

Sun™ StorEdge™ L1000 Service Manual



THE NETWORK IS THE COMPUTER™

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Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Department of Communications (DOC) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted-pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

DOC Class A Notice - Avis DOC, Classe A

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

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

VCCI 基準について

第一種 VCCI 基準について

第一種VCCIの表示があるワークステーションおよびオプション製品は、第一種情報装置です。これらの製品には、下記の項目が該当します。

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取り扱い説明書に従って正しくお取り扱いください。

CISPR-22 Warning!

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

Achtung!

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

Attention!

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

Notice for USA and Canada Only

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

Plug Cap	Parallel blade with ground pin (NEMA 5-15P configuration)
Cord	Type: SJT, three 1.5 mm ² (16 AWG) or 1.0 mm ² (18 AWG) wires
Length	Maximum: 4.5m (15 feet)
Rating	Minimum: 10 A, 125 V

Attention

LIRE LA REMARQUE DANS LE MODE D'EMPLOI.

Remarque

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

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

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

Fiche	Broches parallèles avec une broche de mise à la terre (configuration NEMA 5-15P)
Cordon	Type: SJT, trifilaire 1.5 mm ² (16 AWG) ou 1.0 mm ² (18 AWG)
Longeur	Maximum: 4.5m (15 pieds)
Capacité	Minimum: 10 A, 125 V

Zu Ihrer Sicherheit

Vorsicht

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

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

Achtung

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

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

Zur besonderen Beachtung

Zur Sicherheit

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

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

Zur Aufstellung

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

Zur Reinigung

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

LITHIUM BATTERY STATEMENT

CAUTION - The Dallas Semiconductor DS1225AB-200 component on the robotic controller board inside this product contains a Lithium battery. Lithium is a hazardous material that must be disposed of in accordance with local, state, and federal laws.

FORSIGTIG - Båndbiblioteket indeholder et lithiumbatteri. Halvleder DS1225AB-200 på robotkontrolltavlen indeholder et lithiumbatteri. Lithium kan anses for at være et sundhedsfarligt materiale. Kassér dette batteri i overensstemmelse med lokale og nationale lovbestemmelser.

HUOMAUTUS - Nauhakirjastossa on litiumparisto. Robottiohjainkortin Dallas DS1225AB-200-puolijohteessa on litiumparisto. Litium voidaan luokitella vaaralliseksi aineeksi. Pariston hävittämisessä on noudatettava viranomaisten antamia ohjeita ja määräyksiä.

ATTENTION - La bibliothèque de bande contient une pile au lithium. Le Dallas Semiconductor DS1225AB-200 sur la carte robotique contrôleur contient une pile au lithium. Le lithium est un matériel dangereux. Jeter cette pile conformément aux lois locales, d'état et fédérales.

ACHTUNG! - Die Bandbibliothek enthält eine Lithiumbatterie. Der Halbleiter Dallas DS1225AB-200 auf dem Roboter-Controller enthält eine Lithiumbatterie. Lithium gilt als Schadstoff. Bei der Entsorgung dieser Batterie alle entsprechenden kommunalen, staatlichen und bundesweiten Vorschriften beachten!

ATTENZIONE - La libreria a nastro magnetico contiene una batteria al litio. Il semiconduttore Dallas DS1225AB-200 sulla scheda controller robotico contiene una batteria al litio. Il litio può essere considerato un materiale pericoloso. Eliminare queste batterie in conformità alle normative locali e statali vigenti.

FORSIKTIG - Kassetbiblioteket inneholder et litiumbatteri. Enheten Dallas Semiconductor DS1225AB-200 på robotkontrollkortet inneholder et litiumbatteri. Litium kan anses som et farlig materiale. Batteriet skal kastes i henhold til lokal og nasjonal lovgivning.

PRECAUCIÓN - La biblioteca de cintas contiene una pila de litio. El semiconductor Dallas DS1225AB-200 en el tablero controlador robotico contiene una pila de litio. El litio es un material peligroso. Deseche esta pila de acuerdo con las leyes municipales, estatales y federales.

VARNING! - Magnetbandsbiblioteket innehåller ett litiumbatteri. Dallas halvledare DS1225AB-200 på robotstyrkortet innehåller ett litiumbatteri. Litium kan anses vara ett farligt material. Kassera detta batteri i enlighet med lokala och statliga lagar och förordningar.

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Preface

This document is provided for field service engineers (FSEs) of the Sun™ StorEdge™ L1000 series automated tape library. It describes the library and the maintenance procedures required to keep the library operating at optimal performance.

How This Book Is Organized

This document includes the following:

- **Chapter 1, “Library Description,”** describes and illustrates the ten major components of the L1000 library.
- **Chapter 2, “Security Levels and Passwords,”** describes library control panel security levels and password protection.
- **Chapter 3, “Control Panel Service Screen,”** describes the control panel service screen.
- **Chapter 4, “Service Tools and Preventive Maintenance,”** describes the recommended preventive maintenance schedule and procedures.
- **Chapter 5, “Fault Isolation,”** provides fault isolation tables to assist FSEs in determining root cause of library failures.
- **Chapter 6, “FRU Removal and Replacement Procedures,”** provides detailed instructions on removing, and replacing each field-replaceable unit (FRU).
- **Chapter 7, “Diagnostic Software,”** describes the L1000 diagnostic software installation and operation.
- **Appendix A, “Library Specifications,”** lists the L1000 specifications.
- **Appendix B, “Block Diagram,”** provides the L1000 physical block diagram.
- **Appendix C, “FRU List,”** is a list of L1000 field replaceable units.
- **Appendix D, “Sense Data Values,”** is a list of all error and message information that can be sent from an L1000 to a host computer.

Using UNIX Commands

This document may not contain information on basic UNIX[®] commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris 2.x Handbook for SMCC Peripherals*
- AnswerBook[™] online documentation for the Solaris[™] 2.x software environment
- Other software documentation that you received with your system

Typographic Conventions

The following typographic conventions are used in this manual:

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output.	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
AaBbCc123	What you type, when contrasted with on-screen computer output.	% su Password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized. Command-line variable; replace with a real name or value.	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be <code>root</code> to do this. To delete a file, type <code>rm filename</code> .

- Notes provide information related to the main topic that requires special emphasis.

Note – This is an example of a note.

- There are three types of caution statements:



Caution – An “exclamation point” symbol is used with a caution statement to indicate a risk of personal injury from a nonelectrical hazard, or risk of irreversible damage to data, software, or the operating system.



Caution – A “lightening bolt” symbol is used with a caution statement when there is danger of physical harm to a person or damage to equipment due to an electrical hazard.



Caution – A “heat symbol” is used with a caution statement when there is a risk of personal injury from a heat source.

- References to the left or right side of the library correspond to your left or right as you face the front of the library. Other references to left or right (for example, the upper left corner of rear panel) correspond to your left or right as you face the indicated component or area.
- The following specialized acronyms and abbreviations appear in this manual:
 - A/D—analog-to-digital
 - ASC—additional sense code
 - ASCQ—additional sense code qualifier
 - CFM—cubic feet per minute
 - FSE—field service engineer
 - FRU—field-replaceable unit
 - LU—logical unit
 - NVRAM—nonvolatile RAM
 - PWA—printed wiring assembly

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	<i>machine_name%</i>
C shell superuser	<i>machine_name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

Related Documentation

TABLE P-3 Related Documentation

Application	Title	Part Number
Unpacking	<i>L1000 Series Library Unpacking Instructions</i>	805-4822-10
User's Guide	<i>L1000 Series Library User's Guide</i>	805-4823-10

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TABLE P-4 SunExpress Contact Information

Country	Telephone	Fax
Belgium	02-720-09-09	02-725-88-50
Canada	1-800-873-7869	1-800-944-0661
France	0800-90-61-57	0800-90-61-58
Germany	01-30-81-61-91	01-30-81-61-92
Holland	06-022-34-45	06-022-34-46
Japan	0120-33-9096	0120-33-9097
Luxembourg	32-2-720-09-09	32-2-725-88-50
Sweden	020-79-57-26	020-79-57-27
Switzerland	0800-55-19-26	0800-55-19-27
United Kingdom	0800-89-88-88	0800-89-88-87
United States	1-800-873-7869	1-800-944-0661

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Library Description

The Sun StorEdge L1000 automated tape library stores up to 30 Digital Linear Tape (DLT™) cartridges and holds up to four DLT tape drives. The library accommodates DLTtapeIII or DLTtapeIV cartridges and DLT7000 tape drives.

The StorEdge L1000 is available as a stand-alone unit (Figure 1-1 and Figure 1-2) or in a rackmountable configuration (Figure 1-3).

The library is controlled by a host computer via a SCSI differential bus using the SCSI-2 medium changer command set. There is also an RS-232 diagnostic port interface.

There are ten major components of the StorEdge L1000:

- Cabinet
- Power supply
- Control electronics
- Robotics
- Storage array
- Load port
- Cooling fans
- Control panel
- Rear panel
- Tape drives

A detailed description of these components begins on page 1-4.

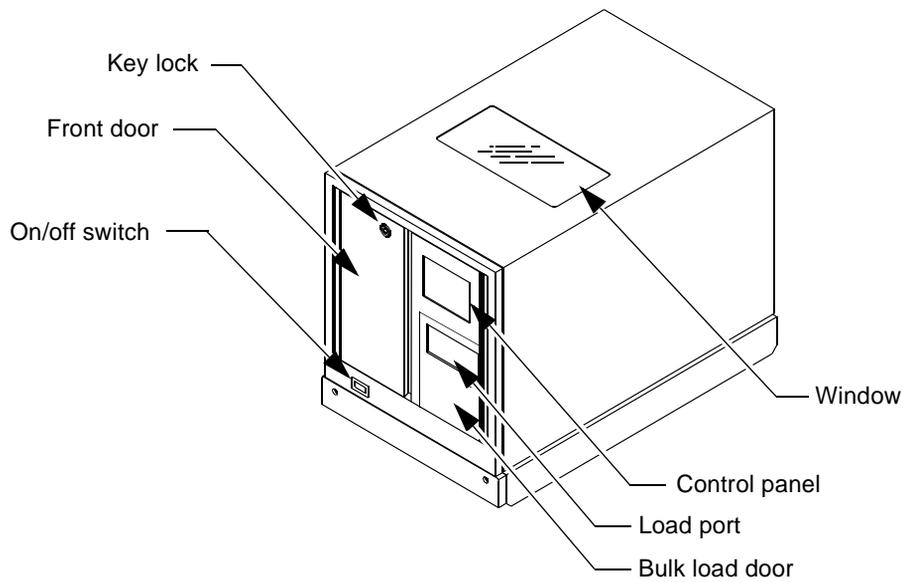


FIGURE 1-1 StorEdge L1000 (Front View)

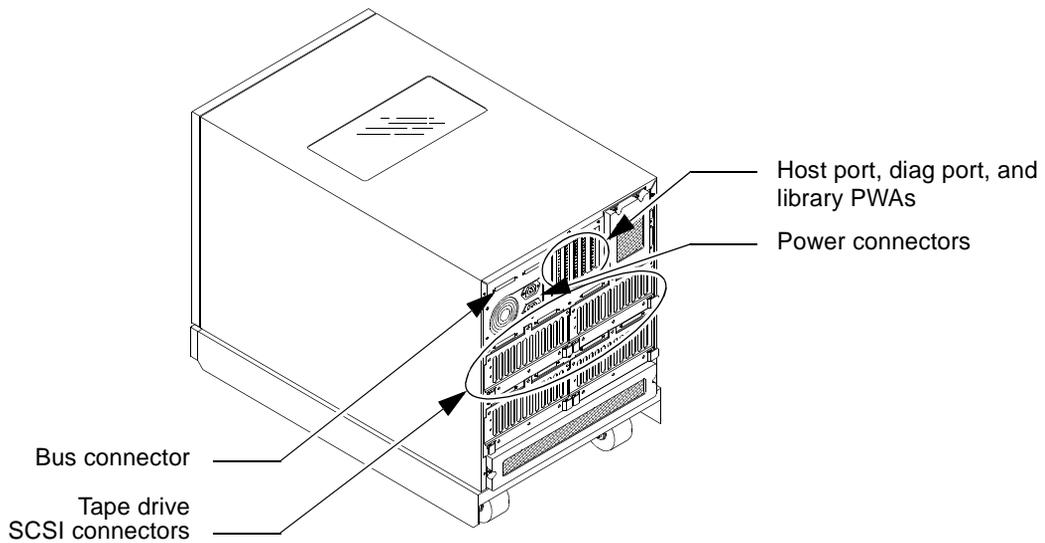


FIGURE 1-2 StorEdge L1000 (Rear View)

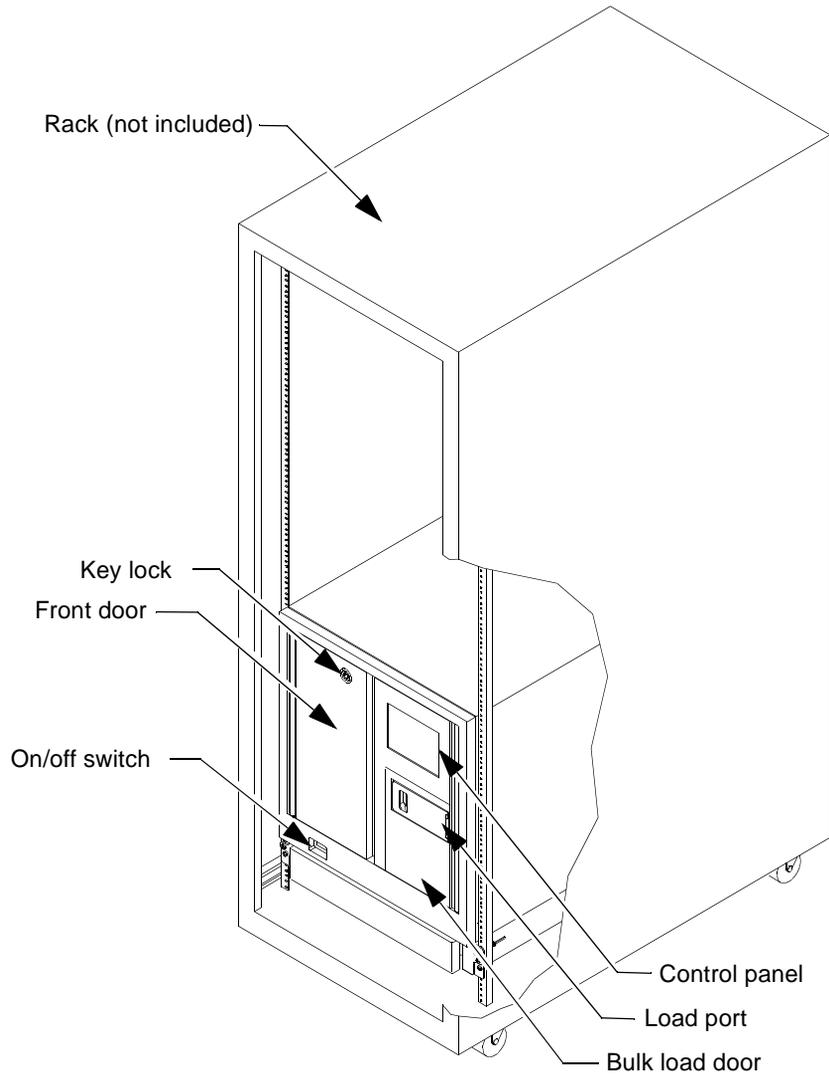


FIGURE 1-3 StorEdge L1000 (Rackmounted)

1.1 StorEdge L1000 Cabinet

The library cabinet dimensions are:

- 17.3 in. wide (43.8 cm)
- 19.8 in. high (50.3 cm)
- 28.5 in. deep (72.1 cm)
- 101 lb (46 kg) stand-alone unit without cartridges
- 89 lb (41 kg) rackmount unit without cartridges

The cabinet houses the power supply, control electronics, robotics, storage array, load port, cooling fans, control panel, rear panel, and tape drives.

The top and sides of the library form a single enclosure that is easily removed (see Figure 6-2) to gain access to internal components.

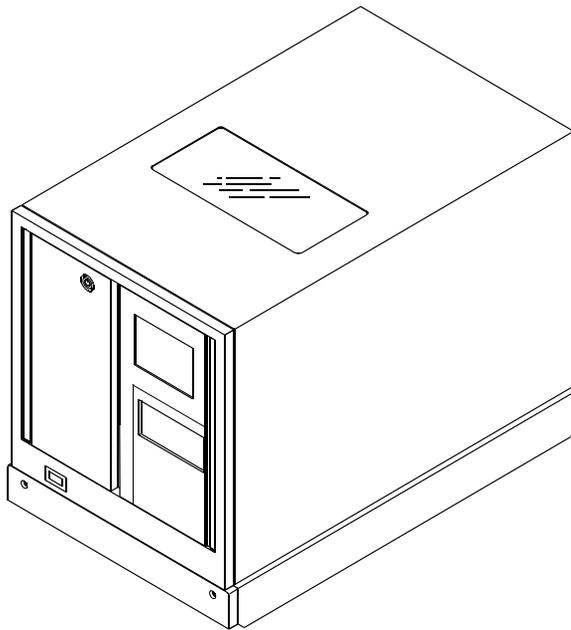


FIGURE 1-4 StorEdge L1000 Cabinet

1.2 Power Supply

The 300-watt power supply mounts in the top, right, rear corner of the library. It is auto-selectable for inputs of 115 to 230 VAC. It supplies outputs of +5 VDC, +12 VDC and -12 VDC. This single power supply provides DC voltage to power all electrical components of the library, including the tape drives.

The AC input receptacle for the power supply is accessible from the rear panel of the library.

The library on/off switch mounted in the bottom, left, front corner of the cabinet is cabled through terminal block TB4 to the power supply.

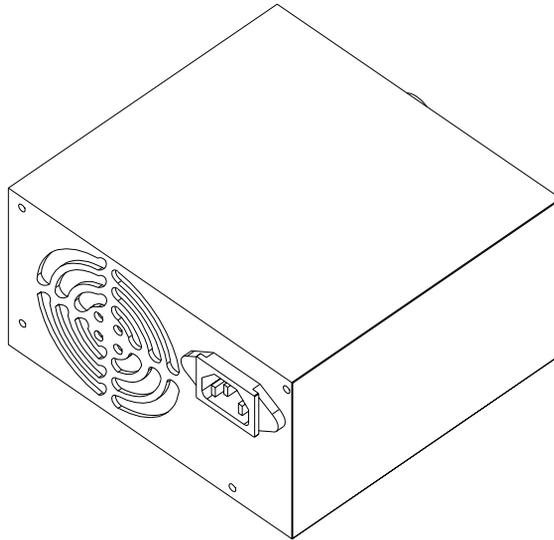


FIGURE 1-5 Power Supply

1.3 Control Electronics

The StorEdge L1000 library control electronics include:

- Passive backplane printed wiring assembly (PWA)
- Robotics controller PWA
- Actuator driver PWA
- SCSI controller PWA (differential)
- Y-axis encoder PWA
- X-motor interconnect PWA
- X-encoder PWA

Each PWA is described in the paragraphs below.

1.3.1 Passive Backplane PWA

The passive backplane PWA is mounted flat in the top, rear center of the cabinet. Its function is to provide power and receptacles for the robotics controller, actuator driver, and SCSI controller boards. This PWA also serves as an interconnect for cables that provide power and signals to all robotic components in the library.

There are four fuses on the passive backplane:

- F1 PN 0395036 1A-12 VDC
- F2 PN 0395113 15A+3.3 VDC (future use / currently no voltage is applied)
- F3 PN 0395113 15A+5 VDC
- F4 PN 0395035 2A+12 VDC

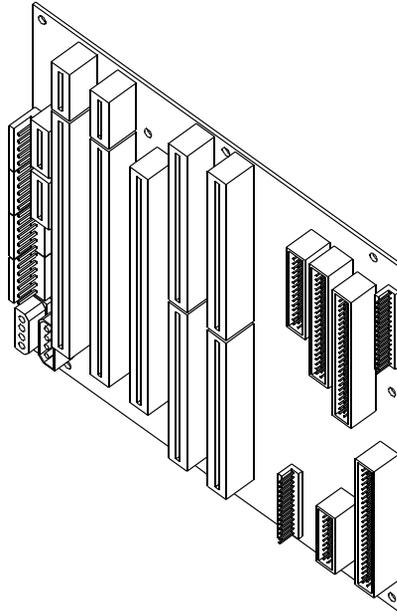


FIGURE 1-6 Passive Backplane

1.3.2 Robotics Controller PWA

The robotics controller PWA connects to J3 and J26 of the passive backplane. The robotics controller responds to commands from a host computer, such as controlling the library robotics movement of cartridges.

The following table lists the robotics controller major components and their functions.

TABLE 1-1 Robotics Controller PWA

Label	Description	Function
LED1	LED1	Indicates that the microprocessor firmware is running
J1	10-pin ribbon connector	For the background mode debugger port on the 68332 microprocessor
J2	9-pin D-sub connector	Auxiliary serial port used for development
J3	9-pin D-sub connector	Serial port used for diagnostics and software updates
J6	72-pin connector	For the single-in-line-memory-module that has on-board flash memory and static memory devices
S1	Micro-miniature push-button switch	Processor reset switch
U1	Motorola 68332 20 MHz microprocessor	132-pin embedded electronic controller
U2	Dallas 64K nonvolatile SRAM	Stores configuration, calibration, and SCSI ID information
U4	Dallas reset IC	Forces a reset of the microprocessor if an out-of-tolerance voltage conditions exists
U9	3.6864 MHz oscillator	Provides baud clock for DUART U10
U10	Microprocessor DUART	Dual RS-232 serial communications IC
U11	RS-232 Line Driver/Receiver	Transceiver between serial diagnostic interface connector J3 and DUART channel A
U12	RS-232 Line Driver/Receiver	Transceiver between serial diagnostic interface connector J2 and DUART channel B
U14	Xilinx 84-pin CPLD	For local microprocessor bus control
U17	Graphics display LCD controller	LCD controller
U18, 19, 44, 45, 48, & 49		8-bit high speed CMOS static RAM

TABLE 1-1 Robotics Controller PWA (Continued)

Label	Description	Function
U25	Xilinx 8-pin serial PROM	Programmable read-only memory
Y1	32.768 MHz crystal oscillator	Used by the 68332 microprocessor
Y2	25 MHz crystal oscillator	Used by the display controller U17

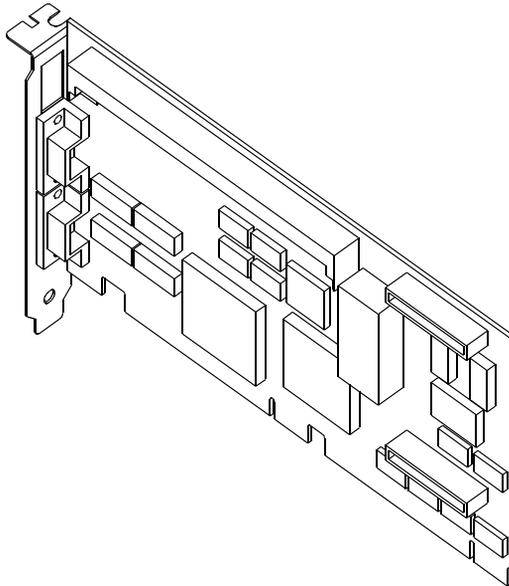


FIGURE 1-7 Robotics Controller

1.3.3 Actuator Driver PWA

The actuator driver PWA connects to J13 and J19 of the passive backplane. The actuator driver provides high current drive signals to the four motors in the library when commanded by the robotics controller.

The following table lists the actuator driver major components and their function.

TABLE 1-2 Actuator Driver PWA

Label	Description	Function
LED1	LED1	Indicates a motor power fault
LED2	Bicolor LED2	Indicates that servos are running and robotics are ready
U1	Xilinx 8-pin serial PROM	Used for configuration of U48 FPGA
U2, U3, U4	Quad 8-bit digital-to-analog converters	Used for current command signals to the motor drivers
U6	Octal bidirectional transceiver	Used for the tape drive interface
U10	Quad differential line driver	Used for the tape drive interface
U29	PWM controller	Used for the motor power DC/DC converter (+12V to +30V)
U39-U47	Stepper motor drivers	Used for extension and gripper motors
U48	Xilinx 240-pin FPGA	Used for servo and limit sensors, tape drive interface, motor drive current loop control, motor drive micro-step interface, position counters, bar code decoding, touch panel interface and decoding

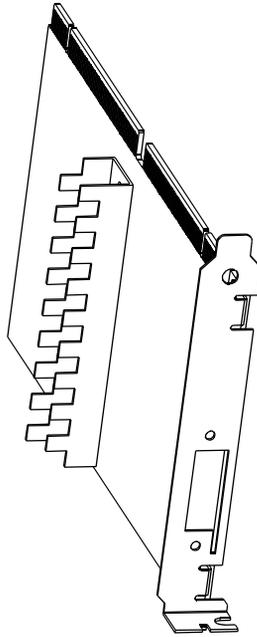


FIGURE 1-8 Actuator Driver

1.3.4 SCSI Controller PWA

The differential SCSI controller PWA connects to J9 of the passive backplane.

The differential SCSI controller is a PCI 2.1-compliant host bus adapter and supports synchronous fast and wide SCSI technology.

The StorEdge L1000 library and its tape drives operate using SCSI synchronous fast and wide (2-byte) communications with data transfer rates up to 20 Mbytes per second.

Table 1-3 defines some common SCSI terms.

TABLE 1-3 SCSI Terms

SCSI Term	Definition
SCSI	Small Computer System Interface - standard protocol for high speed data transfer between computers and peripherals.
Differential	An electrical signal configuration using a pair of lines for data transfer. The advantage of differential SCSI over single-ended SCSI is a relative higher tolerance for common-mode noise. Differential SCSI permits cable lengths between devices of up to 82 feet (25 meters).
Single-Ended	An electrical signal configuration using a single line for each signal, referenced to a ground path common to the other signal lines. The advantage of single-ended SCSI compared to differential SCSI is that half the number of ICs are required on the SCSI adapter board. The disadvantage of single-ended SCSI is higher vulnerability to common-mode noise and a 20 feet (6 meters) limit on cable length between devices.
Asynchronous Transmission	Each byte of data is synchronized individually by interlocking the REQ and ACK signals.
Synchronous Transmission	Timing protocol that uses a master clock. Sending and receiving devices can operate continuously at the same frequency.
Narrow	1-byte (8-bit) wide plus parity data interface
Wide	2-byte (16-bit) or 4-byte (32-bit) wide data interface
Slow	Transfer rates up to 5 Mbytes per second
Fast	Transfer rates above 5 Mbytes and below 10 Megabytes per second
Fast and wide (2-byte)	Transfer rates to 20 Mbytes per second

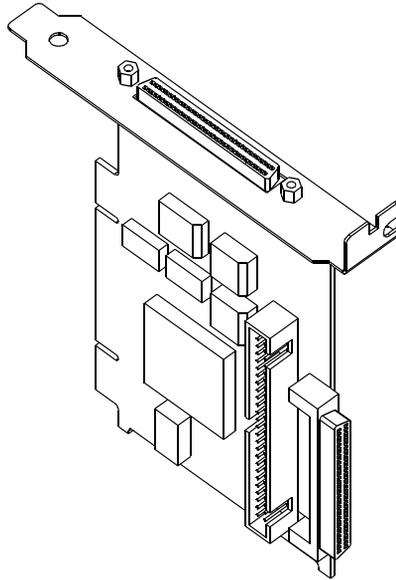


FIGURE 1-9 SCSI Controller

1.3.5 Y-Axis Encoder Interconnect PWA

The y-axis encoder PWA is mounted on a bracket on the right end of the horizontal chassis assembly. It has an optical sensor that reads notches in the y-encoder rail and sends pulses back to the robotics controller to identify the vertical position of the horizontal chassis assembly.

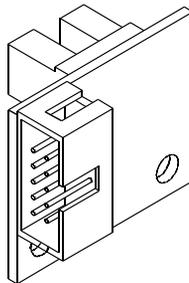


FIGURE 1-10 Y-Axis Encoder PWA

1.3.6 X-Motor Interconnect PWA

The x-motor interconnect PWA mounts on the right end of the horizontal chassis assembly. This PWA provides a cable interconnect point between the x-axis motor and the passive backplane PWA.

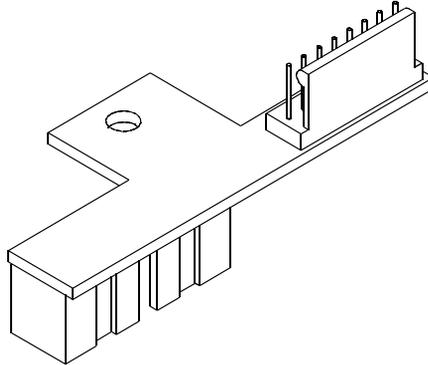


FIGURE 1-11 X-Motor Interconnect PWA

1.3.7 X-Encoder PWA

The x-encoder PWA is mounted on the x-chassis base. It has an optical sensor that reads notches in the x-encoder rail and sends pulses back to the robotics controller to identify the horizontal position of the extension/rotary assembly.

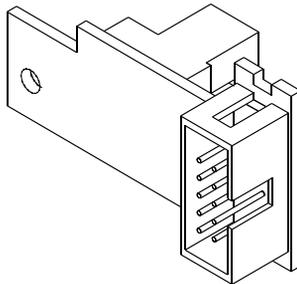


FIGURE 1-12 X-Encoder PWA

1.4 Robotics

The StorEdge L1000 robotics consists of the following four axes:

- Vertical (Y)
- Horizontal (X) / Rotary
- Extension
- Gripper

Each axis is described in detail below.

1.4.1 Vertical (Y) Axis

The vertical axis includes:

- 4.5 VDC, two-phase drive motor
- Primary rail - 17.21 in. (43.71 cm) steel shaft
- Secondary rail - 16.75 in. (42.54 cm) L-shaped steel rail
- Two 1/5 in. (0.508 cm) pitch, 3/8 in. (0.952 cm) wide, kevlar-reinforced drive belts

The function of the vertical axis is to move the horizontal chassis assembly up and down on the vertical rails. The horizontal chassis assembly is mounted on the primary vertical rail at the left side of the cabinet and the secondary vertical rail at the right side of the cabinet. Total available *vertical* travel of the horizontal chassis is approximately 11 in. (27.94 cm).

1.4.2 Horizontal (X) / Rotary Axis

The horizontal/rotary axis includes:

- 2.8 VDC, two-phase drive motor
- Horizontal rail - 16.18 in. (40.19 cm) steel shaft
- Rotary drum
- 1/5 in. (0.508 cm) pitch, 1/4 in. (0.635 cm) wide, kevlar-reinforced drive belt (also used by the rotary axis).

The horizontal/rotary axis has two functions:

1. Drive the extension/rotary assembly horizontally between the left and right sides of the cabinet. Total available *horizontal* travel of the extension/rotary assembly is approximately 9.75 in. (24.76 cm).
2. Rotate the extension/rotary assembly between the front and rear of the cabinet. Total available rotation is 180 degrees.

When the rotary drum is locked, movement of the x-axis belt will drive the extension axis horizontally between the left edge and right edge of the cabinet. When the rotary drum is unlocked, horizontal movement of the extension axis will be locked, and movement of the x-axis belt will drive rotation of the rotary drum, which spins the extension axis between the front and rear of the cabinet.

1.4.3 Extension Axis

The extension axis includes:

- 4.5 VDC, two-phase drive motor
- Extension *shaft* - 7.62 in. (19.35 cm) steel shaft
- Extension *rail* - 7.12 in. (18.08 cm) black delrin strip
- 0.0816 in. (0.207 cm) pitch, 3/16 in. (0.476 cm) wide, kevlar-reinforced belt

The function of the extension axis assembly is to move the gripper, mounted on the extension shaft and rail, into and out of storage slots and tape drives. The gripper moves *in* to retrieve or return a single cartridge and *out* to bring the cartridge onto the extension axis where it can be transported to a different storage element in the library. Total available extension axis travel is approximately 6 in. (15.24 cm).

1.4.4 Gripper

The gripper includes:

- 4.5 VDC, 2-phase drive motor
- Cam
- Upper jaw (movable)
- Lower jaws (stationary)

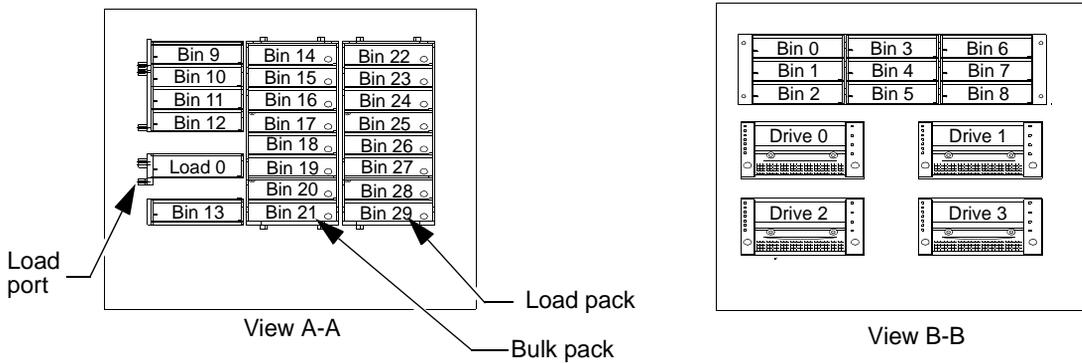
The function of the gripper is to grasp a single cartridge so that it can be moved to a new location within the library. This is accomplished by turning on the gripper motor, which spins the gripper cam. When the cam turns, the upper jaw moves to the closed position, securing the cartridge between the upper (movable) jaw and the lower (stationary) jaws. Once the cartridge has been gripped, the extension, rotary, horizontal, and vertical axes are all engaged to move the cartridge to its new location. When the new location is reached, the gripper motor is again turned on to open the upper jaw and release the cartridge into its new location.

