



Plasmon G-Series

G64 – G638 ~ UDO/MO Libraries

SCSI Reference Manual

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This publication describes the SCSI software interface to the Plasmon G Series family of MO/UDO libraries. It is intended to provide interfacing information to parties wishing to develop software and/or application programs for these libraries. This document corresponds to Product Revision Level 3.06 or later of the library system firmware.

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1. Introduction

The Plasmon G Series libraries are a family of MO/UDO disk robotic library systems capable of holding a number of MO or UDO disk drives and disk cartridges. The robotic device within each library system is referred to as a medium changer device and it uses the protocols and commands for medium changer devices as defined in the American National Standards Institute SCSI Specification. The G Series library system's medium changer device and the disk drives within the library system are all accessed independently.

There are a number of locations or elements within the library system which are capable of holding disk cartridges. These consist of the import/export elements, the storage elements, the medium transport elements, and the data transfer elements.

The import/export elements, IE1 - IE11, are externally accessible slots through which disk cartridges are added to or removed from the library system. The first import/export element, IE1, is a fixed operator accessible slot through which single cartridges can be added to or removed from the library system. It is also known as the mailslot. Import/export elements IE2 - IE11 are slots in a removable magazine from which one to ten cartridges can be added or removed at a time.

The storage elements, ST1 - STn, are locations within the library system's medium store used to store cartridges.

The medium transport elements, MT1 and MT2, are the optical disk transport mechanisms used to remove optical disks from or return optical disks to the import/export elements, the storage elements, or the data transfer elements (the MO drives). The medium transport elements are also referred to as the pickers.

The data transfer elements, DT1 - DTn, are the library system's magneto-optical disk drives.

The medium changer device within the library system responds to commands as defined by and in accordance with the ANSI X3.301-1997 standard - SCSI-3 Primary Commands (SPC), and the ANSI NCITS 314-1998 standard - SCSI-3 Medium Changer Commands (SMC). The commands are sent to the medium changer device by a logical protocol and physical interconnect in accordance with the ANSI SCSI-3 Architecture Model (SAM) standard. The currently supported logical protocol is the SCSI-3 Interlocked Protocol (SIP). The currently supported physical interconnect is the SCSI-3 Parallel Interface, version 2 (SPI-2).

Each command is structured in the form of a Command Descriptor Block (CDB). Some commands require an list of parameters to be sent along with the command in the form of a separate outgoing block of data. Other commands return a block of information from processing the command into a buffer in the host application software. The contents of this buffer may be interpreted by the application at the completion of the command and acted upon accordingly. This document does not specify how this information is to be used by the application.

This document describes the SCSI commands (CDB's) for the library system's medium changer device. Refer to the corresponding drive reference manual for information on SCSI commands for the library system's magneto-optical drives. SCSI reference manuals for the library system's magneto-optical drives may be obtaining by contacting Plasmon Technical Support.

The aforementioned SCSI standards may be obtained by contacting ANSI at the following address.

American National Standards Institute, Inc.
11 West 42nd Street, New York, NY 10036
+1-212-642-4900
Internet: www.ansi.com

2. Glossary of Terms Used

A number of terms are used throughout this document. Some of these terms are defined here.

Alternate MTA: In library systems equipped with a redundant MTA, the MTA used when the primary MTA is malfunctioning.

ASC/ASCQ: Additional Sense Code/ Additional Sense Code Qualifier. Bytes 12 and 13 of the Sense Data block returned by the Request Sense command in response to a CHECK CONDITION from a target device. These bytes, along with the Sense Key in byte 2, indicate the type of error sensed.

Automatic MTA Switch-Over: On library systems equipped with a redundant MTA, the library system will automatically switch from the primary to the alternate MTA when the primary MTA is not performing to a minimum criteria.

CDB: Command Descriptor Block. The structure used to communicate commands from a SCSI initiator device to a SCSI target device.

Data Transfer Elements (DT's): The MO drives within the library system.

Drive Service: Unloading a pair of drives, turning them off (removing drive power), and disconnecting them from the SCSI bus to allow an operator to remove or replace one or both drives.

Drive Type: A numeric classification of the type of library drive installed. This value is encoded in the connector to the drive from the library system drive interface board.

Element: An addressable location within the library system. The library system contains four types of elements: medium transport elements (MT's), storage elements (ST's), import/export element (IE's), and data transfer elements (DT's).

Event History/ Event List: A list of code bytes associated with events occurring within the library system or communication occurring between the library system and an associated drive. The particular code bytes logged depend upon the value of the event history type. This list is used only for error analysis and debugging.

Event History Type: A byte defining the type of bytes logged in the event history list.

Front Service Door: The door on the front of the library system through which the library on/off switch may be accessed, library drives may be inserted or removed, and the library's printed circuit boards and cables may be accessed.

Export: Moving a cartridge to the mailslot or a magazine slot so that the operator may remove it from the library system.

Flash: A nonvolatile, electrically erasable area of memory used to store microcode for the library system.

Hot Swap: To replace a power supply or drive while the library system remains on-line.

Import: Retrieving a cartridge from the mailslot or a magazine slot so that it may be used in the library system.

Import/Export Elements (IE's): The externally accessible slots through which disk cartridges are added to or removed from the library system. This includes the mailslot and the magazine slots.

LSB: Least significant bit.

Lift: The medium transport assembly particularly when moving vertically.

Magazine: An operator-accessible carrier containing up to ten cartridges. Individual cartridges may be imported from or exported to the magazine when it is attached to the library system.

Magazine Access Door: The door through the magazine is inserted or removed. Once closed, this door can only be opened through the front panel or a SCSI Release Magazine command.

Mailslot: The operator accessible media slot through which individual cartridges are added to or removed from the library system.

Medium Transport Elements (MT's): The optical disk transport mechanisms in the library system. The library system contains two medium transport elements. They are also referred to as the pickers.

Medium Transport Assembly (MTA): An assembly of medium transport elements within a single housing. All library systems contain a primary MTA and some contain an alternate MTA.

Micro-Operation List: A list of operations performed by the library system for a single cartridge movement command.

MO: Magneto-Optical. A method of recording involving magnetic and optical techniques.

MSB: Most significant bit.

Pass-Through: Moving a cartridge from one library system to another. Not all models have this capability.

Pass-Through Elements: The internal locations used to temporarily store cartridges before and after they are transferred to or from other library systems. On library systems equipped with the pass-through capability, there is a pass-through element associated with each adjacent library system.

Picker: A medium transport element particularly when pulling or pushing a cartridge.

Pivot: The portion of the library system responsible for rotating the medium transport assembly between columns of slots or drives.

Primary MTA: The MTA used in normal library system operation.

Printed Wire Assembly (PWA): A populated library system circuit board.

Rear Access Door: The door on the rear of the library system through which cartridges may be manually mass loaded or removed, or through which maintenance service may be performed.

SCSI: Small Computer System Interface. An ANSI specification defining the transfer of commands and data between two devices such as a host computer and a computer peripheral. The third version of this specification is known as SCSI-3.

SCSI ID: A unique address for each device on an SCSI bus. The host and the medium changer device must each have an SCSI ID between 0 and 7, inclusive. The drives must each have an SCSI ID between 0 and 7, or between 0 and 15 or 31 if Wide SCSI is supported.

SCSI Initiator: An SCSI device, such as a host computer, that issues SCSI commands.

SCSI Target: An SCSI device that performs an operation requested by an initiator. The library system contains several SCSI targets: an SCSI medium changer device, and one or more SCSI random access storage devices (the drives).

Storage Elements (ST's): Locations within the library system's medium store used to store disks.

3. Library System Operating Modes

The library system can operate in one of three modes: on-line, library set up, and library maintenance.

3.1 Normal On-line

This is the normal operating mode of the library system. Element statuses are displayed on the front panel of the library system. A menu may be selected for accessing the 10-slot cartridge magazine, displaying library status values, turning drives on or off, servicing and restoring drives, and entering one of the other two operating modes of the library.

3.2 Library Set Up Mode

This mode may only be invoked from the front panel. It takes the medium changer device completely off-line (the drives remain on-line). For more information refer to the G Series User Manual.

3.3 Library Maintenance Mode

This mode may only be invoked from the front panel. It takes the medium changer device completely off-line. For more information refer to the G Series User Manual.

4. SCSI Command Overview

The following is a brief description of each of the SCSI commands supported.

The **Inquiry** command requests medium changer device parameters be sent to the SCSI initiator device.

The **Mode Select (6)** and **Mode Select (10)** commands provide a means of selecting medium changer device parameters.

The **Mode Sense (6)** and **Mode Sense (10)** commands provide a means for reporting medium changer device parameters to the initiator.

The **Send Diagnostic** command provides a means for performing diagnostic tests on the medium changer device.

The **Rezero Unit** command is used to 'reset' the medium changer device.

The **Test Unit Ready** and **Request Sense** commands are necessary to interface the medium changer device.

The **Reserve Element** and **Release Element** commands are used to reserve the medium changer device or elements within it for multiple initiator applications. Many implementations will not require these commands.

The **Position to Element** command instructs the medium changer device to position one of the two medium transport elements (MT's) in front of an element in preparation for a move from the element. Use of this command is not required.

The **Move Medium** command instructs the medium changer device to move a unit of media from a source element to a destination element (e.g.: move a cartridge from the mailslot to slot ST3). The Invert bit may be specified to flip the cartridge prior to depositing the cartridge into the destination element.

The **Exchange Medium** command instructs the medium changer device to exchange a cartridge in a source element with a cartridge in a destination element and place that cartridge in another destination element. Invert bits may also be specified.

The **Open/Close Mailslot** command instructs the medium changer device to open or close the mailslot thus enabling cartridge insertion or removal.

The **Prevent/Allow Medium Removal** command instructs the medium changer device to either inhibit or permit opening of the mailslot for cartridge insertion or removal, or to inhibit or permit the releasing of the cartridge magazine for operator access.

The **Initialize Element Status** command causes the medium changer device to test all elements for the presence of media.

The **Initialize Single Element** command causes the medium changer device to test a single element for the presence of media.

The **Read Element Status** command is used to determine status of elements (e.g.: make a directory of cartridges in the library system).

The **Release Magazine** command instructs the medium changer device to energize a solenoid to release the cartridge magazine for operator access. It will also open the magazine access door to allow magazine insertion or removal.

The **Read Magazine Status** command is used to determine the status of the magazine.

The **Service Drive Pair** command prepares a pair of drives for service by powering them off and disconnecting them from the SCSI bus.

The **Restore Drive Pair** command restores a pair of drives previously prepared for service by reconnecting them to the SCSI bus and powering them on.

The **Swap Transport Assys** command is used to switch to the alternate medium transport assembly when the primary assembly is found to be non-functional.

The **Log Sense** command provides a means for reporting medium changer device statistical and error log information.

The **Log Select** command provides a means of clearing certain unit statistics, error statistics, and error log information, and setting the library system date and time.

The **Write Buffer** command is used to write new firmware to the library system or to change certain parameters within the library system.

The **Read Buffer** command is used to read certain parameters from the library system..

5. SCSI Addresses

The default SCSI ID's for the library system devices are as follows.

Default SCSI ID's

Device	Number of Buses=1		Number of Buses=2		Number of Buses=3	
	SCSI Bus	SCSI ID	SCSI Bus	SCSI ID	SCSI Bus	SCSI ID
Library Drive 1	1	0	1	0	1	0
Library Drive 2	1	1	1	1	1	1
Library Drive 3	1	2	2	0	2	0
Library Drive 4	1	3	2	1	2	1
Library Drive 5	1	4	1	2	3	0
Library Drive 6	1	5	1	3	3	1
Library Drive 7			2	2	1	2
Library Drive 8			2	3	1	3
Library Drive 9			1	4	2	2
Library Drive 10			1	5	2	3
Library Drive 11			2	4	3	2
Library Drive 12			2	5	3	3
Medium Changer Device	1	6	1	6	1	6

6. Element Addresses and Counts

Four different element addressing schemes have been implemented for the library system. The following table lists the element addresses used in the different schemes. Scheme 2 only applies to the G Enterprise 64 and 104 models. Scheme 3 only supports 8 drives and does not support magazine access. Scheme 1 is the default scheme.

Element Addresses

Element Type	Scheme 1 (default)	Scheme 2	Scheme 3	Scheme 4
MT	8001, 8002	8001, 8002	8001, 8002	16, 17
ST	1 - n	1 - n	11 - 10+n	31 - 30+n
IE	4001 - 4011	200 - 212	10	20
DT	6001 - 6012	240 - 251	1 - 8	1 - 12

The following table lists the supported models and corresponding element counts.

Element Counts

Model	Number of Medium Transport Elements	Number of Storage Elements	Number of Import/Export Elements	Number of Data Transfer Elements
Model 64	2	64	1	maximum of 4
Model 104	2	104	1	maximum of 4
Model 164	2	164	1, 10, or 11	maximum of 12
Model 238	2	238	1, 10, or 11	maximum of 12
Model 438	2	438	1, 10, or 11	maximum of 12
Model 638	2	638	1, 10, or 11	maximum of 12

7. SCSI Communication

7.1 Supported Messages

In the course of communication between a SCSI initiator device, such as a host computer, and a SCSI target device, such as the library system medium changer device, messages are sent as part of protocol services. This includes both task and link management messages. The following messages are accepted by and/or sent by the medium changer device. The direction field indicates the direction of message transfer. The MESSAGE REJECT message is sent for all unaccepted messages.

Message Codes

Code	Message Name	Direction
06h	ABORT TASK SET (was ABORT in SCSI-2)	Out
0Ch	TARGET RESET (was BUS DEVICE RESET in SCSI-2)	Out
00h	TASK COMPLETE (was COMMAND COMPLETE in SCSI-2)	In
04h	DISCONNECT	In/Out
01h	Extended messages - SYNCHRONOUS DATA TRANSFER (01h) REQUEST and WIDE DATA TRANSFER REQUEST (03h)	In/Out
80h+	IDENTIFY	In/Out
05h	INITIATOR DETECTED ERROR	Out
09h	MESSAGE PARITY ERROR	Out
07h	MESSAGE REJECT	In/Out
08h	NO OPERATION	Out
02h	SAVE DATA POINTER	In
Key: In Target (medium changer device) to Initiator, Out = Initiator to Target (medium changer device) 80h+ Codes 80h through FFh are used for IDENTIFY messages =		

7.2 Supported Status Byte Codes

A status byte code is sent from the medium changer device to the initiator at the termination of each command. The supported status byte code values are listed below.

Status Byte Codes

Status Byte Code	Status
0h	GOOD
2h	CHECK CONDITION
8h	BUSY
18h	RESERVATION CONFLICT
All other codes	Not Returned

GOOD. The medium changer device has successfully completed the command.

CHECK CONDITION. Any error, exception, or abnormal condition resulting in sense data being set causes a CHECK CONDITION status. A Request Sense command should be issued following a CHECK CONDITION status to determine the nature of the condition.

BUSY. The medium changer device is busy and cannot accept a command.

RESERVATION CONFLICT. A command has been sent by an initiator to the medium changer device when it is already reserved by another initiator.

8. Recommended Command Timeouts

The following values are the recommended timeout values for host software to use when issuing commands the medium changer device. The actual command execution times depend upon the various mode settings in effect (see Section 10.7.1), the type of drives used, concurrent front panel operations, and the number of retries performed to successfully complete a command.

Suggested Timeout Values

SCSI Command	Timeout
Inquiry, Mode Select, Mode Sense, Prevent/Allow Medium Removal, Request Sense, Reserve Element, Release Element, Release Magazine, Read Element Status, Read Magazine Status, Test Unit Ready, Log Select, Log Sense, Write Buffer (mode 2), Read Buffer, Service Drive Pair, Restore Drive Pair	10 sec
Send Diagnostic, Position to Element, Move Medium, Exchange Medium, Rezero Unit (without RecalOffs bit set), Initialize Element Status (bar code reader disabled), Initialize Single Element, Swap Transport Assys, Write Buffer (mode 7)	5 min
Rezero Unit with RecalOffs bit set	10 min
Initialize Element Status (bar code reader enabled)	15 min

9. Special SCSI States/Conditions

9.1 Reset State

When the RST signal is asserted or a TARGET RESET message is received from the host, the medium changer device within the library system enters the RESET state. As a result, the following events will take place.

- All SCSI bus signals (except RST) will be released.
- All I/O processes (commands) will be terminated. The library system will be restored to the state it was in before the reset occurred.
- All device reservations will be released.
- All operating (Mode Select) modes will be restored to default or saved values.
- The library system will be reset to the Mailslot Allow and Magazine Allow states (see Prevent/Allow Medium Removal command).
- A Unit Attention condition will be generated.

Note that the medium changer device will itself never assert the RST signal.

9.2 Not Ready State

The medium changer device returns CHECK CONDITION status in response to Test Unit Ready command, or any cartridge movement commands, when it is in a state in which it is unable to process such commands. A subsequent Request Sense command issued to the medium changer device yields

return data containing a Sense Key of 2h - Not Ready. The device will remain in such a state for a specified period of time or until an action by an operator takes place.

The events triggering Not Ready state in the library system are as follows.

- Upon power-up. The medium changer device will be Not Ready while drive power is being restored and the library system is initializing.
- While the rear access door is opened. The medium changer device will be Not Ready until the access door is closed (A Unit Attention condition will be generated when the door is closed).
- Selecting 'Service Drives' via the front panel menus. The medium changer device will be Not Ready for 5 seconds after this option is selected to allow time for SCSI initiator devices to poll the changer device, sense the Not Ready state, and stop SCSI activity to the selected drives.
- If a pair of drives is turned off and placed in Service state because of a drive over-temperature or fan underspeed condition. After an appropriate delay to allow the drives to be unloaded, the medium changer device will be Not Ready for 5 seconds before the drives are turned off and placed in the Service state.
- Selecting 'Turning Drive Off' via the front panel menus. The medium changer device will be Not Ready for 5 seconds after this option is selected to allow time for SCSI initiator devices to poll the changer device, sense the Not Ready state, and stop SCSI activity to the drive being turned off.
- During automatic MTA switch-over. The medium changer device will be Not Ready while the library is switching to the alternate MTA.

9.3 Unit Attention Condition

The medium changer device returns CHECK CONDITION status in response to SCSI commands other than Inquiry when one or more conditions indicating a change in state of the library system has occurred. A subsequent Request Sense command issued to the medium changer device yields return data containing a Sense Key of 6h — Unit Attention. This does not indicate a problem with the particular command that was issued but rather a normal or abnormal change in the state of the library system. This change may signal a failure or require that a different sequence of commands be issued to the changer device. For instance, after the cartridge magazine is inserted, a sequence of Move Medium or Exchange Medium commands may be required to move all disks in the magazine to drives in order to read them. In some cases, no action is required at all, other than reissuing the original command.

The events triggering Unit Attention condition in the library system are as follows.

- The initial application of power to the library system or a bus or device reset.
- The insertion of the magazine - unless magazine operation is disabled or the medium changer device is in the Magazine Prevent state (in this case, the Unit Attention condition will be triggered on the command following the one which returns the medium changer device to the Magazine Allow state).
- The start or end of drive pair service via the front panel 'Service Drives' or 'Restore Drives' selections, or a Service Drive Pair or Restore Drive Pair command from a host.
- A change to one or more of the library system settings via the front panel 'Set Up Library', 'Turn Drive Off', or 'Turn Drive On' selections, or a Mode Select command from a host.
- A change to one or more of the log values via the front panel 'Set Up Library' selection or a Log Select command from a host.
- Closing the rear access door signalling a transition from a Not Ready to a Ready state. The host software should do a reinventory of the library because of possible tampering by the operator.

