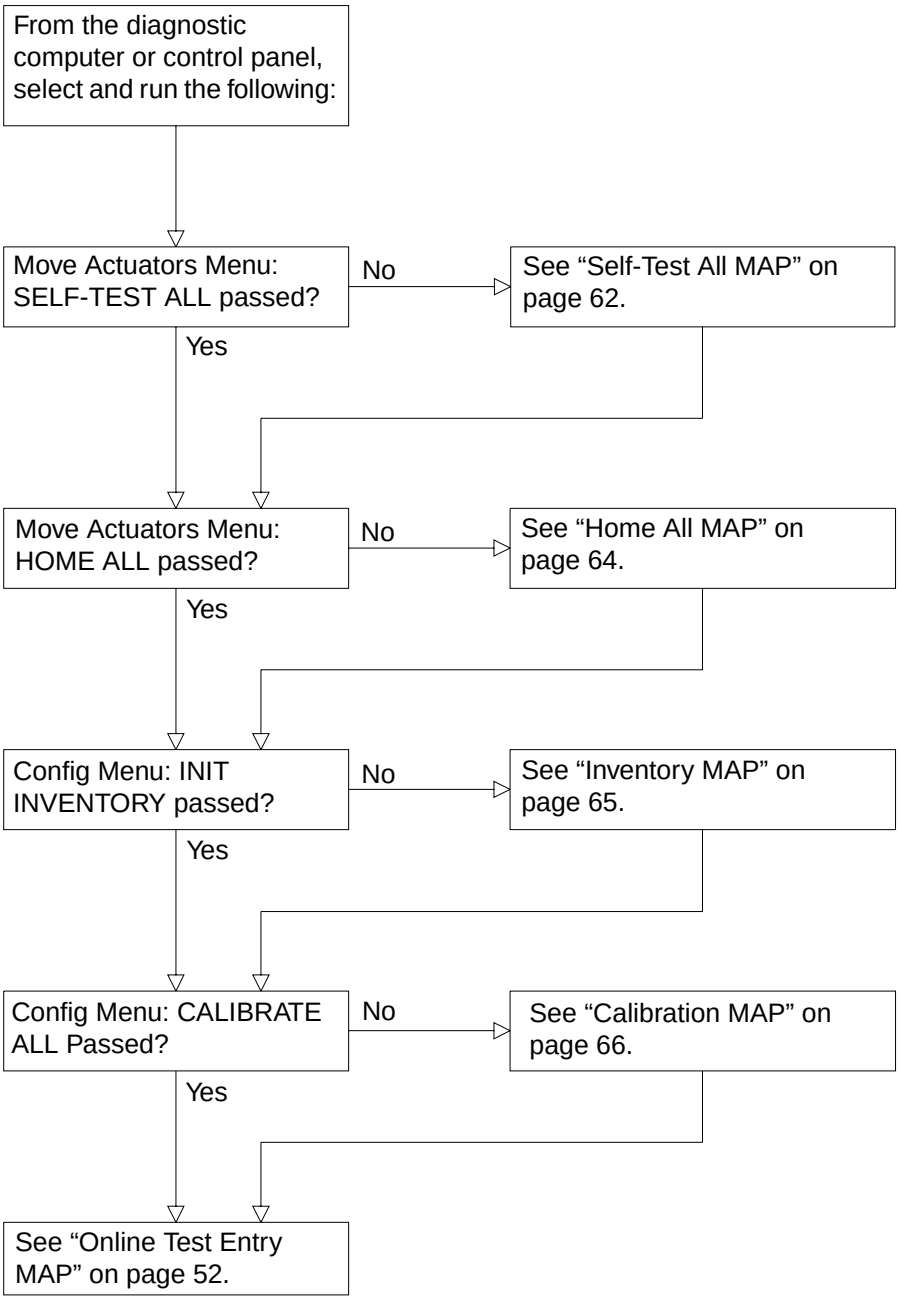
Control Panel and Load Port Debug MAP (Cont.)



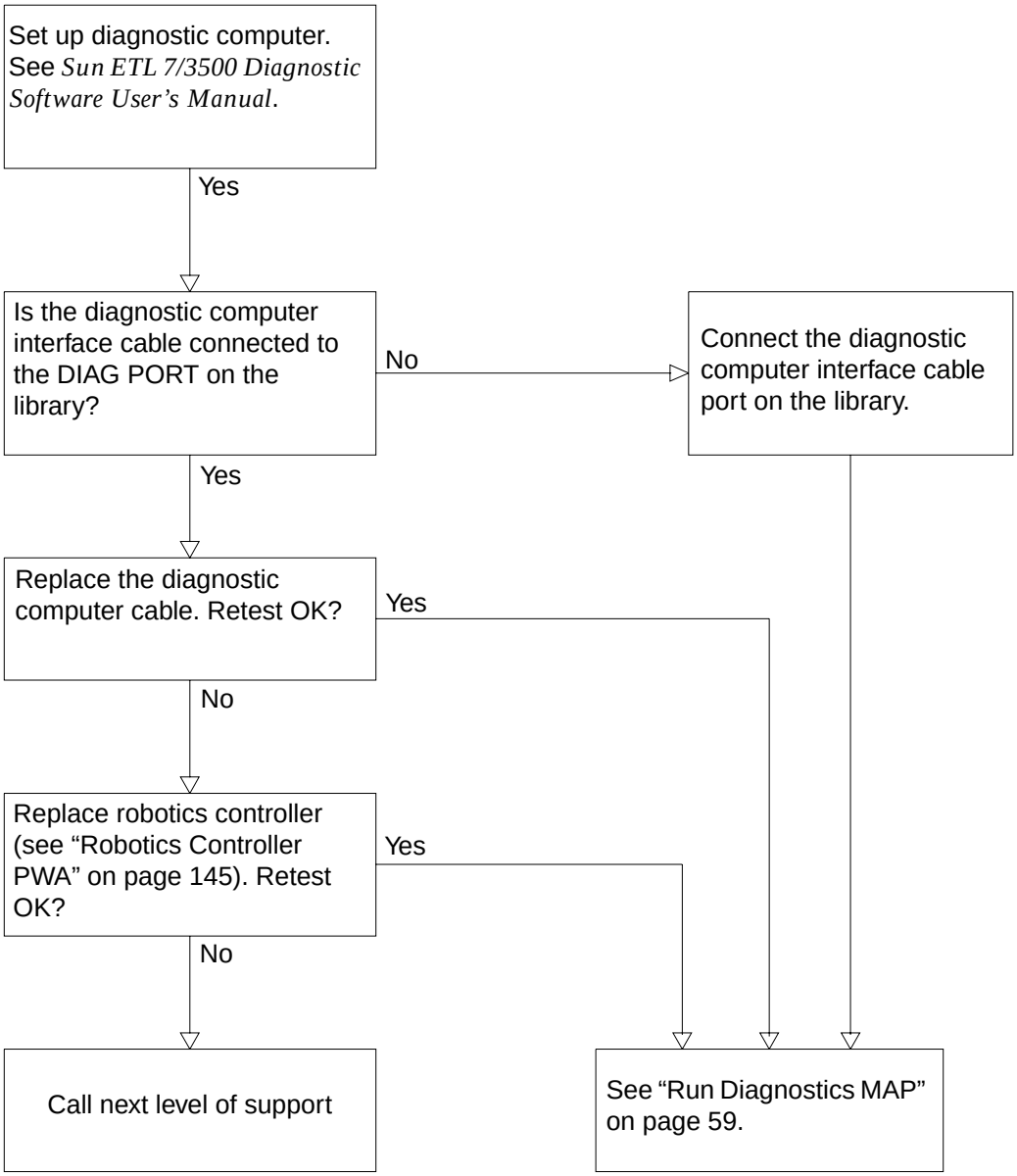
Motor Power Interlock Clearing MAP



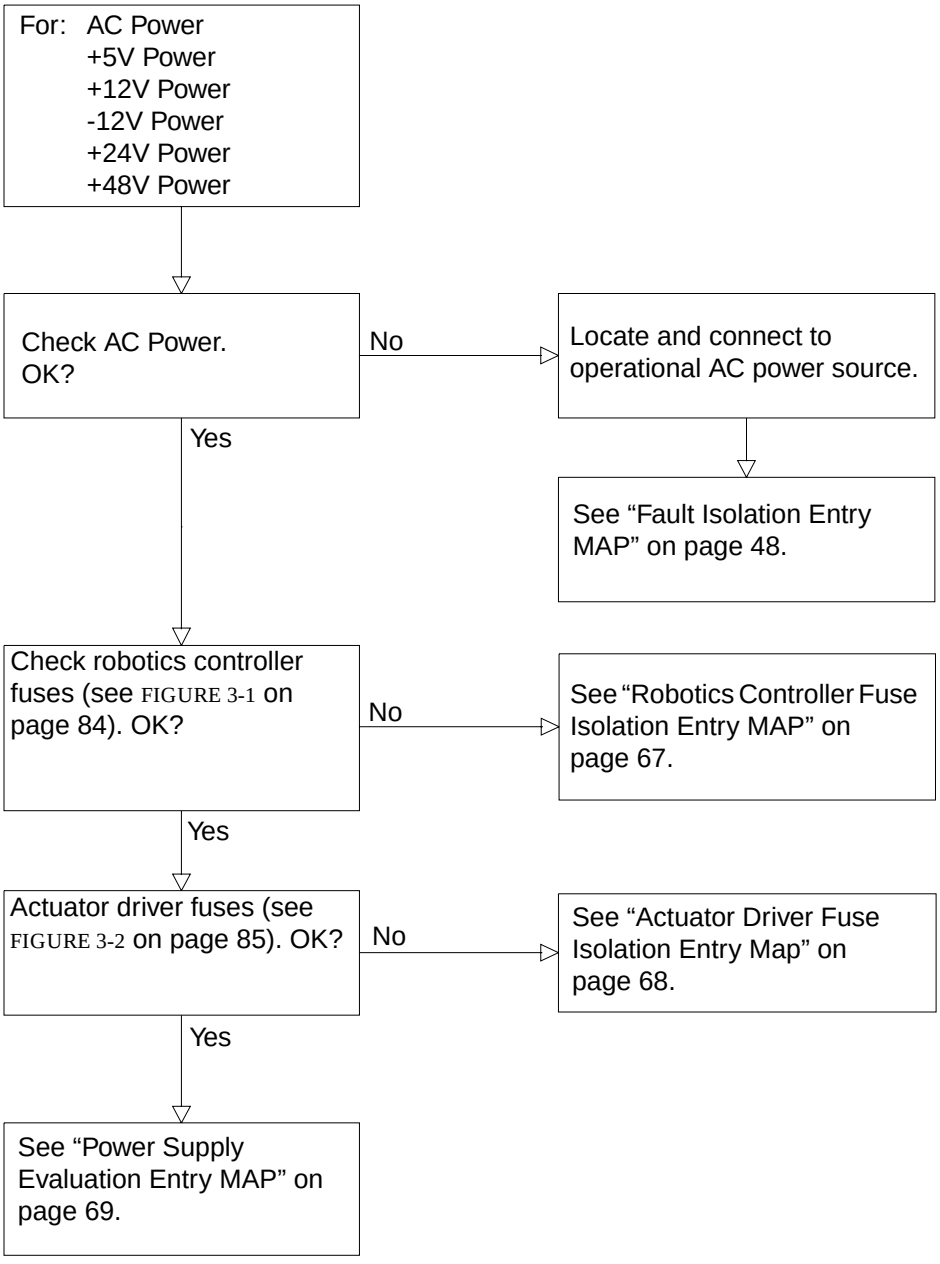
Run Diagnostics MAP



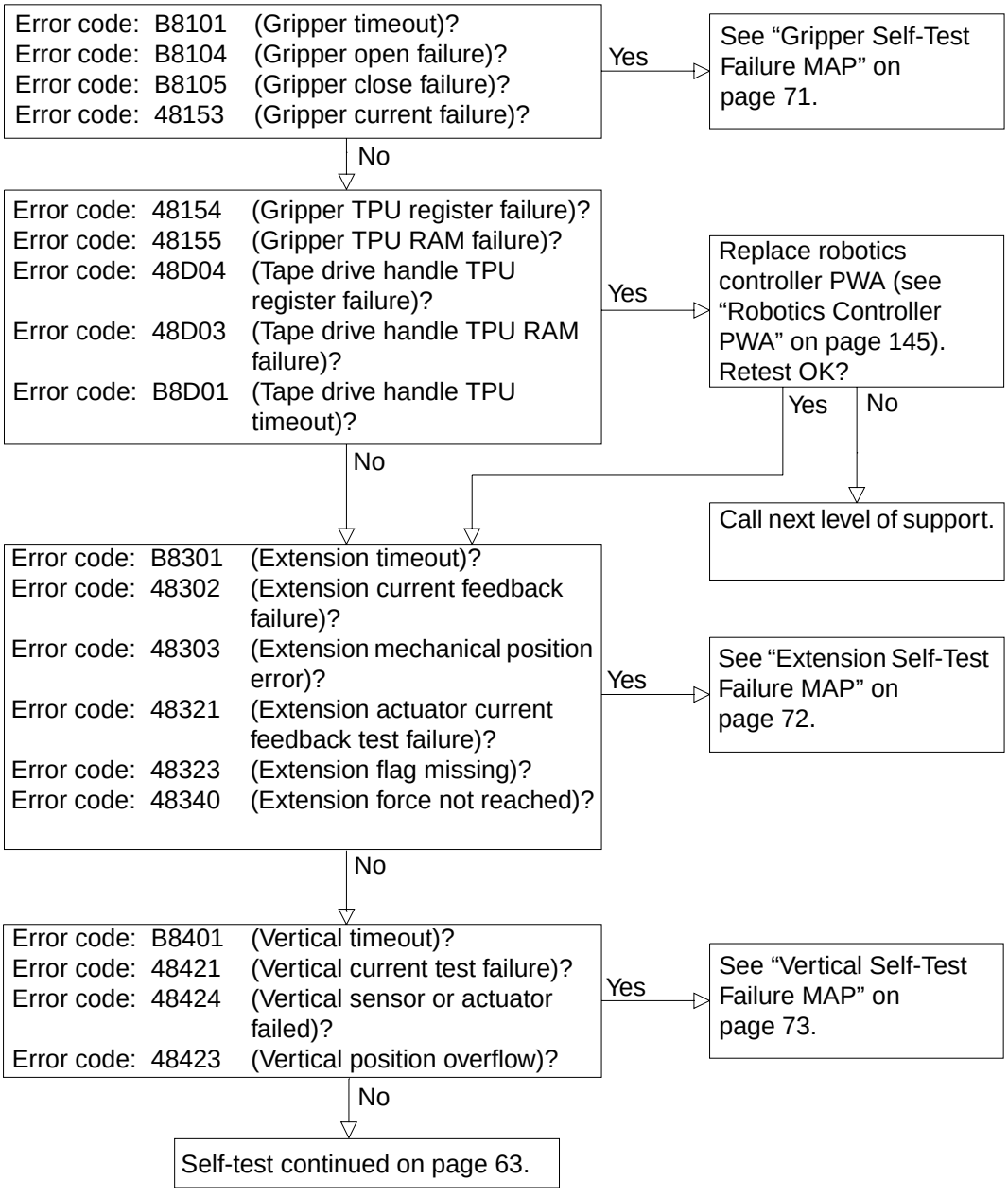
Diagnostics Initialization MAP



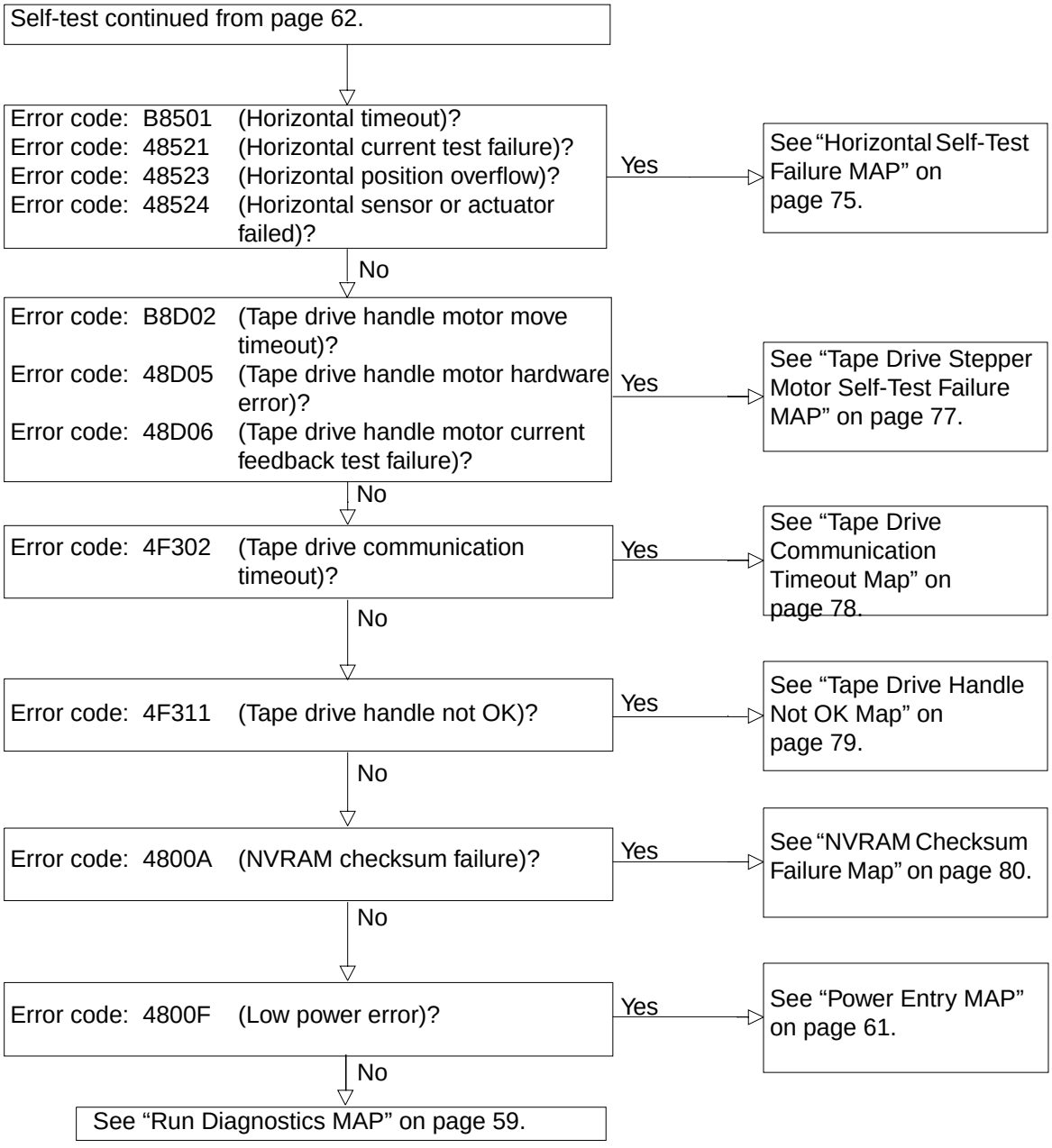
Power Entry MAP



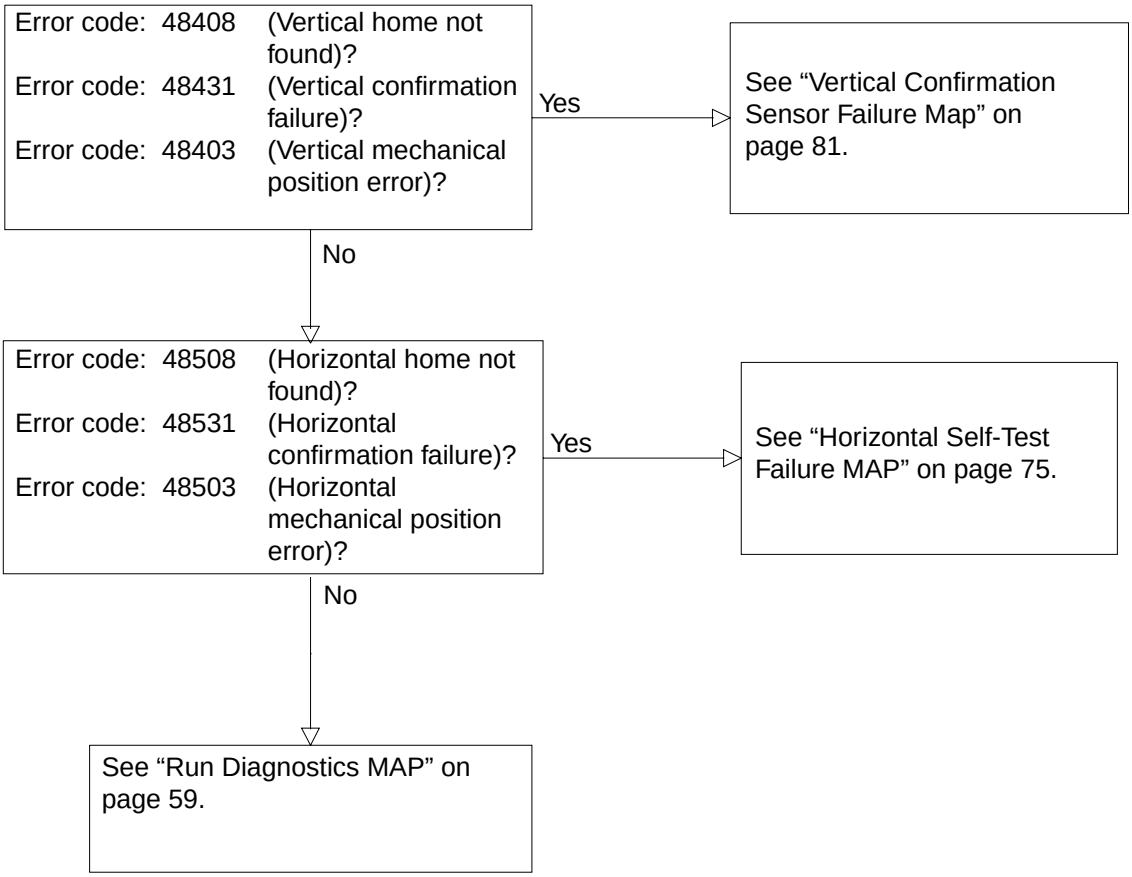
Self-Test All MAP



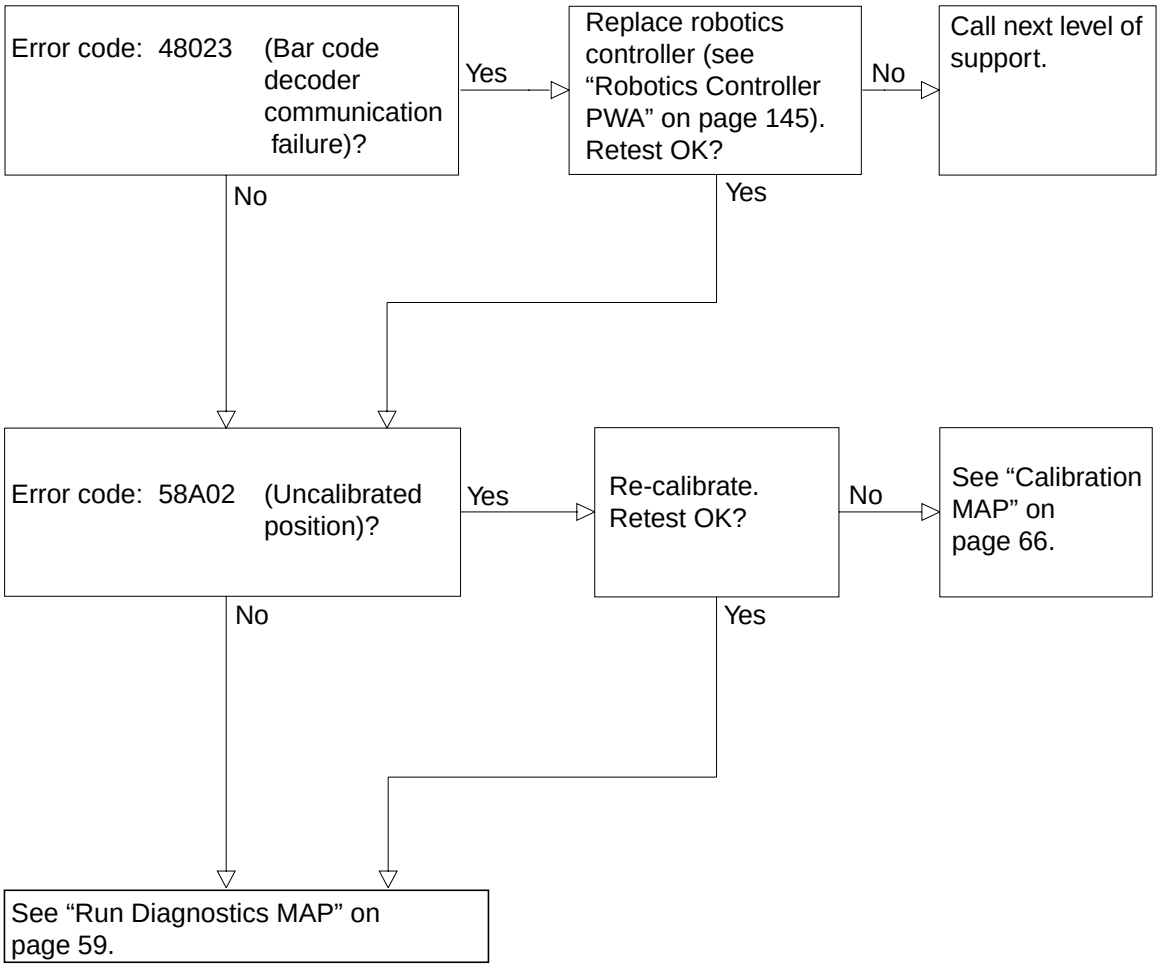
Self-Test All MAP (Cont.)



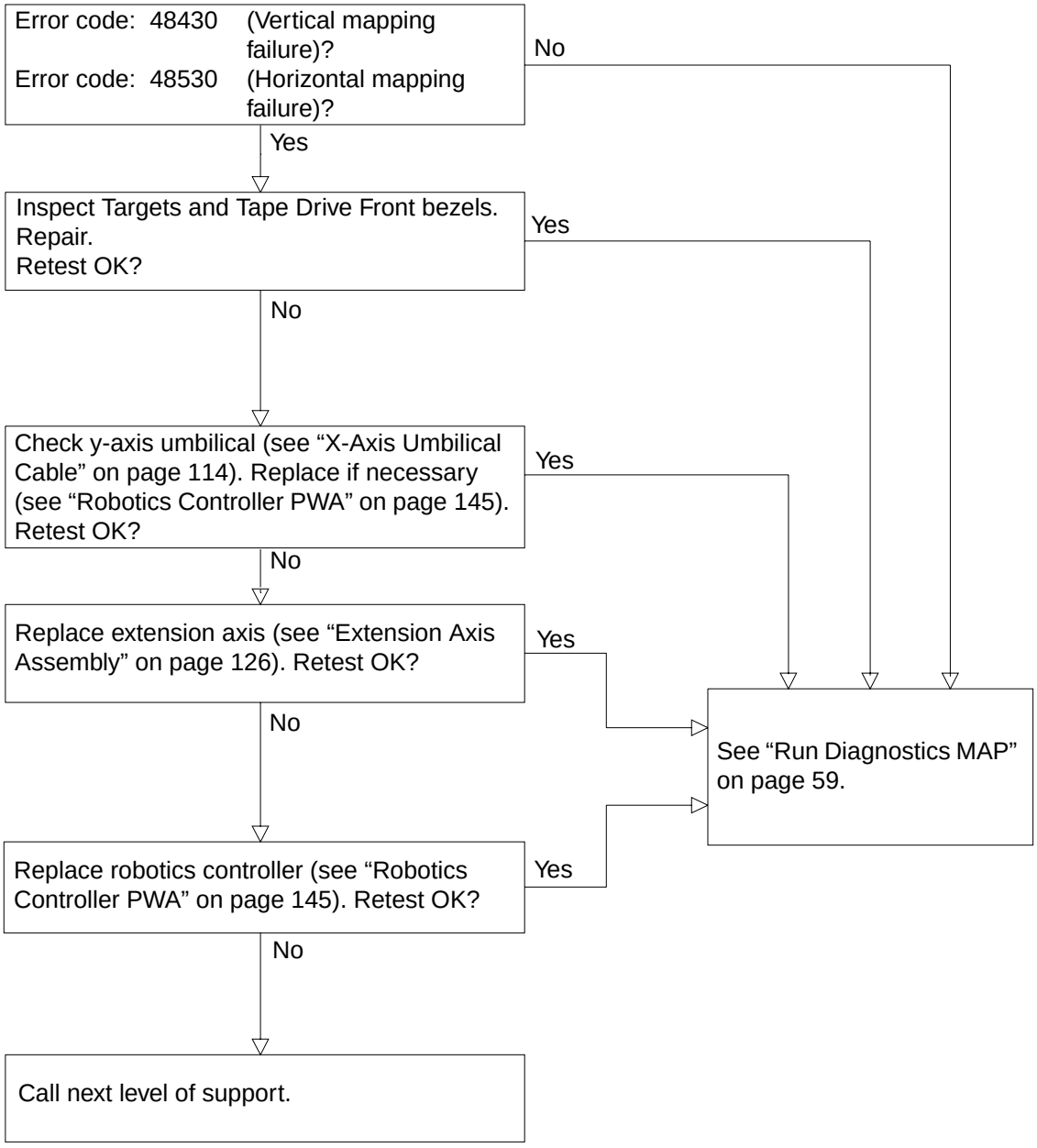
Home All MAP


Error code: 48408 (Vertical home not found)?
Error code: 48431 (Vertical confirmation failure)?
Error code: 48403 (Vertical mechanical position error)?
Yes
See “Vertical Confirmation Sensor Failure Map” on page 81.
No
Error code: 48508 (Horizontal home not found)?
Error code: 48531 (Horizontal confirmation failure)?
Error code: 48503 (Horizontal mechanical position error)?
Yes
See “Horizontal Self-Test Failure MAP” on page 75.
No
See “Run Diagnostics MAP” on page 59.

