

Plasmon M-Series *M20* and *M32*
Optical Disk Library Systems

Technical Reference Manual

Plasmon Data

The purpose of this Technical Reference Manual is to provide technical service personnel with sufficient information to maintain and repair the **M20** and **M32** Library Systems. Any other use of the information contained herein or of this document is prohibited. This manual shall not be reproduced in part or in whole without the prior written consent of Plasmon Data.

NOTE: The equipment to which this document pertains 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 or her own expense.

NOTE: This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

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Preface

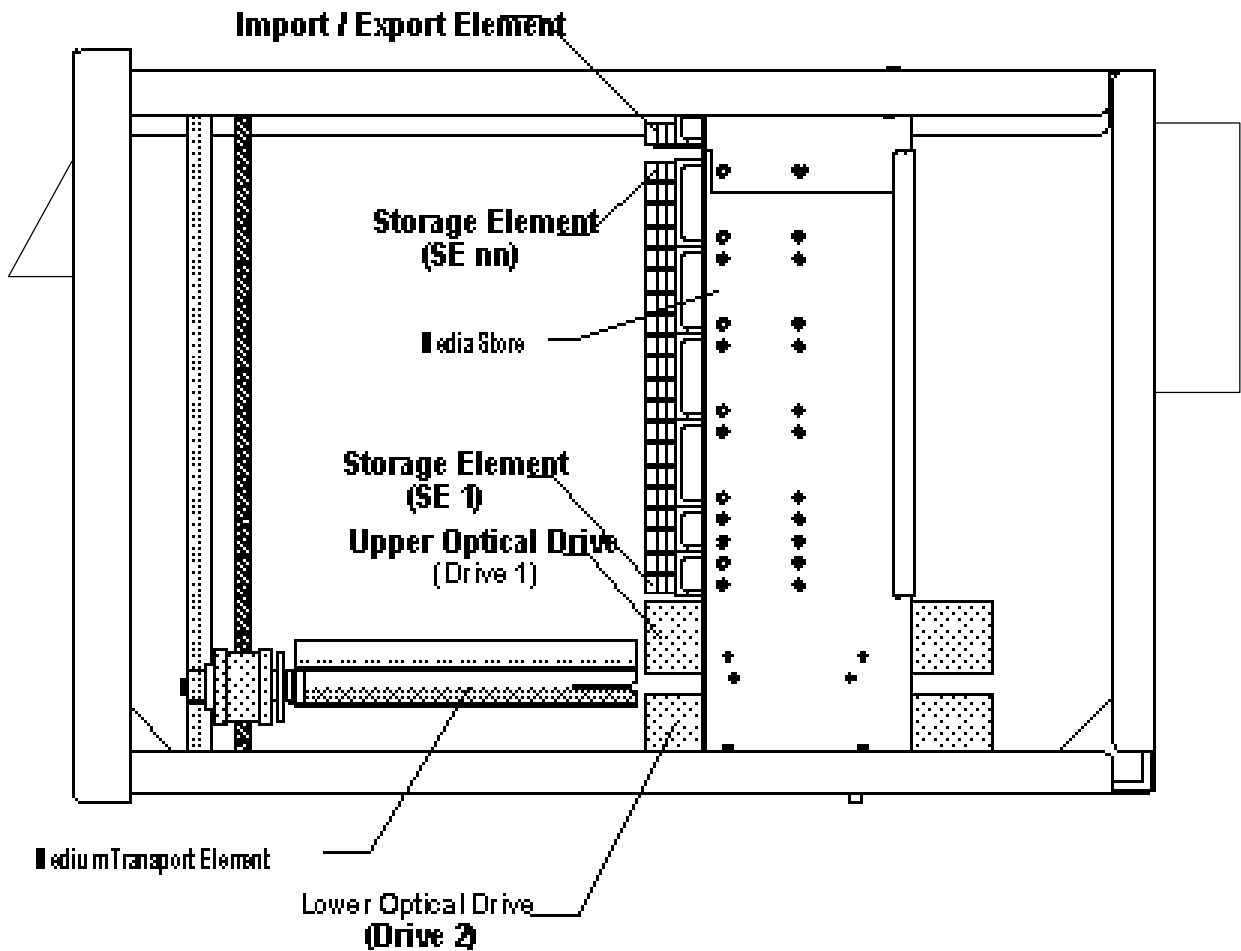
This publication is for reference purposes and is intended for Engineers, Technicians and persons with a knowledge of electronics and sophisticated electromechanical devices. It should be noted that no user serviceable parts are located inside of the Library System.

The information contained herein describes the hardware, operation and maintenance of the *M20* and *M32* Library Systems and is divided into the following sections:

Section 1	General	Functional description of the Library System and their major components.
Section 2	Requirements and Specifications	Power, operating and regulatory requirements and performance specifications.
Section 3	Setup / Installation	Unpacking (and packing) instructions, configuration parameter settings and connecting the SCSI Interface.
Section 4	Hardware	Description and theory of operation.
Section 5	Diagnostics and Maintenance	Function and operation of self contained maintenance firmware and maintenance routines.
Section 6	Library System Adjustments	Optical drive and hard drive removal instructions and Library System adjustment details.
Section 7	Appendix	Error codes, switches and PWA layouts.

Section 1

General



Library System Side View

General

Product Description

The *M-Series* Library System are very high performance, mass storage library units. The *M20* and *M32* Library Systems occupy the low end of the *M-Series* in terms of cost and capacity. They can accommodate up to 20 and 32 optical cartridges, respectively, and 2 half-height optical drives.

Each Library System contains a number of SCSI devices and is controlled via the SCSI bus using SCSI-2 Common Command set commands.

Recovery firmware is contained in the Library System's controller to assure the fullest possible recovery in the event power is lost during operation. The recovery firmware will make every attempt to return media to its correct location within the Media Store.

Diagnostic firmware is also contained in the Library System's controller to assist in diagnosis and troubleshooting. Certain configuration parameters are set using this built-in firmware and are then stored in the Library's non-volatile memory.

Functional Description

The Library System is composed of five major elements.

Media Store

A Media Store is composed of horizontal slots - each of which can hold one optical disk cartridge. The individual slots are called **Storage Elements** and are numbered from the bottom (closest to the optical disk drives) up.

Medium Transport Element

The Medium Transport Element (MTE) is used to move optical disk cartridges between Storage Element locations within the Media Stores and the Optical Disk Drives. The MTE itself is itself composed of two mechanisms.

Slider/Flipper Mechanism

The Slider/Flipper Mechanism moves optical disk cartridges from the Media Stores or from the optical disk drive(s) into the Flipper Mechanism and from the Flipper Mechanism into the Media Stores or into the optical disk drives. A servo motor provides highly accurate positioning.

Presently available Optical Disk Drives have but one laser read/write head assembly. To read or write on either side of an optical disk cartridge, a mechanism for inverting (flipping) the disk cartridge is required.

Lift Mechanism

The Lift Mechanism raises and lowers the Slider/Flipper Mechanism for the transport of optical disk cartridges to and from the Media Store. A servo motor provides highly accurate positioning.

Import / Export Element

Optical disk cartridges are introduced into or removed from the Library System via the Import / Export Element (IEE) which is located in the top cover. The presence of a disk cartridge in this element is detected automatically. This element is not congruent with any storage element.

Data Transfer Element (the Optical Disk Drive)

The Library System is designed to accommodate high-capacity, half-height, ISO Standard optical disk drives. See the publication *Switch Settings for Qualified Optical Disk Drives for Use in the Multi and M-Series Families of Library System* - Document No. 303075 - for information on which optical drives are suitable for use in these Library System and the Library System switch settings for those drives.

Control Electronics

Control Electronics consists of several Printed Wiring Assemblies (PWAs), firmware and a membrane switch panel located on the front of the Library.

Main Controller PWA

An Intel 8032 microcontroller, motor controllers, sensor interfaces, SCSI interface, firmware and non-volatile memory are contained on the Main Controller PWA.

Keypad / Display Controller PWA

The Keypad / Display Controller is mounted to the Library's front center bezel. The display is a twenty (20) character per line, two (2) line Liquid Crystal Display utilizing supertwist technology.

Section 2
Requirements and Specifications

Requirements and Specifications

Power Requirements

AC Input	100 - 240 VAC, Autoranging
Frequency	50/60 Hz
Wattage	110 Watts (375 Btu/Hr)

Environmental Limits, Operating

Ambient Temperature	10 to 40 ° C (50 to 104 ° F)
Gradient	10 ° C / hour (18 ° F / hour)
Humidity	20 to 80 % RH, non-condensing

Environmental Limits, Non-operating

Ambient Temperature	- 40 to 70 ° C (-40 to 158 ° F)
Humidity	5 to 95 % RH, non-condensing

Dimensions and Weight - *M20*

Dimensions	8.5" (21.6 cm) W; 18" (45.7 cm) H; 29" (73.6 cm) D
Weight	65 lbs (29 kg) with two typical optical drives installed
Shipping	82 lbs (37 kg)

Dimensions and Weight - *M32*

Dimensions	13.25" (33.7 cm) W; 26.1" (66.4 cm) H; 26.1" (66.3 cm) D
Weight	80 lbs (36.4 kg) with two typical optical drives installed
Shipping	110 lbs (50 kg)

Regulatory Approvals

Each of the Library System is designed to meet the following:

Safety

- VDE 0805
- UL 1950
- cUL 950
- IEC 950
- EN 60950

Emissions

- FCC Class A
- CISPR 22 Class B

Immunity

- EN 50082-1

Performance Specifications

MSBF	600,000 cartridge swap cycles.
------	--------------------------------

MTTR

30 minutes.

Interface

SCSI-2 (ANSI X3.131-1994 Small Computer System Interface-2).

Internal SCSI cable length is 4 feet (1.2 m).

Note: It is recommended that a high quality braided and foil shielded external SCSI cable be used to conform to approved emission levels.

Section 3

Setup and Installation

Setup and Installation

Unpacking

The Library System are shipped from the factory assembled and aligned. There is no packaging material to be removed from inside the unit. However, a shipping screw must be removed from the bottom of the Library System before applying AC power.

Allow sufficient time for the Library System to normalize to room temperature before applying power.

- Open the shipping container and remove the power cord, SCSI terminator plug, the Technical Reference Manual and any other accessory items from the box.
- Remove the top foam shipping cap.
- Lift the Library System in its protective poly shipping bag straight up and out of the bottom foam shipping cap.
- Save all shipping materials for possible future use.

Refer to **Setup** on Page 2 of this Section for further instructions.

Packing for Shipment

- See **Setup Mode, 12 -- Park Jukebox** later in this section for instruction on 'parking' the Medium Transport Element and installing the shipping screw.
- Turn OFF (0) the AC power switch.
- Remove the SCSI Host Adapter Cable, terminator plug and power cable from the rear of the Library System.
- Carefully place the Library System into its protective poly shipping bag and then place it into the bottom foam shipping cap.
- Pack the power cord, SCSI Terminator and all reference materials.
- Cover the Library System with the top foam shipping cap.
- Fold the upper portion of the shipping carton over the top of the Library System and seal it securely.

Initial Power-up

- Remove the shipping screw from the bottom of the Library System. Its location is clearly labeled.
- Plug the AC Power Cord supplied with the Library System into the Power Receptacle at the lower left rear of the unit.
- Plug the SCSI Terminator supplied with the Library System into either of the SCSI Connectors at the lower right rear of the unit. If the Library System is equipped with the optional differential SCSI interface, the differential terminator should be attached to one of the connectors on the back, and the single-ended terminator must be attached to the connector located below the differential SCSI interface box.
- Do *NOT* attach an external SCSI Bus cable to the other connector at this time.
- Turn on the AC Power Switch at the upper left rear of the unit.