- The removal or insertion of a library power supply.
- The conclusion of an automatic MTA switch-over.
- A change in the library system Flash microcode via a Write Buffer command.

When a Unit Attention condition occurs as a result of an SCSI command issued by an initiator, it is only reported to other initiators on the same SCSI bus and not to the initiator which issued the command.

10. SCSI Commands

10.1 EXCHANGE MEDIUM Command

The **Exchange Medium** command instructs the medium changer device to exchange a cartridge in a source element with a cartridge in a first destination element and place that cartridge in a second destination element. Using this command instead of Move Medium can significantly decrease cartridge swap times.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (A6h)							
1	Reserved (00h)							
2 - 3	(MSB)	Transport Element Address						(LSB)
4 - 5	(MSB)	Source Element Address						(LSB)
6 - 7	(MSB)	First Destination Address						(LSB)
8 - 9	(MSB)	Second Destination Address						(LSB)
10	Reserved (0)						Inv2	Inv1
11	Reserved (00h)							

The cartridge in the source element is moved to the first destination element and the cartridge which previously occupied the first destination element is moved to the second destination element.

Transport Element Address specifies the medium transport element. For the most efficient operation, an address of zero should be used. This will allow the medium changer device to use both medium transport elements to accomplish the cartridge exchange in the least amount of time. A specific medium transport element may also be specified. In this case, however, the second destination element may not be the same as the source element

Source Element Address specifies the source element.

First Destination Address and **Second Destination Address** specify the two destination elements. The first is the destination of the cartridge originally in the Source Element Address. The second is the destination of the cartridge originally in the First Destination Address.

Inv1 and **Inv2** specify the medium should be inverted (“flipped”) prior to being deposited in First Destination Address and Second Destination Address, respectively.

10.2 INITIALIZE ELEMENT STATUS Command

The **Initialize Element Status** command is used to cause the medium changer device to test elements for the presence of media. The status of each element can then be read using the Read Element Status command.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (07h)							
1 - 4	Reserved (00h)							
5	TypeSel	Reserved (0)						

TypeSel selects the types of elements to test according to the following table.

0	test all elements
1	test all elements except data transfer elements (drives)
2	test all elements except storage elements (slots)
3	test all elements in slow-scan mode

Slow-scan mode means that the Library will pull each cartridge from slot into the picker so that the media type (MO or UDO) can be determined.

Note that the status of the drives may not be checked if both medium transport elements are full. Note that a newly installed magazine is automatically scanned for the presence of cartridges upon insertion, apart from this command.

10.3 INITIALIZE SINGLE ELEMENT Command

The **Initialize Single Element** command causes the medium changer device to test a single element for the presence of media. The status of the element can then be read using the Read Element Status command.

Bit	7	6	5	4	3	2	1	0
0	Operation Code (C7h)							
1	Reserved (00h)							
2 - 3	(MSB)			Element Address				(LSB)
4 - 5	Reserved (00h)							

See the conditions for checking elements in the description of the Initialize Element Status command.

10.4 INQUIRY Command

The **Inquiry** command is issued by the initiator to request medium changer device information.

Bit	7	6	5	4	3	2	1	0
0	Operation Code (12h)							
1	Reserved (0)							EVPD
2	Page Code							
3	Reserved (00h)							
4	Allocation Length							
5	Rsvd (0)	FullSN (1)	Reserved (0)					

EVPD (Enable Vital Product Data) equals 1 if the vital product data page as specified by the Page Code field is to be returned or zero if standard Inquiry data is to be returned.

Page Code defines the parameter page for vital product to be returned. A value of 00h, 80h, or C0h must be used. These pages are described following the standard Inquiry data format.

Allocation Length specifies how many bytes of data are to be returned.

FullSN equals 1 to return a full serial number in the Unit Serial Number page.

The following page details the standard Inquiry Data returned when the library is in STD-G Emulation Mode for an Allocation Length of 45.

STD-G Emulation Mode INQUIRY Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier (0)			Peripheral Device Type (08h)				
1	RMB (1)	Device-Type Qualifier (0)						
2	ISO Version (0)		ECMA Version (0)			ANSI-Approved Version (3)		
3	AERC (0)	Reserved (0)			Response Data Format (2)			
4	Additional Length (28h)							
5	Reserved (00h)							
6	Reserved (0)							Addr16 (1)
7	RelAdr (0)	Rsvd (0)	Wbus16 (1)	Sync (1)	Linked (0)	Rsvd (0)	CmdQue(0)	Rsvd (0)
8 – 15	Vendor Identification (“IDE ”)							
16 – 31	Product Identification (“MULTI ”)							
32 – 35	Product Revision Level (e.g., “350 ”)							
36 – 43	Manufacturer Id (“IDEMPLS.”)							
44	Model Identification (see table below)							

Peripheral Qualifier equals 0 indicating connection to a logical unit, or 3h indicating an invalid Logical Unit Number.

Peripheral Device Type equals 08h indicating a medium changer device, or 1Fh indicating an invalid Logical Unit Number.

RMB (Removable Media Bit) equals bit of 1 indicating medium is removable.

ANSI-Approved Version equals 3 indicating compliance with SCSI-3 standard.

AERC (Asynchronous Event Reporting Capability) equals 0 indicating no support of this feature.

Response Data Format equals 2 indicating compliance with SCSI-3 standard.

Additional Length equals 28h.

Addr16 (Address - 16 bits) equals 1 indicating support of 16-bit SCSI addresses.

RelAdr (Relative Address) equals 0 indicating no support of this feature.

WBus16 (Wide Bus - 16 bit) equals 1 indicating support of this feature.

Sync (Synchronous Data Transfers) equals 1 indicating support of this feature.

Linked (Linked Commands) equals 0 indicating no support of this feature.

CmdQue (Command Queueing) equals 0 indicating no support of this feature.

Vendor Identification is “IDE ”.

Product Identification is “MULTI ”.

Product Revision Level starts with “350 ” (3.50).

Model Identification is based on the following table:

Model	Model Identification
unknown	0
Model 64	1
Model 104	2
Model 164	3
Model 238	4
Model 438	5
Model 638	6

The following page details the standard Inquiry Data returned when the library is in G-Enterprise Mode for an Allocation Length of 45.

G-Enterprise Mode INQUIRY Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier (0)			Peripheral Device Type (08h)				
1	RMB (1)	Device-Type Qualifier (0)						
2	ISO Version (0)		ECMA Version (0)			ANSI-Approved Version (3)		
3	AERC (0)	Reserved (0)			Response Data Format (2)			
4	Additional Length (28h)							
5	Reserved (00h)							
6	Reserved (0)							Addr16 (1)
7	RelAdr (0)	Rsvd (0)	Wbus16 (1)	Sync (1)	Linked (0)	Rsvd (0)	CmdQue(0)	Rsvd (0)
8 – 15	Vendor Identification ("Plasmon ")							
16 – 31	Product Identification ("G-Enterprise ")							
32 – 35	Product Revision Level (e.g., "430 ")							
36 – 43	Manufacturer Id ("Plasmon")							
44	Model Identification (see table below)							

Peripheral Qualifier equals 0 indicating connection to a logical unit, or 3h indicating an invalid Logical Unit Number.

Peripheral Device Type equals 08h indicating a medium changer device, or 1Fh indicating an invalid Logical Unit Number.

RMB (Removable Media Bit) equals bit of 1 indicating medium is removable.

ANSI-Approved Version equals 3 indicating compliance with SCSI-3 standard.

AERC (Asynchronous Event Reporting Capability) equals 0 indicating no support of this feature.

Response Data Format equals 2 indicating compliance with SCSI-3 standard.

Additional Length equals 28h.

Addr16 (Address - 16 bits) equals 1 indicating support of 16-bit SCSI addresses.

RelAdr (Relative Address) equals 0 indicating no support of this feature.

WBus16 (Wide Bus - 16 bit) equals 1 indicating support of this feature.

Sync (Synchronous Data Transfers) equals 1 indicating support of this feature.

Linked (Linked Commands) equals 0 indicating no support of this feature.

CmdQue (Command Queueing) equals 0 indicating no support of this feature.

Vendor Identification is “Plasmon ”.

Product Identification is “G-Enterprise ”.

Product Revision Level starts with “430 ” (4.30).

Model Identification is based on the following table:

Model	Model Identification
unknown	00h
Model 64	6Eh
Model 104	6Fh
Model 164	70h
Model 238	71h
Model 438	72h
Model 638	73h

10.4.1 Supported Vital Product Data Pages Page (00h)

The Supported Vital Product Data Pages Page is as follows.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Peripheral Qualifier (0)			Peripheral Device Type (08h)				
1	Page Code (00h)							
2	Reserved (00h)							
3	Page Length (03h)							
4	1st Supported Page (00h)							
5	2nd Supported Page (80h)							
6	3rd Supported Page (C0h)							

10.4.2 Unit Serial Number Page (80h)

The Unit Serial Number Page is as follows.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Peripheral Qualifier (0)			Peripheral Device Type (08h)					
1	Page Code (80h)								
2	Reserved (00h)								
3	Page Length (14h)								
4 - 23	(MSB)			Product Serial Number					(LSB)

Product Serial Number is a twenty character ASCII representation of the library system's factory serial number. If the FullSN field is not set to 1 in the Inquiry command, then the page length is 6, only 10 bytes are returned, and the least significant digit of the serial number is in byte 9. Otherwise, the least significant digit is in byte 23. ASCII spaces (20h) will be prepended to the serial number in order to fill the field.

Peripheral Qualifier and Peripheral Device Type are as in the Standard Inquiry Data Format.

10.4.3 Additional Unit Information Page (C0h)

The Additional Unit Information Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0	
0	Peripheral Qualifier (0)			Peripheral Device Type (08h)					
1	Page Code (C0h)								
2	Reserved (00h)								
3	Page Length (30h)								
4	Firmware Development Level								
5	Hardware Development Level								
6	Reserved(0)	Number of Magazines	Number of Pass-Thru's		Red. MTA	BC Reader	Rsvd(0)		
7 - 8	(MSB)		Total Number of Storage Slots					(LSB)	
9	Maximum Number of Drives Supported								
10	Number of Last Library Column								
11	Number of Slots in Column 1								
12	Number of Slots in Column 2								
13	Number of Slots in Column 3								
14	Number of Slots in Column 4								
15	Number of Slots in Column 5								
16	Number of Slots in Column 6								
17	Number of Slots in Column 7								
18 - 27	Firmware Part Number ("755100-000")								
28 - 37	Reserved (00h)								
38 - 39	(MSB)		Firmware Checksum					(LSB)	
40 - 41	Reserved (00h)								
42 - 47	Library Electronic Signature								
48 - 51	Reserved (00h)								

Firmware Development Level equals one of the following.

Alpha	0
Beta	1
Release	2

Hardware Development Level equals one of the following.

Prototype	0
Pre-Production	1
Production	2

Number of Magazine equals the number of ten-slot magazines supported.

Number of Pass-Thru's equals the number of pass-through elements supported.

Red. MTA equals 1 if the redundant MTA option is supported.

BC Reader equals 1 if a bar code reader is installed.

Total Number of Storage Slots does not include the mailslot, the magazine slots, or the pass-through elements.

Number of Library Columns is the total number of columns of slots and drives present. Note that not all units have columns beginning with column 1. Some units begin with column 3. Drives are typically placed in column 4.

10.5 LOG SELECT Command

The **Log Select** command provides a means of clearing certain unit statistics, error statistics, and error log information, and setting the library system date and time.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Operation Code (4Ch)								
1	Reserved (0)						PCR (0)	SP (1)	
2	PC (1)		Reserved (0)						
3 - 6	Reserved (00h)								
7 - 8	(MSB)			Parameter List Length				(LSB)	
9	Reserved (00h)								

PCR (Parameter Code Reset) equals 0 indicating that not all log parameters are to be reset. Certain parameters, such as the total power-on hours count and library cycle count, cannot be reset.

SP (Save Parameters) equals 1 indicating that all parameter value changes are to be saved in non-volatile memory.

PC (Page Control) equals 1 indicating that current cumulative values are to be affected.

Parameter List Length specifies the length in bytes of the Log Select parameters list.

The Log Select parameter list consists of one or more of the following supported pages.

10.5.1 Unit Statistics Page (30h)

The Log Select Unit Statistics Page is as follows.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Reserved (0)		Page Code (30h)						
1	Reserved (00h)								
2 - 3	(MSB)			Page Length (2Ah)				(LSB)	
4 - 9	Reserved (00)								

Bit	7	6	5	4	3	2	1	0
10 - 12	(MSB)	Drive 1 Load Count						(LSB)
13 - 15	(MSB)	Drive 2 Load Count						(LSB)
16 - 18	(MSB)	Drive 3 Load Count						(LSB)
19 - 21	(MSB)	Drive 4 Load Count						(LSB)
22 - 24	(MSB)	Drive 5 Load Count						(LSB)
25 - 27	(MSB)	Drive 6 Load Count						(LSB)
28 - 30	(MSB)	Drive 7 Load Count						(LSB)
31 - 33	(MSB)	Drive 8 Load Count						(LSB)
34 - 36	(MSB)	Drive 9 Load Count						(LSB)
37 - 39	(MSB)	Drive 10 Load Count						(LSB)
40 - 42	(MSB)	Drive 11 Load Count						(LSB)
43 - 45	(MSB)	Drive 12 Load Count						(LSB)

If any of the **Drive 1-12 Load Count** fields is equal to zero, the load count of the corresponding drive will be set to zero.

10.5.2 Error Statistics Page (31h)

The Log Select Error Statistics Page is as follows.

Bit	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code (31h)					
1	Reserved (00h)							
2 - 3	(MSB)	Page Length (00h)						(LSB)

Sending this page will clear all library error statistics information.

10.5.3 Error Log Page (32h)

The Log Select Error Log Page is as follows.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Reserved (0)		Page Code (32h)						
1	Reserved (00h)								
2 - 3	(MSB)		Page Length (00h)						(LSB)

Sending this page will clear all library error log information.

10.5.4 Event History Page (33h)

The Log Select Event History Page is as follows.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Reserved		Page Code (33h)						
1	Reserved (00h)								
2 - 3	(MSB)		Page Length (02h)						(LSB)
4 - 5	(MSB)		Number of Events Recorded (00h)						(LSB)

Sending this page will clear all event history information.

10.5.5 Micro-Operation Page (34h)

The Log Select Micro-Operation Page is as follows.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Reserved		Page Code (34h)						
1	Reserved (00h)								
2 - 3	(MSB)		Page Length (01h)						(LSB)
4	Number of Micro-Operations Recorded (00h)								

Sending this page will clear all micro operation information.

10.5.6 Library Time Page (35h)

The Log Select Library Time Page is as follows.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Reserved (0)		Page Code (35h)					
1	Reserved (00h)							

Bit	7	6	5	4	3	2	1	0	
Byte									
2 - 3	(MSB) _____ Page Length (08h) _____ (LSB)								
4	Current Library Time - Seconds (0 - 59)								
5	Current Library Time - Minutes (0 - 59)								
6	Current Library Time - Hour (0 - 23)								
7	Reserved (ignored)								
8	Current Library Time - Day (1 - 31)								
9	Current Library Time - Month (1 - 12)								
10	Current Library Time - Year (0 for 2000, 1 for 2001, ...)								
11	Reserved (00h)								

Current Library Time is the current time as maintained by the library system. Sending this page sets the library system time clock.

10.6 LOG SENSE Command

The **Log Sense** command provides a means for reporting medium changer device statistical and error log information.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Operation Code (4Dh)								
1	Reserved (00h)								
2	PC (1)		Page Code						
3 - 6	Reserved (00h)								
7 - 8	(MSB) _____ Allocation Length _____ (LSB)								
9	Reserved (00h)								

PC (Page Control) equals 1 indicating that current cumulative values are to be returned.

Page Code defines the parameter page to be returned. A value of 00h, 30h, 31h, 32h, 33h, 34h, or 35h must be used. The corresponding page as described below is returned.

Allocation Length specifies how many bytes of data are to be returned.

10.6.1 Supported Log Pages Page (00h)

The Log Sense Supported Log Pages Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0	
0	Reserved (0)		Page Code (00h)						
1	Reserved (00h)								
2 - 3	(MSB)			Page Length (07h)					(LSB)
4	1st Supported Page (00h)								
5	2nd Supported Page (30h)								
6	3rd Supported Page (31h)								
7	4th Supported Page (32h)								
8	5th Supported Page (33h)								
9	6th Supported Page (34h)								
10	7th Supported Page (35h)								

10.6.2 Unit Statistics Page (30h)

The Log Sense Unit Statistics Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0	
0	Reserved (0)		Page Code (30h)						
1	Reserved (00h)								
2 - 3	(MSB)			Page Length (88h)					(LSB)
4 - 6	(MSB)			Library Power-On Hours					(LSB)
7 - 9	(MSB)			Library Cycle Count					(LSB)
10 - 12	(MSB)			Drive 1 Load Count					(LSB)
13 - 15	(MSB)			Drive 2 Load Count					(LSB)
16 - 18	(MSB)			Drive 3 Load Count					(LSB)
19 - 21	(MSB)			Drive 4 Load Count					(LSB)
22 - 24	(MSB)			Drive 5 Load Count					(LSB)
25 - 27	(MSB)			Drive 6 Load Count					(LSB)
28 - 30	(MSB)			Drive 7 Load Count					(LSB)
31 - 33	(MSB)			Drive 8 Load Count					(LSB)
34 - 36	(MSB)			Drive 9 Load Count					(LSB)
37 - 39	(MSB)			Drive 10 Load Count					(LSB)

Bit Byte	7	6	5	4	3	2	1	0
40 - 42	(MSB) Drive 11 Load Count (LSB)							
43 - 45	(MSB) Drive 12 Load Count (LSB)							
46	OverTemp	SCC Cable	IntlckCable	TermPwr	PivotCable	VPSE Cable	PSM Cable	DoorOpen
47	Reserved (0)		Drv 6 Disc	Drv 5 Disc	Drv 4 Disc	Drv 3 Disc	Drv 2 Disc	Drv 1 Disc
48	Reserved (0)		Drv 12 Disc	Drv 11 Disc	Drv 10 Disc	Drv 9 Disc	Drv 8 Disc	Drv 7 Disc
49	InitReqd	LastMT		MTASide	Alt MTA	Pwr Sup 3	Pwr Sup 2	Pwr Sup 1
50 - 53	(MSB) Cumulative Lift Movement Count (LSB)							
54 - 57	(MSB) Cumulative Picker Movement Count - Picker 1 (LSB)							
58 - 61	(MSB) Cumulative Picker Movement Count - Picker 2 (LSB)							
62 - 65	(MSB) Cumulative Change of Picker in Use Count (LSB)							
66 - 69	(MSB) Cumulative Pivot Movement Count (LSB)							
70 - 73	(MSB) Cumulative Mailslot Open Count (LSB)							
74 - 77	(MSB) Cumulative Flip Count (LSB)							
78 - 81	(MSB) Cumulative Lift Up/Down Distance Count (LSB)							
82 - 85	(MSB) Cumulative Picker In/Out Distance Count (LSB)							
86 - 89	(MSB) Cumulative Pivot Left/Right Rotation Count (LSB)							
90 - 93	Reserved (00h)							
94	Library Power-On Minutes							
95	Library Power-On Seconds							
96 - 99	Reserved (00h)							
100 - 103	(MSB) Cumulative Magazine Release Count (LSB)							
104 - 107	Reserved (00h)							
108 - 111	(MSB) Cumulative Lift Movement Count - Alt MTA (LSB)							
112 - 115	(MSB) Cumulative Picker Movement Count - Alt MTA Picker 1 (LSB)							
116 - 119	(MSB) Cumulative Picker Movement Count - Alt MTA Picker 2 (LSB)							
120 - 123	(MSB) Cumulative Change of Picker in Use Count - Alt MTA (LSB)							
124 - 127	(MSB) Cumulative Lift Up/Down Distance Count - Alt MTA (LSB)							
128 - 131	(MSB) Cumulative Picker In/Out Distance Count - Alt MTA (LSB)							
132 - 135	(MSB) Cumulative Pass-Through 1 Count (LSB)							

Bit	7	6	5	4	3	2	1	0	
Byte									
136 - 139	(MSB)	Cumulative Pass-Through 2 Count						(LSB)	

Library Power-On Hours equals the total number of hours that power has been applied to the library.