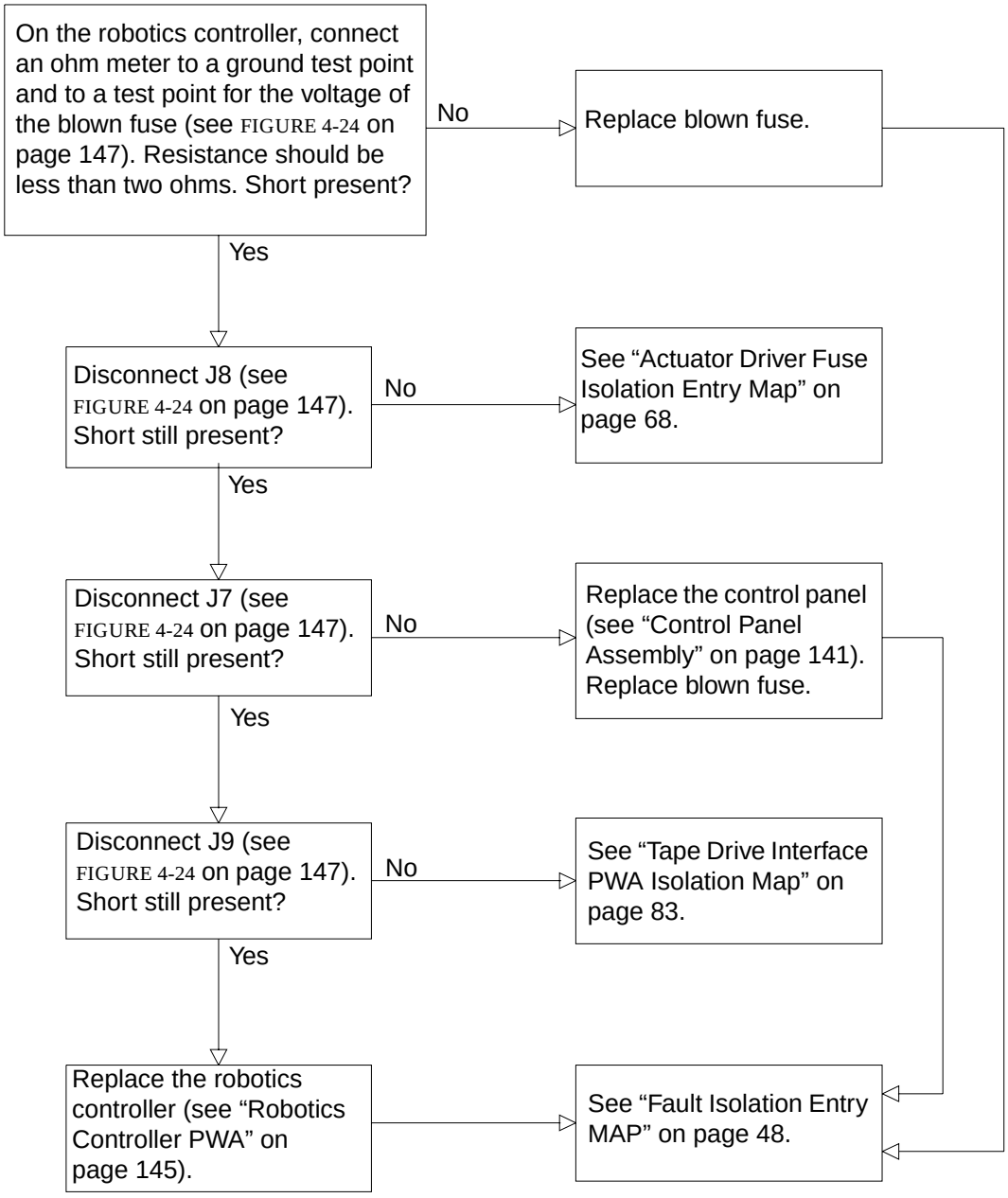
Inventory MAP



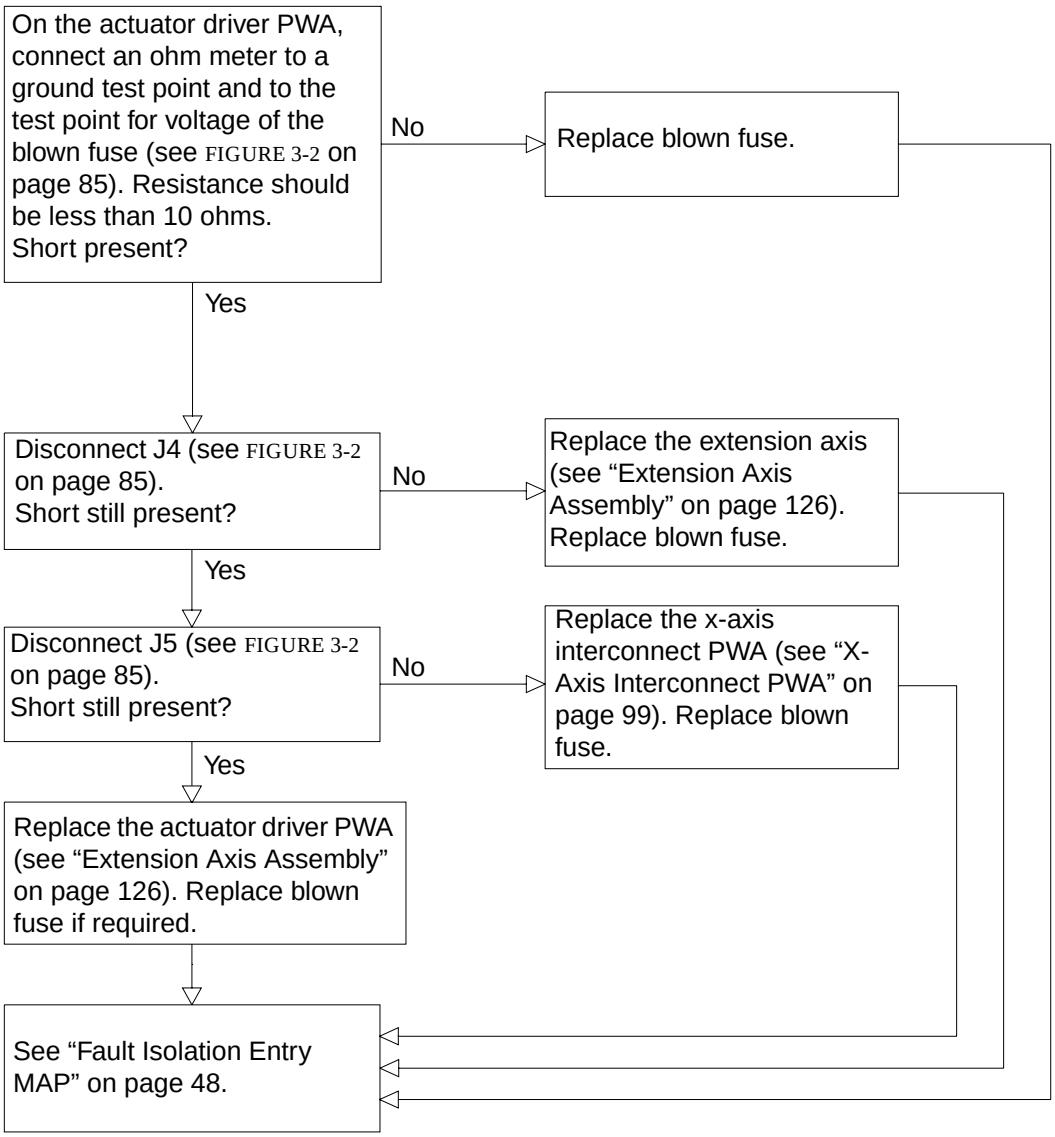
Calibration MAP



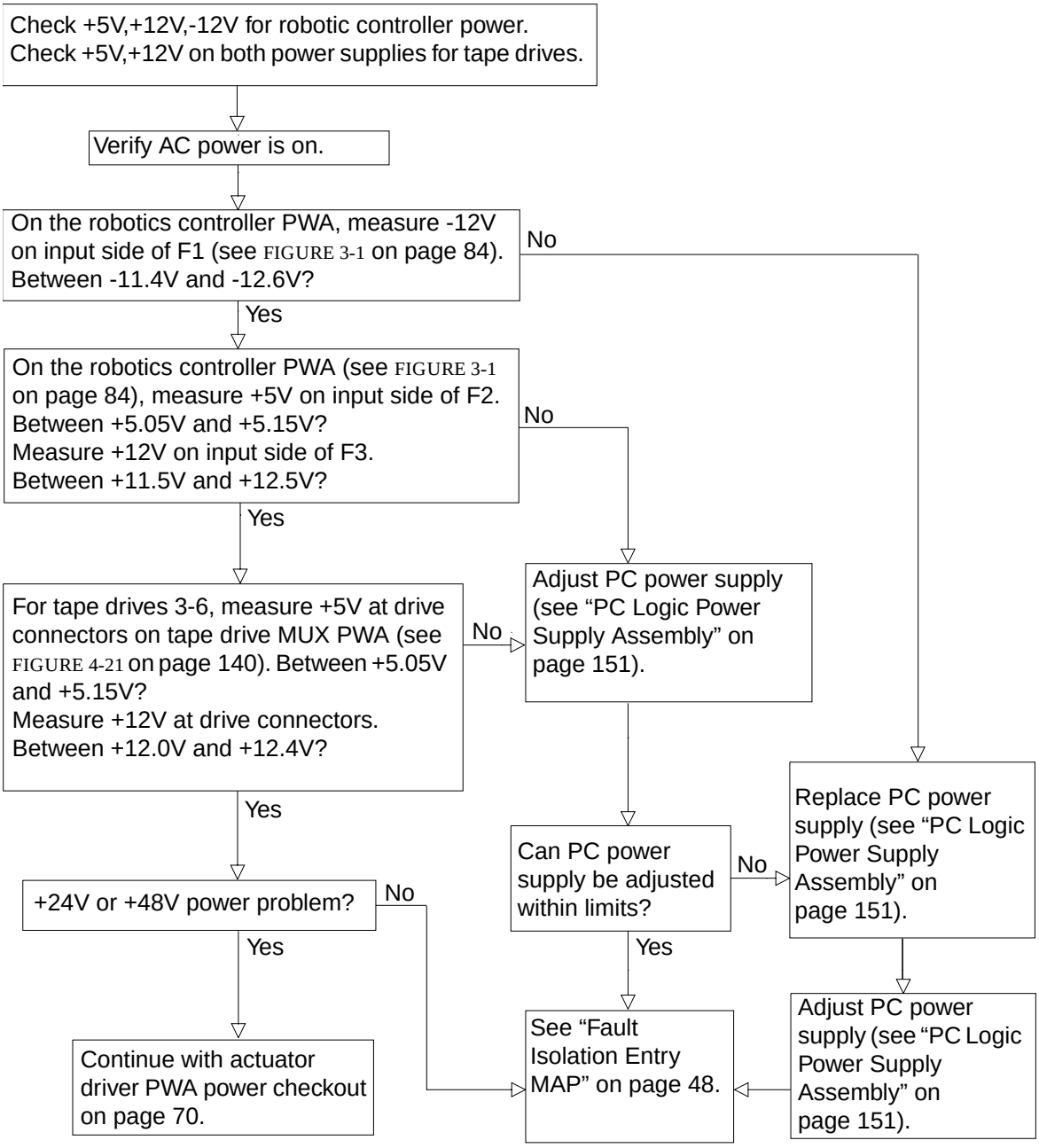
Robotics Controller Fuse Isolation Entry MAP



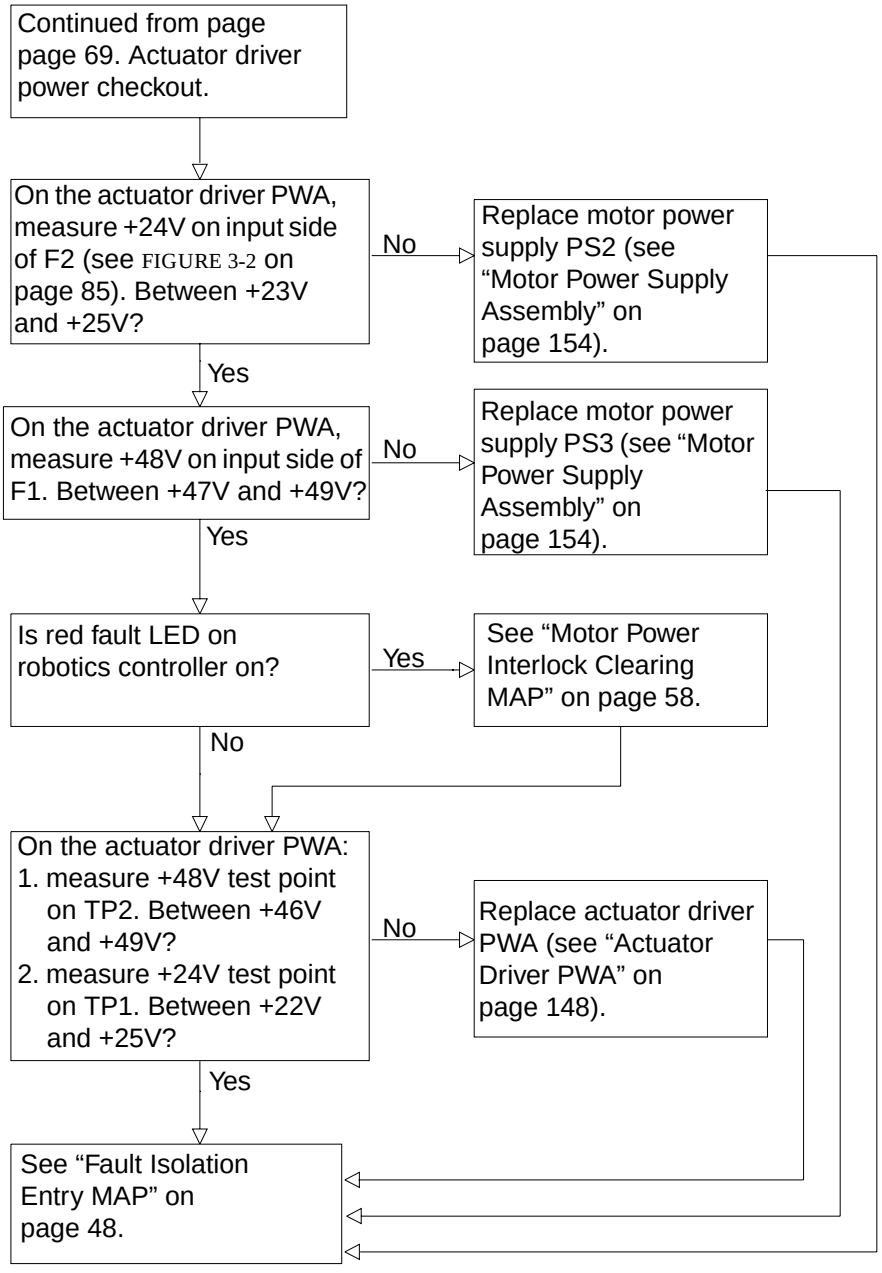
Actuator Driver Fuse Isolation Entry Map



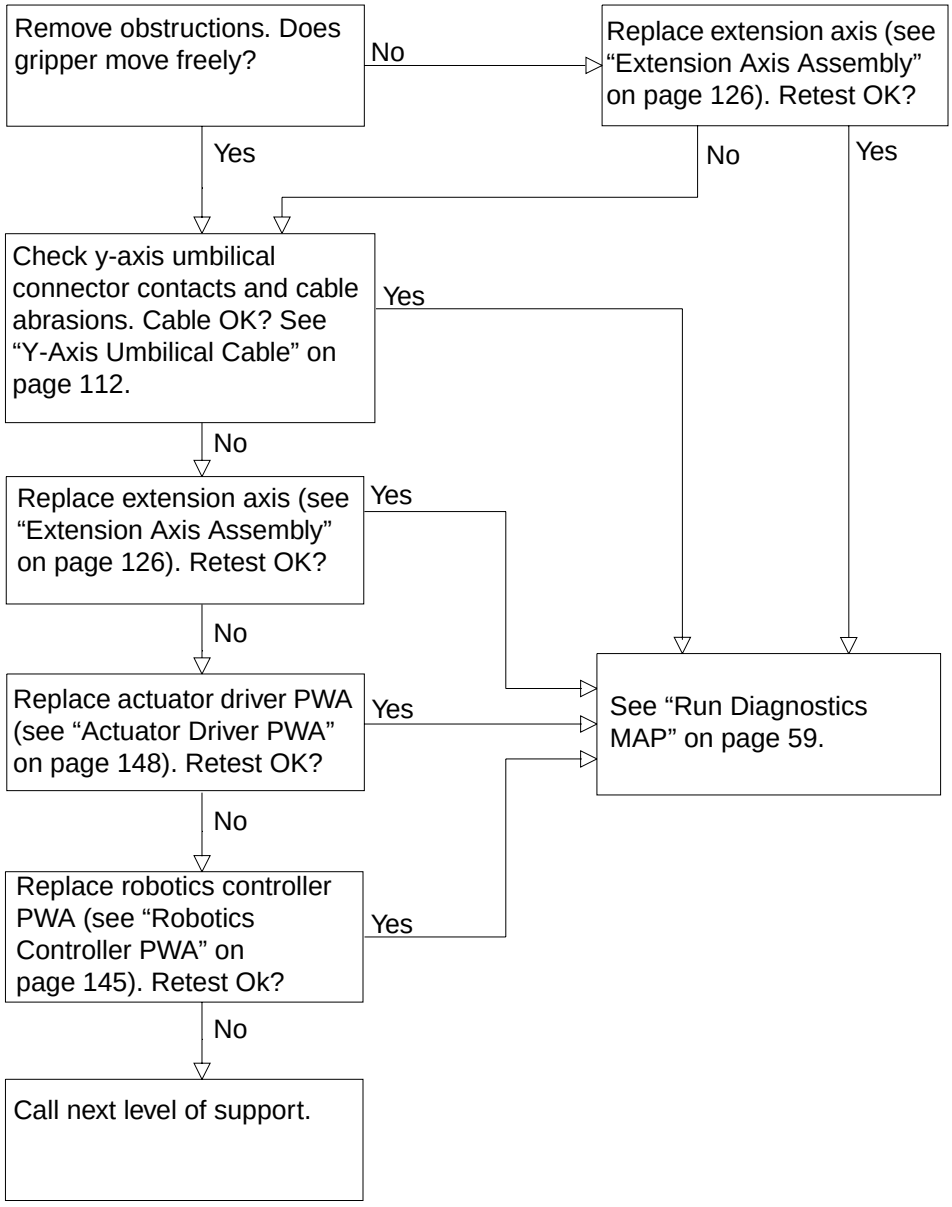
Power Supply Evaluation Entry MAP



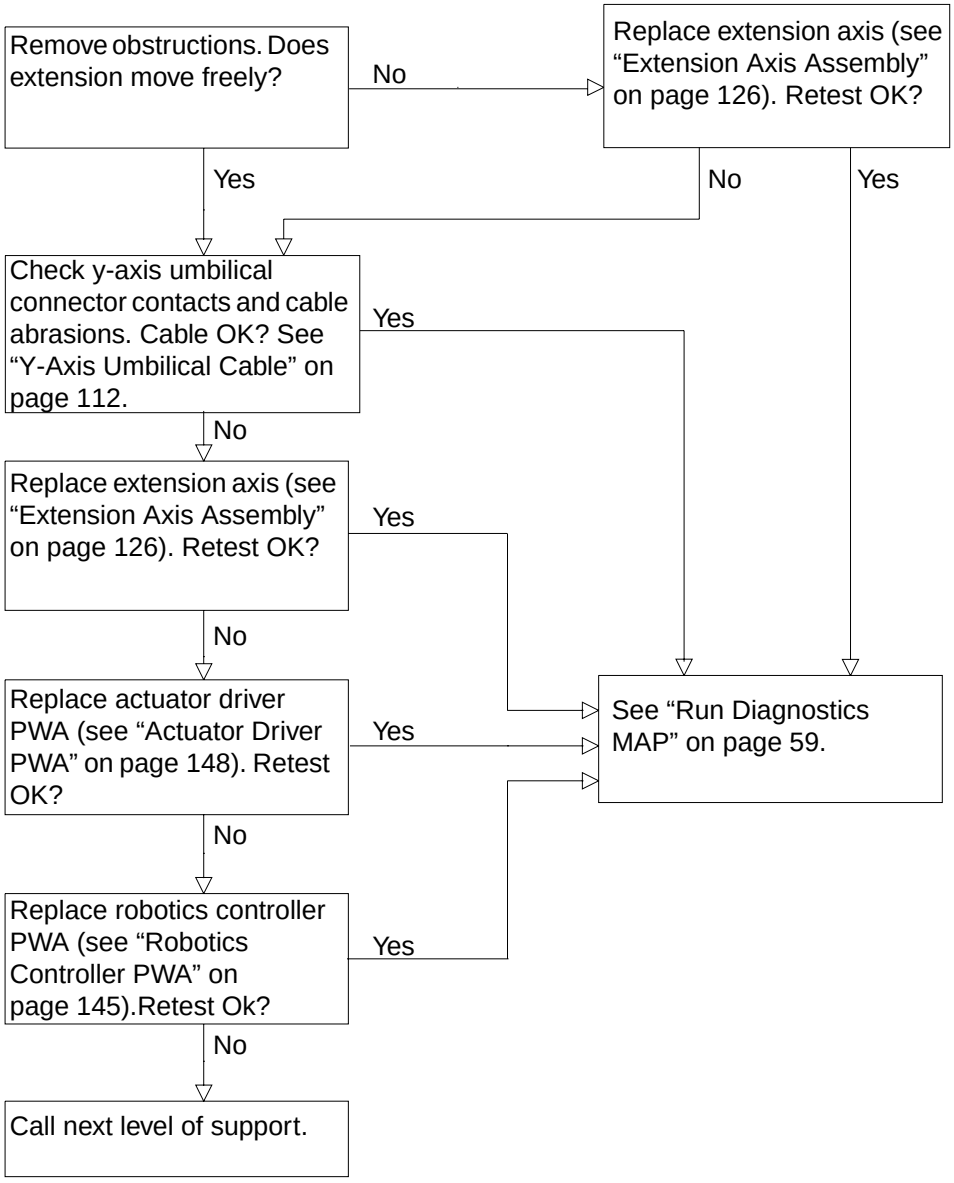
Power Supply Evaluation Entry MAP (Cont.)



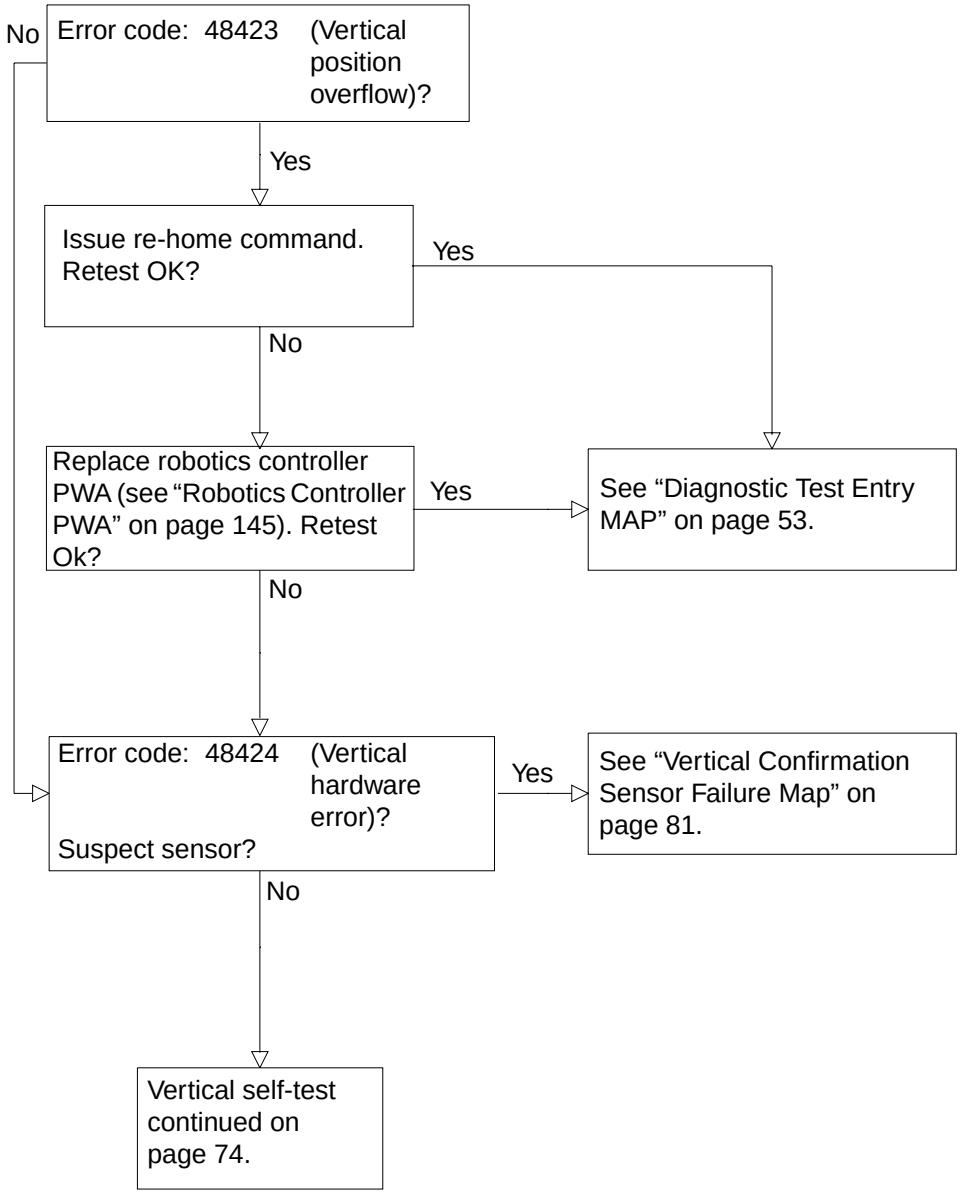
Gripper Self-Test Failure MAP



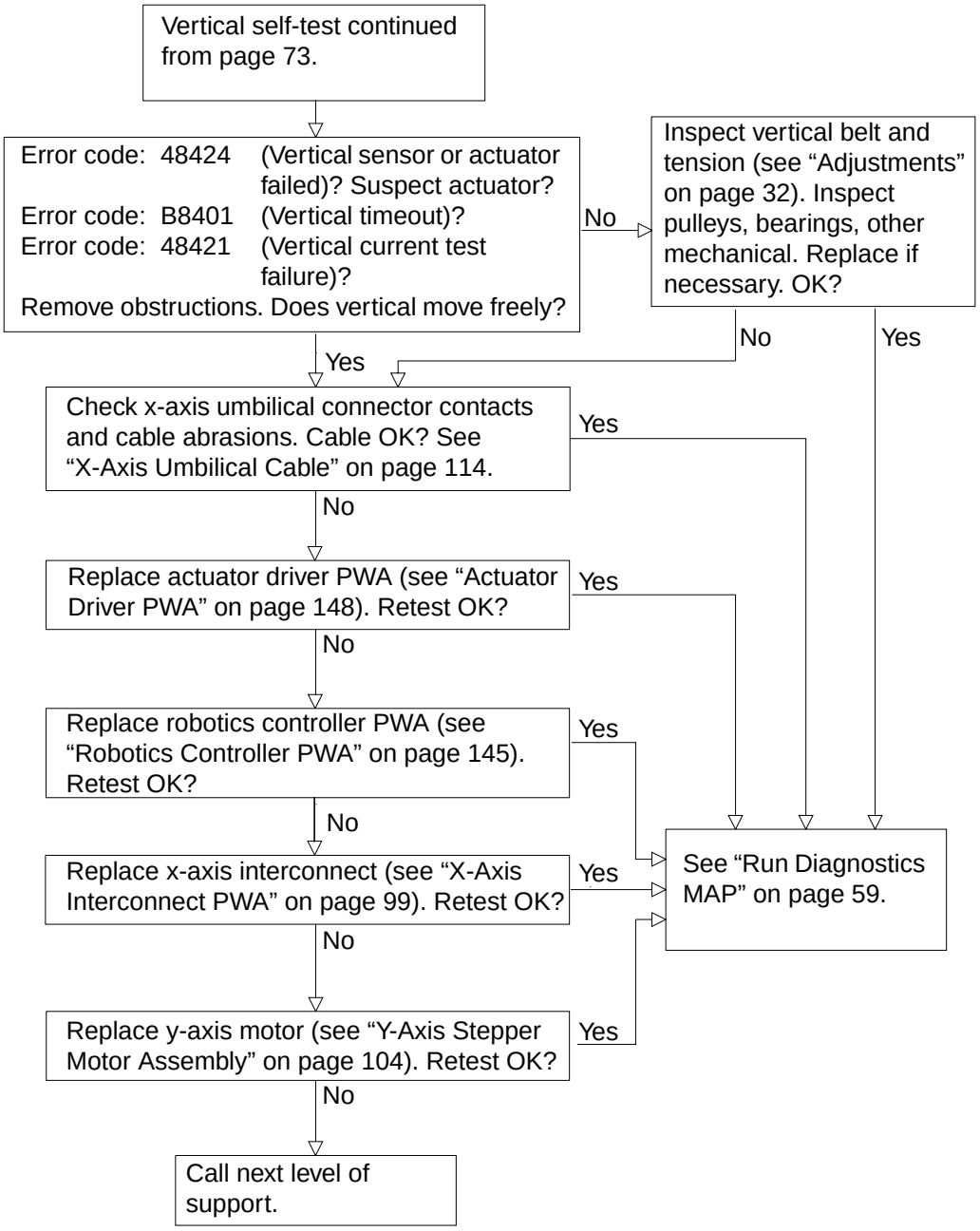
Extension Self-Test Failure MAP



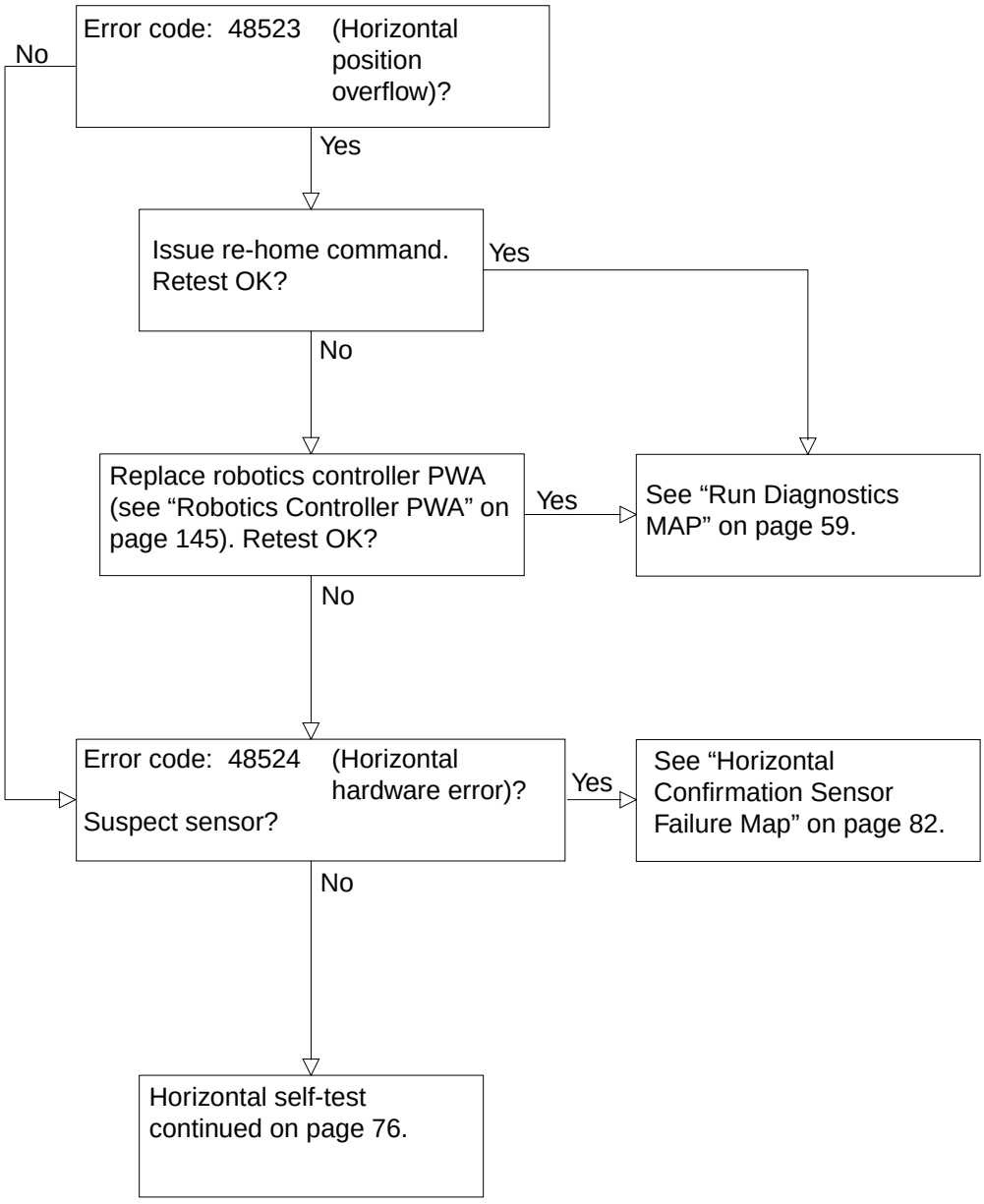
Vertical Self-Test Failure MAP



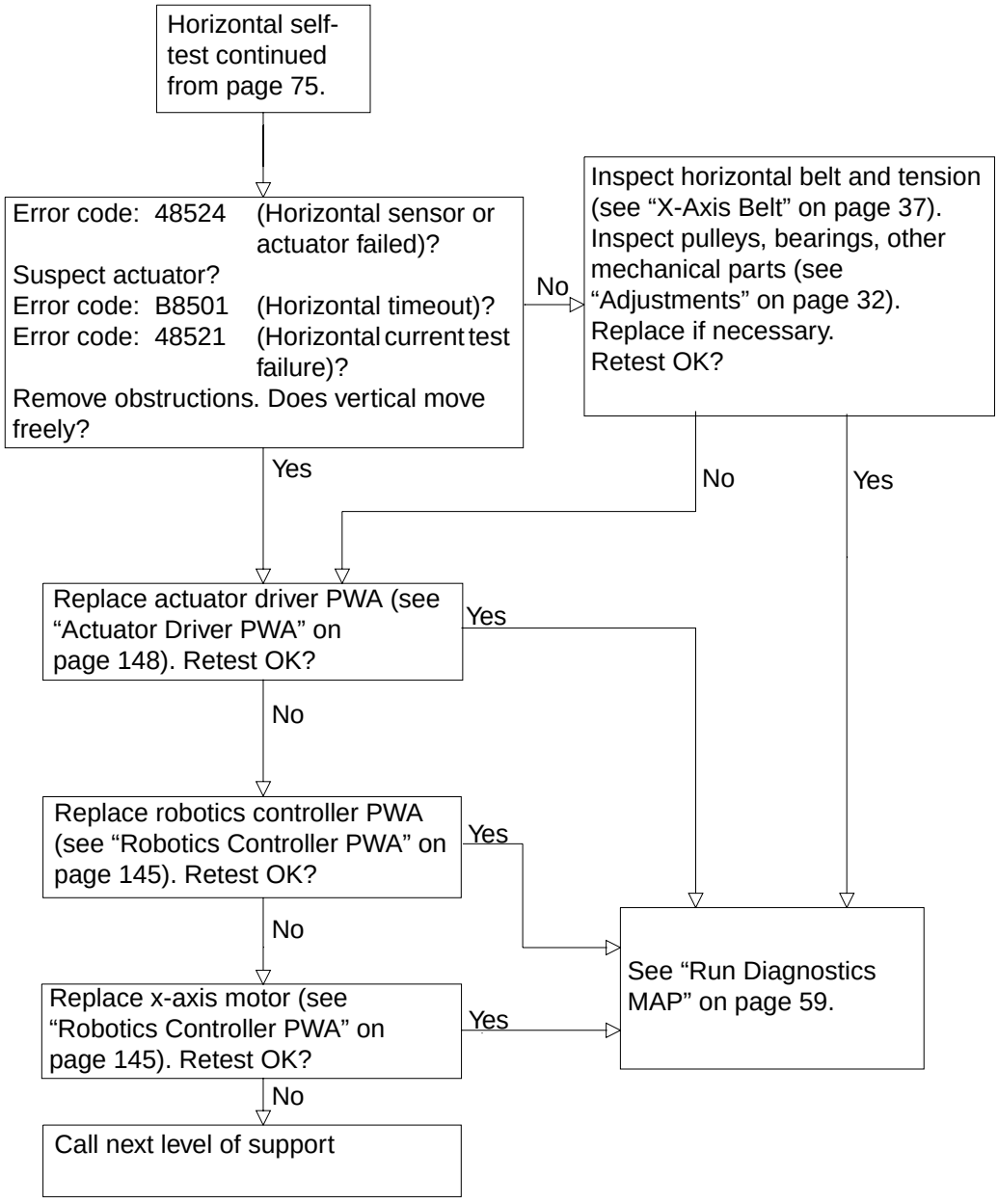
Vertical Self-Test Failure MAP (Cont.)