When you turn on AC power, the Liquid Crystal Display on the front of the Library System will display ...

```
nn DISK, SN nnnnn-L
FIRMWARE V2.XX
```

... where the number of Storage Elements (Disks) is displayed, and the serial number displayed is the one the Library System was serialized with at the factory prior to shipment. The letter trailing the serial number is an identifier for the type of Optical Drives installed.

If the Library System was left in the Language Select state, the following will then be displayed ...

```
ENGLISH ?
[↵]  [-]  [⏏]  [⏏]
```

Press the keys under the [⏏] and [⏏] symbols to select a language to be used in subsequent displays and then press the [↵] key.

The Library System will then begin to perform a diagnostic check of its internal systems and display the following ...

```
ID:2; 3,4
CE -- -- -- --
```

... where the top line in the display indicates ...

ID: 2; 3, 4 = Changer SCSI ID is 2, Drive 1 SCSI ID is 3, Drive 2 SCSI ID is 4

... and the second line indicates the enabled mode settings...

CE = Changer Ejects

Other possibilities are:

WL = Wait on Cartridge Load

IP = Ignore SCSI Bus Parity

10 = Emulate IDE Model 10 (Plasmon RF-10J/11J) Library System

20 = Emulate IDE Model 20 (Plasmon RF-20J) Library System

RR = Report Recovered Errors

LR = Limit Error Recovery

The Library System is auto-sensing and will then determine if the optical disk drives or their SCSI ID's have been manually changed. If so, the Library System will display the message **UNIT NOT SETUP** or **CAN'T INQUIRY DRIVE**. This can be corrected by running **Configure Drives** as described below.

The display panel will then change to ...

```
D:--      M:--  I:--*
[ ←SET UP ] [ - ] [ ↗>I ]
```

... indicating that the unit has successfully been configured, passed all the diagnostic checks of its internal systems, that all drives are empty, that the Medium Transport Element is empty, and that the Import/Export Element is empty. Pressing and holding the leftmost key on the display panel will place the unit in Language Select state and a new language may be specified for subsequent displays. Pressing the rightmost button will open the door to the Import/Export Element to allow insertion of new optical disks and removal of existing ones. If an error is displayed, pressing the key under the **[C]** symbol will clear the message and display status information as above. Information about the error may still be obtained from the **Error Log** as described below.

If the SCSI ID's assigned to the robotic changer or to the optical disk drives are not compatible with your host or other peripherals on your system, or you wish to make any other changes to the setup of the Library System, they can be changed as detailed below.

Press (but do not hold) the leftmost key on the display panel. The unit will respond ...

```
      TAKE OFFLINE ?
[ - ]  YES  [ - ]  NO
```

You must press the key under the word **YES** to proceed. The Library System will then go into **Setup Mode**.

These units are shipped from the factory with certain factory default settings. They are ...

Changer SCSI ID	= 2
Drive 1 SCSI ID	= 3
Drive 2 SCSI ID	= 4
Changer Ejects	= enabled
Wait On Load	= disabled
Ignore Parity	= disabled
Emulation	= disabled
Report Recovered Errors	= disabled
Limit Error Recovery	= disabled

These settings may be changed in **Setup Mode**. Upon entering **Setup Mode**, the following is displayed...

1 UNIT INFORMATION [↩] [□] [↶] [↷]
--

The membrane keys function as follows (press the key directly below the displayed symbol):

- [↩] is used to select the current option, Library System unit information in this case
- [□] is used to exit **Setup Mode** and go back to on-line operation
- [↶] is used to display the previous option
- [↷] is used to display the next option

Press the key under the [↷] symbol. The display will change to ...

2 FIRMWARE VERSION [↩] [□] [↶] [↷]
--

Press the [↷] key again. The display will change to ...

3 CHANGER ADDRESS [↩] [□] [↶] [↷]

If you wish to change the SCSI ID (or address) of the robotic changer to make it compatible with your system or with the software you will be using, press the key under the [↩] symbol. The display will change to ...

SCSI ADDRESS n [←] [□] [→] [↵]
--

Pressing the key under the [→] symbol will decrease the value of the Library System's robotic changer SCSI ID. Pressing the key under the [↵] symbol will increase the value of the Library System's robotic changer SCSI ID.

When you have the value you want, press the [←] key to write the new value into non-volatile memory. The display will now return to the main Setup Menu.

CAUTION: No two devices on a SCSI Bus may share the same SCSI ID. Be sure that you know for sure which IDs are not in use on your system and thus are available.

The SCSI ID's of the optical disk drives may also be changed, but you must proceed exactly as follows:

Two banks of 12-position DIP Switches are provided on the Library System's rear panel. These DIP Switches are connected by cables to the optical disk drives and are used to set their physical addresses (SCSI ID's).

The upper 12 switches control Drive 1 — the upper drive.

The lower 12 switches control Drive 2 — the lower drive.

Refer to the publication *Switch Settings for Qualified Optical Disk Drives for Use in the Multi and M-Series Families of Library System* - Document No. 303075 to determine how to set the SCSI ID's of the optical disk drives. Set the SCSI ID(s) of the optical disk drive(s) as required to meet the requirements of your system. The Library System must be turned off and on again for any switch setting changes to take effect.

Press the key under the word **[▲]** to display ...

```
4 CONFIGURE DRIVES
[⌘] [□] [▼] [▲]
```

Pressing **[⌘]** will display ...

```
          ID'S 3,4
[-] [□] [-] [⌘]
```

where the numbers displayed are the previously determined SCSI ID's of the Optical Drives in the Library System.

Press **[⌘]** to initiate a self-configuring process which may take several minutes.

The next group of settable options are the mode settings.

```
5 MODE SETTINGS
[⌘] [□] [▼] [▲]
```

Pressing **[⌘]** will display ...

```
A.CHANGER EJECT:  Y
[-] [□] [⌘] [▲]
```

If you want to disable the Library System's ability to spin down and eject cartridges from the optical drives when requested to move cartridges from the drives, press **[⌘]** to toggle this mode setting. Then, press **[▲]** to display ...

```
B.WAIT ON LOAD:   N
[-] [□] [⌘] [▲]
```

If you want the Library System to wait for optical drives to spin up and become ready for media access when cartridges are moved into them, press **[⌘]** to toggle this mode setting. Then, press **[▲]** to display ...

```
C.IGNORE PARITY:  N
[-] [□] [⌘] [▲]
```

If you want the Library System to ignore improper parity on the SCSI bus (to be compatible with other older devices), press the **[⌘]** key to toggle this mode setting. Then, press **[▲]** to display ...

```
D.EMULATE 10/20:  N
[-] [□] [⌘] [▲]
```


If you want the Library System to emulate earlier Plasmon/IDE Library Systems for compatibility with your driver or application software, press the [↵] key to toggle this mode setting from N to 10 or 20. Then, press [↵] to display ...

```
E.REPORT RECOVERY:N
[-] [G] [↵] [↵]
```

If you want the Library System to report errors that it has successfully recovered from, press the [↵] key to toggle this mode setting. Then, press [↵] to display ...

```
F.LIMIT RECOVERY: N
[-] [G] [↵] [↵]
```

If you want the Library System to limit the amount of error recovery that it performs, leaving in the Medium Transport Elements or the optical drives cartridges that it cannot move or return to their original location, press the [↵] key to toggle this mode setting. Press [G] to return to the main Setup Menu.

The next display is the Configuration Summary.

```
6 CONFIG SUMMARY
[↵] [G] [↵] [↵]
```

Pressing [↵] will display a summary of the Library System parameters as presently configured.

The next display is the Element Status.

```
7 ELEMENT STATUS
[↵] [G] [↵] [↵]
```

Pressing [↵] will display ...

```
SLOTS: ALL EMPTY
[↵] [G] [↵] [↵]
```

Pressing [↵] and repeating will display ...

```
DRIVES: ALL EMPTY
[↵] [G] [↵] [↵]
```

... followed by ...

```
MTE: EMPTY
[↵] [G] [↵] [↵]
```

... followed by ...

```
IMPEXP: EMPTY
[-] [G] [↵] [↵]
```

Pressing **[E]** returns to the main Setup Menu.

The next display is Power-On Hours.

```
8 POWER-ON HOURS
[⌘] [E] [⏪] [⏩]
```

Pressing **[⌘]** will display ...

```
HOURS = 0
[-] [E] [-] [-]
```

The power-on hours clock is reset to zero before shipment from the factory. Press **[E]** to return to the option menu and then press **[⏩]**.

The next display is Load Counts.

```
9 LOAD COUNTS
[⌘] [E] [⏪] [⏩]
```

Pressing **[⌘]** will display ...

```
DRIVE 1
[↙] [E] [↘] [↑]
```

Use **[↘]** or **[↑]** to select the desired drive and then press **[↙]**. The resulting display is ...

```
COUNT = 0
[-] [E] [-] [→0]
```

Drive load counts are reset to zero before leaving the factory.

The next display is **Scan Elements**. This command causes the Library System to test all elements for the presence of media. The Lift Mechanism places one of the Medium Transport Elements in front of each optical drive and an attempt is made to eject and reinsert a cartridge. It then raises the Medium Transport Element in front of the media store and opto-electronic means are used to detect the physical presence of disk cartridges.

```
10 SCAN ELEMENTS
[⌘] [E] [⏪] [⏩]
```

The next display is **Unload Drives**. This is a very rarely used function as you should always let software unload the drives as this will maintain a correct catalog of the Library System's contents.

```
11 UNLOAD DRIVES
[⌘] [E] [⏪] [⏩]
```

If either of the optical drives are loaded, pressing **[⌘]** will cause the Library System to issue eject commands to the drives and return their cartridges to the storage elements of origin.

The next display is **Park Jukebox**. This function is only used when preparing the Library System for shipment.

```
12 PARK JUKEBOX
[⌘] [□] [▼] [▲]
```

Pressing **[⌘]** will cause the Library System to begin removing any optical disk cartridges from the optical drives and storage elements and delivering them to the Import / Export Element at the top of the Library System.

The display will keep you informed of what it is doing so that you can remove cartridges from the Import / Export Element as they are delivered — the Import / Export Element can hold only one cartridge at a time.

The last four displays are **Drive Tests**, **Error Statistics**, **Error Log** and **Event History**. For a detailed explanation of these, see Section 5.

```
13 DRIVE TESTS
[⌘] [□] [▼] [▲]
```

```
14 ERROR STATISTICS
[⌘] [□] [▼] [▲]
```

```
15 ERROR LOG
[⌘] [□] [▼] [▲]
```

```
16 EVENT HISTORY
[⌘] [□] [▼] [▲]
```

Setup of the Library System should now be complete. Proceed as follows:

- Turn off AC power.

All communications with the Library System is performed by the Host computer via a SCSI Interface cable which must be connected to one of the 50-position SCSI connectors on the Library's rear panel.