Library Cycle Count equals the total number of times that a cartridge has been loaded into any of the drives in the library - even if those drives were later removed or replaced.

Drive 1-6 Load Count equals the number of times the corresponding drive has been loaded.

OverTemp equals 1 if the cabinet is above safe operating temperature for drive operation.

SSC Cable equals 1 if the SCSI converter control interface cable (CJ12) is not properly connected.

IntlckCable equals 1 if the interlock interface cable (CJ7) is not properly connected.

TermPwr equals 1 if the SCSI bus terminator power is low.

PivotCable equals 1 if the pivot / lift / MTA interface cable (CJ4) is not properly connected.

VPSE Cable equals 1 if the VP sensor encoder interface cable (CJ5) is not properly connected..

PSM Cable equals 1 if the power supply monitor cable (CJ10) is not properly connected.

DoorOpen equals 1 if the library system rear access door is open.

Drv 1-12 equals 1 if the interface cable to the corresponding drive is not properly connected.

InitReqd equal 1 if the next SCSI command using the library's robotics will cause the library to initialize itself before performing the command. This is usually the case after a hardware error in which the library is unable to return cartridges to their source locations and restore itself to its original state.

LastMT contains the number of the last medium transport element used - 1 or 2.

MTA Side contains the side of the MTA currently up - 0 or 1.

Alt MTA equals 1 if the alternate MTA is in use.

Pwr Sup 1-3 equals 1 if the corresponding power supply voltage is bad or the power supply fan is not functioning properly.

The **Cumulative Lift Movement Count** is incremented every time the medium transport element is moved vertically (up or down).

The **Cumulative Picker Movement Counts - Pickers 1, 2** are incremented every time the corresponding medium transport element is moved horizontally (in or out).

The **Cumulative Change of Picker in Use Count** is incremented every time the picker in use is changed. An Exchange Medium command, for example, typically requires three changes of picker.

The **Cumulative Pivot Movement Count** is incremented every time the lift assembly is pivoted to reach another column of slots or drives, or the mailslot.

The **Cumulative Mailslot Open Count** is incremented every time the mailslot is opened.

The **Cumulative Flip Count** is incremented every time a cartridge is inverted ("flipped").

The **Cumulative Lift Up/Down Distance Count** is incremented by the distance traveled every time the medium transport element is moved vertically (up or down). The count is in units of meters.

The **Cumulative Picker In/Out Distance Count** is incremented by the distance traveled every time either medium transport element is moved horizontally (in or out). The count is in units of meters.

The **Cumulative Pivot Left/Right Rotation Count** is incremented by the angular distance traveled every time the medium transport element is rotated (left or right). The count is in units of radians.

Library Power-On Minutes equals the total number of minutes (after subtracting the total number of hours) that power has been applied to the library.

Library Power-On Seconds equals the total number of seconds (after subtracting the total number of hours and minutes) that power has been applied to the library.

The **Cumulative Magazine Release Count** is incremented every time the magazine release solenoid is activated.

The **Cumulative Lift Movement Count – Alt MTA** is incremented every time the alternate medium transport element is moved vertically (up or down).

The **Cumulative Picker Movement Counts - Alt MTA Pickers 1,2** are incremented every time the corresponding alternate medium transport element is moved horizontally (in or out).

The **Cumulative Change of Picker in Use Count – Alt MTA** is incremented every time the picker in use in the alternate medium transport element is changed. An Exchange Medium command, for example, typically requires three changes of picker.

The **Cumulative Lift Up/Down Distance Count – Alt MTA** is incremented by the distance traveled every time the alternate medium transport element is moved vertically (up or down). The count is in units of meters.

The **Cumulative Picker In/Out Distance Count – Alt MTA** is incremented by the distance traveled every time either alternate picker in the alternate medium transport element is moved (in or out). The count is in units of meters.

The **Cumulative Pass-Through 1, 2 Count** is incremented every time the corresponding pass-through mechanism is used.

See the G Series User Manual for further information about these values.

10.6.3 Error Statistics Page (31h)

The Log Sense Error Statistics Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code (31h)					
1	Reserved (00h)							
2 - 3	(MSB)		Page Length (64h)				(LSB)	
4 - 13	First Most Frequent Error Info							
14 - 23	Second Most Frequent Error Info							
	:							
94 - 103	Tenth Most Frequent Error Info							

Each set of most frequent error parameters contains error rate information for one of the most frequently occurring errors. The format of these error parameters is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	Error Code							
1 - 2	(MSB)		Error Count				(LSB)	
3 - 4	(MSB)		Number of Recoverable Errors				(LSB)	
5 - 6	(MSB)		Number of Unrecoverable Errors				(LSB)	
7 - 9	(MSB)		Power-On Hours at Last Occurrence				(LSB)	

Error Code is a code for the error which occurred. The error codes are listed in Section 12.2. Only hardware errors are recorded.

Error Count is a count of the number of times that the error occurred. A value of 65535 indicates that the error occurred this many or more times.

Number of Recovered Errors is a count of the number of times that the library system was able to recover from this error - that is, the number of times that it returned Sense Key 1 Recovered Error status to the host in response to a Request Sense command issued after this error was generated; or that it was able to successfully complete the operation in progress when this error was generated in maintenance or setup modes.

Number of Unrecovered Errors is a count of the number of times that the library system was unable to recover from this error even after performing retries.

Power-On Hours at Last Occurrence is equal to the number of library system power-on hours when this error last occurred.

10.6.4 Error Log Page (32h)

The Log Sense Error Log Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0	
0	Reserved (0)		Page Code (32h)						
1	Reserved (00h)								
2 - 3	(MSB) _____			Page Length (1D0h)					_____ (LSB)
4 - 19	First Most Recent Error Info Block A								
20 - 35	Second Most Recent Error Info Block A								
	:								
148 - 163	Tenth Most Recent Error Info Block A								
164 - 165	Reserved (00h)								
166 - 195	First Most Recent Error Info Block B								
196 - 225	Second Most Recent Error Info Block B								
	:								
436 - 465	Tenth Most Recent Error Info Block B								
466 - 467	Reserved (00h)								

There are two blocks of error information – block A and block B – for each of the ten most recent errors.

The format of block A is as follows.

Bit Byte	7	6	5	4	3	2	1	0	
0	Error Code								
1	Initiating Command								
2 - 3	(MSB) _____			Source Element Address					_____ (LSB)
4 - 5	(MSB) _____			Destination Element Address					_____ (LSB)
6	Reserved (0)		Error Type B		MT Number		Invert		
7 - 8	(MSB) _____			Failure Element Address					_____ (LSB)
9 - 10	(MSB) _____			Recurrence Count					_____ (LSB)
11 - 13	(MSB) _____			Power-On Hours at First Occurrence					_____ (LSB)
14	Component Number B								
15	Error Subcode B								

Error Code is a code for the error that occurred. The error codes are listed in Section 12.3. Only hardware errors are recorded.

Initiating Command is the operation code of the SCSI command that initiated the operation or a value from the following table.

Command	Meaning
0 - F7h	Operation code of initiating SCSI command
F8h	Error occurred during library and drive power-up
F9h	Error occurred during on-line library initialization
FAh	Error occurred while performing some operator-initiated action (such as opening or closing the mailslot from the front panel)
FBh	Error occurred during routine sensor and cable checks
FCh	Error occurred during some remotely initiated operation
FDh	Error occurred while performing some on-line menu operation
FEh	Error occurred while in library set up mode
FFh	Error occurred while in library maintenance mode

Source Element Address and **Destination Element Address** are the source and destination addresses for the Position to Element, Move Medium, and Exchange Medium commands. For the Exchange Medium command, these represent either the Source and First Destination Addresses, the First and Second Destination Address or some other intermediate addresses.

Error Type B will contain a copy of the Error Type field in error information block B below if the LogInfo bit is set in the Mode Select library special modes page (Section 10.7.2). This field is provided here for compatibility with previous Plasmon libraries.

MT Number is the number of the medium transport element (1 or 2) in use when the error occurred.

Invert equals 1 for the Move Medium and Exchange Medium commands if the medium was to be inverted (“flipped”) prior to being deposited in the destination element.

Failure Element Address is the address of the closest element to which the medium transport element specified by the Medium Transport Element Number was positioned when the error occurred.

Recurrence Count is a count of the number of consecutive times that the error occurred, including retries, with all other information being identical between instances. The total of these identical instances is recorded as one log entry.

Power-On Hours at First Occurrence is equal to the number of library system power-on hours when this error first occurred (recurrence count = 1).

Component Number B and **Error Subcode B** contains a copy of the Component Number and Error Subcode fields in error information block B below if the LogInfo bit is set in the Mode Select library special modes page (Section 10.7.2). These fields are provided here for compatibility with previous Plasmon libraries.

The format of block B is as follows.

Bit	7	6	5	4	3	2	1	0
0	Component Number							
1	Error Subcode							
2	Error Type							
3	Error Context							
4 - 5	Internal Error Location							
6 - 7	Reserved (0)							
8	Lift Elevation State							
9 - 12	(MSB)	Lift Offset						(LSB)
13 - 14	(MSB)	Picker Step Count						(LSB)
15 - 16	(MSB)	Pivot Offset						(LSB)
17	Reserved (0)						MTA	MTA Side
18 - 19	(MSB)	Flip Offset						(LSB)
20 - 21	(MSB)	Mailslot or Pass-thru Step Count						(LSB)
22	Time at First Occurrence – Year (0 for 2000, 1 for 2001, ...)							
23	Time at First Occurrence – Month (1 - 12)							
24	Time at First Occurrence – Day (1 - 31)							
25	Time at First Occurrence – Hour (0 - 23)							
26	Time at First Occurrence – Minutes (0 - 59)							
27	Time at First Occurrence – Seconds (0 - 59)							
28 - 30	(MSB)	Library Cycle Count at First Occurrence						(LSB)
31	Reserved (00h)							

Error Type indicates the general type of error and the interpretation of the **Component Number** and **Error Subcode** fields. The relationship between Error Type and Component Number is shown in the following table. The Error Subcodes are listed in the G Series User Manual.

Error Type	Meaning of Error Type	Component Number
1	General hardware errors	Not used
2	Errors associated with a specific element position	Picker number
3	Errors associated with a specific library system column	Column number
4	Errors associated with a specific library system drive	Drive number
6	Errors associated with a specific power supply	Power supply number
7	Errors associated with a specific drive module	Drive module number
8	Errors associated with the magazine	Not used
9	Errors associated with a specific printed wire assembly	PWA number

Error Context is a code for the context in which the error occurred. The error context codes are listed in Section 12.4.

Lift Elevation State is the current state of the lift's elevation for performing various library operations. The lift elevation states are as follows.

State	Meaning
0	Lift at elevation at which to pick a cartridge from a slot
1	Lift at elevation at which to store a cartridge to a slot
2	Lift at elevation at which to load a cartridge into a drive
3	Lift at elevation at which to unload a cartridge from a drive
FFh	Lift at indeterminate elevation

Lift Offset is a signed lift encoder count offset from the count associated with the Failure Element Address in block A at the Lift Elevation State above.

Internal Error Location is a number which is useful to Plasmon technical support.

Picker Step Count is a signed motor step count for the active picker when the error occurred.

Pivot Offset is a signed pivot step count offset from the count associated with the Failure Element Address in block A.

MTA is the MTA (0 or 1) in effect when the error occurred. MTA 0 is the primary MTA, MTA 1 is the alternate MTA.

MTA Side is the MTA side (0 or 1) up when the error occurred.

Flip Offset is a signed flip step count offset from the Failure MTA Side flip step count.

Mailslot or Pass-Thru Step Count is a signed motor step count for the mailslot or a pass-thru element, depending upon the failing element.

Time at First Occurrence is equal to the library time (see Library Time page) when this error first occurred (recurrence count = 1).

10.6.5 Event History Page (33h)

The Log Sense Event History Page is as follows.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Reserved (0)			Page Code (33h)					
1	Reserved (00h)								
2 - 3	(MSB)			Page Length (0802h)					(LSB)
4 - 5	(MSB)			Number of Events Recorded					(LSB)
6 - 2053	Event List								

Number of Events Recorded is the number of significant bytes in the Event List.

Event List is a list of events from most recent to least recent within the library system. The contents of this list is determined by the Event History Type field of the Vendor Unique Modes Parameters Page of the Mode Select command (see Section 10.7.1). For a description of possible events within this list see Section 11. This list may be helpful to technical support personnel in diagnosing problems with the library system.

10.6.6 Micro-Operation Page (34h)

The Log Sense Micro-Operation Page is as follows.

Bit	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code (34h)					
1	Reserved (00h)							
2 - 3	(MSB)		Page Length (x-3)				(LSB)	
4	Number of Micro-Operations Recorded							
5	Size of Block for Each Micro-Operation							
6 - x	Micro-Operation List							

Number of Micro-Operations Recorded is the number of blocks of information recorded in the micro-operation list.

Size of Block for Each Micro-Operation is the size of each block of information in the micro-operation list.

Micro-Operation List is a list of operations performed by the library system for the last failing cartridge movement command. This list may be helpful to technical support personnel in diagnosing problems with the library system.

10.6.7 Library Time Page (35h)

The Log Sense Library Time Page is as follows.

Bit	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code (35h)					
1	Reserved (00h)							
2 - 3	(MSB)		Page Length (08h)				(LSB)	
4	Current Library Time - Seconds (0 - 59)							
5	Current Library Time - Minutes (0 - 59)							
6	Current Library Time - Hour (0 - 23)							
7	Current Library Time - Day of Week (1=Sunday, 2=Monday, ...)							
8	Current Library Time - Day (1 - 31)							
9	Current Library Time - Month (1 - 12)							
10	Current Library Time - Year (0 for 2000, 1 for 2001, ...)							
11	Reserved (00h)							

Current Library Time is the current time as maintained by the library system. The time may be set using the Log Select command.

10.7 MODE SELECT (6) Command

The **Mode Select (6)** command provides a means for the initiator to select medium changer device parameters.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (15h)							
1	Reserved (0)			PF (1)	Reserved (0)			SP
2-3	Reserved (00h)							
4	Parameter List Length							
5	Reserved (00h)							

PF (Page Format) equals 1 indicating that parameters are structured as pages of related parameters.

SP (Save Pages) equals 1 if the target is to save changeable parameters in pages, i.e., if values are to be saved to non-volatile memory. If this bit is 0, values are not saved when power is cycled to the library or when it receives a Bus Device Reset message or the SCSI Reset line is asserted.

Parameter List Length specifies the length in bytes of the Mode Select (6) parameter list.

The Mode Select (6) parameter list consists of a 4 byte header followed by one or more of the medium changer device's supported pages. The header is shown below followed by the supported pages.

Mode Select (6) Mode Parameter Header

Bit Byte	7	6	5	4	3	2	1	0
0	Mode Data Length (00h)							
1	Medium Type (00h)							
2	Device-Specific Parameter (00h)							
3	Block Descriptor Length (00h)							

10.7.1 Library Mode Parameters Page (20h)

The Mode Select Library Mode Parameters Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code (20h)					
1	Parameter Length (08h)							
2	ReportRec	Rsvd (0)	LimitRec	ChgrEject	Rsvd (0)	WaitLoad	Rsvd (0)	Park
3	Reserved (0)			SetDr1-6	Loaded	Drive Number		
4	SetNBus	Reserved (0)		SetDr7-12	Rsvd (0)	Number of Buses		
5	Reserved (00h)							
6	SetDrOpt	Reserved (0)				DASDIrq	FVerOnWr	WrCaEnab
7	Reserved (00h)							
8	SetType	Event History Type (bits 8 - 11)				Reserved (0)		
9	Event History Type (bits 0 - 7)							

ReportRec equals 1 if the medium changer device is to return CHECK CONDITION status and set Request Sense data for all recoverable hardware errors, or 0 if the device is to return GOOD status for all recoverable hardware errors. If this bit is set and a recoverable error occurs on a subsequent command, then the Request Sense sense key will be set to RECOVERED ERROR and the ASC and ASCQ fields will be set accordingly. The default for this bit is 0.

LimitRec equals 1 if the medium changer device is to limit the extent of the error recovery that it will perform. Setting this bit will prevent the changer from performing any transfers on a cartridge that cannot be moved to a destination element or returned to its original source element. Rather than placing the cartridge in its original storage element, it will be left in a medium transport element. The host software is then responsible for moving the cartridge from the medium transport element. Setting this bit also prevents the Rezero Unit command from unloading all drives. The default for this bit is 0.

ChgrEject equals 1 if the medium changer device is to eject a cartridge from a drive in response to a Move Medium or Exchange Medium command with the drive specified as the Source Element, or (First) Destination Element for an Exchange Medium command. If this bit is not set then the host software is responsible for ejecting the cartridge from the optical drive before the Move Medium or Exchange Medium command is issued. Setting this bit will also cause the Rezero Unit command to unload all drives before moving the changer device to its home position, unless the LmtErrRec bit is set as described above. The default for this bit is 1.

WaitLoad equals 1 if the medium changer device is to wait for a Ready response from an optical drive in response to a Move Medium or Exchange Medium command with the drive specified as the Destination Element (or Second Destination). Command completion status is not returned to the host until the host is ready, or 35 seconds have elapsed. After 35 seconds, drive power is cycled in an attempt to reseal the cartridge. If this bit is not set then the host is responsible for waiting until the cartridge is spun up and ready. The default for this bit is 0.

Park equals 1 if the Media Transport Element is to be moved to its park position on the next Rezero Unit command issued. This is required in preparation for shipment of the system. The Park field in the in the Rezero Unit command can also be used for this purpose. The default for this bit is 0.

SetDr1-6 and **SetDr7-12** equal 1 if an optical drive is to be set to the loaded or unloaded state in the medium changer device's non-volatile memory. Use SetDr1-6 for drives 1 to 6 and SetDr7-12 for drives 7 to 12. Setting these bits is generally unnecessary as non-volatile memory is updated automatically whenever a drive is loaded or unloaded. The Initialize Element Status command can also be used to update the empty/full status of the optical drives.

Loaded equals 1 if the corresponding optical drives are to be set to the loaded state or 0 if they are to be set to the unloaded state. The SetDrive bit must also be set.

Drive Number is a code for the number of the drive to be set to the loaded or unloaded state. For drives 1 to 6, set SetDr1-6 above and use the values 1 to 6 in this field. For drives 7 to 12, set SetDr7-12 above and use the values 1 to 6 in this field (1 for drive 7, 2 for drive 8, etc.)

SetNBus equals 1 if the Number of Buses is to be set or 0 if it is to remain unchanged.