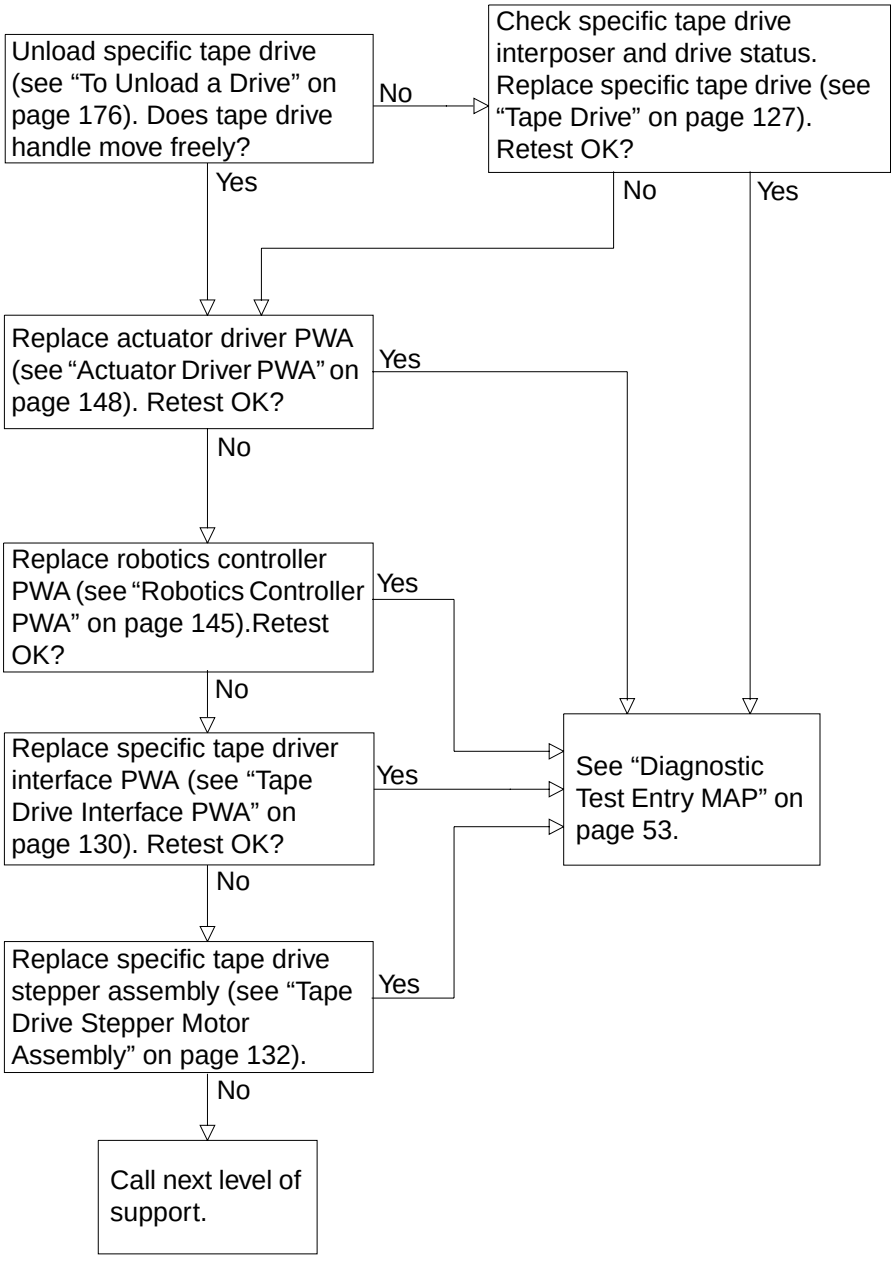
Horizontal Self-Test Failure MAP



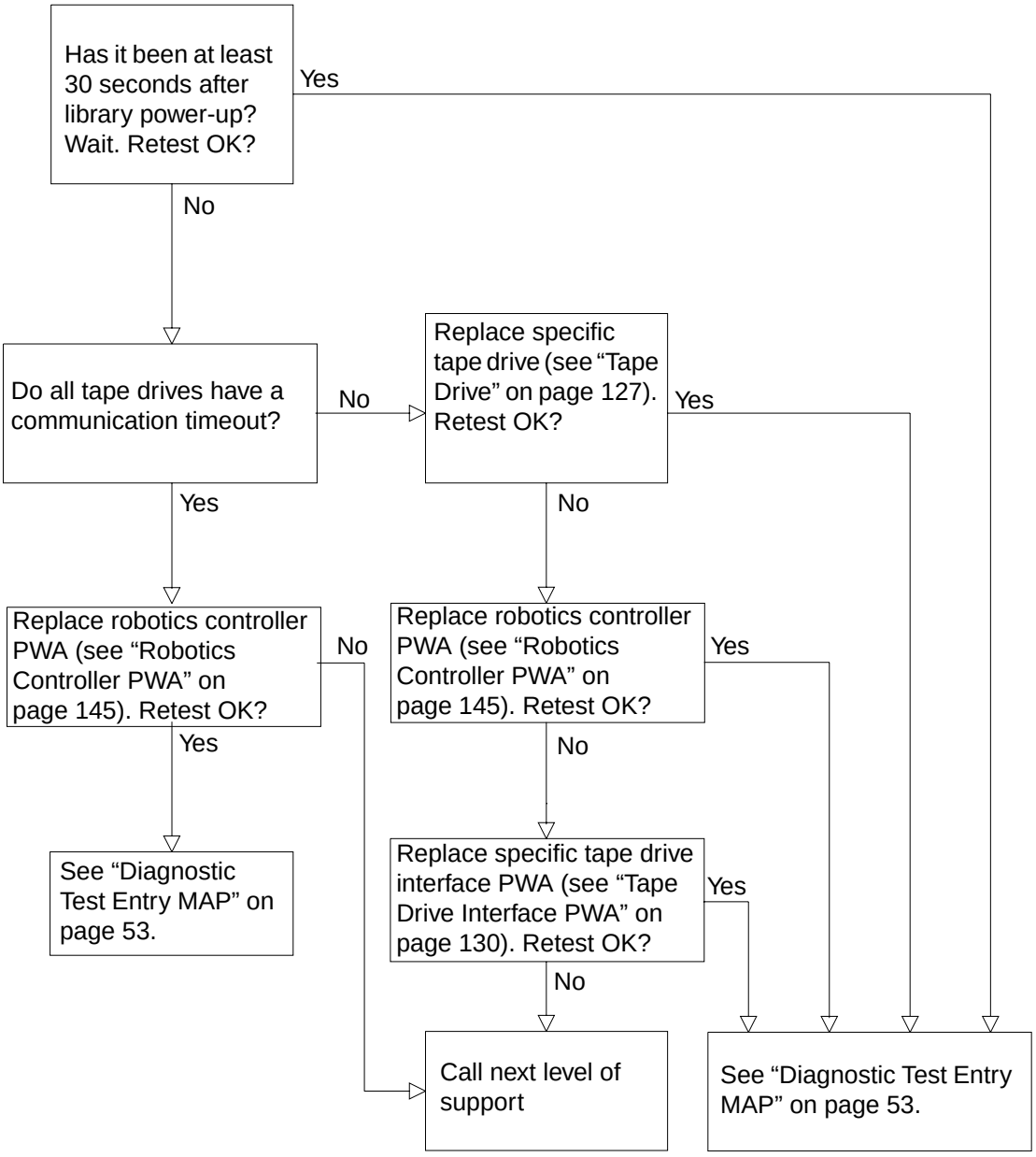
Horizontal Self-Test Failure MAP (Cont.)



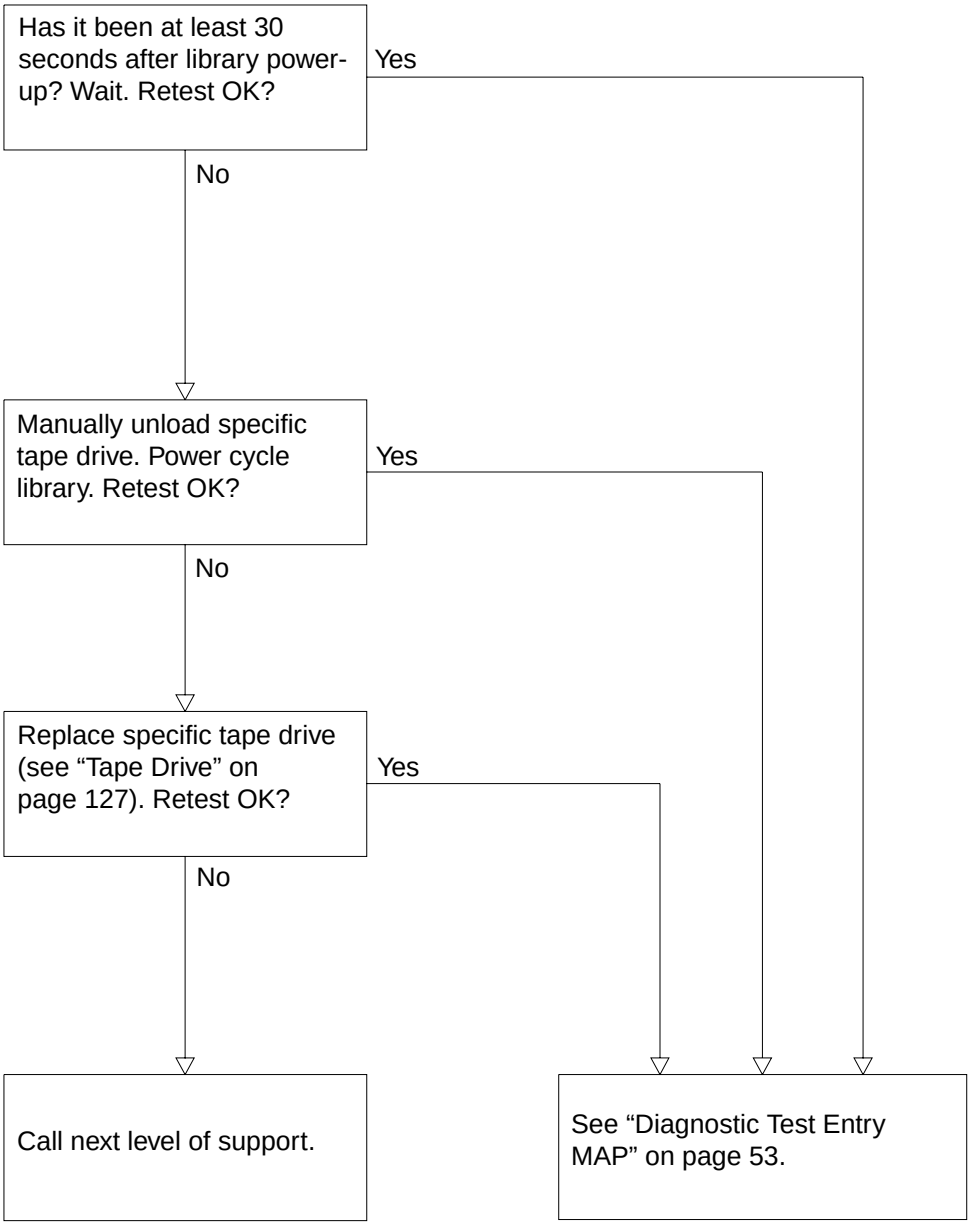
Tape Drive Stepper Motor Self-Test Failure MAP



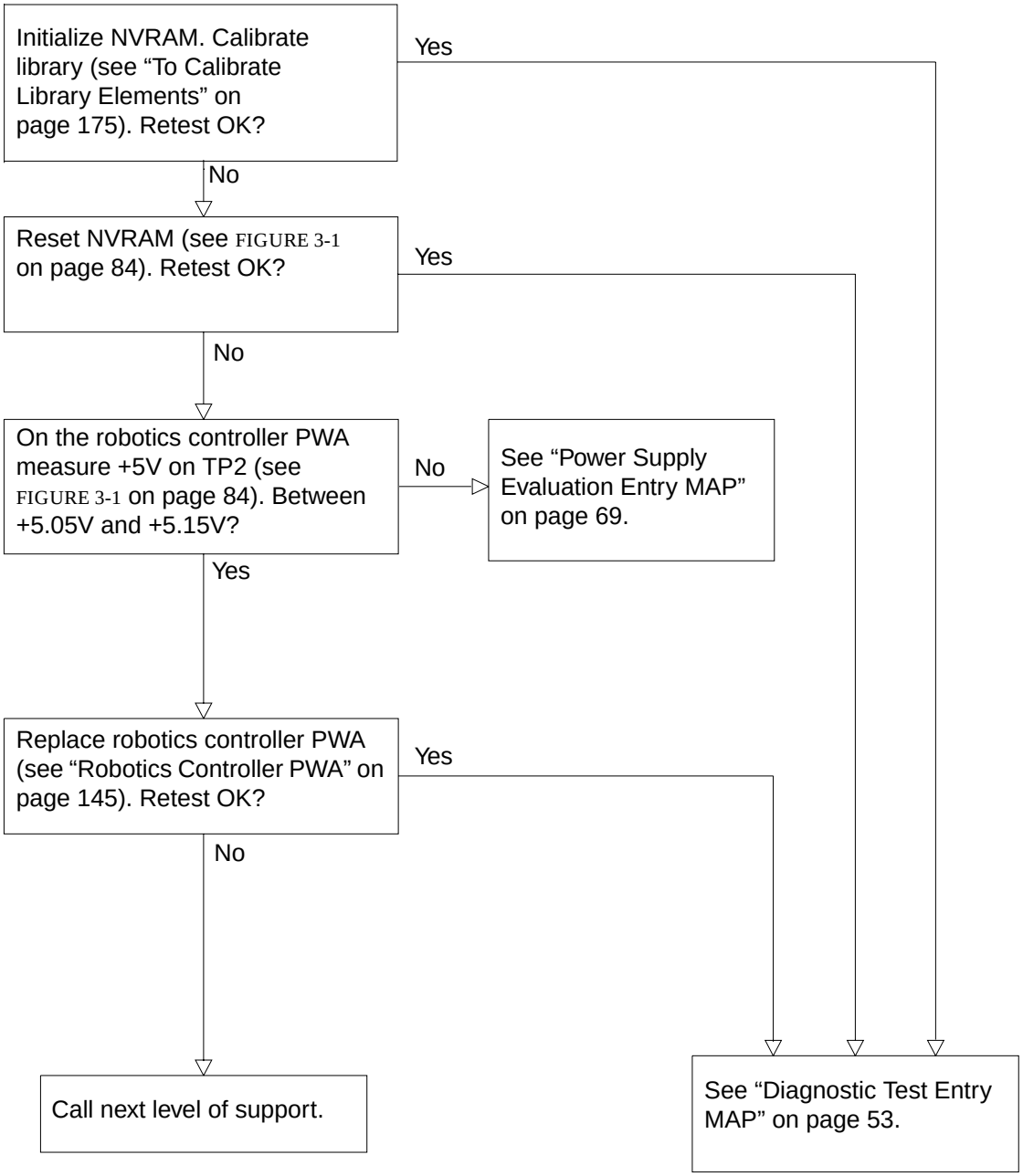
Tape Drive Communication Timeout Map



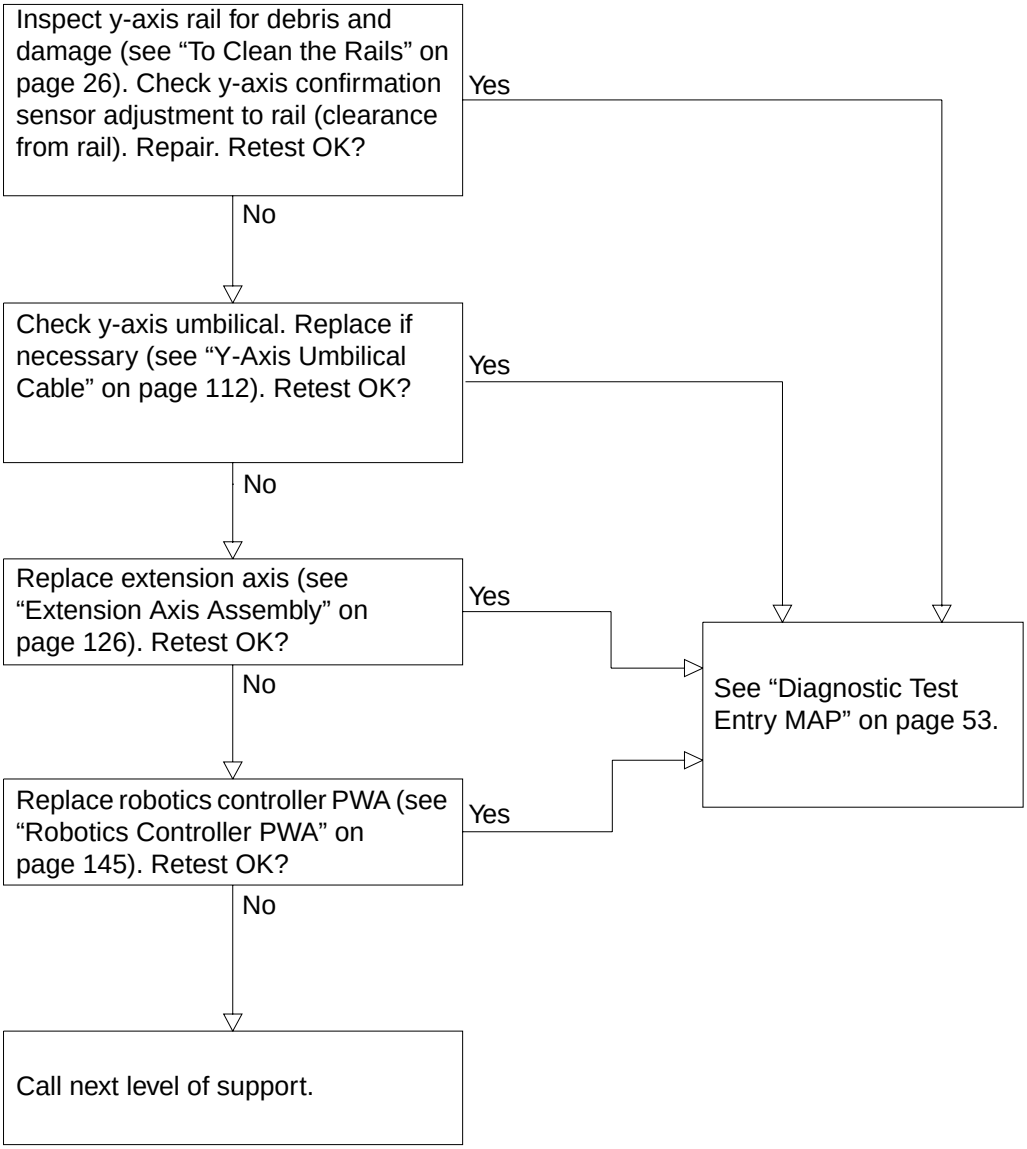
Tape Drive Handle Not OK Map



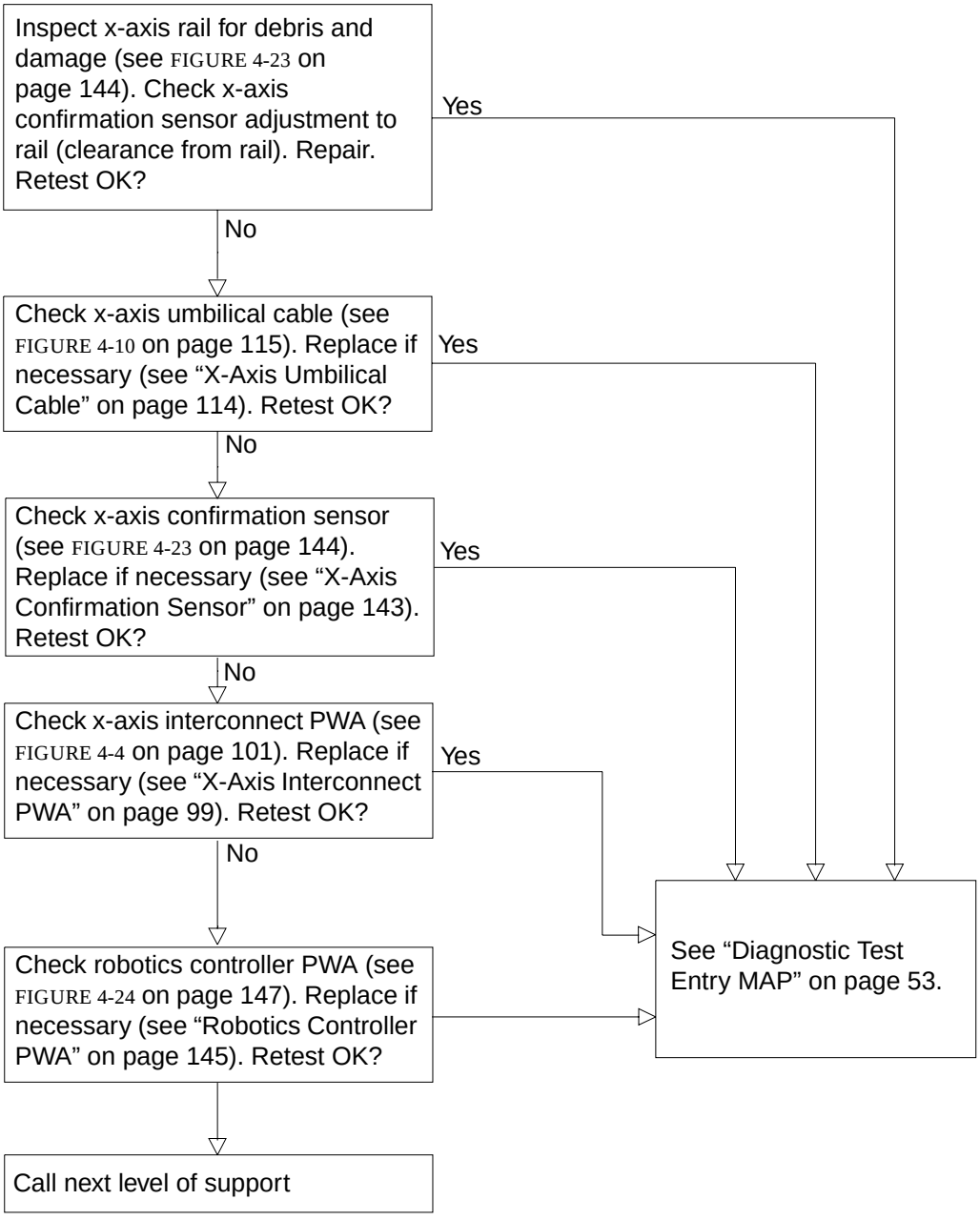
NVRAM Checksum Failure Map



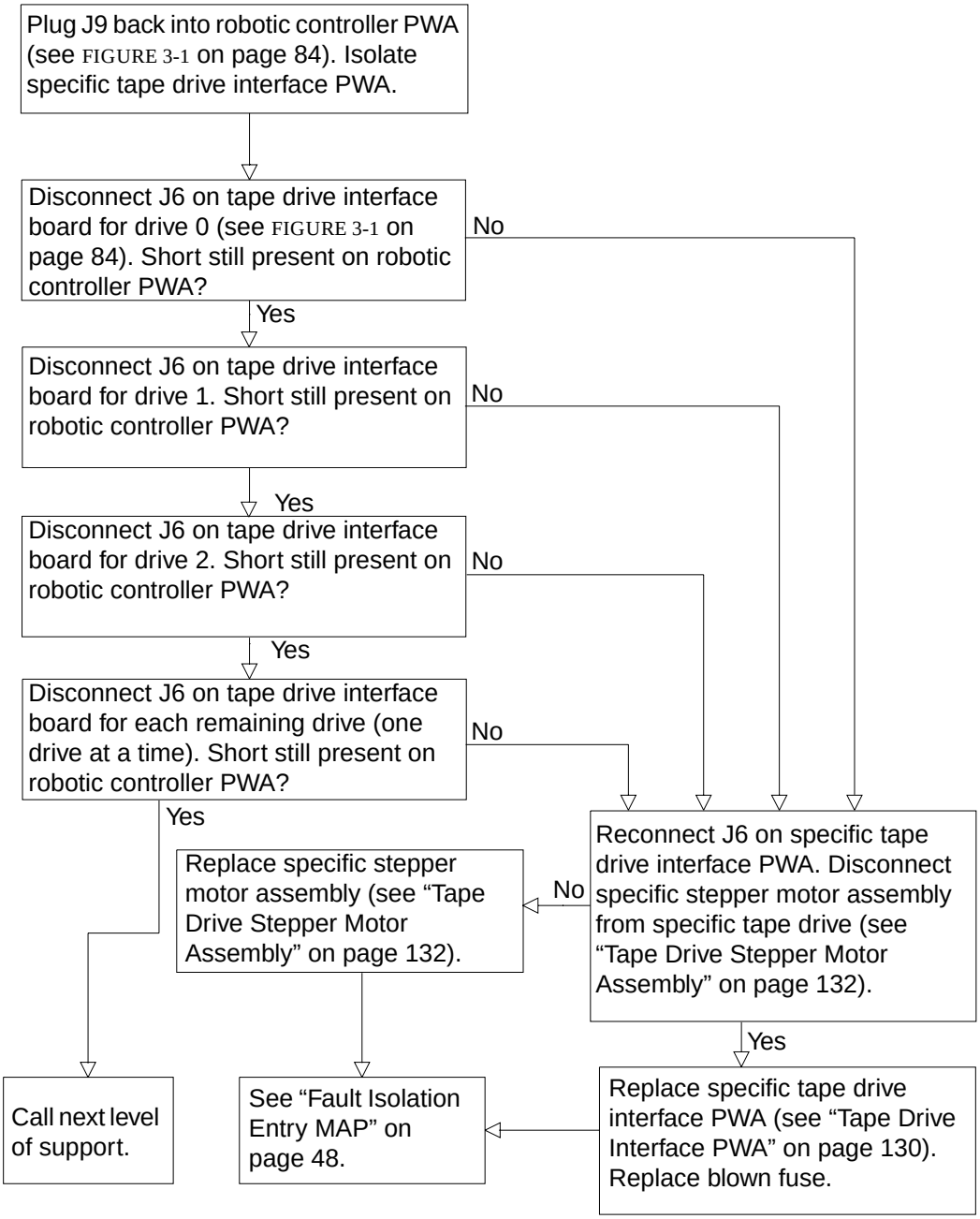
Vertical Confirmation Sensor Failure Map



Horizontal Confirmation Sensor Failure Map



Tape Drive Interface PWA Isolation Map



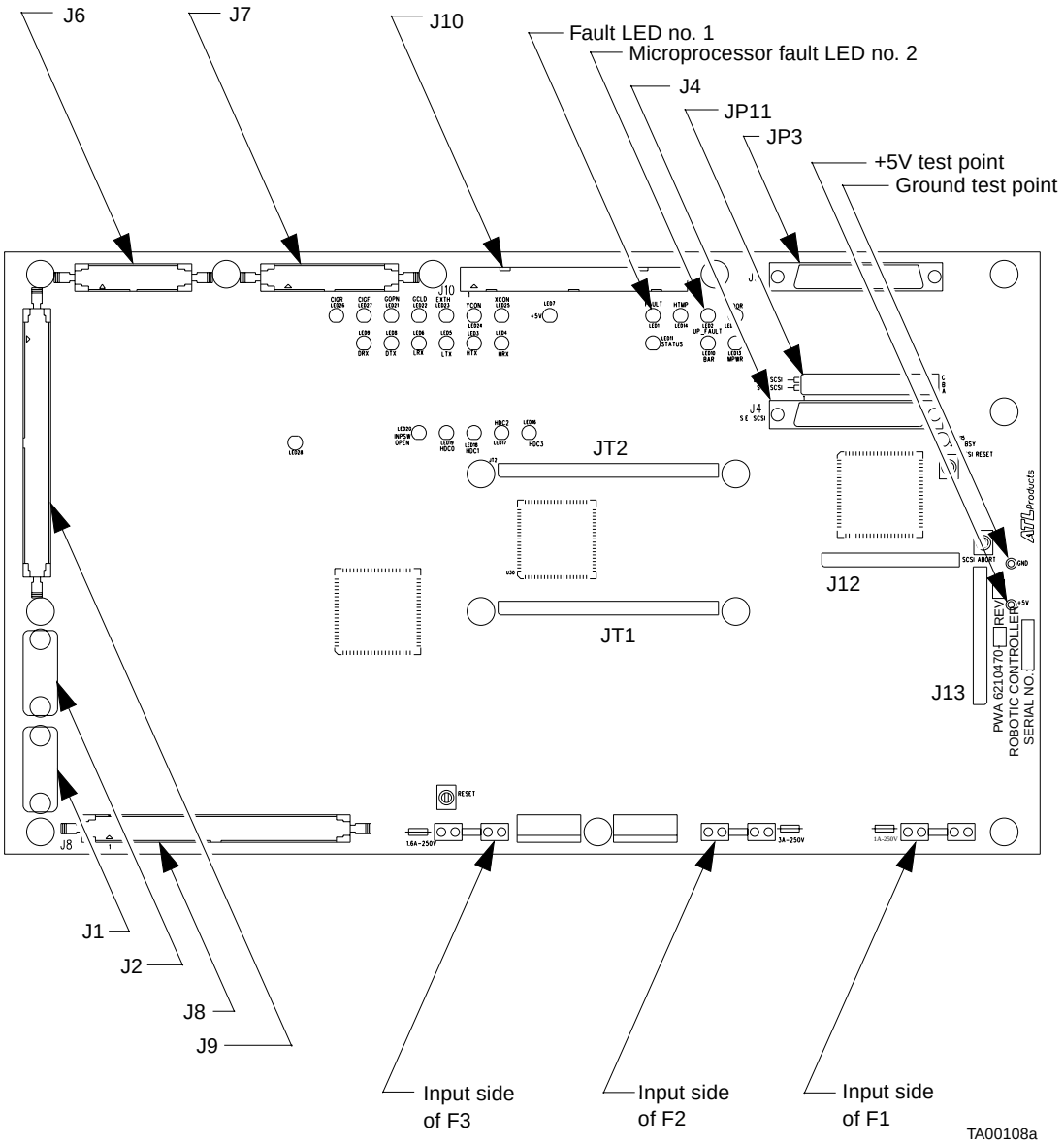


FIGURE 3-1 Robotic Controller PWA Fuse Locations

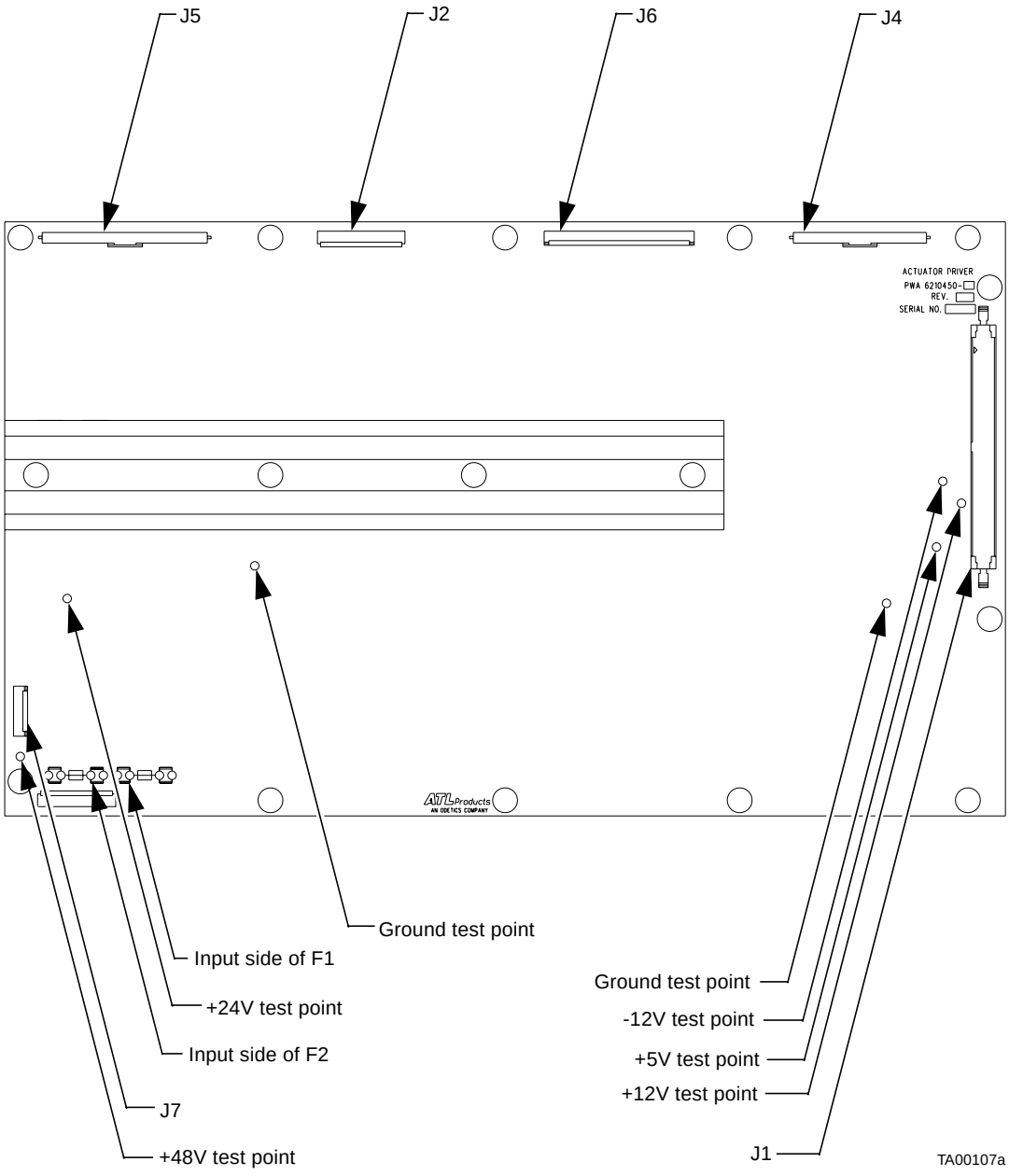


FIGURE 3-2 Actuator Driver PWA Fuse Locations

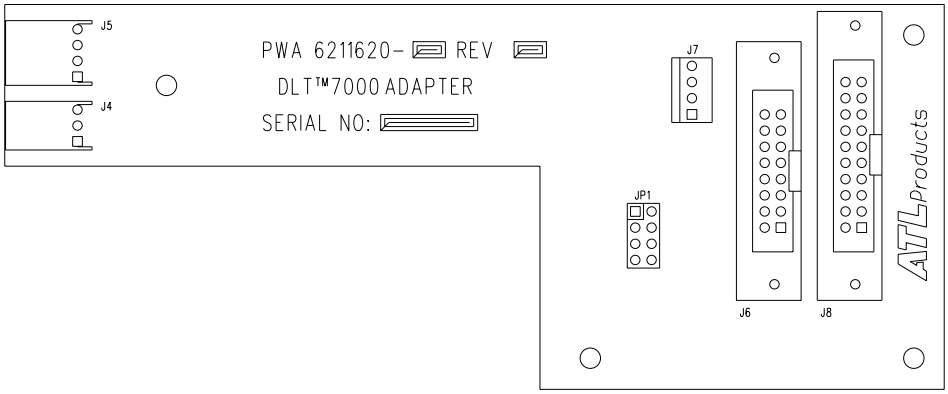


FIGURE 3-3 Tape Drive Interface PWA

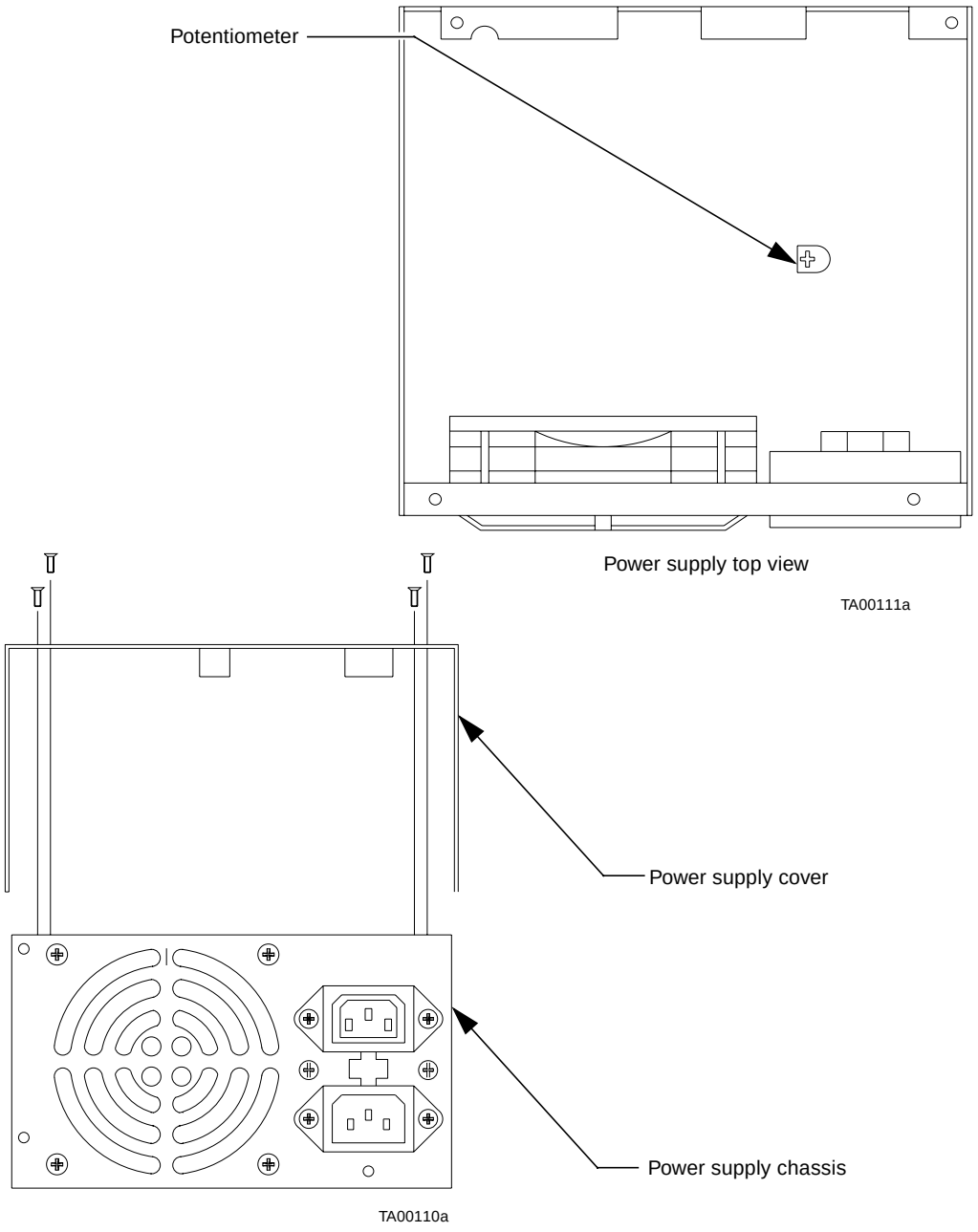


FIGURE 3-4 Logic Power Supply

CHAPTER 4

FRU Removal and Replacement

This chapter contains a list of all field replaceable units (FRUs) of the ETL 7/3500 Library and the procedures for removing and replacing them.