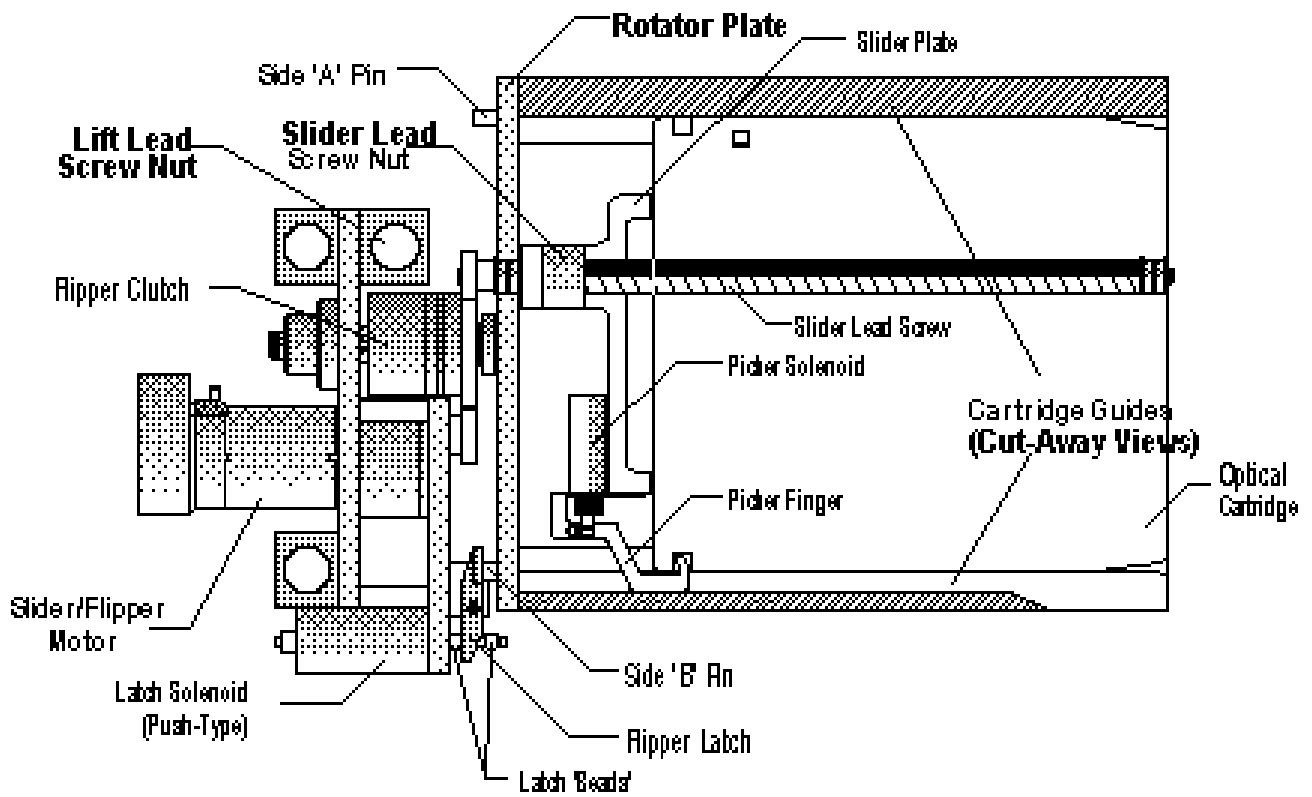
- Plug the SCSI Bus Cable into either of the 50-position SCSI connectors at the rear of the Library System. If the Library System is at the end of the SCSI Bus (i.e., no other SCSI devices are connected beyond it) plug the Terminator Block supplied with the Library System in the open 50-position SCSI connector.

Be sure to secure the cable(s) in place with the bail clips on the connector shell(s).

- Turn on AC power. The Library System will once again go through its power-on sequence and diagnostic checks. When completed, the Library System will be on-line and ready to accept SCSI commands.

Section 4

Hardware



Top View of the Medium Transport Element

General Description

Media Store

The Media Store consists of two vertically arranged plates to which are attached plastic guide panels containing grooves. The grooves in the plastic guide panels form the slots or Storage Element locations of the Media Store in which optical disk cartridges are housed. The plastic guide panels have a low friction coefficient to avoid marring the optical disk cartridge case and to assure smooth, even insertion and withdrawal of the cartridges.

Integrated plastic detents inside the Media Store hold the optical disk cartridges in place. The detents grip notches in the *tapered* end of the optical disk cartridges.

The detents are not strong enough to hold cartridges in the Media Store during movement or shipment of the Library System. Before moving or shipping the Library System, remove all media. See Section 3 for details.

The optical disk drives are mounted on sturdy metal plates which fit over guides in the side plates of the Media Store.

Medium Transport Element

The Medium Transport Element (MTE) is used to move optical disk cartridges between Storage Element locations within the Media Stores and the optical disk drives. The MTE is itself made up of two mechanisms -- the Slider/Flipper Mechanism and the Lift Mechanism.

Slider/Flipper Mechanism

The Slider/Flipper Mechanism consists of the Slider/Flipper Motor which is equipped with an internal optical encoder, the Slider Lead Screw, an electric Flipper Clutch, the Slider Plate and the Picker Solenoid. The Picker Solenoid and its Picker Finger are attached to the Slider Plate which is driven to and fro by the Slider Lead Screw when the Flipper Clutch *is not* energized.

When the Flipper Clutch *is* energized, rotation of the Slider/Flipper Motor will cause the Slider/Flipper Mechanism to rotate. A Flipper Latch Mechanism is used to secure the Slider/Flipper Mechanism in place. The Flipper Latch is released by a solenoid when a 'flip' is to occur.

The Slider/Flipper Motor Encoder measures the distance the Slider Plate travels from its 'home' position within the Medium Transport Mechanism and also the angular motion of the Rotator Plate during flipping. The gearing ratio of the Slider/Flipper Motor Encoder is such that the position of the Slider Plate can be computed to an accuracy of 1/1000 of an inch.

The Library System's microcontroller measures travel distance and time to determine the velocity of the Slider Plate and the load pressure it exerts on the optical disk cartridges when loading them into the optical disk drive.

This is the reason why the Library System was designed to be self-configuring. The loading pressure for each manufacturer's optical drive is different. The location (height) of the drive's loading slot is different. The location of the first Storage Element is different depending on whether the installed drives are full-height or half-height drives. The pitch distance between Storage Elements is different between ISO conforming media and Panasonic media.

All of this information is stored in the Library System's non-volatile memory. During power-on self-test, the Library System queries each installed optical disk drive to determine the manufacturer and model. It then looks this up in a table to find the Drive Type and activate that Drive Type's microcode.

The Drive Type setting is determined automatically by the Library System during the configure drive process. You also cannot install an optical disk drive which has not been qualified for use in the Library System. If the Library System cannot find a corresponding Drive Type in its lookup table during self-configuration, it will not operate.

The Picker Finger is mounted on a bracket attached to the Slider Plate. The Picker Finger swings in a arc to engage the pick notch on a disk cartridge in order to withdraw it from the Media Store or from an optical drive.

The Picker Finger engages the pick notch on one side of the optical disk cartridge. Once the Picker Finger is closed (meaning engaged with the cartridge's pick notch), the cartridge is trapped between the Picker Finger and projections on the leading edge of the Slider Plate.

When a cartridge is being loaded into an optical drive, the Picker Finger opens while the Slider Plate is pushing the cartridge into the drive. The open Picker Finger will pass along side the drive as the cartridge is being loaded.

When a cartridge is to be ejected from the optical drive, the Medium Transport Element is positioned in front of the drive at the correct height. The Slider Plate is positioned at a certain distance from the front of the drive (each qualified drive type has its own position). When the cartridge is ejected from the optical drive, optical sensing means detect the emergence of the cartridge from the drive.

The cartridge is stopped by the Slider Plate and the Picker Finger immediately engages the cartridge and draws it back into the Medium Transport Element. As the cartridge enters the Medium Transport Element, the Picker Finger is mechanically locked into the pick notch of the cartridge.

When a cartridge must be inverted ('flipped'), the Slider/Flipper Motor will rotate the Slider Lead Screw in the direction which brings the Slider Plate all the way back. The Latch Solenoid is then fired to open the Flipper Latch Mechanism.

When the Flipper Latch is open, the Flipper Clutch is energized and the Slider/Flipper Motor can then rotate in the direction required.

The Rotator Plate of the Medium Transport Element is equipped with two precision dowel pins - one on its left side and one on its right side. These pins normally rest against the Flipper Stop which is part of the Flipper Latch Mechanism. When the Rotator Plate is at Side A, its pin is limiting against the bottom of the Flipper Stop.

When the Rotator Plate is at Side B, its pin is limiting against the top side of the Flipper Stop.

Gearing on the Slider/Flipper Motor and the Flipper Clutch provide the means for rotating the MTE (Medium Transport Element) around its centerline so that optical disk cartridges can be placed in the optical drives or the Medium Store either Side A up or Side B up.

Lift Mechanism

The MTE (Medium Transport Element) moves vertically on two very hard, very smooth shafts which are mounted between the Library System's Lift Base and Lift Top Plates. High tech linear bushings are mounted on the MTE's Lift Plate and guide the Lift Plate up and down the Lift Guide Shafts.

A third shaft is actually a precision lead screw. A pulley on the Lift Lead Screw is linked with another pulley on the output shaft of the Lift Motor via a timing belt. The Lift Motor is equipped with an internal optical encoder to measure the distance the MTE travels.


During power-on self-test, the Lift Motor will slowly raise the MTE until the top of the lift plate limits against the Lift Top Plate at which point the Lift Motor will stall. This point is 'lift-home'. All further vertical positioning of the Media Transport Element is then done by counting encoder position marks.

Should the Media Transport Element loose its position, it will automatically raise until the Lift Motor is stalled to reinitialize itself.

The vertical position at which the optical disk drive is to be loaded is controlled by the Drive Type which is determined during power-on self-test.

Import / Export Element

The Import / Export Element (IEE) is the means by which optical disk cartridges are normally entered into the Library System or removed from it. Cartridges may be added to or removed from the IEE at any time except when the Library System is executing a command to move cartridges to or from the IEE or the Library System is in the 'Prevent' state.

The IEE is mounted at the top of the Library System. Pressing the [] key on the front panel while in on-line mode will release the IEE up and out of the Media Store. Insert the cartridge between the guides, tapered end first, and lower the Element.

Two optical sensors are incorporated within the IEE. One detects the presence of a cartridge and the other detects whether the Element is open or closed.

Main Controller PWA

The Main Controller PWA contains an Intel 8032 microprocessor along with DC motor drivers and sensor inputs to control the operation of the Library System. Connectors are provided to interface the PWA to DC motors, optical sensors and the internal SCSI cable. A 20-position connector is provided as an external I/O interface to the Keypad / Display PWA.

Memory

Non-volatile SRAM is used to store volume information and provide for power failure recovery.

Sensor Inputs

There are two photointerruptor OPTO inputs along with two tone decoded OPTO inputs, two Encoders and several cable sensors. The tone decoded inputs are used to reject the effects of ambient light. One of the tone decoders has sensitivity controls.

<u>Sensor Name</u>	<u>Sensor Type</u>
Slider-Encoder	Encoder
Lift-Encoder	Encoder
Import-Open	Photointerruptor
Store-Media	Tone decoded
Media-Eject	Tone decoded
Import-Media	Photointerruptor

Photointerruptor sensors are optical IC's. They contain biasing, detection circuitry and an open collector driver inside the OPTO case. The circuit requirements are + 5 VDC, signal ground and a signal path for the open collector output. When the OPTO is blocked its output is low.

The tone decoded sensors are operated by LM567 tone decoders. Each tone decoder is set up to output a different frequency which in turn is connected to the emitter portion of the assembly via a high current driver. The photo detector portion of the assembly picks up the frequency of the emitted/detected light and this signal is fed back into the tone decoder. The tone decoder will output a low active signal as long as it receives a signal strength greater than 200 mv P-P at the proper frequency of detected light.

Sensors

Slider/Flipper Encoder

Measures the travel distance of the Slider Mechanism from its home position and also to determine the angular rotation of the Rotator Plate during flipping.

Lift Encoder

Measures the travel distance of the lift mechanism from its home position.

Import-Open OPTO Photointerruptor

Activated (blocked) when the Import / Export Element is in its lowered (closed) position.

Store-Media Discrete Optical (Emitter and Receiver -- tone decoded)

Detects the presence of media in a Storage Element location.

Media-Eject (MIT) Discrete Optical (Emitter and Receiver -- tone decoded)

Determines if media is protruding from the Media Store or either of the optical disk drives.

Import-Med OPTO Photointerruptor

Determines if media is present in the Import / Export Element.

Motor Drivers

The Main Controller PWA contains two DC motor drivers. The drivers control the motor direction, torque and provide dynamic braking. Each driver has built in current limiting and thermal shut-down.