1.5 Storage Array

The storage array includes:

- Front fixed storage bins (5 cartridges)
- Rear fixed storage bins (9 cartridges)
- Load pack (8 cartridges)
- Bulk pack (8 cartridges)

Figure 1-13 identifies storage locations and numbering conventions.



Note The load pack in View A-A (bins 22–29) can be configured for import/export. In this case, the bins are classified with the load port and numbered load 1–8.

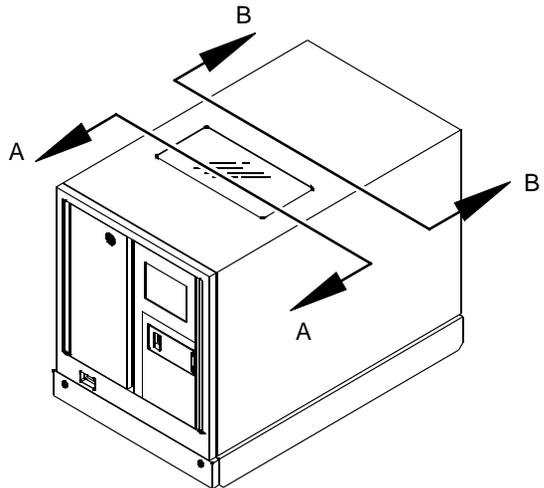


FIGURE 1-13 Bin Locations

1.6 Load Port

The load port is mounted under the control panel in the right front door assembly. It includes a microswitch that indicates when the load port door is closed.

The load port functions as a user interface, enabling you to remove a tape cartridge from the library or to add a new tape cartridge to the library. The load port is keyed to prevent the operator from improperly loading a cartridge.

1.7 Cooling Fans

There are up to seven cooling fans in a stand-alone library, and up to thirteen fans in a rackmounted library.

- Two 24 VDC, 90 CFM fans in the base of the cabinet
- One 24 VDC, 41 CFM fan at the top, left, rear corner of the cabinet
- One 24 VDC, 14 CFM fan is mounted on each (up to four) tape drive assembly
- Six 24 VDC, 14 CFM fans are mounted on the back of a rackmounted library

All fans on a stand-alone library are air intake fans. The 90 CFM and 41 CFM fans are field-replaceable units (FRUs). However, the 14 CFM fans mounted on each tape drive are not FRUs; if one of these fans is defective, the entire tape drive assembly must be replaced. The 14 CFM exhaust fans mounted on the back of a rackmounted library are field-replaceable.

1.8 Control Panel

The control panel is the operator interface of the StorEdge L1000 library and includes:

- Display panel
- Touch panel
- Control panel interface PWA

The display panel mounts between the control panel interface PWA and the touch panel, and the entire assembly is mounted in the right, front door. To replace the control panel replace the right, front door assembly.

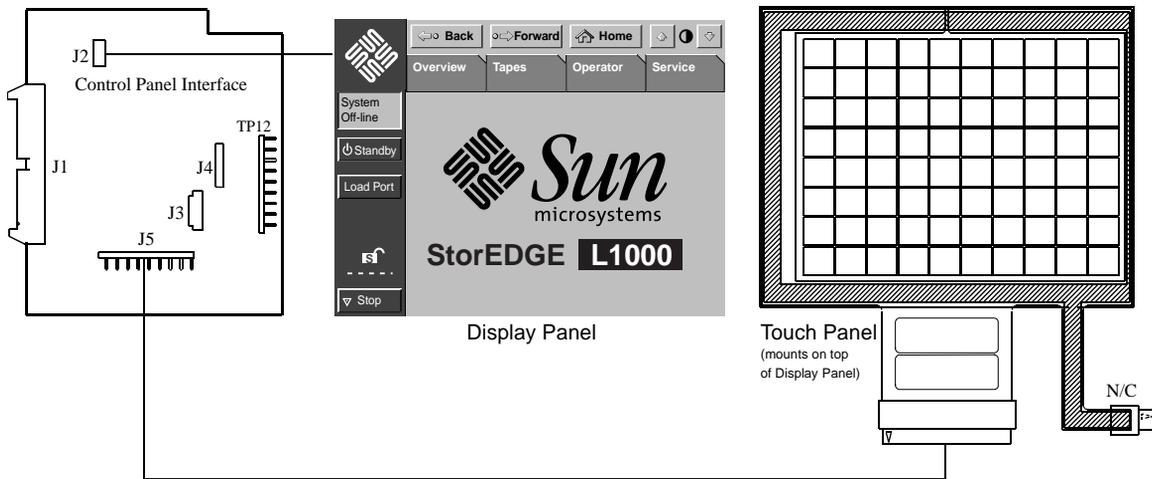


FIGURE 1-14 Control Panel Components

Figure 1-15 shows the initial control panel screen.

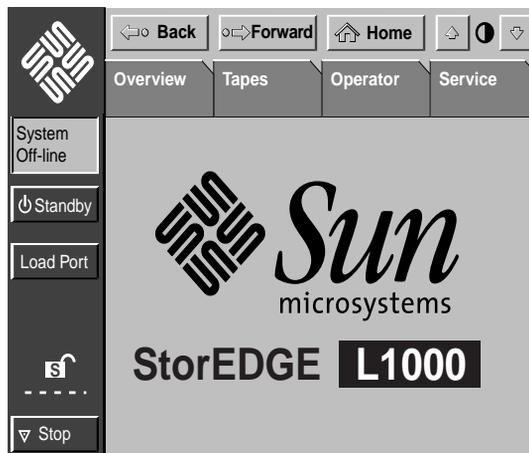


FIGURE 1-15 Initial Control Panel Screen

Operation of the **Service** menu commands is described in Chapter 3, "Control Panel Service Screen." For basic operation of the Control Panel and a detailed description of the **Overview**, **Tapes**, and **Operator** menu commands, see the *Sun StorEdge L1000 User's Guide (805-4823)*.

1.9 Rear Panel

The rear panel of the library includes:

- Communication interface ports
- RS-232 diagnostic port
- Power connectors
- Drive access (hot swap)

These components provide the library with operating power and communication links with external systems.

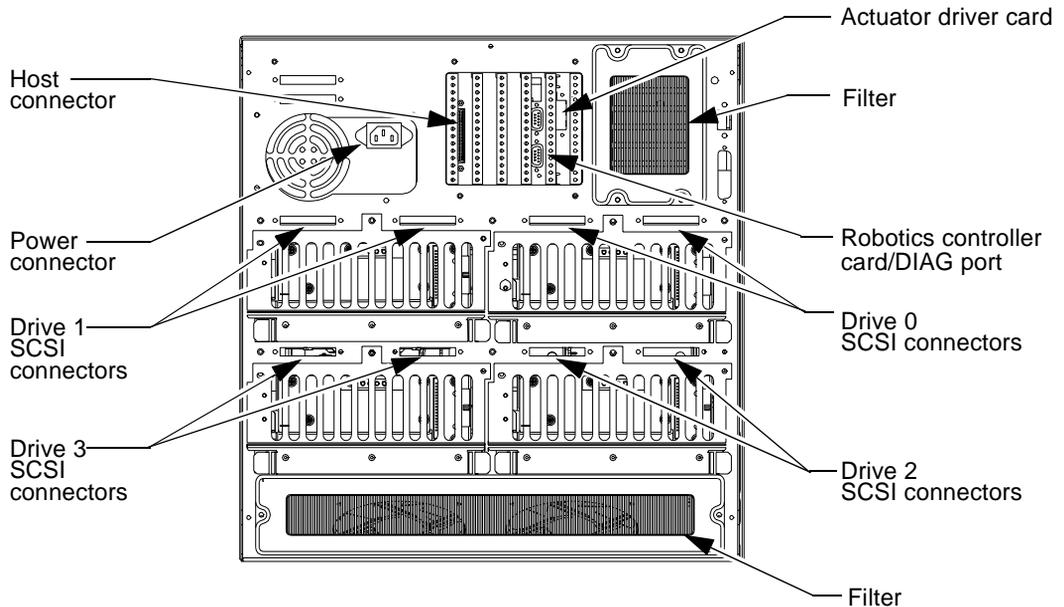


FIGURE 1-16 Rear Panel

The SCSI ports can be configured to provide up to five separate SCSI busses. Configuring with multiple SCSI busses improves the overall system performance by permitting concurrent operation of more than one SCSI device.

1.10 Tape Drives

The library can hold up to four DLT7000 tape drives. When fewer than four tape drives are installed, the tape drives must occupy consecutive drive bays beginning with drive bay 0 (top left position when looking into the library from the front).

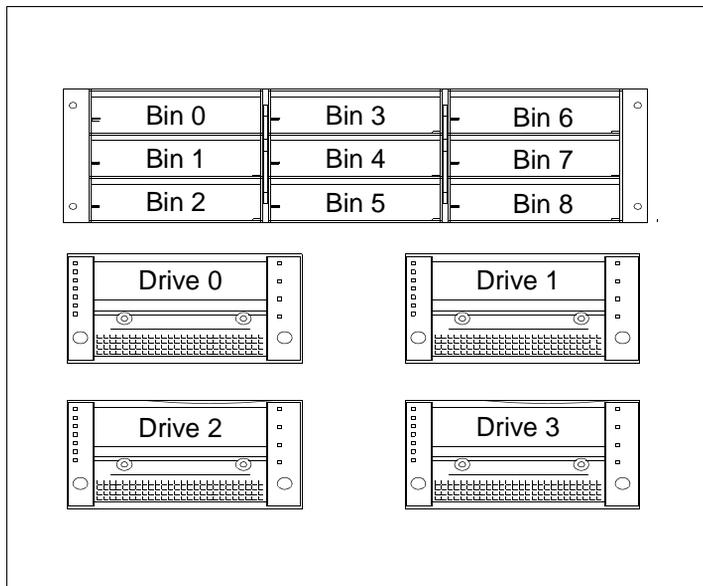


FIGURE 1-17 Tape Drive Numbering

Tape Drive specifications are shown in Table 1-4.

TABLE 1-4 Tape Drive Specifications

Model Number	Native Mode		With 2:1 Compression	
	Transfer Rate	Capacity	Transfer Rate	Capacity
DLT7000	5 MB/sec	35 GB	10 MB/sec	70 GB

1.10.1 Hot-Swap Feature

The L1000 permits the removal and replacement of tape drives without removing library power. A magnet is attached to the rear cover of each tape drive. Removal of the cover triggers a sensor which initiates a controlled, 50 msec power-down of the affected tape drive. This controlled power-down of the tape drive prevents voltage spikes on the power supply line which could effect other tape drives. The drive assembly can then be removed and replaced while the L1000 is continuing to function. When the rear cover is reinstalled the cover magnet initiates a controlled, 50 msec power-up of the tape drive which protects the power supply line in the same manner as the power-down sequence.

Security Levels and Passwords

This chapter describes:

- The control panel security levels
- The factory default control panel passwords
- Setting the control panel security level
- Changing the control panel passwords

2.1 Control Panel Security Levels

There are three levels of security on the L1000 control panel:

- User (U)
- Operator (O)
- Service (S)

The current security level is displayed with the single letter indicators U, O, or S inside the lock icon () on the control panel screen (see Figure 2-1).

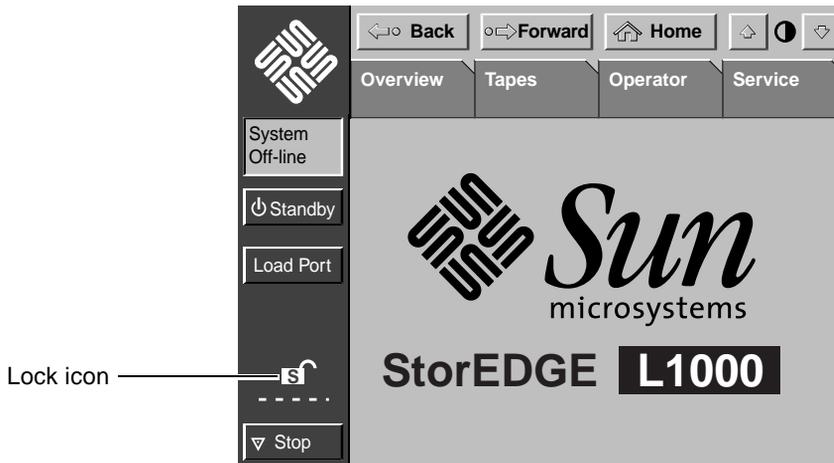


FIGURE 2-1 Main Menu Screen

Table 2-1 lists the security level required for each control panel screen.

TABLE 2-1 Control Panel Security Levels

Security Level	Lock Icon Indicator	Password Protected	Menu Access			
			Overview	Tapes	Operator	Service
User	U	No	Yes	Yes	No	No
Operator	O	Yes	Yes	Yes	Yes	No
Service	S	Yes	Yes	Yes	Yes	Yes

2.2 Control Panel Factory Default Passwords

- The factory default password for the Operator screen is 1234.
- The factory default password for the Service screen is 5678.

2.3 Setting the Control Panel Security Level

To set the current security level of the library:

1. **Touch the lock () icon.**

The following screen is displayed.

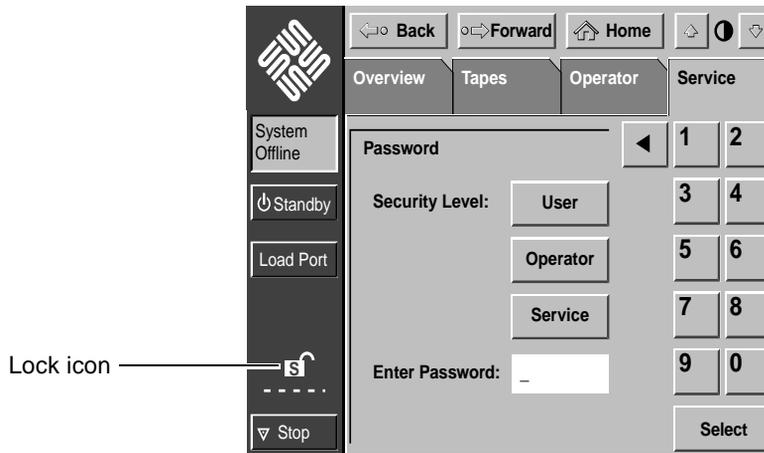


FIGURE 2-2 Setting the Security Level

2. **Touch the desired security level button (User, Operator, or Service).**
3. **Enter the appropriate password. (User level does not require a password.)**
4. **Touch Select. The following user message is displayed:**

New Security Level Has Been Set Successfully.

5. Touch OK.

The lock () icon now displays the single letter indicator (U, O, or S) of the new current level of security.

2.4 Changing the Control Panel Passwords

To change the Operator or Service password:

1. Touch the Service menu button.

The following screen is displayed.



FIGURE 2-3 Service Password Prompt

2. Enter the current Service password. (The factory default is 5678.)

3. Touch the Enter button.

The following screen is displayed.

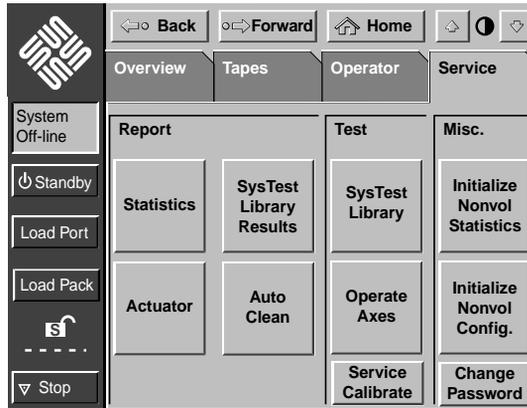


FIGURE 2-4 Service Screen

4. Touch the Change Password button.

The following screen is displayed.

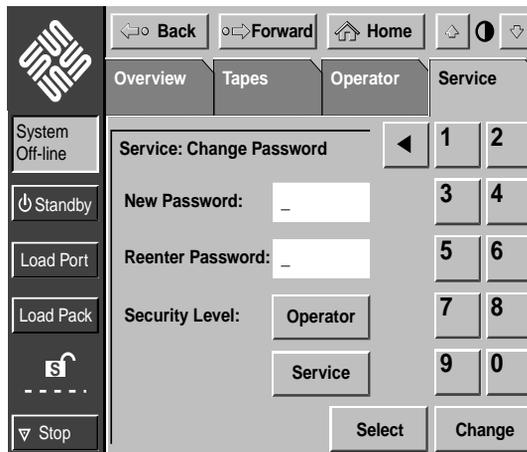


FIGURE 2-5 Change Password Screen

5. Enter the new password.

6. Touch the Select button.

7. Reenter the new password.

8. Touch the Operator or Service button.

This determines to which security level the new password will apply.

9. Touch the Change button. The following user message is displayed:

New Password Has Been Set Successfully.

10. Touch the OK button.

The new password is now effective.

2.4.1 Testing the New Password

1. Set the security level back to User.

See Section 2.3 “Setting the Control Panel Security Level.”

2. Enter the Operator or Service screen (whichever has the new password).

3. Enter the new password when prompted by the Password screen.

Control Panel Service Screen

This chapter describes the commands found in the **Service** screen of the library control panel (see Figure 3-1). These commands include:

- Actuator, auto clean, statistical, and system test reports
- Performing axes operation and system tests
- Initializing nonvolatile statistics and configuration

Note – For information about using the Overview, Tapes, or Operator screens, refer to the *Sun StorEdge L1000 User's Guide (805-4823)*.

The **Service** screen is restricted to individuals with service security clearance. When you press the **Service** tab, a dialog box is displayed requesting a password. Enter the correct service password to gain access to the **Service** screen (see Figure 3-1).

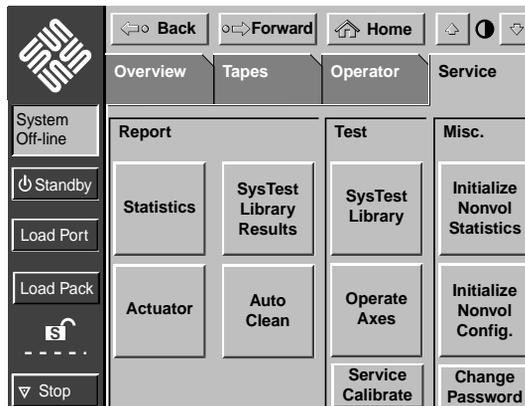


FIGURE 3-1 Service Screen

Figure 3-2 and Figure 3-3 show an overview of the service menus.

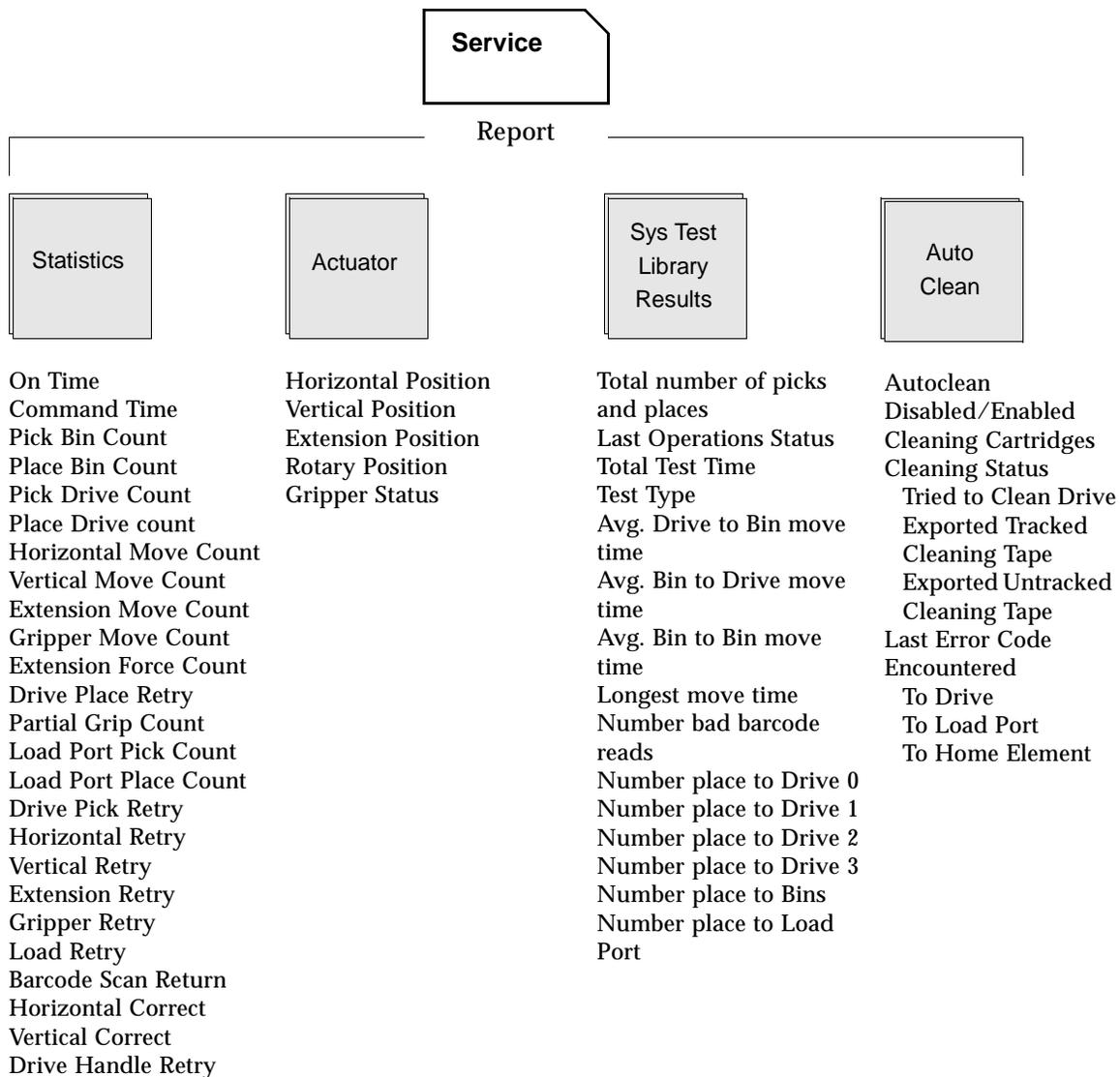
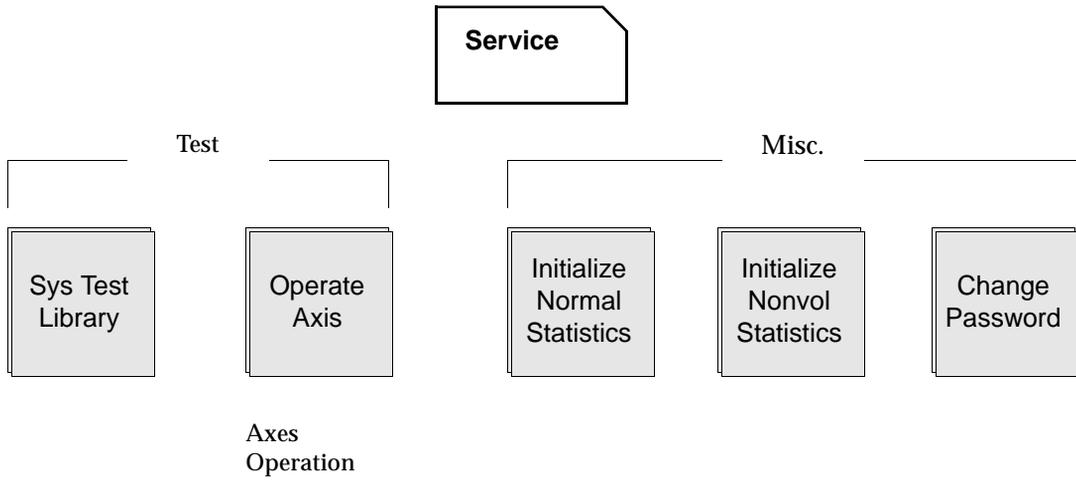


FIGURE 3-2 Control Panel Service Menu—Part 1

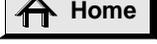


Control Panel Navigation

Select one of the menu tabs to start

To move back screen by screen:  **Back**

To move forward screen by screen:  **Forward**

To go back to the Main Menu:  **Home**

To adjust the contrast: 

FIGURE 3-3 Control Panel Service Menu—Part 2

3.1 Generating Reports

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

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

To generate any of these reports:

1. **Press the appropriate button in the Service screen.**

Within a few seconds, the report is displayed on the screen.

Figure 3-4 shows a sample statistics report.

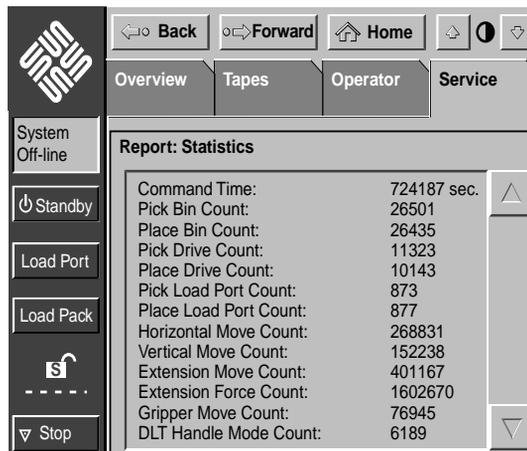


FIGURE 3-4 Statistics Report

Figure 3-5 shows a sample auto clean report.



FIGURE 3-5 Auto Clean Report

Figure 3-6 shows a sample actuator report.

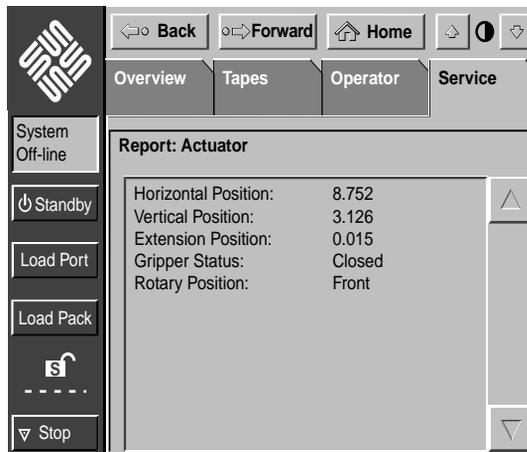


FIGURE 3-6 Actuator Report

Figure 3-7 shows a sample system test report.

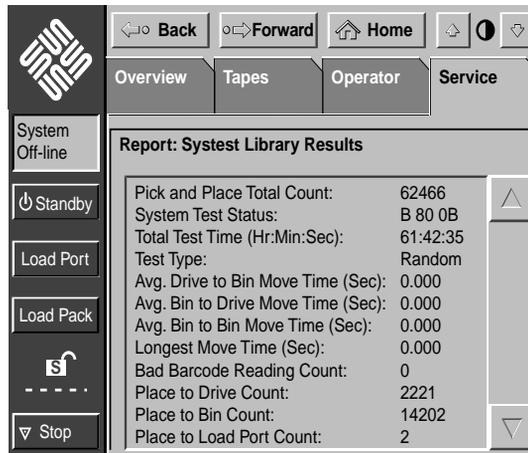


FIGURE 3-7 System Test Report

2. When you have finished reviewing the report, press the Back button to return to the main Service screen.

3.2 Testing the Library

The **Service** screen provides two testing commands:

- **System test**—tests library operation by swapping tape cartridges between storage bins or drives.
- **Axes operation tests**—enables you to select selftest, home, position, and exercise options with specific library elements.

3.2.1 Performing the System Test

1. From the **Service** screen, press the **Systest Library** button.

The **Test: Systest Library** screen is displayed (see Figure 3-8).

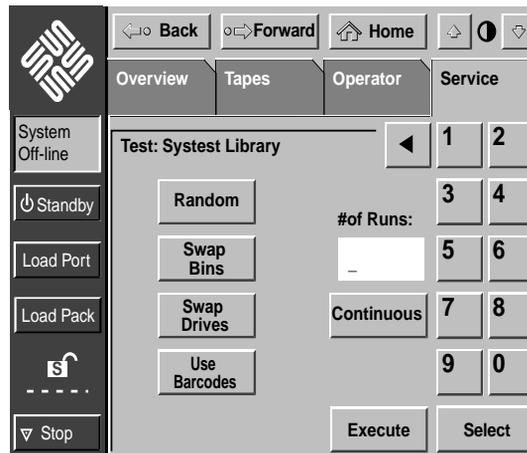


FIGURE 3-8 Test: Systest Library Screen

2. Select one of the following system tests:
 - **Swap Bins** to test storage bins only.
 - **Swap Drives** to test tape drives only.
 - **Swap Bins and Swap Drives** buttons to test both bins and tape drives.
3. Select the desired test options as follows:
 - **Random** button to swap cartridges at random.
 - **Use Barcode** button to have the library read the barcode label as it swaps cartridges.
 - **Continuous** button to repeat the test continuously until aborted.

4. When you have selected the type of test and all test options, press the **Execute** button.

An In Progress dialog box is displayed (see Figure 3-9).



FIGURE 3-9 System Test In Progress Screen

The system test continues until completed unless you press the **Abort** button. If you pressed the **Continuous** button in Step 3, you must press the **Abort** button to stop the test.

5. After the test is completed or aborted, press the **Back** button until you return to the **Service** screen.

3.2.2 Operate Axes Tests

The Operate Axes feature consists of a series of tests that can be performed on any of the following axes: the horizontal axis, the vertical axis, the gripper, the drive door, or the load port.

The following four tests are a part of this feature:

- *Selftest*—checks the basic operation of the selected axis.
- *Home*—sends the selected axis to its home position.
- *Move to...*—moves the selected axis to an assigned position.
- *Exercise*—performs operations involving the selected axis.

To perform one of these tests with a particular axis:

1. From the Service screen, press the Operate Axes button.

The Test: Operate Axes screen is displayed (see Figure 3-10).

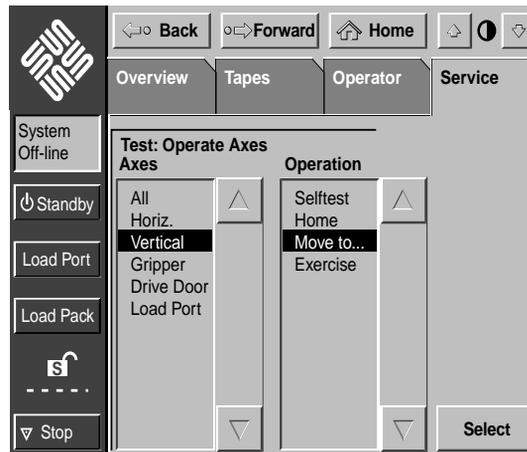


FIGURE 3-10 Test: Operate Axes Screen

2. Use the up and down arrow buttons to highlight the axis you wish to test in the Axes column. To test all axes, highlight All.
3. Use the corresponding up and down arrow buttons to highlight the desired test in the Operation column.
4. Press the Select button.

- If you selected the “Move to” test option in Step 3, a **Move to** screen is displayed (see Figure 3-11). Continue with Step 5.
- If you selected the Selftest, Home, or Exercise options in Step 3, an “In Progress” screen is displayed (see Figure 3-12). Skip Step 5.

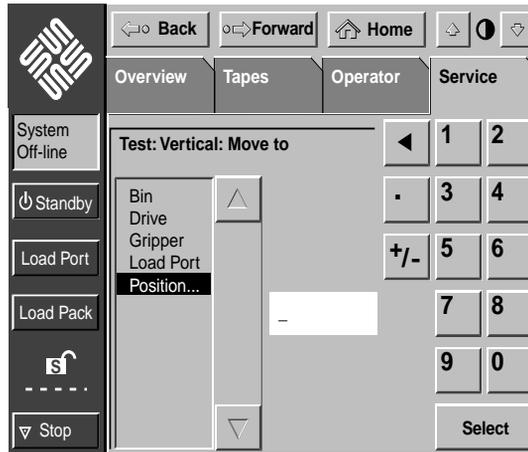


FIGURE 3-11 Move To Test Screen

5. To complete the “Move to” test, select a destination for the move. The destination can be a bin, a drive, the gripper, the load port, or a position relative to the home position of the axis. To make this selection and start this test:
 - a. Using the up and down arrows, highlight one of the destination element types in the left-hand column.
 - b. With the destination element type highlighted, enter the number of the destination element or the position (in inches) from home.

Note – Numbers do not have to be entered for the gripper or the load port.

- c. Press the Select button to start the test. An In Progress dialog box is displayed (see Figure 3-12).



FIGURE 3-12 Sample Operate Axes In Progress Screen

The test continues until completed unless you press the **Abort** button.

6. After the test is completed or aborted, press the **Back** button until you return to the **Service** screen.

3.3 Initializing Nonvolatile Information

The **Service** screen contains two commands involving information stored in nonvolatile memory:

- *Initialize nonvolatile memory configuration*—returns the library configuration to its factory-default condition, eliminating any changes made using the **Configure Library** and **Configure Options** commands in the **Operator** screen.
- *Initialize nonvolatile memory statistics*—purges nonvolatile memory of all statistical information about library operation. This information is used to generate the statistical report described on page 3-4.