Number of Buses specifies the number of SCSI buses for which the library system is to be configured. The following values may be used: 1, 2, or 3. This setting effects the Mode Sense Drive Layout Page and the NotBus bit in the Read Element Status data transfer element descriptors. Changing the number of buses also causes the drive SCSI addresses to change to their default values. See the table in Section 5 for a summary of which drives are on which SCSI bus and the default SCSI ID for each drive. The default for this value is 1.

SetDrOpt equals 1 if any of the drive options in byte 6 are to be changed or 0 if they are to remain unchanged.

DASDIrq equals a bit of one if all library system drives are to identify themselves as Direct-Access Storage Devices (hard drives) in response to an Inquiry command, or a bit of zero if they are to identify themselves as optical drives. Some operating systems, such as UNIX, may require that the drives identify themselves as DASD devices. The default for this bit is zero.

FVerOnWr equals 1 if Force Verify on Write line on all library system drives is to be made active, or 0 if it is to be made inactive. Note that all drives will have to be powered off and then back up before any changes to this option take effect. This can be done by turning the library off and on again or via the Mode Select Drive Assignments Page (see Section 10.7.3). The default for this bit is 1.

WrCaEnab equals 1 if Write Cache Enable line on all library system drives is to be made active, or 0 if it is to be made inactive. Note that all drives will have to be powered off and then back up before any changes to this option take effect. This can be done by turning the library off and on again or via the Mode Select Drive Assignments Page (see Section 10.7.3). The default for this bit is 0.

SetType equals 1 if the Event History Type is to be set or 0 if it is to remain unchanged.

Event History Type (bits 0-7, 8-11) specifies the type of event history to collect for diagnostic purposes (see Section 11). No history information will be collected for a value of 0. For a further description of this byte see Section 11. The default for this byte is 0BBh (187).

10.7.2 Library Special Modes Page (21h)

The Mode Select Library Special Modes Page is as follows.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Reserved (0)		Page Code (21h)					
1	Parameter Length (08h)							
2	LightOff	Reserved (0)				NoScanST	NoScanDT	
3	SetOptions3	Rsvd (0)	LogInfo	Reserved (0)			OpnExport	NoPwrCyc
4	SetOptions4	Rsvd(0)	Mixed Media	EnabMag	EnabMslot	EnabBCR	EnabAMS	Rsvd (0)
5	SetEmul	Library Emulation Code						
6	SetAddr	Element Addressing Scheme						
7	SetBCType	Bar Code Type						
8	SetOptions8	Reserved (0)						EnabAllUA
9	Reserved (00h)							

LightOff equals 1 if the medium changer device is to leave its front panel ACTIVE light off for future SCSI bus activity. This is useful for element status polling. The ACTIVE light will remain enabled for any motor activity regardless of the setting of this bit. A 0 in this field reenables the ACTIVE light for SCSI bus activity.

NoScanST and **NoScanDT** are provided for compatibility with the Plasmon M-Series. These should be set to 0.

SetOptions3 equals 1 if any of the options in byte 3 are to be changed, or 0 if they are to remain unchanged.

LogInfo is provided for compatibility with the Plasmon M-Series.

OpnExport equals 1 if the mailslot is to be opened when a cartridge is moved to it, or 0 if the mailslot is to remain closed. The SetOptions bit must also be set for this bit to be effective. The default for this bit is 1.

NoPwrCyc equals 1 if the AC power to the optical drives is not to be cycled as part of the normal error recovery procedure or 0 if the AC power is to be cycled. The SetOptions bit must also be set for this bit to be effective. The default for this bit is 1.

SetOptions4 equals 1 if any of the options in byte 4 are to be changed, or 0 if they are to remain unchanged.

Mixed Media equals 1 if the Library contains MO and UDO media, 0 if all media in the Library is the exact same type.

EnabMag equals 1 if the magazine is to be enabled. The default for this bit is 0. This field cannot be changed for the Model 64 and 104 library systems since they do not have a magazine.

EnabMslot equals 1 if the mailslot is to be enabled. The default for this bit is 1.

EnabBCR equals 1 if the bar code reader is to be enabled. The default for this bit is 1.

EnabAMS equals 1 if automatic MTA switch-over (from the normal MTA to the redundant MTA) is to be enabled. The default for this bit is 0.

SetEmul equals 1 if the Library Emulation Code is to be changed.

Library Emulation Code selects the type of library system (if any) that the library system is to emulate according to the following table. Note that the SetEmul bit must also be set for this change to be effective. Also, unless the SetAddr bit is set, changing the library emulation code may also change the element addressing scheme in the following manner: if the library emulation code is set to 1, the element addressing scheme will be set to 1.

0	No emulation - commands and parameters are as specified in this specification.
1	Hard M-Series emulation - refer to appropriate Plasmon M-Series SCSI Interface specification.

More information about Hard M-Series emulation mode can be found in the developer notes at the end of this manual.

Note: Changing the library emulation code causes the library to respond to subsequent commands (including Mode Select) in a manner possibly inconsistent with this specification. To restore the no emulation setting it may be necessary to use the library's front panel interface.

SetAddr equals 1 if the Element Addressing Scheme is to be changed.

Element Addressing Scheme is set according to the table in Section 6. Note that the SetAddr bit must also be set for this change to be effective. If the SetAddr bit is not set but the SetEmul bit is set, the element addressing scheme could change as described in Library Emulation Code above.

SetBCType equals 1 if the bar code type is to be changed, or 0 if it is to remain unchanged.

Bar Code Type specifies the type of bar code labels used in the library. The default for this field is 2.

1	Single, Centered
2	Double, Biased – side differentiated by first character of bar code
3	Double, Biased – side differentiated by last character of bar code

SetOptions8 equals 1 if any of the options in byte 8 are to be changed, or 0 if they are to remain unchanged.

EnabAllUA equals 1 if all Unit Attention conditions are to be enabled. If this bit is 0, only three Unit Attention conditions will be returned: Power-On, Reset, Bus Device Reset; Log Parameters Changed; and Mode Parameters Changed. The default for this bit is 1.

10.7.3 Drive Assignments Page (22h)

The Mode Select Drive Assignments Page is as follows.

Bit	7	6	5	4	3	2	1	0
Byte	Reserved (0)			Page Code (22h)				
1	Parameter Length (1Ah)							

Bit Byte	7	6	5	4	3	2	1	0
2	Drive 1 On-Line							
3	Drive 1 SCSI ID							
4	Drive 2 On-Line							
5	Drive 2 SCSI ID							
6	Drive 3 On-Line							
7	Drive 3 SCSI ID							
8	Drive 4 On-Line							
9	Drive 4 SCSI ID							
10	Drive 5 On-Line							
11	Drive 5 SCSI ID							
12	Drive 6 On-Line							
13	Drive 6 SCSI ID							
14	Drive 7 On-Line							
15	Drive 7 SCSI ID							
16	Drive 8 On-Line							
17	Drive 8 SCSI ID							
18	Drive 9 On-Line							
19	Drive 9 SCSI ID							
20	Drive 10 On-Line							
21	Drive 10 SCSI ID							
22	Drive 11 On-Line							
23	Drive 11 SCSI ID							
24	Drive 12 On-Line							
25	Drive 12 SCSI ID							
26 - 27	Reserved (00h)							

Drive 1-12 On-Line are the on-line designators for the drives in the library system. If set to zero, the corresponding drive will be powered off and considered off-line. If set to a non-zero value, the corresponding drive will be powered on and considered on-line. This provides a means of taking malfunctioning drives off-line and reinstating them to on-line status, if so desired. If a drive is to be disconnected for replacement (hot-swapped), the other drive of the drive pair should also be powered off. Any attempt to position to an off-line drive will be considered an error.

Drive 1-12 SCSI ID are the SCSI ID's of the optical drives in the library system. Changing these values changes the address of the drives on the SCSI bus on which they are located. The drives corresponding to the altered SCSI ID's will be automatically powered off and back up again to effect the change of address. SCSI ID's should be unique for drives on the same SCSI bus. The SCSI ID field is only used if the drive is on-line (powered on).

10.7.4 Front Panel Display Mode Page (23h)

The Mode Select Front Panel Display Mode Page is as follows.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Reserved (0)		Page Code (23h)					
1	Parameter Length (52h)							
2	Tone	LightOff	Section1	Reserved (0)			ClrKeys	DispMode
3 - 22	Line 3 Display Text							
23 - 42	Line 4 Display Text							
43	Blink	Rsvd (0)	Section2	Reserved (0)				
44 - 63	Line 1 Display Text							
64 - 83	Line 2 Display Text							

Tone equals 1 if a short alert tone is to be sounded within the library system. This bit is only effective if DispMode is set to 1 and Section1 is set to 0.

LightOff equals 1 if the front panel ACTIVE light is to be left in the off state for SCSI bus activity while the DispMode bit is set. This is useful for element status and key polling.

Section1, Section2 indicates equals the section of the display to control if DispMode equals 1.

Section1	Section2	Section to Control
0	0	Entire four lines of display including keypad
0	1	Lines 3 and 4 including keypad
1	0	Lines 1 and 2 (display only - no keypad polling)
1	1	Reserved

ClrKeys equals 1 to clear all front panel key flags in preparation for subsequent key polling with the Mode Sense command. This bit is only effective if DispMode is set to 1 and Section1 is set to 0.

DispMode equals 1 to gain and maintain control a section of the library system front panel display or 0 to release control. DispMode will not be effective while the on-line menu is selected at the library front panel interface (see the MenuSeld bit in the Mode Sense front panel display mode page - Section 10.9.7).

Blink equals 1 if the backlight on the display is to repeatedly blink on and off. This can be used to give visual indication of an error or service required condition. This bit is only effective if DispMode is set to 1.

Line 1-4 Display Text is the ASCII representation of text to be displayed on the corresponding line of the library system front panel display.

In addition to the ASCII characters 20h (‘ ’) through 7Dh (‘}’), the following characters are available: FEh=‘[’, 01h=‘]’, 02h=‘⌘’, 04h=‘⌘’, 05h=‘□’, 06h=‘⌘’, 07h=‘⌘’, 7Eh=‘⌘’, and 7Fh=‘⌘’, and A5h=‘▪’.

10.8 MODE SELECT (10) Command

The **Mode Select (10)** command provides a means for the initiator to select medium changer device parameters. It performs the same function as the Mode Select (6) command.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (55h)							
1	Reserved (0)			PF (1)	Reserved (0)			SP
2 - 6	Reserved (00h)							
7 - 8	(MSB)			Parameter List Length				(LSB)
9	Reserved (00h)							

PF (Page Format) equals 1 indicating that parameters are structured as pages of related parameters.

SP (Save Pages) equals 1 if the target is to save changeable parameters in pages.

Parameter List Length specifies the length in bytes of the Mode Select (10) parameter list.

The Mode Select (10) parameter list consists of a 8 byte header followed by one or more of the medium changer device's supported pages. The header is shown below.

Mode Select (10) Mode Parameter Header

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	Mode Data Length (00h)							
2	Medium Type (00h)							
3	Device-Specific Parameter (00h)							
4 - 5	Reserved (00h)							
6 - 7	Block Descriptor Length (00h)							

See the Mode Select (6) command (Section 10.7) for information about supported mode pages.

10.9 MODE SENSE (6) Command

The **Mode Sense (6)** command provides a means for reporting medium changer device to an initiator.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (1Ah)							
1	Reserved (00h)							
2	PC			Page Code				
3	Reserved (00h)							
4	Allocation Length							
5	Reserved (00h)							

DBD (Disable Block Descriptor) is ignored.

PC (Page Control) defines the type of parameter values to be returned. Normally, a value of 0 is used to return the current values.

Page Code defines the parameter page(s) to be returned. A value of 00h, 1Dh, 1Eh, 1Fh, 20h, 21h, 22h, 23h, 24h, or 3Fh must be used. If a value of 0 is used, no pages are returned. If a value of 1Dh, 1Eh, 1Fh, 20h, 21h, 22h, 23h, or 24h is used, the corresponding page as described below is returned. If a value of 3Fh is used, all supported pages are returned.

The **Allocation Length** specifies how many bytes of data are to be returned.

The Mode Sense (6) data block consists of a 4 byte header followed by one or more supported pages. The header is shown below followed by the supported pages.

Mode Sense (6) Mode Parameter Header

Bit Byte	7	6	5	4	3	2	1	0
0	Mode Data Length							
1	Medium Type (00h)							
2	Device-Specific Parameter (00h)							
3	Block Descriptor Length (00h)							

Mode Data Length is the length in bytes of the remainder of the Mode Sense (6) return data.

10.9.1 Element Address Assignment Page (1Dh)

The Mode Sense Element Address Assignment Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	PS (0)	Rsvd (0)	Page Code (1Dh)					
1	Parameter Length (12h)							
2 - 3	(MSB)	First Medium Transport Element Address						(LSB)
4 - 5	(MSB)	Number of Medium Transport Elements						(LSB)
6 - 7	(MSB)	First Storage Element Address						(LSB)
8 - 9	(MSB)	Number of Storage Elements						(LSB)
10 - 11	(MSB)	First Import/Export Element Address						(LSB)
12 - 13	(MSB)	Number of Import/Export Elements						(LSB)
14 - 15	(MSB)	First Data Transfer Address						(LSB)
16 - 17	(MSB)	Number of Data Transfer Elements						(LSB)
18 - 19	Reserved (00h)							

See the tables in Section 6 for the element addresses and counts returned in this page. It should be noted that the number of data transfer elements is the maximum number of drives the library supports. Examine the IDValid bit or the ASC/ASCQ values in the Read Element Status data transfer element descriptors (see Section 10.16.4) to determine if specific drives are present and turned on.

10.9.2 Transport Geometry Parameters Page (1Eh)

The Mode Sense Transport Geometry Parameters Page is as follows.

Bit	7	6	5	4	3	2	1	0
0	PS(0)	Rsvd (0)	Page Code (1Eh)					
1	Parameter Length (04h)							
2	Reserved (0)							Rotate (1)
3	Member Number in Transport Element Set (00h)							
4	Reserved (0)							Rotate (1)
5	Member Number in Transport Element Set (01h)							

Where **Rotate** equals 1 indicating that the medium transport element supports media rotation for handling double-sided media.

10.9.3 Device Capabilities Page (1Fh)

The Mode Sense Device Capabilities Page is as follows.

Bit	7	6	5	4	3	2	1	0	
0	PS(0)	Rsvd (0)	Page Code (1Fh)						
1	Parameter Length (12h)								
2	Reserved (0)				StorD(1)	StorI(1)	StorS(1)	StorM(0)	
3	Reserved (00h)								
4	Reserved (0)				M → D(1)	M → I(1)	M → S(1)	M → M(0)	
5	Reserved (0)				S → D(1)	S → I(1)	S → S(1)	S → M(1)	
6	Reserved (0)				I → D(1)	I → I(1)	I → S(1)	I → M(1)	
7	Reserved (0)				D → D(1)	D → I(1)	D → S(1)	D → M(1)	
8 - 11	Reserved (00h)								
12	Reserved (0)				M ↔ D(0)	M ↔ I(0)	M ↔ S(0)	M ↔ M(0)	
13	Reserved (0)				S ↔ D(1)	S ↔ I(1)	S ↔ S(1)	S ↔ M(0)	
14	Reserved (0)				I ↔ D(1)	I ↔ I(1)	I ↔ S(1)	I ↔ M(0)	
15	Reserved (0)				D ↔ D(1)	D ↔ I(1)	D ↔ S(1)	D ↔ M(0)	
16 - 19	Reserved (00h)								

Where **D** is a data transfer element
I is the Import / Export Element
S is a storage element
M is the medium transport element
Stor indicates storage capability
→ indicates Move Medium capability (first element type is for Source, second element type is for Destination)
↔ indicates Exchange Medium capability (first element type is for Source and Second Destination, second element type is for First Destination)

and the available capabilities are as indicated (1 means yes in all cases and 0 means no in at least some cases).

10.9.4 Library Mode Parameters Page (20h)

The Mode Sense Library Mode Parameters Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	PS (1)	Rsvd (0)	Page Code (20h)					
1	Parameter Length (08h)							
2	ReportRec	Rsvd (0)	LimitRec	ChgrEject	Rsvd (0)	WaitLoad	Rsvd (0)	Park
3	Library Group (5)				Reserved (0)			
4	Reserved (0)					Number of Buses		
5	Internal Cabinet Temperature							
6	Reserved (0)				Rsvd (1)	DASDIrq	FVerOnWr	WrCaEnab
7	Model Identification							
8	Rsvd(0)	Event History Type (bits 8 - 11)				NoVTag(0)	CanClose(1)	CanOpen(1)
9	Event History Type (bits 0 - 7)							

ReportRec, **LimitRec**, **ChgrEject**, **WaitLoad**, **Park**, **Number of Buses**, **DASDIrq**, **FVerOnWr**, **WrCaEnab**, and **Event History Type** are as set by the Mode Select command.

Library Group equals 5 for G Series.

Internal Cabinet Temperature equals the temperature inside the library system cabinet in degrees Celsius.

Model Identification equals a unique code to indicate the model of library system. See the Inquiry command (Section 10.4) for a table of possible values.

CanOpen equals 1 indicating that the library supports mailslot opening via the Open/Close Mailslot command. This bit can be used to distinguish this capability of the G Series from other Plasmon libraries which do not support this feature.

CanClose equals 1 indicating that the library supports mailslot closure via the Open/Close Mailslot command. This bit can be used to distinguish this capability of the G Series from other Plasmon libraries which do not support this feature.

NoVTag equals 0 indicating that the library does support volume tags. This bit can be used to distinguish this ability of the G Series from other Plasmon libraries which do not support volume tags.

10.9.5 Library Special Modes Page (21h)

The Mode Sense Library Special Modes Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	PS (1)	Rsvd (0)	Page Code (21h)					
1	Parameter Length (08h)							
2	LightOff	Reserved (0)					NoScanST	NoScanDT
3	Reserved (0)		LogInfo	Reserved (0)			OpnExport	NoPwrCyc
4	Reserved (0)		Mixed Media	EnabMag	EnabMslot	EnabBCR	EnabAMS	Rsvd (0)
5	Rsvd (0)	Library Emulation Code						
6	Rsvd (0)	Element Addressing Scheme						
7	Rsvd(0)	Bar Code Type						
8	Reserved (0)							EnabAllUA
9	Reserved (00h)							

LightOff, NoScanST, NoScanDT, LogInfo, OpnExport, NoPwrCyc, MixedMedia, EnabMag, EnabMslot, EnabBCR, EnabAMS, Library Emulation Code, and Element Addressing Scheme, Bar Code Type, and EnabAllUA are as set by the Mode Select command.

10.9.6 Drive Assignments Page (22h)

The Mode Sense Drive Assignments Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	PS (1)	Rsvd (0)	Page Code (22h)					
1	Parameter Length (1Ah)							
2	Drive 1 Type							
3	Drive 1 SCSI ID							
4	Drive 2 Type							
5	Drive 2 SCSI ID							
6	Drive 3 Type							
7	Drive 3 SCSI ID							
8	Drive 4 Type							
9	Drive 4 SCSI ID							
10	Drive 5 Type							
11	Drive 5 SCSI ID							
12	Drive 6 Type							
13	Drive 6 SCSI ID							
14	Drive 7 Type							
15	Drive 7 SCSI ID							
16	Drive 8 Type							
17	Drive 8 SCSI ID							
18	Drive 9 Type							
19	Drive 9 SCSI ID							
20	Drive 10 Type							
21	Drive 10 SCSI ID							
22	Drive 11 Type							
23	Drive 11 SCSI ID							
24	Drive 12 Type							
25	Drive 12 SCSI ID							
26 – 27	Reserved (00h)							

Drive 1-12 Type are the drive type designators for the optical drives in the library system. If a drive is off-line (powered-off), it's Drive Type will be 0. Otherwise, an MO drive will report 0x0E, a UDO1 drive will report 0x1E and a UDO2 drive will report 0x3C.