Switches

DIP switch SW1 (see Section 7, the Appendix) is used to select different operating modes and used to reset the CPU.

DIP switches on the back of the Library System are used to set the SCSI address of the Optical Drives and various drive options. See the publication *Switch Settings for Qualified Optical Disk Drives for Use in the Multi and M-Series Families of Library System* - Document No. 303075 - for information on these switches.

SCSI Terminator Power

Fuse F10 supplies terminator power to the SCSI cable through a non-removable auto-resetting fuse.
NOTE: *No more than five devices may supply terminator power.*

Keypad / Display Controller PWA

The Keypad / Display Controller PWA provides operator interface to the Library System. It contains the decoding and buffering to drive the LCD display module, a four key membrane switch type keypad, a sound transducer, a power LED and a active LED.

LCD

The LCD display is a twenty character per line by two line display utilizing supertwist technology with back lighting.

LED's

There are two LED's on the Keypad / Display Controller PWA. The Power LED is illuminated when +5 volts is present. The Active LED is under software control and is illuminated whenever the Library System is active or there is activity on the SCSI Bus.

Keypad

The Keypad / Display Controller PWA has an 8-position connector which connects to the membrane switch pad affixed to the front bezel of the Library System.

Lift Interface Adaptor PWA

The Lift Interface Adaptor PWA is used to connect the Slider/Flipper Motor and Encoder, the Picker Solenoid, the Flip Latch Solenoid, the Flipper Clutch and the Media-Store OPTOs of the Media Transport Element to the Main Controller PWA via a ribbon cable. It is mounted to the Lift Plate Assembly.

MTE Interface Adaptor PWA

The MTE Interface Adaptor PWA is used to connect the Media-Store OPTOs and the Picker Solenoid of the Media Transport Element to the Lift Interface Adaptor PWA via discrete wires. It is mounted on the inside of the Rotator Plate. Its wires pass through the hollow Flipper Shaft and are connected to a terminal block on the Lift Interface PWA.

Store-Media and Media-Eject Tone Decoded Devices

The Store-Media Emitter and Detector work together to determine if media is present in a Storage Element. They are mounted at an oblique angle to each other in the Cover Plates of the Medium Transport Element.

The Media-Eject Devices are PWA mounted. The Emitter PWA works in conjunction with the Detector PWA to sense media protruding from an optical disk drive or a Storage Element.

Section 5
Diagnostics and Maintenance

Diagnostics and Maintenance

CAUTION! *The Library System uses non-volatile memory to keep track of the status of the Storage Elements, the Medium Transport Element and the optical disk drives. This array may NOT be updated when using certain maintenance mode tests. If media is removed by hand or by running maintenance mode motor tests, it should be replaced before exiting maintenance mode or system errors may occur.*

Maintenance Mode

Maintenance Mode allows the Service Engineer to run a series of tests on the Library System using the device's LCD display and keypad.

When using Maintenance Mode, it is recommended that the Library System be disconnected from the Host computer by removing the SCSI Host Adaptor Cable from the rear of the unit and replacing it with a qualified Terminator Block.

If an error occurs during a Maintenance Mode test and retries do not correct the problem, the test will pause and the routine error, current position and load count will be displayed accompanied by a repetitive beep. When the **[]** membrane switch is pressed, the Library System will attempt to recover from the error which may cause the display of cascading errors.

NOTE: *The Lift Motor is servo controlled to hold its position. The Service Engineer may override this servo braking function by manually turning the Lift Lead Screw beyond the controlled servo range.*

To enter Maintenance Mode, Switch 1 of the Main Controller PWA must be set to **ON** and the AC power cycled.

When AC power comes back on, the Library System will begin initializing itself to come up in Maintenance Mode.

Test 1 Sensors

When through initializing, the LCD display will show the following ...

```
Test 1  SENSORS ...
[ ]  [ - ]  [ ]  [ ]
```

The top row of the display shows the Maintenance Mode test -- in this case **Sensors**. An ellipsis (...) following a test name indicate that the test contains several sub tests.

The bottom line of the display shows the function of the membrane switch located just below the legend.

Pressing the **[]** switch will begin the Sensor Test and bring up ...

```
IMPORT-OPEN OPTO
-0-  [ ]  [ ]  [ ]
```

... where ...

-0- indicates the state of the OPTO -- Photointerruptor OPTOs will read zero if blocked and one if unblocked

[] is used to exit back to the **Sensor Test**

[] is used to go to the previous sensor

[] is used to go to the next sensor.

An audible tone will sound each time the status of the sensor changes -- high pitch = 1, low pitch = 0. Use the [↵] and [⬆] membrane keys to select the sensor to be tested.

The following OPTO sensors and cables are testable in **Sensors**:

- Import-Open
- Store-Media
- Media-Eject
- Import-Media
- Lift-Cable
- Terminator-Power

Test 2 Motors / Solenoids

```
Test 2 MOTORS ...  
[⌘] [-] [↵] [⬆]
```

CAUTION! Do not overrun travel. Motors do not stop with sensors in this test.

Press the [⌘] key in the above display to enter **Motor Test ...**

```
FINGERS CLOSE  
[⌘] [□] [↵] [⬆]
```

Use the [↵] and [⬆] keys to select the motor or solenoid to be tested.

Operate the selected motor or solenoid by holding the [⌘] key depressed. The motors do not run at full power during this test. Solenoids will turn off after one second.

The following motor tests are available in **Motors**:

Fingers Close	Lift Motor Up
Slider Forward	Lift Motor Down
Slider Reverse	Import Door Open
Flip Lock Off	
Flip Clutch On	

Test 3 Disk Side

```
Test 3 DISK SIDE  
[⌘] [-] [↵] [⬆]
```

Pressing the [⌘] key will display ...

```
DISK SIDE = 2  
[↵] [□] [-] [⌘]
```

With Disk Side = 2, operations involving the movement of cartridges will flip the cartridge. If you do not want the cartridge flipped, press the [⌘] key to toggle the display to 1 and then press the [↵] key. The display will return to the main menu.

Test 4 Initialize

```
Test 4 INITIALIZE
[?] [-] [v] [u]
```

Pressing [?] calls the initialize routine which is normally called on power up. The Library System must be initialized before Tests Test 7 , Test 8 , Test 9 , or Test 10 can be run.

Test 5 Rezero Unit

```
Test 5 REZERO UNIT
[?] [-] [v] [u]
```

If the Library System is not initialized, pressing the [?] switch will initialize the unit and then return any disk not in its 'home' Storage Element.

Test 6 Position

```
Test 6 POSITION
[?] [-] [v] [u]
```

Pressing the [?] switch will display ...

```
CP = 20 NP = 1
[?] [0] [+ ] [↑ ]
```

Pressing the [?] switch positions the Medium Transport Element to the Next Position (NP =) that is specified. Use the [+] and [↑] keys to select a new position. Possible positions are as follows:

IE The Import / Export Position.

D1 or D2 The Drive Load Positions.

1 - nn Storage Elements where SE 1 is closest to the upper Drive in the right-hand Media Store.

The Current Position (CP =) is also displayed on line one of the display. A question mark (?) means the current position is unknown.

Note: *The Slider Mechanism must be retracted to the Slider-Home position before positioning to either of the Drives is allowed.*

Test 7 Load Media (into Optical Disk Drive)

```
Test 7 LOAD MEDIA
[?] [-] [v] [u]
```

Pressing **[*]** will display ...

```
DRIVE 1
[*] [□] [←] [→]
```

Use **[←]** or **[→]** to select the drive to be loaded and then press **[*]** to load the media in the current slot (the slot to which a Medium Transport Element is positioned) into the selected drive. If the disk side is set to 2 (Test Test 3), the media will be inverted prior to loading. The Library System must be initialized (Test Test 4 or Test 5) before this test can be run.

Test 8 Unload Media (from Optical Disk Drive)

```
Test 8 UNLOAD MEDIA
[*] [-] [↵] [↕]
```

Pressing **[*]** will display ...

```
DRIVE 1
[*] [□] [←] [→]
```

Use **[←]** or **[→]** to select the drive to be unloaded and then press **[*]** to unload the media and return it to its slot of origin. If the disk side is set to 2 (Test Test 3), the media will be inverted during the unload. The Library System must be initialized (Test Test 4 or Test 5) before this test can be run.

Test 9 Move Media

```
Test 9 MOVE MEDIA
[*] [-] [↵] [↕]
```

Moves media from one slot to another. Pressing the **[*]** switch will display ...

```
FROM = n TO = n
[*] [□] [F→] [T→]
```

The first display line shows the FROM position and the TO position. Use the **[F→]** key to change the FROM position and the **[T→]** key to change the TO position. If the disk side is set to 2 (Test 3), the media will be inverted during the move. The Library System must be initialized (Test 4 or 5) before this test can be run. Press **[*]** to start the move.

The possible positions are the same as shown in Test Test 6 . Press **[□]** to return to the Setup menu.

Test 10 Reload Media

```
Test 10 RELOAD
MEDIA
[*] [-] [↵] [↕]
```

Pressing **[*]** will display ...

```
DRIVE 1
[*] [0] [+ ] [+ ]
```

Use **[+]** or **[+]** to select the drive to be reloaded and then press **[*]**. This test will eject the disk from the selected drive and reload it back into the drive immediately after flipping it (if Disk Side is set to 2).

Test 11 Home Lift

```
Test 11 HOME LIFT
[*] [- ] [v] [^]
```

Pressing **[*]** will first align the Slider/Flipper Mechanism and 'home' the Slider. It will then slowly raise the Lift Plate Assembly until the Lift Motor stalls.

Test 12 Home Slider

```
Test 12 HOME SLIDER
[*] [- ] [v] [^]
```

Pressing **[*]** will align the Slider/Flipper Mechanism and send the Slider Mechanism to its 'home' position.

Test 13 Slider Store

```
Test 13 SLIDER
STORE
[*] [- ] [v] [^]
```

Pressing **[*]** moves the Slider Mechanism forward to the position at which a cartridge is fully returned to the Media Store.

Test 14 Slider Pick

```
Test 14 SLIDER PICK
[*] [- ] [v] [^]
```

Pressing **[*]** will engage the Pick Fingers and pull a disk into the MTE.

Test 15 Push In Drive

```
Test 15  PUSH IN
DRIVE
【*】  [- ]  [▼]  [▲]
```

Pressing 【*】 moves the Slider Mechanism to the position at which it loads the Drive. The MTE must be positioned in front of a drive for this test to run.

Test 16 Slide Unload

```
Test 16  SLIDE
UNLOAD
【*】  [- ]  [▼]  [▲]
```

Pressing 【*】 moves the Slider Mechanism to the position at which it waits for a disk cartridge to be ejected from the Drive.

Test 17 Eject Media

```
Test 17  EJECT MEDIA
【*】  [- ]  [▼]  [▲]
```

Pressing 【*】 will display ...

```
DRIVE 1
【*】  [0]  [←]  [→]
```

Use 【←】 or 【→】 to select the drive to be ejected and then press 【*】. This test will eject the disk from the selected drive. If the cartridge does not eject, verify proper SCSI bus termination and drive address settings.

Test 18 Flip

```
Test 18  FLIP
【*】  [- ]  [▼]  [▲]
```

Pressing 【*】 rotates the MTE from Side A to Side B (or vice versa). The Slider Mechanism must be fully retracted (at its home position) for this test to run.

Test 19 Lift Encoder

```
Test 19  LIFT
ENCODER
[↩]  [-]  [↵]  [↲]
```

Pressing [↩] displays the current lift encoder count.

Test 20 Slider Encoder

```
Test 20  SLIDER
ENCODER
[↩]  [-]  [↵]  [↲]
```

Pressing [↩] displays the current slider encoder count.