To execute either of these commands:

1. **Press the appropriate button in the Service screen.**



FIGURE 3-13 Initialize Nonvolatile Verification Screen

2. **Press Okay to continue with the initialization process.**
Pressing ABORT stops the initialization process before any changes are made.
3. **When initialization is complete, press the Back button to return to the Service screen.**

Service Tools and Preventive Maintenance

This chapter describes the service upgrade kit, the preventive maintenance schedule and the following procedures:

- Cleaning
- Lubrication
- Belt tension adjustments

Maintenance should be performed by an authorized field service engineer (FSE).

4.1 Service Upgrade Kit

Sun provides a service upgrade kit to use during maintenance and upgrades of StorEdge L1000 libraries. Table 4-1 lists the contents of the service upgrade kit.

TABLE 4-1 Service Upgrade Kit PN 565-1477-01

Qty	Part Number	Description
1	6211266-04	StorEdge L1000 Utility CD
1	6220151-01	StorEdge L1000 Training Video kit
1	6207311-15	Diagnostic Software Package
1	0715027	1/4-5/16 in. combination open end wrench
1	0715029	5/16 in. nut driver
1	0715028	3/8 in. nut driver
1	0715026	Fold up Allen wrench set
1	6221367-01	Force gauge 16 oz (500 gram)
1	0505004	Force gauge 100 gram
1	6221364-01	Touch gauge, extension belt
1	6221365-01	Touch gauge, vertical belt
1	6221366-01	Touch gauge, horizontal belt

4.2 Preventive Maintenance Schedule

Table 4-2 lists the StorEdge L1000 preventive maintenance schedule.

TABLE 4-2 Preventive Maintenance Schedule

Description	Service Interval
Clean the fan filter	Every 12 months
Clean/lubricate rails and rollers	Every 12 months
Clean/lubricate extension axis shaft	Every 12 months
Clean extension rail	Every 12 months
Clean/lubricate gripper motor cam and roller	Every 12 months
Clean the tape drives	Only when the “Use Cleaning Tape” LED is lit.
Check/adjust belt tensions	Every 12 months

4.3 Preventive Maintenance Supplies

The following preventive maintenance supplies are provided with the library:

- PN 0715022 Double-wrapped cotton swabs (qty 100)
- PN 0725082 Half ounce tube of lubricating oil with Teflon®

4.4 Cleaning and Lubrication

1. Remove power from the library.

See Section 6.1 “Turning the Library On and Off” on page 6-2.



Caution – Do not disconnect the power cord. It provides a ground to the chassis to help prevent electrostatic discharge (ESD) damage.

2. Remove the library enclosure.

See Section 6.2 “Removing the StorEdge L1000 Enclosure” on page 6-3.

3. Use proper ESD procedures when servicing the library.

The following components of the library require periodic cleaning and/or lubrication.

- Fan filters
- Vertical rails and rollers
- X-chassis horizontal rail
- Extension axis shaft
- Extension axis rail
- Gripper cam and roller
- Tape drives

Where preventive maintenance procedures call for cleaning with a lint free cloth, the cloth may be dampened with isopropyl alcohol. Where lubrication is required, use only the lubricating oil with Teflon supplied with the library.

4.4.1 Fan Filters

The StorEdge L1000 library has three fan filters located:

- Outside the cabinet at the top, right, rear corner
- Outside the cabinet at the base of the library
- Inside the cabinet at the base of the unit

4.4.1.1 Upper Fan Filter

1. Remove the four Phillips screws that secure the fan filter cover to the library.
2. Remove the cover and filter.

3. Vacuum the dust from the fan filter.
4. Reinstall the fan filter and cover.

4.4.1.2 Lower Fan Filter

1. Remove the two Phillips screws that secure the fan filter cover to the library.
2. Remove the cover and filter.
3. Vacuum the dust from the fan filter.
4. Reinstall the fan filter and cover.

4.4.1.3 Base Fan Filter

1. Remove the lower fan filter.
2. Remove the base filter wing nut and bezel.
3. Remove the base fan filter.
4. Vacuum the dust from the filter
5. Reinstall the fan filter, bezel and wing nut.

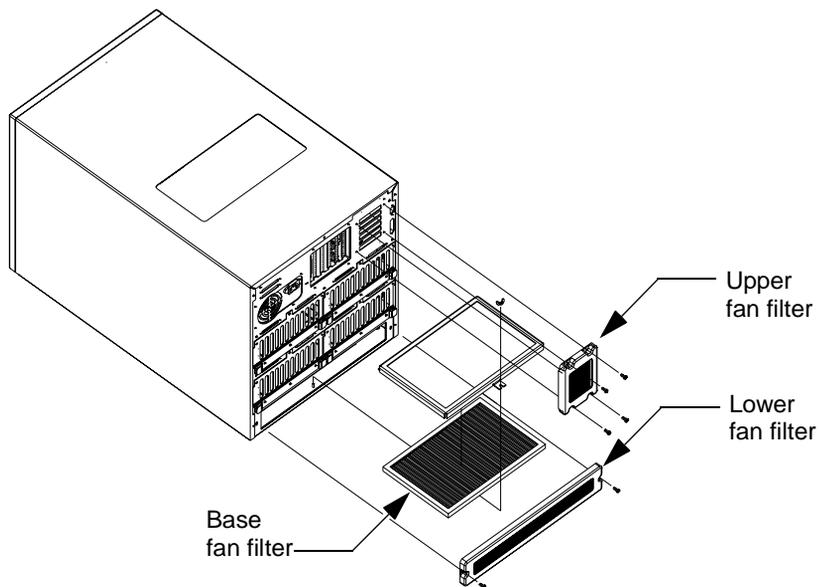


FIGURE 4-1 Fan Filters

4.4.2 Vertical Rail, Primary

The primary vertical rail is a 17.21 in. x 0.374 in. (43.71 cm x 0.949 cm) steel shaft located at the left edge near the front of the library.

1. **Use a lint-free cloth to remove all dirt and grease that has accumulated on the vertical rail.**
2. **Spread a thin film of lubricant across the entire length of the rail.**
3. **Manually move the x-chassis up and down the vertical rail to spread the lubricant evenly.**

4.4.3 Vertical Rail, Secondary, and Rollers

The secondary vertical rail is a 16.75 in. (42.54 cm) L-shaped steel rail located at the right edge near the front of the library. Rollers at the top and bottom of the x-chassis assembly ride on the secondary rail.

1. **Use a lint free cloth to remove all dirt and grease that has accumulated on the secondary vertical rail and rollers.**
2. **Spread a thin film of lubricant across the entire length of the secondary vertical rail.**
3. **Manually move the x-chassis up and down the secondary vertical rail to spread the lubricant evenly.**

4.4.4 X-Chassis Horizontal Rail

The x-chassis horizontal rail is a 16.18 in. x 0.373 in. (41.09 cm x 0.947 cm) shaft that is located at the top, front of the x-chassis assembly.

1. **Use a lint free cloth to remove all dirt and grease from the horizontal rail.**
2. **Spread a thin film of lubricant across the entire length of the rail.**
3. **Manually move the extension/rotary assembly left and right on the horizontal rail to spread the lubricant evenly.**

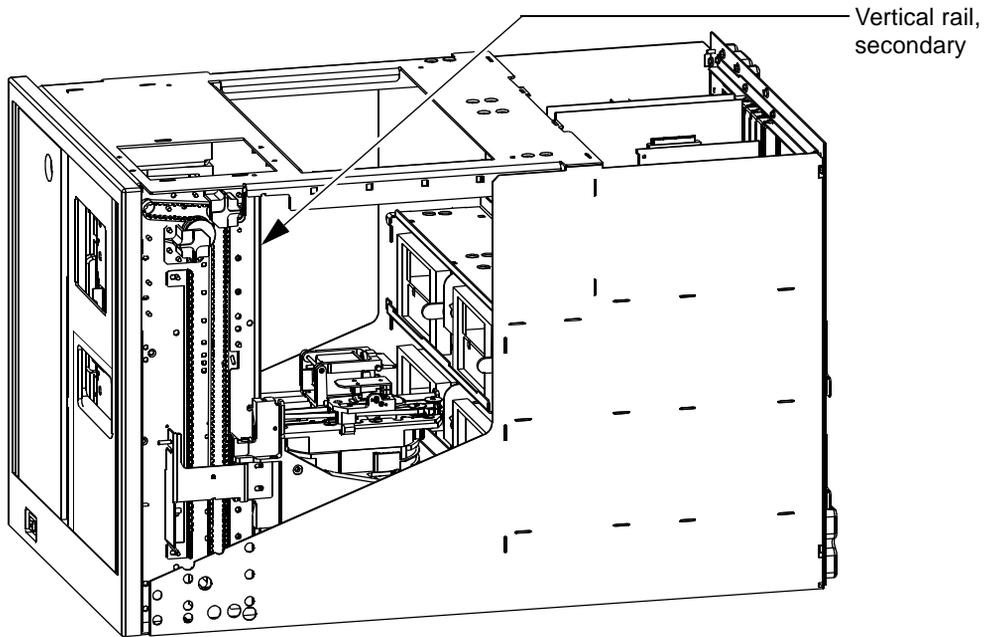
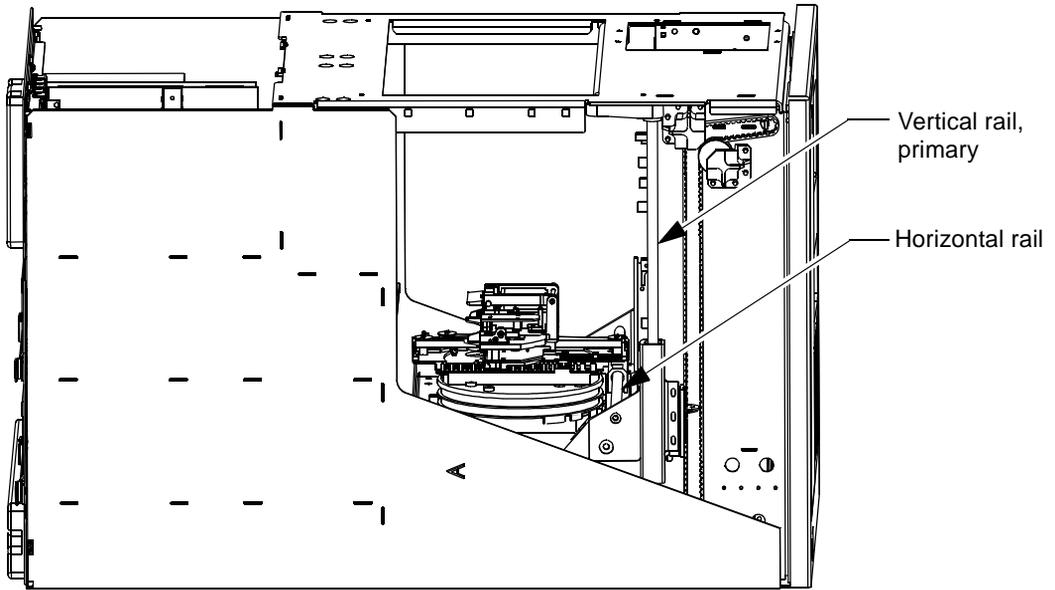


FIGURE 4-2 Cleaning and Lubricating Rails

4.4.5 Extension Axis Shaft and Rail

The extension axis shaft is a 7.62 in. x 1/4 in. (19.35 cm x 0.635 cm) steel shaft located on the top of the extension/rotary assembly.

The extension axis rail is a 7.12 in. x 0.750 in. (18.08 cm x 1.90 cm) black delrin strip that lays flat and is parallel to the extension axis shaft.

1. **Use a lint free cloth to remove all dirt and grease that has accumulated on the extension axis shaft and rail.**
2. **Spread a thin film of lubricant across the entire length of the extension axis *shaft*. Do *not* lubricate the extension axis *rail*.**
3. **Manually move the gripper mechanism back and forth on the extension axis to spread the lubricant evenly on the extension axis shaft.**

4.4.6 Gripper Cam and Roller

The gripper cam is located on the gripper motor shaft. The gripper roller rides on the gripper cam to open and close the top gripper jaw as the gripper motor turns.

1. **Use a lint-free cloth to remove all dirt and grease that has accumulated on the gripper cam and roller.**
2. **Spread a thin film of lubricant around the edge of the gripper cam.**

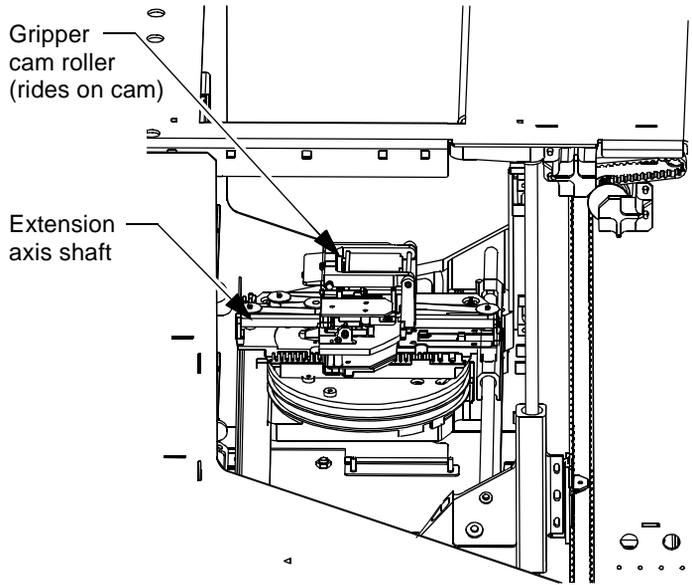


FIGURE 4-3 Cleaning and Lubricating the Extension Axis and Gripper

4.4.7 Tape Drives

The library has an Auto Clean feature that can be set from the control panel “Config: Options” screen. When Auto Clean is selected, the library monitors the status of each tape drive and automatically sends a cleaning cartridge to the drive when cleaning is required. Otherwise, cleaning of the tape drives is normally an operator function that should **only** be performed when the “Use Cleaning Tape” LED is illuminated on the front panel of the tape drive.



Caution – Cleaning cartridges are made of abrasive material. Routinely cleaning the tape drive when it is not requested by the drive will prematurely wear out the tape drive head.

If the “Use Cleaning Tape” LED *is* lit (when power is applied), the tape drive can be cleaned using the following procedure.

1. **Turn the library power on. See Section 6.1 “Turning the Library On and Off” on page 6-2.**
2. **Move the drive handle to the open position.**
3. **Insert a cleaning cartridge into the tape drive (only when the “Use Cleaning Tape” LED is lit).**
4. **Move the drive handle to the closed position.**
5. **The tape drive loads the cleaning cartridge and uses it for approximately five minutes. During the cleaning process the “Tape In Use” LED on the tape drive front panel blinks.**
6. **When the “Tape In Use” LED goes off and the “Operate Handle” LED illuminates, move the handle to the open position, wait two seconds after the cleaning cartridge is ejected, and then remove the cartridge from the drive.**

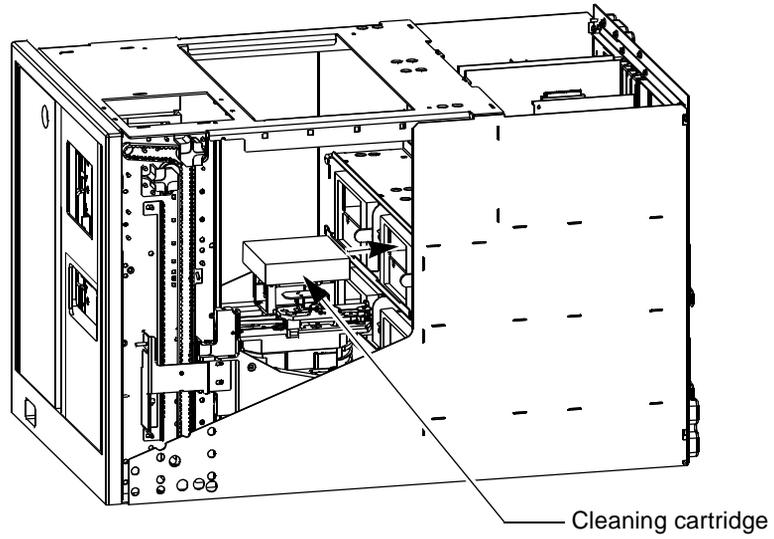


FIGURE 4-4 Tape Drive Cleaning

4.5 Checking and Adjusting Belt Tension

Table 4-3 describes the four timing belts and their respective tension adjustments.

TABLE 4-3 Belt Specifications

Belt Description	Pitch	Width	Tension Adjustment	Metric Adjustment
Left Y-Axis (Vertical) Belt	1/5 in. (0.508 cm)	3/8 in. (0.952 cm)	16.5 ± 1.5 oz applied at midspan of belt will deflect the belt to contact the touch gauge post	468 ± 42.5 grams applied at midspan of belt will deflect the belt to contact the touch gauge post
Right Y-Axis (Vertical) Belt	1/5 in. (0.508 cm)	3/8 in. (0.952 cm)	8.5 ± 1.5 oz applied at midspan of belt will deflect the belt to contact the touch gauge post	241 ± 42.5 grams applied at midspan of belt will deflect the belt to contact the touch gauge post
X-Axis (Horizontal) Belt	1/5 in. (0.508 cm)	1/4 in. (0.635 cm)	10.5 ± 1.0 oz applied to belt across from touch gauge arrow, will deflect the belt until it just disappears under the touch gauge notch	298 ± 28.35 grams applied to belt across from touch gauge arrow, will deflect the belt until it just disappears under the touch gauge notch
Extension Axis Belt	0.0816 in. (0.207 cm)	3/16 in. (0.476 cm)	60 ± 6.0 grams applied at midspan of belt will deflect the belt to just contact the touch gauge	60 ± 6.0 grams applied at midspan of belt will deflect the belt to just contact the touch gauge

Figure 4-5 and Figure 4-6 show the gauges required for belt tension measurements.

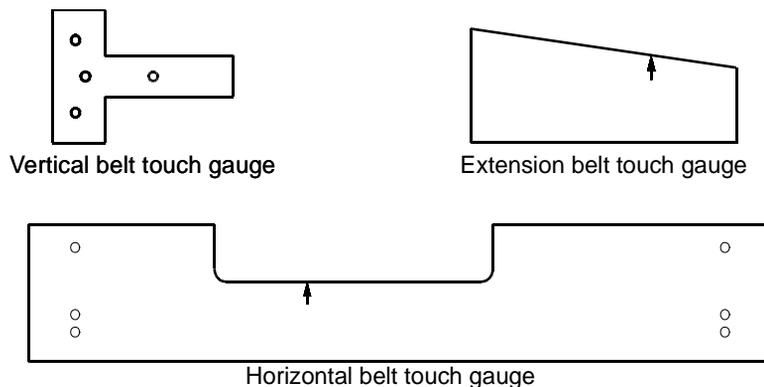


FIGURE 4-5 Touch Gauges

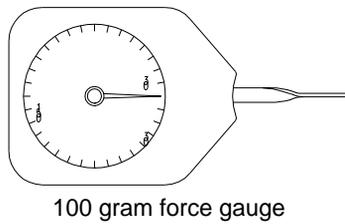
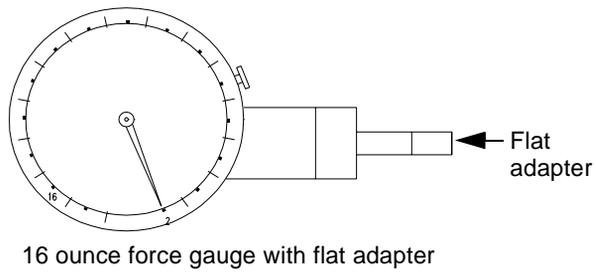
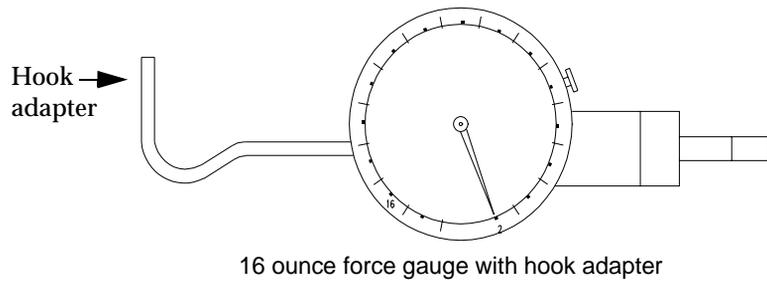
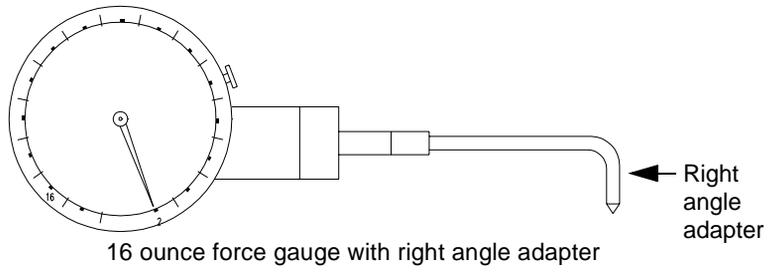


FIGURE 4-6 Force Gauges and Adapters

4.5.1 Left Y-Axis (Vertical) Belt

Required Tools

- 16 ounce force gauge (PN 6221367)
- 3/32 in. Allen wrench
- 1/4 in. open end wrench
- Touch gauge (PN 6221365)

Tension Measurement Procedure

1. **Library power must remain on.**
2. **Remove the library enclosure.**

Note – To properly check tension of the left y-axis belt the vertical motor must be under power and holding the x-chassis approximately 4 inches (10.16 cm) above the base of the cabinet. Use Step 3 to position the x-chassis.

3. **To position the x-chassis for checking the tension of the left y-axis belt:**
 - a. **At the control panel set the library in Standby (off-line) mode.**
 - b. **Select the Operator menu.**
 - c. **Select the Move Cartridges menu.**
 - d. **If bin #19 (6th bin from top of bulk pack— see “Storage Array” on page 1-18) has a cartridge present, use the Move Cartridges menu and enter “Bin 19” in Source, and “Bin 19” in Destination, then press Execute. If bin #19 is empty enter “Bin X” (where X is any storage location from 0 to 29 that has a cartridge present) in Source, and “Bin 19” in Destination, and press Execute.**

Placing a cartridge into bin #19 will leave the x-chassis positioned properly for checking the left y-axis belt tension.
4. **Install the touch gauge (PN 6221365) at midspan of the left y-axis belt as shown in Figure 4-7.**

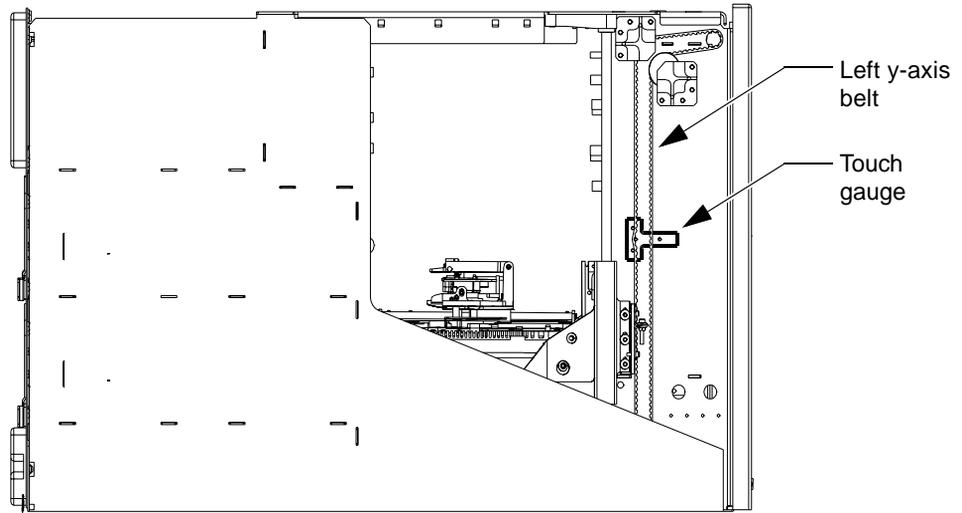


FIGURE 4-7 Left Vertical Belt Touch Gauge Installation

5. Using the 16 oz force gauge (PN 6221367) with the right angle adapter installed, push the right side of the belt toward the touch gauge post as shown in Figure 4-8. The force required to push the belt until it contacts the touch gauge post should be 16 ± 1.5 ounces (468 ± 42.5 gms).

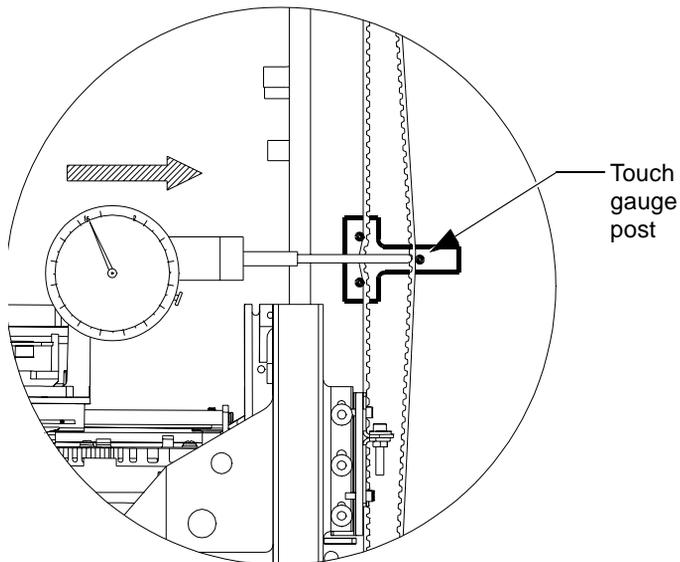


FIGURE 4-8 Left Vertical Belt Tension Measurement

6. If adjustment is required, continue to the tension adjustment procedure.

Tension Adjustment Procedure

1. Remove power from the library.
2. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position” on page 6-4.
3. Loosen the two 3/32 in. Allen screws that secure the lower belt clamp in place.
4. Loosen the 1/4 in. adjustment screw locknut.
5. To tighten belt tension, turn the 3/32 in. Allen adjustment screw clockwise.
6. To loosen belt tension, turn the 3/32 in. Allen adjustment screw counterclockwise.
7. Tighten the 1/4 in. locknut and the lower clamp screws.
8. Recheck the belt tension using “Tension Measurement Procedure” on page 4-14.

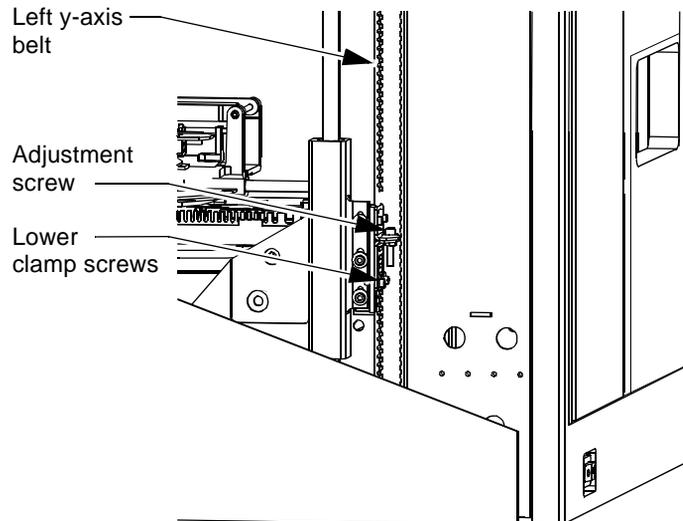


FIGURE 4-9 Left Vertical Belt Tension Adjustment

4.5.2 Right Y-Axis (Vertical) Belt

Required Tools

- 16 ounce force gauge (PN 6221367)
- Phillips screwdriver
- 3/32 in. Allen wrench
- 1/4 in. open end wrench
- Touch gauge (PN 6221365)

Tension Measurement Procedure

1. Remove power from the library.
2. Remove the library enclosure.
3. Leave the x-chassis in its resting position at the base of the cabinet.
4. Install touch gauge (PN 6221365) at midspan of the right y-axis belt as shown in Figure 4-10.

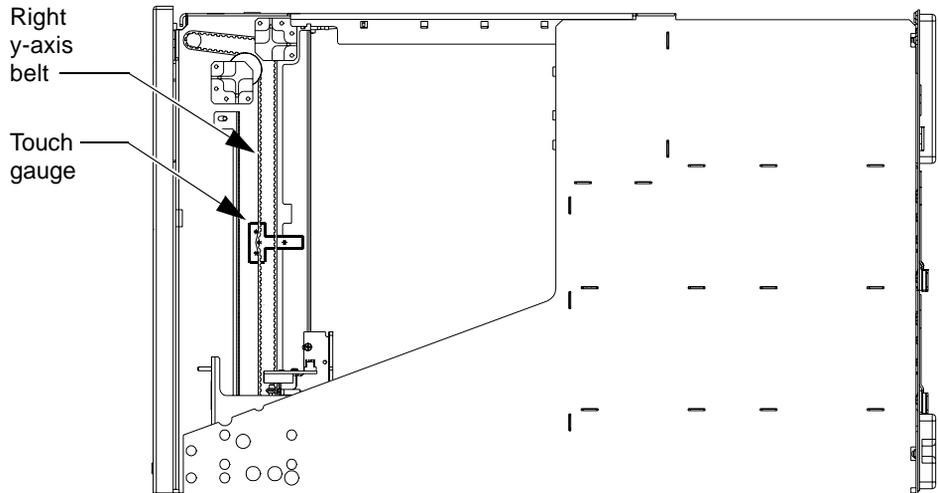


FIGURE 4-10 Right Vertical Belt Touch Gauge Installation

5. Using the 16 oz force gauge (PN 6221367) with the hook adapter installed, pull the right side of the belt toward the touch gauge post as shown in Figure 4-11. The force required to pull the belt until it contacts the touch gauge post should be 8.5 ± 1.5 ounces (241 ± 42.5 gms).

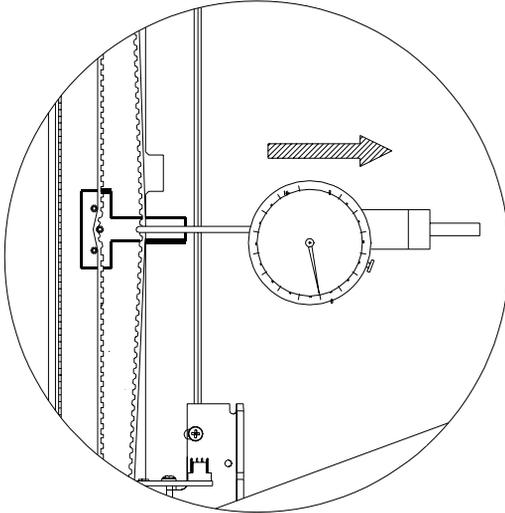


FIGURE 4-11 Right Vertical Belt Tension Measurement

6. If adjustment is required, continue to the tension adjustment procedure.

Tension Adjustment Procedure

1. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position” on page 6-4.
2. To access the right y-axis belt clamp (see Figure 4-12):
 - a. Disconnect the x-axis motor power cable connector from the x-motor interconnect board.
 - b. Remove the Phillips screw that secures the x-axis motor interconnect board to the x-chassis.
 - c. Remove the two Phillips screws that secure the y-axis sensor assembly to the x-chassis.
 - d. Move the vertical axis sensor assembly and x-motor interconnect away from the y-axis belt clamps (see Figure 4-13).