Drive 1-12 SCSI ID are the SCSI ID's of the optical drives in the library system. If a drive is off-line (powered off), its SCSI ID will not be used until the drive is brought back on-line (powered on).

10.9.7 Front Panel Display Mode Page (23h)

The Mode Sense Front Panel Display Mode Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	PS (0)	Rsvd (0)	Page Code (23h)					
1	Parameter Length (01h)							
2	Rsvd (0)	LightOff	Rsvd (0)	Key Pressed			MenuSeld	DispMode

LightOff and **DispMode** are as set by the Mode Select command.

Key Pressed equals 0 if no key was pressed or one of the following:

Key Pressed	Meaning
1	First (left-most) key was pressed
2	Second key was pressed
3	Third key was pressed
4	Fourth (right-most) key was pressed

The Key Pressed field is cleared every time that this page is returned so that each Mode Sense command returns key presses since the last Mode Sense command was issued.

MenuSeld equals 1 if the on-line menu has been selected at the library front panel interface. **KeyPressed** is not updated if this bit is set.

10.9.8 Drive Layout Page (24h)

The Mode Sense Drive Layout Page is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0	PS (0)	Rsvd (0)	Page Code (24h)					
1	Parameter Length (19h)							
2	Drive 1 Column				Drive 1 Vertical Position			
3	Drive 1 SCSI Bus							
4	Drive 2 Column				Drive 2 Vertical Position			
5	Drive 2 SCSI Bus							
6	Drive 3 Column				Drive 3 Vertical Position			
7	Drive 3 SCSI Bus							
8	Drive 4 Column				Drive 4 Vertical Position			
9	Drive 4 SCSI Bus							
10	Drive 5 Column				Drive 5 Vertical Position			
11	Drive 5 SCSI Bus							
12	Drive 6 Column				Drive 6 Vertical Position			
13	Drive 6 SCSI Bus							
14	Drive 7 Column				Drive 7 Vertical Position			
15	Drive 7 SCSI Bus							
16	Drive 8 Column				Drive 8 Vertical Position			
17	Drive 8 SCSI Bus							
18	Drive 9 Column				Drive 9 Vertical Position			
19	Drive 9 SCSI Bus							
20	Drive 10 Column				Drive 10 Vertical Position			
21	Drive 10 SCSI Bus							
22	Drive 11 Column				Drive 11 Vertical Position			
23	Drive 11 SCSI Bus							

Bit	7	6	5	4	3	2	1	0
Byte								
24	Drive 12 Column			Drive 12 Vertical Position				
25	Drive 12 SCSI Bus							
26	Reserved (00h)							

Drive 1-12 Column are the library system column numbers for the drives in the library system. The drives occupy the first column (column 1) in the G Series 64 and 104, and the center column (column 4) in other model library systems.

Drive 1-12 Vertical Position are vertical positions of the corresponding drives in each column with position 1 corresponding to the lowest drive position within the column.

Drive 1-12 SCSI Bus are the internal library SCSI bus numbers for the drives in the library system. Note that this number depends upon whether the library system is configured for one, two, or three internal SCSI buses. Refer to the Number of Buses field in the Mode Select Vendor Unique Mode Parameters Page (Section 10.7.1) and the default drive SCSI ID's in Section 5.

10.10 MODE SENSE (10) Command

The **Mode Sense (10)** command provides a means for reporting medium changer device to an initiator. It performs the same function as the Mode Sense (6) command.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Operation Code (5Ah)								
1	Reserved (00h)								
2	PC		Page Code						
3 - 6	Reserved (00h)								
7 - 8	(MSB)			Allocation Length				(LSB)	
9	Reserved (00h)								

DBD (Disable Block Descriptor) is ignored.

PC (Page Control) defines the type of parameter values to be returned. Normally, a value of 0 is used to return the current values.

Page Code defines the parameter page(s) to be returned.

The **Allocation Length** specifies how many bytes of data are to be returned.

The Mode Sense (10) data block consists of a 8 byte header followed by one or more supported pages. The header is shown below.

Mode Sense (10) Mode Parameter Header

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	(MSB) Mode Data Length							(LSB)
2	Medium Type (00h)							
3	Device-Specific Parameter (00h)							
4 - 5	Reserved (00h)							
6 - 7	Block Descriptor Length (00h)							

Mode Data Length is the length in bytes of the remainder of the Mode Sense (10) return data. See the Mode Sense (6) command (Section 10.9) for information about supported mode pages.

10.11 MOVE MEDIUM Command

The **Move Medium** command instructs the medium changer device move a unit of media from a source element to a destination element.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (A5h)							
1	Reserved (00h)							
2 - 3	(MSB) Transport Element Address							(LSB)
4 - 5	(MSB) Source Element Address							(LSB)
6 - 7	(MSB) Destination Address							(LSB)
8 - 9	Reserved (00h)							
10	Reserved (0)							Invert
11	IE Option		Reserved (0)					

Transport Element Address specifies the medium transport element. A value of 0 should normally be used. This will move the cartridge using the first medium transport element. The address of a specific medium transport element may also be used.

Source Element Address specifies the source element.

Destination Address specifies the destination element.

Invert specifies the medium should be inverted. If the Invert bit is 1, the media is inverted (“flipped”) prior to being deposited into the destination element.

IE Option selects an alternate function to be performed if the Source and Destination Element Address both designate the same import/export element (mailslot or magazine slot). The function performed is based on the type of import/export element according to the following table. If the Source or Destination Element Address is not that of a mailslot or a magazine slot, this field is reserved and should be set to 0. The mechanism (mailslot or magazine) for the selected import/export element must be enabled (See Section 10.7.2).

IE Option	Source and Destination	Action
0	Mailslot	No alternate function, cartridge is moved from mailslot to mailslot.
1	Mailslot	Mailslot is opened.
2	Mailslot	Mailslot is closed.
3	Mailslot	Reserved (do not use).
0	Magazine slot	No alternate function, cartridge is moved from magazine slot to magazine slot.*
1	Magazine slot	Magazine is released.*
2	Magazine slot	No effect, command is ignored.*
3	Magazine slot	Reserved (do not use).
1 - 3	Not Import/Export	Reserved (do not use).

* not available for the Model 64 and 104 library systems.

10.12 OPEN/CLOSE MAILSLLOT Command

The **Open/Close Mailslot** command instructs the medium changer device to open the mailslot thus enabling operator cartridge insertion or removal, or to close the mailslot thus disabling operator cartridge insertion and removal. The mailslot must be enabled (see Section 10.7.2) before issuing this command. This command has no effect if the changer has been placed in the Mailslot Prevent state by the Prevent/Allow Medium Removal command. The IE Option bits in the Move Medium command may also be used to open or close the mailslot.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (0Ch)							
1 - 3	Reserved (00h)							
4	Reserved (0)							Open
5	Reserved (00h)							

Open equals 1 if the medium changer device is to open rather than close the mailslot.

10.13 POSITION TO ELEMENT Command

The **Position to Element** command positions one of the two medium transport elements (MT's) in front of the specified Destination Element so that no further movement of the MT is necessary to execute a subsequent Move Medium or Exchange Medium command. Note that the two medium transport elements are connected so positioning one will also move the other.

Bit	7	6	5	4	3	2	1	0
0	Operation Code (2Bh)							
1	Reserved (00h)							
2 - 3	(MSB) _____		Transport Element Address				_____ (LSB)	
4 - 5	(MSB) _____		Destination Element Address				_____ (LSB)	
6 - 7	Reserved (00h)							
8	Reserved (0)							Invert
9	Reserved (00h)							

Transport Element Address specifies the medium transport element to be positioned. A value of 0 should normally be used. This will position the first medium transport element in front the destination element specified. The address of a specific medium transport element may also be used.

Destination Address specifies the destination element to position in front of.

Invert equals 1 if the medium transport element is to be inverted (“flipped”) before it is positioned at the destination element.

10.14 PREVENT/ALLOW MEDIUM REMOVAL Command

The **Prevent/Allow Medium Removal** command instructs the medium changer device to either prevent or allow the removal of media (cartridges) from the library system, depending upon the value of the Prevent bit. If the Prevent bit equals 1, cartridge removal is prevented. If the Prevent bit is 0, cartridge removal is allowed.

Removal of medium can take place from either the mailslot or via the removable cartridge magazine. The PA Option field specifies whether this command applies to the mailslot or the magazine. When applied to mailslot, the medium changer device is either placed in or removed from the Mailslot Allow state. When applied to the magazine, the medium changer device is either placed in or removed from the Magazine Allow state.

If left in the Mailslot Allow state, the mailslot can be opened by the Open/Close Mailslot command or by a button on the front panel. If not in the Mailslot Allow state, the mailslot cannot be opened.

If left in the Magazine Allow state, the magazine and magazine access door can be released by using the Release Magazine command or by a button on the front panel. If not in the Magazine Allow state, the magazine cannot be released and the magazine access door is latched if it is closed.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (1Eh)							
1 - 3	Reserved (00h)							
4	Reserved (0)							Prevent
5	PA Option		Reserved (0)					

Prevent equals 1 if opening of the mailslot or releasing of the magazine is to be inhibited, or 0 if the opening of the mailslot or releasing of the magazine is to be allowed.

PA Option specifies whether the mailslot and/or the magazine is to be effected according to the following table.

PA Option	Prevent	Action
0	1	Prevent the operator from opening the mailslot, or releasing and removing the magazine.
0	0	Allow the operator to open the mailslot, and release and remove the magazine.
1	1	Reserved (do not use).
1	0	Reserved (do not use).
2	1	Prevent the operator from opening the mailslot.
2	0	Allow the operator to open the mailslot.
3	1	Prevent the operator from releasing and removing the magazine.*
3	0	Allow the operator to release and remove the magazine.*

* not available for the Model 64 and 104 library systems.

If the appropriate import/export mechanism (mailslot or magazine) is not enabled, it will not be effected.

The Prevent states remain effective until one of the following conditions occurs:

1. All initiators which have issued the Prevent/Allow Medium Removal command with Prevent set to 1 reissue the command with Prevent set to 0 (when applied to the same device, mailslot and/or magazine, as specified by the Option field).
2. The medium changer device receives a TARGET RESET message.
3. The medium changer device receives a hard reset or power is cycled.
4. The medium changer device completes download of new firmware or the SCSI ID of the medium changer device is changed by the Write Buffer command (see Section 10.30.2).

10.15 READ BUFFER Command

The **Read Buffer** command is used to read the current SCSI ID of the medium changer device, to read a good / bad status code for each drive, or to read a buffer to test the integrity of communication with the medium changer device via the SCSI bus.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (3Ch)							
1	Reserved (0)					Mode		
2	Buffer ID							
3 - 5	(MSB)		Buffer Offset				(LSB)	
6 - 8	(MSB)		Allocation Length				(LSB)	
9	Reserved (00h)							

Mode and **Buffer ID** select the function to be performed based on the following table.

Mode	Buffer ID	Function
2	0	Read SCSI ID of medium changer device.
2	1	Read drive status code.
2	2	Read from echo buffer to test SCSI data transfer.

Buffer Offset is the beginning byte offset within the designated buffer from which data is to be returned. For Buffer ID = 0 and ID = 1, the buffer offset must equal 0.

Allocation Length specifies how many bytes of data are to be returned.

10.15.1 Reading the Medium Changer Device SCSI ID

To read the SCSI ID of the medium changer device, set Mode to 2, Buffer ID to 0, Buffer Offset to 0, and Allocation Length to 1. The return data consists of a single byte containing the current SCSI ID of the medium changer device.

The returned medium changer device SCSI ID data is shown below.

Medium Changer Device SCSI ID Data

Bit Byte	7	6	5	4	3	2	1	0
0	Current Medium Changer Device SCSI ID							

10.15.2 Reading the Drive Good / Bad Status Codes

To read the drive status codes, set Mode to 2, Buffer ID to 1, Buffer Offset to 0, and Allocation Length to 12. The return data consists of an array of bytes containing a status code for each drive. These values are only changed by a corresponding Write Buffer command.

The returned drive status codes data is shown below.

Drive Good / Bad Status Code Data

Bit Byte	7	6	5	4	3	2	1	0
0	Drive 1 Status							
1	Drive 2 Status							
2	Drive 3 Status							
3	Drive 4 Status							
4	Drive 5 Status							
5	Drive 6 Status							
6	Drive 7 Status							
7	Drive 8 Status							
8	Drive 9 Status							
9	Drive 10 Status							
10	Drive 11 Status							
11	Drive 12 Status							

Drive 1-12 Status is a user-defined value to indicate the good / bad status of a drive. For example, a 1 could indicate a good drive while a 2 could indicate a bad drive.

10.15.3 Reading from the Echo Buffer to Test SCSI Communication

A 256 byte echo buffer is supported to test communication with the medium changer device.

To read to the echo buffer, set Mode to 2 and Buffer ID to 2.

Buffer Offset can be any value between 0 and 255.

Allocation Length can be any value between 1 and 256. The sum of Buffer Offset and Allocation Length cannot exceed 256.

The returned Echo Buffer data is shown below.

Echo Buffer Data

Bit Byte	7	6	5	4	3	2	1	0
0-n	Echo Buffer Data							

The echo buffer should first be written by the Write Buffer command (Section 10.30.4). After the buffer is read, its contents should be compared with the data originally written.

10.16 READ ELEMENT STATUS Command

The **Read Element Status** command requests the medium changer device report the status of its internal elements to the initiator.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (B8h)							
1	Reserved (0)			VolTag	Element Type Code			
2 - 3	(MSB) _____			Starting Element Address				(LSB)
4 - 5	(MSB) _____			Number of Elements				(LSB)
6	Reserved (0)				CurData	Rsvd(0)		
7 - 9	(MSB) _____			Allocation Length				(LSB)
10	Reserved (00h)							
11	Rsvd (0)	BarCodes	Reserved (0)					

VolTag equals 1 if the medium changer device is to return bar code information in the form of SCSI volume tags, or 0 if bar codes are to be returned in the condensed format described in this document. Not all models support bar codes.

Element Type Code specifies an element type to be returned as follows.

Code	Element Types Returned
0	All element types
1	Medium transport elements
2	Storage elements
3	Import/export elements
4	Data transfer elements

Starting Element Address specifies the minimum element address to report. Only elements with an element type permitted by the Element Type Code and the Starting Element Address are reported.

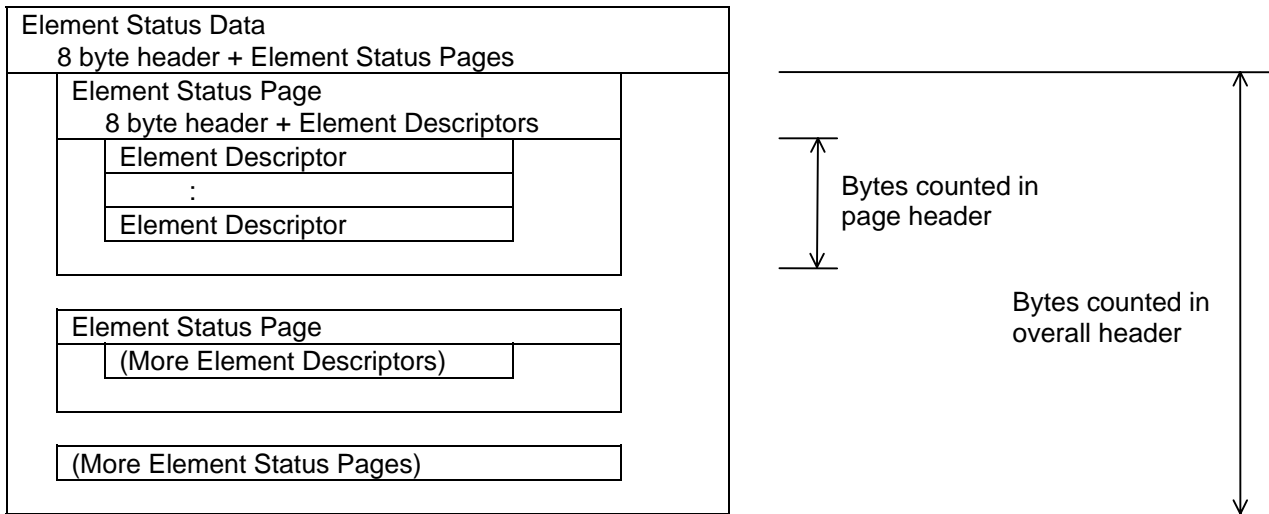
Number of Elements specifies the maximum number of element descriptor tags to be reported by the medium changer device for this command. The value specified by this field is not the range of element addresses to be considered for reporting but rather the number of elements to report.

CurData (Current Data) specifies that the element status data is to be returned without causing any device motion. This field is ignored as the library system will always return element status data without causing device motion.

Allocation Length specifies the length of the Element Status Data.

Bar Codes equals 1 if the medium changer device is to return bar code information, or 0 if bar code information is not to be returned. This field is only valid if VolTag equals 0. If VolTag equals 1 bar code information is always returned. Not all models support bar codes.

The structure of the **Element Status Data** returned is as follows:



The element status data header format is shown following.

Element Status Data

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	(MSB) _____ First Element Address Reported _____							(LSB)
2 - 3	(MSB) _____ Number of Elements Reported _____							(LSB)
4	Reserved (00h)							
5 - 7	(MSB) _____ Byte Count of Report Available (all pages, x - 7) _____							(LSB)
8 - x	Element Status Page(s)							

The element status page header format is shown following.

Element Status Page Header

Bit Byte	7	6	5	4	3	2	1	0
0	Element Type Code							
1	PVolTag	AVolTag	Reserved (0)					
2 - 3	(MSB) _____ Element Descriptor Length (z + 1) _____							(LSB)
4	Reserved (00h)							
5 - 7	(MSB) _____ Byte Count of Descriptor Data Available (this page, y - 7) _____							(LSB)
8 - y	Element Descriptor(s)							

PVolTag (Primary Volume Tag) equals 1 if bar code information in the form of SCSI volume tags will be returned. Bar code information may also be returned in the condensed format (see VolTag field above).

AVolTag (Alternate Volume Tag) equals 1 if bar code information in the form of SCSI volume tags will be returned and the Bar Code Type (see Section 10.7.2) is such that each side of the cartridge has a unique bar code. In this case, the Primary Volume Tag contains the bar code corresponding to the 'A' side of the cartridge, and the Alternate Volume Tag contains the bar code corresponding to the 'B' side of the cartridge. Bar code information may also be returned in the condensed format (see VolTag field above).

The format of the element descriptors follows. Descriptors are returned in element address order.