Test 21 Memory Test

```
Test 21  MEMORY TEST
[↩]  [-]  [↵]  [↲]
```

Pressing [↩] will display ...

```
TEST SRAM
[-]  [□]  [-]  [↲]
```

Pressing [↲] will cause the Library System to test its memory. At test completion, it will display PASS or FAIL.

Test 22 Cycle Count

```
Test 22  CYCLE COUNT
[↩]  [-]  [↵]  [↲]
```

Pressing [↩] will display ...

```
CYCLE = nnnnnnnn
[-]  [□]  [-]  [↲0]
```

Press [□] to exit or [↲0] to clear the cycle count. This counter is incremented only by the various Maintenance Mode cycle test.

Test 23 Cycle Fingers

```
Test 23  CYCLE
FINGERS
【⌘】  【-】  【↵】  【⏏】
```

Pressing 【⌘】 continuously cycles the Picker Finger. Terminate the test by pressing any key.

Test 24 Cycle Flip

```
Test 24  CYCLE FLIP
【⌘】  【-】  【↵】  【⏏】
```

Pressing 【⌘】 cycles the Flipper Mechanism and Slider Mechanism continuously. If the MTE is positioned in front of a Storage Element housing a cartridge, the cartridge will be picked, flipped and returned to the Storage Element in a repeating cycle.

While cycling, the display will show the cycle count, the current position of the Lift and the last error logged. Press any key to terminate this test.

Test 25 Cycle Slider

```
Test 25  CYCLE
SLIDER
【⌘】  【-】  【↵】  【⏏】
```

Pressing 【⌘】 cycles the Slider Mechanism continuously. While cycling, the display shows the cycle count, the current Lift position and the last error logged. Press any key to terminate this test.

Test 26 Cycle Lift

```
Test 26  CYCLE LIFT
【⌘】  【-】  【↵】  【⏏】
```

Pressing 【⌘】 cycles the Lift Mechanism continuously in a random pattern. If Disk Side is set to 2 (Test Test 3), the Flipper Mechanism will rotate with each position. While cycling, the display shows the cycle count, the current lift position and the last error logged. Press any key to terminate this test.

Test 27 Cycle Slot (to a Drive)

```
Test 27  CYCLE SLOT
【⌘】  【-】  【↵】  【⏏】
```

Pressing **[*]** will display ...

```
DRIVE 1
[*] [0] [+ ] [↑ ]
```

Use **[+]** or **[↑]** to select the drive to which you want to continuously cycle a disk cartridge and then press **[*]**. While cycling, the display will show you what functions are being performed while also showing the cycle count and the last error logged. If Disk Side is set to 2 (Test Test 3), the cartridge will be flipped before being inserted into the Drive. This cycle repeats using the other slider. Press any key to terminate this test.

Test 28 Cycle Drive

```
Test 28 CYCLE DRIVE
[*] [- ] [↵] [↑ ]
```

Pressing **[*]** will display ...

```
DRIVE 1
[*] [0] [+ ] [↑ ]
```

Use **[+]** or **[↑]** to select the drive to which you want to continuously cycle a disk cartridge and then press **[*]**.

The MTE must be positioned in front of an occupied Storage Element. That cartridge will then be picked and moved to the selected Drive. If Disk Side is set to 2 (Test Test 3), the cartridge will be flipped before being inserted into the Drive. After loading the Drive, the Library System will change its active slider and issue an eject command to the Drive.

When the cartridge is ejected, it will be withdrawn fully into the MTE and then immediately reinserted into the Drive. While cycling, the display will show the cycle count and the last error logged. Press any key to terminate this test.

Test 29 Cycle 2-Disks

```
Test 29 CYCLE 2-
DISKS
[*] [- ] [↵] [↑ ]
```

This test requires two cartridges loaded in any two slots. Pressing **[*]** will initialize the Library System -- during which it will determine where the two cartridges are located. Then, one of the cartridges will be moved to a Drive.

After loading, the Drive will be unloaded and its cartridge moved to the Storage Element immediately above the other cartridge. This process then repeats with the other cartridge using the other slider.

If disk side is set to 2 (Test Test 3), the cartridges will be flipped every other transit of the Media Store. While cycling, the display will show the cycle count and the last error logged. Press any key to terminate this test.

Test 30 Cycle Full

```
Test 30  CYCLE FULL
[⌘]  [-]  [↵]  [⏏]
```

This test will work with cartridges in any of the Storage Element locations. Pressing [⌘] will initialize the Library System and then begin moving cartridges to the drives. If disk side is set to 2 (Test Test 3), the cartridges will be flipped every other transit of the Media Store. After every cycle, the active slider is changed.

While cycling, the display will show the cycle count and the last error logged. Press any key to terminate this test.

Test 31 Demonstration

```
Test 31
DEMONSTRATION
[⌘]  [-]  [↵]  [⏏]
```

This test will work with cartridges in any of the Storage Element locations. A minimum of three cartridges are required. For the most interesting results, two to seven cartridges are recommended. Pressing [⌘] will initialize the Library System during which it will determine how many cartridges are present and where they are.

It will then begin to randomly pick cartridges and either move them to an empty Storage Element or to one of the drives. Cartridges in the drives will be randomly exchanged with cartridges in the Storage Elements.

While cycling, the display will show the operations being performed. Press any key to terminate this test.

Test 32 Constants

```
Test 32  CONSTANTS
...
[⌘]  [-]  [↵]  [⏏]
```

Constants consist of Library System offsets. Offsets are one of the most significant features of the Library System. Generally, all adjustment you are likely to make to a Library System will the keys on the display panel and the feature offsets.

The Library System was fine tuned at the factory for the installed drives and for a standard suite of test media. The cartridges you will be using may be slightly different and may require changing one or more of the offset values. It is highly recommended that you write down the current value of any offset before you change it. That way, you can easily go back to the previous setting if your new value doesn't work.

The Library System's self-configuring feature automatically loads the nominal settings for Lift position, Slider position, Drive load positions and the location of the Import / Export Element and the location of Storage Element 1 into non-volatile memory based on the Drive Type encountered.

Offsets lets you fine tune these values to suit the particulars of your installation.

Import Offset

Pressing **[*]** will display ...

```
1 IMPORT OFFSET
[*] [-] [v] [u]
```

Pressing **[*]** will move the MTE to the Import / Export Element so that you can determine how well the entrance to the MTE aligns with the Import / Export Element. The display will change to ...

```
IMPORT = 100
[-] [0] [+ ] [↑]
```

Pressing **[+]** will lower the MTE in fine increments and pressing **[↑]** will raise the MTE in fine increments. There are limits — +/- 100 counts. Pressing either the **[+]** or the **[↑]** keys will instantly write that value to non-volatile memory. The cartridge should be centered (up and down) just as it enters the Import / Export Element. When you have achieved perfect alignment, press **[0]**.

NOTE: If a cartridge is protruding from a slot or a drive, it will trigger the Media-Eject sensor and prevent the MTE from repositioning during this adjustment.

Bottom Slot Offset

Press **[u]** to display ...

```
2 BOTTOM SLOT OFFSET
[*] [-] [v] [u]
```

Press the **[*]** key. The following will be displayed ...

```
SELECT FLIP SIDE
[-] [0] -A- -B-
```

Select Side A or Side B. The MTE will move to the bottom slot and will flip if required. For Side A, the display will change to ...

```
SIDE A = 100
[-] [0] [+ ] [↑]
```

Pressing the **[-]** key will lower the MTE in fine increments and pressing the **[+]** key will raise the MTE in fine increments. There are limits — +/- 100 counts. Pressing either the **[-]** or the **[+]** keys will instantly write that value to non-volatile memory. The cartridge should be centered (up and down) just as it enters the store guide. When you have achieved perfect alignment, press **[0]**.

Top Slot Offset

Press **[3]** to display ...

```
3 TOP SLOT OFFSET
[ * ] [ - ] [ 0 ] [ + ]
```

Press the **[*]** key. The following will be displayed ...

```
TOP SLOT = 100
[ - ] [ 0 ] [ + ] [ + ]
```

Top Slot Offset is set the same way as is Import Offset. Remember, a protruding cartridge will prevent the MTE from positioning.

Drive Offsets

Press **[4]** to display ...

```
4 DRIVE OFFSETS
[ * ] [ - ] [ 0 ] [ + ]
```

Pressing **[*]** will display ...

```
DRIVE 1
[ * ] [ 0 ] [ + ] [ + ]
```

Use **[-]** or **[+]** to select the drive to be aligned and then press **[*]**. The display will change to ...

```
DRIVEN = 100
[ - ] [ 0 ] [ + ] [ + ]
```

The MTE will move to the drive so that you can determine how well the entrance slot to the MTE aligns with a cartridge in the drive. Pressing **[-]** will lower the MTE in fine increments and pressing **[+]** will raise the MTE in fine increments. There are limits — +/- 100 counts. Pressing either the **[-]** or the **[+]** keys will instantly write that value to non-volatile memory. The cartridge should slide easily into the MTE as it is ejected from the drive. When you have achieved perfect alignment, press **[0]**. Remember, a protruding cartridge will prevent the MTE from repositioning.

Slider Offset

Press **[↵]** to display ...

```
5 SLIDER OFFSET
[↵] [-] [↵] [↵]
```

Pressing **[↵]** will change the display to ...

```
SLIDER = 100
[-] [□] [↵] [↵]
```

Pressing **[↵]** will move the Slider towards the Media Store in fine increments and pressing **[↵]** will move the Slider into the MTE in fine increments. There are limits — +/- 50 counts.

Test 33 Setup

```
Test 33 SETUP ...
[↵] [-] [↵] [↵]
```

Twelve of the sixteen functions and settable options available under Setup are covered in depth in **Section 3 -- Setup and Installation**. Refer to that Section for details on the first twelve functions.

Setup Submenus 13, 14, 15, and 16 are covered below. They can be accessed by pressing the **[↵]** key to enter Setup Mode and then by pressing the **[↵]** key.

Setup Test 13 Drive Tests

```
13 DRIVE TESTS
[↵] [□] [↵] [↵]
```

Pressing **[↵]** will display ...

```
DRIVE 1
[↵] [□] [↵] [↵]
```

Use **[↵]** or **[↵]** to select the drive to be aligned and then press **[↵]**.

The first test will display optical disk drive and cartridge information. The following will be displayed ...

```
A.DRIVE INFORMATION
[↵] [□] [↵] [↵]
```


Pressing **[*]** will display ...

```
LOAD NEW DISK ?  
[ - ] YES [ - ] NO
```

Press **NO** if the currently loaded cartridge is to be used or if no cartridge is currently loaded in the optical disk drive selected. Pressing **YES** will display ...

```
INSERT CARTRIDGE  
[ - ] [ ] [ - ] [*]
```

Insert a cartridge into the Library's Import / Export Element and then press **[*]**. The following will be displayed ...

```
PUSH A KEY AFTER  
EACH DISPLAY-NOW
```

Press any key on the display and keep pressing as each new screen of information is displayed. Stop when the following is displayed ...

```
END OF INFO !  
[ - ] [ ] [ - ] [ - ]
```

Press **[]** to return to the Drive Tests menu.

The next test will low level format a cartridge. The following will be displayed ...

```
B.FORMAT CARTRIDGE  
[*] [ ] [ ] [ ]
```

Pressing **[*]** will display ...

```
INSERT CARTRIDGE  
[ - ] [ ] [ - ] [*]
```

Insert a cartridge into the Library's Import / Export Element and then press **[*]**. The following will be displayed ...

```
LL FORMAT WILL  
ALTER CARTRIDGE
```

followed by ...

```
ARE YOU SURE ?  
[ - ] YES [ - ] NO
```

Pressing YES will display ...

```
LL FORMATTING
(30 MIN)...
```

After approximately thirty (30) minutes, the following will be displayed ...

```
END OF INFO !
[-] [ ] [-] [-]
```

Press [] to return to the Drive Tests menu.

