THE PLASMON *INFINITY*

LD 6100 LASERDRIVE®

LF 6600 RAPIDCHANGER™

LF 6602 RAPIDCHANGER™

HIGH-PERFORMANCE OPTICAL DISK DRIVE AND AUTOCHANGERS

SCSI INTERFACE SPECIFICATION

P/N 97653978 H

Plasmon

New features and changes to information in this document are indicated by change bars. Revision level is indicated by the letter following the eight-digit document number. If a document has undergone major modifications, change bars will not be inserted in the document.

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SCOPE

This document describes the physical and functional characteristics of the Small Computer System Interface (SCSI) for the LaserDrive (LD) 6100, the LaserFile (LF) 6600 RapidChanger and the LF 6602 RapidChanger. The specification is provided for users, system integrators and managers of information systems.

NOTE

The word "LaserDrive", as used in this document, refers to the LD 6100, LF 6600 and the LF 6602. If a feature applies specifically to the LD 6100, LF 6600 or LF 6602, then the appropriate model number is used.

The LD 6100 is a single-cartridge optical disk drive; the LF 6600 RapidChanger is an optical disk drive with an integral six-cartridge shuttle; the LF 6602 consists of two LF 6600 drives enclosed in a cabinet.

The LaserDrive is a write once, read many times (WORM) device used for long-term storage of data. It has a user storage capacity of 12 GBytes per double-sided cartridge. Comprehensive error correction and recovery capabilities are incorporated for maintaining data integrity. Media management, including error recovery, is transparent to the host.

The LaserDrive's integrated controller interfaces with other SCSI devices and a host system via SCSI.

RELATED PUBLICATIONS

The following Plasmon LMS publications pertain to this document:

LM 6000 Media Product Specification	97647044
LD 6100/LF 6600/LF 6602 Product Specification	97653977
LD 6100 Hardware Maintenance Manual	97653979
LF 6600/LF 6602 Hardware Maintenance Manual	97653980
LD 6100 User Manual	97654437
LF 6600 User Manual	97653976
LF 6602 User Manual	97654438

External reference cited in this specification:

American National Standards Institute (ANSI) - Small Computer Systems Interface (SCSI-2) Specification American National Standards Institute, New York, NY	X3.131- 1994

GENERAL DESCRIPTION

The Small Computer System Interface (SCSI) standard defines an input/output bus for interconnecting computers and peripheral devices. SCSI is a local I/O bus that can be operated over a wide range of data rates. The primary objective of SCSI is to provide system integrators with an easy to use, reliable, industry-standard peripheral device interface. Other objectives include provision for device independence and interoperability and to move device-dependent intelligence out to the peripherals.

NOTE

The word "LaserDrive", as used in this document, refers to the LD 6100, the LF 6600 and the LF 6602. If a feature applies specifically to a configuration, then the appropriate model number is used.

The interface uses logical rather than physical addressing for all data blocks. The LaserDrive implements SCSI commands that facilitate the writing of self-configuring software drivers that can "discover" all necessary attributes without prior knowledge of specific peripheral characteristics (such as storage capacity).

The SCSI protocols include provisions for the connection of multiple initiators and multiple targets. SCSI bus arbitration is supported by the LaserDrive.

SCSI defines a message protocol for control of the interface. These messages allow the peripherals and the host adapters to manage the use of the SCSI bus. In most cases, messages are not directly apparent to the host computer software.

There are two electrical interface alternatives: single ended and differential. Single-ended and differential devices are electrically different and cannot be mixed on the same bus. The single-ended configuration supports cable lengths of up to 6 m (19.5 ft). The differential driver option supports cable lengths of up to 25 m (82 ft).

NOTE

Plasmon LMS does not recommend single-ended fast synchronous.

The LaserDrive implements all mandatory and extended set commands in the American National Standards Institute (ANSI) Small Computer Systems Interface (SCSI-2), specification X3.131-1994, defined for write once read many times (WORM) devices and many of the optional commands. The LaserDrive supports one Logical Unit Number (LUN) - LUN 0 only - on the SCSI bus.

SCSI Bus Parity generation is always performed and parity checking is selectable. This device implements the "hard" reset option. Reservation queuing is not supported.

The LF 6600 and LF 6602 implement all of the commands implemented by the LD 6100. Additionally, the LF 6600 and LF 6602 implement commands which control and report status of the shuttle. These additions are noted throughout this document.

LASER-DRIVE SCSI CHARACTERISTICS

This section discusses physical characteristics and logical architecture of SCSI as applied to the LaserDrive. For general information concerning SCSI, refer to the ANSI SCSI document, X3.131-1994.

COMMAND TIMEOUT

Command timeout values are dependent on the command being executed. A value of 60 sec is adequate for all commands except for those listed in the following table. The values listed in the table should be used with the command length field in the CDB (bytes 7 and 8) to calculate an adequate timeout when more than 60 sec is required. These nominal values are only guidelines and do not represent transfer rates. Actual time-out values may significantly change due to hardware and media conditions.