10.16.1 Medium Transport Element Descriptor

The medium transport element descriptor is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	(MSB) _____ Element Address _____ (LSB)							
2	Reserved (0)				Except	Rsvd (0)	Full	
3	Reserved (00h)							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6 - 8	Reserved (00h)							
9	Svalid	Invert	Reserved (0)					
10 - 11	(MSB) _____ Source Storage Element Address _____ (LSB)							

Format 1. No bar codes requested (VolTag=0, BarCodes=0):

12 - 15	Reserved (00h)
16	MediaType (MO = 0x00, UDO = 0x01, Unknown = 0xFF)

Format 2. Bar codes requested, condensed format (VolTag=0, BarCodes=1):

12 - 15	Reserved (00h)					
16	Reserved (0)		SidIdent	SideB	BCValid	BCScand
17	Bar Code Length (z - 17)					
18 - z	Bar Code					
z + 1	MediaType (MO = 0x00, UDO = 0x01, Unknown = 0xFF)					

Format 3. Bar codes requested, volume tag format - one bar code per cartridge (VolTag=1, PVolTag=1, AVolTag=0):

12 - 43	Bar Code
44 - 51	Reserved (00h)
52	MediaType (MO = 0x00, UDO = 0x01, Unknown = 0xFF)

Format 4. Bar codes requested, volume tag format - side unique bar codes (VolTag=1, PVolTag=1, AVolTag=1):

12 - 43	Primary Volume Tag Bar Code
44 - 47	Reserved (00h)
48 - 79	Alternate Volume Tag Bar Code
80 - 87	Reserved (00h)
88	Media Type (MO = 0x00, UDO = 0x01, Unknown = 0xFF)

Except equals 1 if the element is in an abnormal state. In this case, additional information is given in the Additional Sense Code and in the Additional Sense Code Qualifier fields.

Full equals 1 if the element contains a unit of media.

Additional Sense Code (ASC) and **Additional Sense Code Qualifier** indicate detailed information related to a condition of the element. The following values are used.

ASC	ASCQ	Meaning
83h	00h	Bar code not scanned.
83h	09h	Unable to read bar code.

SValid (Storage Element Valid) equals bit of 1 if Source Storage Element Address and Invert bit are valid.

Invert equals 1 if the unit of media now in this element was inverted by Move Medium operation since it was last in the Source Storage Element Address.

Source Storage Element Address provides the address of the last storage element this unit of media was moved from.

SideIdent equals 1 if the cartridge side for which the bar code applies has been identified (side unique bar codes), or 0 if the bar code applies to both sides of the cartridge.

SideB equals 1 if the bar code applies to cartridge side B rather than cartridge side A.

BCValid (Bar Code Valid) equals 1 if Bar Code is valid, i.e., if a valid bar code was read.

BCScand (Bar Code Scanned) equals 1 if the bar code was scanned, i.e., if an attempt was made to read it.

Bar Code Length equals the length of the following bar code. The default for this length is 20.

Bar Code contains the bar code of the cartridge if it is known. The bar code will be returned as ASCII characters followed by spaces if a valid bar code was read. Zeros will be returned if the bar code was not scanned or is not valid.

Media Type only differentiates between MO and UDO media. It does NOT differentiate between UDO1 and UDO2 media types.

10.16.2 Storage Element Descriptor

The storage element descriptor is as follows.

Bit	7	6	5	4	3	2	1	0
0 - 1	(MSB) _____ Element Address _____ (LSB)							
2	Reserved (0)			Access	Except	Rsvd (0)	Full	
3	Reserved (00h)							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6 - 8	Reserved (00h)							
9	Svalid	Invert	Reserved (0)					
10 - 11	(MSB) _____ Source Storage Element Address _____ (LSB)							
12 - z	(See Medium Transport Element Descriptor)							

Access equals 1 if element access by the medium transport element is allowed.

Other fields are the same as for the medium transport element descriptor.

10.16.3 Import / Export Element Descriptor

The import/export element descriptor is as follows.

Bit	7	6	5	4	3	2	1	0
0 - 1	(MSB) _____ Element Address _____ (LSB)							
2	Reserved (0)		InEnab(1)	ExEnab(1)	Access	Except	ImpExp	Full
3	Reserved (00h)							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6 - 8	Reserved (00h)							
9	Svalid	Invert	Reserved (0)					
10 - 11	(MSB) _____ Source Storage Element Address _____ (LSB)							
12 - z	(See Medium Transport Element Descriptor)							

InEnab (Import Enable) equals 1 indicating that the import/export element supports movement of media into the scope of the medium changer device.

ExEnab (Export Enable) equals 1 indicating that the import/export element supports movement of media out of the scope of the medium changer device.

Access equals 1 if access to the import/export element by the medium transport element is allowed (the mailslot is closed or the magazine is installed and latched) or 0 if access is not allowed (the mailslot is open or the magazine has been released or removed).

ImpExp equals 1 if the unit of media in the import/export element was placed there by an operator, or 0 if the unit of media was placed there by the medium transport element.

Additional Sense Code (ASC) and **Additional Sense Code Qualifier** for import/export elements may contain the following values.

ASC	ASCQ	Meaning
83h	00h	Bar code not scanned.
83h	02h	No magazine installed.
83h	09h	Unable to read bar code.

Other fields are the same as for the medium transport element descriptor.

10.16.4 Data Transfer Element Descriptor

The data transfer element descriptor is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	(MSB) Element Address (LSB)							
2	Reserved (0)			Access	Except	Rsvd (0)	Full	
3	Reserved (00h)							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6	NotBus	Rsvd (0)	IDValid	Reserved (0)				
7	SCSI Bus Address							
8	Reserved (00h)							
9	Svalid	Invert	Reserved (0)					
10 - 11	(MSB) Source Storage Element Address (LSB)							
12 - z	(See Medium Transport Element Descriptor)							

Access bit of 1 indicates access to the data transfer element by the medium transport element is allowed. Access may require that a SCSI Start Stop Unit command be sent to the corresponding optical drive to effect an eject.

Additional Sense Code (ASC) and **Additional Sense Code Qualifier** for data transfer elements may contain the following values.

ASC	ASCQ	Meaning
80h	5Dh	Drive operating in overheated state.
80h	5Eh	Drive being shut down due to overheat condition.
80h	63h	Drive operating with low module fan speed.
80h	5Fh	Drive being shut down due to low module fan speed.
83h	00h	Bar code not scanned.
83h	04h	Drive not installed or in service state (off-line).
83h	09h	Unable to read bar code.
83h	0Ah	Drive being placed in service state (5 sec warning).

Not Bus equals 1 if the data transfer element (the drive) is on a different SCSI bus than the medium changer device internal to the library system, or 0 if it is on the same SCSI bus as the medium changer device internal to the library system, based on the drive number and the number of SCSI buses selected in the Mode Select Library Mode Parameters page (see Section 10.7.1). External jumpers between the buses are not taken into account.

IDValid equals 1 if the SCSI Bus Address field contains valid information. This bit will be set if the drive is installed and turned on.

SCSI Bus Address is the SCSI ID of the corresponding library drive.

Other fields are the same as for the medium transport element descriptor.

10.17 READ MAGAZINE STATUS Command

The **Read Magazine Status** command is used to determine the status of the magazine.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (B9h)							
1	Reserved (00h)							
2 - 3	(MSB)	First Magazine (1)						(LSB)
4 - 5	(MSB)	Number of Magazines (1)						(LSB)
6	Reserved (00h)							
7 - 9	(MSB)	Allocation Length						(LSB)
10 - 11	Reserved (00h)							

Allocation Length specifies the length of the Magazine Status Data.

The **Magazine Status Data** returned is as follows.

Magazine Status Data

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	(MSB)	First Magazine (1)						(LSB)
2 - 3	(MSB)	Number of Magazines (1)						(LSB)
4	Reserved (00h)							
5 - 7	(MSB)	Byte Count of Report Available (4)						(LSB)
8	Magazine Number (1)							
9 - 10	(MSB)	First Element Address in Magazine						(LSB)
11	Reserved (0)				Changed	Rsvd(0)	Present	

Present equals 1 if the magazine is present and latched in place.

Changed equals a value of 1 if this magazine has been recently removed, exchanged, or installed. This bit is cleared after this descriptor is returned.

10.18 RELEASE ELEMENT Command

The **Release Element** command is used to release reservations on a previously reserved medium changer device or previously reserved elements within it.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (17h)							
1	Reserved (0)							Element
2	Reservation Identification							
3-5	Reserved (00h)							

Element equals bit of 1 if a specific set of elements is to be released or 0 if the entire medium changer device is to be released.

Reservation Identification is a code byte used to identify a specific element reservation to be released.

Refer to the Reserve Element command for more information.

10.19 RELEASE MAGAZINE Command

The **Release Magazine** command instructs the medium changer device to energize a solenoid to release the magazine for operator access. The magazine access door will also open allowing magazine insertion or removal. After this command is issued, the magazine slots, IE2 – IE11, are no longer available as a source, destination, or second destination for the Move Medium and Exchange Medium commands. The magazine must be enabled (see Section 10.7.2) before issuing this command. This command has no effect if the changer has been placed in the Magazine Prevent state by the Prevent/Allow Medium Removal command. The IE Option bits in the Move Medium command may also be used to release the magazine. This command is not available in the Model 64 and 104 library systems.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (C3h)							
1-5	Reserved (00h)							

10.20 REQUEST SENSE Command

The **Request Sense** command requests that the medium changer device send Sense Data to the initiator.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (03h)							
1-3	Reserved (00h)							
4	Allocation Length							
5	Reserved (00h)							

The Sense Data will be valid for a CHECK CONDITION status returned on the prior command. The Sense Data will be preserved by the medium changer device until retrieved by the Request Sense command or until receipt of any other command.

The Request Sense command shall return a CHECK CONDITION status only to report fatal errors for the Request Sense command. For example:

- 1) The medium changer device detects a non-zero reserve bit in the CDB.
- 2) An unrecoverable parity error occurred on the DATA BUS.
- 3) An medium changer device malfunction prevents return of the sense data.

Any nonfatal error occurring during the execution of the Request Sense command shall return the sense data with GOOD status.

The Sense Data Format is as follows.

Sense Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Valid (0)	Error Code (70h)						
1	Reserved (00h)							
2	Reserved (0)				Sense Key			
3 - 6	Reserved (00h)							
7	Additional Sense Length (x-7)							
8 - 11	Reserved (00h)							
12	Additional Sense Code							
13	Additional Sense Code Qualifier							
14	Reserved (00h)							
15	SKSV	Sense-Key Specific						
16 - 17								
18 - x	Additional Sense Bytes							

Sense Key is described below.

Additional Sense Code and **Additional Sense Code Qualifier** indicate detailed information related to an error or exception condition. These error codes are listed in Section 12.1.

SKSV (Sense-Key Specific Valid) equals 1 if the Sense Key Specific field contains valid information.

Sense-Key Specific contains information that is specific to the type of error returned.

Additional Sense Bytes contain additional information about the error returned.

The following Sense Key values are returned by the medium changer device.

Sense Key Descriptions

Sense Key	Description
0h	NO SENSE. Indicates that there is no specific sense key information to be reported. This is the case for a successful command.
1h	RECOVERED ERROR. Indicates that the last command completed successfully with some recovery action performed. Information about the first hardware error encountered is available in the data fields above.
2h	NOT READY. Indicates that the medium changer device cannot be accessed.
4h	HARDWARE ERROR. Indicates that the medium changer device encountered a non-recoverable hardware failure while performing the command or during self test.
5h	ILLEGAL REQUEST. Indicates an illegal parameter in the CDB or in additional parameters supplied as data.
6h	UNIT ATTENTION. Indicates that Mode parameters have been changed or the target has been reset.
Bh	ABORTED COMMAND. Indicates that the medium changer device aborted the command. This is typically due to a SCSI communication error.

If the Sense Key is equal to 5 (Illegal Request) and the SKSV is set to 1, the Sense-Key Specific fields contain the following information.

Bit	7	6	5	4	3	2	1	0	
Byte									
15	SKSV	C/D	Reserved (0)		BPV	Bit Pointer			
16 - 17	(MSB)		Field Pointer				(LSB)		

C/D (Command/Data) equals 1 if the illegal parameter is in the command descriptor block or 0 if the illegal parameter is in the data parameters sent.

BPV (Bit Pointer Valid) equals 1 if the value in the Bit Pointer field is valid.

Bit Pointer indicates the left-most (most-significant) bit of the field which is in error.

Field Pointer indicates the byte of the command descriptor block or of the parameter data which in error. When a multiple-byte field is in error, this field contains the first (most-significant) byte of the field which is in error.

If the Sense Key is equal to 4 (Hardware Error) or 1 (Recovered Error) and the SKSV is set to 1, the Sense-Key Specific fields contain the following information.

Bit	7	6	5	4	3	2	1	0	
Byte									
15	SKSV	Reserved (0)							
16 - 17	(MSB)		Actual Retry Count				(LSB)		

Actual Retry Count equals the number of retries used in attempting to recover from the error.

Also, for these types of errors, the **Additional Sense Bytes** field contains the following information.

Bit Byte	7	6	5	4	3	2	1	0
18	ChgrReady	Restored	Completed	AllReturned	MT1Full	MT2Full	Rsvd (0)	FailSecond
19	InfoValid	(First) Source Cartridge Location			(First) Containing Element Number			Inverted
20 - 21	(MSB)	(First) Source Element Address						(LSB)
22 - 23	(MSB)	(First) Destination Element Address						(LSB)
24	Info2Valid	Second Source Cartridge Location			Second Containing Element Number			Inverted2
25 - 26	(MSB)	Second Source Element Address						(LSB)
27 - 28	(MSB)	Second Destination Element Address						(LSB)
29		Medium Transport Element Number						
30 - 31	(MSB)	Failure Element Address						(LSB)
32		Component Number						
33		Error Subcode						
34		Error Type						
35		Error Context						
36 - 37		Internal Error Location						
38 - 40		Reserved (0)						
41 - 44	(MSB)	Lift Offset						(LSB)
45 - 46	(MSB)	Picker Step Count						(LSB)
47 - 48	(MSB)	Pivot Offset						(LSB)
49		Reserved (0)					MTA	MTA Side
50 - 51	(MSB)	Flip Offset						(LSB)
52 - 53	(MSB)	Mailslot or Pass-thru Step Count						(LSB)

ChgrReady equals 1 if the medium changer device is ready to accept new cartridge movement commands or 0 if the medium changer device is jammed and a Rezero Unit command is required to reinitialize the unit.

Restored equals 1 if all cartridges being moved have been returned to their source elements and the medium changer device has been restored to the state in which it was in before the last command was issued.

Completed equals 1 if cartridges have been moved and the last command completed successfully.

AllReturned equals 1 if all cartridges have been returned to their last storage element locations.

MT1Full equals 1 if the first medium transport element (address 8001) is full.

MT2Full equals 1 if the second medium transport element (address 8002) is full.

FailSecond equals 1 if the failure occurred on the second move of an Exchange Medium command (from the First Destination Element to the Second Destination Element) or 0 if the failure occurred on

the first move (from the Source Element to the First Destination Element). The second move is actually executed first.

InfoValid equals 1 if bytes 18 to 23 contain valid information about the last cartridge movement command, or the first move of an Exchange Medium command (Source to First Destination Element).

Info2Valid equals 1 if bytes 24 to 28 contain valid information about the second move of an Exchange Medium command (First Destination Element to Second Destination Element).

(First) Source Cartridge Location and **Second Source Cartridge Location** contain values indicating the final location of the cartridges in the first and second source elements, respectively. (The second source element is the First Destination Element of an Exchange Medium command.) These values are as follows:

1	Cartridge is in source element
2	Cartridge is in medium transport element (if not the source or destination element) where the MT number (picker) is specified by the (First) Containing Element Number or Second Containing Element Number fields (1 for MT1 or 2 for MT2)
3	Cartridge is in destination element
4	Cartridge is in its last occupied storage element (if not the source or destination element)
5	Cartridge has been lost
6	Cartridge is in an import/export element (if not the source or destination element) where the IE is specified by the (First) Containing Element Number or Second Containing Element Number fields (0 for IE1 (mailslot) or 1-7 for IE2-8 (magazine slot)).
0	Cartridge is in an import/export element (if not the source or destination element) where the IE is specified by the (First) Containing Element Number or Second Containing Element Number fields (0-2 for IE9-11 (magazine slot)).

(First) Containing Element Number and **Second Containing Element Number** are the numbers of the elements containing the cartridges originally in the first and second source elements, respectively.

Inverted and **Inverted2** equal bits of 1 if the cartridges originally in the first and second source elements, respectively, are now inverted from their original states.

(First) Source Element and **(First) Destination Element** are the addresses of Source and Destination Elements of the last cartridge movement command, or the Source and First Destination Elements of the last Exchange Medium command.

Second Source Element and **Second Destination Element** are the addresses of First and Second Destination Elements of the last Exchange Medium command.

Medium Transport Element Number is the number of the medium transport element (1 or 2) in use when the error occurred.

Failure Element Address is the address of the closest element to which the medium transport element specified by the Medium Transport Element Number was positioned when the error occurred.

Error Type indicates the general type of error and the interpretation of the **Component Number** and **Error Subcode** fields. Section 10.6.4 for more information.

Error Context is a code for the context in which the error occurred. The error context codes are listed in Section 12.4.

Internal Error Location is a number which is useful to Plasmon technical support.

Lift Offset is a signed lift encoder count offset from the count associated with the Failure Element Address at the Lift Elevation State above.

Picker Step Count is a signed motor step count for the active picker when the error occurred.

Pivot Offset is a signed pivot step count offset from the count associated with the Failure Element Address in block A.

MTA is the MTA (0 or 1) in effect when the error occurred. MTA 0 is the primary MTA, MTA 1 is the alternate MTA.

MTA Side is the MTA side (0 or 1) up when the error occurred.

Flip Offset is a signed flip step count offset from the Failure MTA Side flip step count.

Mailslot or Pass-Thru Step Count is a signed motor step count for the mailslot or a pass-thru element, depending upon the failing element.

10.21 REQUEST VOLUME ELEMENT ADDRESS Command

The **Request Volume Element Address** command is used to transfer the results of a Send Volume Tag command. Multiple Request Volume Element Address commands may be used to recover the results of a single Send Volume Tag command.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (B5h)							
1	Reserved (0)			VolTag	Element Type Code			
2 - 3	(MSB) _____			Element Address				(LSB)
4 - 5	(MSB) _____			Number of Elements				(LSB)
6	Reserved (00h)							
7 - 9	(MSB) _____			Allocation Length				(LSB)
10 - 11	Reserved (00h)							

For each Send Volume Tag command, the medium changer device will report, in element address order, multiple elements that match a volume tag template. Once information for a given element address has been reported, only higher element addresses will be reported by subsequent Request Volume Element Address commands.

VolTag equals 1 if the medium changer device is to report bar code information in the form of volume tags, or 0 if the bar code information in the form of volume tags is not to be reported.

Element Type Code specifies an element type to be returned as follows.

Code	Element Types Returned
0	All element types
1	Medium transport elements
2	Storage elements
3	Import/export elements
4	Data transfer elements

Element Address specifies the minimum element address to report. Only elements with an element type permitted by the Element Type Code and the Element Address are reported.

Number of Elements specifies the maximum number of element descriptor tags to be reported by the medium changer device for this command. The value specified by this field is not the range of element addresses to be considered for reporting but rather the number of elements to report that match the last Send Volume Tag translate template.

Allocation Length specifies the length of the Element Status Data.

The structure of the **Element Status Data** returned is identical to that of the Read Element Status command. See the Read Element Status command (Section 10.16) for the format of the data returned by this command.

10.22 RESERVE ELEMENT Command

The **Reserve Element** command is used to reserve the medium changer device or specific elements within it. If the entire medium changer device is reserved, any other SCSI initiator will only be permitted to execute the following commands: Inquiry, Request Sense, Read Element Status, Read Magazine Status, and Release (ignored). Any other command will generate RESERVATION CONFLICT status.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (16h)							
1	Reserved (0)							Element
2	Reservation Identification							
3 - 4	(MSB)	Element List Length						(LSB)
5	Reserved (00h)							

Element equals bit of 1 if specific elements are to be reserved or 0 if the entire medium changer device is to be reserved.