Preparing for Maintenance

The procedures in this section are written for the FRUs listed in TABLE 4-1 on page 98 and under the assumption that the library has been prepared for maintenance. The preparation of the library includes removing power from the library and removing the appropriate cosmetic panels. To prepare the library for maintenance, use the procedures that follow.

▼ To Turn Off the Library

Caution – Employ all appropriate measures to protect the library from electrostatic discharge (ESD) damage.

1. **Press control panel STANDBY switch and verify that System Offline is displayed in the status display area (SDA).**
2. **At the rear panel, set the power switch to the 0 (off) position.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

▼ To Take the Library Offline

1. **With the library power applied and the SDA showing System Online, press the control panel STANDBY button.**
2. **Verify that System Offline is displayed in the SDA.**

Removing the Cosmetic Panels

Use the procedures below along with FIGURE 4-1 and FIGURE 4-2 to remove the cosmetic panels.

Caution – Employ all appropriate measures to protect the library from ESD damage.

▼ To Remove the Top Panel

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **At the rear of the library, remove the screws that secure the top panel to the rear of the library frame (**FIGURE 4-1**).**
3. **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.**
4. **Set aside the panel.**

▼ To Remove the Left Panel

Caution – You must remove the top panel before removing the left panel.

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **At the rear of the library, remove the screws that secure the left panel to the rear of the library frame (**FIGURE 4-1**).**
3. **Pull the left-rear panel towards the rear of the library (to disengage the retention tabs attached to the left of the frame) and then away from the library frame.**
4. **Set aside the panel.**

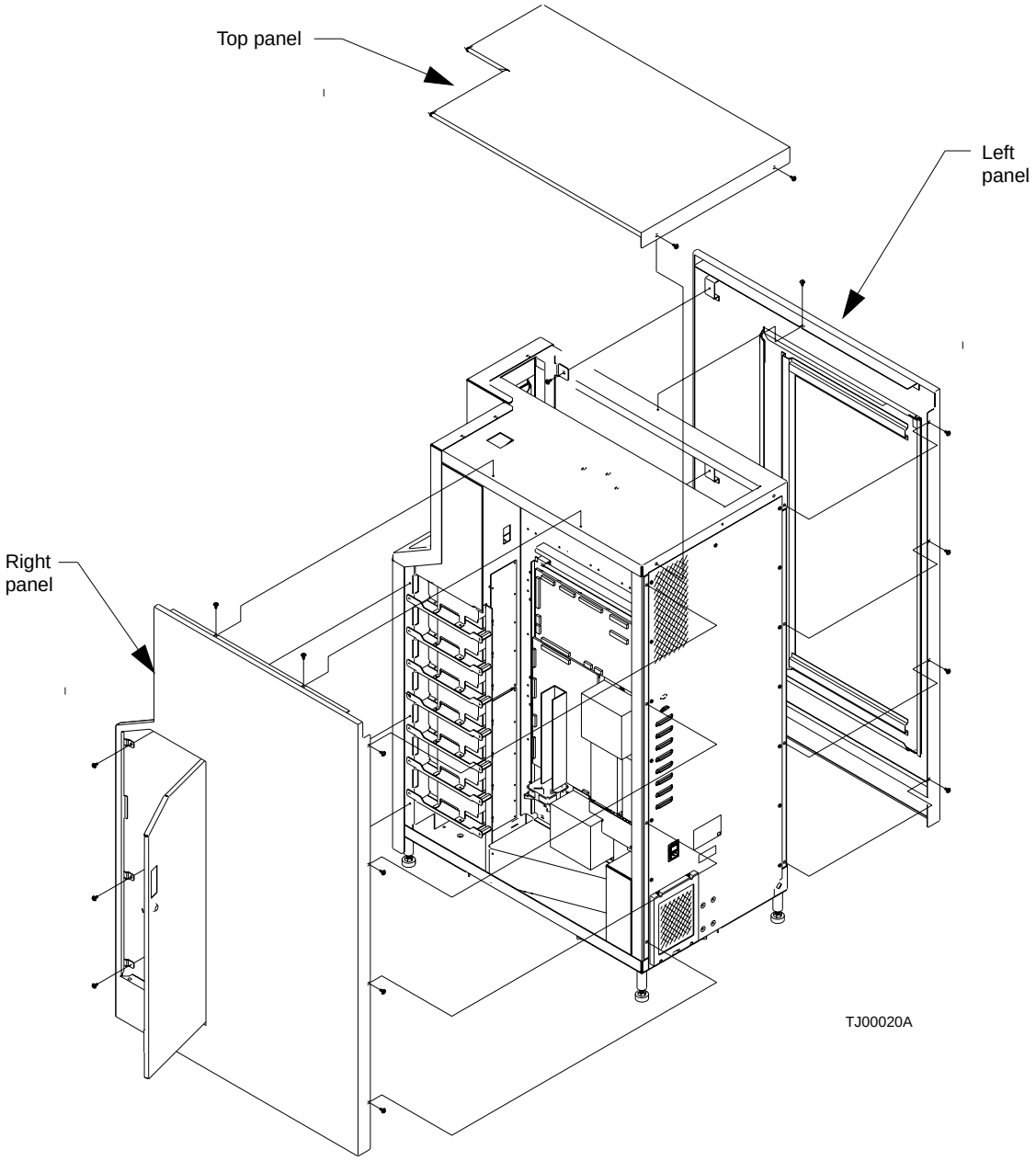


FIGURE 4-1 Top, Right, and Left Panels

▼ To Remove the Right Panel

Caution – You must remove the top panel before removing the right panel.

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **At the rear of the library, remove the screws that secure the right panel to the rear of the library frame (**FIGURE 4-1**).**
3. **Open the drive bay door and remove the remaining screws securing the panel.**
4. **Pull the panel away from the frame.**
5. **Set aside the panel.**

▼ To Remove the Front Panel

Caution – Employ all appropriate measures to protect the library from ESD damage.

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Remove the top, right, and left cosmetic panels.**
3. **From the right side of the library, remove the screws that mount the EMI cover to the library frame (**FIGURE 4-2**).**
4. **Pull away the EMI cover.**
5. **From the front top of the library, remove the screws that secure the upper mounting lip of the front panel to the library frame.**
6. **From the lower front inside of the library, remove the screws that hold the lower mounting lip of the front panel to the library frame.**
7. **Disconnect load port solenoid in-line connector SOL_J1.**

8. **Carefully slide the front panel (from the top) away from the library frame.**
9. **Disconnect the front door interlock switch in-line connector SW2_J1.**
10. **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.

---

11. **Disconnect control panel ribbon connector A3_J1.**

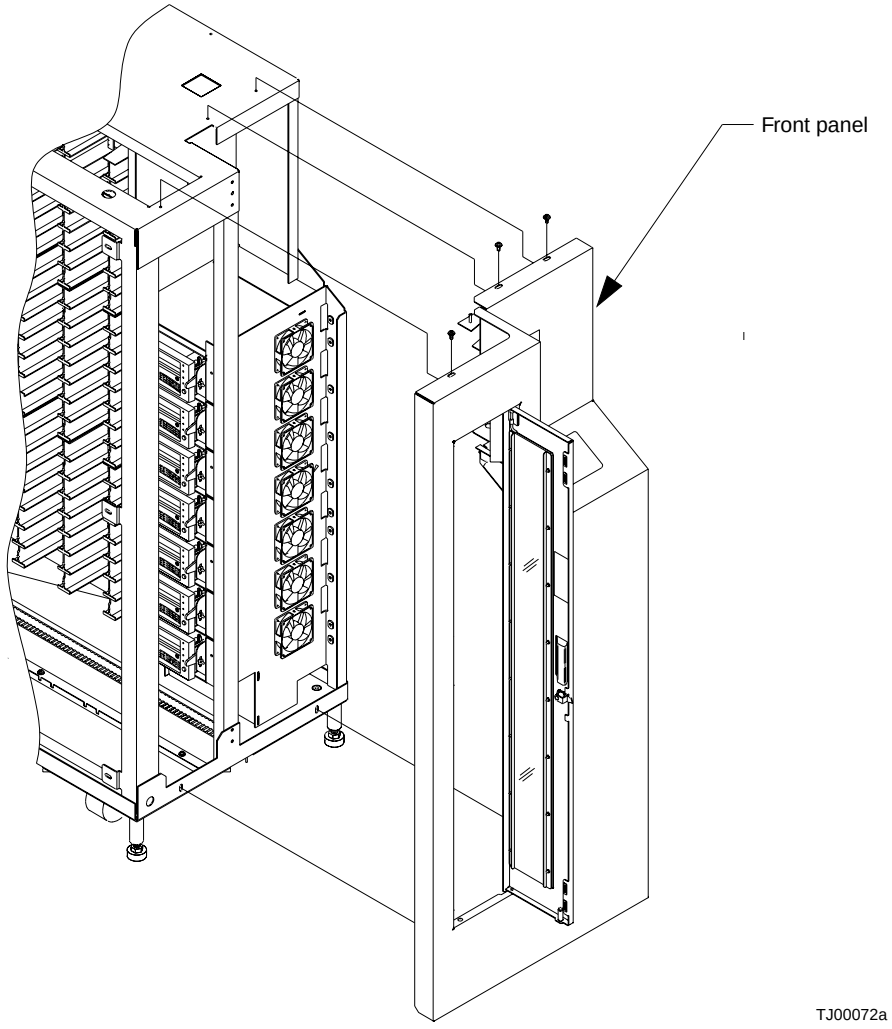


FIGURE 4-2 Front Panel

Removing the Controller Electronics Assembly

The controller electronics assembly is not a FRU. At times, it is necessary to remove this assembly to complete other operations.

Required Tools

Phillips screwdriver

▼ To Remove the Controller Electronics Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Remove the top, left, and right cosmetic panels as shown in "Removing the Cosmetic Panels" on page 90.**
3. **Connect your ESD wrist grounding strap to the closest grounding point on the library frame.**
4. **On the controller electronics assembly, disconnect the robotics controller PWA connectors P2, P3, P6, P7 and P9.**
5. **Disconnect actuator driver PWA connectors P2, P4, P5, P6 and P7.**
6. **Disconnect the connectors coming from the logic power supplies.**

Note – To prevent lost and hard to retrieve screws, cover the fan opening directly below the controller electronics assembly.

7. **Remove the screws that secure the controller electronics assembly to the library frame.**
8. **Slide the controller electronics assembly towards the front of the library, then lift up and out.**

▼ To Replace the Controller Electronics Assembly

- **Follow the removal instructions in reverse order.**

Note – Make sure all connectors and cables are out of the way before reinstalling the controller electronics assembly into the library.

▼ Adjustments Required After Replacement

- **Ensure that the controller electronics assembly is seated against the rear panel of the library.**

▼ To Troubleshoot

- **Check all connectors for proper engagement.**

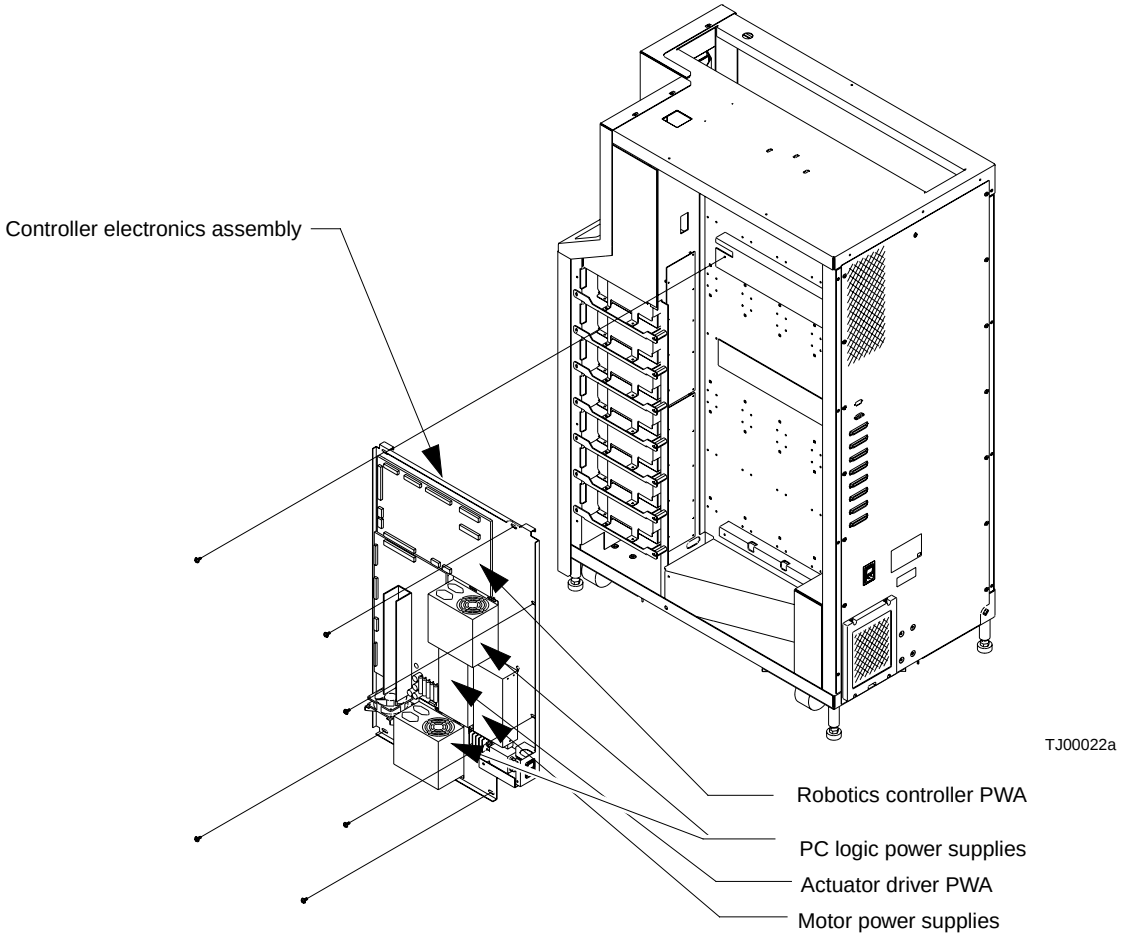


FIGURE 4-3 Controller Electronics Assembly

FRU Removal and Replacement Procedures

Caution – Perform all replacement procedures with the library power removed. Failure to remove power could result in injury or damage to the equipment.

TABLE 4-1 is a list of all FRUs of the library. The removal/replacement procedures are written for authorized field service engineers (FSEs) only.

Caution – Do not attempt field repair of FRUs. The FRUs specified in this section are replaceable in the field, but must be repaired at the factory.

Caution – Employ all appropriate measures to protect the library from ESD damage.

TABLE 4-1 FRU List

Part Number	FRU Name	Page
6210480-01	X-Axis Interconnect PWA	99
6210510-01	Y-Axis Stepper Motor Assembly	104
6210511-01	X-Axis Stepper Motor Assembly	102
6210512-01	Load Port Door Lockout Solenoid	107
6210516-01	Front Door Interlock Switch	110
6210518-01	Y-Axis Umbilical Cable	112
6210520-02	X-Axis Umbilical Cable	114
0645115	X-Axis Drive Belt	116
0645116	Y-Axis Drive Belt	118
6240515-01	DC Fan Assembly	121
6240516-01	DC Fan Assembly	121
6240720-01	Extension Axis Assembly	126
6210202-06	Tape Drive	127

TABLE 4-1 FRU List *(Continued)*

Part Number	FRU Name	Page
6211630-01	Tape Drive Interface PWA	130
0815033	Tape Drive Stepper Motor Assembly	132
6204202-01	Tape Drive Tray Assembly	134
6240320-01	Tape Drive Distribution PWA	136
6240330-01	Tape Drive MUX PWA	138
6210440-01	Control Panel Assembly	141
6210515-03	X-Axis Confirmation Sensor	143
6210470-01	Robotics Controller PWA	145
6210450-01	Actuator Driver PWA	148
0355038	Motor Power Supply Assembly	154
0355041	PC Logic Power Supply Assembly	151

X-Axis Interconnect PWA

Required Tools

Phillips screwdriver, flashlight

▼ To Remove the X-Axis Interconnect PWA

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Remove the top, left, and right side cosmetic panels as shown in “Top, Right, and Left Panels” on page 92.**
3. **Connect your ESD wrist grounding strap to the closest grounding point on the library frame.**
4. **Move the horizontal axis to the front of the library positioning the gripper directly under the tape drives.**

Note – The PWA is accessed through the service port directly under the tape drives.

5. **From the right side, remove the Phillips screws securing the strain relief to the PWA.**
6. **Disconnect the cables.**
7. **From the left side, remove the ESD guard mounting hardware.**
8. **From the right side, remove the guard and liner.**

Caution – Pay attention to the orientation of connector Px when you remove it. Reinstalling connector A4_J4 incorrectly causes the library robotics to malfunction and may cause damage to the library.

9. **Disconnect the horizontal home sensor, connector A4_J4.**
10. **Disconnect the y-axis motor connector A4_K3.**
11. **Remove the remaining two Phillips screws that secure the PWA to the horizontal frame.**
12. **Carefully lift the PWA out of the library.**

▼ To Replace the X-Axis Interconnect PWA

- **Follow the removal instructions in reverse order.**

▼ To Troubleshoot

- **If the library malfunctions, check the orientation of the horizontal home sensor connector A4_J4 and reseat it if necessary.**

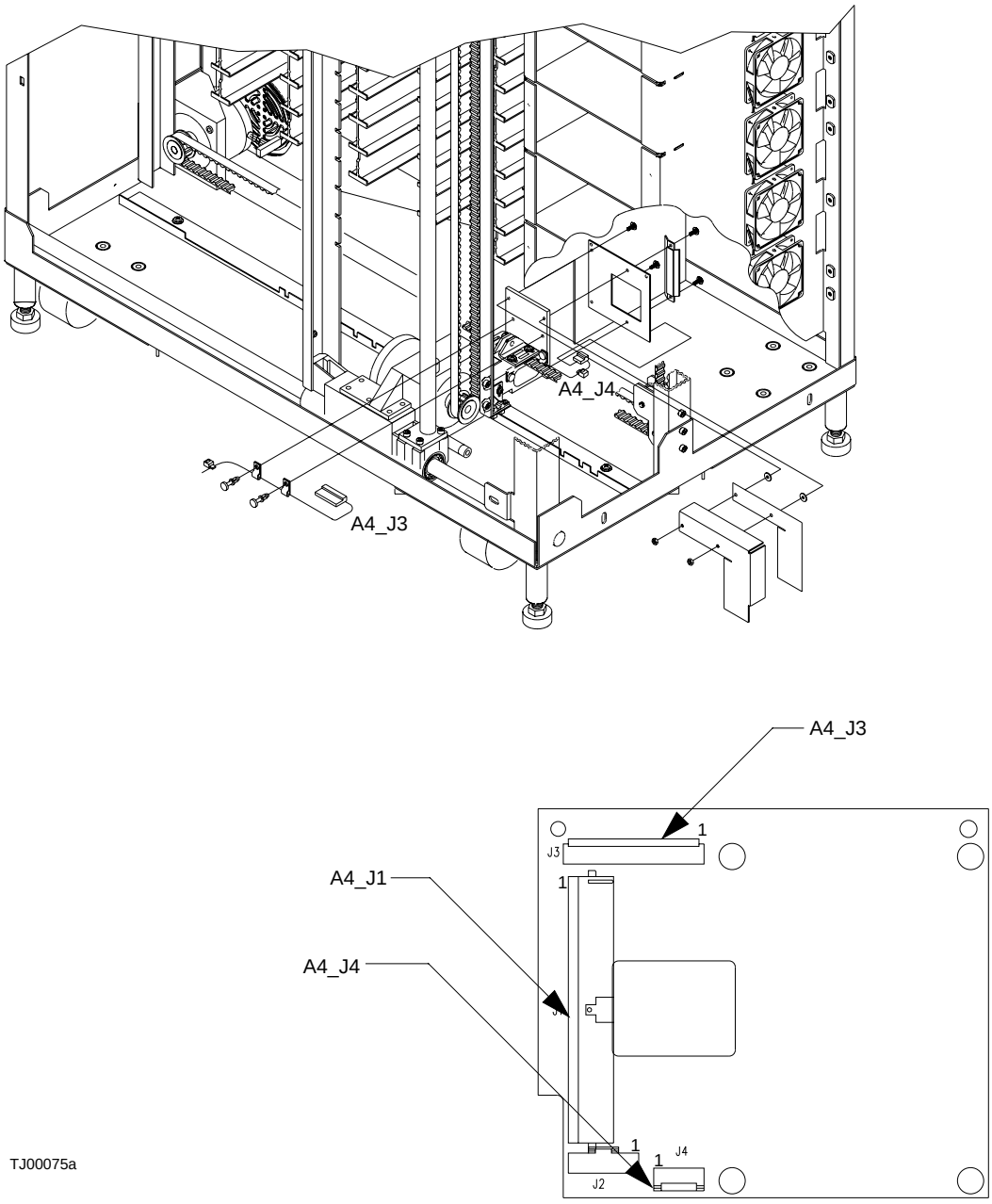


FIGURE 4-4 X-Axis Interconnect PWA

X-Axis Stepper Motor Assembly

Required Tools

Phillips screwdriver, 5/32 allen wrench

▼ To Remove the X-Axis Stepper Motor Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
3. **Connect your ESD wrist grounding strap to the closest grounding point on the library frame.**
4. **Position the horizontal axis toward the front of the library.**
5. **From the left rear of the library, locate the x-axis stepper motor assembly. See (**FIGURE 4-5**).**
6. **Disconnect the x-axis stepper motor in-line connector J1 that is plugged into connector M2_J2.**
7. **Cut the cable ties that secure the x-axis stepper motor cable.**
8. **Loosen the horizontal belt at the horizontal belt tensioner. See "X-Axis Belt" on page 40.**
9. **Remove the four screws that secure the x-axis stepper motor mounting bracket to the frame.**
10. **Remove the four screws that secure the x-axis stepper motor to its mounting bracket.**

▼ To Replace the X-Axis Stepper Motor Assembly

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

1. **Complete horizontal belt tension adjustment using “X-Axis Belt” on page 40.**
2. **Auto calibrate all.**

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

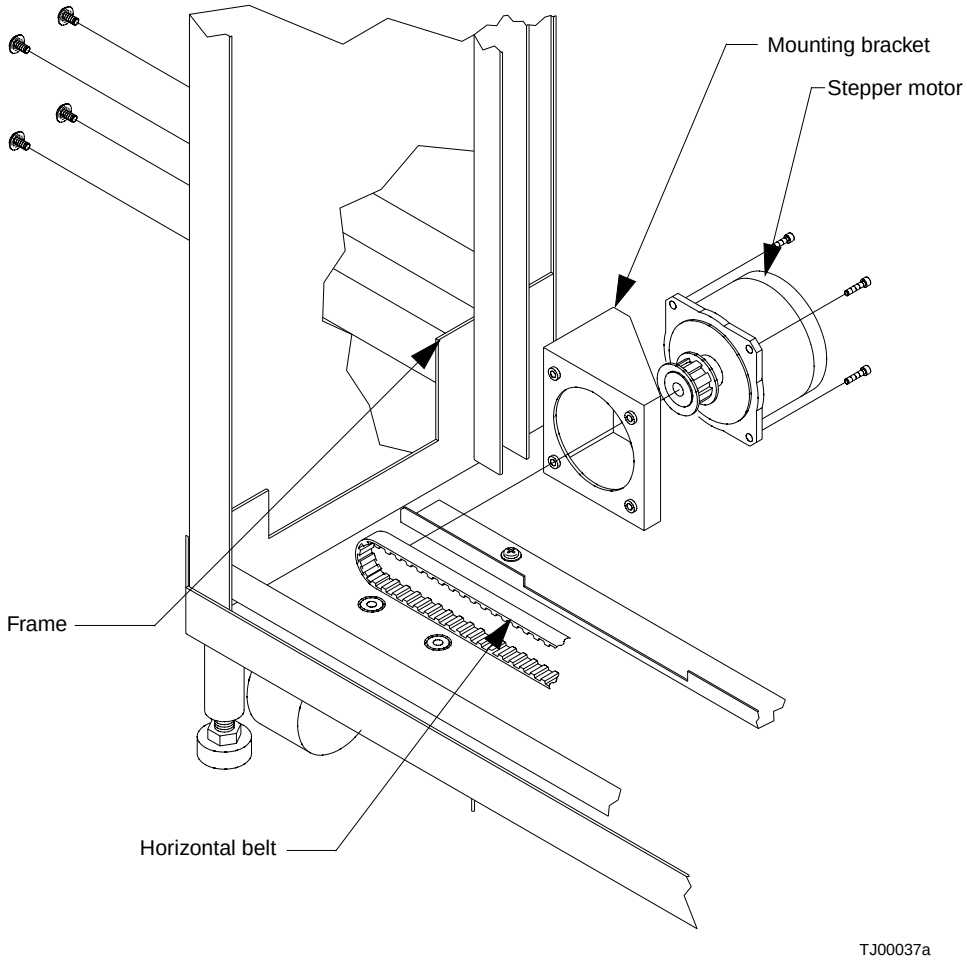


FIGURE 4-5 X-Axis Stepper Motor Assembly

Y-Axis Stepper Motor Assembly

Required Tools

5/32 Allen wrench hex, flat- blade screwdriver, 11/32 hex nut driver

▼ To Remove the Y-Axis Stepper Motor Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Move the horizontal carriage towards the front of the library.**
5. **Secure the extension axis up and out of the way using a cable tie around the y-axis rail. Wrap the cable tie around the y-axis rail using one of the conformation sensor slots.**

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

6. **From the left of the library, locate and loosen the vertical belt using the belt tensioner. See "To Clean the Rollers" on page 31.**
7. **Remove the cable clamps to free the stepper motor connector cable. (**FIGURE 4-6**).**
8. **Disconnect the y-axis stepper motor connector P1 and remove cable clamps holding the harness to back of PWA.**

Note – Pay attention to the routing of the harness before removal.