COMMAND TYPE	TIMEOUT VALUE
Media Scan Command	3200 blocks/sec(1)
Read Commands	1000 blocks/sec(2)
Send Diagnostic Command	15 min.
Verify Commands	1200 blocks/sec(2)
Write Commands	1150 blocks/sec(2)
Write/Verify Commands	400 blocks/sec(2)

(1)This value was measured for a sequential scan of a completely blank media surface. Overhead was added for processing and media management.

(2)These values do not include Map Read times.

SCSI BUS CONDITIONS

The SCSI bus has two asynchronous conditions: ATTENTION and RESET. These conditions cause the LaserDrive to perform certain actions and can alter the phase sequence.

ATTENTION CONDITION

The ATTENTION condition allows an Initiator to inform the LaserDrive that the Initiator has a message ready. The LaserDrive receives this message by performing a MESSAGE OUT phase.

The Initiator creates the ATTENTION condition by asserting ATTN at any time except during the ARBITRATION or BUS FREE phases.

The Initiator should assert the ATTN signal before releasing ACK for the last byte transferred in a bus phase so the ATTENTION condition can be honored before a transition to a new bus phase. An ATTN asserted later might not be honored until a later bus phase and then may result in an unexpected action. The LaserDrive responds with MESSAGE OUT phase as follows:

1) If ATTN occurs during a COMMAND phase, MESSAGE OUT occurs after transfer of all Command Descriptor Block (CDB) bytes.

2) If ATTN occurs during a DATA phase, MESSAGE OUT will occur at the LaserDrive's convenience at a logical block boundary. The Initiator must continue REQ/ACK handshakes until it detects the phase change. Normally, DATA phase transfers are controlled by the LaserDrive SCSI processor; however, once Attention is asserted, the REQ/ACK handshake is controlled by firmware. Therefore, to ensure maximum performance, the Initiator should assert Attention during the last ACK of a logical block transfer.

3) If ATTN occurs during a STATUS phase, the MESSAGE OUT shall occur after the status byte has been acknowledged by the Initiator.

4) If ATTN occurs during a MESSAGE IN phase, MESSAGE OUT phase shall occur after the current MESSAGE IN byte has been acknowledged by the Initiator.

5) If ATTN occurs during a SELECTION phase and before the Initiator releases the BSY signal, MESSAGE OUT shall occur immediately after that SELECTION phase.

6) If ATTN occurs during a RESELECTION phase, MESSAGE OUT shall occur after the LaserDrive has received an ACK for its IDENTIFY message for that RESELECTION phase.

The Initiator must keep ATTN asserted if more than one byte is to be transferred. The Initiator may negate the ATTN signal at any time; however, it shall not negate the ATTN signal while the ACK signal is asserted during a MESSAGE OUT phase. Normally, the Initiator negates ATTN while REQ is true and ACK is false during the last REQ/ACK handshake of the MESSAGE OUT phase.

RESET CONDITION

The RESET condition is used to immediately clear all SCSI devices on the bus. This condition takes precedence over all other phases and conditions. Any SCSI device may create the RESET condition by asserting RST for a minimum of a reset hold time. During the RESET condition, the state of all SCSI bus signals other than RST is not defined.

The LaserDrive does not create the RESET condition and never asserts the RST signal.

All SCSI devices will release all SCSI bus signals (except RST) within a bus clear delay of the transition of RST to true. The BUS FREE phase always follows the RESET condition.

The ANSI SCSI standard defines two alternative responses by a Target to a RESET condition. The LaserDrive implements hard reset handling. Upon detection of the RESET condition, the LaserDrive:

1) Clears all incomplete commands

2) Releases all SCSI device reservations

3) Returns any SCSI device operating modes (such as MODE SELECT and PREVENT/ALLOW MEDIA REMOVAL commands) to their saved or default conditions, whichever is appropriate.

4) Ensures that UNIT ATTENTION condition is set for all Initiators

MESSAGE SYSTEM SPECIFICATION

The message system allows communication between an Initiator and the LaserDrive for the purpose of interface management.

MESSAGE PROTOCOL

The LaserDrive implements the mandatory SCSI messages.

The first message sent by the Initiator after the SELECTION phase shall be either the IDENTIFY, ABORT or BUS DEVICE RESET message. The IDENTIFY message establishes the physical path for a particular logical unit specified by the Initiator. After the RESELECTION phase, the LaserDrive's first message is IDENTIFY. This allows the physical path to be re-established for the LaserDrive specified logical unit number. Only one logical unit number can be identified for any one selection sequence; a second IDENTIFY message with a new logical unit number must not be issued before the SCSI bus has been released (BUS FREE phase). The treatment of other logical unit addressing errors is described in the Messages section.