Reservation Identification provides a means for the initiator to identify each element reservation with a specified code byte. It is used in the Release Element command to specify which reservation is to be released and in a superseding Reserve Element command to specify which reservation is to be superseded.

Element List Length specifies the length in bytes of the Reserve Element element list.

The Reserve Element element list consists of zero or more of the following reserve element list descriptors.

10.22.1 Reserve Element Element List Descriptor

The Reserve Element Element List Descriptor is as follows.

Bit Byte	7	6	5	4	3	2	1	0
0 - 1	Reserved (00h)							
2 - 3	(MSB)	Number of Elements						(LSB)
4 - 5	(MSB)	Element Address						(LSB)

Element Address is the beginning element address to start assigning reservations for.

Number of Elements is the number of elements to reserve or zero if elements are to be assigned beginning at the specified element address through the last element address on the unit.

10.23 RESTORE DRIVE PAIR Command

The **Restore Drive Pair** command restores a pair of drives previously prepared for service (see Service Drive Pair command) by reconnecting them to the SCSI and powering them on.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (C1h)							
1	Drive Pair							
2-5	Reserved (00h)							

Drive Pair equals the drive pair to restore (e.g., Drive Pair 1 = drives 1 and 2).

10.24 REZERO UNIT Command

The **Rezero Unit** command reinitializes the medium changer device. Then, depending upon the ChgrEjects and LmtErrRec bits in the Mode Select Vendor Unique Mode Parameter Page (see Section 10.7.1), cartridges in the medium transport element and loaded data transfer elements (optical drives) may be put back in the storage elements from which they originally came. The medium changer device will then go to its home position.

Note: unless the LmtErrRec bit is set or the ChgrEjects bit is reset in the Mode Select Vendor Unique Mode Parameter Page, the Rezero Unit command will unload all drives.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (01h)							
1 - 4	Reserved (00h)							
5	RecalOffs	Park	Reserved (0)					

RecalOffs equals 1 if all library system offsets are to be recalibrated.

Park equals 1 if the Media Transport Element is to be moved to its park position. This is required in preparation for shipment of the system.

10.25 SEND DIAGNOSTIC Command

The **Send Diagnostic** command instructs the medium changer device to perform a self-diagnostic test on itself.

Bit Byte	7	6	5	4	3	2	1	0	
0	Operation Code (1Dh)								
1	Reserved (0)			PF (0)	Rsvd (0)	Selftest (1)	DevOfI (0)	UnitOfI (0)	
2	Reserved (00h)								
3 - 4	(MSB)				Parameter List Length (00h)				(LSB)
5	Reserved (00h)								

PF (Page Format) is ignored.

Selftest (Self Test) equals 1 indicating default self-test.

Dev0fL (Device Off-line) and **Unit0fL** (Unit Off-line) both equal bits of 0 indicating no vendor specific diagnostic that may be visible to other initiators.

Parameter List Length equals 0.

The Send Diagnostic command returns status of GOOD if no errors occur, else a CHECK CONDITION will be set. Send a Request Sense command to obtain information about the problem.

10.26 SEND VOLUME TAG Command

The **Send Volume Tag** command transfers a template to be used to search for cartridges with specific bar codes (volume tags). Only this template matching “translate” function of the Send Volume Tag command is supported. The Request Volume Element Address command is used to transfer the results of the template matching operation.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (B6h)							
1	Reserved (0)				Element Type Code			
2 - 3	(MSB) _____				Element Address _____ (LSB)			
4	Reserved (00h)							
5	Reserved (0)				Send Action Code			
6 - 7	Reserved (00h)							
8 - 9	(MSB) _____				Parameter List Length _____ (LSB)			
10 - 11	Reserved (00h)							

Element Type Code specifies an element type for a translate action as follows.

Code	Element Types Returned
0	All element types
1	Medium transport elements
2	Storage elements
3	Import/export elements
4	Data transfer elements

Send Action Code specifies the function to be performed by the command as shown below.

Code	Function
00h or 04h	Translate - search all defined (side A and side B) bar codes of the specified element types.
01h or 05h	Translate - search only primary (side A) bar codes of the specified element types.
02h or 06h	Translate - search only alternate (side B) bar codes of the specified element types.
03h, 07h-1Fh	Reserved

The specified elements are searched for a matching volume identification template. The results are stored and are available for return in the next Request Volume Element Address command (see Section 10.21).

The parameters required for the Send Volume Tag command are as follows.

Send Volume Tag Parameters Format

Bit Byte	7	6	5	4	3	2	1	0
0 - 31	Volume Identification Template							
32 - 33	Reserved (00h)							
34 - 35	Minimum Volume Sequence Number (ignored)							
36 - 37	Reserved (00h)							
38 - 39	Maximum Volume Sequence Number (ignored)							

Volume Identification Template specifies a 32 character template to be used for matching bar codes, although only the first 20 characters are used. The template may contain bar code characters or the wildcard characters '*' and '?'. The '*' will match any string of characters and the '?' will match any single character.

Minimum/Minimum Volume Sequence Number are not used and are ignored.

10.27 SERVICE DRIVE PAIR Command

The **Service Drive Pair** command prepares a pair of drives for service by unloading them, powering them off, and disconnecting them from SCSI bus.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (C0h)							
1	Drive Pair							
2 - 5	Reserved (00h)							

Drive Pair equals the drive pair to service (e.g., Drive Pair 1 = drives 1 and 2).

10.28 SWAP TRANSPORT ASSYS Command

The **Swap Transport Assys** command is used to switch to the alternate medium transport assembly (MTA) when the primary assembly is found to be non-functional. It is also used to switch back to the primary transport assembly after it has been repaired.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (C2h)							
1	Reserved (0)							NewMTA
2 - 5	Reserved (00h)							

NewMTA is the medium transport assembly to swap to: 0 for the primary assembly and 1 for the alternate assembly.

It should be noted that the library may automatically switch-over to the alternate MTA apart from this command if the primary MTA is found to be malfunctioning and automatic switch-over is enabled by the EnabAMS bit in the Mode Select Library Special Modes page (see Section 10.7.2).

10.29 TEST UNIT READY Command

The **Test Unit Ready** command provides a means of checking medium changer device ready status.

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (00h)							
1 - 5	Reserved (00h)							

If the medium changer device is able to accept a medium access command without returning a CHECK CONDITION status, the Test Unit Ready command will return a GOOD status.

10.30 WRITE BUFFER Command

The **Write Buffer** command is used to write new firmware to the library system, to change the SCSI ID of the medium changer device, to assign a good / bad status code to each drive, or to write to a buffer to test communication with the medium changer device via the SCSI bus.

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Operation Code (3Bh)								
1	Reserved (0)					Mode			
2	Buffer ID								
3 - 5	(MSB) _____				Buffer Offset				(LSB)
6 - 8	(MSB) _____				Parameter List Length				(LSB)
9	Reserved (00h)								

Mode and **Buffer ID** select the function to be performed based on the following table.

Mode	Buffer ID	Function
7	0	Download firmware (microcode).
2	0	Change SCSI ID of medium changer device.
2	1	Assign drive status codes.
2	2	Write to echo buffer to test SCSI data transfer.

Buffer Offset is the beginning byte offset within the designated buffer to which data is to be written. For Buffer ID = 0 and ID = 1, the buffer offset must be equal to 0. For Buffer ID = 2, if the Buffer Offset and the Parameter List Length fields specify a transfer that would exceed the buffer capacity, the target shall return Check Condition status with a Sense Key of Illegal Request and an ASC of Invalid Field in Cdb.

Parameter List Length specifies the length in bytes of the accompanying parameter list.

10.30.1 Downloading Firmware

To write new firmware to the library system, set Mode to 7 and Buffer ID to 0.

The Buffer Offset begins at 0 but may be incremented as described in the next paragraph.

The required Parameter List Length value can be obtained from the size of the firmware object file, or the first four bytes of the file, or multiple Write Buffer commands can be issued with smaller values of

Parameter List Length and increasing values of Buffer Offset (the Buffer Offset for each command is incremented by the Parameter List Length of the previous command). The sum of the Parameter List Lengths of such a group of commands must equal the size of the firmware object file. Each such Write Buffer transfer may be repeated in the event of receiving a checksum error due to a communication failure. The Parameter List Length must always be a multiple of 258 (since data is transferred in blocks of 256 bytes with 2 byte checksums).

The Firmware Download parameter list is shown below.

Firmware Download Parameter Data

Bit	7	6	5	4	3	2	1	0
Byte								
0 - n	Library System Firmware Object File							

The format of the Library System Firmware Object File is as follows.

Bit	7	6	5	4	3	2	1	0
Byte								
0 - 3	(MSB)	Size of Library System Firmware Object File (n)						(LSB)
4 - n	Library System Firmware Object Code							

Upon completion of the Write Buffer command, the library system will reboot the library system controller board. Host software should again poll with the Request Sense command, waiting for GOOD status.

10.30.2 Changing the Medium Changer Device SCSI ID

To change the SCSI ID of the medium changer device, set Mode to 2, Buffer ID to 0, Buffer Offset to 0, and Parameter List Length to 1. The parameter data consists of a single byte specifying the new SCSI ID the medium changer device.

The medium changer device SCSI ID parameter list is shown below.

Medium Changer Device SCSI ID Parameter Data

Bit	7	6	5	4	3	2	1	0
Byte								
0	New Medium Changer Device SCSI ID							

After returning good status to this command, the medium changer device will respond to the new SCSI ID for subsequent SCSI commands issued to it.

10.30.3 Assigning Drive Good / Bad Status Codes

To assign drive status codes, set Mode to 2, Buffer ID to 1, Buffer Offset to 0, and Parameter List Length to 12. The parameter data consists of an array of bytes containing a status code for each drive.

The drive status code parameter data is shown below.

Drive Good / Bad Status Code Parameter Data

Bit Byte	7	6	5	4	3	2	1	0
0	Drive 1 Status							
1	Drive 2 Status							
2	Drive 3 Status							
3	Drive 4 Status							
4	Drive 5 Status							
5	Drive 6 Status							
6	Drive 7 Status							
7	Drive 8 Status							
8	Drive 9 Status							
9	Drive 10 Status							
10	Drive 11 Status							
11	Drive 12 Status							

Drive 1-12 Status is a user-defined value to indicate the good / bad status of a drive. For example, a 1 could indicate a good drive while a 2 could indicate a bad drive.

10.30.4 Writing to the Echo Buffer to Test SCSI Communication

A 256 byte echo buffer is supported to test communication with the medium changer device.

To write to the echo buffer, set Mode to 2 and Buffer ID to 2.

Buffer Offset can be any value between zero and 255.

Parameter List Length can be any value between one and 256. The sum of Buffer Offset and Parameter List Length cannot exceed 256.

The Echo Buffer parameter list is shown below.

Echo Buffer Parameter Data

Bit Byte	7	6	5	4	3	2	1	0
0 - n	Application Supplied Data							

The data transferred is not defined by this specification and may be selected by the application. After the buffer is written, a Read Buffer command should be used to read the buffer and check its contents. The buffer is maintained when the library system is powered off.

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11. Event History Type and Event Description

The event list is a buffer maintained in the library system's non-volatile memory and used for diagnostic debugging purposes. The Event History Type byte of the Mode Select Library Mode Parameters Page (Section 10.7.1) determines which values will be recorded in the event list. The format of the Event History Type byte is as follows.

Event History Type (see Mode Select Library Mode Parameters Page)

Bit	15	14	13	12	11	10	9	8
	N/A				Rsvd(0)	DriveCAN	MslotCAN	PthruCAN

Bit	7	6	5	4	3	2	1	0
	CmdFilter	SCSI Activity		Terse	Src/Dst	MT	Drive Pwr	Front Panel

The host can set this byte (via the Mode Select command) to specify the types of events to be recorded. The event list can then be examined using the Log Sense command Event History Page (Section 10.6.4).

The fields of the Event History Type byte to set and the corresponding bytes recorded in the event list for these settings are provided below. If the Event History Type byte is equal to zero, no further events will be recorded. This provides a means of retaining a previously recorded sequence of event bytes until they can be analyzed.

For a non-zero Event History Type, the following event bytes will always be recorded.

- FFh, 00h Power-on.
- FFh, 01h SCSI bus or device reset.
- F0h Beginning of medium changer command.
- F1h Beginning of library system initialize and recovery sequence, followed by byte values indicating the particular sequence followed.
- F2h End of library system initialize and recovery sequence.

DriveCAN equals 1 if CAN message activity to the drives is to be recorded.

The following bytes will be recorded for each drive CAN message if this bit is set.

- A1h NNh The second byte indicates the type and destination of the CAN message (it is the LSB of the CAN message id). These two bytes are followed by a (command and data) byte count, and the corresponding command and data bytes.

MslotCAN equals 1 if CAN message activity to the mailslot and magazine elements is to be recorded.

The following bytes will be recorded for each mailslot and magazine CAN message if this bit is set.

- A3h NNh The second byte indicates the type and destination of the CAN message (it is the LSB of the CAN message id). These two bytes are followed by a (command and data) byte count, and the corresponding command and data bytes.

PthruCAN equals 1 if CAN message activity to the pass-through elements is to be recorded.

The following bytes will be recorded for each pass-through CAN message if this bit is set.

- A7h NNh The second byte indicates the type and destination of the CAN message (it is the LSB of the CAN message id). These two bytes are followed by a (command and data) byte count, and the corresponding command and data bytes.

CmdFilter equals 1 if only SCSI commands which effect a change to the library are to be recorded in the Event List. If this bit is set, all Test Unit Ready, Request Sense, Inquiry, Mode Sense, Log Sense,

and Read Element Status commands will not be recorded in the Event List. If this bit is zero, all SCSI commands received will be recorded, subject to the SCSI Activity field and the Terse bit.

SCSI Activity should be set to one of the following:

- 0 No recording of SCSI activity
- 1 Record first byte (byte 0) of command only
- 2 Record all command bytes and all data bytes received by the changer device
- 3 Record first byte of command byte and all message and status bytes

The following bytes will be recorded in the event list for a non-zero SCSI Activity field.

- F3h Non-zero ASC/ASCQ returned to host. This byte is followed by the ASC and ASCQ bytes.
- F4h Non-zero ASC/ASCQ received from drive. This byte is followed by the ASC and ASCQ bytes.

The following bytes will be recorded in the event list, depending upon the setting of the SCSI Activity field. The E5 and E6 values are not recorded if the Terse bit is set to one below.

- E3h One or more message bytes received from host, followed by the message bytes.
- E4h One or more message bytes sent to the host, followed by the message bytes.
- E5h One or more command bytes received from the host, followed only by the first command byte (byte 0).
- E6h One or more command bytes received from the host, followed by a byte count and the command bytes.
- E7h One or more data bytes received from the host, followed by two bytes of byte count (MSB and LSB), and the data bytes.
- E8h A status byte sent to the host, followed by the status byte.

Terse should be set to a bit of one if all bytes specified by the SCSI Activity field are to be recorded except E5 and E6. This bit should only be set for SCSI Activity field settings of 1 or 2. Setting this bit increases the amount of SCSI activity data that may be stored in the list.

Src/Dst equals a bit of one if source and destination element addresses for Position To Element, Move Medium, and Exchange Medium commands; or front panel, Rezero Unit, or power-on cartridge movement operations; are to be recorded, or a bit of zero if no source and destination element addresses are to be recorded. Source and destination element addresses for front panel, Rezero Unit, or power-on cartridge movement operations are preceded by an F7h flag byte. Source and destination element addresses for Position To Element, Move Medium, and Exchange Medium commands are also preceded by an F7h flag byte but only if no command byte was recorded (i.e., if the SCSI Activity field is set to zero).

- F7h A cartridge was moved. The source and destination element addresses follow as described below.

For clarity and to save space in the Event List, drives are logged as D1h, D2h, etc.. Medium transport elements are logged as E1h and E2h. Storage elements less than 200 (C8h) are logged as one byte; and storage element numbers greater than or equal to 200 are logged as two bytes - the first (MSB) being OR'd with FAh. The mailslot is logged as EEh. Magazine slots are logged as two bytes - F9 and then the magazine slot number (1-10).

For example, the following is the event list of an Exchange Medium from ST3 to D1 to ST255:

F0 (E5) A6 (..) 03 D1 FA FF

MT equals a bit of one if the medium transport element used for Position To Element, Move Medium, and Exchange Medium commands is to be recorded, or a bit of zero if the medium transport element is not to be recorded

The MT used is logged as E1h or E2h (for MT1 or MT2, respectively). For the default address of zero used with the Exchange Medium command, E9h is recorded if the exchange begins with MT1 or EAh is

recorded if the exchange begins with MT2. The MT used is recorded after the source and destination element bytes if the Src/Dst bit is also set.

DrivePwr equals a bit of one if flag bytes for drive power cycling are to be recorded.

The following flag bytes are recorded for drive power cycling. The two bytes recorded are followed by a byte indicating the number of the drive effected.

- F5h, 01h Drive power cycled because cartridge did not load into drive
- F5h, 03h Drive power cycled because drive did not become ready after load
- F5h, 04h Drive power cycled because cartridge could not be ejected
- F5h, 05h Drive power removed because drive was taken off-line
- F5h, 06h Drive power applied because drive was brought back on-line
- F5h, 07h Drive power cycled because drive SCSI ID was changed

Front Panel equals a bit of one if events related to front panel functions are to be recorded.

The bytes recorded in the event history list related to front panel functions are as follows:

- F6h, 02h Drive Service mode was entered.
- F7h A cartridge was moved prior to turning off or servicing a drive. The source and destination addresses of the cartridge are recorded in the manner described in the Src/Dst field above. The Src/Dst field must be set to one to record these bytes.
- F8h A magazine was inserted and latched. The magazine number (1) is also recorded.
- F9h A magazine was released. The magazine number (1) is also recorded.
- FEh, 03h The mailslot was opened by the operator.
- FEh, 04h The mailslot was closed by the operator.

12. Error Codes

12.1 Medium Changer Device SCSI Error Codes

The following is a list of error codes returned by a Request Sense command issued to the medium changer device within the library. The codes are listed in ASC, ASCQ order. See the Request Sense command, Section 10.20, for a description of the Sense Key values. Errors listed here with a Sense Key of 04h, hardware error, may also be returned with a Sense Key of 01h, recovered error. This indicates that the command was successful although the library did have some difficulty in completing the command. Recovered errors indicate a possible problem with the library.

Error codes returned by optical drives within the library system are not listed — see the appropriate drive manuals for a description of these errors.

Also listed are the internal error codes associated with the SCSI error returned, and the procedures that a host may use to recover when it has received one of the errors listed here. See Section 12.3 for a list of the internal library error codes, and the G Series User Manual for the cause or corrective action for each code. Refer to the next section for a list of the suggested host error recovery procedures. Not all errors have host recovery procedures. It should be noted that the library system attempts extensive error recovery on its own.