9. **Remove the screws that secure the y-axis stepper motor to the x-axis carriage assembly and lift it out.**

▼ To Replace the Y-Axis Stepper Motor Assembly

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

1. **Adjust vertical belt tension. See “Y-Axis Belt” on page 37.**
2. **Adjust horizontal belt tension. See “X-Axis Belt” on page 40.**
3. **Auto calibrate all.**

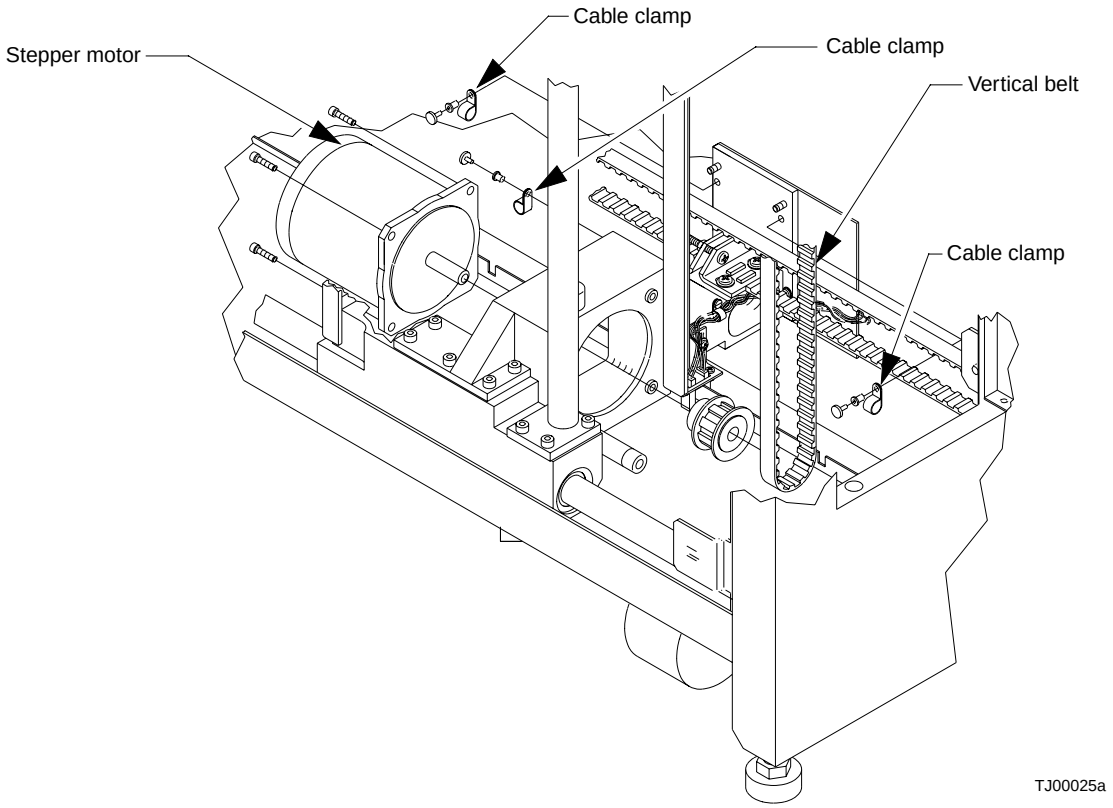


FIGURE 4-6 Y-Axis Stepper Motor Assembly

Load Port Door Lockout Solenoid

Required Tools

Phillips screwdriver, crescent wrench, small punch

▼ To Remove the Load Port Door Lockout Solenoid

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Remove the front cover as shown in "Top, Right, and Left Panels" on page 92.**
5. **With the front panel removed, locate the load port door lockout solenoid from inside the front panel. (**FIGURE 4-7**).**
6. **Disconnect the in-line solenoid connector J1 plugged into SOL_J1.**
7. **Remove the self-locking nuts that secure the load port upper pivot block to the front panel.**
8. **Remove the pivot block from the front panel.**
9. **Invert the pivot block and lift out the load port locking lever assembly.**
10. **Remove the solenoid from the solenoid mounting bracket by removing the solenoid retaining nut and lock washer.**

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

---

11. **With the solenoid plunger on a firm surface, press out the pivot pin.**

▼ To Replace the Load Port Door Lockout Solenoid

- **Follow the removal instructions in reverse order.**

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

▼ To Make Adjustments Required After Replacement

- **Auto calibrate load port.**

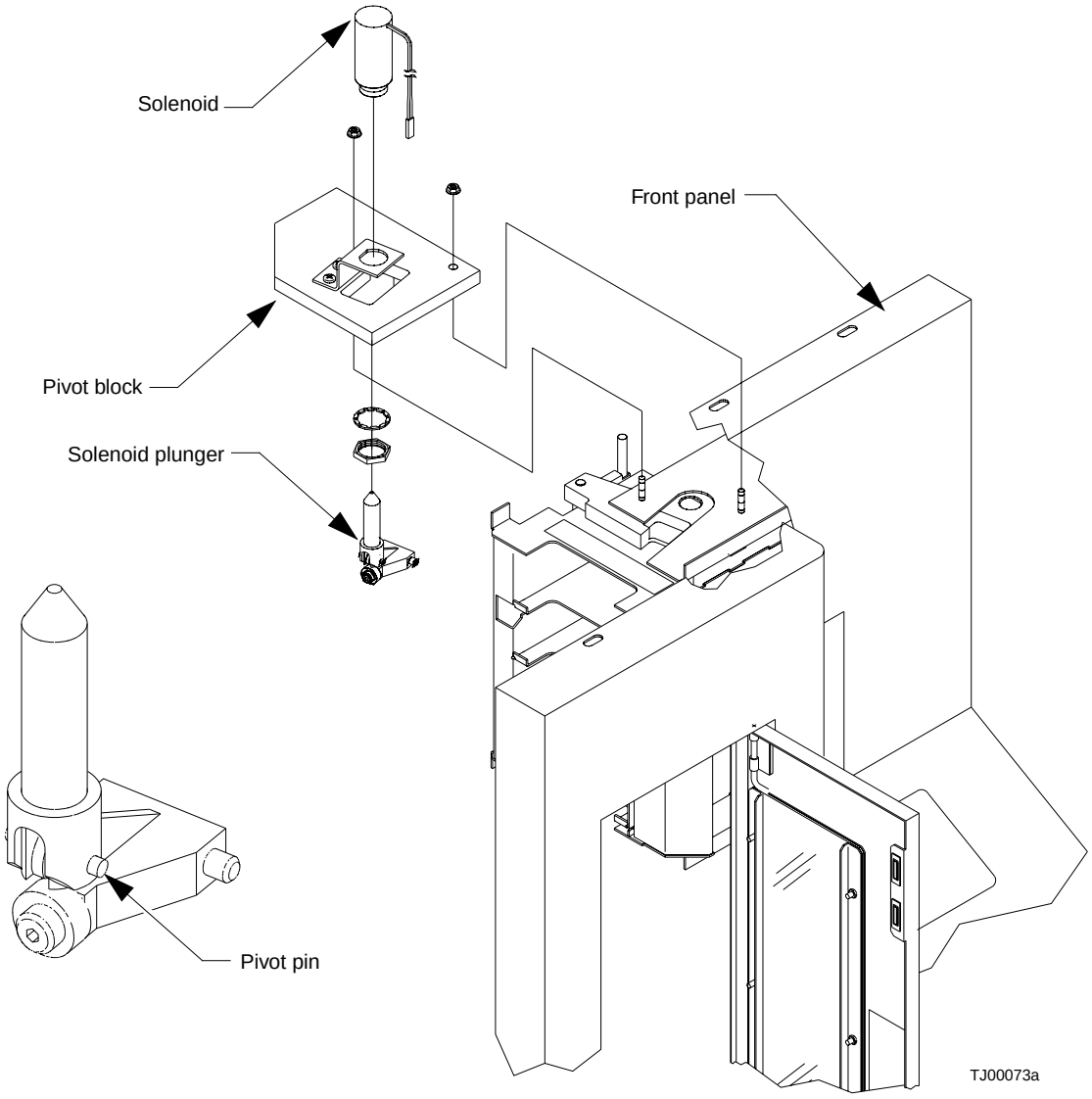


FIGURE 4-7 Load Port Door Lockout Solenoid

Front Door Interlock Switch

Required Tools

Snap ring pliers with angled tip, diagonal cutters

▼ To Remove the Front Door Interlock Switch

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Open the front door.**
5. **From the left lower side of the library, locate and disconnect the front door interlock switch connector J1, which is plugged into SW2_J1 connector. See (**FIGURE 4-8**).**
6. **Using snap ring pliers, remove the snap ring that holds the interlock switch.**
7. **Lift the interlock switch and its cable up through hole.**

▼ Replacing the Front Door Interlock Switch

- **Follow the removal instructions in reverse order.**

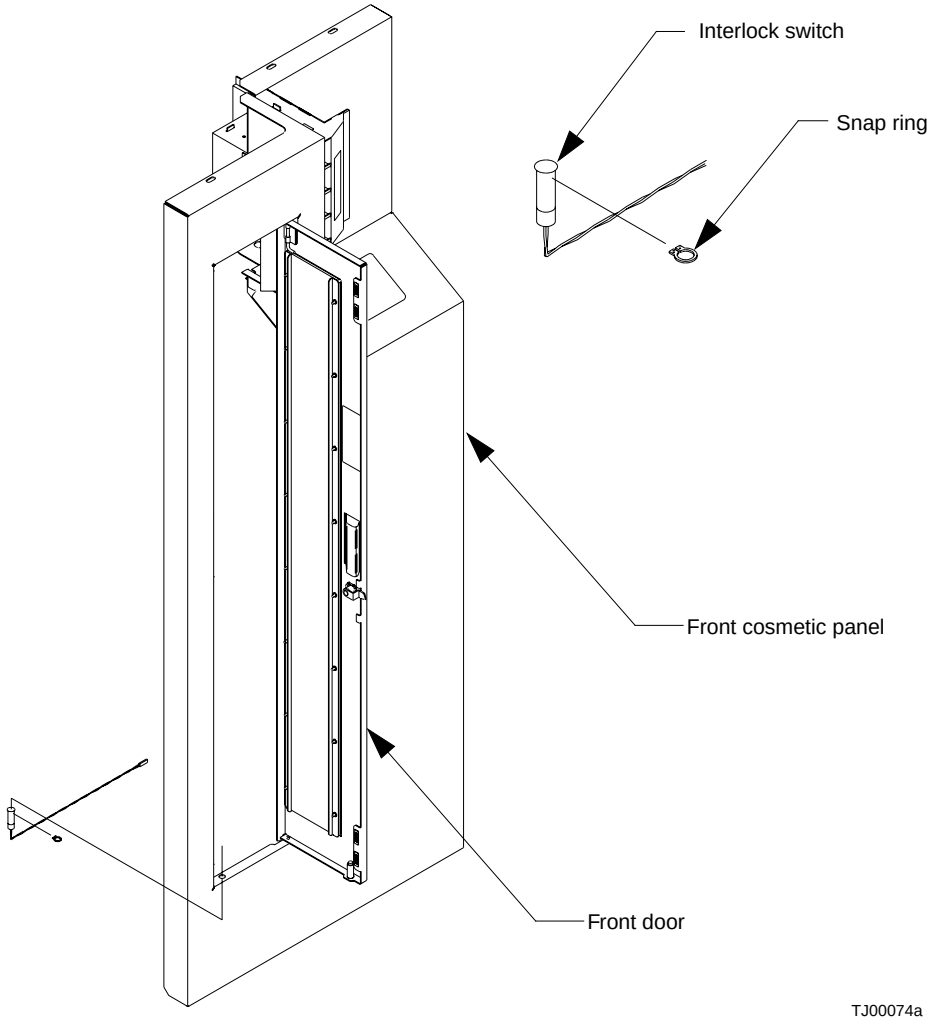


FIGURE 4-8 Front Door Interlock Switch

Y-Axis Umbilical Cable

Required Tools

Phillips screwdriver

▼ To Remove the Y-Axis Umbilical Cable

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Move the x-axis carriage assembly to the front of the library.**
5. **From the left side of the library, locate the y-axis stepper motor assembly and remove the top and bottom cable strain reliefs by removing the screws.**
6. **Disconnect A5_J3 and free the cable from the extension carriage PWA (not shown).**
7. **From the upper inside back wall of library, remove the cable strain relief by removing the screws.**
8. **From the right side of the library, remove connector A2_J4 from the actuator driver PWA.**
9. **Remove the controller electronics assembly. See "Controller Electronics Assembly" on page 97 for removal instructions.**
10. **Lift cable out.**

▼ To Replace the Y-Axis Umbilical Cable

1. **Use the removed cable as a template for folding the replacement cable.**
2. **Follow the removal instructions in reverse order.**

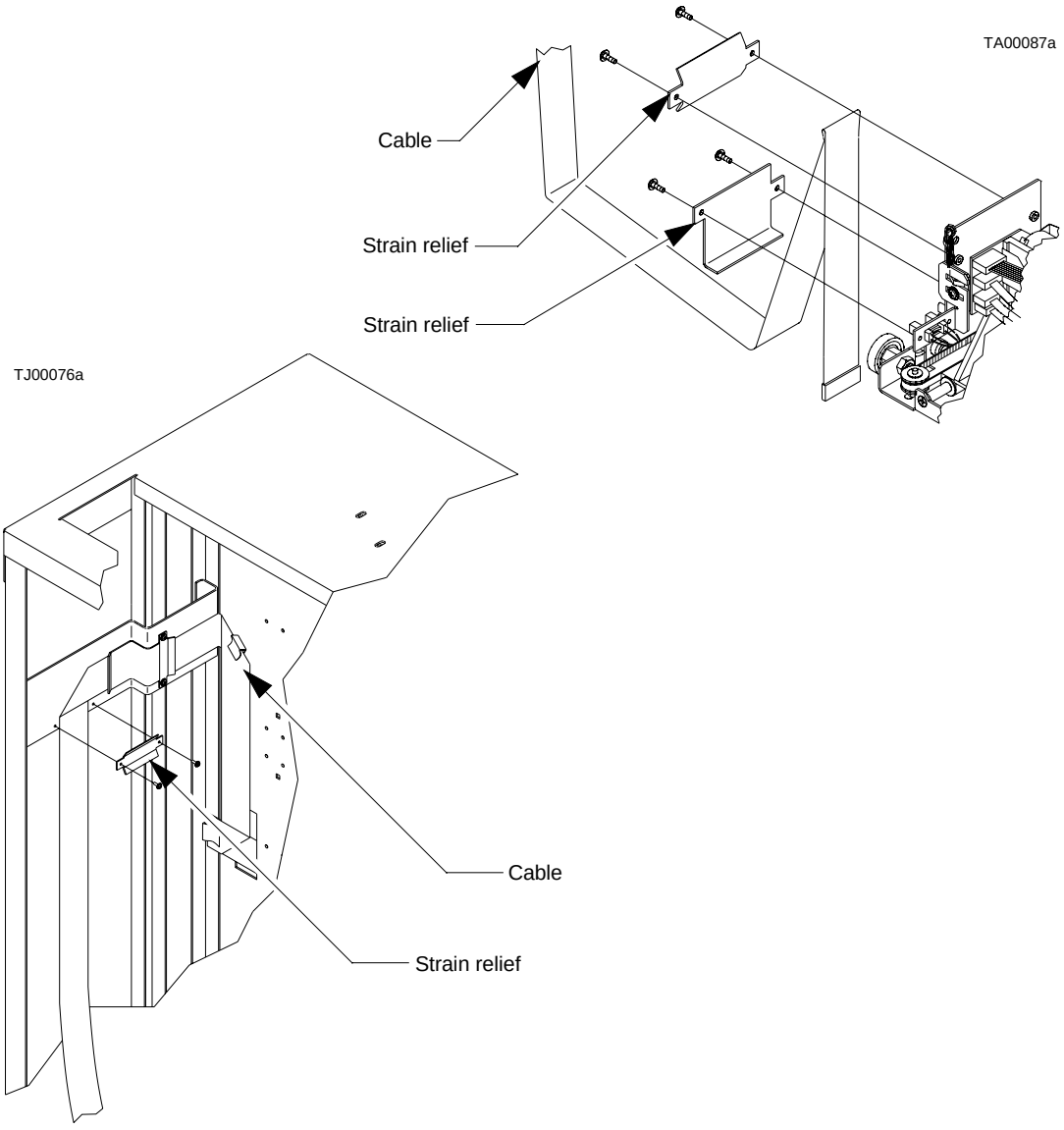


FIGURE 4-9 Y-Axis Umbilical Cable

X-Axis Umbilical Cable

Required Tools

Phillips screwdriver, small wrench

▼ To Remove the X-Axis Umbilical Cable

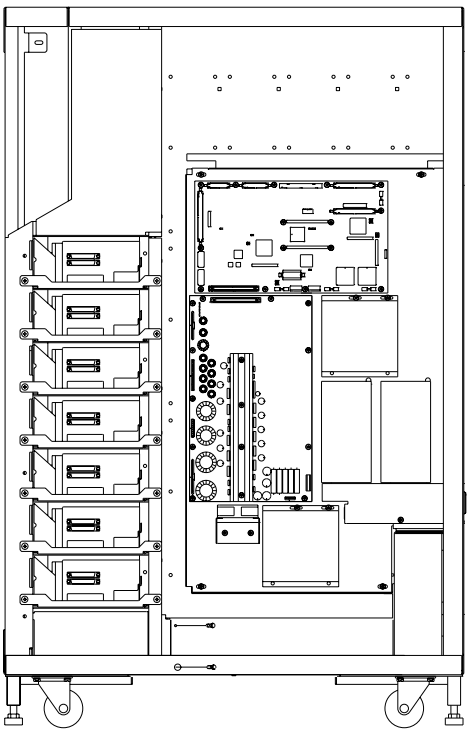
1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

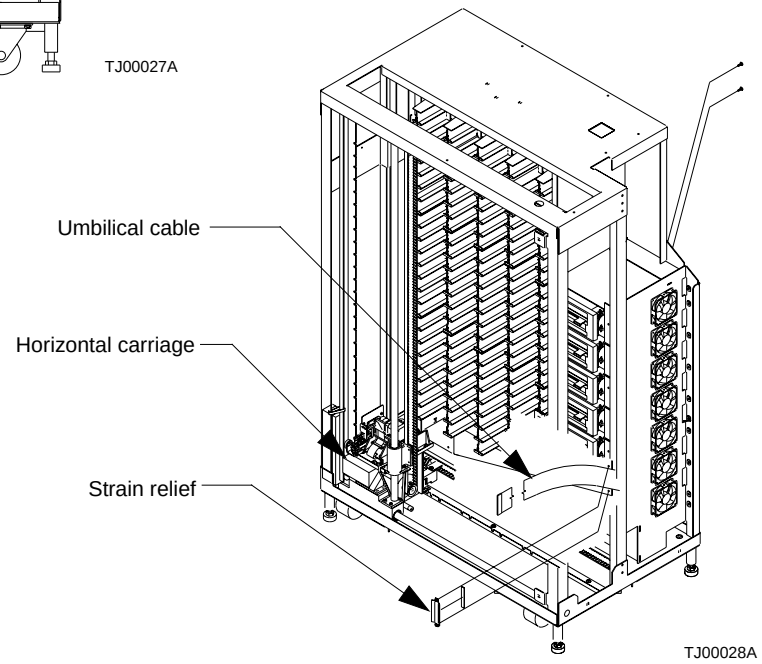
2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Position the horizontal carriage to the front of the library directly under the tape drives.**
5. **From the right side of the library, remove x-axis umbilical cable connector A4_J1 using removal steps 1 and 2 in procedure "X-Axis Interconnect PWA" on page 99.**
6. **From left side of the library, move the horizontal carriage to the rear of library. (**FIGURE 4-10**).**
7. **Remove the screws retaining the strain relief which secures the x-axis umbilical cable to the library frame.**
8. **Remove the tape drive MUX PWA (see "Tape Drive MUX PWA" on page 138).**
9. **Lift the cable out.**

▼ To Replace the X-Axis Umbilical Cable

1. **Use the removed cable as a template for folding the replacement cable.**
2. **Follow the removal instructions in reverse order.**



TJ00027A



TJ00028A

FIGURE 4-10 X-Axis Umbilical Cable

X-Axis Drive Belt

Required Tools

Short handled Phillips screwdriver, small wrench

▼ To Remove the X-Axis Drive Belt

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Move the horizontal axis to the middle of the library.**
5. **From the left side of the library, on the x-axis assembly, loosen (to near removal) the screws on the fixed half of the belt tensioner. (**FIGURE 4-11**).**
6. **Loosen (to near removal) the screws on the adjustable half of the belt tensioner.**
7. **Allow the belt to fall away.**
8. **Loosen the adjustment screw on the belt tensioner by loosening the jam nut and unscrewing it to its fullest extension.**

▼ To Replace the X-Axis Drive Belt

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

- **Complete horizontal belt tension adjustment using "X-Axis Belt" on page 40.**

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

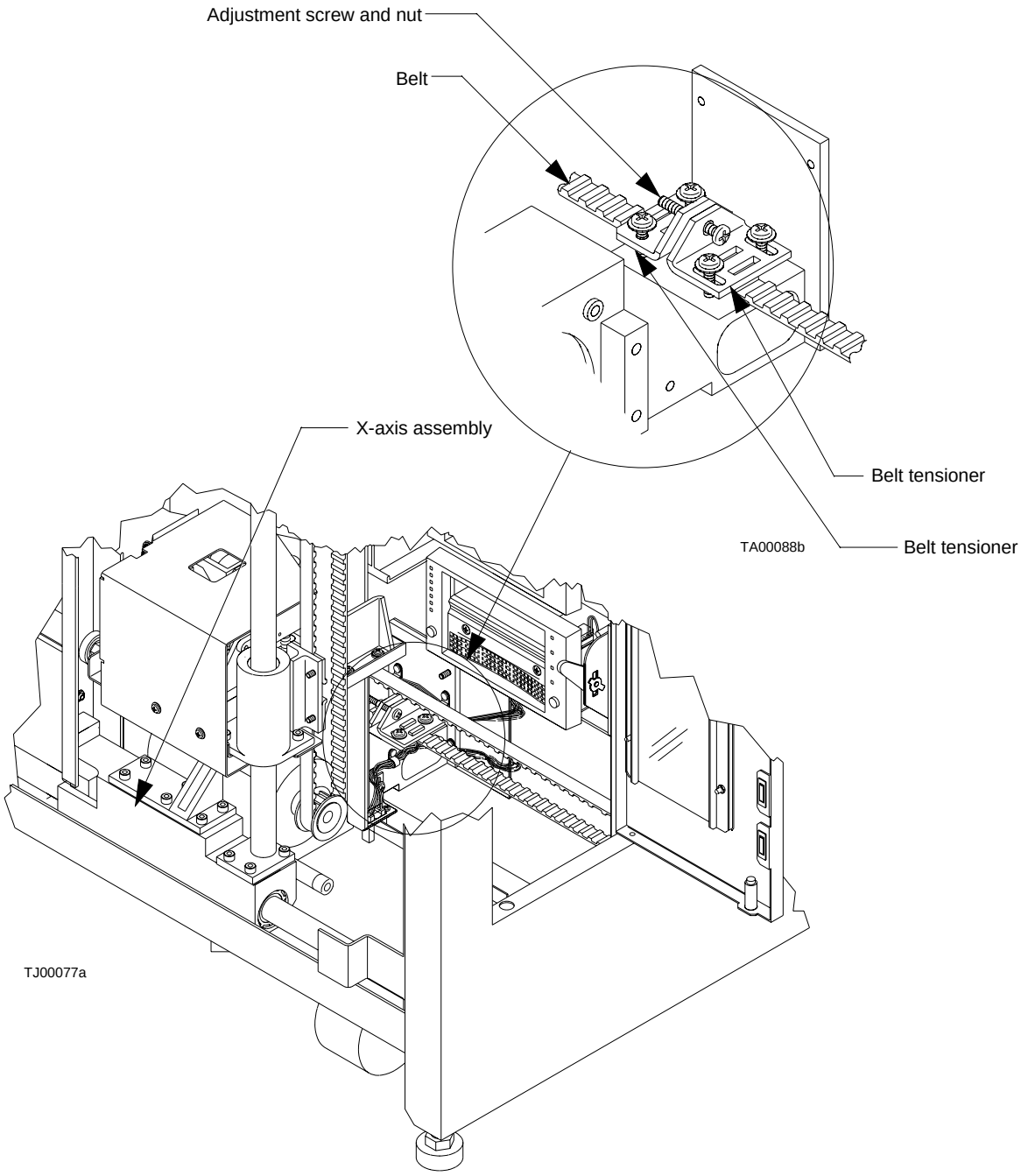


FIGURE 4-11 X-Axis Drive Belt

Y-Axis Drive Belt

Required Tools

Short handled Phillips screwdriver, small wrench

▼ To Remove the Y-Axis Drive Belt

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Move the horizontal axis to the rear of the library and secure the extension axis assembly midway up the y-axis.**
5. **From the left side of the library, on the y-axis assembly, loosen the belt tensioning adjustment screw by loosening the jam nut and unscrewing it to its fullest extension. (**FIGURE 4-12**).**
6. **Loosen (to near removal) the screws in both halves of belt tensioner.**
7. **Allow the belt to fall away.**

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

▼ To Replace the Y-Axis Drive Belt

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

5. **Hold the tensioner adjustable half and belt tightly while reinstalling the two upper screws.**

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

▼ To Make Adjustments Required After Replacement

- **Complete the vertical belt tension adjustments using “Y-Axis Belt” on page 37.**

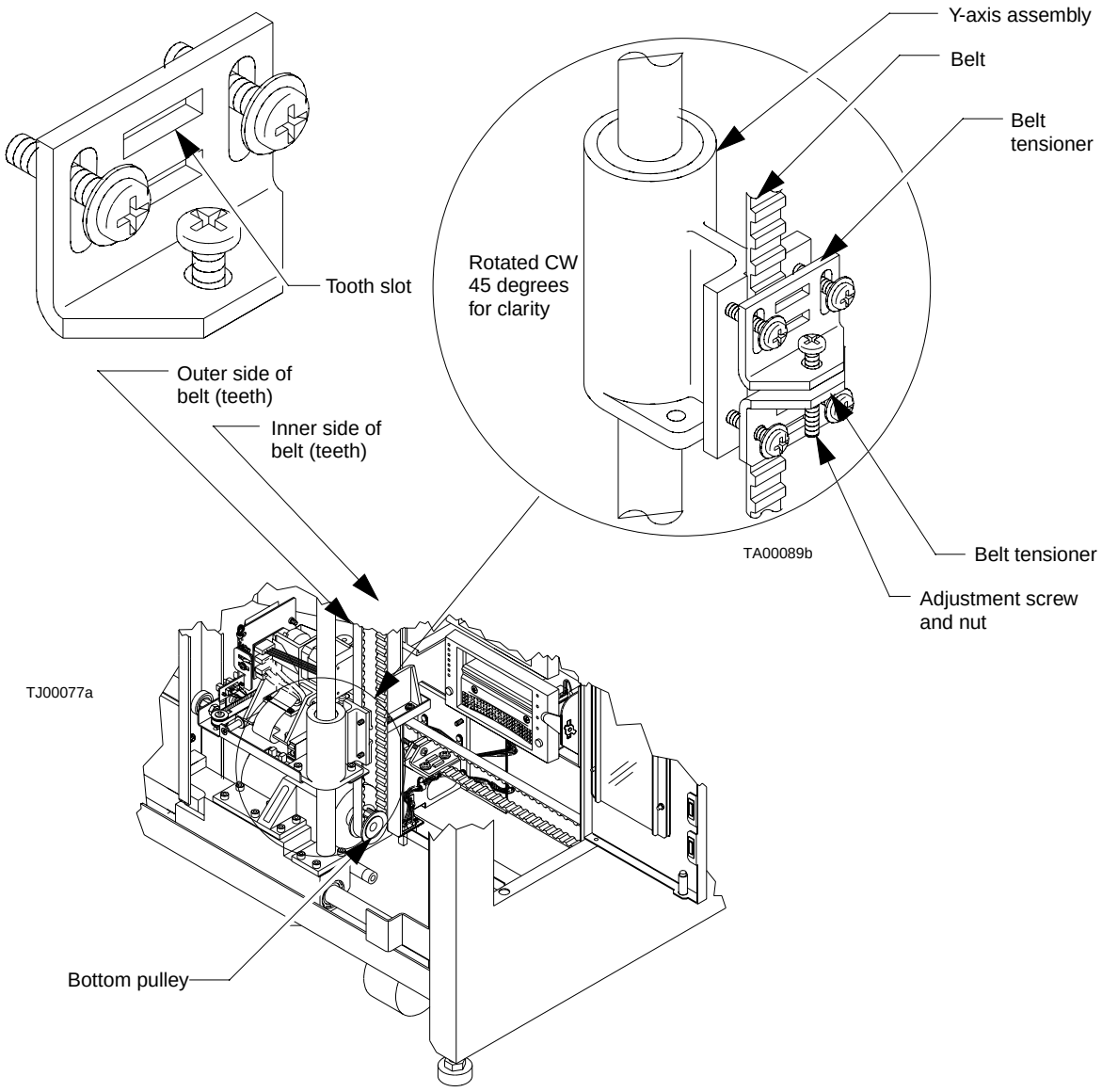


FIGURE 4-12 Y-Axis Drive Belt

DC Fan Assembly

The library uses up to ten DC fans for cooling. A fan for each tape drive is located in the front of the library, one fan is located under the electronic control assembly, and two fans are located in the rear. The steps to remove and replace the fans has been broken down into three procedures: front fans, controller electronics assembly fan, and rear fans).

Required Tools

Phillips screwdriver, thin blade screwdriver, wire cutters, flashlight

▼ To Remove the Front Fan

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in “Top, Right, and Left Panels” on page 92.**
4. **Remove the front cover as shown in “Removing the Cosmetic Panels” on page 90.**
5. **From the front of the library, disconnect fan connectors FAN3_J1 and/or FAN4_J1. (**FIGURE 4-13**).**
6. **From the right side of the library, remove the rivets by sliding a thin blade screwdriver under the rivet head and lift until it pops up. Repeat for each rivet.**
7. **Remove the fan guard for each fan.**
8. **Remove the fan(s).**

▼ To Replace the Front Fan

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacing the Front Fan

- **Auto calibrate load port.**

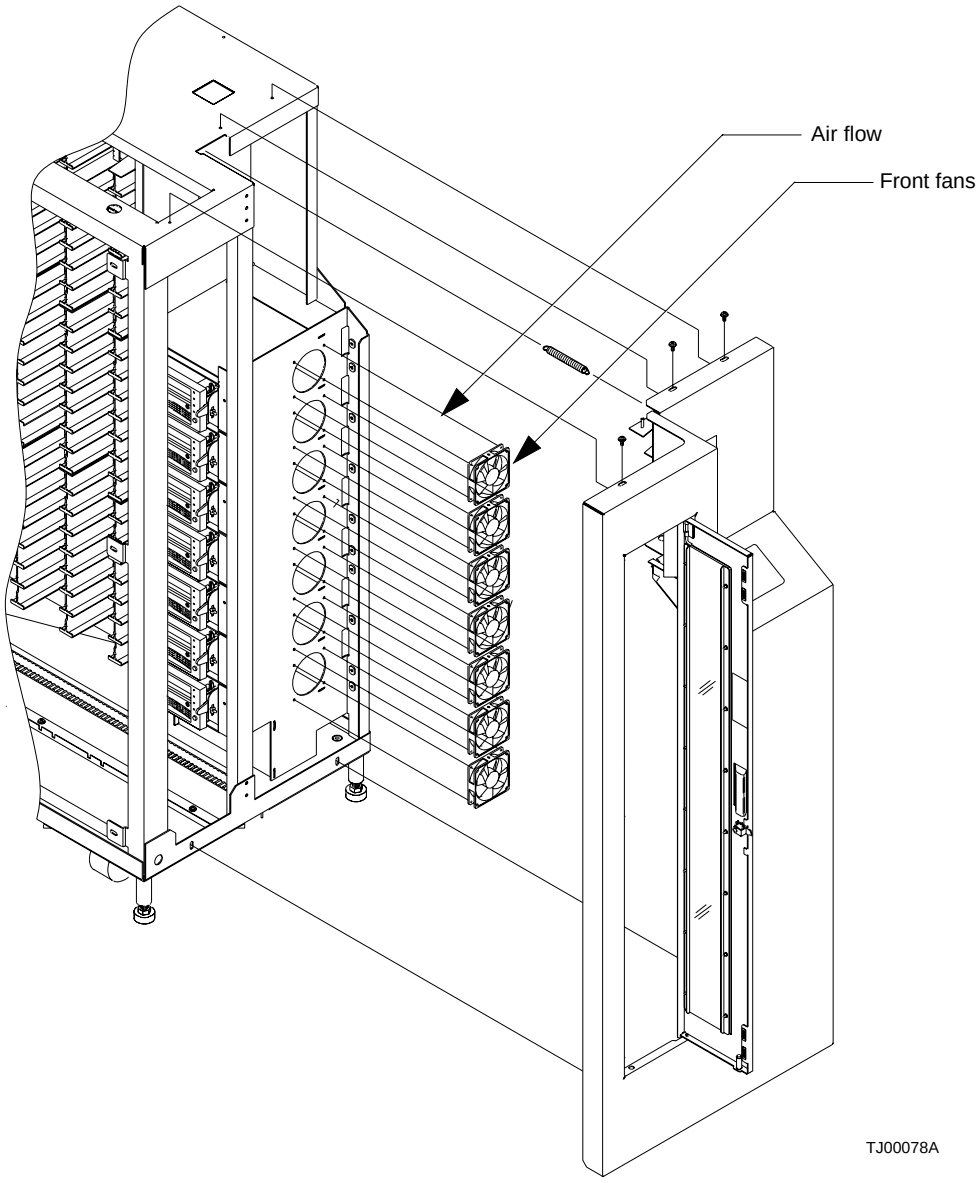


FIGURE 4-13 Front Fans

▼ To Remove the Controller Electronics Assembly Fan

1. **Free the ribbon cable from the cable clamp on the library frame.**
2. **Remove the standoffs that retain the connectors to the rear panel.**
3. **Disconnect the fan connector.**
4. **Slide a thin blade screwdriver under the rivet head and lift until it pops up. Repeat for each rivet.**
5. **Remove the finger guard.**

▼ To Replace the Controller Electronics Assembly Fan

- **Follow the removal instructions in reverse order.**

▼ To Remove the Rear Fan

1. **Remove the back panel.**

1. **Free the ribbon cable from the cable clamp on the library frame.**
2. **Remove the standoffs that secure the connectors to the rear panel.**
3. **Disconnect the fan connectors.**
4. **Slide a thin blade screwdriver under the rivet head and lift until it pops up. Repeat for each rivet.**
5. **Remove the fan guard for each fan.**

▼ Replacing the Rear Fan

- **Follow the removal instructions in reverse order.**

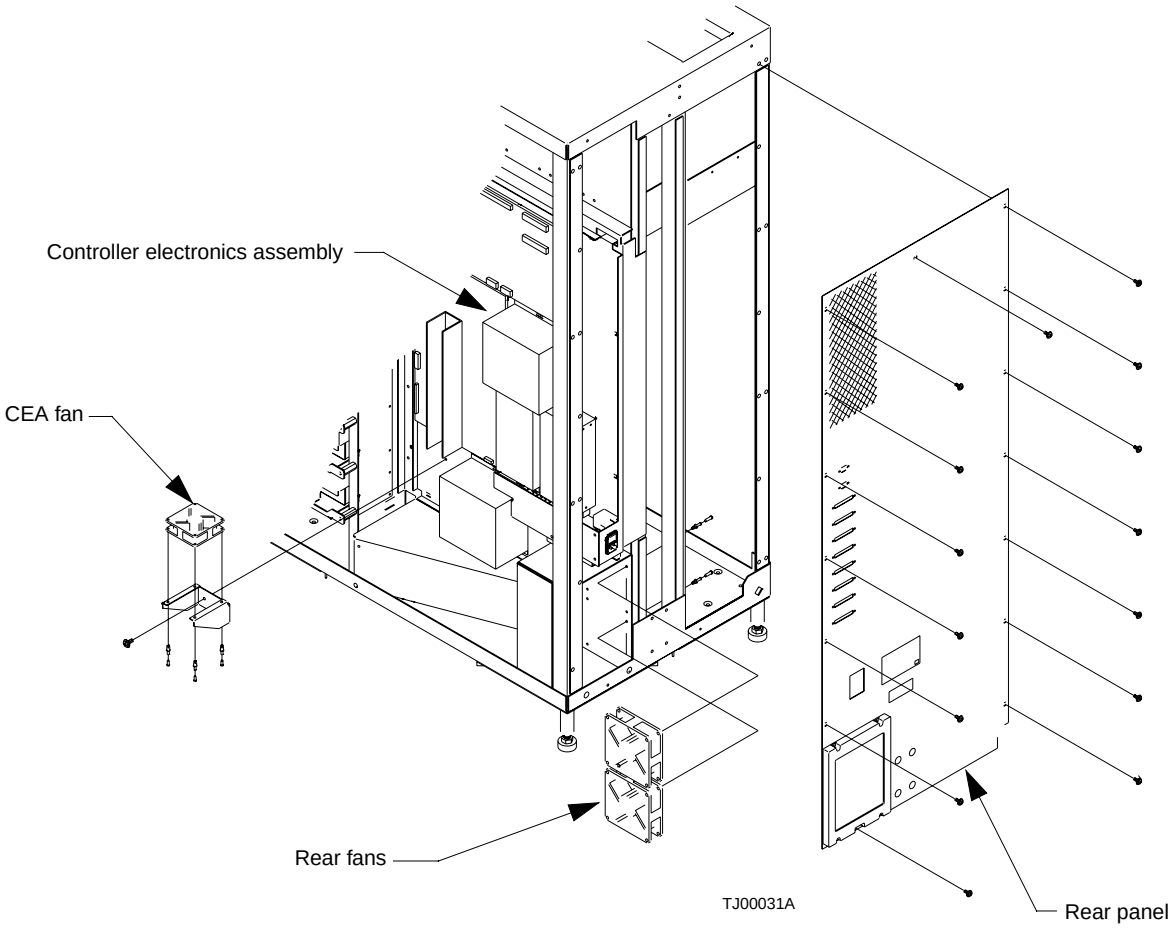


FIGURE 4-14 CEA and Rear Fans

Extension Axis Assembly

Required Tools

Phillips screwdriver, 5/32 Allen wrench

▼ To Remove the Extension Axis Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Remove the ESD guard.**
5. **From the left side of the library, locate the y-axis stepper motor assembly and remove the top and bottom cable strain reliefs by removing the screws. (**FIGURE 4-15**).**
6. **Disconnect A5_J3 and free the cable from the extension carriage PWA (not shown).**
7. **Remove the three mounting screws that secure the extension axis to the linear bearing on the vertical rail.**

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

8. **Gently turn the extension axis assembly clockwise and remove from between rails towards you.**

▼ To Replace the Extension Axis Assembly

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

- **Auto calibrate all.**

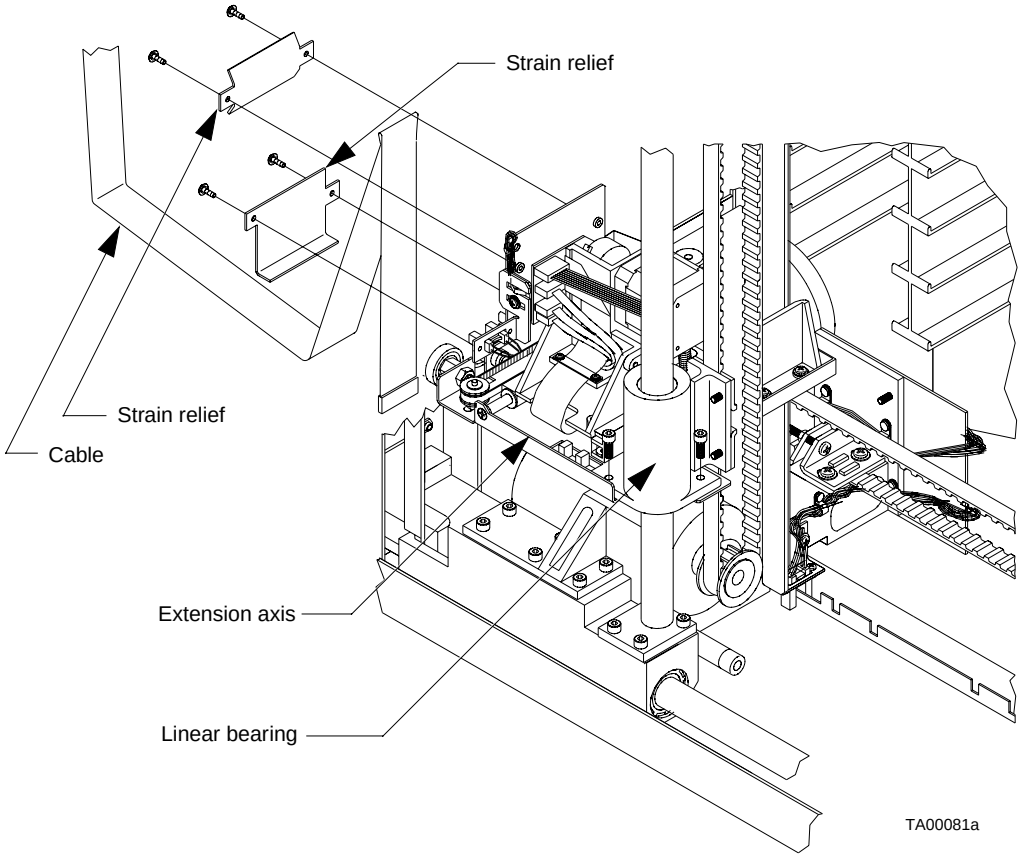


FIGURE 4-15 Extension Axis Assembly

Tape Drive

Libraries may have up to seven tape drives. The following procedure applies to all drives.