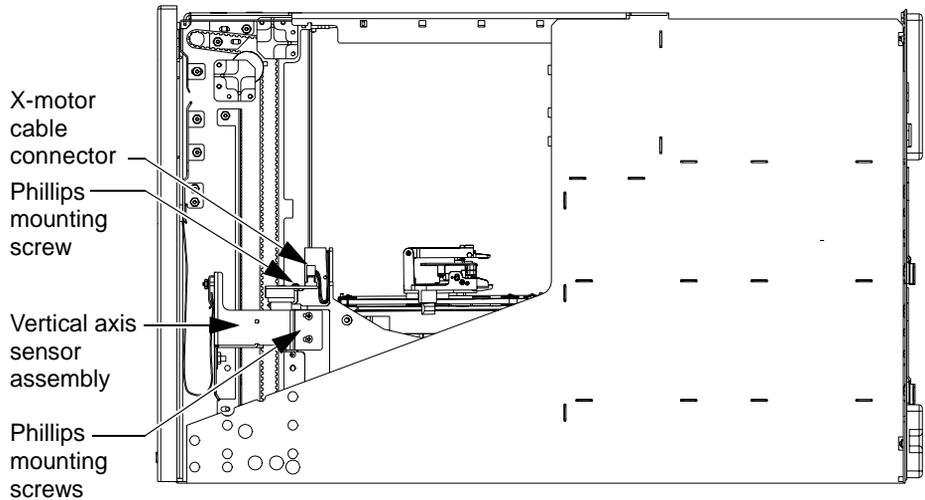


FIGURE 4-12 Accessing the Right Y-Axis Belt Clamp

- 3. Prepare the belt clamps for adjustment by (see Figure 4-13):**
 - a. Loosening the two 3/32 in. Allen screws that secure the lower belt clamp in place.**
 - b. Loosening the 1/4 in. adjustment screw locknut.**
- 4. Adjust the belt tension as follows:**
 - a. To tighten belt tension, turn the 3/32 in. Allen adjustment screw clockwise.**
 - b. To loosen belt tension, turn the 3/32 in. Allen adjustment screw counterclockwise.**
- 5. Retest the belt tension as follows:**
 - a. Tighten the 1/4 in. locknut and the lower clamp screws.**
 - b. Lower the x-chassis back to the base of the cabinet.**
 - c. Recheck the belt tension using “Tension Measurement Procedure” on page 4-17.**
- 6. Repeat Steps 3 through 5, if necessary.**

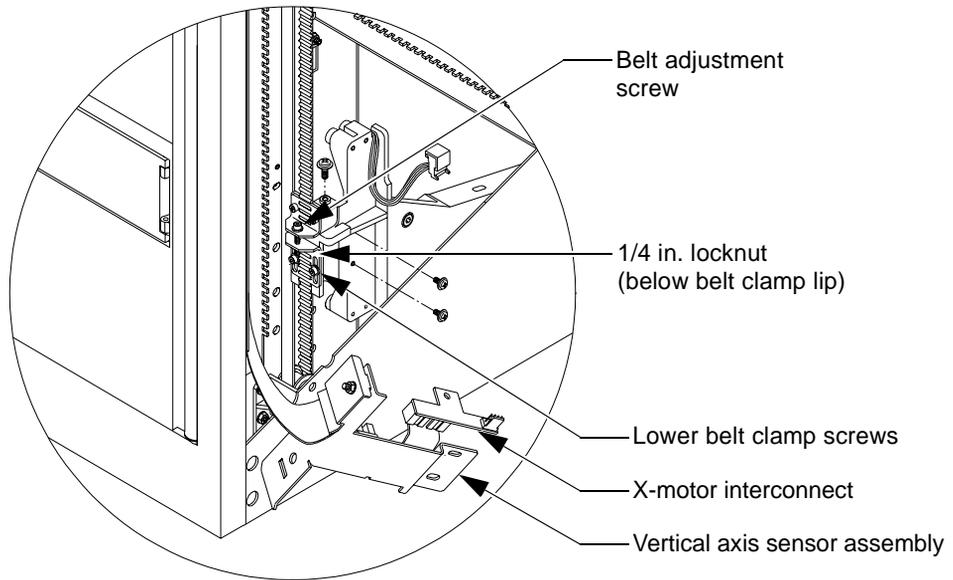


FIGURE 4-13 Right Vertical Belt Tension Adjustment

4.5.3 X-Axis (Horizontal) Belt

Required Tools

- 16 ounce force gauge (PN 6221367)
- 3/32 in. Allen wrench
- 7/64 in. Allen wrench
- 5/16 in. open end wrench
- Touch Gauge (PN 6221366)

Tension Measurement Procedure

1. Remove power from the library.
2. Remove the library enclosure.
3. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position” on page 6-4.
4. Move the extension/rotary assembly to the left edge of the cabinet.
5. Install touch gauge (PN 6221366) on the x-axis belt as shown in Figure 4-14.

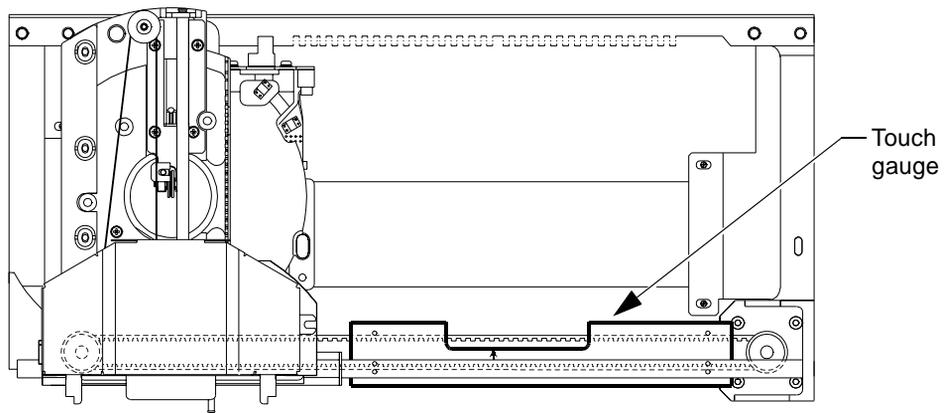


FIGURE 4-14 Horizontal Belt Touch Gauge Installation

- Using the 16 oz force gauge (PN 6221367) with the flat adapter installed, push the belt toward the touch gauge as shown in Figure 4-15. The force required to push the belt until it just disappears under the notch in the gauge at the arrow should be 10.5 ± 1.0 ounces (298 ± 28.35 gms).

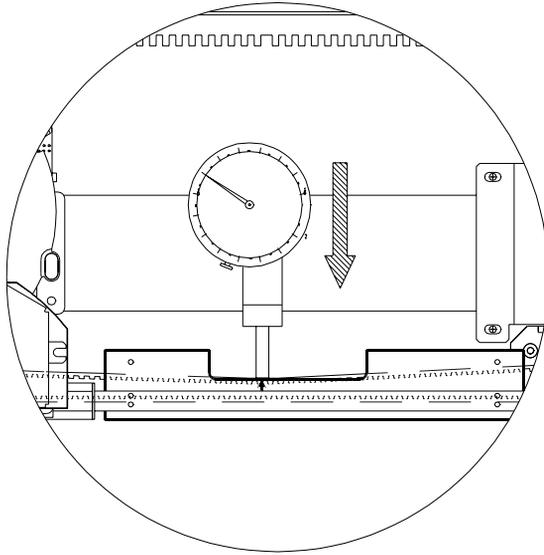


FIGURE 4-15 Horizontal Belt Tension Measurement

- If adjustment is required, continue to the tension adjustment procedure.

Tension Adjustment Procedure

- At the left end of the x-chassis, adjacent to the belt tensioning pulley, loosen the two $3/32$ in. Allen locking screws.
- Loosen the adjustment screw $5/16$ in. locknut.
- Adjust the belt tension as follows:
 - To tighten belt tension, turn the $7/64$ in. Allen adjustment screw clockwise.
 - To loosen belt tension, turn the $7/64$ in. Allen adjustment screw counterclockwise.
- Tighten the locking screws and locknut.
- Recheck the belt tension using “Tension Measurement Procedure” on page 4-21.

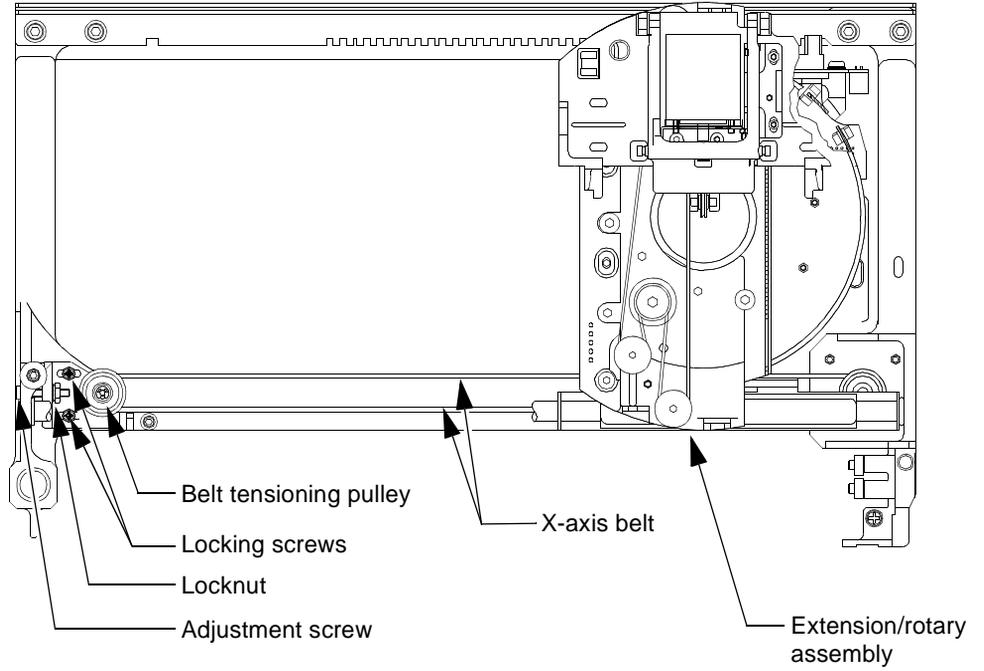


FIGURE 4-16 Horizontal Belt Adjustment

4.5.4 Extension Axis Belt

Required Tools

- 100 gram force gauge (PN 0505004)
- Phillips screwdriver
- 5/16 in. open-end wrench
- Touch gauge (PN 6221364)

Tension Measurement Procedure

1. Remove power from the library.
2. Remove the library enclosure.
3. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position” on page 6-4.
4. Move the extension/rotary assembly to the left end of the cabinet.
5. Move the gripper assembly toward the front of the cabinet to the end of its travel.
6. Install touch gauge (PN 6221364) inside the extension axis belt as shown in Figure 4-17.

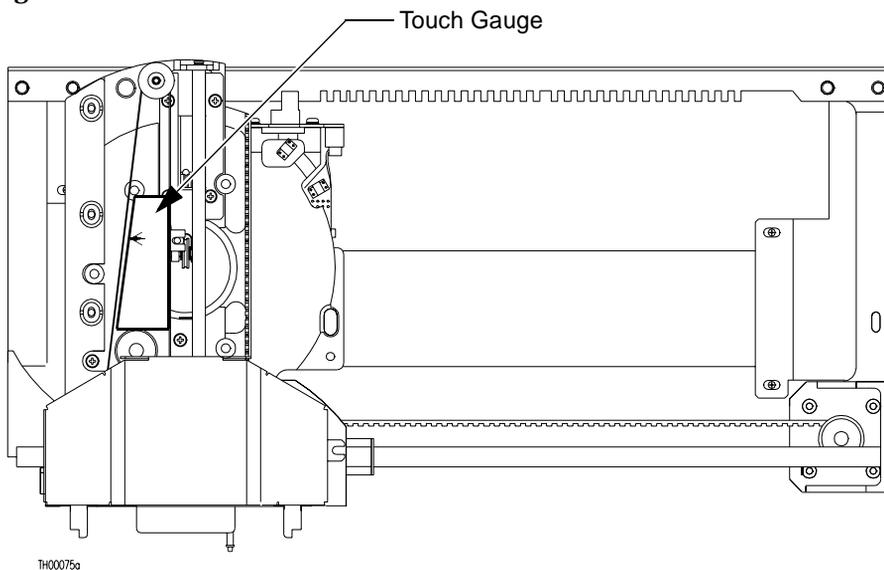


FIGURE 4-17 Extension Axis Touch Gauge Installation

- Using the 100 gram force gauge (PN 0505004), push the belt toward the arrow on the touch gauge as shown in Figure 4-18. The force required to push the belt until it just contacts the touch gauge should be 60.0 ± 6.0 grams.

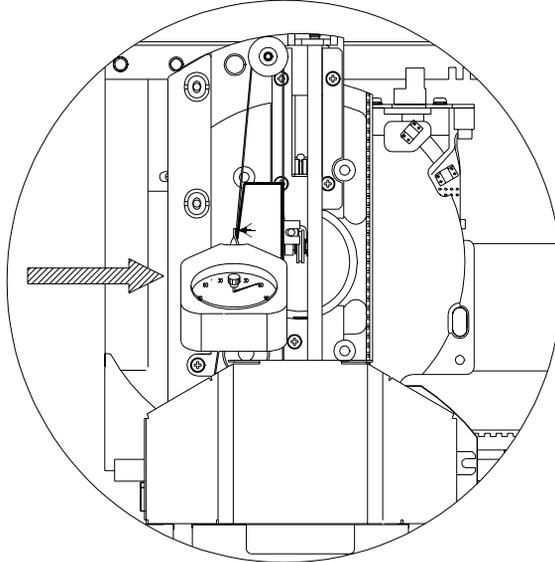


FIGURE 4-18 Extension Belt Tension Measurement

Tension Adjustment Procedure

- Loosen the extension axis belt adjustment pulley locking screw (see Figure 4-19).
- Loosen the belt adjustment screw 5/16 in. lock nut.
- Adjust the belt tension as follows:
 - To tighten belt tension, turn the Phillips adjustment screw clockwise.
 - To loosen belt tension, turn the Phillips adjustment screw counterclockwise.
- Tighten the locking nut and locking screw.
- Recheck the belt tension using “Tension Measurement Procedure” on page 4-24.

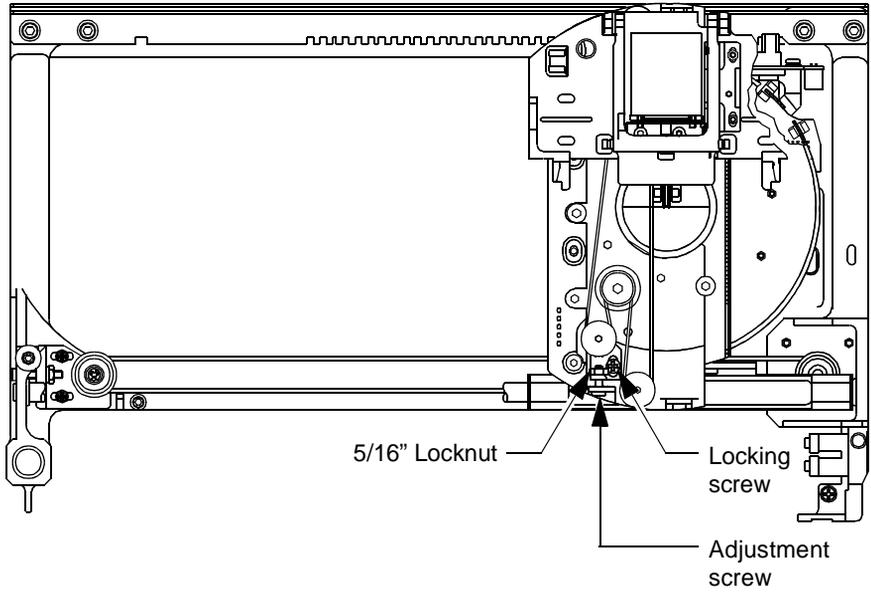


FIGURE 4-19 Extension Belt Tension Adjustment

Fault Isolation

This chapter provides a fault isolation table describing known symptoms and corresponding causes and corrective actions. For some symptoms, there are test questions and answers to help narrow the possible root cause of the problem.

When the table refers to connector numbers, see the library block diagram in Appendix B for connector locations.

This fault isolation table is provided as a guide only, and is to be used along with the field service engineer's training and experience, the diagnostic software, and other troubleshooting tools to effectively service the customer's library.

5.1 Fault Isolation Table

The fault isolation table begins on page 5-2

TABLE 5-1 Fault Isolation

Symptom	Test Question	Ans	Possible Cause	Corrective Action
Control panel is not lit.	Is power supply fan at rear of library running?	No	No power is applied to library	1. Plug in library 2. Turn on power switch. 3. Verify facility power is present.
			Power supply is defective	Replace the power supply.
			Power switch is defective	Replace the power switch.
	Is +5 and +12 VDC present at test points on control panel interface PWA?	Yes	Control panel cable is not seated tightly	1. Open the right front door. 2. Reseat the ribbon cable at connector J1. 3. Reseat the flex cable at connector J5. 4. Reseat the two-conductor cable at connector J2. 5. Reseat the ribbon cable on the passive backplane at connector J1.
		Yes	Control panel Interface or display panel is defective	1. Replace the right door assembly (this FRU includes the control panel interface, display panel and touch panel).
		No	Control panel cable is not seated tightly	1. Open the right front door. 2. Reseat the ribbon cable at connector J1. 3. Reseat the flex cable at connector J5. 4. Reseat the two-conductor cable at connector J2. 5. Reseat the ribbon cable on the passive backplane at connector J1.
Host indicates logical unit (library) is not ready.	Is library control panel standby button pressed?	Yes		Press to release library control panel standby button
		No	Disconnected or loose host to library interface cable	Check and reseat host to library interface cable.

TABLE 5-1 Fault Isolation (Continued)

Symptom	Test Question	Ans	Possible Cause	Corrective Action
Diagnostics come up in simulation mode only and fails to communicate with library.	Is library control panel standby button pressed?	No		1. Press control panel standby button to set library off-line and ready to communicate through diagnostic port. 2. Reinitialize diagnostics.
		Yes	Sun workstation to library RS-232 interface cable is missing or loose.	1. Connect or reseal the RS-232 interface cable between the diagnostic workstation serial port and the library diagnostic port. 2. Reinitialize diagnostics.
	Is the control panel standby button pressed and the RS-232 interface cable in place properly?	Yes	The diagnostic software was started using an improper baud rate for communication with the library.	Set the diagnostic communications baud rate to 9600 (the default is 2400) See <i>Chapter 7 "Diagnostic Software."</i>
04800A error NVRAM Checksum Failure			Corrupted non-volatile random access memory on the robotics controller board.	1. Using the diagnostic software, initialize the non-volatile RAM. 2. Recalibrate the library. Note: Current configuration information and statistics data will be lost when non-volatile RAM is initialized.
058A02 error Uncalibrated Position			Library has lost its calibration parameters.	Recalibrate the library.
All indicators on face of a specific tape drive are on solid.			Poor connection at power connector on rear of tape drive.	Reseat the power connector at the rear of the tape drive.
			Defective tape drive.	Replace the tape drive assembly.
All indicators on face of a specific tape drive are flashing.			Tape drive has "swallowed" its take-up reel leader.	Replace the tape drive.

TABLE 5-1 Fault Isolation (Continued)

Symptom	Test Question	Ans	Possible Cause	Corrective Action
0B8D02 error DLT Drive Handle Motor Move Timeout Extension axis fails diagnostic self-test.			Poor connection at J24 of the passive backplane.	Reseat the connector at J24 of the passive backplane.
			Defective tape drive stepper motor or sensor.	Replace the tape drive assembly.
			Poor connection at J16 of the passive backplane.	Reseat the connector at J16 of the passive backplane.
			Defective extension axis assembly.	1. Replace the extension axis assembly. 2. Run the extension axis self-test from the diagnostic software.
0B8301 error Extension Axis Timeout			Defective extension axis assembly	1. Replace the extension axis assembly. 2. Run extension self-test from the diagnostic software.
048301 error Extension Current Feedback Failure			Library is mis-calibrated.	Calibrate the library.
			Defective extension axis assembly.	Replace the extension axis assembly.
0B8310 error Extension Invalid Actuator Start Position			Extension axis position has been lost.	1. From diagnostics send the extension axis to the home position. 2. From the host send a Rezero Unit command.
			Defective extension motor.	Replace the extension axis assembly.

TABLE 5-1 Fault Isolation (Continued)

Symptom	Test Question	Ans	Possible Cause	Corrective Action
Gripper fails diagnostic self-test.			Poor connection at J16 of the passive backplane.	1. Reseat the connector at J16 of the passive backplane. 2. Run the gripper self-test from the diagnostic software.
			Defective gripper motor.	Replace the extension axis (FRU that includes the gripper motor).
0B800D error Cartridge is Only Partially Gripper			Library is slightly miscalibrated.	Recalibrate the library.
			Defective cartridge in gripper sensor on the extension axis.	Replace the extension axis assembly (FRU that includes the gripper sensors).
			Gripper jaws are not gripping with enough force to maintain a grip on the cartridge.	Replace the extension axis assembly (FRU that includes the gripper jaws).
0B8101 error Gripper Timeout				Replace the extension axis assembly (FRU that includes the gripper assembly).
0B8104 error Gripper Open Failure				Replace the extension axis assembly (FRU that includes the gripper assembly).
0B8105 error Gripper Close Failure				Replace the extension axis assembly (FRU that includes the gripper assembly).

TABLE 5-1 Fault Isolation (*Continued*)

Symptom	Test Question	Ans	Possible Cause	Corrective Action
Horizontal axis fails diagnostic self-test.			Poor connection at J25 of passive backplane.	Reseat the cable at J25 of the passive backplane.
			Poor connection at J2 of x-motor interconnect.	Reseat the cable at J2 of the x-motor interconnect.
			Poor connection at J1 of x-motor interconnect.	Reseat the cable at J1 of the x-motor interconnect.
			Defective x-axis (horizontal) motor.	Replace the x-axis (horizontal) motor.
0B8501 error Horizontal Timeout			Horizontal belt is out of adjustment.	<ol style="list-style-type: none"> 1. Check and adjust the tension of the horizontal belt. See <i>X-Axis (Horizontal) Belt</i> on page 4-21. 2. Run horizontal self-test from the diagnostic software.
048520 error Horizontal Test Failure			Dirt accumulation on the x-encoder optical sensor.	<ol style="list-style-type: none"> 1. Clean the x-encoder optical sensor. 2. Run horizontal self-test from the diagnostic software.
048524 error Horizontal Hardware Error			Defective x-axis (horizontal) motor.	<ol style="list-style-type: none"> 1. Replace the x-axis (horizontal) motor. 2. Run the horizontal self-test from the diagnostic software.
0B8201 error Rotary Timeout			Horizontal axis belt tension is out of adjustment.	Check and adjust the horizontal belt tension. See <i>X-Axis (Horizontal) Belt</i> on page 4-21.
0B8220 error Rotary Test Failure			Horizontal axis belt tension is out of adjustment.	Check and adjust the horizontal belt tension. See <i>X-Axis (Horizontal) Belt</i> on page 4-21.

TABLE 5-1 Fault Isolation (Continued)

Symptom	Test Question	Ans	Possible Cause	Corrective Action
Vertical axis fails diagnostic self-test.			Poor connection at J20 of passive backplane.	Reseat the cable at J20 of the passive backplane.
			Poor connection at J25 of the passive backplane.	Reseat the cable at J25 of the passive backplane.
			Poor connection at J1 of y-axis encoder.	Reseat the cable at J1 of the y-axis encoder.
			Defective y-axis (vertical) motor.	Replace the y-axis (vertical) motor.
0B8401 error Vertical Timeout			Vertical belts are out of adjustment.	<ol style="list-style-type: none"> 1. Check and adjust the tension of the two vertical belts. See <i>Left Y-Axis (Vertical) Belt</i> on page 4-14 and <i>Right Y-Axis (Vertical) Belt</i> on page 4-17. 2. Run vertical self-test from the diagnostic software.
048420 error Vertical Test Failure			Dirt accumulation on the y-encoder optical sensor.	<ol style="list-style-type: none"> 1. Clean the y-encoder optical sensor. 2. Run vertical self-test from the diagnostic software.
048424 error Vertical Hardware Error			Defective y-axis (vertical) motor.	<ol style="list-style-type: none"> 1. Replace the y-axis (vertical) motor. 2. Run the vertical self-test from the diagnostic software.

FRU Removal and Replacement Procedures

This chapter provides the following information for each field-replaceable unit (FRU) of the StorEdge L1000:

- *FRU Name*
- *FRU Part Number*
- *Location*—describes the physical location of the part within the library as viewed from the front of the library cabinet.
- *Characteristics*—provides distinguishing details about the part.
- *Function*—describes how the part is used in the library.
- *Tools Required*—lists the tools necessary to remove and replace the part.
- *Removal Procedure*—describes instructions to remove the part. Except where noted, replacement is accomplished by performing the removal procedures in reverse order.

Note – In many illustrations some parts are left out to improve clarity.

6.1 Turning the Library On and Off

To turn the library on:

1. **Make sure:**
 - All internal packaging (foam, tie wraps, and so forth) is removed
 - The front doors and load port are closed
 - The library enclosure is installed
 - All rear panel connections are secure
2. **At the front panel, set the AC power switch to the on position.**
3. **After several seconds, verify that the control panel comes on.**

To turn the library off:

1. **Set the AC power switch to the off position.**
2. **Verify that the control panel turns off.**

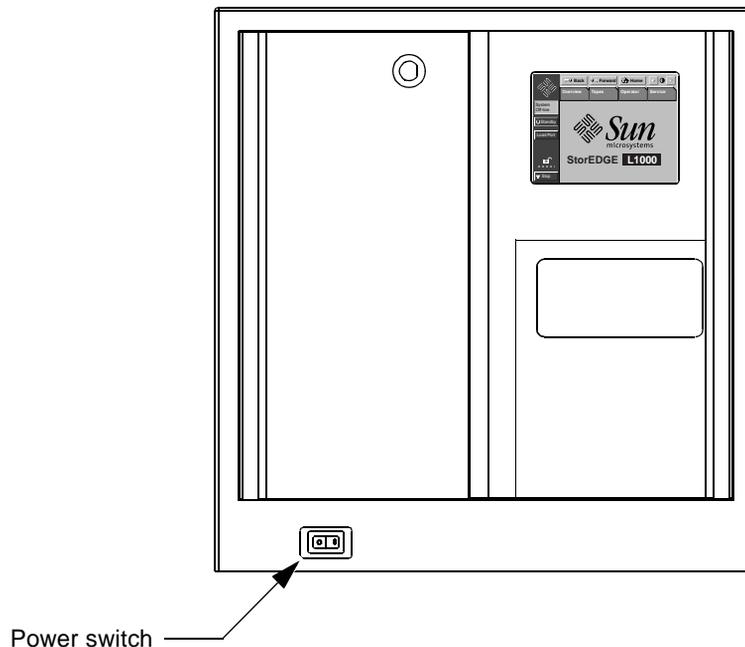


FIGURE 6-1 Library Power Switch

6.2 Removing the StorEdge L1000 Enclosure

1. At the rear of the library, remove the five screws holding the enclosure to the library frame.
2. Slide the enclosure toward the rear of the library about 1/2 inch (12.7 mm) and then lift the enclosure off the library frame.
3. Set the enclosure aside.

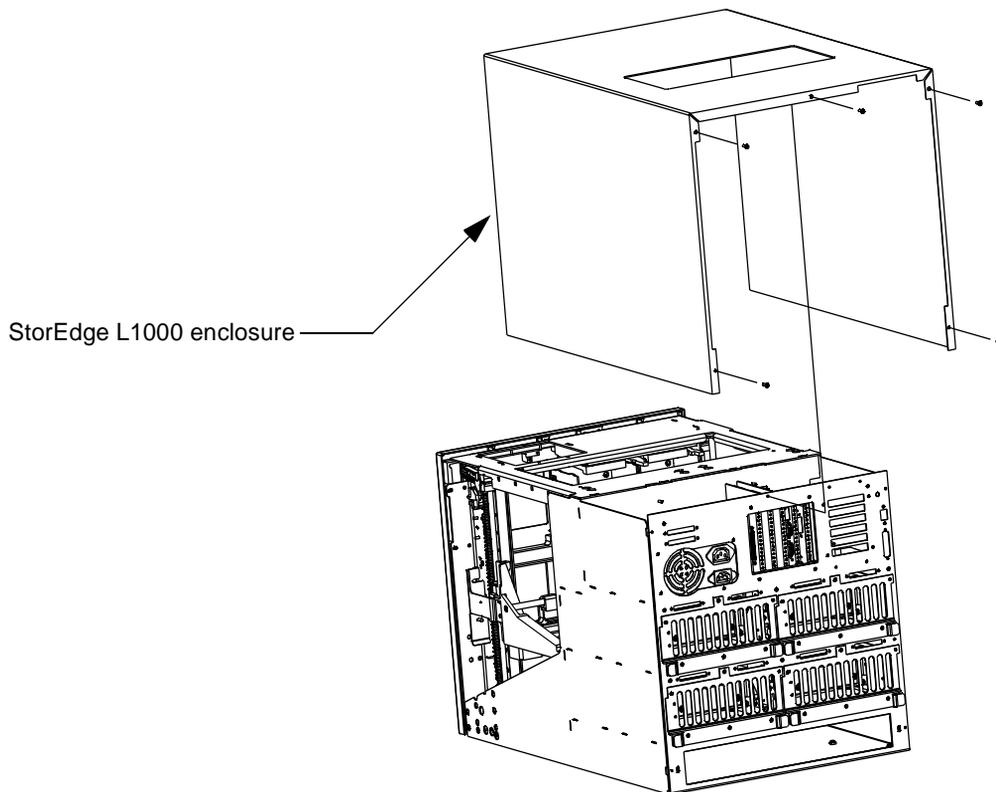


FIGURE 6-2 Removing the Library Enclosure

6.3 Securing the X-Chassis in the Maintenance Position

To perform some maintenance procedures it is necessary to raise and secure the X-chassis approximately three inches above its resting position at the base of the cabinet. There is a 1/4 in. hole provided on the left, front side of the cabinet frame in which a #2 shaft screwdriver or similar tool can be inserted to support the x-chassis in the raised (maintenance) position.



Caution – The y-axis motor provides dampening of the x-chassis in the vertical direction. When the x-chassis is in a raised position, and the left side y-axis belt is removed, (disengaging the y-axis motor) the x-chassis must be secured in its raised position or it will slam to the base of the cabinet.

Securing the X-chassis

1. **Manually raise the x-chassis approximately four inches.**
2. **Insert a #2 shaft screwdriver or similar tool in the maintenance hole located on the left side of the cabinet frame.**
3. **Move the x-chassis down so it is resting on and supported by the tool in the maintenance hole.**

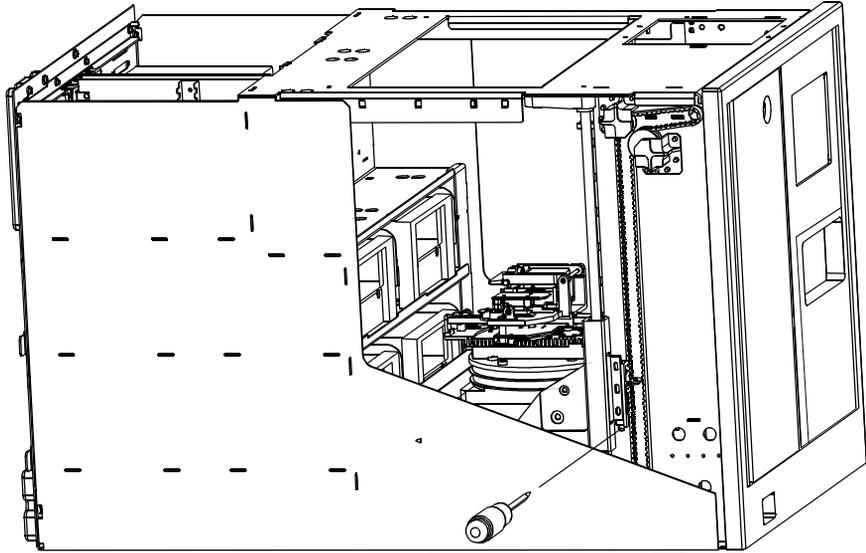


FIGURE 6-3 Securing the X-Chassis in the Maintenance Position

6.4 Stepper Motor, Y-Axis

Part Number	F370-3517-01
Location	Front, lower left corner of the cabinet
Characteristics	4.5 VDC Two-phase 1.856 in. x 1.856 in. x 2.99 in
Function	Engages the left y-axis (vertical) belt to drive the x-chassis up and down on the vertical rails.

Required Tools

- Small blade screwdriver
- 3/32 in. Allen wrench
- 1/4 in. open-end wrench
- 5/16 in. nut driver

Removal Procedure

1. **Remove power from the library.**
2. **Remove the library enclosure.**
3. **Disconnect the four pairs of motor power conductors from the terminal strip at the left front corner of the cabinet and push the conductors through the rubber grommet in the frame.**

Caution – The y-axis motor and belt restrain the x-chassis in the vertical direction. When the y-axis belt on the left side is removed, the x-chassis must be secured or it will fall to the base of the cabinet.

4. **Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position.”**

5. Remove the left y-axis belt as follows (see Figure 4-9 on page 4-16).
 - a. Loosen the two 3/32 in. Allen screws that secure the lower belt clamp in place.
 - b. Loosen the 1/4 in. adjustment screw locknut and turn the belt adjustment screw counterclockwise.
 - c. Remove the end of the belt from under the lower belt clamp.
6. Insert a 5/16 in. nut driver through the access holes in the side of the cabinet and remove the four hex nuts that secure the y-axis motor to the cabinet.
7. Remove the motor from the cabinet.
8. After the motor is replaced and the vertical belt reinstalled, adjust the belt tension as described in Section 4.5.1 “Left Y-Axis (Vertical) Belt” on page 4-14.