Sense Key	ASC	ASCQ	Error Description	Internal Error	Recovery Procedure
-----------	-----	------	-------------------	----------------	--------------------

02h	04h	01h	Not ready, in process of becoming ready	-	1
02h	04h	80h	Not ready, turning off a drive	-	1
02h	04h	81h	Not ready, beginning drive service	-	1
02h	04h	82h	Not ready, motors are running	-	1
02h	04h	83h	Not ready, library is parked	-	1
02h	04h	84h	Not ready, programming DSP	-	1
02h	80h	2Ch	Mailslot is open	2Ch	18
02h	80h	4Ah	Rear door is open	4Ah	-
04h	44h	00h	Internal target failure	-	-
04h	52h	59h	Unexpected media type at pick	-	-
04h	80h	01h	Flash checksum error	-	21
04h	80h	0Eh	Flash program fail – main controller	0Eh	21
04h	80h	0Fh	Flash program fail – DSP	0Fh	21
04h	80h	1Ah	Drive not installed	1Ah	12
04h	80h	1Dh	Element unexpectedly empty	1Dh	9
04h	80h	1Eh	Element unexpectedly full	1Eh	9
04h	80h	20h	Pick cartridge failure	20h	13
04h	80h	21h	Store cartridge failure	21h	13
04h	80h	23h	Drive not ready	23h	14
04h	80h	24h	Drive load failure	24h	15
04h	80h	25h	Drive unload failure	25h	16
04h	80h	26h	Eject failure	26h	16
04h	80h	29h	SCSI terminator power is low	29h	-
04h	80h	2Bh	Cannot export cartridge	2Bh	17
04h	80h	2Fh	Pivot failure	2Fh	-
04h	80h	32h	Lift position failure	32h	-

Sense Key	ASC	ASCQ	Error Description	Internal Error	Recovery Procedure
04h	80h	33h	Cartridge projecting (lift blocked)	33h	-
04h	80h	35h	Flip failure	35h	-
04h	80h	37h	Flip alignment failure	37h	-
04h	80h	3Bh	Picker position failure	3Bh	9,13
04h	80h	3Ch	Swap picker failure	3Ch	23
04h	80h	3Fh	Picker misposition	3Fh	24
04h	80h	40h	Pivot alignment failure	40h	-
04h	80h	43h	Cannot open mailslot	43h	25
04h	80h	45h	Element scan fail	45h	-
04h	80h	47h	Picker unexpectedly full	47h	29
04h	80h	49h	Bar code reader not installed	49h	-
04h	80h	4Bh	Bar code read fail (failures on multiple cartridges)	4Bh	-
04h	80h	4Eh	Drive not responding	4Eh	-
04h	80h	52h	Cannot close mailslot	52h	25
04h	80h	54h	Bad drive type	54h	-
04h	80h	58h	Mailslot jammed	58h	-
04h	80h	59h	Power supply failure	59h	-
04h	80h	5Ah	Cable connect failure	5Ah	-
04h	80h	5Bh	Fuse overload	5Bh	-
04h	80h	5Ch	Circuit board failure	5Ch	-
04h	80h	5Dh	Drive overheat condition	5Dh	27
04h	80h	5Eh	Drive shutdown due to temperature	5Eh	-
04h	80h	5Fh	Drive shutdown due to fan failure	5Fh	-
04h	80h	62h	Cartridge not a cleaning cartridge	62h	-
04h	80h	63h	Low module fan speed	63h	-
04h	80h	64h	Power supply voltage out of range	64h	-
04h	80h	65h	Main controller board SCSI terminator power	65h	-
04h	80h	66h	Mailslot motor position failure	66h	-
04h	80h	67h	Pass-through motor position failure	67h	-
04h	80h	68h	Mailslot motor position timeout	68h	-
04h	80h	69h	Pass-through motor position timeout	69h	-
04h	80h	70h	Communications timeout with DSP	70h	-
04h	80h	71h	CAN communications timeout with drive board	71h	-
04h	80h	72h	CAN communication timeout with mailslot board	72h	-
04h	80h	73h	CAN communications timeout with magazine board	73h	-
04h	80h	74h	CAN communications timeout with pass-through board	74h	-
04h	80h	75h	Failed to isolate drive module SCSI bus	75h	-
04h	80h	76h	Too few power supplies for number of drives supported	76h	-
04h	80h	78h	Mailslot not installed	78h	-
04h	80h	80h	Magazine not installed	80h	-
04h	80h	81h	Magazine not latched	81h	-
04h	80h	84h	Magazine release failure	84h	-
04h	80h	90h	Flip offset failure	90h	-
04h	80h	91h	Pick offset failure	91h	-
04h	80h	92h	Lift offset failure	92h	-
04h	80h	93h	Pivot offset failure	93h	-
04h	80h	94h	Target offset failure	94h	-
04h	80h	95h	Reference offset failure	95h	-
04h	80h	96h	Mailslot linear offset failure	96h	-
05h	1Ah	00h	Parameter list length error	-	2

Sense Key	ASC	ASCQ	Error Description	Internal Error	Recovery Procedure
05h	20h	00h	Invalid command operation code	-	2
05h	21h	01h	Invalid element address	-	2
05h	24h	00h	Invalid field in CDB	-	2
05h	25h	00h	Logical Unit not supported	-	3
05h	26h	00h	Invalid field in parameter list	-	4
05h	28h	01h	Import or export element accessed	-	5
05h	2Ch	00h	Command sequence error (data blocks out of order)	-	19
05h	3Bh	0Dh	Medium destination element full	1Ch	9
05h	3Bh	0Eh	Medium source element empty	1Bh	9
05h	52h	5Ah	Cartridge Error: MO cartridge/UDO drive	28h	-
05h	52h	60h	Cartridge Error: UDO cartridge/MO drive	29h	-
05h	53h	02h	Medium removal prevented	2Dh,82h	11
05h	80h	55h	Drive address conflict	55h	26
05h	81h	03h	Download checksum error	-	-
05h	86h	00h	Transport element full	1Fh	29
06h	28h	00h	Not ready to ready transition (door closed)	-	9
06h	29h	00h	Power-on, Reset, or Bus Device Reset occurred	-	6
06h	2Ah	00h	Log Parameters changed	-	7
06h	2Ah	01h	Mode parameters changed	-	8
06h	3Bh	14h	Magazine inserted and latched	-	20
06h	3Bh	15h	Magazine released	-	20
06h	3Fh	01h	Microcode has changed	-	10
06h	80h	6Ch	Start of drive service	6Ch	10
06h	80h	6Dh	End of drive service	6Dh	10
06h	80h	6Eh	Switch to alternate MTA	6Eh	10
06h	80h	6Fh	Switch to primary MTA	6Fh	10
06h	81h	00h	Component failure	-	-
06h	81h	01h	Power supply installed	-	-
06h	81h	02h	Power supply removed	-	-
0Bh	4Eh	00h	Overlapped commands	-	-

12.2 Medium Changer Device Error Host Recovery Procedures

The following is a list of procedures that a host could use to recover from the SCSI errors listed in the previous section. In some, if not most cases, no action taken by the host will cause full recovery to take place and the G Series User Manual should be consulted to determine the ultimate cause or corrective action to be taken to rectify the problem. Many situations call for operator intervention.

Procedure	Description
1	Wait a few seconds and then retry command.
2	Examine command block for errors. Sense data identifies offending byte and field.
3	Examine command block or Identify message for non-zero LUN value.
4	Examine parameter list for errors. Sense data identifies offending byte and field.
5	Use Mode Select command enable magazine or mailslot, or do not reference disabled magazine or mailslot.
6	Determine cause of reset, reselect mode parameters not previously saved, and resubmit command.
7	Issue Log Sense, if desired, to obtain log parameters changed via front panel or by another host, and then resubmit original command.
8	Issue Mode Sense, if desired, to obtain mode parameters changes via front panel or by another host, and then resubmit original command.
9	Issue Initialize Element Status and Read Element Status commands to reinventory library.
10	No error - reissue command.
11	Wait for other host to issue Prevent/Allow Medium Removal command to allow access to magazine or mailslot or issue Bus Device Reset to changer device, and retry command.
12	Restore drive using the Restore Drive Pair command, or turn on drive using the Mode Select drive assignments page, and then retry command.
13	Issue Position to Element command to any storage element with the Invert bit set. This causes the transport element to be placed in the flipped position. Retry the move or exchange command. If this does not work, specify a transport element address other than 0 in the move or exchange command. Use the medium transport element not active at the time that the error occurred. The medium transport element that was active is identified in the Request Sense return data. Note: specifying a non-zero transport element address in the Exchange Medium command may allow the library to operate but at reduced performance.
14	Reload drive by issuing a Move Medium command with the drive as the source and destination address. If this does not work, load the drive and then use the Mode Select command, Drive Assignments Page, to first power-off the drive and then, after a few seconds, to power-on the drive again. Wait a few seconds before issuing a Test Unit Ready to the drive to check for ready status.
15	Specify a non-zero transport element address in the move or exchange command. Use the medium transport element not active at the time that the error occurred. The medium transport element that was active is identified in the Request Sense return data. If this does not work, issue the Initialize Element Status/Initialize Single Element and Read Element Status commands to reinventory the drive. If the drive is truly empty, issue the Mode Select command with the Drive Assignments page to cycle power to the drive as in procedure 14 and then reinventory the drives.
16	Issue the Initialize Element Status/Initia and Read Element Status commands to reinventory the drives. If the drive is truly full, issue the Mode Select command with the Drive Assignments page to cycle power to the drive as in procedure 14 and then reinventory the drive.
17	If Rezero Unit command, move cartridges from medium transport elements and drives before issuing command, or set Limited Recovery flag using Mode Select command before issuing command. If not Rezero Unit, move one or more cartridges from magazine and then retry command.
18	Issue Open/Close Mailslot command to close the mailslot and then retry command.
19	When using Write Buffer commands to download firmware, make sure that the firmware packets as defined by the Buffer Offset and Transfer Length fields are contiguous.
20	Issue Read Element Status commands referencing changed magazine slots to update host inventory. Possibly load new cartridges into drives to read contents.

Procedure	Description
21	Redownload Flash firmware to library using Write Buffer commands, and repeat failing command.
23	Specify a non-zero transport element address in the move or exchange command. Use the medium transport element active at the time that the error occurred. The medium transport element that was active is identified in the Request Sense return data. Note: specifying a non-zero transport element address in the Exchange Medium command may allow the library to operate but at reduced performance.
24	Issue a Rezero Unit command and then retry the original command.
25	Wait a few seconds and then retry command.
26	Issue a Mode Sense command with the Drive Assignments page to determine the SCSI ID's of on-line drives and then issue the Mode Select command with the same page to set the SCSI ID of the drive to be powered-on to a non-conflicting address (and non-conflicting with the medium changer device if on the same SCSI bus). Finally, issue a Mode Select command with the same page to power-on the drive.
27	Decrease drive read/write activity until cabinet temperature has cooled down significantly. Use the Mode Select command to power-down unused drives. The internal cabinet temperature can be read using the Mode Sense command.
29	Use the Move Medium command to move the cartridge out of the medium transport element.

12.3 Internal Error Codes

The following error codes are stored in the library system error log and error statistics buffers and are returned by the Log Sense command. For more information about the causes and corrective actions for these errors, refer to the G Series User Manual.

Error Code	Error Description
01h	Flash checksum failure
02h	NV RAM failure
07h	SCSI chip failure
0Ah	Bad element code
0Ch	Operation stack overflow
0Dh	Bad operation stack index
0Eh	Flash program fail - main controller
0Fh	Flash program fail - DSP
1Ah	Drive not installed
1Bh	Source is empty
1Ch	Destination is full
1Dh	Element unexpectedly empty
1Eh	Element unexpectedly full
1Fh	Picker is full
20h	Pick cartridge failure
21h	Store cartridge failure
22h	Drive not connected
23h	Drive not ready
24h	Drive load failure
25h	Drive unload failure
26h	Eject failure
29h	SCSI terminator power is low
2Bh	Cannot export cartridge
2Ch	Mailslot is open
2Dh	Medium removal is prevented
32h	Lift position failure
33h	Cartridge projecting from slot or drive
35h	Flip failure
37h	Flip alignment failure

Error Code	Error Description
3Bh	Picker position failure
3Ch	Swap picker failure
3Fh	Picker misposition
40h	Pivot alignment failure
43h	Cannot open mailslot
44h	Picker not at drive
45h	Element scan fail
49h	Bar code reader not installed
4Ah	Rear access door is open
4Bh	Bar code read fail (failures on multiple cartridges)
4Eh	Drive not responding
52h	Cannot close mailslot
54h	Bad drive type
55h	Drive address conflict
58h	Mailslot jammed
59h	Power supply failure
5Ah	Cable connect failure
5Bh	Fuse overload
5Ch	Circuit board fail
5Dh	Drive overheat condition
5Eh	Drive shutdown due to temperature
5Fh	Drive shutdown due to fan failure
62h	Cartridge not a cleaning cartridge
63h	Low module fan speed
64h	Power supply voltage out of range
65h	Main controller board SCSI terminator power
66h	Mailslot motor position failure
67h	Pass-through motor position failure
68h	Mailslot motor position timeout
69h	Pass-through motor position timeout
70h	Communication timeout with DSP
71h	CAN communications timeout with drive board
72h	CAN communication timeout with mailslot board
73h	CAN communication timeout with magazine board
74h	CAN communication timeout with pass-through board
75h	Failed to isolate drive module SCSI bus
76h	Too few power supplies for number of drives supported
78h	Mailslot not installed
80h	Magazine not installed
81h	Magazine not latched
82h	Magazine release prevented
84h	Magazine release failure
90h	Flip offset failure
91h	Pick offset failure
92h	Lift offset failure
93h	Pivot offset failure
94h	Target offset failure
95h	Reference offset failure
96h	Mailslot linear offset failure
F7h	SCSI parity error
F9h	Abort message received
FDh	Host communication timeout (host stopped handshaking)

12.4 Internal Error Context Codes

The following error context codes are stored in the library system error log and are returned by the Log Sense command.

Context	Description
1	Powering up library and drives
2	Initializing library
3	Positioning to pick from source element
4	Picking from source element
5	Positioning to pick from destination element
6	Picking from destination element
7	Positioning to store to destination element
8	Storing to destination element
9	Positioning to store to destination 2 element
10	Storing to destination 2 element
11	Positioning to element
12	Checking element for media
13	Scanning bar codes
14	Opening mailslot
15	Closing mailslot
16	Sending pass-through
17	Recalling pass-through
18	Programming Flash
19	Setting offsets

12.5 Examining Errors

After processing a command, the medium changer device or optical drive will normally return GOOD completion status or CHECK CONDITION status. If the host receives CHECK CONDITION status, it should issue a Request Sense command. The Sense Key field can then be examined to see if an error occurred and, if so, the severity of the error. The Additional Sense Code (ASC) and Additional Sense Code Qualifier (ASCQ) fields provide more information about the error or condition that triggered the CHECK CONDITION. Depending upon the Allocation Length specified in the Request Sense command, more information about the error will also be returned. The error codes listed in this manual are for the medium changer device only. Consult the specific optical drive manual for information about errors returned by the drives themselves.

12.6 Drive Temperature and Low Fan Speed Warnings

If, during normal operation conditions, one or more drives are found to be overheating or their modules have experienced a significant drop in fan speed, a drive warning Unit Attention will be generated.. If the host receives this notification, it should stop reading from or writing any cartridges in those drives and unload those cartridges. If the drives continue to overheat or the fan speeds drops further, a drive shutdown Unit Attention condition will be generated. After 60 seconds, the drives will automatically be powered down. Since both drives in a drive module share temperature and fan speed sensors, both drives will be shut down at the same time (however, only one Unit Attention will be generated). At this point, the drives are disconnected from the SCSI bus and a third Unit Attention condition will be generated indicating that drives have been placed in the service state. To restore the drives to service, use the Restore Drives menu selection on the front panel or the Restore Drive Pair SCSI command.

The current state of any drive can be obtained by issuing a Read Element Status using the drive element address. The Additional Sense Code and Additional Sense Code Qualifier fields in the data transfer element descriptor identify the current normal/warning/or shutdown state of the drive. These fields should be examined in every data transfer element descriptor after being notified of any drive-related Unit Attention condition.

13. Appendix A – UDO2 Integration

13.1 Introduction

The purpose of this section is to outline recommendations for implementing support for UDO2 drives and media. The Plasmon libraries support a field upgrade to UDO2 drives and media. Additionally, a mix of UDO1 and UDO2 is allowed by the Plasmon G Series libraries. Plasmon software connectivity partners (i.e. ISVs) will want to give consideration to whether they will support upgraded configurations with a mix of UDO1 and UDO2 drives and media.

The following table defines the compatibility between UDO1 and UDO2 media and drives:

UDO Media and Drive Compatibility Table

Media Type	UDO1 Media			UDO2 Media		
	RW	WO	CW	RW	WO	CW
UDO1 Drive	R-W	R-W	R-W-S	NS	NS	NS
UDO2 Drive	R	R	R-S	R-W	R-W	R-W-S

Legend: RW-Rewriteable WO-WriteOnce CW-Compliant WriteOnce
R-Read, W-Write, S-Shred NS-Not Supported

Customers who currently have UDO1 drives may not have filled all their UDO1 media when they upgrade to UDO2 drives. Hence, supporting a mixed drive environment where UDO1 media can be written by UDO1 drives is desirable. Once all UDO1 media is filled, a decision can be made to switch all drives to UDO2.

13.2 Suggested Implementation

The G-Enterprise libraries will accept UDO2 drives. UDO1 and UDO2 media must be loaded into an available UDO2 drive by the ISV software to detect whether it is UDO1 or UDO2 media. Once established, it is required that the ISV software maintain information on the drive types and media types for future use. Then, based on the above UDO Media and Drive Compatibility Table the appropriate drive can be selected to provide the appropriate functionality required for the media type.

The following is the required strategy for managing a mixed UDO1 and UDO2 drive and media environment:

Establishing Drive Type (UDO1 or UDO2)

1. Detect the drive type of each drive by issuing a SCSI Mode Sense Command Drive Assignment Page (22h) to the Plasmon library. The drive type field for each drive will report UDO1 or UDO2. A drive type value of 0x1E will indicate UDO1 and a drive type value of 0x3C will indicate UDO2.

Establishing Media Type (UDO1 or UDO2)

1. All media introduced to the system with an unknown media type should be placed in an available UDO2 drive to establish whether it is UDO1 or UDO2 media.
2. Detect the media type by issuing a SCSI Mode Sense Command to the UDO2 drive while the media is loaded. The Density Code, byte 0 of the Mode Sense Block Descriptor, will be 0 for UDO1 media and 1 for UDO2 media.
3. If UDO2 media is loaded into a UDO1 drive, media access commands will return an error: Incompatible cartridge (0x3/0x30/0x0), The ID hole locations of the cartridge are invalid.

Process for Managing Mixed Drive and Media

The ISV software maintains the drive type in some type of tracking system (e.g. database) and establishes/verifies each time the system is restarted to insure the drive type has not changed. See “Establishing Drive Type”.

Media introduced to the library via the mailbox will have its media type determined by initially loading it into a UDO2 drive. The media type will be stored in a tracking system (e.g. database) for future reference when media must be accessed. See “Establishing Media Type”.

All UDO1 media that can be written (either RW or WORM that is not filled) will be loaded into UDO1 drives to accommodate either reading or writing. Any UDO1 media which is read-only or shred-able, can be loaded into either UDO1 or UDO2 drives.

UDO2 media should only be loaded into UDO2 drives. The inadvertent insertion of UDO2 media into a UDO1 drive will illicit a drive check condition (0x03-0x30-0x00, Incompatible Cartridge (Medium Error)). The ISV application should as contingency implement a recovery process in case this event occurs.

It should also be noted that the issuance of a RES (Read Element Status) command will only return a media type as either UDO or MO, *i.e.* both UDO1 and UDO2 media are considered UDO type media.