Required Tools

Phillips screwdriver

▼ To Remove a Tape Drive

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Open the drive access door.**
4. **Remove the tape drive tray assembly from the library. See "Tape Drive Interface PWA" on page 131 for removal instructions.**
5. **Remove the screws that secure the tape drive to the mounting plate.**
6. **Disconnect the 3- and 4-pin connectors coming from the stepper motor assembly to the tape drive interface PWA.**
7. **Remove the screws that secure the tape drive interface PWA to the PWA mounting bracket.**
8. **From the left side of the tape drive, remove the screws that secure the tape drive interface PWA mounting bracket**
9. **Remove the bracket.**
10. **Remove the stepper motor assembly from the drive. See "Tape Drive Stepper Motor Assembly" on page 133 for removal instructions.**

▼ To Replace a Tape Drive

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

- **Auto calibrate drives.**

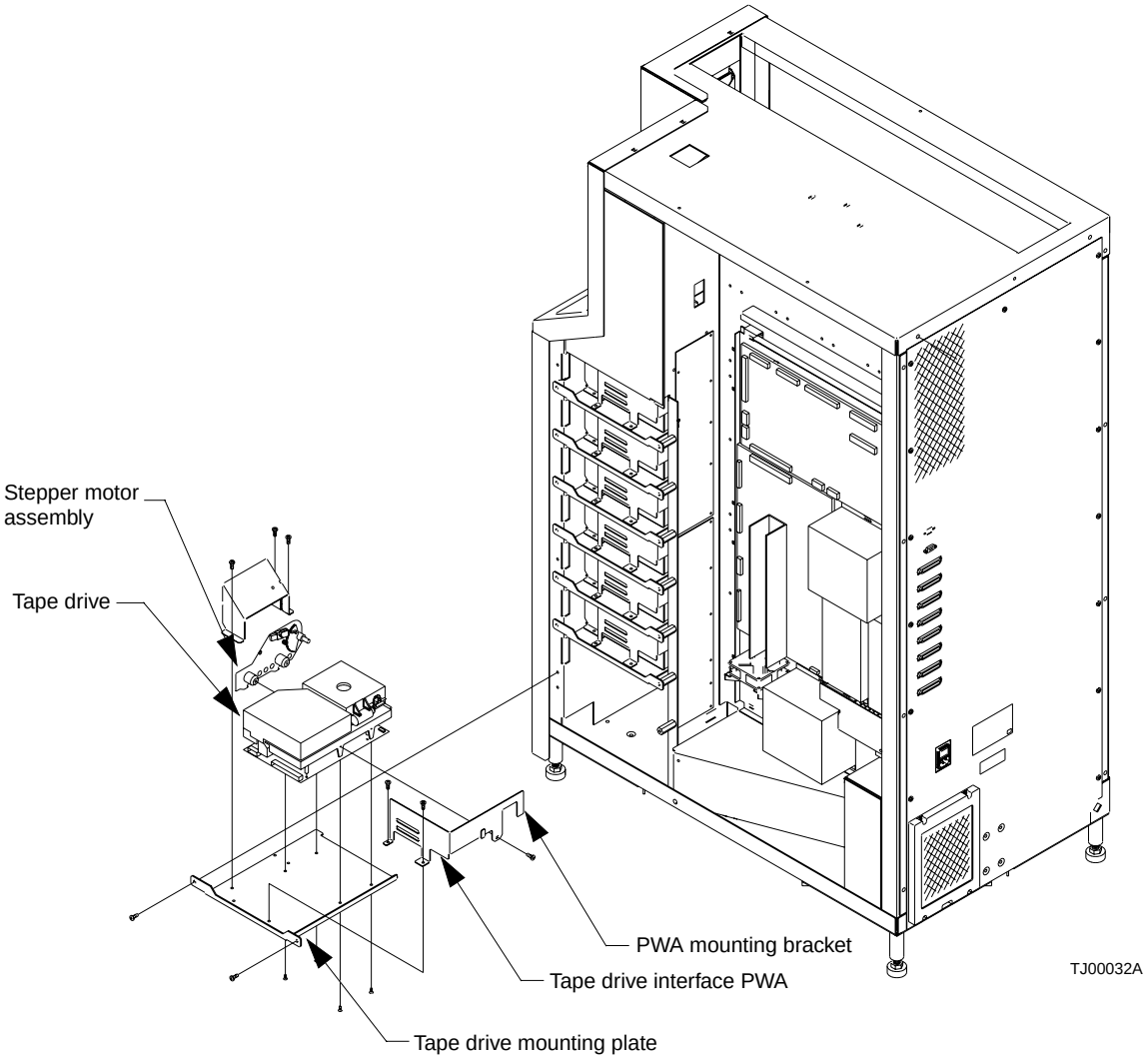


FIGURE 4-16 DLT 7000 Tape Drive

Tape Drive Interface PWA

Required Tools

Phillips screwdriver

▼ To Remove a Tape Drive Interface PWA

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Open the drive access door.**
4. **Remove the tape drive tray assembly from the library. See “Tape Drive Tray Assembly” on page 134 for removal instructions.**
5. **Disconnect all remaining cables from the tape drive interface PWA.**

Caution – Do not disconnect the ribbon cables at the tape drive. If the ribbon cables are inadvertently disconnected at the tape drive, do not reverse the cables when reconnecting to the tape. Reversing the cables will damage the tape drive and cables.

6. **Remove the screws that secure the PWA to the mounting bracket, and remove the PWA.**

▼ To Replace a Tape Drive Interface PWA

- **Follow the removal instructions in reverse order.**

▼ To Troubleshoot

- **If SCSI errors, tape drive errors, I/O errors, or reset errors occur after replacing a tape drive interface PWA, the short SCSI cable between the tape drive and the SCSI connector on the tape drive assembly bracket may not be seated properly. Reseat the cable.**

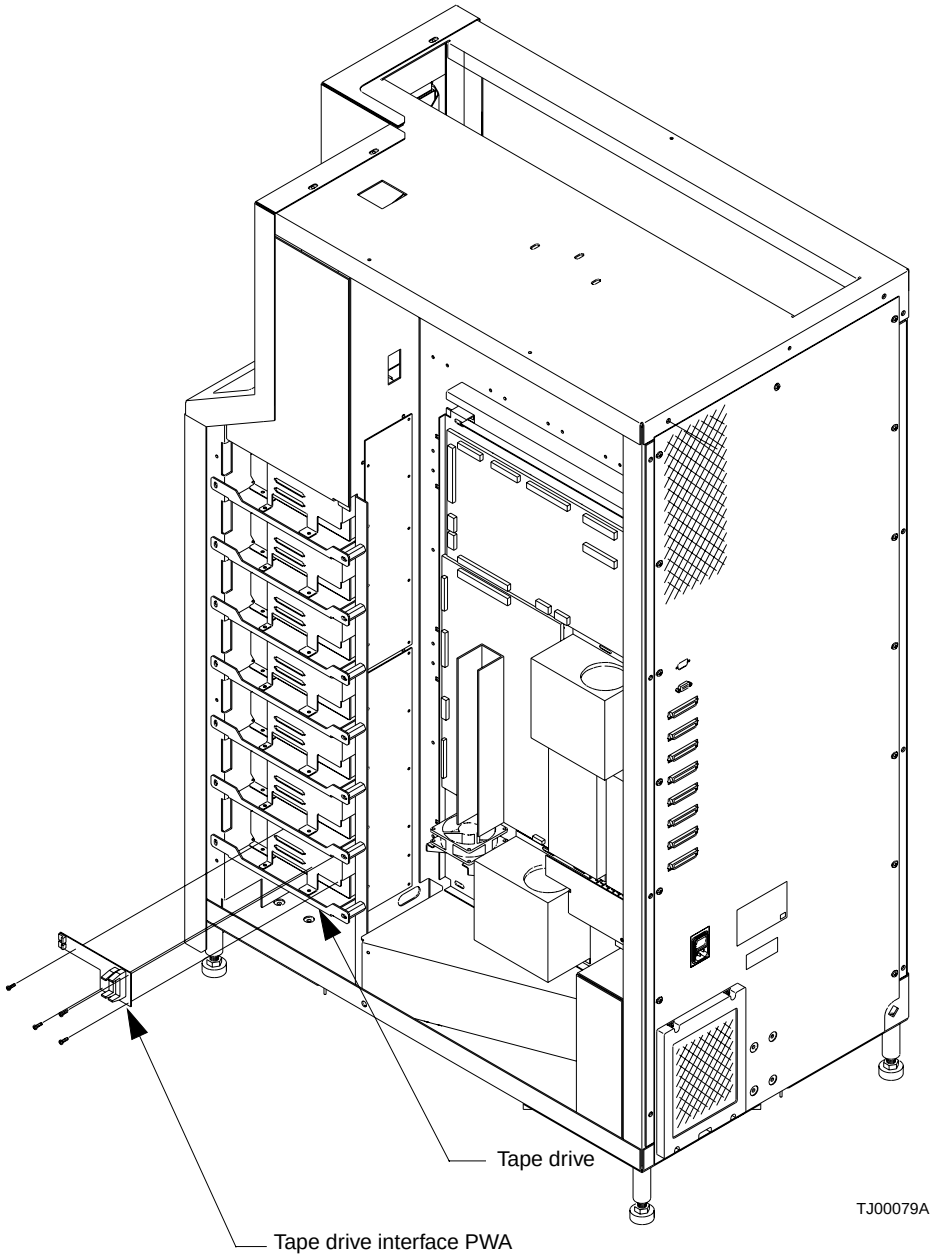


FIGURE 4-17 Tape Drive Interface PWA

Tape Drive Stepper Motor Assembly

Required Tools

Phillips screwdriver

▼ To Remove a Tape Drive Stepper Motor Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Open the drive access door.**

Note – See “Tape Drive Stepper Motor Assembly” on page 133 throughout this procedure.

▼ To Remove a Tape Drive Stepper Motor Assembly

4. **Remove the tape drive tray assembly from the library. See “Tape Drive Tray Assembly” on page 135 for removal instructions.**
5. **Remove the fan shield from the tape drive tray assembly.**
6. **Disconnect the tape drive stepper motor cables from the tape drive interface PWA.**
7. **Loosen the captive screws that attach the stepper motor assembly to the tape drive.**
8. **Lift counter clock wise and pull the stepper motor assembly off tape drive.**

▼ To Replace a Tape Drive Stepper Motor Assembly

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

- **Auto calibrate drives.**

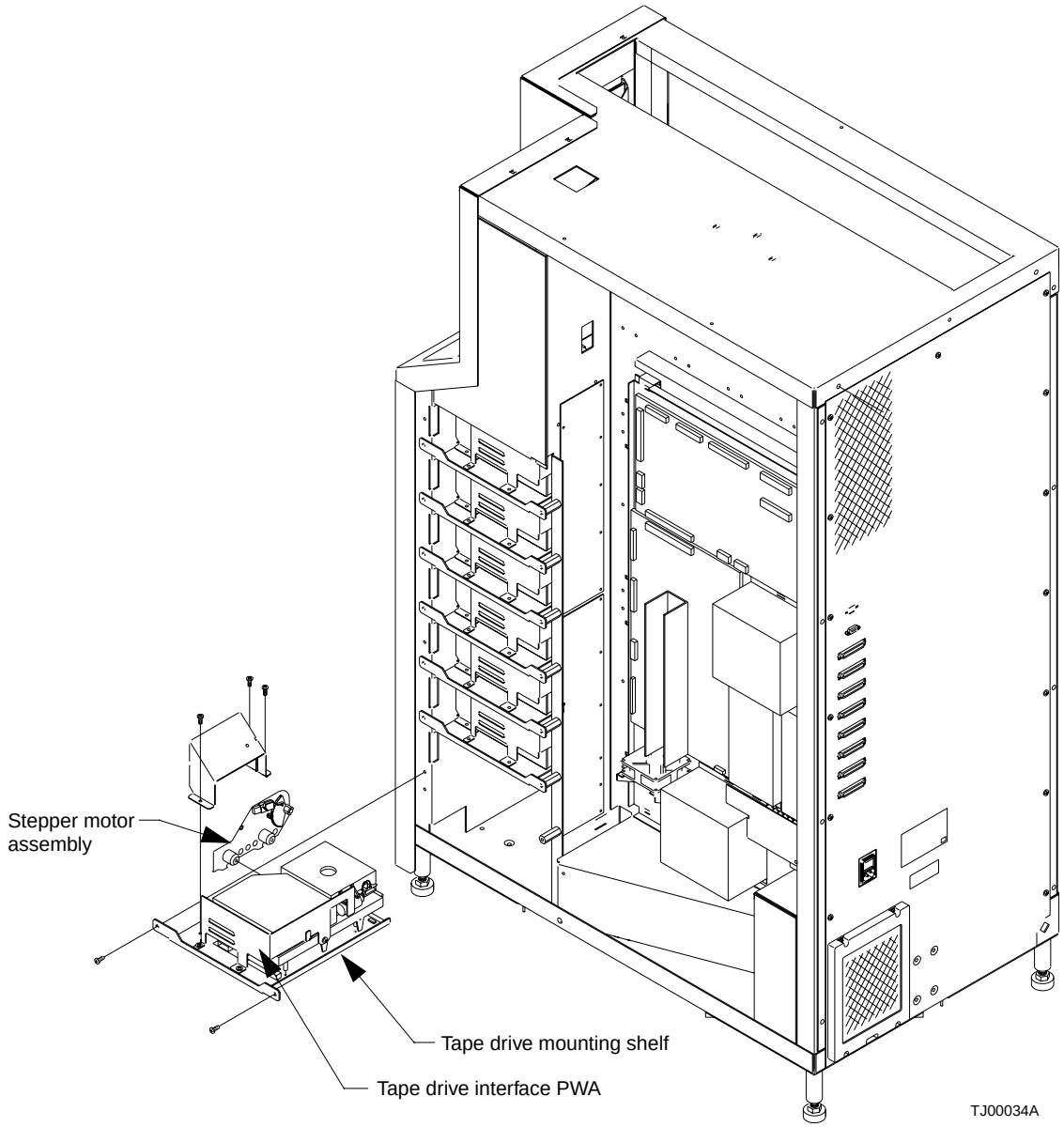


FIGURE 4-18 Tape Drive Stepper Motor Assembly

Tape Drive Tray Assembly

Required Tools

Phillips screwdriver

▼ To Remove a Tape Drive Tray Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Open the drive access door.**
4. **Disconnect the SCSI cables connecting the library to the tape drive tray assembly.**
5. **Disconnect all other cables connecting the library to the tape drive distribution PWA.**
6. **Disconnect the SCSI terminator, if one is installed.**
7. **Remove the two base plate mounting screws.**
8. **Slide the tray out.**

▼ To Replace a Tape Drive Tray Assembly

- **Follow the removal instructions in reverse order.**

Note – When replacing the base plate mounting screws, replace the left screw (as viewed through the drive access door) first. This screw is the reference screw and must be replaced first to assure proper positioning of the tape drive tray assembly.

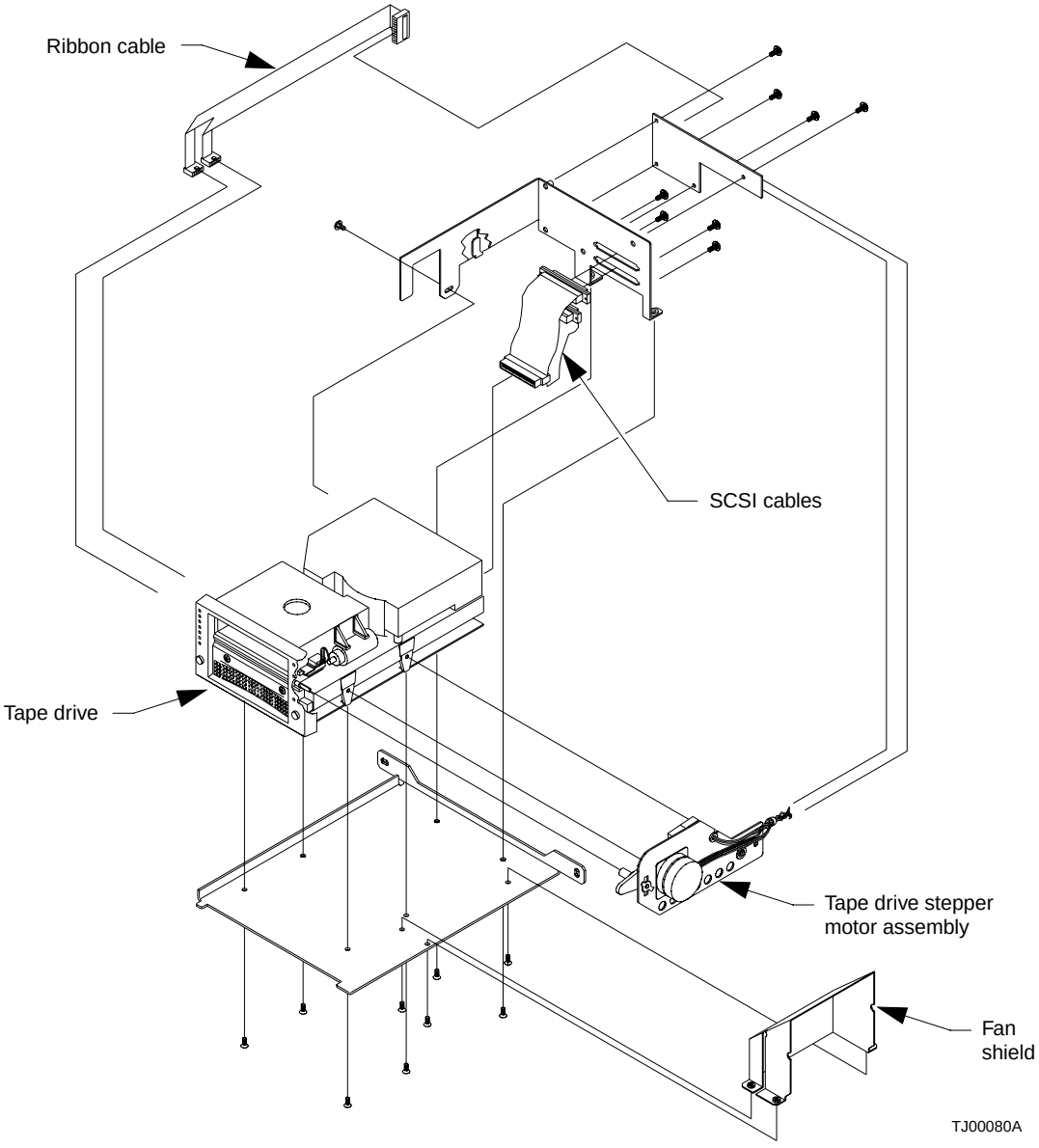


FIGURE 4-19 Tape Drive Tray Assembly

Tape Drive Distribution PWA

Required Tools

Phillips screwdriver

▼ To Remove a Tape Drive Distribution PWA

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the right cosmetic panel as shown in "Top, Right, and Left Panels" on page 92.**
4. **Disconnect all cabling between the tape drive distribution PWA and the tape drives.**
5. **Disconnect cables at J1, J3, J4, J8, and J9 on the PWA.**
6. **Disconnect the light assembly power connector at the top of the PWA.**
7. **Remove the PWA mounting screws, and remove the PWA.**

▼ To Replace a Tape Drive Distribution PWA

- **Follow the removal instructions in reverse order.**

▼ To Troubleshoot

- **If the load port does not operate after replacing the PWA, check if the cables connected to J7 and J9 on the PWA are reversed.**

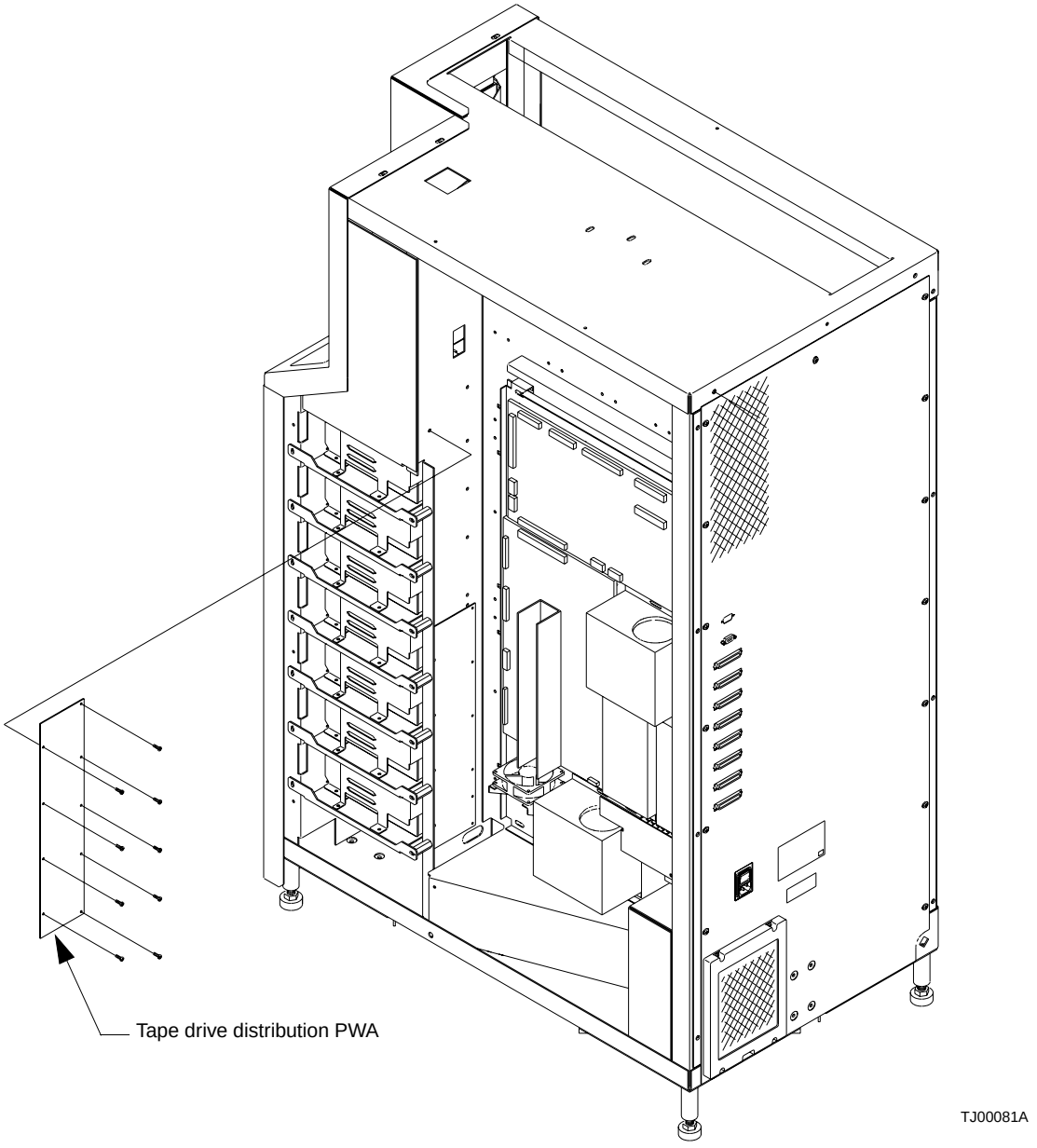


FIGURE 4-20 Tape Drive Distribution PWA

Tape Drive MUX PWA

Required Tools

Phillips screwdriver

▼ To Remove the Tape Drive MUX PWA

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Disconnect all cabling between the tape drive MUX PWA and the tape drives.**
5. **Disconnect the cable at J20 on the PWA and tag it.**

Caution – The cable at J20 must be replaced to J20. If it is connected to J19, the library will be damaged. Be sure to tag this cable when it is removed.

6. **Disconnect cables at J2, J16, J17, and J18, and J21 on the PWA.**
7. **Remove the PWA mounting screws, and remove the PWA.**

▼ To Replace the Tape Drive MUX PWA

- **Follow the removal instructions in reverse order.**

Caution – Be sure to reconnect the cable tagged during the removal procedure to J20 on the PWA. If it is connected to J19, the library will be damaged.

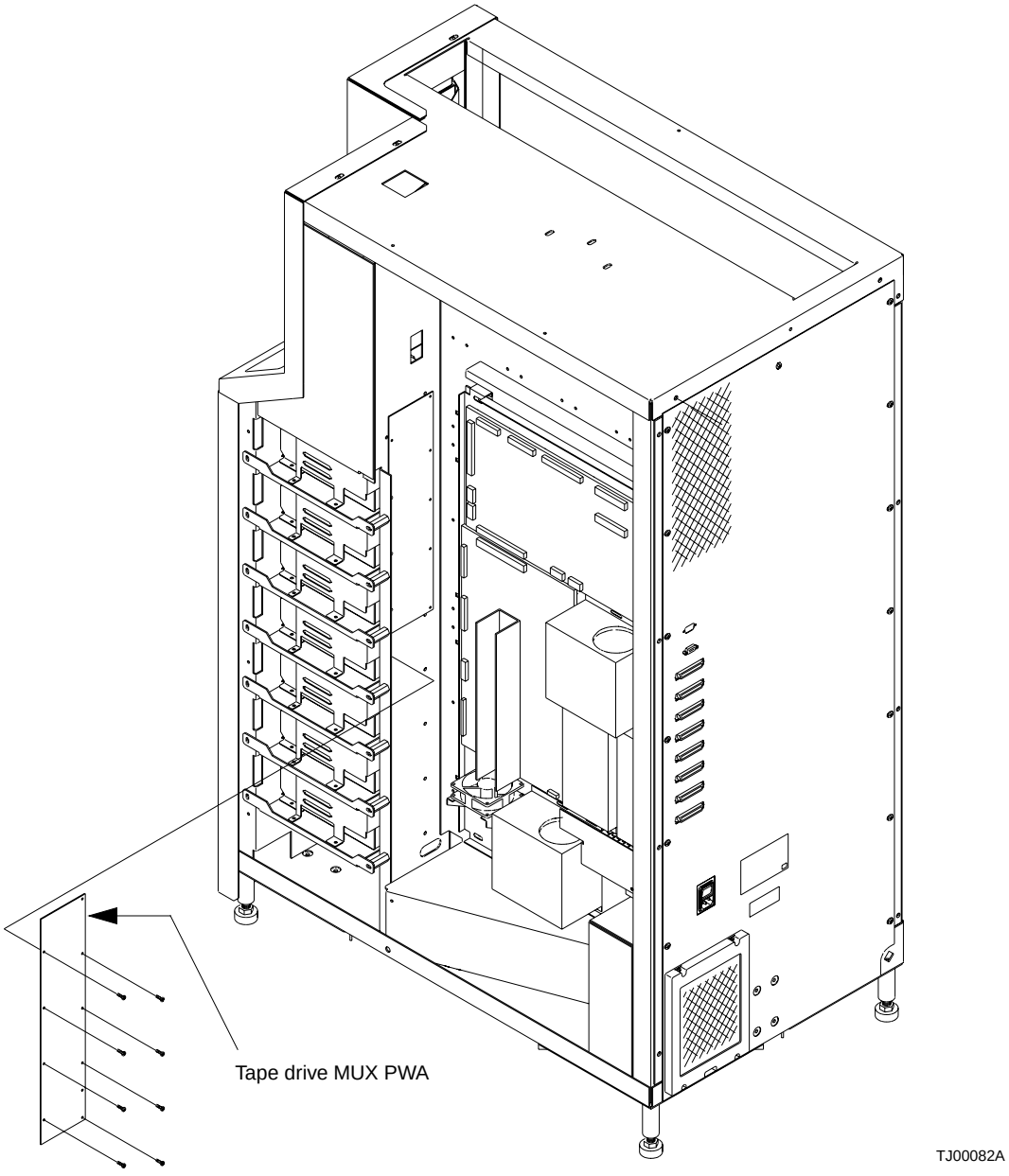


FIGURE 4-21 Tape Drive MUX PWA

Control Panel Assembly

Required Tools

Phillips screwdriver

▼ To Remove the Control Panel Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **Remove the front cover as shown in "Top, Right, and Left Panels" on page 92.**
5. **With the front panel removed, locate the control panel assembly from within the front panel. (**FIGURE 4-22**).**
6. **Remove connector A3_J1 from the control panel assembly.**
7. **Remove the self-locking nuts that retain the control panel assembly.**
8. **Remove the ESD guard.**
9. **Pull the control panel assembly down and out to remove.**

▼ To Replace the Control Panel Assembly

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

- **Auto calibrate the load port.**

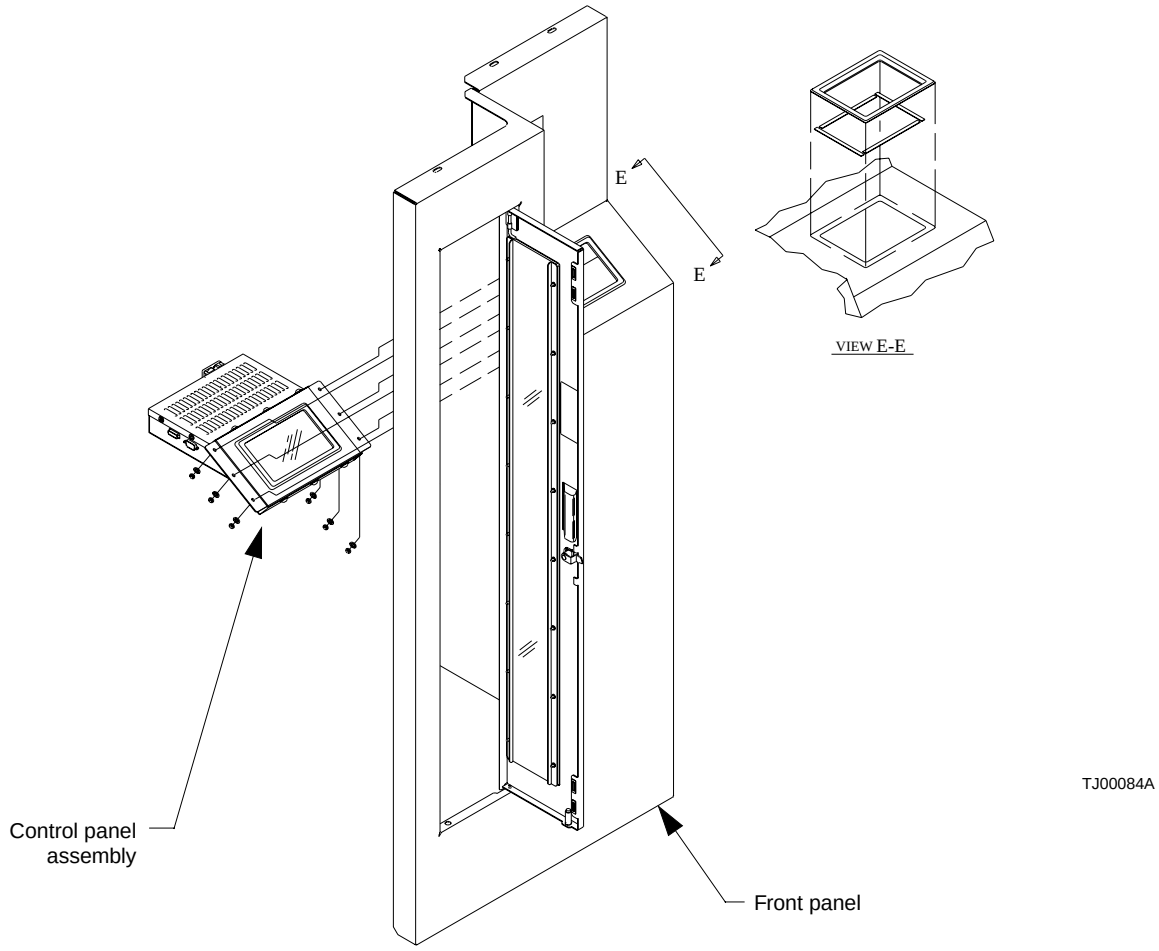


FIGURE 4-22 Control Panel Assembly

X-Axis Confirmation Sensor

Required Tools

Phillips screwdriver, thin blade screwdriver

▼ To Remove the X-Axis Confirmation Sensor

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in “Top, Right, and Left Panels” on page 92.**
4. **Disconnect connector A4_J4 from the back of the x-axis interconnect PWA.**

Note – Take careful note of the cable routing.