The next test will perform a destructive read / write test on a cartridge. The following will be displayed ...

```
C.READ/WRITE TEST
[ ] [ ] [ ] [ ]
```

Pressing [] will display ...

```
INSERT CARTRIDGE
[-] [ ] [-] [ ]
```

Insert a cartridge into the Library's Import / Export Element and then press []. The following will be displayed ...

```
MEDIA TEST WILL
ALTER CARTRIDGE
```

followed by ...

```
ARE YOU SURE ?
[-] YES [-] NO
```

Pressing YES will display ...

```
WRITING ... 1024
PRESS TO STOP
```

The writing portion of the text can be run to completion (about an hour) or any key on the keypad can be pressed to stop the test. The following is then displayed ...

```
READING ... 0
COMPARING 1024
```

After the read-back portion of the test is completed, the following is displayed ...

```
TEST PASSED !
[-] [ ] [-] [-]
```

Press [] to return to the Drive Tests menu.

Setup Test 14 Error Stats

```
14 ERROR STATISTICS
[*] [ ] [v] [^]
```

Pressing [*] will display ...

```
- NO ERRORS -
[-] [ ] [-] [-]
```

If recorded errors had been present, the following would have been displayed.

```
# 1 E# nnh   nnx
[-] [ ] [v] [^]
```

where ...

- ... #1 is the most frequently logged error
- E# is the hexadecimal error number
- nnx is the number of occurrences of this error

Pressing [v] will display the next most frequently logged error. Pressing [] will display ...

```
ERRORS LISTED = nn
[-] [ ] [-] [→0]
```

Pressing [] will exit the routine back to Error Stats. Pressing [→0] will completely erase the error statistics log.

Setup Test 15 Error Log

```
15 ERROR LOG
[*] [ ] [v] [^]
```

Pressing [*] will display ...

```
- NO ERRORS -
[-] [ ] [-] [-]
```

If recorded errors had been present, the following would have been displayed.

```
#1 E# nnh POS nn
[ * ] [ ] [ * ] [ * ]
```

where ...

- ... #1 is the most recent error logged (a top down stack is used for error logging)
- E# is the hexadecimal error number
- POS nn is the Storage Element position at the time the error occurred.

For each error, more information may be displayed by pressing the [*] key. The following will be displayed ...

```
SETUP MODE 1→20i
[ - ] [ ] [ - ] [ - ]
```

If the error occurred while in Setup Mode, the above message is displayed. Otherwise, one of the following will be displayed.

Message	State in which Error Occurred
NO COMMAND	During initialization
REZERO	During Rezero Unit command
INIT ELEM	During Initialize Element Status command
POSITION	During Position command
MOVE MED	During Move Medium command
EXCHANGE	During Exchange Medium command
MAINT MODE	During Maintenance Mode

The source and destination elements are as displayed. An 'i' will also be displayed if a cartridge invert (flip) was involved. Certain errors have additional information. If the error was due to a low-level SCSI communications problem, the following will be displayed ...

```
COULD NOT TALK
TO DRIVE 1
```

After a few seconds, the following will be displayed ...

```
ERROR #F6 L 1
[ - ] [ ] [ - ] [ - ]
```

These errors are listed in Section 7. The L (location) codes are also listed in Section 7.

If the error was due to a drive or media problem, the following will be displayed ...

```
REQUEST SENSE
INFO DRIVE 1
```

After a few seconds, the following will be displayed ...

```
ASC=3Ah ASCQ=00h
[ - ] [ ] [ - ] [ - ]
```

The errors are listed in the Drive Manufacturer's Technical Reference Manual. They are the Additional Sense Code and Additional Sense Code Qualifier fields returned in response to a Request Sense command sent to the drive.

Press **[E]** until the following is displayed ...

```
ERRORS LOGGED = nn
[-] [E] [-] [→0]
```

Pressing **[E]** will exit the routine back to Error Log. Pressing **[→0]** will completely erase the error log.

Setup Test 16 Event History

```
16 EVENT HISTORY
[↩] [E] [▼] [▲]
```

Pressing **[↩]** will display ...

```
EVENT TYPE = 59
[↩] [E] [←] [→]
```

Pressing **[↩]** again will display ...

```
- LIST EMPTY -
[-] [E] [-] [-]
```

If recorded events had been present, the following would have been displayed.

```
0001: nn nn nn nn nn
[-] [E] [←] [→]
```

The hexadecimal numbers displayed define SCSI and machine control events that may be helpful to technical support personnel in the event of an error. Press **[→]** to scroll the list to the right and **[←]** to scroll the list back to the left. The first number displayed is the list index. Pressing **[E]** will display the following ...

```
EVENTS LOGGED = nn
[-] [E] [-] [→0]
```

Pressing **[E]** will exit the routine back to Event History. Pressing **[→0]** will completely erase the event history list.

Test 34 Open Door

```
Test 34 OPEN DOOR
[↩] [-] [▼] [▲]
```

Pressing the [✖] key will open the door to the Import/Export Element.

Section 6
Library System Adjustments

Adjustments

CAUTION! *Various mechanisms of the Library System are factory assembled using sophisticated permanent fixtures and measuring devices. This is done to eliminate the need for field adjustments and / or alignment.*

Never attempt to align or adjust any mechanism for which specific instructions are not provided herein.

Never loosen any screw which has been painted with red paint. Red paint is used to warn you that this screw was tightened while the mechanism was on a precision fixture. Loosening these screws can cause the loss of precision alignment of a mechanism resulting in an inoperable Library System.

General Comments

Maintenance utilities have been provided for your convenience which allow you to operate the motors at low speed and power to position things where you need them. See **Section 5 -- Diagnostics and Maintenance** for details on how to access and use these utilities.

It is a wise practice to remove the SCSI Host Adapter Cable from the back panel of the Library System and install a SCSI terminator plug while performing maintenance.

All tests and adjustments detailed herein require that the Library System be placed in **Maintenance Mode**.

Gaining Internal Access

Removing the Cover

To remove the cover ...

- Turn the power switch to the OFF (0) position.
- Loosen the nuts securing the Import / Export Element (IEE) Cover and then remove the IEE Cover.
- Remove the screws holding the Library System's Cover at the rear of the Library System. A #2 phillips drive screwdriver is required.

The Cover is required to provide proper cooling for the optical drives. Never operate the optical drive(s) for an extended period with the cover removed.

Replacing an Optical Drive

1. Removing the Optical Drive

The optical drives sit atop metal plates which are screwed to the front of the side plates of the Media Store. They are held in place with two screws which attach to the front of the side plates of the Media Store.

- Be sure that the MTE is positioned well above the drive mounting area.
- Remove the SCSI cable from the rear of the drive.
- Remove the Drive Power Cable from the rear of the drive.
- Remove the Drive ID and Function Cable from the rear of the drive.

- Remove the two screws holding the drive plate to the Media Store and slide the drive on its mounting plate towards the MTE until it is clear of the Media Store.

2. Installing an Optical Drive

To install an optical drive ...

- Attach the drive to the Media Store using the drive mounting hardware removed in the above procedure.
- Connect the SCSI, SCSI ID and power cables to the optical drive.
- Power up the Library System and run **Test Test 33 Setup, Subtest 4 -- Config Drives**. Verify the proper Drive Type and SCSI address for the newly installed drive.

Adjustments

Positioning

1. Import / Export Element Position

The Medium Transport Element should position in front of the Import / Export Element so that a cartridge in the I/E is in-line with the opening to the MTE.

This position is controlled by import offset — **Test Test 32 Constants, Subtest 1 -- Import Offset**. See Section 5.

2. Bottom Slot Position

The Medium Transport Element should position in front of the selected bottom Storage Element so that a cartridge in this element is in-line with the opening to the MTE.

This position is controlled by bottom slot offset — **Test Test 32 Constants, Subtest 2 -- Bottom Slot Offset**. See Section 5.

3. Top Slot Position

The Medium Transport Element should position in front of the selected top Storage Element so that a cartridge in this element is in-line with the opening to the MTE.

This position is controlled by top slot offset — **Test Test 32 Constants, Subtest 3 -- Top Slot Offset**. See Section 5.

4. Drive Positions

The Medium Transport Element should position in front of the selected Drive so that a cartridge being ejected from the drive is in-line with the opening to the MTE.

This position is controlled by drive offsets — **Test Test 32 Constants, Subtest 4 -- Drive Offsets**. See Section 5.

5. Slider-Store Position

The Slider Mechanism should return the optical disk cartridge to the Media Store until its tapered end seats in the retainers of the Storage Element. Travel is controlled by slider offsets — **Test Test 32 Constants, Subtest 5 -- Slider Offset**. See Section 5.

Sensing

1. Store-Media Discrete OPTOs

The Store-Media Discrete OPTOs are used to detect the presence of media in the Media Store. They are housed in precision housings mounted to the covers of the MTE and point at the back edge of the cartridge. You cannot adjust the position of the Store-Media OPTOs; you can only adjust their sensitivity for detection of different colored cartridge shells.

To check for operation of the Store-Media OPTO ...

- Place an optical disk cartridge into one of the Storage Elements of the Media Store and use **Test Test 6 -- Position** to move the MTE to that storage element.
- Select **Test Test 1 -- Sensors** and then select **Store-Media**.
- The sensor should read **-0-** indicating that the sensor is receiving reflected energy from the optical disk cartridge.

If the sensor does not read **-0-**, check sensor sensitivity between **Test Point 1** on the **Main Controller PWA** and **Ground**. The minimum output should be 200 mv p-p.

To adjust the Store-Media OPTO sensitivity ...

- Rotate potentiometer **RF1** on the **Main Controller PWA** clockwise to increase sensitivity.

2. Media-Eject Detection

The media-eject sensors detects disk cartridges protruding from the Media Store and the optical drive.

To check for operation ...

- Select **Test Test 1 -- Sensors** and then select the **Media-Eject**. The LCD display should display a logical state of **-0-**.

If the sensor does not read **-0-**, check wire connections to the PWAs and sensor sensitivity between **Test Point 2** on the **Main Controller PWA** and **Ground**. The minimum output should be 200 mv p-p. Sensor sensitivity cannot be adjusted.

Section 7

Appendix

Error Codes and Locations

Library System Processor Error Codes

Error	Description	Cause / Corrective Action
01h	EPROM 1 Checksum Failure	Fatal error. Replace the Main Controller PWA or install new BIOS. <i>Note: Setup may have to be performed.</i>
02h	SRAM Failure	Fatal error. Replace the Main Controller PWA or install new BIOS. <i>Note: Setup may have to be performed.</i>
04h	Mismatched EPROM's	Fatal error. Replace one or both BIOS EPROM's to ensure compatibility.
05h	EPROM 2 Checksum Failure	Fatal error. Replace the Main Controller PWA or install new BIOS. <i>Note: Setup may have to be performed.</i>
07h	5380 Chip Failure	Fatal error. Replace the Main Controller PWA or check SCSI connections.
0Ah	Bad Element Code	Fatal error. Replace the Main Controller PWA.
0Ch	Undo Overflow	Fatal error. The Main Controller PWA may need replacement. To recover from this error, reset the Library System by cycling AC power.
0Dh	Internal Error	Fatal error. The Main Controller PWA may need replacement. To recover from this error, reset the Library System by cycling AC power.