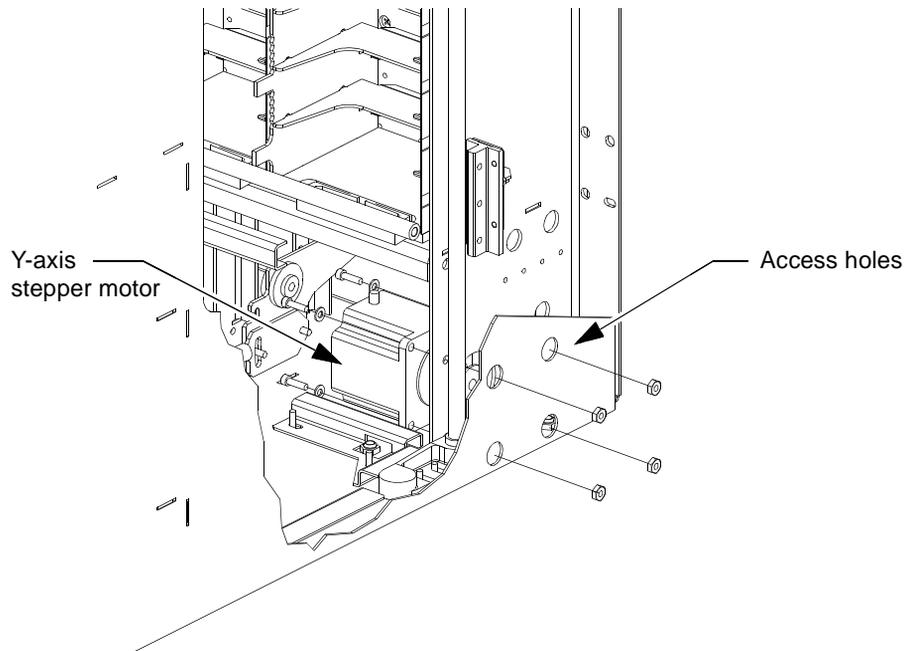


FIGURE 6-4 Stepper Motor, Y-Axis

6.5 Stepper Motor, X-Axis

Part Number	F370-3518-01
Location	Right, front corner of the x-chassis
Characteristics	2.8 VDC Two-phase
Function	Engages the x-axis belt and provides horizontal and rotary drive to the extension/rotary assembly.

Required Tools

- 3/32 in. Allen wrench
- 7/64 in. Allen wrench

Removal Procedure

1. Remove power from the library.
2. Remove the library enclosure.
3. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position.”
4. At the left end of the x-chassis, adjacent to the belt tensioning pulley, loosen the two 3/32 in. Allen locking screws (see Figure 4-16 on page 4-23).
5. At the left end of the x-chassis, turn the 7/64 in. belt tension adjustment screw counterclockwise to loosen the belt tension.
6. At the right end of the x-chassis, disengage the x-axis belt from the drive motor pulley.
7. Disconnect the 4-pin motor power cable from its connector on the x-motor interconnect board and remove the tie wrap that secures this cable to the x-chassis.
8. Remove the four 3/32 in. Allen screws that secure the x-motor to the x-chassis.
9. Remove the x-axis motor from the cabinet.
10. After the motor is replaced and the horizontal belt reinstalled, adjust the belt tension as described in Section 4.5.3 “X-Axis (Horizontal) Belt” on page 4-21.

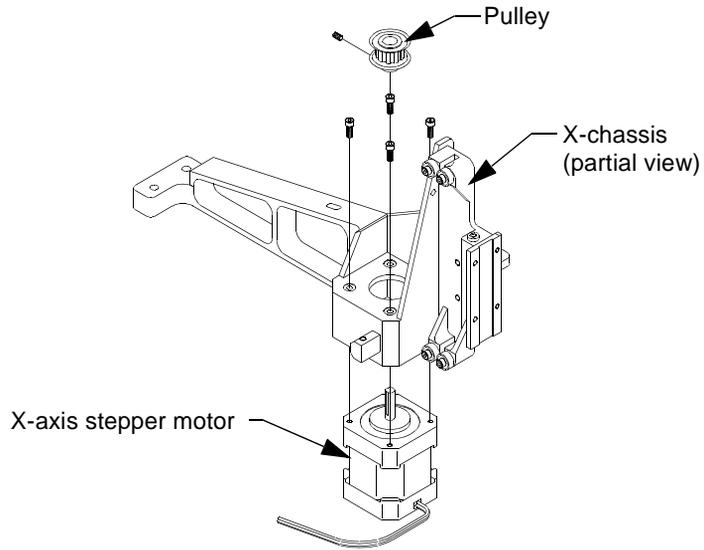


FIGURE 6-5 Stepper Motor, X-Axis

6.6 Power Supply, 300 Watt

Part Number	F370-3531-01
Location	Top, right, rear corner of the library cabinet
Characteristics	Power rating of 300 watts Auto select for inputs of 115 to 230 VAC Thermal controlled variable speed BB fan
Function	Supplies +5 VDC logic voltage Supplies +/- 12 VDC to drive stepper motors

Required Tools

- Small cutters
- Small Phillips screwdriver
- Medium Phillips screwdriver

Removal Procedure

- 1. Remove power from the library.**
- 2. Disconnect the power cord.**
- 3. Remove the library enclosure.**
- 4. Disconnect 4-pin female connector P0.**
- 5. Disconnect 4-pin female connector P2.**
- 6. Disconnect 4-pin female connector P3.**
- 7. Remove the tie-wrap that secures the power supply cable bundles together.**
- 8. Disconnect 4-pin female connector from J7 of the backplane.**
- 9. Disconnect 4-pin male connector from J8 of the backplane.**
- 10. Disconnect 6-pin female connector from J6 of the backplane.**
- 11. Disconnect 6-pin female connector from J5 of the backplane.**
- 12. Remove the screw at the front of the power supply terminal strip to disconnect the green ground wire.**

13. At the terminal strip disconnect the brown, black, blue, and white wires that are connected to the power supply.
14. Remove four Phillips screws that secure the power supply to the rear panel of the library.
15. Remove two Phillips screws that secure the front of the power supply to its baseplate.
16. Remove the power supply from the cabinet.

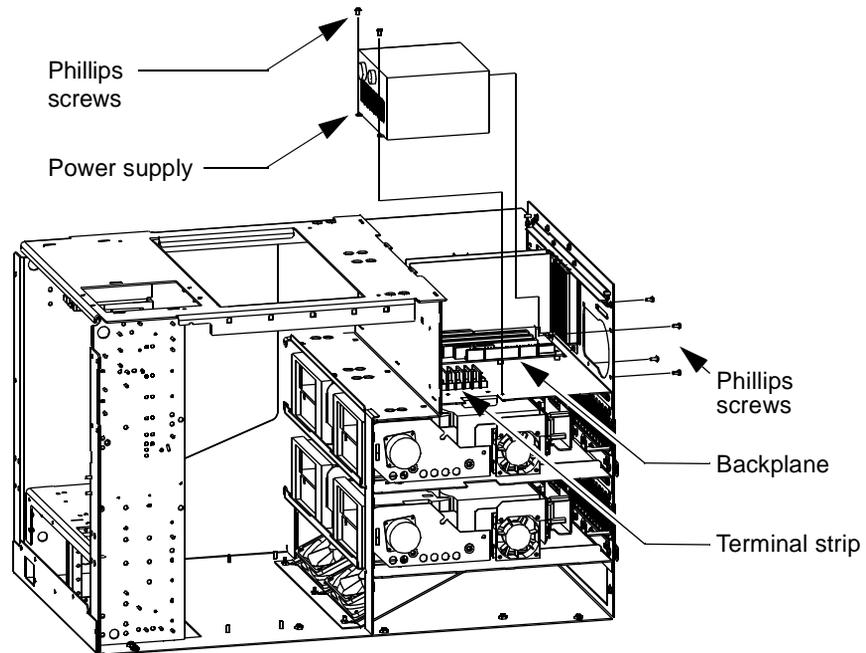


FIGURE 6-6 Power Supply, 300 Watt

6.7 Timing Belt, X-Axis

Part Number	F370-3522-01
Location	Runs width at the front edge of the x-chassis Wraps around the rotary drum
Characteristics	1/5 in. pitch 14/ in. wide Kevlar reinforced
Function	Engaged by the x-axis motor and connected to the rotary drum When the rotary drum is locked the x-axis belt will drive the x-chassis horizontally between the left edge and the right edge of the cabinet. When the rotary drum is unlocked, horizontal movement of the x-axis will be locked out, and the x-axis belt will drive rotation of the rotary drum.

Required Tools

- 3/32 in. Allen wrench
- 5/16 in. open end wrench
- 7/64 in. Allen wrench

Removal Procedure

1. **Remove power from the library.**
2. **Remove the library enclosure.**
3. **Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position.”**
4. **At the left end of the x-chassis, adjacent to the belt tensioning pulley, loosen the two 3/32 in. Allen locking screws.**
5. **Loosen the 5/16 in. locknut.**
6. **Turn the 7/64 in. belt tension adjustment screw counterclockwise to loosen belt tension.**
7. **Note the belt path around the two pulleys and the rotary drum.**

8. Disengage the timing belt from the tensioner pulley at the left edge of the x-chassis and the motor pulley at the right edge of the x-chassis.
9. Slide each end of the belt out of the clamps on the rotary drum.
10. Remove the belt from the cabinet.
11. After the belt is replaced, adjust the belt tension as described in Section 4.5.3 “X-Axis (Horizontal) Belt” on page 4-21.

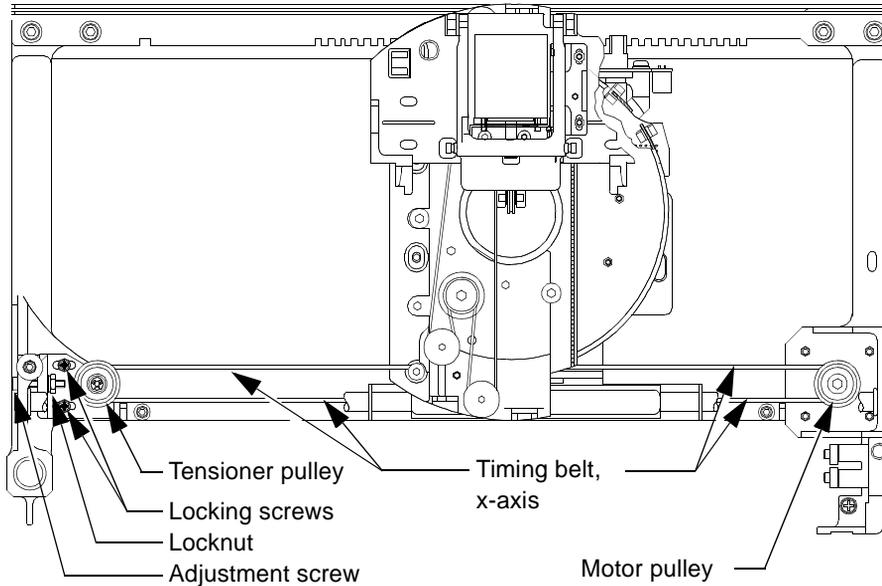


FIGURE 6-7 Timing Belt, X-Axis

6.8 Power Switch

The power switch comes with the power supply assembly (PN 370-3531-01), and does not have its own part number.

Location	Lower, left, front of cabinet
Characteristics	Black switch marked with 0 (off) and 1 (on) 0.5 in. x 1.12 in. switch (1.27cm x 2.84cm)
Function	Connects the library power supply to incoming AC voltage.

Required Tools

- Small Phillips screwdriver
- Small needle nose pliers

Removal Procedure

1. Remove power from the library.
2. Disconnect the library power cord.
3. Remove the library enclosure.
4. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position.”
5. Remove the left front door (see Section 6.23 “Left Door” on page 6-46).
6. Open the right front door.
7. Remove the five screws that secure the lower cosmetic panel in place and remove the cosmetic panel.
8. Remove the Phillips screw that secures the power switch cover in place and remove the cover.
9. Make a note of the position of the four conductors that are plugged into the back of the power switch.
10. Disconnect the four conductors from the back of the power switch.
11. Squeeze the tabs on the left and right sides of the power switch and push the switch through its mounting hole and out the front of cabinet.

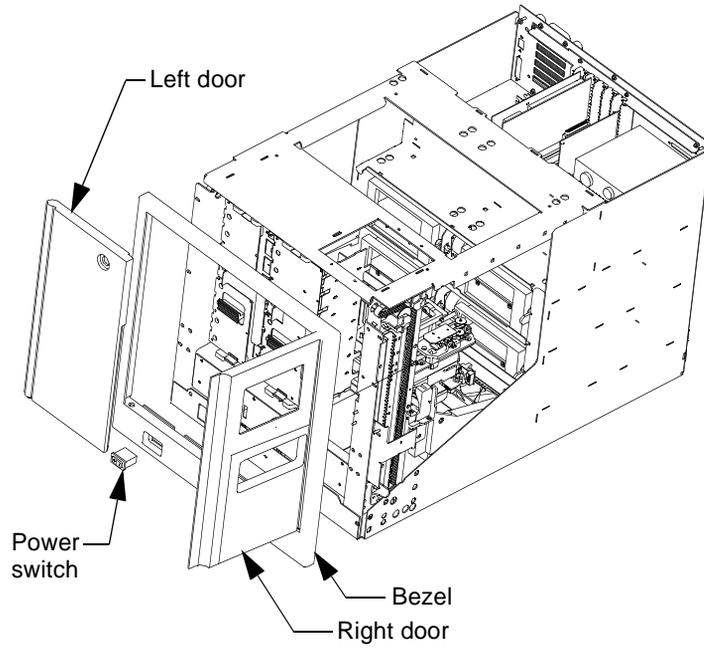


FIGURE 6-8 Power Switch

6.9 Single and Double Fan Bracket Assemblies

Rackmounted L1000 libraries have additional exhaust fans mounted on the rear of the cabinet to draw hot air away from the tape drives. Drives on the left side of the cabinet (when facing the rear) have fan bracket assemblies with one fan in each assembly. Drives on the right side of the cabinet (facing the rear) have fan bracket assemblies with two fans in each assembly. The drives on the right side require more cooling capacity because internal fans mounted on each drive assembly move air from left to right (facing the rear) inside the cabinet. The external fans act to move the hot air away from the tape drives and out of the cabinet. The removal procedure for the single fan bracket assembly is the same as the double fan bracket assembly. The fan power connector is disconnected as the assembly is removed from the cabinet.

Part Number	F370-3627-01 Single Fan Bracket Assembly F370-3628-01 Double Fan Bracket Assembly
Location	Installed on back of rackmounted libraries only
Characteristics	Contains fan(s) with the following characteristics: <ul style="list-style-type: none">• 24 VDC• 14 CFM• 3800 RPM• 2.36 in. x 2.36 in. x 0.79 in. (60 mm x 60 mm x 20mm)
Function	Exhausts air from cabinet to provide additional cooling for tape drives in rackmounted libraries.

Required Tools

- Small Phillips screwdriver

Removal Procedure

Note – Removal of a fan bracket assembly activates a switch which turns power off to the associated tape drive. Before removing a fan bracket assembly be sure the associated tape drive has no DLT cartridge present.

1. Slide the library forward on the rack mounts to gain access to the back of the library cabinet.
2. Remove the six Phillips screws that secures the fan bracket assembly to the back of the cabinet.
3. Remove the fan bracket assembly.
As the fan bracket assembly is removed, the fan power is disconnected and the associated tape drive power is turned off.

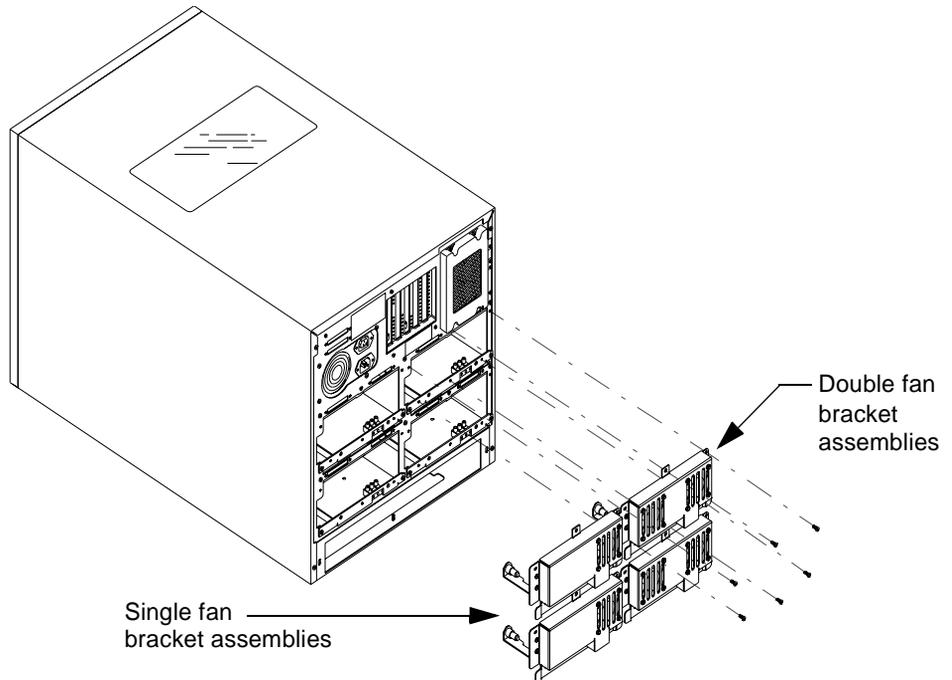


FIGURE 6-9 Fan Bracket Assemblies (Rackmounted Libraries only)

6.10 Fan, 41 CFM

Part Number	F370-3519-01
Location	Top, left, rear corner of cabinet
Characteristics	24 VDC 41 CFM 2450 RPM 3.62 in. x 3.62 in. x 0.98 in.
Function	Draws air into rear of cabinet to cool electronic printed wiring assemblies.

Required Tools

- Small pair of cutters

Removal Procedure

1. **Remove power from the library.**
2. **Remove the library enclosure.**
3. **Disconnect the fan power connector from the passive backplane PWA at connector TB1.**
4. **Cut the tie-wrap that secures the fan power conductors (red and black) to the cable bundle along the left edge of the backplane.**
5. **Remove the black plastic push pins and flanges at the four corners of the fan that secure it to the rear panel of the cabinet.**
6. **Remove the fan from the cabinet.**

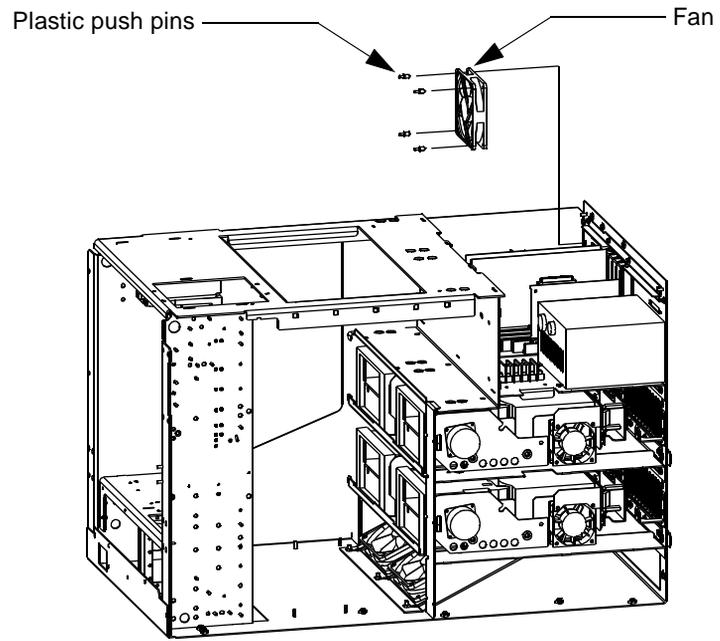


FIGURE 6-10 Fan, 41 CFM

6.11 Fan, 90 CFM

Part Number	F370-3520-01
Location	Two identical fans are located on a mounting plate at the center, base of the cabinet.
Characteristics	24 VDC 90 CFM 1400 RPM 4.69 in. x 4.69 in. x 1 in.
Function	Draws air into the library through filter at rear base of cabinet.

Required Tools

- 5/16 in. nut driver
- small cutters

Removal Procedure

1. **Remove power from the library.**
2. **Remove the library enclosure. See Section 6.2 “Removing the StorEdge L1000 Enclosure.”**
3. **Slide the x-axis to the right side of the cabinet.**
4. **Slowly raise the y-chassis and tie-wrap one of the vertical belts to hold the y-chassis at the top of the cabinet.**
5. **Disconnect the single red lead and single black lead from the front side of the terminal strip at the left edge of the fan mounting plate.**
6. **Remove the fan mounting plate from the library as follows:**
 - a. **Loosen the 5/16 in. hex nuts that secure the fan mounting plate to the base of the cabinet.**
 - b. **Hold the x-umbilical cable at the right edge of the cabinet.**
 - c. **Slide the fan mounting plate forward to disengage the rear edge of the mounting plate from its retention tabs.**

6.12 SCSI Wide, Differential PWA

Part Number	F370-3521-01
Location	Top, rear, center of cabinet Connects to J9 of the passive backplane
Characteristics	Differential SCSI bus adapter 3.25 in. x 5.00 in.
Function	Provides a differential SCSI communication interface to the host computer.

Required Tools

- Small Phillips screwdriver

Removal Procedure

- 1. Remove power from the library.**
- 2. Remove the library enclosure.**
- 3. Disconnect the SCSI cable connected to the back of the SCSI PWA.**
- 4. Remove the small Phillips screw that secures the SCSI PWA to the rear panel of the cabinet.**
- 5. Disconnect the SCSI PWA from the passive backplane and remove it from the cabinet.**

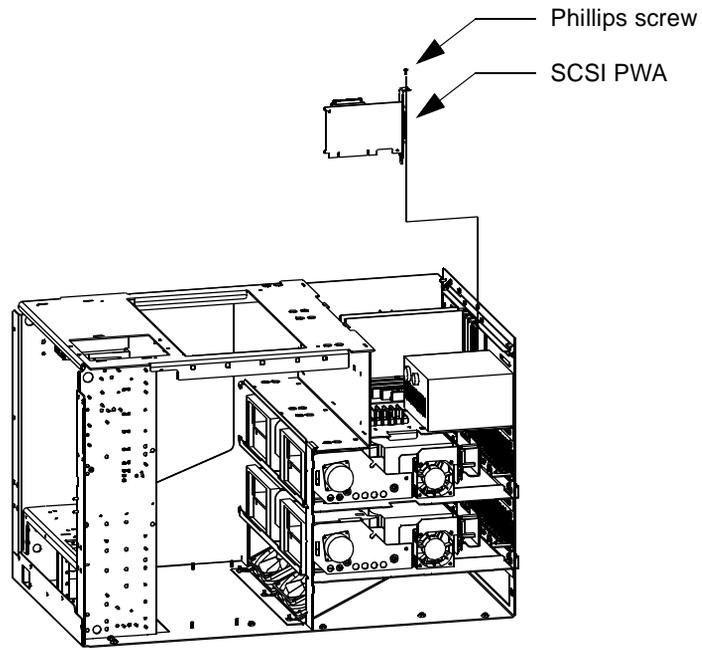


FIGURE 6-12 PWA, SCSI Wide, Differential

6.13 Timing Belt, Y-Axis

Part Number	F370-3523-01
Location	There are two y-axis (vertical) belts. One is on the left side and one is on the right side near the front of the cabinet.
Characteristics	1/5 in. pitch 3/8 in. wide Kevlar reinforced
Function	The left side y-axis belt is directly engaged by the y-axis motor to drive the x-chassis up and down the vertical rails. The right side y-axis belt is driven by a pulley and shaft from the left side y-axis belt to assist in driving the x-chassis up and down the vertical rails.

Required Tools

- 3/32 in. Allen wrench
- 1/4 in. open-end wrench
- Small Phillips screwdriver

Removal Procedure (Left Side Y-Axis Belt)

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

Caution – The y-axis motor and belt restrain the x-chassis in the vertical direction. When the y-axis belt on the left side is removed, the x-chassis must be secured or it will fall to the base of the cabinet.

3. **Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position.”**
4. **Remove the y-axis belt from the cabinet as follows:**
 - a. **Loosen the two 3/32 in. Allen screws that secure the lower belt clamp in place.**
 - b. **Loosen the 1/4 in. adjustment screw locknut and turn the belt adjustment screw counterclockwise.**

- c. Remove the end of the belt from under the lower belt clamp.
 - d. Loosen the two 3/32 in. Allen screws that secure the upper belt clamp in place and remove the end of the belt.
 - e. Remove the belt from the cabinet.
5. After the belt has been replaced, adjust the belt tension as described in Section 4.5.1 “Left Y-Axis (Vertical) Belt” on page 4-14.

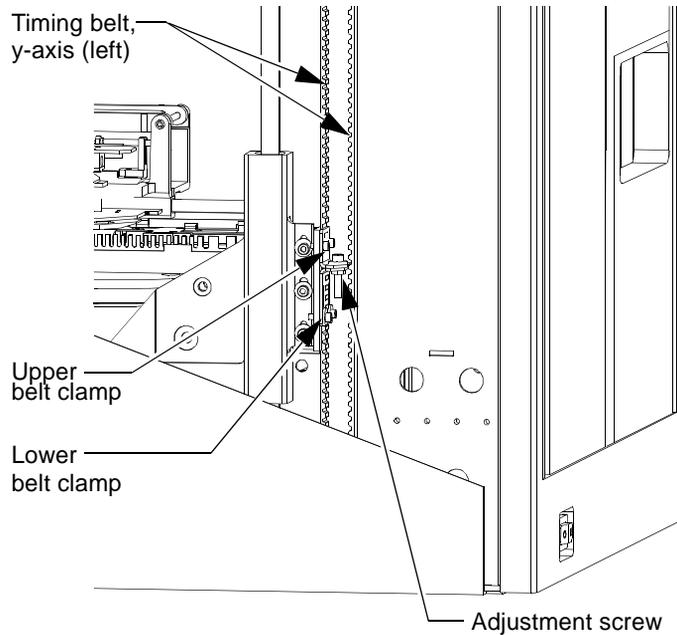


FIGURE 6-13 Timing Belt, Y-Axis (Left Side)

Removal Procedure (Right Side Y-Axis Belt)

- 1. Remove power from the library.**
- 2. Remove the library enclosure.**
- 3. Disconnect the x-axis motor power cable connector from the x-motor interconnect board.**
- 4. Remove the Phillips screw that secures the x-axis motor interconnect board to the x-chassis.**
- 5. Secure the x-chassis. See Section 6.3 “Securing the X-Chassis in the Maintenance Position.”**
- 6. Remove the two Phillips screws that secure the y-axis sensor assembly to the x-chassis.**
- 7. Move the vertical axis sensor assembly and x-motor interconnect away from the y-axis belt clamps.**
- 8. Loosen the two 3/32 in. Allen screws that secure the lower belt clamp in place.**
- 9. Loosen the 1/4 in. adjustment screw locknut and turn the belt adjustment screw counterclockwise to loosen the belt tension.**
- 10. Remove the end of the belt from under the lower belt clamp.**
- 11. Loosen the two 3/32 in. Allen screws that secure the upper belt clamp in place and remove the end of the belt.**
- 12. Remove the belt from the cabinet.**
- 13. After the belt has been replaced, adjust the belt tension as described in Section 4.5.2 “Right Y-Axis (Vertical) Belt” on page 4-17.**

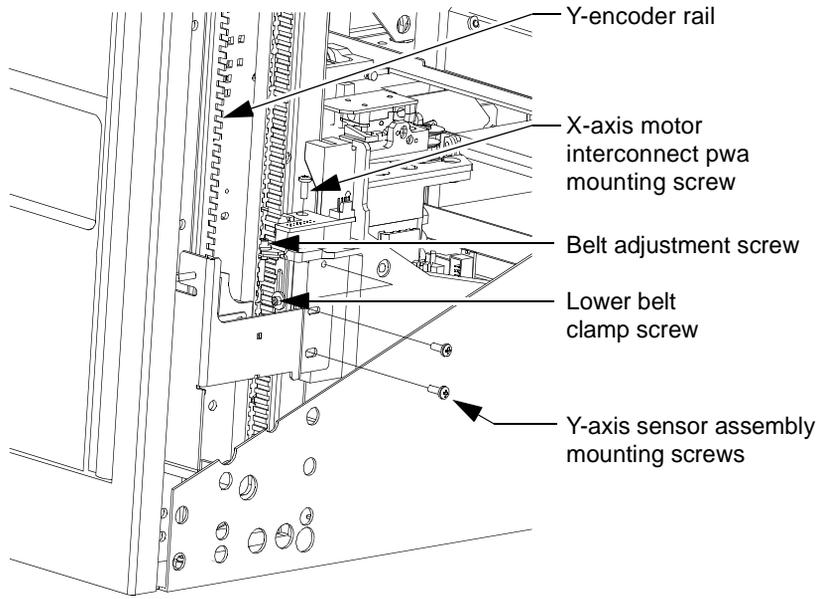


FIGURE 6-14 Timing Belt, Y-Axis (right side)

6.14 Right Door Assembly, With B/W Control Panel

Part Number	F370-3524-01
Location	Right, front of cabinet
Characteristics	Includes the control panel
Function	Provides access to the library to bulk load tape cartridges. Provides access to the front panel of each tape drive in the library.

Required Tools

- Small screwdriver

Removal Procedure

1. Remove power from the library.
2. Remove the library enclosure.
3. Open the left, front door.
4. Open the right, front door.
5. Disconnect the 44-pin ribbon cable from J1 of the control panel interface PWA on the inside of the right, front door.
6. Disconnect the 2-pin ground cable from the connector at the bottom of the control panel assembly.
7. Locate the spring-loaded hinge pin just behind the front cover at the top, right, front corner of the cabinet.

Caution – The door hinge pin is spring-loaded. When tilting the door forward in the next step, place a finger on the top edge of the door and cover the hinge pin to prevent it from flying out as the door is removed.

8. Push down on the hinge pin and slowly tilt the top, right corner of the door out of the cabinet.

9. Remove the door from the cabinet.

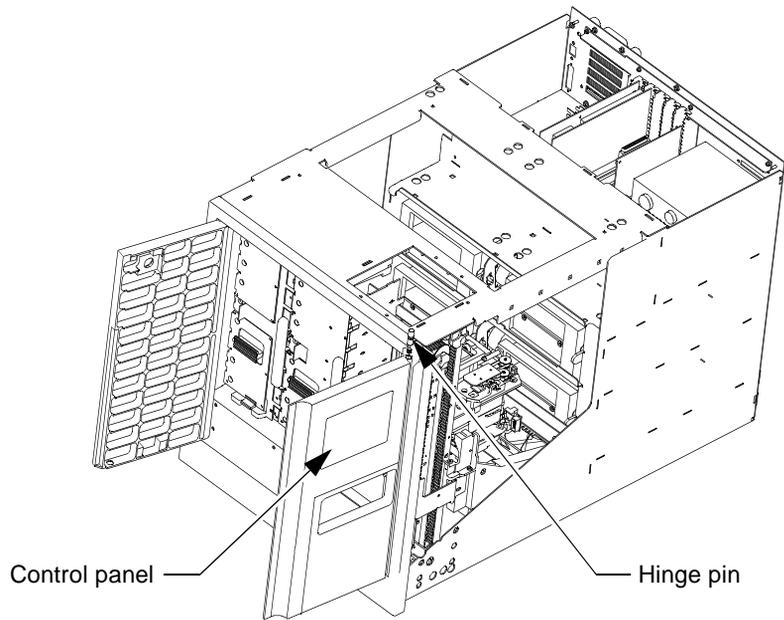


FIGURE 6-15 Right Door Assembly, With B/W Control Panel

6.15 DLT7000 Differential Tape Drive

Part Number	F370-3516-01
Location	Accessed from the rear of the library
Characteristics	5.25 in. form factor Hot swap feature. See Section 1.10.1 “Hot-Swap Feature.”
Function	Writes data to and reads data from DLT tape cartridges.

Required Tools

- Medium Phillips screwdriver

Removal Procedure

1. **If a tape is present, eject and remove it from the tape drive.**
2. **Remove the six screws that secure the tape drive access panel to the rear of the library cabinet, and remove the panel. Removing this panel will initiate a controlled, 50 msec power down of the tape drive. See Section 1.10.1 “Hot-Swap Feature.”**
3. **Remove two screws that secure the tape drive tray in the library cabinet.**
4. **Slide the tape drive tray out the rear of the library approximately 2 inches.**
5. **Disconnect the SCSI cable at the back of the tape drive.**
6. **Disconnect the 4-pin male power connector at the top, center of the tape drive.**
7. **Disconnect the 36-pin ribbon cable near the right edge of the tape drive.**
8. **Slide the tape drive assembly out the rear of the library.**

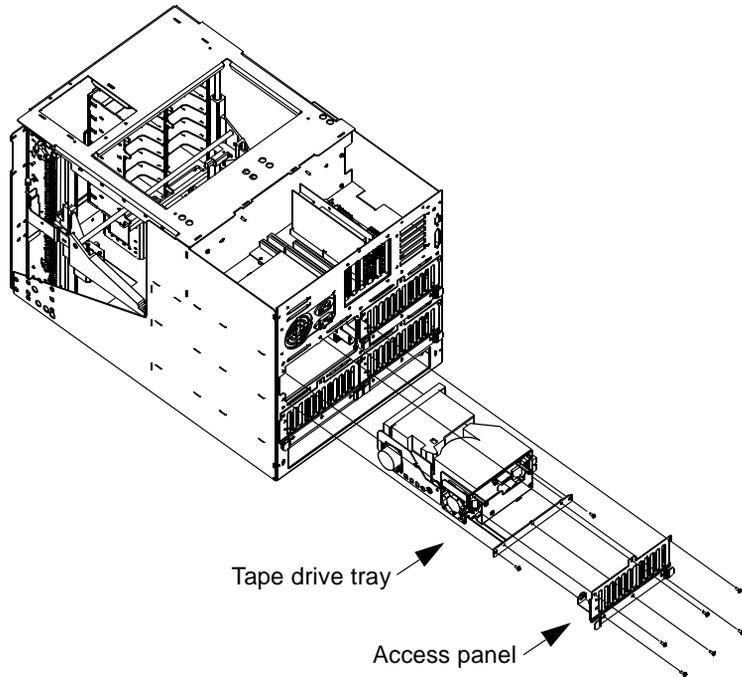


FIGURE 6-16 DLT Tape Drive Assembly

6.16 Robotics Controller PWA

Part Number	F370-3525-01
Location	Inside top, rear center of cabinet Connects to J3 and J26 of the passive backplane
Characteristics	Contains Motorola 132-pin 68332 20MHz microprocessor (U1) Contains Dallas 64K nonvolatile SRAM (U2) 4.20 in. x 7.60 in. PWA (10.67cm x 19.30cm)
Function	Responds to RS-232 commands from a host computer to control and track movement of cartridges.