5. **Using a thin blade screwdriver, remove the cable clamp retaining the x-axis interruptive sensor cable. (**FIGURE 4-23**).**
6. **Remove the screws that secure the x-axis confirmation sensor to its mounting bracket on the horizontal axis.**
7. **Remove the x-axis confirmation sensor.**

▼ To Replace the X-Axis Confirmation Sensor

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

- **Auto calibrate all.**

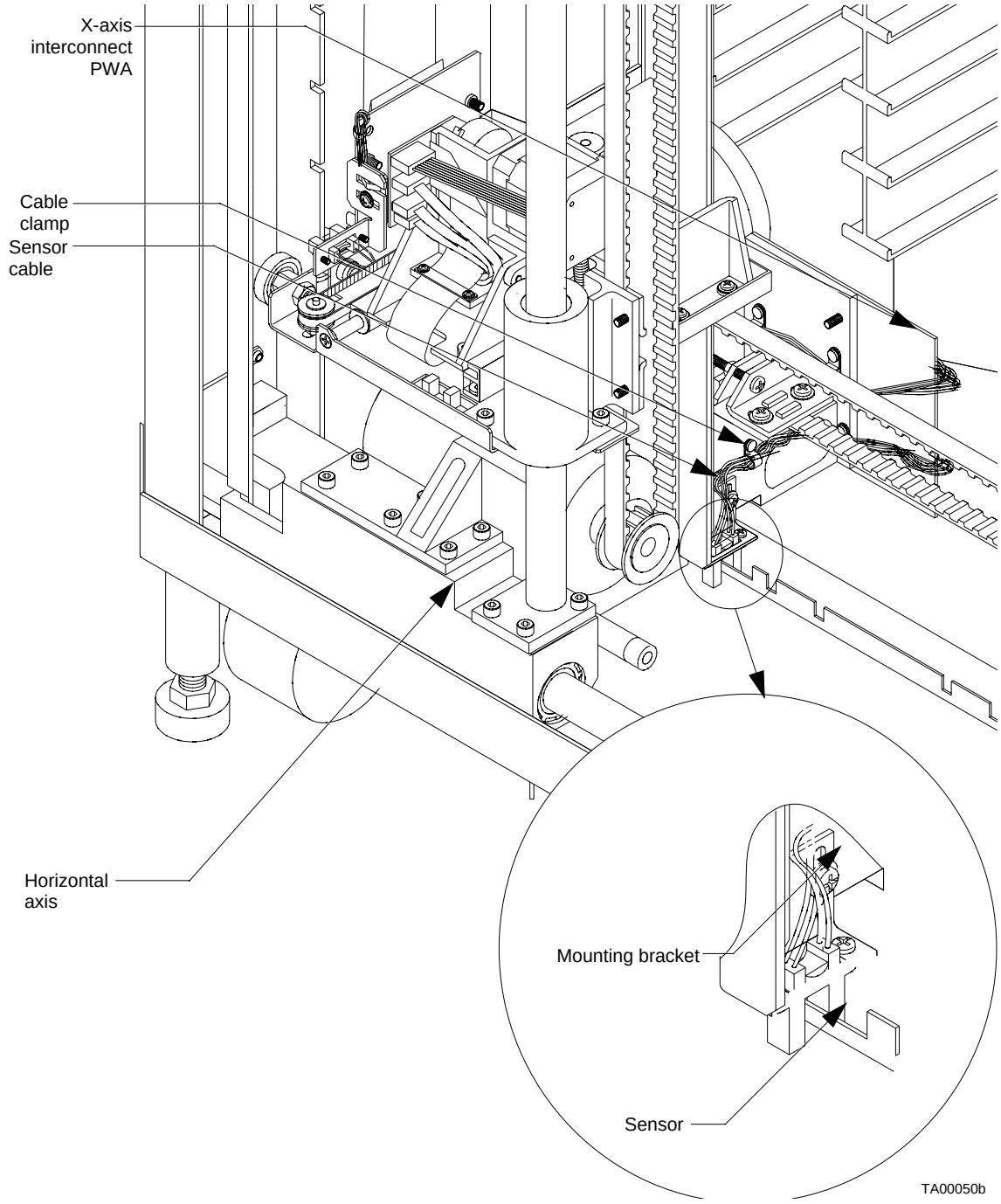


FIGURE 4-23 X-Axis Confirmation Sensor

Robotics Controller PWA

Required Tools

Phillips screwdriver

▼ To Remove the Robotics Controller PWA

1. **If possible, record the contents of the NVRAM (U38) (for example., calibration values, statistics, and so forth).**
2. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

3. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
4. **Remove the top, left, and right cosmetic panels as shown in “Top, Right, and Left Panels” on page 92.**
5. **From the right side of the library, locate the robotics controller PWA on the upper half of the controller electronics assembly. (**FIGURE 4-24**).**
6. **Disconnect connectors A1_J1, A1_J3, A1_J6, A1_J7, A1_J8, A1_J9, A1_J11 and A1_J15.**

Note – To prevent lost and hard to retrieve screws, cover the fan opening directly below the controller electronics assembly.

7. **Remove the screws that secure the robotics controller PWA and lift out.**

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

▼ To Replace the Robotics Controller PWA

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

---

1. **Follow the removal instructions in reverse order.**
2. **Initialize NVRAM.**
3. **Configure for existing drives.**
4. **Calibrate the drives.**
5. **Calibrate all.**
6. **Cycle power.**

▼ To Make Adjustments Required After Replacement

1. **Using the diagnostic software program, perform a System Info (see the** *Sun ETL 7/3500 Library 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) was not swapped, using the DSP, perform an Init Nov-Vol RAM from the configuration menu.**
4. **From the library menu, perform the Cal All from the Calibration menu.**

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

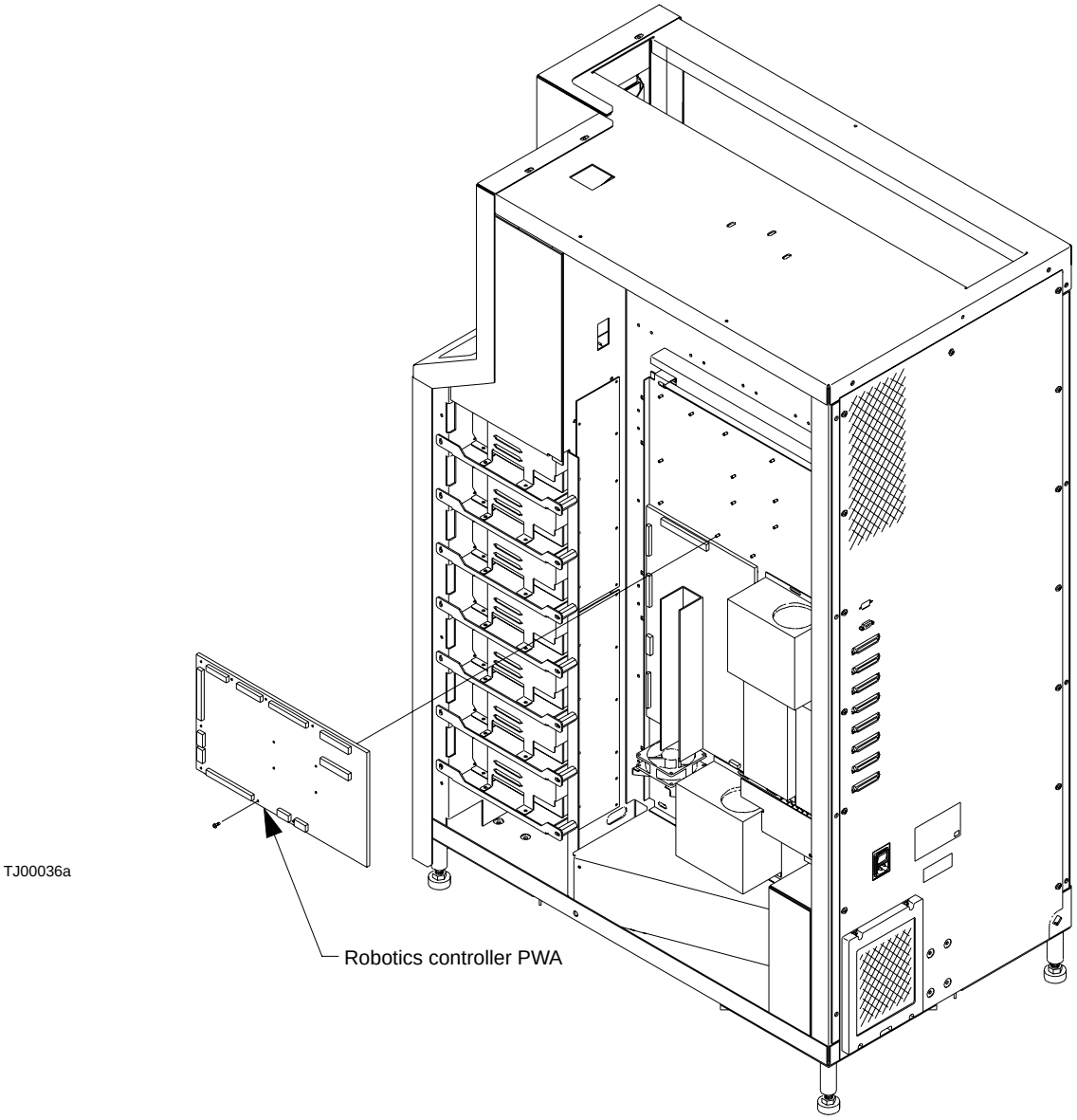


FIGURE 4-24 Robotics Controller PWA

Actuator Driver PWA

Required Tools

Phillips screwdriver

▼ To Remove the Actuator Driver PWA

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top, left, and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **From the right side of the library, disconnect connectors A2_J1, A2_J2, A2_J4, A2_J5,A2_J6 and A2_J7 from the actuator driver PWA. (**FIGURE 4-25**).**

Note – To prevent the difficult retrieval of dropped hardware, cover the fan opening directly below the controller electronics assembly.

5. **Remove the screws from the perimeter of the actuator driver PWA.**

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

6. **Remove the screws from inside the heat sink channel on the actuator driver PWA.**
7. **Lift out the actuator driver PWA.**

Note – The screws removed from the heat sink are longer.

▼ To Replace the Actuator Driver PWA

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

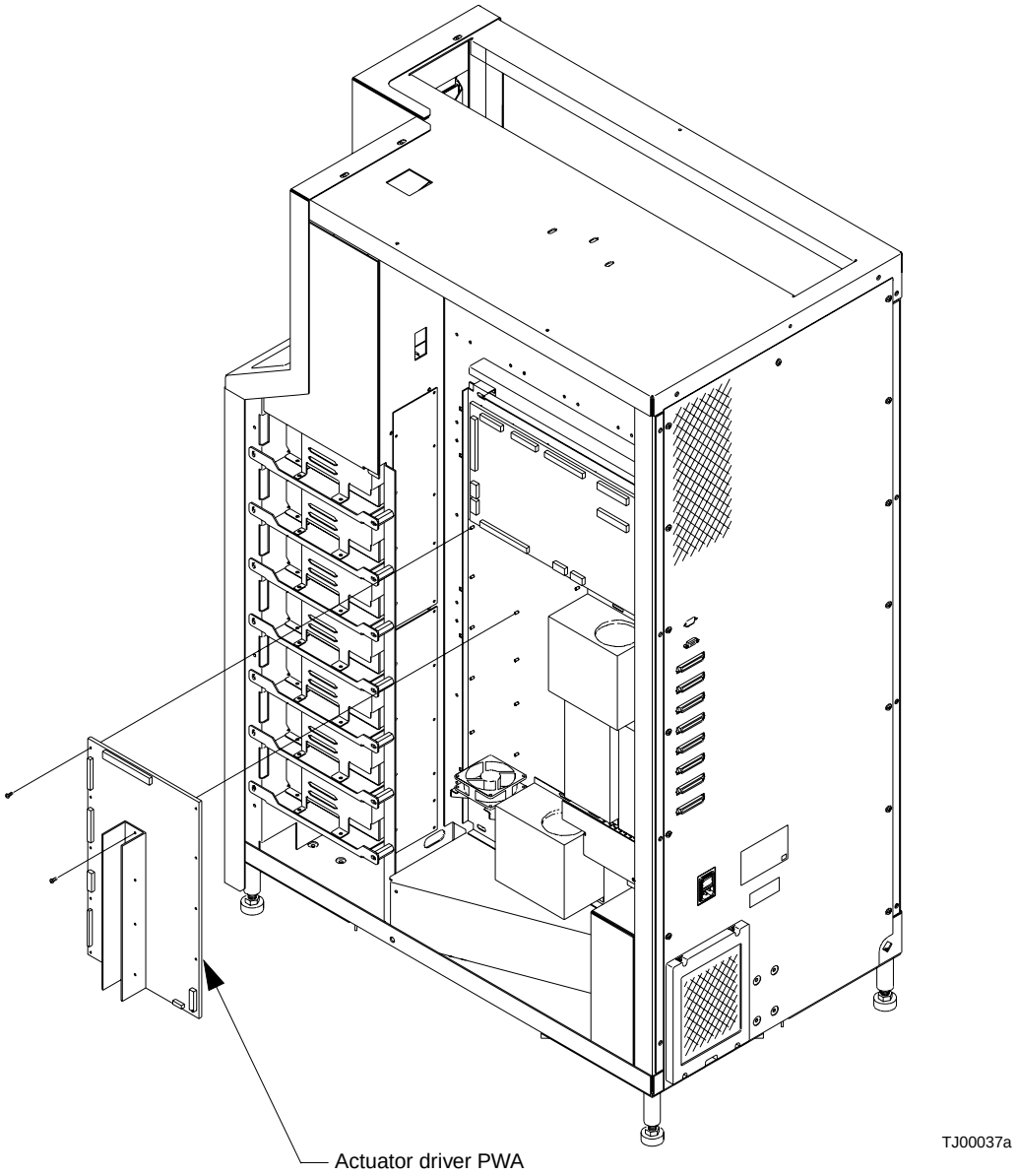


FIGURE 4-25 Actuator Driver PWA

PC Logic Power Supply Assembly

Each library has two PC logic power supply assemblies. The following procedure applies for each power supply assembly.

Required Tools

Phillips screwdriver

▼ To Remove the Top PC Logic Power Supply

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top and right cosmetic panels as shown in “Top, Right, and Left Panels” on page 92.**
4. **Disconnect A1_J11 and A1_J15 from the robotics controller PWA.**
5. **Disconnect connectors P1_J2, P1_J3, P1_J4, and P1_J5 from the PC logic power supply.**

Note – To prevent loosing removed hardware, cover the fan opening directly below the controller electronics assembly.

6. **Remove the screws that secure the PC logic power supply and brackets to the controller electronics assembly.**

Note – Hold the PC logic power supply assembly securely when removing the last mounting screw.

7. **Detach the mounting bracket from power supply by removing the screws).**
8. **Disconnect the AC power.**

▼ To Replace the Top PC Logic Power Supply

- **Follow the removal instructions in reverse order.**

▼ To Remove the Bottom PC Logic Power Supply

1. **Detach the connectors from the tape drive MUX PWA.**
2. **Disconnect the AC power.**

▼ To Replace the Bottom PC Logic Power Supply

- **Follow the removal instructions in reverse order.**

▼ To Make Adjustments Required After Replacement

1. **Turn off AC power and remove the PC power supply cover (remove the screws on the top of the power supply).**
2. **Verify that +5V, +12V, and -12V fuses are replaced and that no shorts exist.**
3. **Hook a DVM up to +5V and GND test points on the robotics controller.**
4. **Turn on AC power.**
5. **Locate potentiometer in PC power supply main board.**
6. **Adjust +5V to between +5.05V and +5.15VDC.**
7. **Verify that +12V is between +11.5V and +12.5V. If not, adjust +12V within limits and reverify that the +5V is within limits.**
8. **If power cannot be adjusted, replace power supply and repeat procedure.**

▼ To Troubleshoot

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

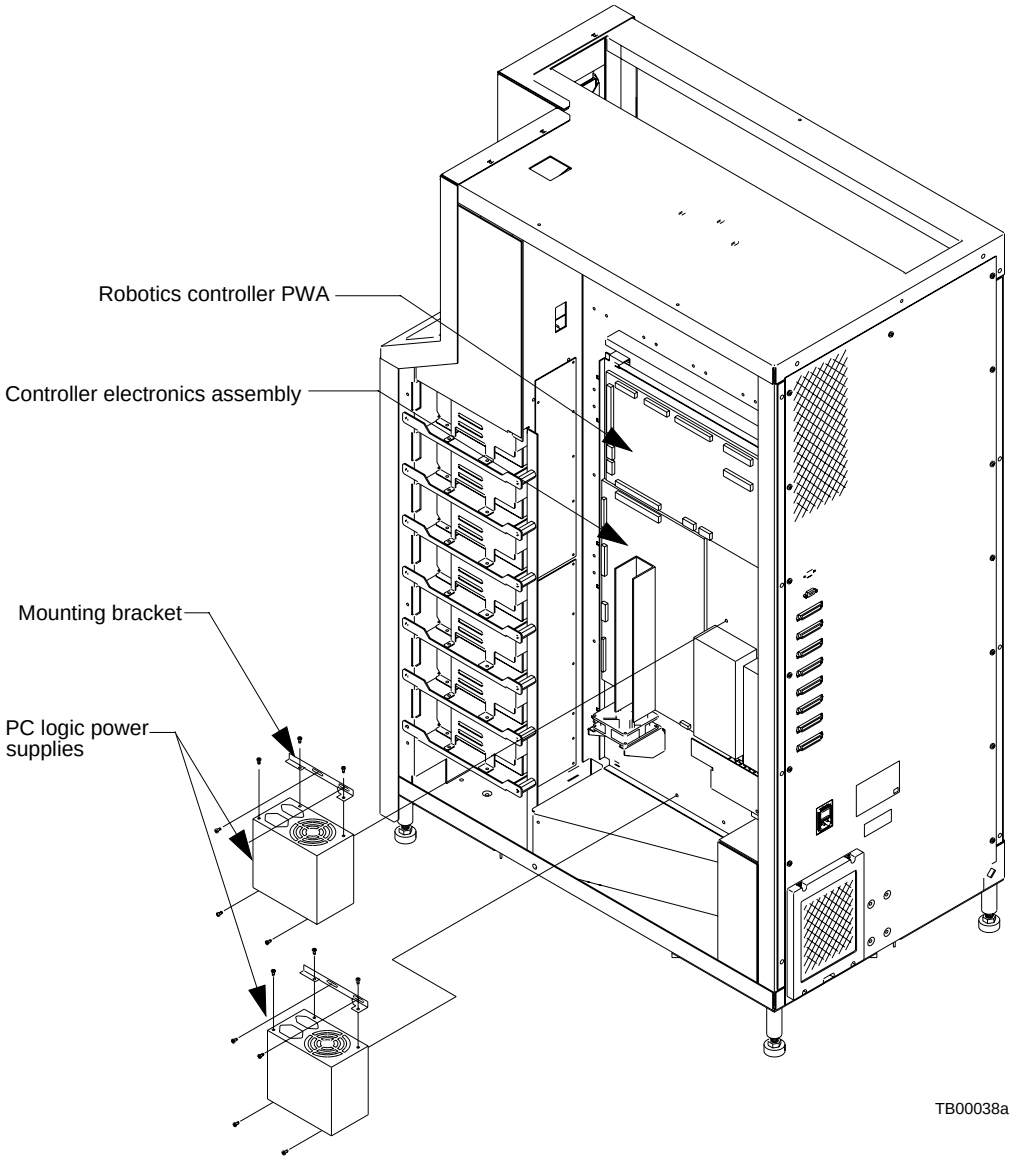


FIGURE 4-26 PC Logic Power Supply

Motor Power Supply Assembly

Each library has two motor power supply assemblies. The following procedure applies for each power supply assembly.

Required Tools

Phillips screwdriver

▼ To Remove the Motor Power Supply Assembly

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top and right cosmetic panels as shown in "Top, Right, and Left Panels" on page 92.**
4. **On the selected motor power supply, loosen all of the terminals on the power supply barrier strip.**
5. **Remove the wires.**

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

6. **Remove the controller electronics assembly. See "Controller Electronics Assembly" on page 97 for removal instructions.**
7. **From the back of the controller electronics assembly, remove the lower mounting screw from the motor power supply.**

Note – If you are replacing PS2, also remove the over voltage protector.

8. **Loosen the upper mounting screw.**
9. **Lift out the motor power supply.**

▼ To Replace the Motor Power Supply Assembly

- **Follow the removal instructions in reverse order.**

▼ To Troubleshoot

- **Check the motor power supply barrier strip terminal connections.**

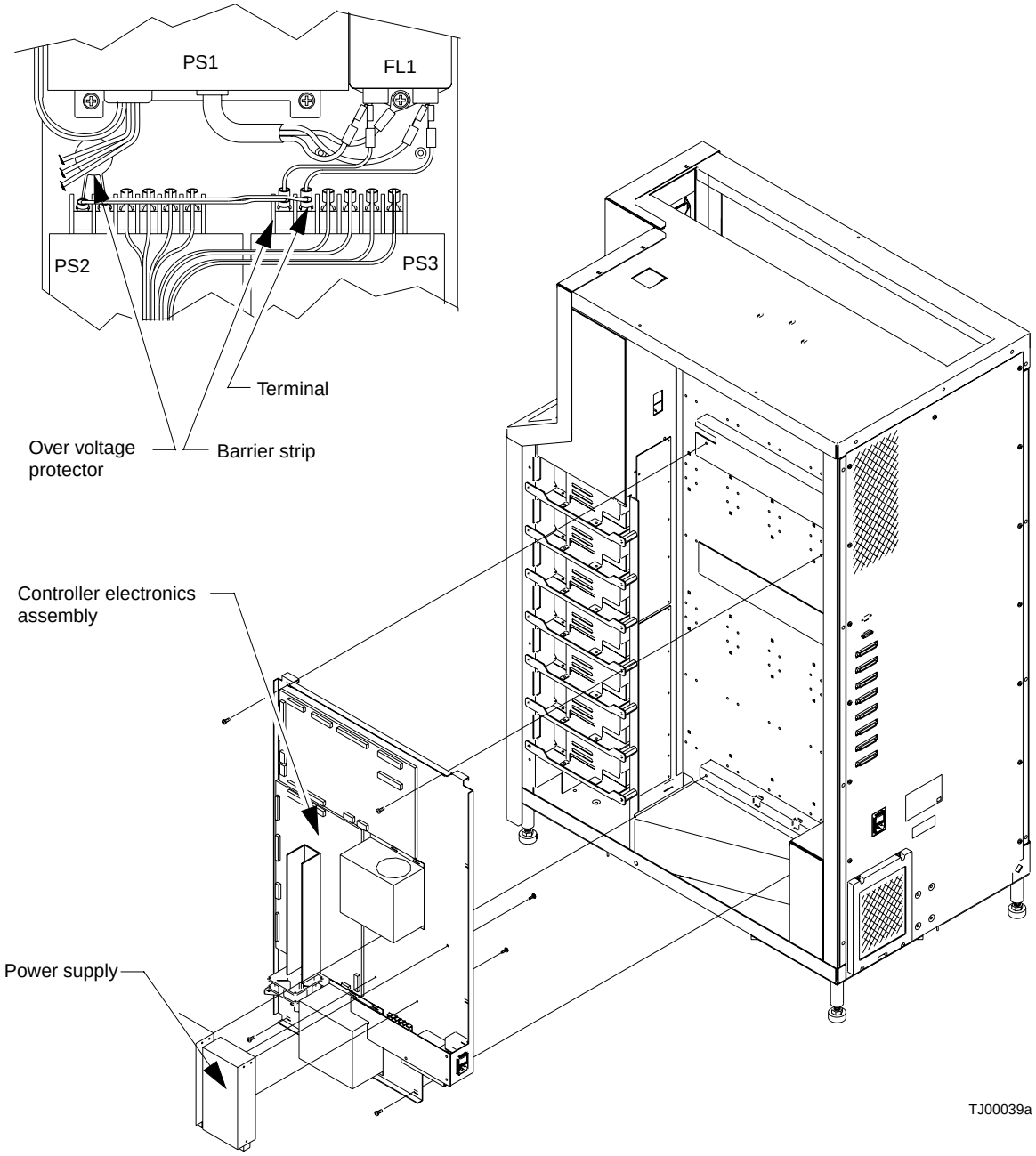


FIGURE 4-27 Motor Power Supply Assembly

Light Bulb

Required Tools

Phillips screwdriver

▼ To Remove the Light Bulb

1. **Remove power from the library.**

Caution – DO NOT disconnect the power cord from facility power or the library. The power cord is the only means of grounding the chassis and helping to prevent electrostatic discharge (ESD) damage.

2. **Connect your ESD wrist grounding strap to the closest grounding point on the frame of the library.**
3. **Remove the top and right cosmetic panels as shown in “Top, Right, and Left Panels” on page 92.**
4. **Disconnect power from the tape drive distribution PWA.**
5. **Remove the screws that secure the light bulb assembly. See “Light Bulb Assembly” on page 158.**
6. **Lift out the light bulb assembly.**
7. **Pop off the cover.**
8. **Remove the bulb.**

▼ To Replace the Light Bulb

- **Follow the removal instructions in reverse order.**

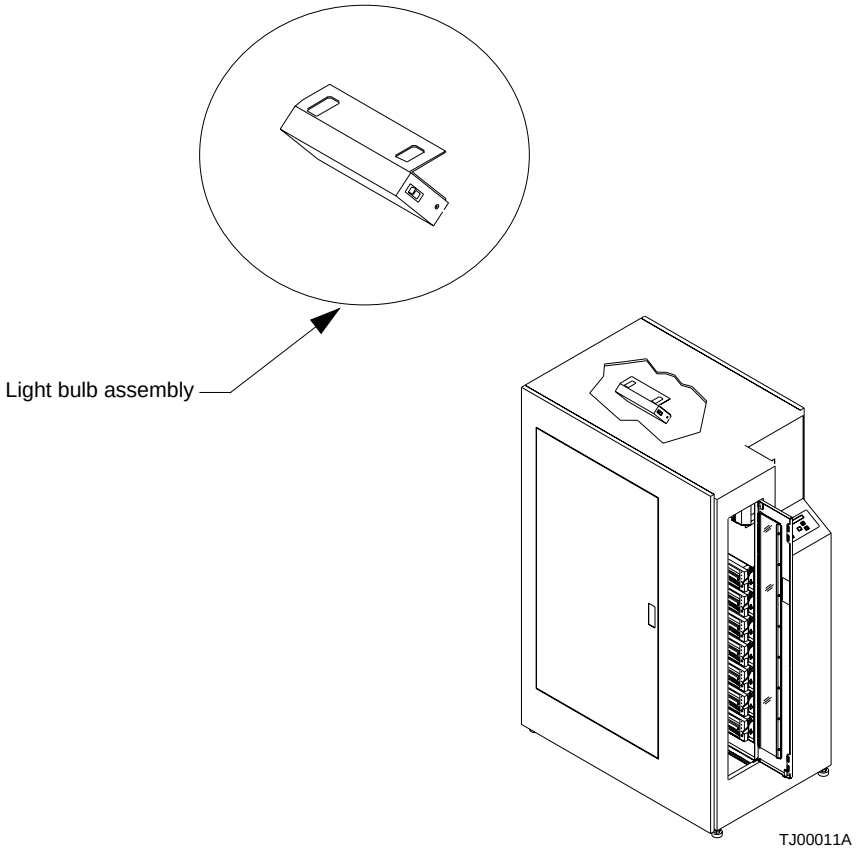


FIGURE 4-28 Light Bulb Assembly

Reassembling the Library

Replacing the Cosmetic Panels

Use the procedures below along with FIGURE 4-1 on page 92 and FIGURE 4-2 on page 95 to replace the cosmetic panels.

▼ To Replace the Front Panel

Caution – You must replace the front panel before replacing the top, left or right panels.

1. **Position the front panel at the front of the library.**
2. **Reconnect control panel ribbon connector A3_J1.**
3. **From the front of the library, pick up the front panel and replace it on the library frame (from bottom to top).**
4. **Reconnect the remaining miscellaneous sensors cable assembly connectors.**
    a. Plug SW1 blade lug black wire onto the bottom (common) spade of SW1.
    b. Plug SW1 blade lug white wire onto the top (N.C.) spade of SW1.
    c. Plug SW2 blade lug black wire onto the bottom (common) spade of SW2.
    d. Plug SW2 blade lug white wire onto the top (N.C.) spade of SW2.
    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 mounting screws.**
6. **From the right side of the library, reinstall the EMI cover.**

▼ To Replace the Left Panel

1. **Rest the top lip of the left panel on the top of the library frame.**
2. **Push the panel towards the front of the library and insert the frame buckles into the retention tabs.**

3. **At the rear of the library, insert and tighten the screws to secure the left panel to the rear of the library frame.**

▼ To Replace the Right Panel

1. **Rest the top lip of the right panel on the top of the library frame.**
2. **At the rear of the library, insert and tighten the screws to secure the right panel to the rear of the library frame.**
3. **Insert and tighten the screws behind the drive bay door.**

▼ To Replace the Top Panel

Caution – You must replace the front, left, and right panels before replacing the top panel.

1. **Place the panel on top of the library.**
2. **Push the panel towards the front of the library and insert the retention tab into the slot.**
3. **At the rear of the library, insert and tighten the screws to secure the top panel to the library frame.**

▼ To Apply Power to the Library

1. **Verify the following:**
   - Front door and load port closed
   - All outer skins attached
   - All rear panel connections secured
2. **At the rear panel, set the POWER switch to the | (on) position.**
3. **After several seconds, verify that SDA shows System Online.**

Note – "System Online" is only displayed if the library power-on state is configured for online. Otherwise, System Offline (STANDBY) is displayed in the SDA.

▼ To Place the Library Online

1. **With the library power applied and the SDA showing System Offline, press the control panel STANDBY button.**
2. **Verify that System Online is displayed in the SDA.**

APPENDIX **A**

Control Panel Menus

This appendix provides an overview of the control panel menus.

Control Panel Overview

The control panel (FIGURE A-1) is located on the front of the library on the right-hand side.