Library System Hardware Error Codes

Error	Description	Cause / Corrective Action
10h	Unit Not Set Up	<p>Check</p> <ul style="list-style-type: none"> • Drive Switch settings. • Run Configure Drives in Setup Mode.
12h	Park Lift Failure	<p>Check...</p> <ul style="list-style-type: none"> • Is a cartridge projecting from a drive or from the Media Store?
17h	Lift Cable Error	<p>Check ...</p> <ul style="list-style-type: none"> • Lift ribbon cable and connections.
1Ah	Drive Not Installed	<p>The unit tried to load an uninstalled drive.</p> <p>Check ...</p> <ul style="list-style-type: none"> • Drive switch settings. • Run Configure Drives in Setup Mode.
1Bh	Source is Empty	<p>No cartridge was detected in the Storage Element to which the MTE was directed.</p> <p>Check ...</p> <ul style="list-style-type: none"> • Sensitivity adjustment of the Store-Media OPTOs (RF1). Is a disk actually present? • Check SRAM. • Unit may have received a command to move to an element that is truly empty.
1Ch	Destination is Full	<p>A cartridge was detected in the Storage Element to which the MTE was directed.</p> <p>Check ...</p> <ul style="list-style-type: none"> • Sensitivity adjustment of the Store-Media OPTOs (RF1). Is a disk actually present? • Check SRAM. • Unit may have received a command to move to an element that is truly full.
1Dh	Element Unexpectedly Empty	<p>Not enough disks are available for a Maintenance Mode test..</p> <p>Check ...</p> <ul style="list-style-type: none"> • Sensitivity adjustment of the Store-Media OPTOs (RF1). Is a disk actually present? • If running Cycle-2-Disks, you need two cartridges in the Library System.
1Eh	Element Unexpectedly Full	<p>Too many disks are present for a Maintenance Mode test.</p> <p>Check ...</p> <ul style="list-style-type: none"> • Sensitivity adjustment of the Store-Media OPTOs (RF1). Is a disk actually present? • If running Cycle-2-Disks, you have too many cartridges in the Library System.

Error	Description	Cause / Corrective Action
20h	Pick Disk Fail	<p>Check ...</p> <ul style="list-style-type: none"> • Finger Solenoid and connections. • Slider/Flipper Motor and Encoder. • Media-Eject OPTOs. • Lift position offsets in Setup Mode.
21h	Store Disk Fail	<p>Check ...</p> <ul style="list-style-type: none"> • Slider/Flipper Motor and Encoder. • Media-Eject OPTOs. • Lift position offsets in Setup Mode.
23h	Drive Not Ready	<p>Check ...</p> <ul style="list-style-type: none"> • Drive switch settings. • Run Configure Drives in Setup Mode. • SCSI cable connections. • Does drive have power? • Try different media.
24h	Drive Load Fail	<p>Check ...</p> <ul style="list-style-type: none"> • Slider/Flipper Motor and Encoder. • Media-Eject OPTOs. • Is there already a disk in the drive? • Lift position offsets in Setup Mode. • If Lift is not aligned with drive, check Drive Switch settings and run Configure Drives in Setup Mode.
25h	Unload Drive Fail	<p>Check ...</p> <ul style="list-style-type: none"> • Slider/Flipper Motor and Encoder. • Media-Eject OPTOs. • Is there really a disk in the drive? • Lift position offsets in Setup Mode. • If Lift is not aligned with drive, check Drive Switch settings and run Configure Drives in Setup Mode.
26h	Eject Fail	<p>Check ...</p> <ul style="list-style-type: none"> • Drive switch settings. • Run Configure Drives in Setup Mode. • SCSI cable connections. • Does drive have power? • Try different media.
28h	Can't Inquiry Drive	<p>Check ...</p> <ul style="list-style-type: none"> • Drive switch settings. • Run Configure Drives in Setup Mode. • SCSI cable connections.

Error	Description	Cause / Corrective Action
29h	No Terminator Power	<ul style="list-style-type: none"> Does drive have power? Check ...
2Ah	Incompatible Drive Types	<ul style="list-style-type: none"> SCSI cable connections. SCSI terminator. Check ...
2Bh	Cannot Export	<ul style="list-style-type: none"> Drive switch settings. Run Configure Drives in Setup Mode. SCSI cable connections. Drive(s). Check ...
2Ch	Import Door Open	<ul style="list-style-type: none"> Is the Import / Export Element already occupied? Import Media sensor. Check ...
2Dh	Medium Removal Prevented	<ul style="list-style-type: none"> Is Import / Export Element ajar? Cable connections to Import-Door OPTO. An operation command was made to open the import door while in the Prevent state.
2Eh	Unit Not Initialized	An operation command was given prior to unit initialization.
30h	Shipping Screw	The shipping screw has not been removed.
31h	Lift-Home Fail	Check ... <ul style="list-style-type: none"> Is the Power Supply delivering 24 VDC? The Slider Mechanism must be 'homed' after initial power-on before the Lift will 'home'. Lift Motor and connections. Lift Encoder (Test Test 19 - Lift Encoder); also, connections. Is a cartridge projecting from a drive or Storage Element?
32h	Position Fail	Check ... <ul style="list-style-type: none"> Lift Motor and connections. Lift Encoder and connections. Run Test Test 19. Is a cartridge projecting from a drive or Storage Element?
33h	Lift Blocked	Check ... <ul style="list-style-type: none"> Is a cartridge projecting from a drive or Storage Element? Media-Eject OPTOs and connections.
35h	Flip Fail	The Flipper Mechanism was unable to flip to the directed side. Check ... <ul style="list-style-type: none"> Slider/Flipper Motor and connections; gears. Any obstructions?
36h	Flip Timeout	The Flipper Mechanism was unable to flip in the allotted time. Check ... <ul style="list-style-type: none"> Flipper Latch failed to open?

Error	Description	Cause / Corrective Action
37h	Flip Align Fail	<ul style="list-style-type: none"> • Flipper Motor and connections; gears. • Any obstructions? <p>The Flipper Mechanism was unable to align itself to either side. Check ...</p>
38h	Flip Not Aligned	<ul style="list-style-type: none"> • Flip Latch failure. • Flipper Motor and connections; gears. • Any obstructions? <p>The Flipper Mechanism was not aligned at either Side A or B when the Lift was trying to position or was not aligned after positioning. Check ...</p>
39h	Flip Latch Failure	<ul style="list-style-type: none"> • Slider/Flipper Motor and connections; gears. • Any obstructions causing Flipper misalignment during positioning? <p>The Flipper Latch Mechanism failed to close. Check ...</p>
3Ah	Slider Home Fail	<ul style="list-style-type: none"> • Latch Solenoid and related mechanisms. <p>Check ...</p> <ul style="list-style-type: none"> • Is power supply delivering 24 VDC? • Slider/Flipper Motor and connections. • Encoder and connections; run Test Test 20 . • Any obstructions?
3Bh	Slider Position Fail	<ul style="list-style-type: none"> • Slider/Flipper Motor and connections. • Encoder and connections; run Test Test 20 . • Any obstructions? <p>Check ...</p>
3Dh	Slider Load Fail	<ul style="list-style-type: none"> • Slider/Flipper Motor and connections. • Encoder and connections; run Test Test 20 . • Any obstructions? <p>Check ...</p> <ul style="list-style-type: none"> • Did cartridge stay in drive after loading? Try a different cartridge. • Any obstructions? • Is cartridge catching in drive? • Slider/Flipper Motor and Encoder and connections; run Test Test 20 .
3Fh	Slider Mispositioned	<p>Slider is not in a safe position for the Lift to move. Check ...</p> <ul style="list-style-type: none"> • Reinitialize unit. • Slider/Flipper Motor and connections; gears. • Encoder and connections; run Test Test 20 .
43h	Cannot Open Access Door	<ul style="list-style-type: none"> • Import solenoid and connections; run Test Test 34 . • Access door opening blocked. <p>Check ...</p>
44h	MTE Not At Drive	<p>The MTE was not positioned in front of the drive during a load or unload attempt.</p>

Error	Description	Cause / Corrective Action
		Check ... <ul style="list-style-type: none"> • Reinitialize unit.
45h	Element Scan Failed	Check ... <ul style="list-style-type: none"> • Is the Power Supply delivering 24 VDC? • Lift Motor and connections. • Lift Encoder (Test Test 19 - Lift Encoder); also, connections. • Is a cartridge projecting from a drive or Storage Element?
46h	SRAM Reset	Check ... <ul style="list-style-type: none"> • This is normal if a new Main Controller PWA or SRAM is being powered up for the first time. • Power Supply. • Was Main Controller powered up without EPROMs. • Check SRAM.
F1h	SCSI Bus Unavailable	Check... <ul style="list-style-type: none"> • SCSI terminators. • Terminator power. • SCSI cable. • Do two different devices have the same SCSI address?
F2h	SCSI SelectionTime Out	Check... <ul style="list-style-type: none"> • SCSI terminators. • Terminator power. • SCSI cable. • Do two different devices have the same SCSI address?
F3h	Two ID's On SCSI Bus	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
F4h	Undefined SCSI Phase	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
F5h	SCSI Phase Error	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
F6h	SCSI Bus Not Terminated	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?

Error	Description	Cause / Corrective Action
F7h	SCSI Parity Error	Check... <ul style="list-style-type: none"> • Initiator must use parity. • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
F8h	Unexpected Loss of Busy	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
F9h	Abort Message Received	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
FAh	Improper Message Received	Check... <ul style="list-style-type: none"> • SCSI host adapter.
FBh	Two Devices Responding to Same Selection	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
FCh	SCSI Command Time Out	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
FEh	Drive is Busy	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?
FFh	Cannot Get Sense Info	Check... <ul style="list-style-type: none"> • SCSI terminators. • SCSI cable. • Do two different devices have the same SCSI address?

Library System SCSI Communication Error Location Codes

Error	Location
-------	----------

- | | |
|----|---|
| 1 | Selection phase (host selecting changer). |
| 2 | Receiving the disconnect message (from the host). |
| 3 | Checking for reselection by drive or selection by another initiator while busy processing a command (drive-changer or other initiator-changer). |
| 4 | Reselection phase (changer reselecting host). |
| 10 | Command phase (host-changer nexus). |
| 11 | Data out phase (host-changer nexus). |
| 12 | Message out phase (host-changer nexus). |
| 13 | Status phase (host-changer nexus). |
| 14 | Data in phase (host-changer nexus). |
| 15 | Message in phase (host-changer nexus). |
| 20 | Command phase while disconnected and busy (other initiator-changer nexus). |
| 21 | Data out phase while disconnected and busy (other initiator-changer nexus). |
| 22 | Message out phase while disconnected and busy (other initiator-changer nexus). |
| 23 | Status phase while disconnected and busy (other initiator-changer nexus). |
| 24 | Data in phase while disconnected and busy (other initiator-changer nexus). |
| 25 | Message in phase while disconnected and busy (other initiator-changer nexus). |
| 30 | Arbitration phase (changer arbitrating for bus). |
| 31 | Selection phase (changer selecting optical drive). |
| 32 | Waiting for new information transfer phase (changer-drive nexus). |
| 40 | Command phase (changer-drive nexus). |
| 41 | Data out phase (changer-drive nexus). |
| 42 | Message out phase (changer-drive nexus). |
| 43 | Status phase (changer-drive nexus). |
| 44 | Data in phase (changer-drive nexus). |
| 45 | Message in phase (changer-drive nexus). |

Library System SCSI Request Sense Error Codes

The sense codes conform to the SCSI-2 Specification. For detailed definitions of the Sense Key, ASC and ASCQ errors, refer to the SCSI-2 Specification (Document Number X3.131-1994).