Required Tools

- Small Phillips screwdriver

Removal Procedure

- 1. Remove power from the library.**
- 2. Remove the library enclosure.**
- 3. Disconnect the RS-232 cables at the rear edge of the robotics controller PWA (J2 and J3).**
- 4. Remove the small Phillips screw that secures the robotics controller PWA to the rear panel of the cabinet.**
- 5. Disconnect the robotics controller PWA from the passive backplane and remove it from the cabinet.**
- 6. After replacing the robotics controller pwa reset the library configuration using Section 7.5.9.1 “Configure System” on page 7-30.**

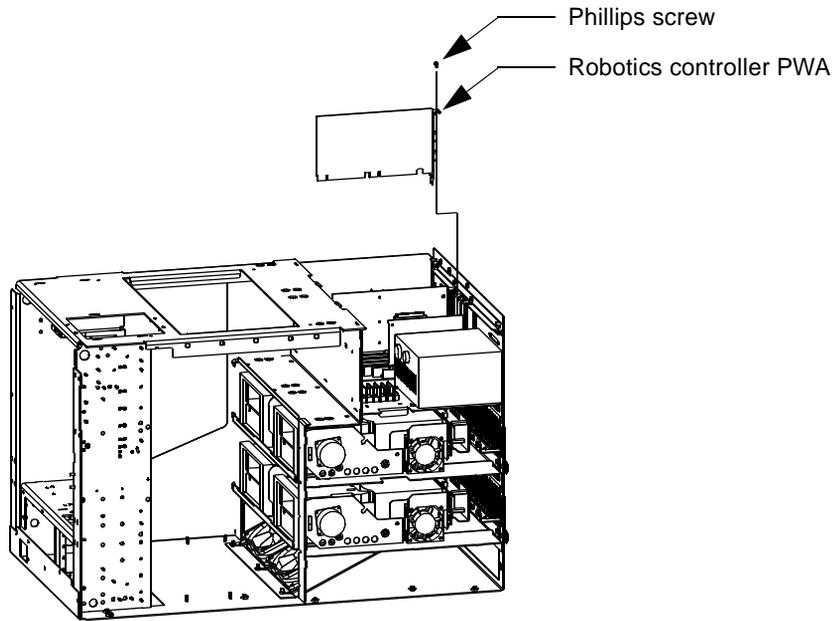


FIGURE 6-17 Robotics Controller PWA

6.17 Actuator Driver PWA

Part Number	F370-3526-01
Location	Top, rear, center of cabinet Connects to J13 and J19 of the passive backplane
Characteristics	Contains Xilinx 208-pin FPGA (U48) 4.20 in. x 7.60 in. PWA (10.67cm x 19.30cm)
Function	Provides high current drive signals to the four motors in the library when commanded by the robotics controller.

Required Tools

- Small Phillips screwdriver

Removal Procedure

- 1. Remove power from the library.**
- 2. Remove the library enclosure.**
- 3. Remove the small Phillips screw that secures the actuator driver PWA to the rear panel of the cabinet.**
- 4. Disconnect the actuator driver PWA from the passive backplane and remove it from the cabinet.**

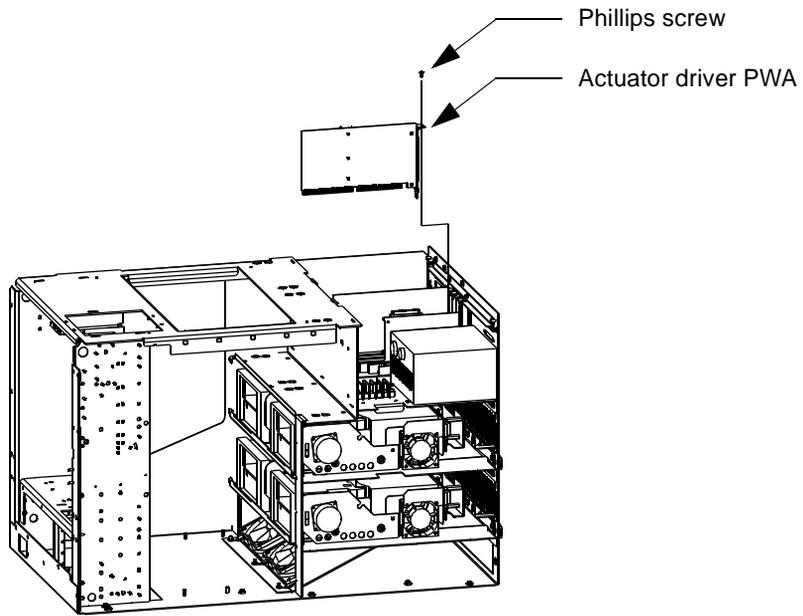


FIGURE 6-18 Actuator Drive PWA

6.18 Passive Backplane PWA

Part Number	F370-3532-01
Location	Top, rear, left side of cabinet Lays flat on cabinet baseplate above tape drives
Characteristics	Contains 14 cable connectors Contains 9 board sockets Contains 4 replaceable fuses 7.40 in. x 8.00 in. PWA (18.80cm x 20.32cm)
Function	Provides power and sockets for the robotics controller, actuator driver, and SCSI controller boards. Serves as an interconnect for cables that provide power and signals to all robotic components in the library.

Required Tools

- Medium-size Phillips screwdriver

Removal Procedure

1. **Remove power from the library.**
2. **Remove the library enclosure.**
3. **Remove the actuator driver. See Section 6.17 “Actuator Driver PWA.”**
4. **Remove the robotics controller. See Section 6.16 “Robotics Controller PWA.”**
5. **Remove the SCSI PWA. See Section 6.12 “SCSI Wide, Differential PWA.”**
6. **Disconnect connectors J5, J6, J7, and J8 from the right edge of the passive backplane.**
7. **Disconnect connectors J20, J25, J16, J24, J1, J14, and TB1 from the left edge of the passive backplane.**
8. **Remove the 15 Phillips screws that secure the passive backplane to the baseplate of the cabinet.**
9. **Carefully remove the passive backplane from the library cabinet.**

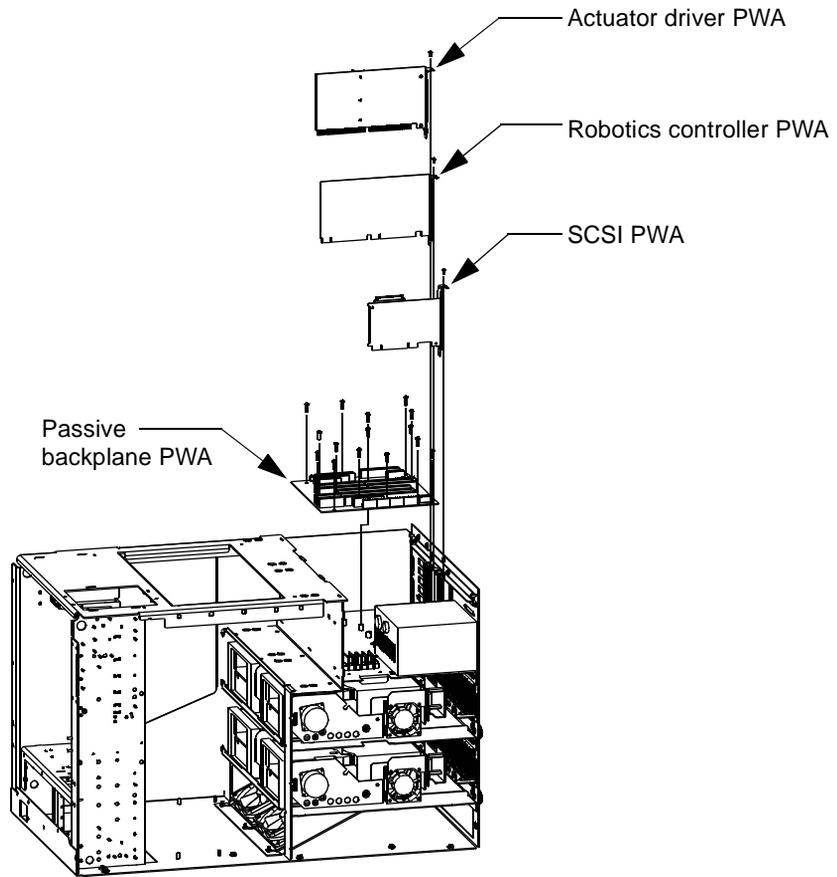


FIGURE 6-19 Passive Backplane PWA

6.19 Y-Encoder Interconnect PWA

Part Number	F370-3527-01
Location	Mounts on the right end of the horizontal chassis assembly
Characteristics	Includes an optical sensor 1.16 in. x 1.31 in. PWA (2.95cm x 3.33cm)
Function	Optical sensor reads notches in the y-encoder rail to track vertical position of the horizontal chassis assembly.

Required Tools

- Medium-size Phillips screwdriver
- 3/8 in. nut driver

Removal Procedure

1. Remove power from the library.
2. Remove the library enclosure.
3. Remove the two Phillips screws that secure the y-axis sensor assembly to the horizontal chassis (see Figure 6-14 on page 6-27).
4. Remove the Phillips screw securing the x-axis interconnect PWA to the horizontal chassis (see Figure 6-14 on page 6-27).
5. Disconnect the y-axis umbilical cable from P1 of the y-encoder interconnect PWA (see Figure 6-20).
6. Remove the 3/8 in. hex nut that secures the small PWA mounting bracket to the y-axis sensor assembly. Remove the sensor assembly with the y-encoder interconnect PWA from the library cabinet.
7. Remove the two Phillips screws that secure the y-encoder interconnect PWA to the sensor assembly.

- 8. When installing the new y-encoder interconnect PWA, adjust the y-axis sensor assembly (before tightening the 3/8 in. hex nut) so that the optical sensor is centered on the notched y-encoder rail (see Figure 6-14 on page 6-27).**

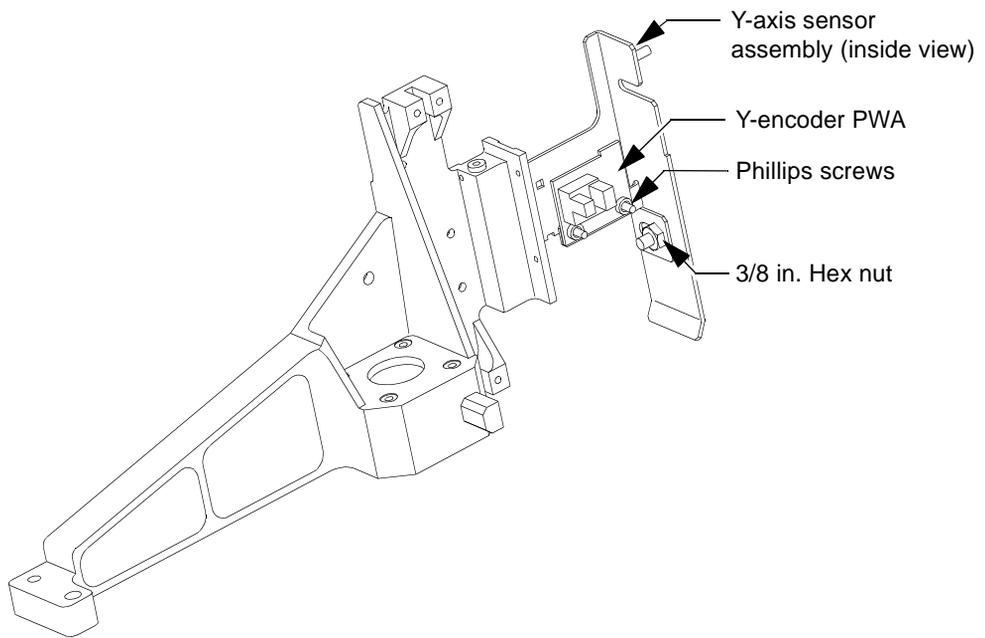


FIGURE 6-20 Y-Encoder PWA

6.20 X-Motor Interconnect PWA

Part Number	F370-3528-01
Location	Mounts on the right end of the horizontal chassis assembly
Characteristics	T-shaped 1.98 in. x 0.96 in. PWA (5.03cm x 2.44cm)
Function	Provides cable interconnect point between the x-axis motor and the passive backplane PWA.

- *Required Tools*
- Medium-size Phillips screwdriver

Removal Procedure

1. **Remove power from the library.**
2. **Remove the library enclosure.**
3. **Disconnect the x-axis motor cable from J1.**
4. **Disconnect the y-umbilical cable from J2 on the underside of the PWA.**
5. **Remove the Phillips screw that secures the x-motor interconnect PWA to the y-chassis assembly.**
6. **Remove the x-motor interconnect PWA from the library cabinet.**

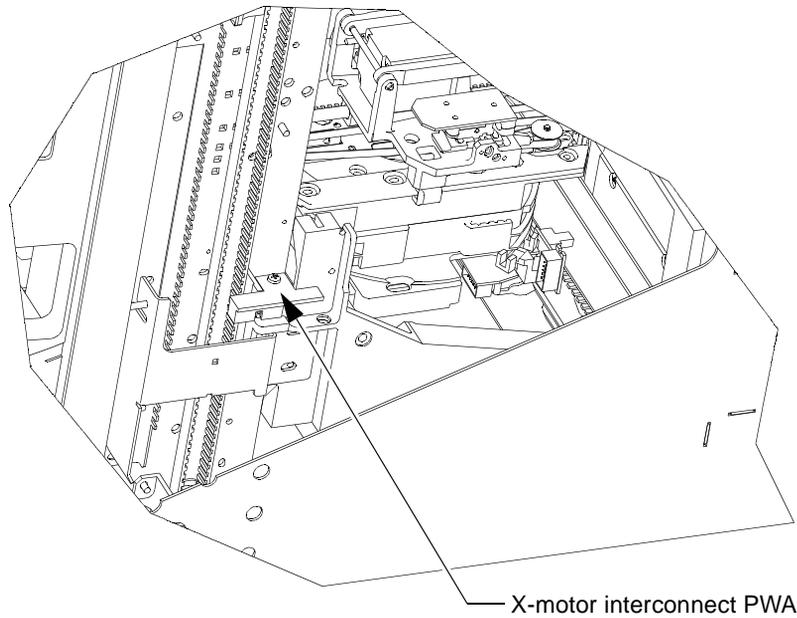


FIGURE 6-21 X-Motor Interconnect PWA

6.21 Extension / Rotary Assembly

Part Number	F370-3529-01
Location	Mounts on top of the x-chassis rotary drum
Characteristics	Contains extension motor which drives gripper forward and backward Contains gripper motor which opens and closes the gripper jaw
Function	Grips a single cartridge at a time for transport to a new location.

Required Tools

- Small needle-nose pliers
- Small Phillips screwdriver

Removal Procedure

- 1. Remove power from the library.**
- 2. Remove the library enclosure.**
- 3. Move the x-chassis to the left or right edge of the cabinet.**
- 4. Manually move the gripper and compress it against its rear limit. This will unlock the rotary assembly and permit the extension axis to spin.**
- 5. Spin the extension axis so the gripper is facing the rear of the cabinet, and slide the gripper toward the rear.**
- 6. Using a small needle-nose pliers, unhook the lock actuator cable from the x-chassis pulley block near the center of the extension axis. This is accomplished by gently pulling up on the cable, then slowly releasing the cable through the open slot on the x-chassis pulley block.**
- 7. Remove the small Phillips screw and flat washer from the bushing in the center of the extension axis.**
- 8. Remove the four recessed Phillips screws that secure the extension axis assembly to the rotary drum.**

- Carefully lift straight up, pulling the extension axis off of the center hub of the rotary drum. There are cables attached underneath that you must disconnect from the rotary drum before the extension axis can be completely removed.

Caution – When reinstalling the extension axis be very careful not to pinch any of the motor power cable conductors underneath the extension axis frame.

- Disconnect the umbilical cable connectors J2 and J6 from their respective connectors on the rotary drum.
- Disconnect the single ground wire from the bottom side of the extension axis.
- Remove the extension axis assembly from the cabinet.

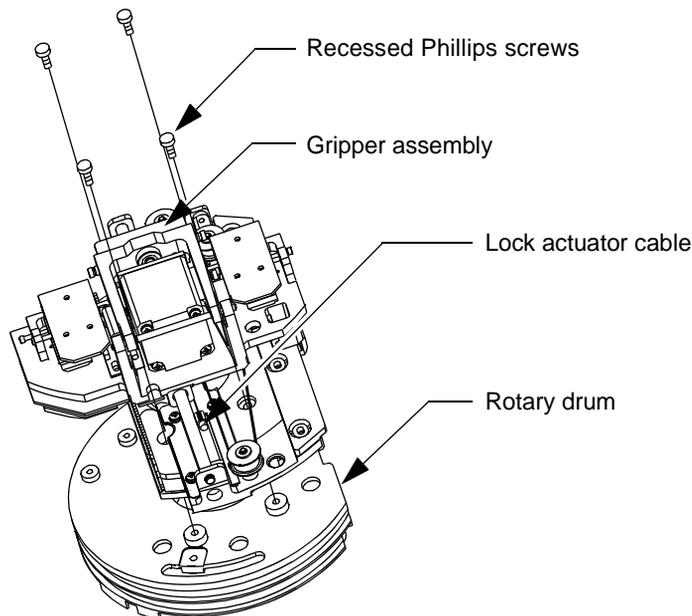


FIGURE 6-22 Extension/Rotary Assembly

6.22 Load Pack Assembly

Part Number	F370-3530-01
Location	Inside left door
Characteristics	Holds eight DLT cartridges
Function	Provides operator access to eight of the thirty library cartridges.

Required Tools

- none

Removal Procedure

- 1. Press the Load Pack button on the control panel.**
- 2. Wait for the lock to release, then open the left door.**
- 3. Push the release latches at the top and bottom of the load pack and remove the load pack from the cabinet.**

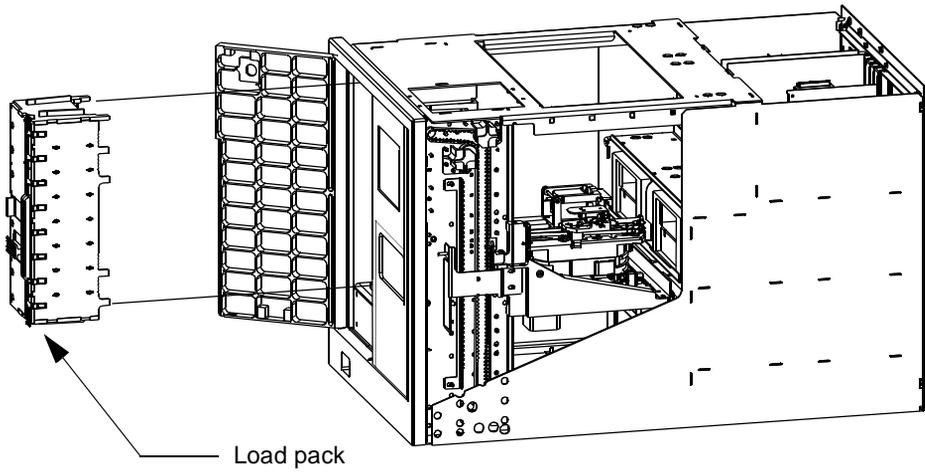


FIGURE 6-23 Load Pack Assembly

6.23 Left Door

Part Number	6221082-01
Location	Left, front of cabinet
Characteristics	Includes lock near top of door
Function	Provides access to the load pack inside the left door.

Required Tools

- Small screwdriver

Removal Procedure

- 1. Remove power from the library.**
- 2. Remove the library enclosure.**
- 3. Open the left, front door.**
- 4. Locate the spring-loaded hinge pin just behind the front cover at the top, left, front corner of the cabinet.**

Caution – The door hinge pin is spring-loaded. When tilting the door forward in the next step, place a finger on the top edge of the door and cover the hinge pin to prevent it from flying out as the door is removed.

- 5. Push down on the hinge pin and slowly tilt the top, left corner of the door out of the cabinet.**
- 6. Remove the door from the cabinet.**

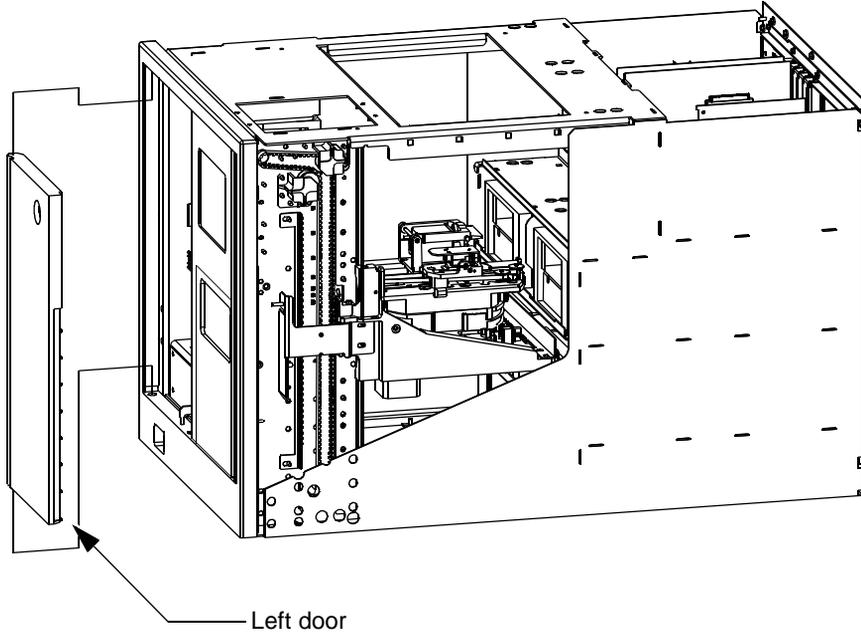


FIGURE 6-24 Left Door

Diagnostic Software

The L1000 diagnostic software runs on a Sun workstation, and provides the ability to test individual components and overall operation of the library. This chapter describes:

- Installing the diagnostic software
- Connecting the library to a Sun workstation
- Starting the diagnostic software
- The diagnostic software user interface
- Using the diagnostic software
- Exiting the diagnostic software

7.1 Installing the Diagnostic Software

Diagnostic software files can be found on the Diagnostic CD-ROM in:

```
/cdrom/diag_tools/serial_diag
```

The diagnostic software installation requires approximately 2 Mbytes of hard disk space and contains the following files:

- README—contains the latest information about the diagnostic software, and installation instructions
- diagtool—the executable file.
- Diagtool—used to properly configure the Motif environment.

1. Insert the diagnostic CD-ROM in the CD-ROM drive.

2. Go to root and enter your superuser password:

```
% su root <Enter>
% passwd: password <Enter>
```

3. Check the CD-ROM drive:

```
% volcheck <Enter>
```

4. Make a directory for the diagnostic software:

```
% mkdir /opt/serial_diag <Enter>
```

5. Copy the diagtool and Diagtool files from CD-ROM to the serial_diag directory:

```
% cp /cdrom/diag_tools/serial_diag/diagtool /opt/serial_diag/ <E>
% cp /cdrom/diag_tools/serial_diag/Diagtool /opt/serial_diag/ <E>
```

6. Set the environment:

```
% setvar XENVIRONMENT /opt/serial_diag/Diagtool <Enter>
```

7.2 Connecting the StorEdge L1000 Library to a Sun Workstation

The StorEdge L1000 has a DIAG port on the rear panel that must be connected to a serial port on the Sun workstation.

1. Connect a 9-pin RS-232 cable to the port marked DIAG at the rear of the library.

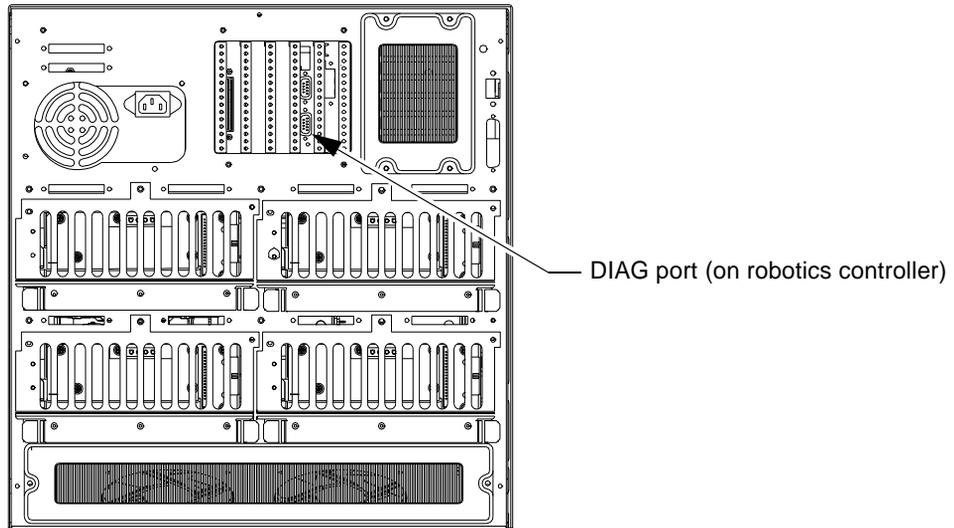


FIGURE 7-1 DIAG Port Location

2. Connect the opposite end of the RS-232 cable to a serial port on a Sun workstation.

7.3 Starting the Diagnostic Software

1. Turn the library on.
2. Put the library in standby (off-line) mode.
3. At the Sun workstation type:

```
% diagtool -b<baud> -p<address> <Enter>
```

where *<baud>* is the baud rate of the designated serial port,
and *<address>* is the address of the designated serial port
Example:

```
% diagtool -b9600 -p/dev/ttya <Enter>
```

The Serial Diagnostic Tool Menu screen is displayed

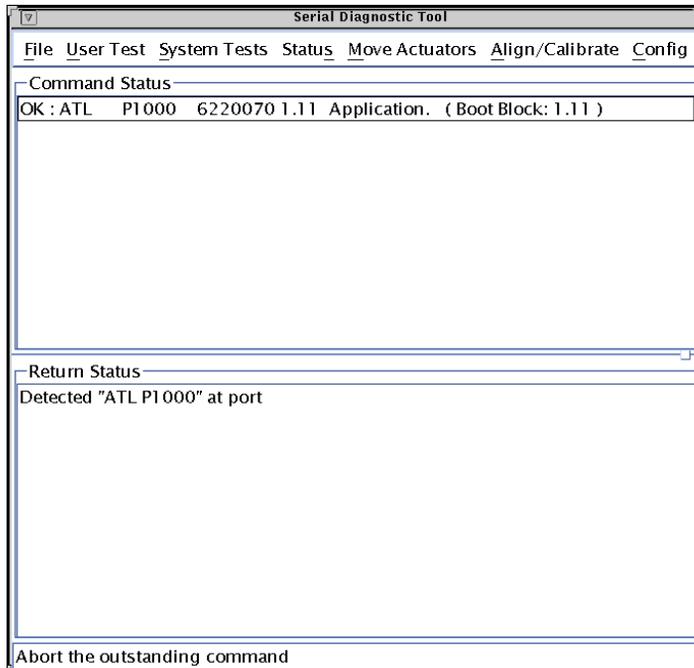


FIGURE 7-2 Serial Diagnostics Main Menu

7.4 The Diagnostic Software User Interface

This section describes the four components of the diagnostic software user interface:

- Menu bar
- Command status window
- Return status window
- Help line

7.4.1 Menu Bar

The serial diagnostic tool menu bar includes the following seven drop-down menus:

- File
- User Test
- System Test
- Status
- Move Actuators
- Align/Calibrate
- Config

To activate a menu:

- Point and click with a mouse, or
- Hold the **ALT** key and press the key underlined in the menu title.

Menus and submenus are described in detail in this chapter.

7.4.2 Command Status Window

The command status window displays the communications between the diagnostic program and the L1000. Each command from the diagnostic software and each response from the library is listed here.

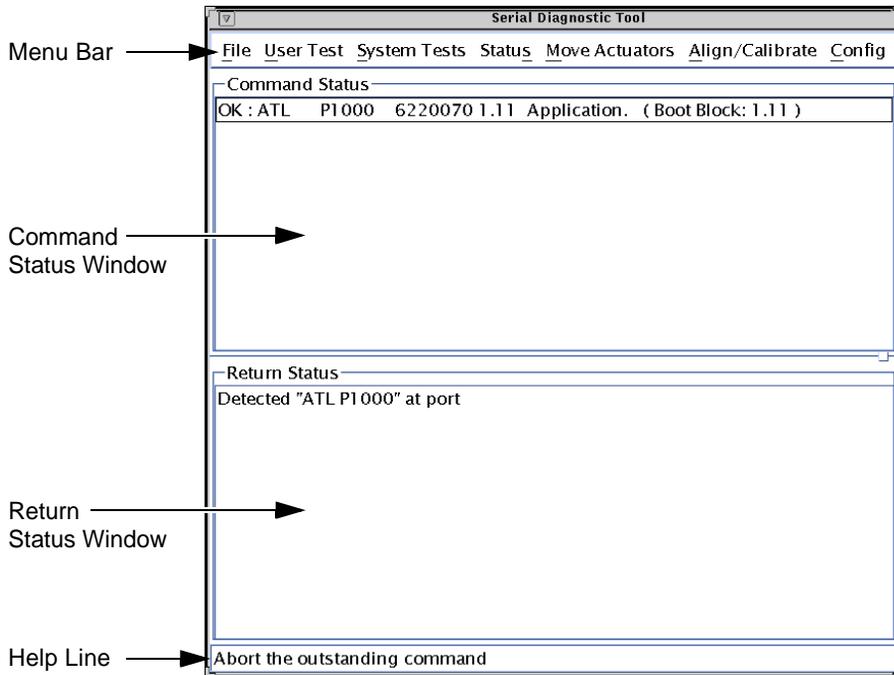


FIGURE 7-3 User Interface

7.4.3 Return Status Window

The return status window displays detailed information about the function that you have selected.

7.4.4 Help Line

The help line is a short description of a selected command or feature. It is displayed at the bottom of the screen when a menu or command is selected.

7.5 Using the Diagnostic Software

The diagnostic software options are described in the following sections in the order in which they appear in the Main Menu, beginning with the File Menu (page 7-9) and ending with the Config Menu (page 7-30). Figure 7-4 shows the Main Menu screen, and Figure 7-5 lists the diagnostic menu structure. An arrow (>) to the right of the option in the pull-down menu indicates that a submenu exists.

7.5.1 Using the Main Menu

There are seven pull-down options in the Main Menu screen. To open a pull-down click on the option or type the underlined letter in the option name.