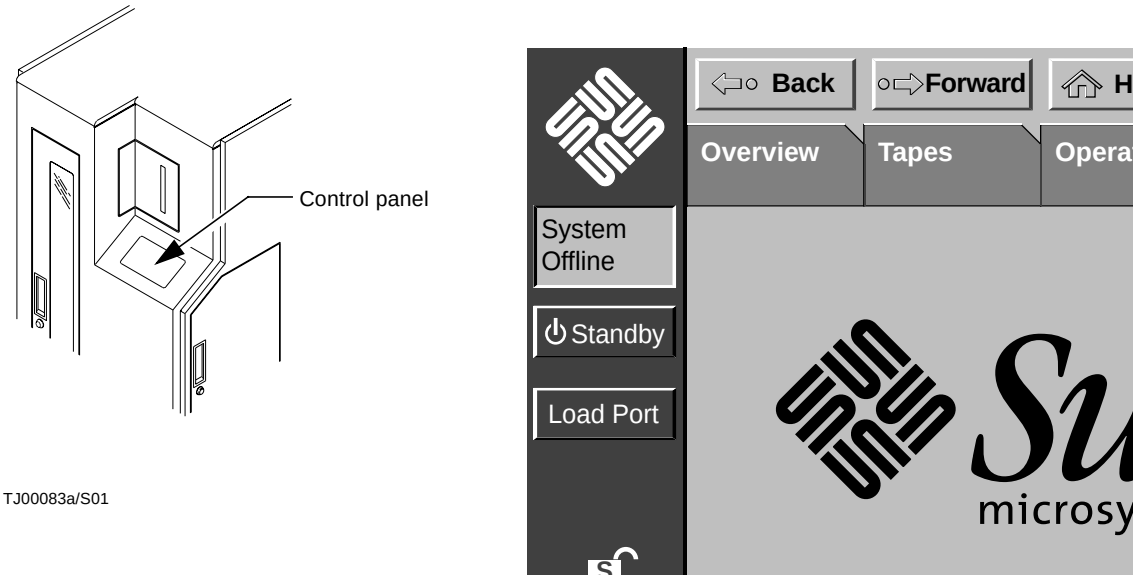


FIGURE A-1 Control Panel

The control panel's main display area consists of the following screens:

- Overview
- Tapes
- Operator
- Service

FIGURE A-2 lists the structure of the control panel main display area.

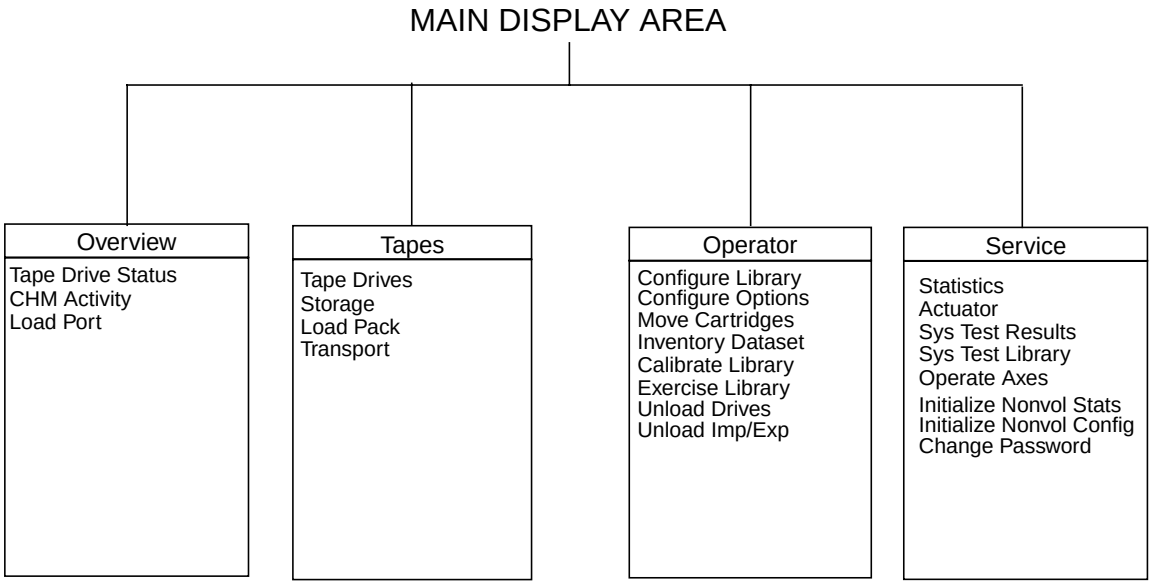


FIGURE A-2 Menu Structure

Control Panel Navigation

The control panel uses a touch-screen for convenient navigation. To activate a command or open a screen, simply touch the appropriate “button” on the screen. You can also move backward and forward through screens opened previously by pressing the Back and Forward buttons.

The Home button returns the control panel to the initial screen.

Using Library Controls

Library controls are located in the vertical bar on the left side of the control panel. They are always available, even when using the main display area to open operator- or service-related screens.

Opening a Screen

To open one of the four main screens (Overview, Tapes, Operator, or Service), press the appropriate tab near the top of the control panel. That screen is displayed in the main area.

Note – If you press either the Operator or Service tabs, a dialog box is displayed requesting a password. You must enter a password to display these screens.

Once the desired screen is displayed, you can view information or press buttons to execute commands and open other screens.

Exiting a Screen

You can exit any screen by pressing the Back or Home buttons.

If a command is executing, a dialog box is displayed in the main area with an ABORT button. Pressing this button cancels the command and stops the ongoing operation. (Pressing the Back or Home button is still required to exit the screen associated with the dialog box.)

Basic Library Information

You can obtain basic information about library configuration and operation by using the Overview and the Tapes screens.

Overview Screen

The Overview screen (FIGURE A-3) displays a snapshot of the following:

- Tape drive status
- Cartridge handling activity
- Load port status

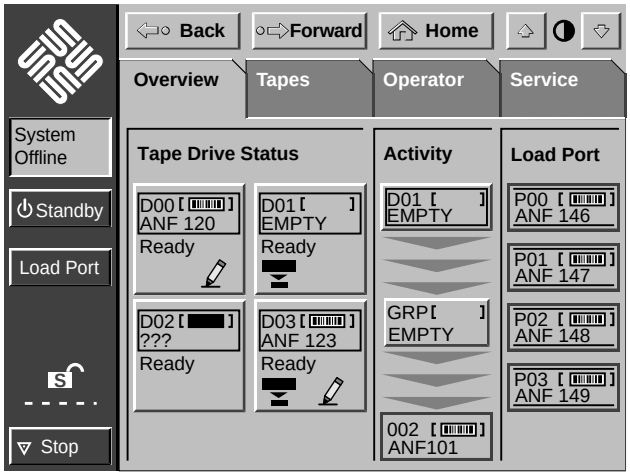


FIGURE A-3 Overview Screen

Tapes Screen

The Tapes screen (FIGURE A-4) displays the inventory of all elements in the library.

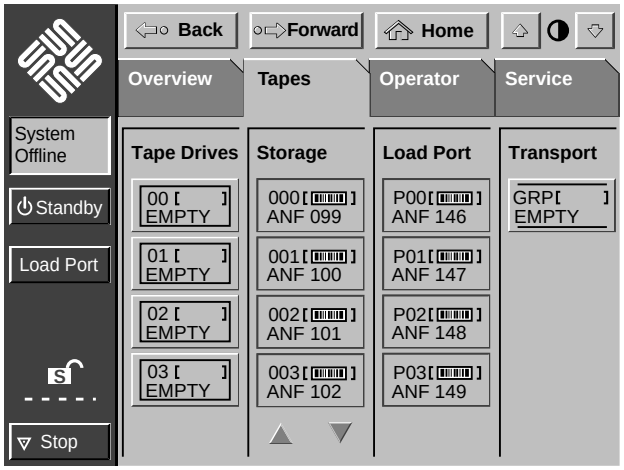


FIGURE A-4 Tapes Screen

In this screen, there are four element types:

- Tape drives
- Storage
- Transport (gripper)
- Load port

Using these categories, you can determine whether a particular element has a tape cartridge and whether the cartridge is labeled.

Viewing Screen Elements

Some categories in the Overview and Tapes screens contain too many elements to display on the screen at one time. Up and down arrow buttons at the bottom of a category indicate that there are more elements to view. To scroll through these elements, touch the arrow buttons.

You can also expand a category to fill the screen by touching the category anywhere above the scrolling arrows. For example, touching the storage category on the Tapes screen causes the screen expansion shown in (FIGURE A-5).

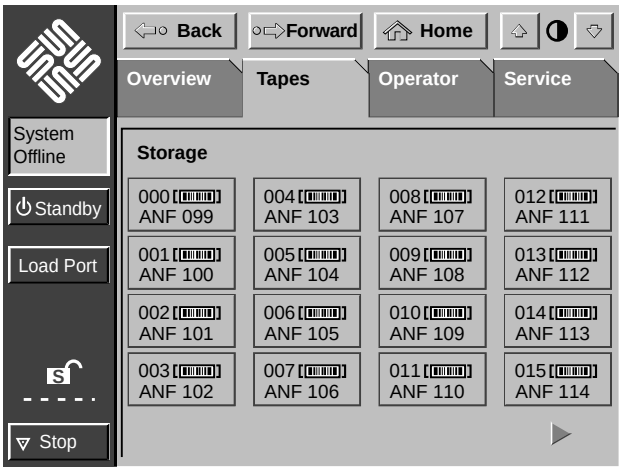


FIGURE A-5 Tapes Screen with Expanded Storage Display

To return the screen to normal, press the Back button at the top of the control panel.

Operator Screen

You can obtain detailed information on how to configure the library, configure the library options, move a cartridge, calibrate library elements, and unload a drive.

Configure Library

This Configure Library command enables you to assign the following:

- Library model number
- Number of storage bins
- Number of drives
- Library SCSI ID
- Tape drive SCSI IDs

▼ To Configure Library Attributes:

1. **In the Operator screen, press the Configure Library button.**

   The Config: Library screen is displayed with the current configuration settings (FIGURE A-6).

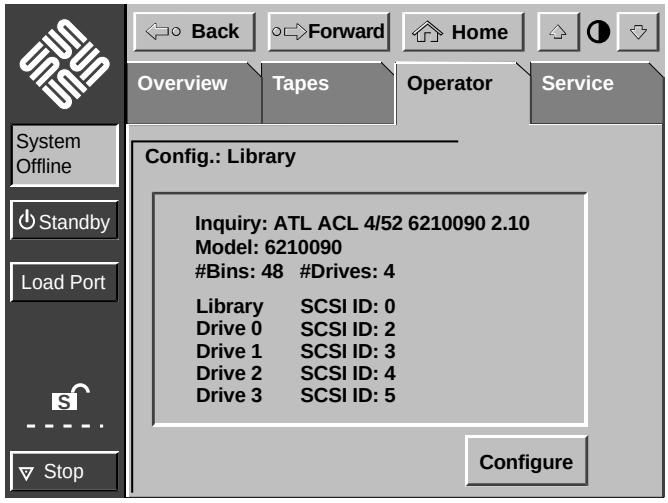


FIGURE A-6 Config.: Library Screen

2. **Press the Configure button.**

   The Configure: Library Settings screen is displayed (FIGURE A-7).

FIGURE A-7 Configure: Library Settings Screen

3. **Press the Select button to highlight the desired option.**
4. **Press the Left and Right Arrow buttons to scroll to the desired setting.**
5. **Press the Execute button to change to the new setting.**
6. **To return to the Operator screen, press the Back button twice.**

SCSI ID Assignment Guidelines

When selecting SCSI IDs using this procedure, remember that each SCSI device on the same SCSI bus must have a unique ID number (from 0 to 15). SCSI devices include the library robotics, the host computer, the library tape drives, internal and external hard disk drives, and so on.

If you set up the library with multiple SCSI busses, you can assign the same number to two or more devices provided each device is on a different SCSI bus.

Configure Options

The Configure Options command enables you to set the following. (TABLE A-1)

TABLE A-1 Configure Options

Options	Description
Library power-up state	Determines whether the library is online or in Standby mode when powered up.
Auto clean	Enables the library to perform drive cleaning tasks automatically as needed.
Retries	Causes the library to automatically retry a failed move command before issuing an error message.
Exabyte emulation	Causes the library to return the same inquiry string as the Exabyte tape library.
Bar code scan	Turns bar code scanning on or off during inventory.
Auto inventory	Causes the library to perform an inventory whenever the library is powered up.
Auto load	Automatically moves any cartridge placed in the load port to an empty storage bin.

▼ To Configure Library Options

1. **In the Operator screen, press the Configure Options button.**

   The Config.: Options screen is displayed (FIGURE A-8).

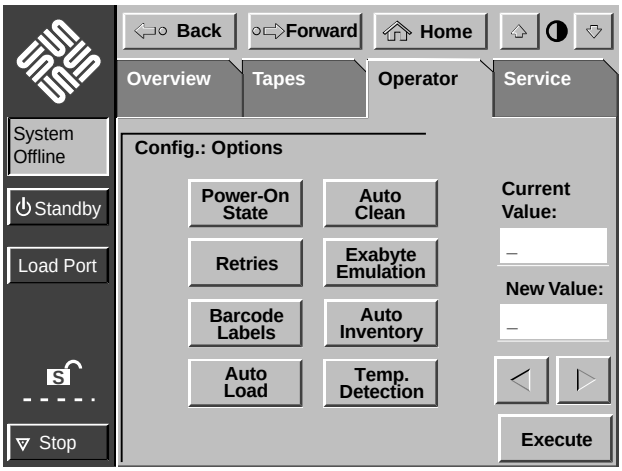


FIGURE A-8 Config.: Options Screen

2. **Using the Up and Down Arrow buttons, select the item you wish to change.**
3. **Press the Select button.**

   Pressing Select toggles between available settings. The current setting is in bold.
4. **Repeat Steps 2 and 3 to change other library options.**

Move Cartridges

This command enables you to move any tape cartridge in the library to the destination element you specify. The destination can be a storage bin, a tape drive, the load port, or the gripper.

Note – To move a cartridge from a tape drive, you must first issue an Unload Drive command as explained later in this chapter.

▼ To Move a Cartridge

1. **In the Operator screen, press the Move Cartridges button.**

   The Move Cartridges screen is displayed (FIGURE A-9).

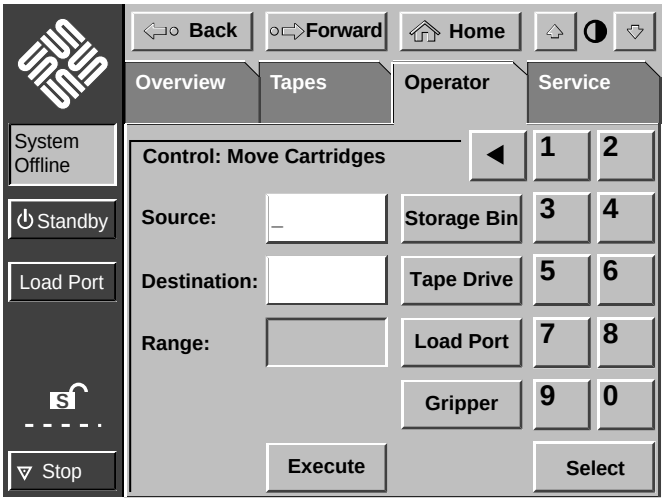


FIGURE A-9 Move Cartridge Screen

2. **Identify the source element (that is, the element with the tape cartridge to be moved):**

   a. **Press the appropriate element type button (Storage Bin, Tape Drive, Load Port, or Gripper).**

      When you press an element type button, the range of addresses is displayed in the Range display.

   b. **Using the keypad, enter the address for the source element**

      The source information is displayed in the Source input field.

   c. **When you have finished entering the address, press the Destination input field.**

      The Destination input field becomes active.

3. **Select a destination for the cartridge:**

   a. **Press the appropriate element type button (Storage Bin, Tape Drive, Load Port, or Gripper).**

      When you press an element type button, the range of addresses is displayed in the Range display.

   b. **Using the keypad, enter the address for the destination element.**

      The destination information is displayed in the Destination input field.

   c. **When you have finished entering the address, press the Execute button.**

      This initiates the move command from the source element to the destination element. An "In Progress" dialog box is displayed.

      The dialog box remains on the screen until the move is completed, aborted by pressing the ABORT button, or stopped due to an error condition.

Inventory Tapes

This command identifies all tape cartridges in the library by bar code label and determines their location. Elements that are empty or that contain unlabeled cartridges are marked as such.

▼ To Perform an Inventory

- **Press the Inventory Tapes button in the Operator screen.**

  An "In Progress" screen is displayed.

  The dialog box remains on the screen until the inventory is completed, aborted by pressing the ABORT button, or stopped due to an error condition.

Calibrate Library

This command enables you to calibrate the storage bins, the tape drives, the load port, or the entire library. The library should be calibrated during initial installation and after any maintenance procedure.

▼ To Calibrate Library Elements

1. **In the Operator page, press the Calibrate Library button.**

   The Calibrate Library screen is displayed (FIGURE A-10).

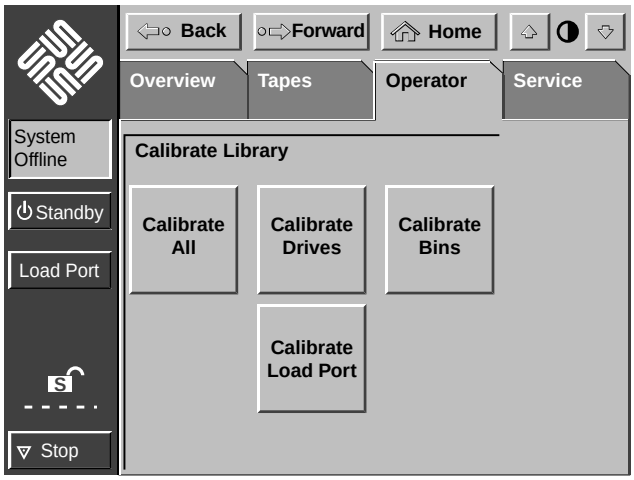


FIGURE A-10 Calibrate Library Screen

2. **Press the button with the desired calibration option.**

   This initiates the calibration command. An “In Progress” dialog box is displayed.

   The dialog box remains on the screen until the calibration is completed, aborted by pressing the ABORT button, or stopped due to an error condition.

Exercise Library

This command tests library robotics and calibration by randomly moving tape cartridges from one element to another.

▼ To Exercise Library Elements

- **Press the Exercise Library button in the Operator screen.**

  An “In Progress” dialog box is displayed.

  The exercise process runs continuously until you stop the process by pressing the ABORT button. The exercise process is also stopped if an error is detected.

Unload Drives

This command prepares a tape cartridge to be ejected from a drive by disengaging the tape from the read/write heads and rewinding it. After unloading the drive, you can eject and remove the tape cartridge using the Move Cartridge command described earlier in this chapter.

▼ To Unload a Drive

1. **In the Operator screen, press the Unload Drive button.**

   The Unload Drive screen is displayed (Figure A-11).

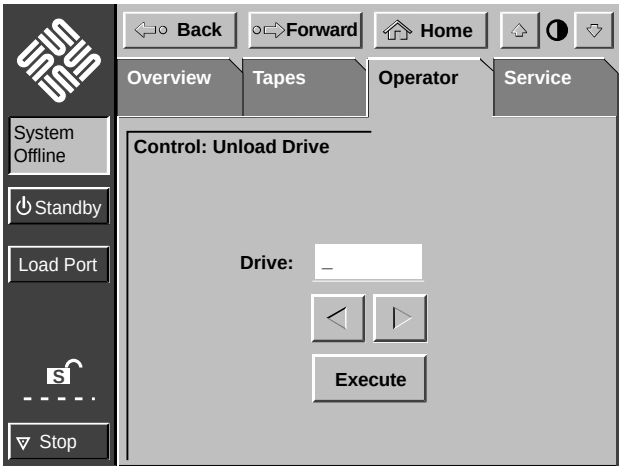


FIGURE A-11 Unload Drives Screen

2. **Use the Left and Right Arrow buttons to select the desired tape drive.**

3. **Press the Execute button.**

   This initiates the unload drive operation. An “In Progress” dialog box is displayed.

   The dialog box remains on the screen until the unload operation is completed, aborted by pressing the ABORT button, or stopped due to an error condition.

Unload the Load Port

This command moves a tape cartridge from the load port to an available storage bin. It must be invoked after inserting one or more tape cartridges into the load port whenever the library’s auto load feature is disabled.

Note – You can also use the Move command (described earlier in this chapter) to unload the load port. The Move command is especially useful if the destination of the move needs to be specified.

▼ To Unload the Load Port

- **Press the Unload Imp/Exp button in the Operator screen.**

  An “In Progress” dialog box is displayed.

  The dialog box remains on the screen until the move is completed, aborted by pressing the ABORT button, or stopped due to an error condition.

Service Screen

The Service screen enables you to generate on-screen reports about the following:

- Actuator positions and status
- Auto clean status and tracking information
- Statistics regarding library operation
- System test results

Statistics

This command displays a statistics report (FIGURE A-12).

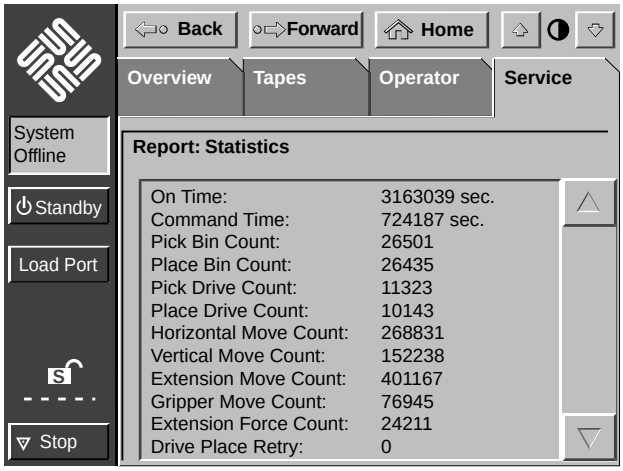


FIGURE A-12 Statistics Screen

Actuator

This command displays the current actuator position and status (FIGURE A-13).

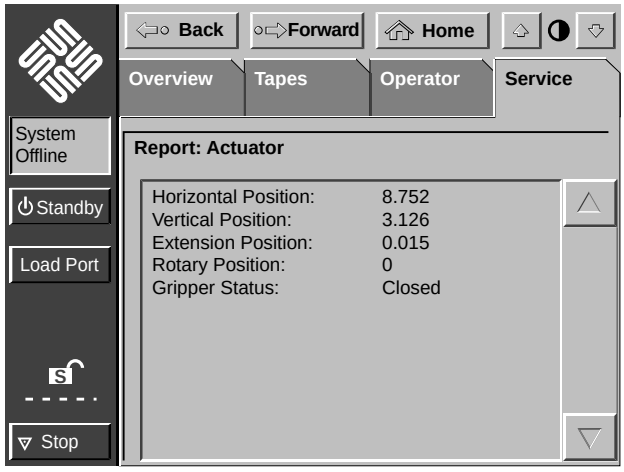


FIGURE A-13 Actuator Status Screen

Systest Library Results

This command displays the results of library tests (FIGURE A-14).

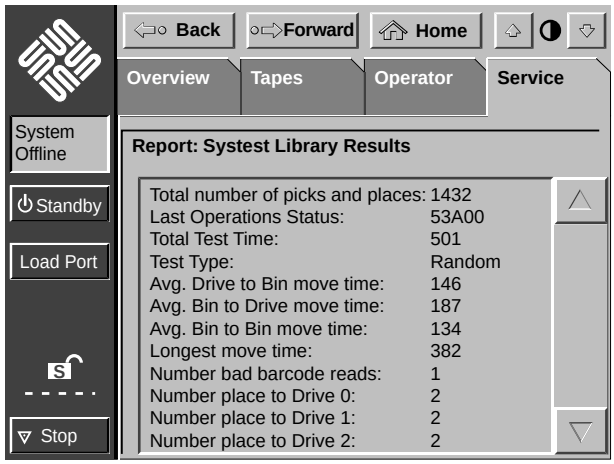


FIGURE A-14 Systest Library Results Screen

Systest Library

The Systest Library command is used to test the library (FIGURE A-15).

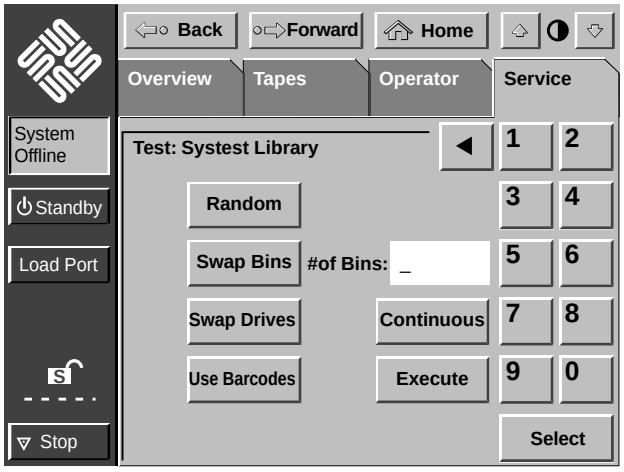


FIGURE A-15 Systest Library Screen

▼ To Test Library Operation

1. **Press the Systest Library button on the Service screen.**

   The Systest Library screen is displayed.

2. **Select which bins and/or drives to test:**

   - To test storage bins only, press the Swap Bins button. You can then use the keypad and Select button to specify the number of bins to test. If you press Select without entering a number, all bins are tested.
   - To test drives only, press the Swap Drives button.
   - To test both bins and drives, press both the Swap Bins and Swap Drives buttons.

3. **Select the desired test options:**

   - To swap cartridges at random, press the Random button. (If this button is not pressed, cartridges are swapped sequentially from the first bin or drive.
   - To have the library read the bar code as it swaps a cartridge, press the Use Barcodes button.
   - To have the test repeat continually until aborted, press the Continuous button. (If this button is not pressed, the test runs one time and then stops.

4. **Press the Execute button to begin the test.**

   The test continues until completed or until the Abort button is pressed. If you pressed the Continuous button, you must press Abort to stop the test.

Operate Axes

Operate Axes consists of a series of tests (TABLE A-2) that can be performed on any of the following axes:

- Horizontal axis
- Vertical axis
- Gripper
- Drive door
- Load port

TABLE A-2 Operate Axes Tests

Test	Description
Selftest	Checks the sensors and basic operation of the selected axis.
Home	Causes the selected axis to find the home position.
Move to	Causes the selected axis to move to an assigned position.
Exercise	Performs operations involving the selected axis.

▼ To Operate an Axis

1. **Press the Operate Axes button on the Service screen. The Operate Axes screen is displayed.** (FIGURE A-16)

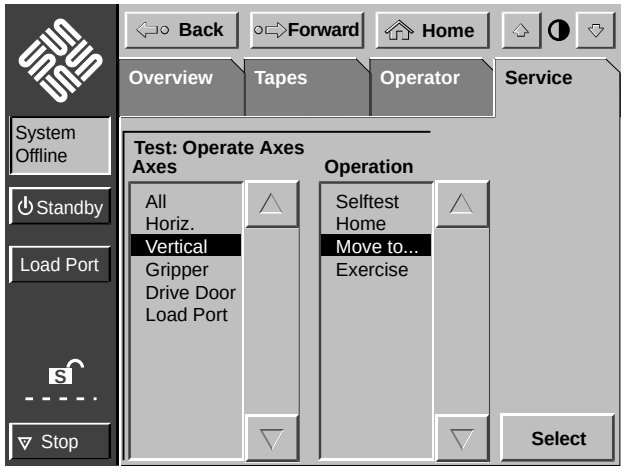


FIGURE A-16 Operate Axes Screen

2. **Use the up and down arrows to select the axis and test options.**

3. **Press the Select button.**

   If you selected the Move To option, the Move To screen is displayed for you to specify the destination of the move. Select an element type to move to and specify the position in inches from home for the destination. Press Select to start the move.

Initialize Nonvol Statistics

This command purges NVRAM of all statistical information about library operation (the information reported with Statistics on the Service screen).

Initialize Nonvol Config

This command returns the library configuration to the factory defaults, negating any changes made using Configure Library and Configure Options on the Operator screen.

Change Password

This command is used to change the operator password or service password. Passwords must be four to eight numbers in length.

APPENDIX **B**

Sense Data Values

TABLE B-1 lists message information that can be sent from the ETL 7/3500 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:

LU	=	logical unit
REQ'D	=	required
DEV	=	device
Dia	=	diagnostics
NVRAM	=	nonvolatile RAM
A/D	=	analog-to-digital

TABLE B-1 Sense Data Values (Hexadecimal)

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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 *Sun ETL 7/3500 Software Interface Guide.*	SCSI
5	21	01	INVALID ELEMENT ADDRESS Check Mode Sense data for correct element addresses.	SCSI

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	24	00	INVALID FIELD IN COMMAND DATA BLOCK Ensure all reserve fields are set to zero.	SCSI
5	25	00	LOGICAL UNIT IS NOT SUPPORTED Verify the logical unit field specified in the command contains a legitimate logical unit number. Check cabling to logical unit.	SCSI
5	26	00	INVALID FIELD IN PARAMETER LIST Verify Mode Select page fields.Verify that fields comply with the command format described in the Sun *ETL 7/3500 Software Interface Guide.*	SCSI
5	26	02	PARAMETER VALUE INVALID Verify Mode Select page fields. Verify that fields comply with the command format described in the Sun *ETL 7/3500 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.	Both
6	28	01	IMPORT OR EXPORT ELEMENT ACCESSED Load port door has been closed.	Both
6	29	00	POWER-ON, RESET OR BUS DEV. RESET OCCURRED 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.	Both
6	2A	01	MODE PARAMETERS CHANGED Mode parameters may have changed due to another host issuing a Mode Select command.	SCSI

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

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 A cleaning cartridge cannot be removed from a drive because it is being used in a cleaning operation. A cartridge cannot be placed into the drive because the drive is being cleaned. 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.	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 Sun *ETL 7/3500 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

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

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 Time-out occurred when 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

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	4E	00	OVERLAPPED COMMANDS ATTEMPTED Second command was sent when previous had not completed. This may also occur when executing offline commands via the control panel and Diagnostic Port simultaneously.	Both
5	53	02	MEDIUM REMOVAL PREVENTED Prevent Medium Removal command was executed and command was received to export cartridge. Execute Allow Medium Removal command and retry move medium command.	SCSI
6	54	00	SCSI TO HOST SYSTEM INTERFACE FAILURE Possible SCSI bus time-out or premature disconnect. Check cable connections and cable length.	SCSI
2	5A	01	OPERATOR MEDIUM REMOVAL REQUEST 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. The load port door is open, so import/export elements can not be accessed.	Both
2	80	00	DOOR IS OPENED INVENTORY MAY HAVE BEEN CORRUPTED Close door and retry command. If the system is ONLINE, it executes its initialization procedure.	Both
6	80	00	DOOR WAS OPENED INVENTORY MAY HAVE BEEN CORRUPTED Close door and retry command.	Both

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	80	01	TRANSFER FULL - COMMAND CAN NOT BE EXECUTED Gripper has cartridge in it. Move cartridge to empty storage element using Move Medium command. Retry command.	Both
B	80	01	TRANSFER FULL - AT END OF PLACE 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.	Both
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 offline.	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 online.	SCSI

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
6	80	09	LOGICAL UNIT STANDBY BUTTON WAS PRESSED Retry command.	SCSI
B	80	10	LOAD RETRY FAILED Library 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	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

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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
4	81	50	BACK CASSETTE IN GRIPPER SENSOR IS BLOCKED, BUT FRONT SENSOR IS CLEAR 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.	Both
B	81	51	UNABLE TO PICK CARTRIDGE Cartridge was sensed in front gripper sensor, but was unable to seat cartridge in the back gripper sensor. Check that gripper sensors are working and/or that tape was ejected far enough.	Both

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	81	53	GRIPPER CURRENT FAIL Gripper motor driver failed or operating out of specifications. Replace actuator driver board.	Both
4	81	54	GRIPPER TPU REGISTER FAILURE Replace Robotic Controller Board.	Both
4	81	55	GRIPPER TPU RAM FAILURE Replace Robotic Controller Board.	Both
B	83	01	EXTENSION TIMEOUT Extension axis did not reach desired position. Retry command. If failure repeats, use Diagnostic Software to run extension self-test.	Both
4	83	02	EXTENSION CURRENT FEEDBACK FAILURE Extension axis collided with obstruction. Determine cause of obstruction. Calibrate the system. Lubricate the rail.	Both
4	83	03	EXTENSION MECHANICAL POSITION ERROR Extension axis was unable to move to commanded position. Retry command. If failure repeats, run extension self-test.	Both
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

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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
4	84	03	VERTICAL MECHANICAL POSITION ERROR Vertical axis did not reach desired position. Retry command. If failure repeats, run vertical self-test.	Both

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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
4	84	30	VERTICAL MAPPING FAILURE Scanner was unable to detect vertical target during calibration.	Both

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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
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^{o}F).	Both
4	88	01	MAXIMUM TEMPERATURE EXCEEDED Library turns off and remains off until the temperature returns to an acceptable level (59-90^{o}F).	Both

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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
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

TABLE B-1 Sense Data Values (Hexadecimal) *(Continued)*

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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
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

actuators Robotic components that move inside the library to manipulate cartridges. These include the cartridge handling mechanism, extension axis, vertical and horizontal axes.

automated tape library A robotic storage and retrieval system for DLT tape cartridges.

bar code label The identification label on DLT tape 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.

CHM Cartridge handling mechanism

DLT Digital linear tape

control panel A touch-screen panel on the front of the library that contains a main display area as well as indicators and control buttons.

EIA/TIA-574 A serial communications cabling and protocol standard for nine pin connectors, sometimes referred to as RS-232. The diagnostic port (DIAG), on the rear of the library, uses this protocol.

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.

FSA Fixed storage array. This is a 4-column by 24-row fixture mounted inside the library. Its purpose is to store up to 96 cartridges in the library.

FSE	Field service engineer
gripper assembly	The assembly that mounts on the extension axis and grips cartridges, referred to as the CHM or 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 operator accessible component of the library that allows up to four cartridges to be import/export loaded and unloaded into/from the library.
MTBF	Mean time between failures
MTTR	Mean time to repair
NVRAM	Nonvolatile RAM
offline	Not ready for communications with a host. This mode is required for configuration, diagnostic, and maintenance operations.
online	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 AC power switch, AC power receptacle 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 cartridge.
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 the vertical rails and all components mounted on the crossbar.

ZIF connector Zero insertion force connector

Index

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

X

Y