Sense Key	ASC	ASCQ	Error Description
02h	04h	01h	Logical Unit is in process of becoming ready
02h	04h	03h	Logical Unit not ready; manual intervention required
02h	80h	2Ch	Import door is open
04h	40h	00h	Diagnostic failure (EPROM)
04h	43h	00h	Message error
04h	44h	00h	Internal target failure
04h	45h	00h	Select or Reselect failure
04h	47h	00h	SCSI parity error
04h	48h	00h	Initiator detected error message received
04h	49h	00h	Invalid message error
04h	4Bh	00h	Data Phase error
04h	80h	10h	Unit has not been set up
04h	80h	12h	Park failure
04h	80h	17h	Lift cable failure
04h	80h	1Ah	Drive not installed
04h	80h	1Dh	Element unexpectedly empty
04h	80h	1Eh	Element unexpectedly full
04h	80h	20h	Pick-disk failure
04h	80h	21h	Store-disk failure
04h	80h	23h	Drive not ready
04h	80h	24h	Drive load failure
04h	80h	25h	Drive unload failure
04h	80h	26h	Eject failure
04h	80h	28h	Can't inquiry drive
04h	80h	29h	SCSI terminator power is low
04h	80h	2Ah	Incompatible drive types
04h	80h	2Bh	Cannot export cartridge
04h	80h	2Eh	Unit not initialized
04h	80h	30h	Shipping screw
04h	80h	31h	Lift-home failure
04h	80h	32h	Lift-position failure
04h	80h	33h	Cartridge projecting from slot or drive
04h	80h	35h	Flip failure
04h	80h	36h	Flip timeout
04h	80h	37h	Flip-align failure
04h	80h	38h	Flip not aligned
04h	80h	3Ah	Slider-home failure
04h	80h	3Bh	Slider-position failure
04h	80h	3Fh	Slider misposition
04h	80h	43h	Cannot open access door
04h	80h	45h	Element scan fail
05h	1Ah	00h	Parameter list length error
05h	20h	00h	Invalid command operation code
05h	21h	01h	Invalid element address
05h	24h	00h	Invalid field in CDB
05h	25h	00h	Logical Unit not supported
05h	26h	00h	Invalid field in parameter list
05h	28h	01h	Import/Export element accessed
05h	3Bh	0Dh	Medium destination element full

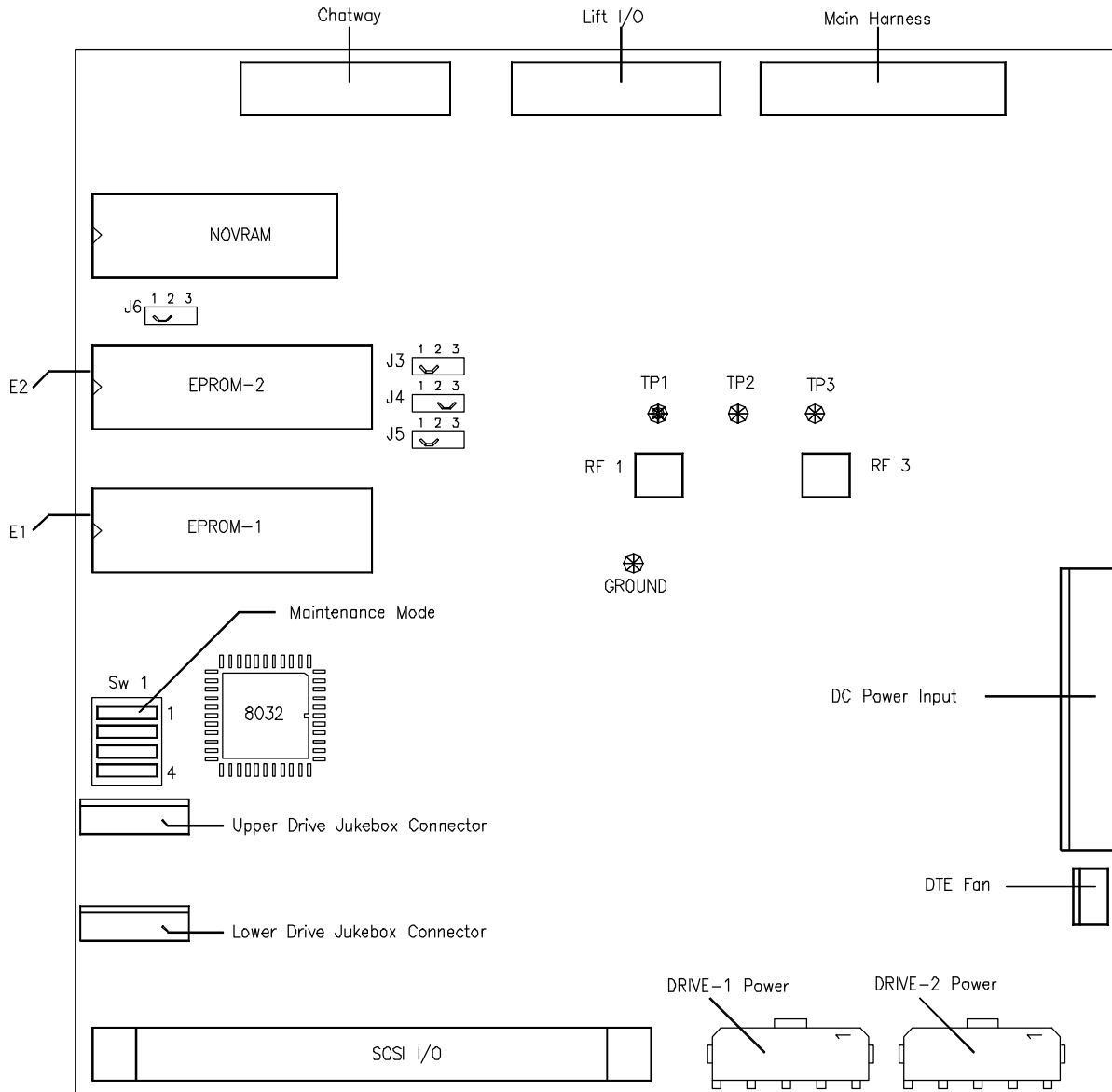
Sense			
Key	ASC	ASCQ	Error Description
05h	3Bh	0Eh	Medium source element empty
05h	3Dh	00h	Invalid bits in identify message
05h	53h	02h	Medium removal prevented
05h	81h	00h	Volume tag information already defined
05h	84h	00h	Host serial number mismatch
05h	86h	00h	Transport element full
05h	87h	00h	Position with transport full
06h	29h	00h	Power-on, Reset, or Bus Device Reset occurred
06h	2Ah	00h	Log Parameters changed
06h	2Ah	01h	Mode parameters changed
06h	80h	46h	SRAM reset

Switches

Main Controller PWA

SW1 DIP Switches

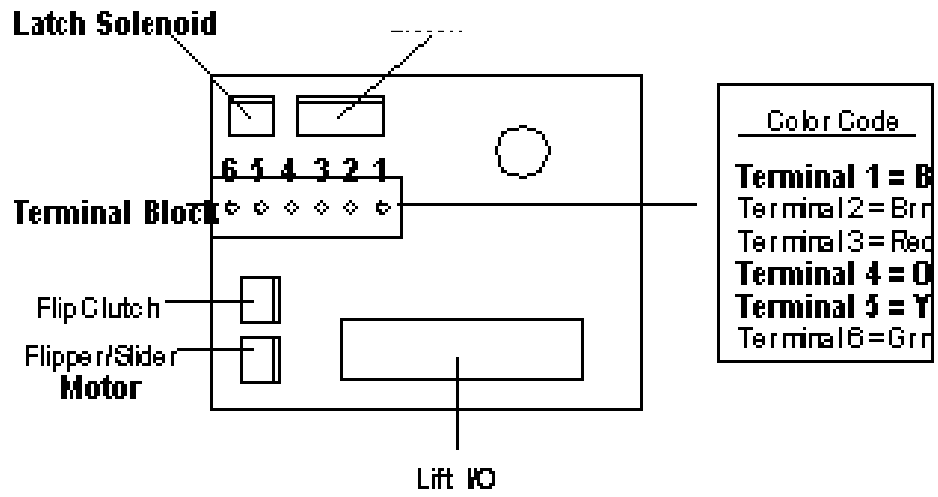
Switch ON	Function	
SW1-1	Maintenance Mode	Places unit in Maintenance Mode if on at power-up. If turned off after power-up with SW1-3 on, Cycle 2-Disk will only move cartridges within the Storage Elements — not to drives. Installed drives are not required for Cycle 2-Disk under this condition.
SW1-2	Cycle Limit	Stops all cycle tests at 2,000 cycles when in Maintenance Mode (SW1-1 on).
SW1-3	Load Drive Limit	Stops Cycle 2-Disk from loading installed drives after each drive has been loaded 200 times.
SW1-4	Hardware Reset	Same effect as turning Library System off and on again.



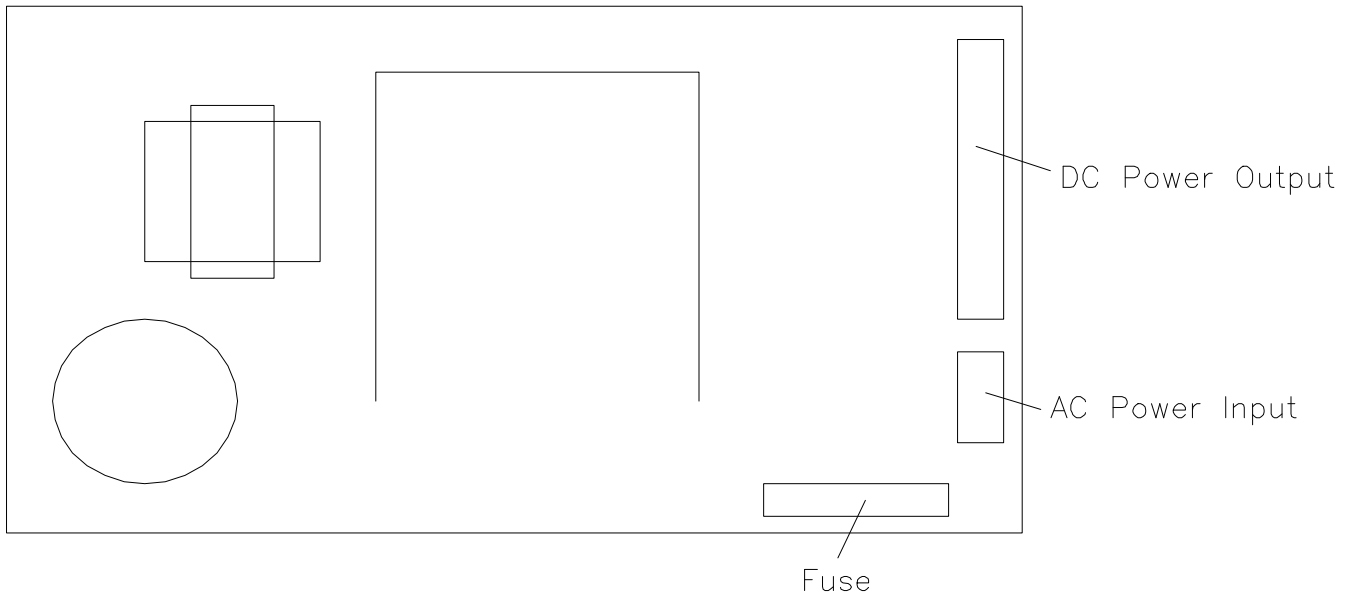
Main Controller PWA Component Layout

Caution: *The NOVRAM chip contains an internal lithium battery which could explode if incorrectly replaced. Replace only with a qualified replacement chip. Return the old chip to the manufacturer for disposal or dispose of in accordance with local regulations for the disposal of lithium batteries.*

“ATTENTION: IL Y A DANGER D’EXPLOSION S’IL Y A REMPLACEMENT INCORRECT DE LA BATTERIE. REMPLACER UNIQUEMENT AVEC UNE BATTERIE DU MEME TYPE OU D’UN TYPE RECOMMANDE PAR LE CONSTRUCTEUR. METTRE AU REBUT LES BATTERIES USAGEES CONFORMEMENT AUX INSTRUCTIONS DU FABRICANT,”



Lift Interface PWA Component Layout



Power Supply Component Layout

Caution! *For continued protection against the risk of fire, replace only with same type and rating of fuse (2A 250VAC).*

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