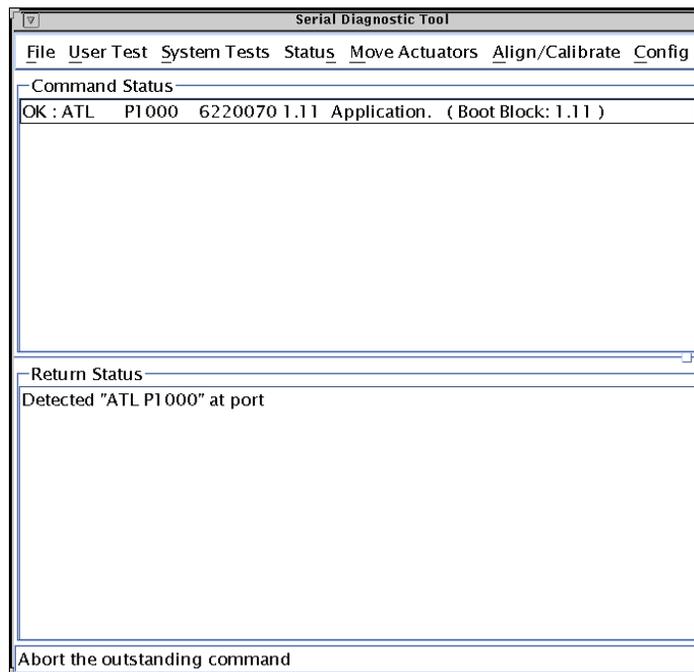


FIGURE 7-4 Main Menu

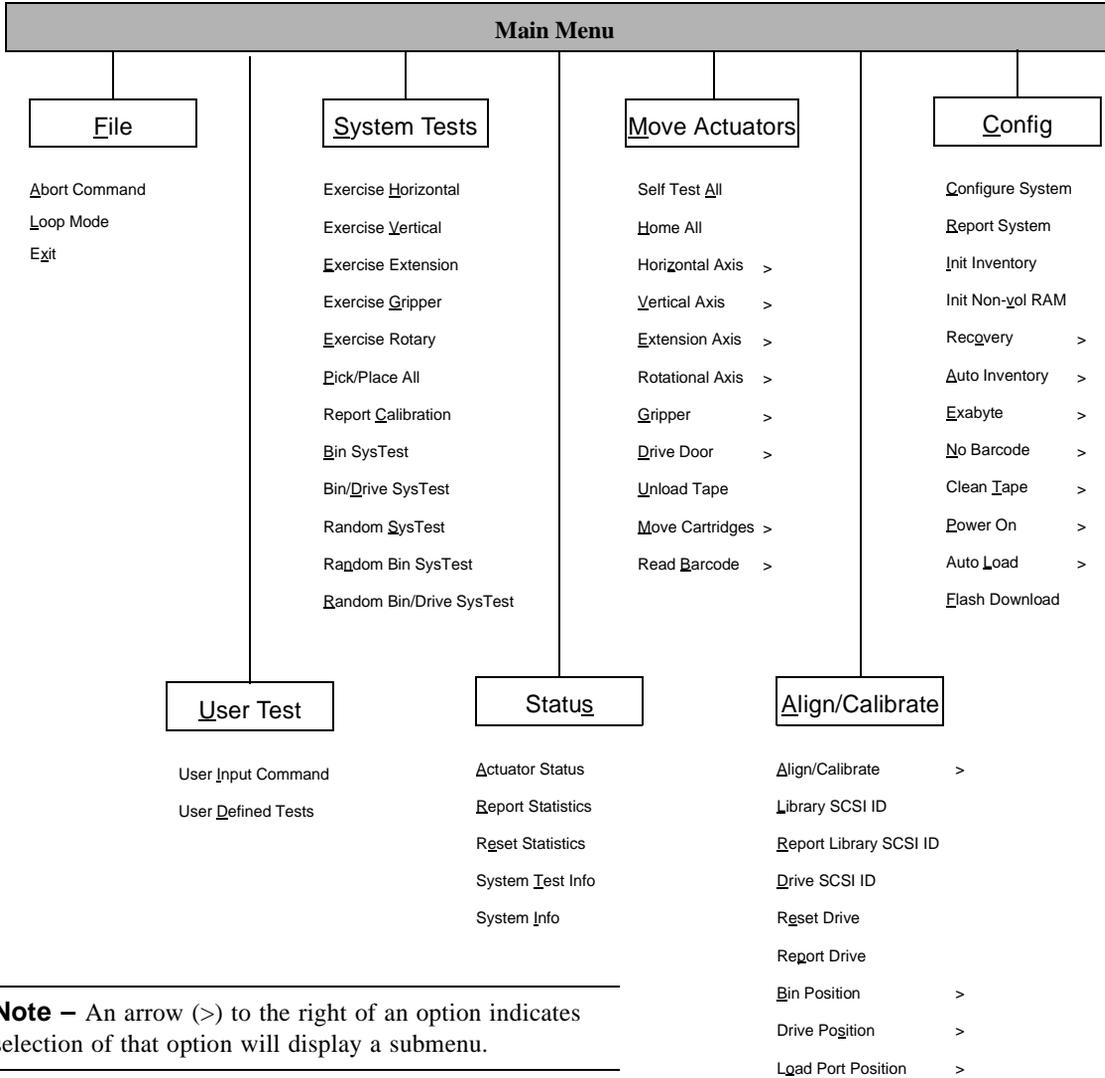


TABLE 7-1 Menu Structure

7.5.2 Using the File Menu

The File Menu has the following options:

7.5.2.1 Abort Command

Aborts the current operation. Displays the response from the most recent command in the Command Status window.

7.5.2.2 Loop Mode

Runs next selected command or operation continuously until stopped with the Abort command.

7.5.2.3 Exit

Exits Serial Diagnostic Tool.

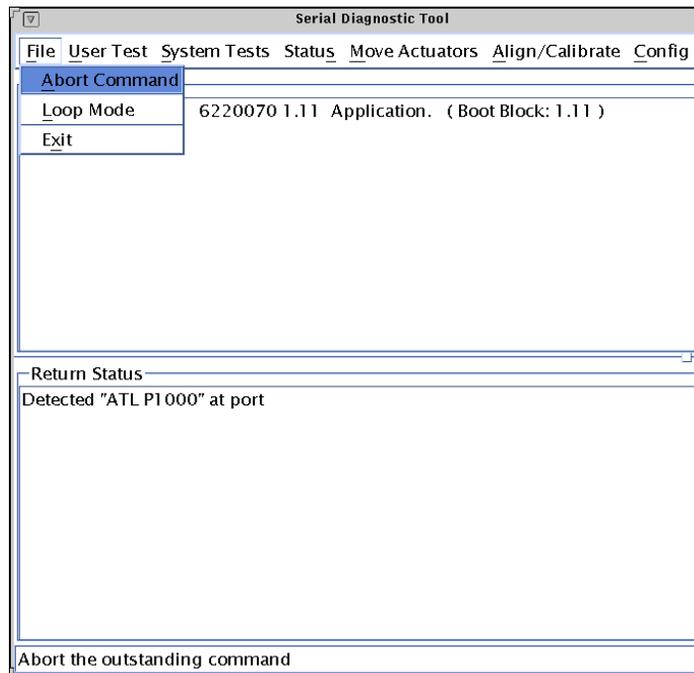


FIGURE 7-5 File Menu

7.5.3 Using the User Test Menu

The User Test Menu has the following options:

7.5.3.1 User Input Command

Initiates commands and operations using ASCII character strings. This is a development tool, not normally used by field service.

1. **Select User Test / User Input Command.**
2. **In the dialog box, type an ASCII character string representing the desired function.**

Example: typing `self test all` is the same as executing Move Actuators / Self Test All.

3. **Click the Execute button.**

7.5.3.2 User Defined Tests

Use to create and run custom diagnostic routines.

To create a new user defined test:

1. **Select User Test / User Defined Tests.**
A File Search dialog box is displayed.
2. **In the Selection box enter a new filename.**
3. **Click OK.**
A `<filename>` dialog box is displayed.
4. **Using ASCII character strings, enter each desired command line and press return.**

Example: typing `self test all` is the same as executing Move Actuators / Self Test All.

5. **Click the Save button.**
6. **Click the Execute button.**
The new test begins.
7. **Click the Stop button to stop the test.**
8. **Click the Done button to exit.**

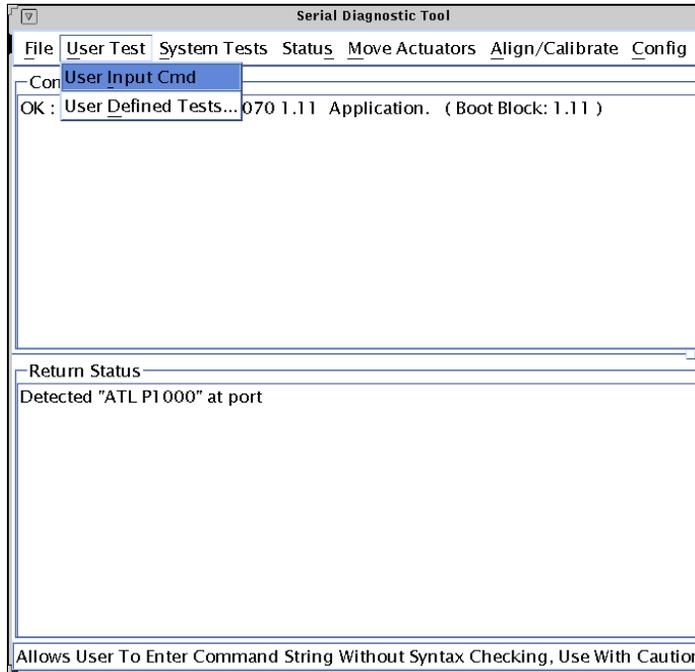


FIGURE 7-6 User Test Menu

To run a previously defined test:

1. Select User Test / User Defined Tests.

A File Search dialog box is displayed.

2. Enter the desired filename in the Filter window.

3. Click the Filter button.

4. Highlight the desired test in the Files window.

5. Click the OK button.

The <filename> dialog box appears.

6. Click the Execute button.

The test begins.

7. Click the Stop button to stop the test.

8. Click the Done button to exit.

7.5.4 Using the System Tests Menu (Options 1 - 7)

The System Tests Menu provides high level commands that exercise entire hardware components and test routines that run all library actuators. System Tests has the following options:

7.5.4.1 Exercise Horizontal

Use to test the horizontal axis motor and sensors. Sends the horizontal axis to the home position, then to its limit position, then back to home.

7.5.4.2 Exercise Vertical

Use to test the vertical axis motor and sensors. Sends the vertical axis to the home position, then to its limit, then back to home.

7.5.4.3 Exercise Extension

Use to test the extension axis motor and sensors. Sends the extension axis home, then to its approximate mid-point, then back to home.

7.5.4.4 Exercise Gripper

Use to test the gripper motor, and open and close sensors. Sends the gripper home then closed.

7.5.4.5 Exercise Rotary

Use to test the rotary axis motor and sensors. Sends the rotary axis home, then rotates to back, then rotates to front.

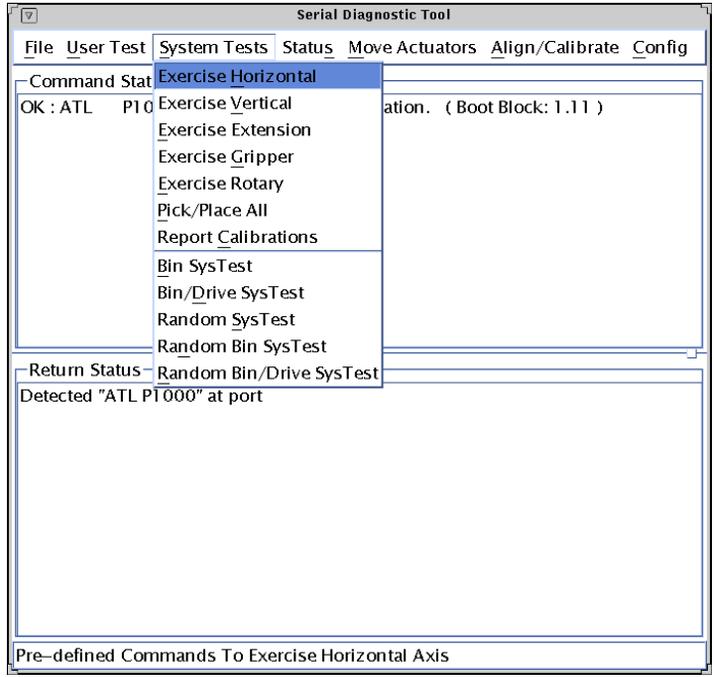


FIGURE 7-7 Systems Test Menu

7.5.4.6 Pick/Place All

Caution – Pick/Place All does not return cartridges to their original locations. Do not run if the customer is sensitive to the position of cartridges within the library.

This test picks a cartridge from every storage bin and places it into a new bin. Pick/Place All runs continuously until aborted. This is a good overall test of the library and can be used to demonstrate the library operation.

To start Pick/Place All, the following is required:

- Storage bin 0 must be empty
- All other storage bins must have a cartridge present

1. Select System Tests / Pick/Place All.

A warning dialog box is displayed.

2. Click Yes to continue.

3. Select File / Abort Command to stop the test.

Note – After aborting the test, verify that the gripper is empty. If not use Move Cartridges / Place to place the cartridge in the empty bin, a tape drive or the load port.

7.5.4.7 Report Calibration

Reports the current calibration values for the tape drives, load port, load pack, and bin 0.

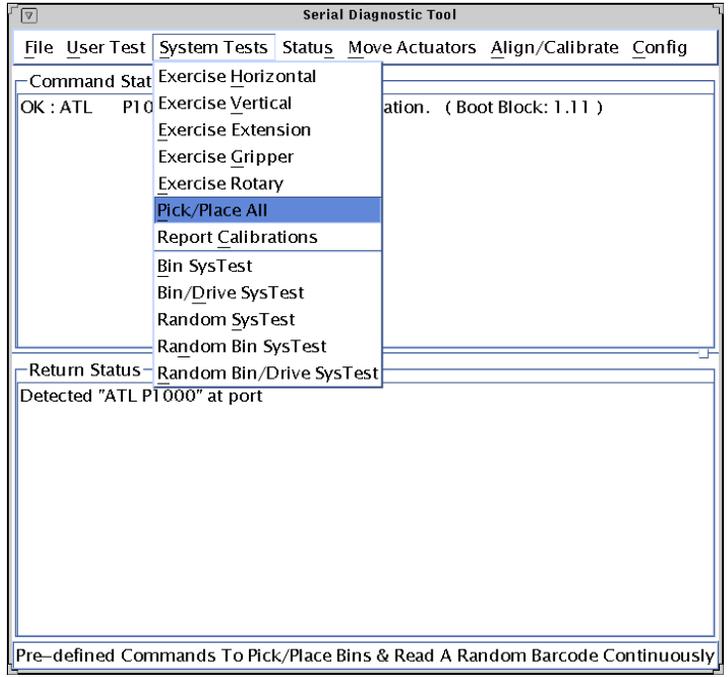


FIGURE 7-8 Systems Tests / Pick/Place All

7.5.5 Using the System Tests Menu (Options 8 - 12)

Caution – The tests in the following sections do not return cartridges to their original locations. Do not run if the customer is sensitive to the position of cartridges within the library.

Caution – The tests in the following sections do not distinguish between data tapes and cleaning cartridges. Remove cleaning cartridges before starting tests that use tape drives.

The last five options on the System Tests Menu move cartridges around the library. There must be at least one empty storage location in the library to begin each test. Each test prompts for number of times you wish the test to run, and whether to enable or disable bar code scanning.

- Enter 0 to run the test continuously.
- Enter X to run the test X number of times.
- Enter Y to enable bar code scanning.
- Enter N to disable bar code scanning.

7.5.5.1 Bin SysTest

Performs a sequential pick/place of all bins. One cycle is complete when each bin has been accessed.

7.5.5.2 Bin/Drive SysTest

Performs a sequential pick/place test between bins and tape drives. One cycle is complete when each bin has been accessed.

7.5.5.3 Random SysTest

Performs an initial sequential pick/place to every bin, then performs a random pick/place test between bins and tape drives. One cycle is complete when each bin has been randomly accessed.

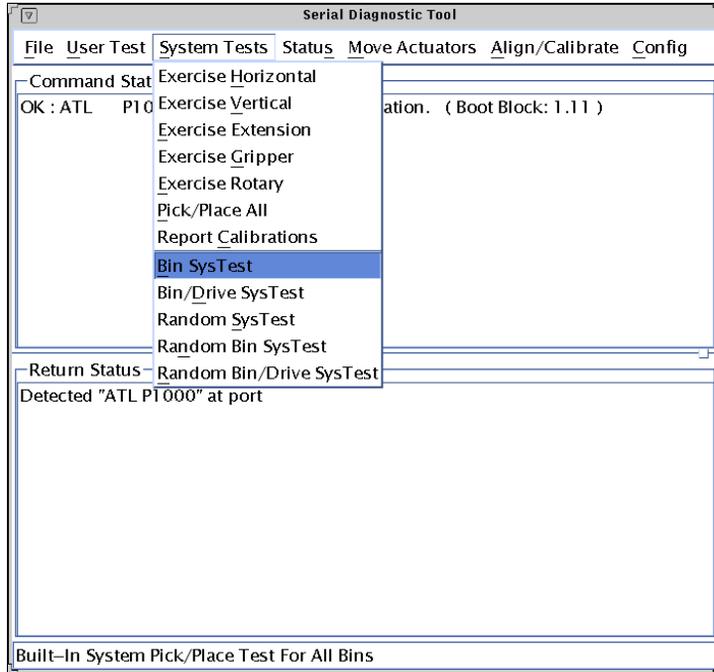


FIGURE 7-9 System Tests / Bin SysTest

7.5.5.4 Random Bin SysTest

Performs an initial sequential pick/place to every bin, then performs a random pick/place test of all bins. One cycle is complete when each bin has been randomly accessed.

7.5.5.5 Random Bin/Drive SysTest

Performs an initial sequential pick/place to every bin, then performs a random pick/place test between bins and tape drives. This test differs from Random SysTest because it does not move tapes between bins (during the random cycle). One cycle is complete when each bin has been randomly accessed.

7.5.6 Using the Status Menu

The Status Menu reports actuator status, statistics information, and system configuration information. The Status Menu has the following options:

7.5.6.1 Actuator Status

Reports the position (in the Return Status window) of each of the five actuators (horizontal, vertical, rotary, extension, and gripper) in the library.

Caution – Perform a Self Test All and Home All before selecting Actuator Status.

7.5.6.2 Report Statistics

Displays library statistics including:

- POH (total power on hours)
- Command execution time
- Number of picks (bins and drives)
- Number of places (bins and drives)
- Number of actuations (each axis)
- Number of operational retries

7.5.6.3 Reset Statistics

Resets the statistics table. This option is a development tool and is not expected to be used by field service.

7.5.6.4 System Test Info

Reports pick and place information in the Return Status window related to the most recent test run.

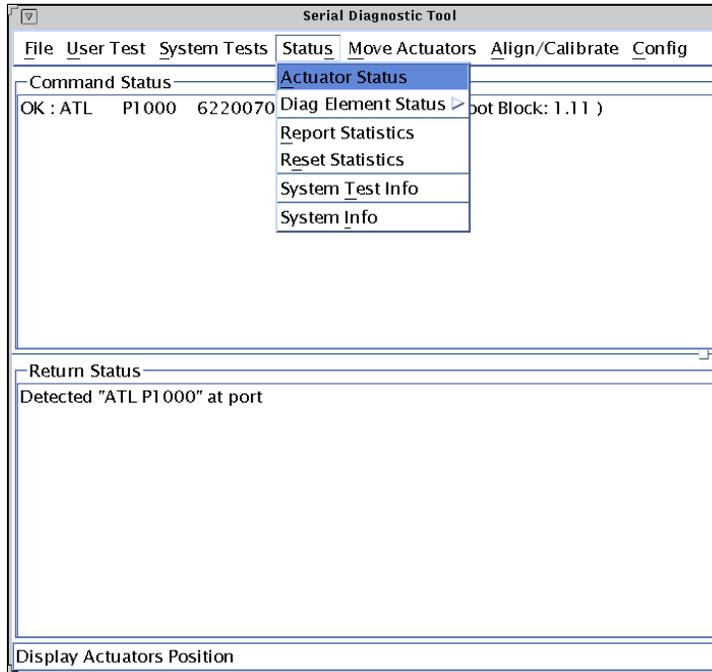


FIGURE 7-10 Status Menu

7.5.6.5 System Info

Reports the following information in the Return Status window:

- Vendor ID
- Product ID
- Library model number
- Firmware revision

7.5.7 Using the Move Actuators Menu

The Move Actuators Menu provides low-level commands to individual actuators, move cartridge commands, and read bar code commands, using the following options:

7.5.7.1 Self Test All

Sends a short electrical pulse to each actuator (horizontal, vertical, extension, rotary, and gripper) and reads the sensor information from each actuator to confirm that actuators and sensors are responding properly.

7.5.7.2 Home All

Sends all actuators to their respective home positions.

7.5.7.3 Horizontal Axis

Opens a submenu with the following options:

- Self test perform a horizontal axis self test
- Home return the horizontal axis to home
- Move to Bin move the horizontal axis to a specified (0-29) bin location
- Move to Load Port move the horizontal axis to the load port
- Move to Drive move the horizontal axis to a specified (0-3) tape drive
- Move to Position move the horizontal axis to a specified location relative to home (-0.434 in. to 9.082 in.)

7.5.7.4 Vertical Axis

Opens a submenu with the following options:

- Self test perform a vertical axis self test
- Home return the vertical axis to home
- Move to Bin move the vertical axis to a specified (0-29) bin location
- Move to Load Port move the vertical axis to the load port
- Move to Drive move the vertical axis to a specified (0-3) tape drive
- Move to Position move the vertical axis to a specified position relative to home (-0.400 in. to 10.283 in.)

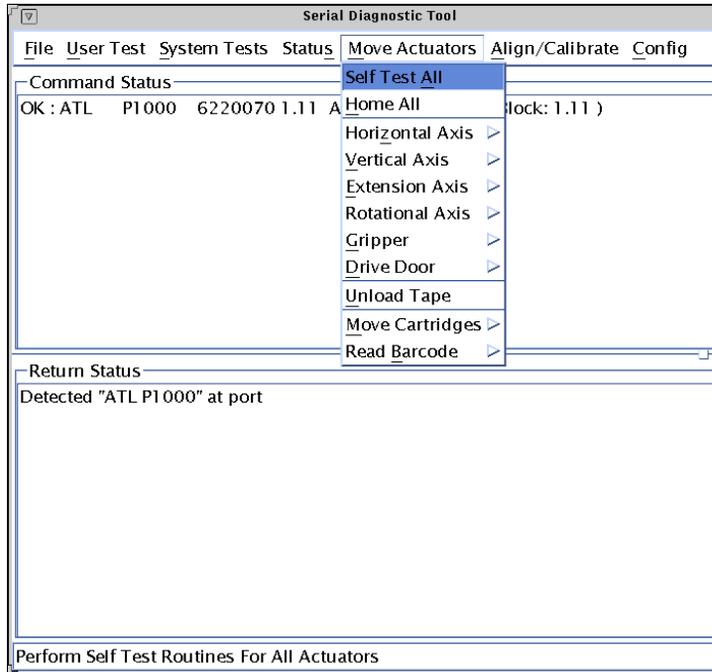


FIGURE 7-11 Move Actuators Menu

7.5.7.5 Extension Axis

Opens a submenu with the following options:

- Self test perform an extension axis self test
- Home return the extension axis home
- Move to Bin move the extension axis to a specified (0-29) bin location
- Move to Load Port move the extension axis to the load port location
- Move to Drive move the extension axis to a specified (0-3) drive location
- Move to Position move the extension axis to a specified position
relative to home (0.504 in. to 5.093 in.)

7.5.7.6 Rotational Axis

Opens a submenu with the following options:

- Self test perform a rotary axis self test
- Home return the rotary axis home (facing back)
- Front rotate the axis to facing front
- Back rotate the axis to facing back

7.5.7.7 Gripper

Opens a submenu with the following options:

- Self test perform a gripper self test
- Home return the gripper home (closed)
- Open open the gripper jaws
- Close close the gripper jaws

7.5.7.8 Drive Door

Opens a submenu with the following options:

- Self test perform a self test on a specified (0-3) tape drive door
- Home return a specified (0-3) tape drive door home (closed)
- Open open a specified (0-3) tape drive door
- Close close a specified (0-3) tape drive door

7.5.7.9 Unload Tape

Unload the tape from a specified (0-3) tape drive

Note – Depending on the position of the tape, it will take 10 to 120 seconds for the tape to completely rewind prior to unload. When the unload command is complete, the Operate Handle indicator on the tape drive will light.

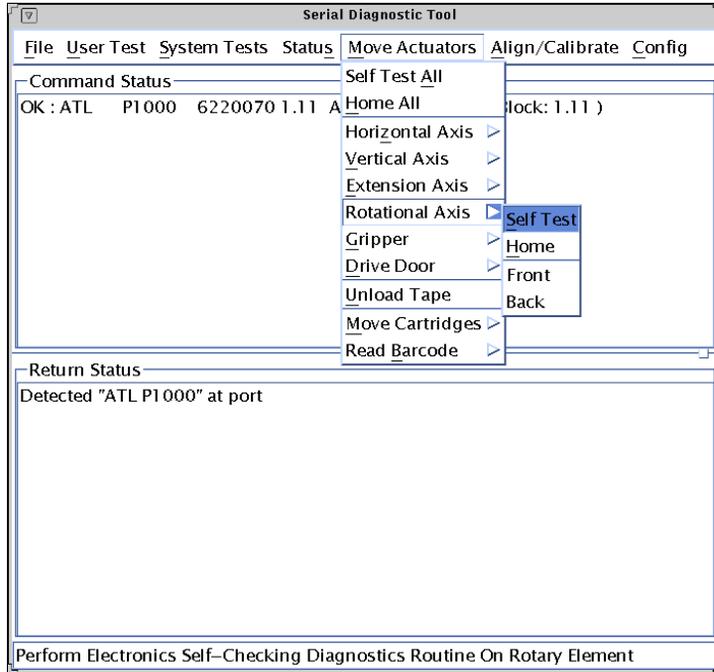


FIGURE 7-12 Move Actuators / Rotational Axis

7.5.7.10 Move Cartridges

Note – Before performing a Move Cartridge option, the library must have a current inventory and the gripper must be empty.

Opens a submenu with the following options:

- Pick from Bin pick a cartridge from a specified (0-29) storage bin
- Pick from Load Port pick a cartridge from the load port bin
- Pick from Drive pick a cartridge from a specified (0-3) tape drive
- Place into Bin place a cartridge into a specified (0-29) bin
- Place into Load Port place a cartridge into the load port bin
- Place into Drive place a cartridge into a specified (0-3) tape drive

7.5.7.11 Read Barcode

Opens a submenu with the following options:

- Bar Code - Bin read the cartridge label in a specified (0-29) bin
- Bar Code - Drive read the cartridge label in a specified (0-3) tape drive
- Bar Code - Load Port read the cartridge label in the load port

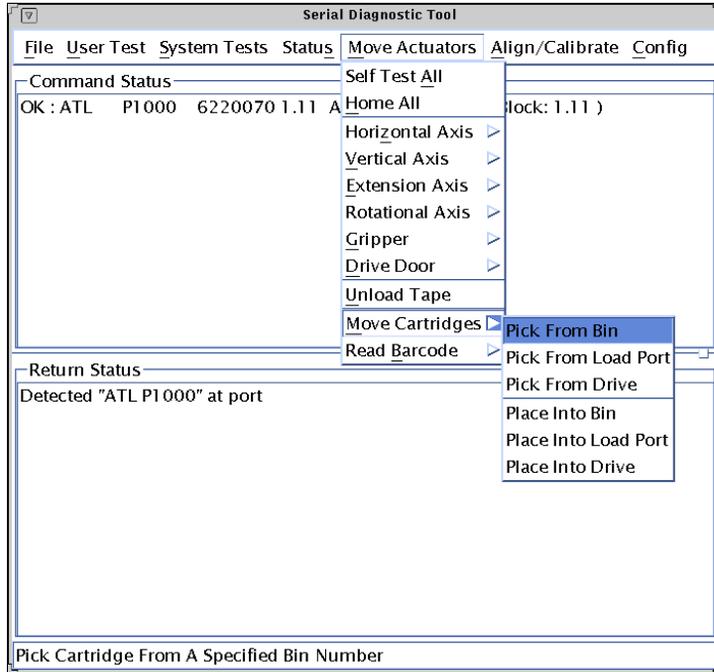


FIGURE 7-13 Move Actuators / Move Cartridges

7.5.8 Using the Align/Calibrate Menu

The Align/Calibrate Menu provides commands to calibrate the library, set or report SCSI IDs, and report tape drive configuration data. Align/Calibrate has the following options:

7.5.8.1 Align/Calibrate

Opens a submenu with the following options:

- All automatically calibrate all bins, tape drives, and load port
- Bin automatically calibrate all bins
- Drive automatically calibrate all tape drives
- Load port automatically calibrate the load port

7.5.8.2 Library SCSI ID

Enter the desired library SCSI ID number (0 - 15).

7.5.8.3 Report Library SCSI ID

Display the current library SCSI ID number in the Return Status window.

7.5.8.4 Drive SCSI ID

Enter drive number (0-3).

Enter desired SCSI ID number (0-15).

Use the Reset Drive command immediately after setting a new drive SCSI ID. This will make the new drive SCSI ID setting effective.

7.5.8.5 Reset Drive

Use this command immediately after setting the drive SCSI ID. This will make the new SCSI ID setting effective.

Enter Drive number to reset (0-3).

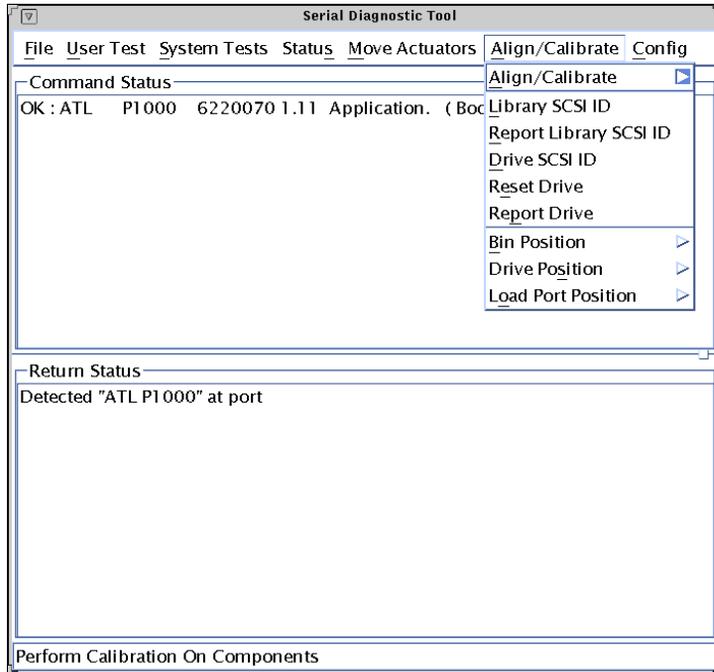


FIGURE 7-14 Align/Calibrate Menu

7.5.8.6 Report Drive

Enter drive number (0-3).

Displays the following tape drive data in the Return Status window:

- Drive type:
- Drive microcode revision number:
- No SCSI ID has been set (Y or N):
- Cartridge present (Y or N):
- Drive hardware error (Y or N):
- Cleaning required (Y or N):
- Compression enabled (Y or N):
- Cartridge write protected (Y or N):
- Handle OK to operate (Y or N):
- Drive SCSI ID number:
- Tape format:
- Tape motion:

Caution – The next three options permit manual change of the calibration values for the bins, tape drives and load port, which will directly affect library operation. These options should only be used by trained field service engineers.

7.5.8.7 Bin Position

Change or report the calibration values for all bins. See Table 7-2.

7.5.8.8 Drive Position

Change or report the calibration values for all tape drives. See Table 7-2

7.5.8.9 Load Port Position

Change or report the calibration values for the load port. See Table 7-2

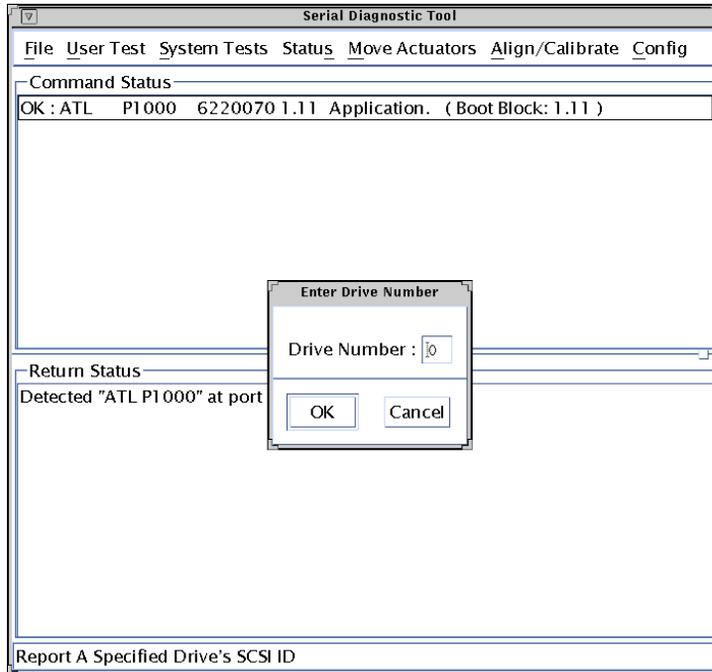


FIGURE 7-15 Align/Calibrate / Report Drive

TABLE 7-2 Submenu Options for Bin Position, Drive Position, and Load Port Position

Option	Description
Current Vertical Position	Set vertical calibration value to current physical location
Input Vertical Position	Input new vertical calibration value from keyboard
Report Vertical Position	Display current vertical calibration value
Current Extension Position	Set extension calibration value to current physical location
Input Extension Position	Input new extension calibration value from keyboard
Report Extension Position	Display current extension calibration value
Current Horizontal Position	Set horizontal calibration value to current physical location
Input Horizontal Position	Input new horizontal calibration value from keyboard
Report Horizontal Position	Display current horizontal calibration value

7.5.9 Using the Config Menu

The Config Menu has the following options:

7.5.9.1 Configure System

To set the library configuration, enter the following:

- Library model number: 6220070
- Number of drives (1-4): (enter number of tape drives present)
- Number of bins: (enter number of storage bins present)
- Library SCSI ID (0-15): (typically 0)

Note – After setting a new library SCSI ID, cycle power on the library to make the new SCSI ID effective.

7.5.9.2 Report System

Displays the current library configuration, including:

- Model number:
- Number of bins:
- Number of drives:
- Library SCSI ID:

7.5.9.3 Init Inventory

The bar code reader scans all bins, tape drives, and the load port and saves the cartridge inventory data in memory.

7.5.9.4 Init Non-Volatile RAM

Configuration and calibration data is kept in non-volatile RAM. If the library MPU board is replaced, (where the NVRAM resides) use the Init Non-volatile RAM option to reset the new MPU boards NVRAM before configuring or calibrating the library.

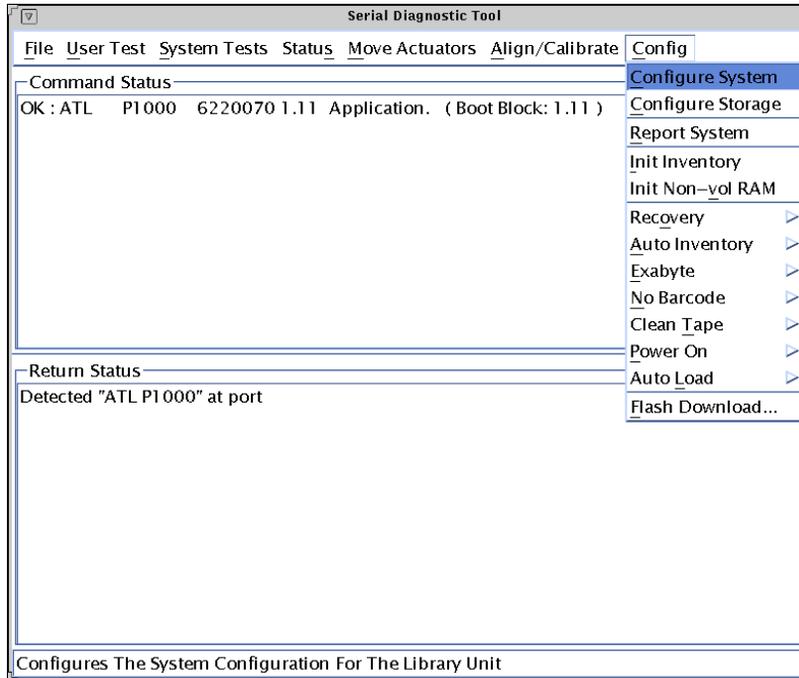


FIGURE 7-16 Config Menu

7.5.9.5 Recovery

Opens a submenu with the following options:

- Enable library retries low-level commands if an error occurs
- Disable library does not retry low-level commands
- Report display the current status of the Recovery switch

Note – The power-on default for Recovery is Enabled.

7.5.9.6 Auto Inventory

Opens a submenu with the following options:

- Enable on power-up, automatically perform an inventory process
- Disable do not perform automatic inventory on power up
- Report display the current status of the Auto Inventory switch

7.5.9.7 Exabyte

Opens a submenu with the following options:

- Enable emulate the Exabyte 210 tape library
- Disable no emulation
- Report displays the status of the Exabyte switch

7.5.9.8 No Barcode

Opens a submenu with the following options:

- Enable library does not use the bar code scanner
- Disable library does use the bar code scanner
- Report displays the status of the No Barcode switch

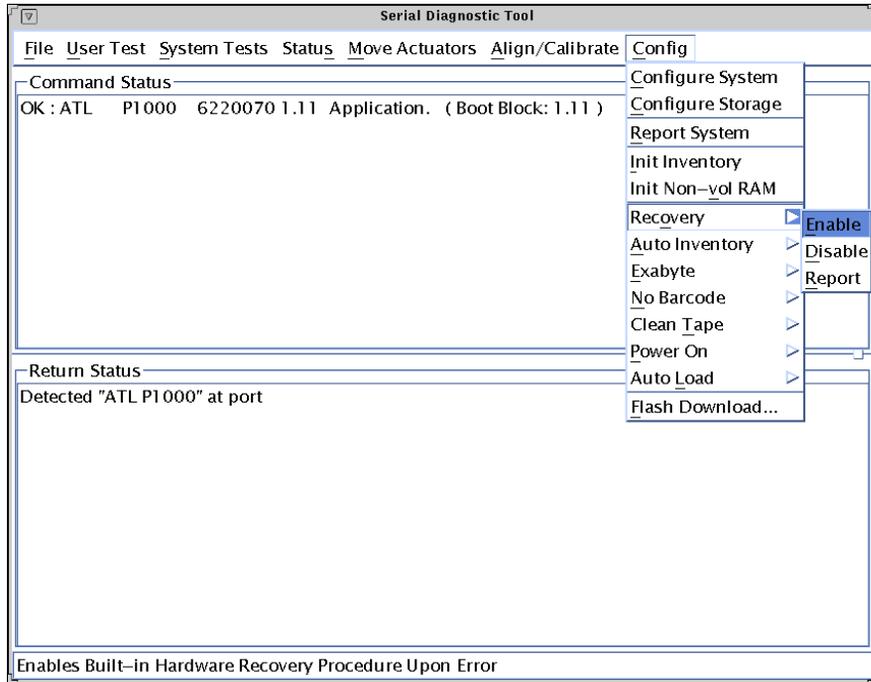


FIGURE 7-17 Config / Recovery

7.5.9.9 Clean Tape

Opens a submenu with the following options:

- Enable Clean Tape turn on the automatic tape cleaning feature
- Disable Clean Tape turn off the automatic tape cleaning feature
- Report Clean Tape display the complete autoclean report in the Return Status window

7.5.9.10 Power On

Opens a submenu with the following options:

- Online set the library online at power-up
- Offline set the library offline at power-up
- Report display the current status of the Power On switch

7.5.9.11 Auto Load

Opens a submenu with the following options:

- Enable Auto Load automatically place to the first available bin any cartridge inserted in the load port
- Disable Auto Load do not automatically move cartridges inserted in the load port
- Report Auto Load display the current status of the Auto Load switch

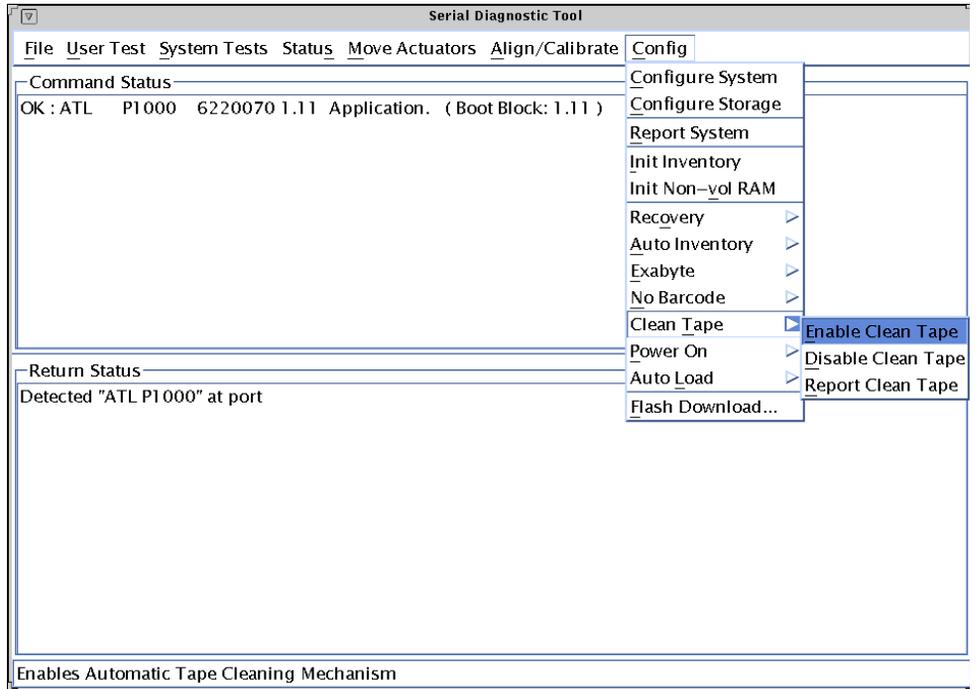


FIGURE 7-18 Config / Clean Tape

7.5.9.12 Flash Download

Use to load new robotics controller firmware.

1. **Copy the new firmware hex file to the diagnostic directory** (/opt/serial_diag).

2. **Select Config / Flash Download.**
A warning dialog box is displayed.

3. **Click the Yes button.**
A File Search dialog box is displayed.

4. **Select the new firmware hex file in the Files window.**

5. **Click the OK button.**

Flash download takes approximately 15 to 20 minutes. When complete, FLASH DOWNLOAD COMPLETED is displayed in the Command Status window.

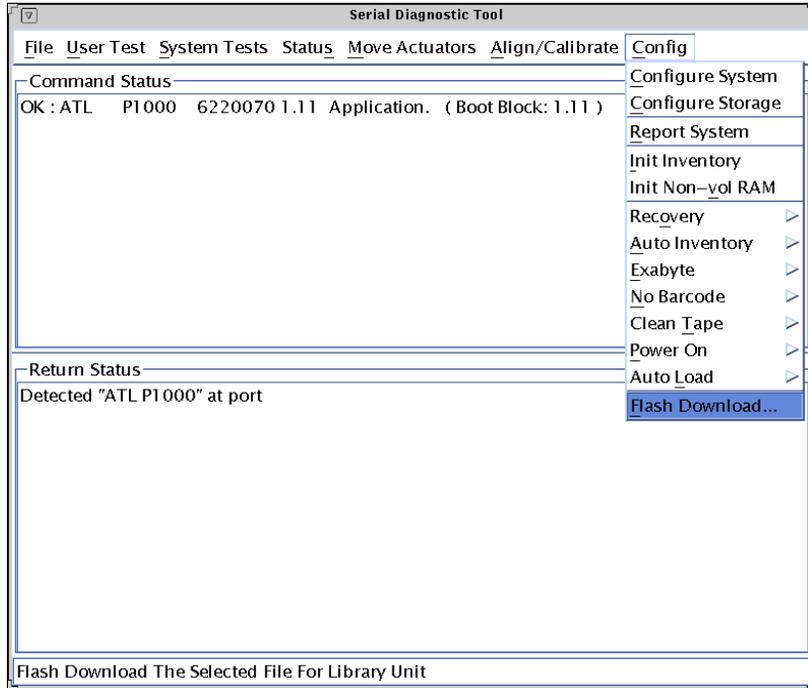


FIGURE 7-19 Config / Flash Download

7.6 Exiting the Diagnostic Software

1. From the Main Menu select File / Exit.

Library Specifications

A.1 Appendix Overview

This appendix lists the following characteristics and specifications of the Sun StorEdge L1000 library:

- Physical characteristics
- Performance characteristics
- Environmental specifications
- Tape drive specifications

A.2 Physical Characteristics

TABLE A-1 Physical Characteristics

Unit Dimensions	
Width	17.3 in. (43.8 cm)
Depth	28.5 in. (72.1 cm)
Footprint	3.4 ft ² (0.31 m ²)
Height	19.8 in. (50.3 cm)
Unit Weight	
Rackmount Configuration	89 lbs (41 Kg) without cartridges
Stand-alone Configuration	101 lbs (46 Kg) without cartridges
Tape Drives and Cartridges	
Tape Drives, Max. No. and Type	Up to 4 DLT7000
Cartridges, Max. No. and Type	<i>High-density:</i> 0–30 DLTtape III or IV

A.3 Performance Characteristics

TABLE A-2 Performance Characteristics

Average Swap Time	28 seconds, consisting of two “MOVE MEDIUM” commands.
Inventory	Less than 3 minutes, fully loaded with labeled cartridges

A.4 Environmental Specifications

TABLE A-3 Environmental Specifications

Power Environment		
Electrical Input Tolerances	Voltage	90 to 132 VAC or 180 to 264 VAC
	Frequency	47 to 63 VAC
	Power Consumption	350 VA max
	Elect. Connection to Power	IEC 320 male connector on rear panel
Climatic Environmental		
Temperature (Operating)	Dry Bulb	15 to 32°C (59 to 90°F)
	Wet Bulb	25°C (77°F) maximum
	Thermal Transition	11°C per hour
Temperature (Shipping and Storage)	Dry Bulb	-40 to 66°C (-40 to 151°F)
	Wet Bulb	46°C (115°F) maximum
	Thermal Transition	30°C (54°F) per hour
Relative Humidity	Operating	20% to 80%, non-condensing
	Shipping and Storage	5% to 95%, non-condensing
Altitude	Operating	Sea Level to 10,000 ft.
	Shipping and Storage	Sea Level to 12,000 ft.
Heat Dissipation	Operating	830 BTU/hr (207 KCal/hr or 245 watts)
Electromagnetic/Electrostatic Susceptibility		
Direct ESD	Contact Discharge	@ 4.0 kV
	Air Discharge	@ 8.0 kV
Indirect ESD	Contact Discharge	@ 4.0 kV
Radiated Fields per IEC-801-3	unmodulated	27 MHz to 500 MHz @ 3 V/m
Fast Transients (EFT or Burst) per IEC801-4	Data Cables	@ 0.5kV
	Power Cables	@ 1.0kV

Acoustical Noise		
Sound Power Level	Operating	6.0 Bel
	Idle	5.0 Bel
Sound Pressure @ Bystander	Operating	49 dB

A.5 Tape Drive Specifications

TABLE A-4 Tape Drive Specifications

Model Number	Native Mode		With 2:1 Compression	
	Transfer Rate	Capacity	Transfer Rate	Capacity
DLT7000	5 Mbytes/s	35 Gbytes	10 Mbytes/s	70 Gbytes

Block Diagram

B.1 Appendix Overview

The Sun StorEdge L1000 functional connectivity block diagram is shown on page B-3.

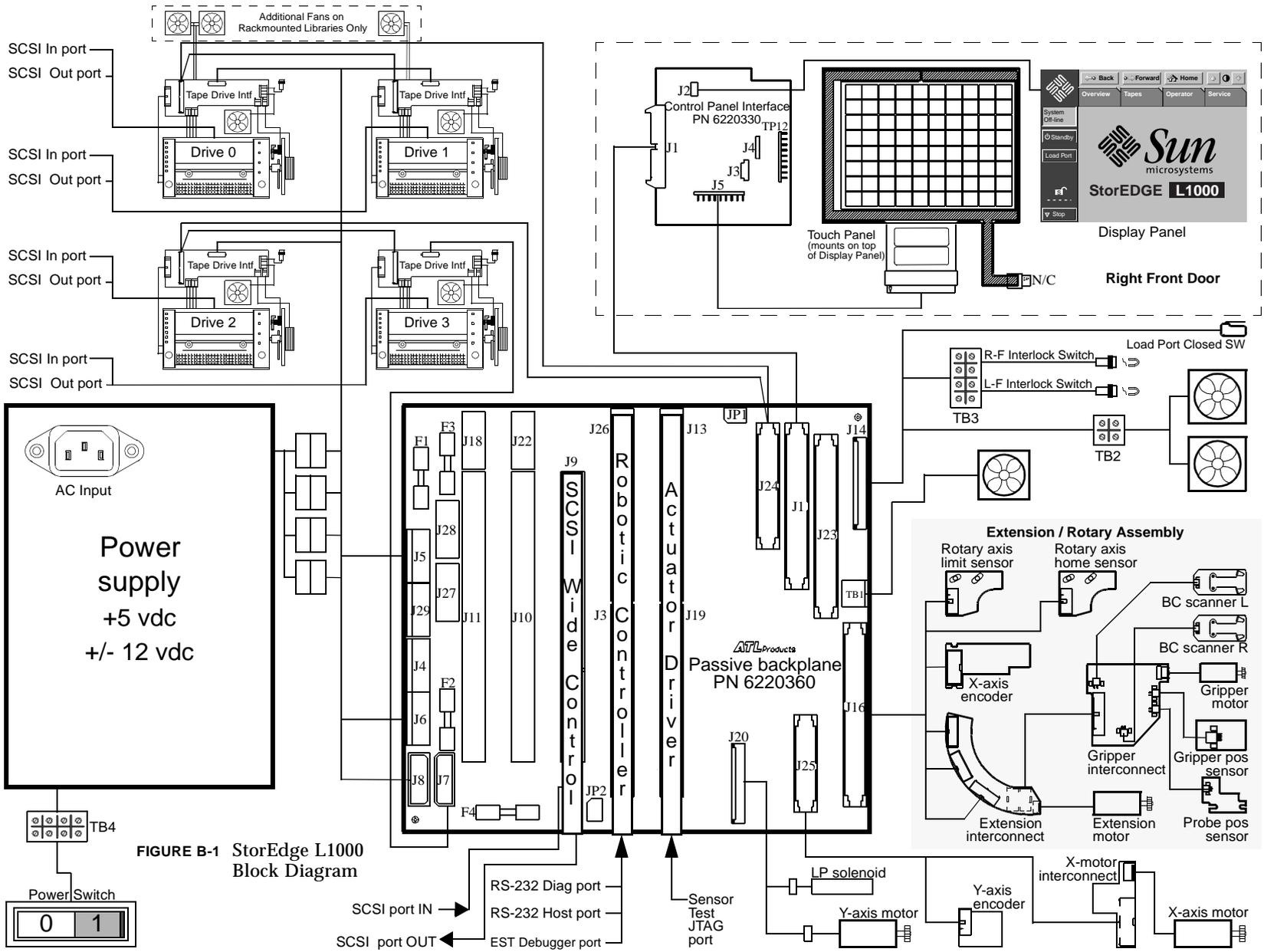


FIGURE B-1 StorEdge L1000 Block Diagram

FRU List

C.1 Appendix Overview

Table C-1 is a list of the field-replaceable units (FRUs) for the L1000 library.

TABLE C-1 FRU List

Part Number	Description
6221082-01	Left door
F370-3516-01	DLT7000 tape drive assembly, differential
F370-3517-01	Stepper motor, 2 phase (y-axis)
F370-3518-01	Stepper motor, 2 phase (x-axis)
F370-3519-01	Fan, 24 VDC, 41 CFM
F370-3520-01	Fan, 24 VDC, 90 CFM
F370-3521-01	SCSI wide, differential PWA
F370-3522-01	Timing belt, 1/5 in. pitch, 1/4 in. wide (x-axis)
F370-3523-01	Timing belt, 1/5 in. pitch, 3/8 in. wide (y-axis)
F370-3524-01	Right door assembly, with black and white control panel
F370-3525-01	Robotics controller PWA
F370-3526-01	Actuator driver PWA
F370-3527-01	Y-encoder PWA

TABLE C-1 FRU List

Part Number	Description
F370-3528-01	X-motor interconnect PWA
F370-3529-01	Extension/rotary assembly
F370-3530-01	Load pack assembly
F370-3531-01	Power supply, 300 watt (includes power switch)
F370-3532-01	Passive backplane PWA
F370-3545-01	Short Jumper Cable
F370-3546-01	Long Jumper Cable
F370-3627-01	Single fan bracket assembly
F370-3628-01	Double fan bracket assembly

Sense Data Values

D.1 Appendix Overview

Table D-1 lists message information that can be sent from the L1000 to a host computer. The table is sorted by the data in the ASC column (second column from left) and lists the following information:

- Sense Key (SK)
- Additional Sense Code (ASC)
- Additional Sense Code Qualifier (ASCQ)
- Message name, description and potential recovery action
- Valid Interfaces
 - SCSI (Host Computer)
 - Diag (Diagnostic Port/Computer)
 - Both = SCSI and Diag

The message name and description may contain abbreviations as follows:

- | | |
|---------|-------------------|
| ■ LU | Logical Unit |
| ■ REQ'D | Required |
| ■ DEV | Device |
| ■ Diag | Diagnostics |
| ■ NVRAM | Nonvolatile RAM |
| ■ A/D | Analog-to-Digital |

D.2 Sense Data Values Table

TABLE D-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	02	LOGICAL UNIT INIT REQUIRED Element status or calibration unknown. Perform "Initialize Element Status" command (SCSI) or "Initialize Inventory" command (Diag)	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 the host command is in the proper format.	SCSI
5	21	01	INVALID ELEMENT ADDRESS Check Mode Sense data for correct element addresses.	SCSI
5	24	00	INVALID FIELD IN COMMAND DATA BLOCK Ensure all reserve fields are set to zero.	SCSI

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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 are in the proper format.	SCSI
5	26	02	PARAMETER VALUE INVALID Verify Mode Select page fields are in the proper format. 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 or Load Pack door has been closed.	Both
6	29	00	POWER-ON, RESET OR BUS DEVICE 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.	Both

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. OR	SCSI
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 is in the proper format.	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
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

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	3B	0E	<p>MEDIUM SOURCE ELEMENT EMPTY</p> <p>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.</p>	Both
B	43	00	<p>SCSI MESSAGE ERROR</p> <p>Detected message error in message processing on the SCSI BUS.</p>	SCSI
B	45	00	<p>SELECT OR RE-SELECT FAILURE</p> <p>L1000 timed out trying to reselect host. Make sure host is running.</p>	SCSI
B	47	00	<p>SCSI PARITY ERROR</p> <p>SCSI Parity Error detected. Check cable connections and cable length.</p>	SCSI
B	48	00	<p>INITIATOR DETECTED ERROR</p> <p>Initiator Detected Error Message was received from the host.</p>	SCSI
5	4E	00	<p>OVERLAPPED COMMANDS ATTEMPTED</p> <p>Due to a second command being sent from the same host before a previous command has completed, the previous command has been aborted. This may also occur when executing off-line commands via the Control Panel and Diagnostic Port simultaneously.</p>	Both
5	53	02	<p>MEDIUM REMOVAL PREVENTED</p> <p>Prevent Medium Removal command was executed and command was received to export cartridge. Execute Allow Medium Removal command and retry move medium command.</p>	SCSI
6	54	00	<p>SCSI TO HOST SYSTEM INTERFACE FAILURE</p> <p>Possible SCSI bus time-out or premature disconnect. Check cable connections and cable length.</p>	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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 ON-LINE, it executes its initialization procedure.	Both
6	80	00	DOOR WAS OPENED INVENTORY MAY HAVE BEEN CORRUPTED Close door and retry command.	Both
- none -	80	01	DLT DRIVE REQUIRES CLEANING DLT tape drive indicates that drive needs cleaning. Clean the DLT tape drive. This is returned with element status data, which has no sense key.	SCSI
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

Sense Key	ASC	ASCQ	Message Name/Description	Interface
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 ON-LINE The library is ready to communicate with the host computer. Press the Control Panel STANDBY button to take the library off-line.	Diag
2	80	09	LOGICAL UNIT IS TURNED OFF-LINE The library is ready to communicate with the diagnostic PC. Press the Control Panel STANDBY button to place the library on-line.	SCSI
6	80	09	LOGICAL UNIT STANDBY BUTTON WAS PRESSED Retry command.	Both
B	80	10	LOAD RETRY FAILED L1000 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. 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
6	80	0E	DATA TRANSFER CHANGED A drive has been inserted into the system. Use "Read Element Status" to determine status of drives.	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	80	0F	LOW POWER ERROR Check power connections.	Both
4	80	11	MOTOR POWER FAILURE Indicates motor power turned off for a reason not otherwise reported. Toggle of the Stop button should clear.	Both
5	80	22	ELEMENT CONTENTS UNKNOWN The contents of an element address are unknown. Issue a Read Element Status for the element address. If contents are still unknown issue an Initialize Element Status command.	Both
4	80	23	BAR CODE DECODER COMMUNICATION FAILURE Unable to initialize decoder. Verify that the decoder is powered on. Cycle power and/or check cable connections.	Both
4	81	00	GRIPPER AXIS INTERNAL FAIL Gripper axis code internal failure. Call Technical Support.	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.	Both
B	81	05	GRIPPER CLOSE FAILURE Gripper did not reach close position. Issue a Rezero Unit command.	Both
B	81	51	UNABLE TO PICK CARTRIDGE Cartridge was sensed in front gripper sensor, but was unable to seat cartridge in the rear gripper sensor. Check that gripper sensors are working and/or that tape was ejected far enough.	Both
4	81	54	GRIPPER TPU REGISTER FAILURE Replace robotic controller board.	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	81	55	GRIPPER TPU RAM FAILURE Replace robotic controller board.	Both
4	82	00	ROTARY AXIS INTERNAL FAIL Rotary axis code internal failure. Call Technical Support.	Both
4	82	01	ROTARY TIMEOUT The rotary axis did not reach the desired position within the time limit. Retry the command. If the failure repeats, issue a Self-test command.	Both
4	82	03	ROTARY MECHANICAL POSITION FAILURE The rotary actuator drove the axis 20 degrees more than necessary to reach the target position. Issue a Self-test command.	Both
4	82	04	ROTARY FRONT MOVE FAILED The rotary move to the front position failed. Retry the command. If the failure repeats, issue a Self-test command.	Both
4	82	05	ROTARY BACK FAILURE The rotary move to the back position failed. Retry the command. If the failure repeats, issue a Self-test command.	Both
4	82	08	ROTARY HOME NOT FOUND The home flag was not found. Issue Rezero Unit to retry command. If the failure repeats, issue a Self-test command.	Both
4	82	10	ROTARY INVALID START The rotary axis has not been homed yet. Issue a Rezero Unit command.	Both
5	82	11	ROTARY INVALID COMMAND Rotary axis was commanded to a position out of its legal range. This is an internal code failure.	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	82	20	<p>ROTARY TEST FAILURE</p> <p>The Self-test failed. Check the rotary flags, flag sensors, motor, "x-rail pin," and "locking cable." Check that the rotary flags are not broken. Check that the flags extend into the sensors without contact. Check the motor cables/connectors. Disable motor power, then move the extension axis rearward to check that the x-rail pin extends freely and that the locking cable is constantly under tension.</p>	Both
4	82	23	<p>ROTARY POSITION OVERFLOW</p> <p>The position step counter overflowed. Issue a Rezero Unit command.</p>	Both
4	83	00	<p>EXTENSION INTERNAL FAILURE</p> <p>Extension axis code internal failure. Call Technical Support.</p>	Both
B	83	01	<p>EXTENSION TIMEOUT</p> <p>Extension axis did not reach desired position. Retry command. If failure repeats, use Diagnostic Software to run extension self-test.</p>	Both
4	83	03	<p>EXTENSION MECHANICAL POSITION ERROR</p> <p>Extension axis was unable to move to commanded position. Retry command. If failure repeats, run extension self-test.</p>	Both
4	83	08	<p>EXTENSION HOME NOT FOUND</p> <p>The extension axis did not reach the home position. Issue Rezero Unit to retry the command. If the failure repeats, then issue the Self-test command.</p>	Both
B	83	10	<p>EXTENSION INVALID ACTUATOR START POSITION</p> <p>Extension axis position is unknown. Issue a Rezero Unit command.</p>	Both
5	83	11	<p>EXTENSION INVALID COMMAND</p> <p>Extension axis was commanded to a position out of the systems mechanical limits. .</p>	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	83	20	EXTENSION TEST FAILURE The extension axis failed to see a confirmation flag of a given width. Check flags, flag sensor and its cable connection. Check for obstacles in the path. Check motor and its cable connection. Reissue the Self-test command. If the failure repeats, contact Technical Support.	Both
4	83	21	EXTENSION ACTUATOR CURRENT FEEDBACK TEST FAILURE Unable to detect current feedback during self-test. Check motor cable connection.	Both
4	83	22	EXTENSION ENCODER FAILURE The requisite numbers and widths of extension confirmation flags were not found. Check flag sensor, cable connections and obstructions on the extension rail. Also check that the motor is operational. Issue a Self-test command.	Both
4	83	41	EXTENSION FORCE OBJECT MISSING During calibration or pushing into a drive, the extension never made contact with any object.	Both
4	83	50	EXTENSION SENSOR FAIL The CIG sensor was occluded unexpectedly during calibration, inventory or pick/place. Check that the sensor moves freely and is not bent. Retry the command. If the failure repeats, contact Technical Support.	Both
4	84	00	VERTICAL INTERNAL FAILURE Vertical axis code internal failure. Call Technical Support.	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

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	22	VERTICAL ENCODER FAILURE The requisite numbers and widths of vertical confirmation flags were not found. Check flag sensor, cable connections and obstructions on the vertical rail. Also check that the motor is operational. Issue a Self-test command.	Both
4	84	23	VERTICAL POSITION OVERFLOW The position step counter overflowed. Issue a Rezero Unit command.	Both
4	84	30	VERTICAL MAPPING FAILURE Scanner was unable to detect vertical target during calibration.	Both
4	85	00	HORIZONTAL INTERNAL FAILURE Horizontal axis code internal failure. Call Technical Support.	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

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	85	03	HORIZONTAL MECHANICAL POSITION ERROR Horizontal axis did not reach desired position. Retry command. If failure repeats, use the Diagnostic Software to run horizontal self-test.	Both
4	85	08	HORIZONTAL HOME NOT FOUND Horizontal axis did not reach the home position. Issue Rezero Unit and retry command. If failure repeats, run horizontal self-test.	Both
B	85	10	HORIZONTAL INVALID ACTUATOR START POSITION Position of horizontal axis is unknown. Issue a Rezero Unit command.	Both
5	85	11	HORIZONTAL INVALID COMMAND Horizontal axis commanded to position out of system mechanical limits. Issue a Rezero Unit command. If problem persists, calibrate the library.	Both
4	85	20	HORIZONTAL TEST FAILURE The axis crossed no confirmation flags at expected velocities during self-test. Check flag sensor and cable connection. Check for obstacles in path. Check motor cable connection.	Both
4	85	22	HORIZONTAL ENCODER FAILURE The requisite numbers and widths of horizontal confirmation flags were not found. Check flag sensor, cable connections and obstructions on the horizontal rail. Also check that the motor is operational. issue a Self-test command.	Both
4	85	23	HORIZONTAL POSITION OVERFLOW The position step counter overflowed. Issue a Rezero Unit command.	Both
4	85	30	HORIZONTAL MAPPING FAILURE Scanner was unable to detect horizontal target during calibration.	Both
6	88	00	WARNING SAFE TEMPERATURE EXCEEDED This is only a warning that the temperature in the library exceeds the normal operational temperature of 32° C (90°F).	Both

Sense Key	ASC	ASCQ	Message Name/Description	Interface
4	88	01	<p>MAXIMUM TEMPERATURE EXCEEDED</p> <p>Library turns off and remains off until the temperature returns to an acceptable level of 15-32°C (59-90°F).</p>	Both
5	8A	02	<p>UNCALIBRATED POSITION</p> <p>System requires calibration.</p>	Both
B	8C	01	<p>LOAD PORT TIMEOUT</p> <p>The load port 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.</p>	Both
4	8C	06	<p>LOAD PORT DOOR OPEN</p> <p>Load port door unlocked but failed to open</p>	Both
B	8D	01	<p>DLT DRIVE HANDLE TIMEOUT</p> <p>Drive handle did not reach commanded position within time limits. Retry the command. If failure repeats, issue a Self-test command.</p>	Both
4	8D	24	<p>DLT HANDLE HARDWARE</p> <p>Stepper was unable to reach destination (open or close). Retry command. If failure repeats, run drive handle Self-test.</p>	Both
4	8E	01	<p>FLASH MEMORY UNABLE TO IDENTIFY</p> <p>Flash is soldered onto the board. Replace the robotic controller.</p>	Diag
4	8E	02	<p>FLASH MEMORY UNABLE TO ERASE</p> <p>Flash is soldered onto the board. Replace the robotic controller.</p>	Diag
4	8E	03	<p>FLASH MEMORY UNABLE TO PROGRAM</p> <p>Flash is soldered onto the board. Replace the robotic controller.</p>	Diag
B	8F	00	<p>LIBRARY UNIT COMMAND TIMED OUT</p> <p>Verify that communications to library still exists by issuing another command</p>	SCSI

Sense Key	ASC	ASCQ	Message Name/Description	Interface
5	F0	01	RESERVATION CONFLICT Internal firmware error. Report this occurrence and previous command (if known) to Technical Support.	Both
5	F1	00	COMMAND UNSPECIFIED Internal firmware error. Report this occurrence and previous command (if known) to Technical Support.	Both
5	F1	01	COMMAND HEAP OVERFLOW Internal firmware error. Report this occurrence and previous command (if known) to Technical Support.	Both
5	F1	02	UNRECOGNIZED COMMAND Internal firmware error. Report this occurrence and previous command (if known) to Technical Support.	Both
5	F1	03	COMMAND REGISTER ERROR Internal firmware error. Report this occurrence and previous command (if known) to Technical Support.	Both
5	F3	00	DLT COMMUNICATION INTERNAL FAILURE Internal drive communication port code or hardware failure.	Both
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 gripper, extension axis, rotary axis, horizontal axis, and vertical axis.
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 L1000.
control panel	The panel on the front of the L1000 that contains the graphical user interface (GUI) screen.
DLT	Digital linear tape.
extension axis assembly	The extension axis assembly consists of the gripper assembly and the baseplate on which the gripper assembly is mounted.
extension axis belt	The drive belt connecting the extension motor/gearbox to the gripper assembly.
FCC Class A	Standard established by the U.S. Federal Communications Commission governing electromagnetic emissions in industrial environments.
FSE	Field service engineer.
gripper assembly	The assembly that mounts on the extension axis and grips cartridges.
host computer	The computer that issues SCSI commands to control the library robotics.
L1000 library	An automated storage and retrieval peripheral used for storing and handling DLT cartridges.

MTBF	Mean time between failures
MTTR	Mean time to repair
NVRAM	Nonvolatile random access memory
on-line	Ready for communications with a host.
off-line	Ready for communication through the diagnostic port
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 a previous location.
PROM	Programmable read-only memory.
PWA	Printed wiring assembly.
RAM	Random access memory.
rear panel	The panel at the back of the L1000 that contains the SCSI ports, RS-232 diagnostic port, power receptacle, tape drive access panels, and the fan filter.
RS-232	A serial communications cabling and protocol standard.
SCSI	Small Computer System Interface is a communications standard for attaching peripheral equipment to computers.
standby	Ready for communication through the diagnostic port
tape drive	Mechanism that writes data to and reads data from a magnetic tape.

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