All Initiators shall support the mandatory messages as indicated in the "Initiator Support" column of Table 1. The LaserDrive supports messages as indicated in the Sends and Accepts columns of Table 1.

Whenever a physical path is established in an Initiator that is utilizing disconnection and reconnection, the Initiator shall ensure that the active pointers of the physical path are equal to the saved pointers for that particular logical unit number. An implied restore pointers operation occurs as a result of a reselection.

The LaserDrive will respond with a message reject message to messages with a "No" in the Drive Accepts column. Messages that are not applicable "N.A.", are referred to as inappropriate messages. The LaserDrive will terminate the command and report an Inapplicable/Inappropriate Message Error, if a Request Sense Command is the next command sense.

MESSAGES

The messages supported by the LaserDrive are listed in the following paragraphs along with their code values and definitions.

Command Complete 00H

This message is sent from the LaserDrive to an Initiator to indicate that the execution of a command has terminated and that valid status has been sent to the Initiator. After successfully sending this message, the LaserDrive goes to the BUS FREE phase by releasing BSY. The LaserDrive considers the message transmission to be successful when it detects the negation of ACK for the COMMAND COMPLETE message with the ATTN signal false.

NOTE

The command may have been executed successfully or unsuccessfully as indicated in the status.

Extended Message 01H

This message is sent from either the Initiator or the LaserDrive as the first byte of a multiple-byte message. The LaserDrive supports only the SYNCHRONOUS DATA TRANSFER REQUEST (SDTR) extended messages. Refer to the SDTR message section.

Table 1. Message Codes

HEX CODE	DESCRIPTION	DIRECTION	DRIVE SENDS	DRIVE ACCEPTS	INITIATOR SUPPORT
00	COMMAND COMPLETE	In	Yes	N.A.	M
01	EXTENDED MESSAGE(1)	In Out	Yes	Yes	--
02	SAVE DATA POINTER	In	Yes	N.A.	0(2)
03	RESTORE POINTERS	In	Yes	N.A.	0(3)
04	DISCONNECT	In Out	Yes	No	0(2)
05	INITIATOR DETECTED ERROR	Out	N.A.	Yes	0
06	ABORT	Out	N.A.	Yes	0
07	MESSAGE REJECT	In Out	Yes	Yes	0(3)
08	NO OPERATION	Out	N.A.	Yes	0(4)
09	MESSAGE PARITY ERROR	Out	N.A.	Yes	0(4)
0A	LINKED COMMAND COMPLETE	In	No	N.A.	--
0B	LINKED COMMAND COMPLETE WITH FLAG	In	No	N.A	--
0C	BUS DEVICE RESET	Out	N.A.	Yes	0
0D	ABORT TAG	Out	N.A.	No	--
0E	CLEAR QUEUE	Out	N.A.	No	--
0F	INITIATE RECOVERY	In Out	No	No	--
10	RELEASE RECOVERY	Out	N.A.	No	--
11	TERMINATE I/O PROCESS	Out	No	Yes	0
12 - 1F	RESERVED	-- --	No	N.A.	--
20	SIMPLE QUEUE TAG	In Out	No	No	0
21	HEAD OF QUEUE TAG	Out	No	No	0
22	ORDERED QUEUE TAG	Out	No	No	0
23	IGNORE WIDE RESIDUE	In	No	N.A.	0
24 - 2F	RESERVED FOR 2-BYTE MESSAGE	--	No	No	--
30 - 7F	RESERVED	--	No	N.A.	--
80 - FF	IDENTIFY	In Out	Yes	Yes	0(2)(3)

Key: M = Mandatory Support; In = LaserDrive to Initiator; 0 = Optional Support; Out = Initiator to LaserDrive; N.A. = Not Applicable

Initiator support of the indicated messages is required if any of the following SCSI features are to be used.

(1)Synchronous Data Transfer Request only

(2)SCSI Bus Disconnect/Reconnect

(3)Data Transfer Retries

(4)All message system activity, including the features listed in these notes

Save Data Pointer 02H

This message is sent from the LaserDrive to direct the Initiator to save a copy of the present active data pointer for the currently attached logical unit.

Restore Pointers 03H

This message is sent from the LaserDrive to direct the Initiator to restore the most recently saved pointers (for the currently attached logical unit) to the active state. Pointers to the command, data and status locations for the logical unit shall be restored to the active pointers. Command and status pointers shall be restored to the beginning of the present command and status areas. The data pointer shall be restored to the value at the beginning of the data area in the absence of a SAVE DATA POINTER message or to the value at the point at which the last SAVE DATA POINTER message occurred for that logical unit.

Disconnect 04H

This message is sent from the LaserDrive to inform an Initiator that the present physical path is going to be broken (the LaserDrive plans to disconnect by releasing BSY), but that a later reconnect will be required in order to complete the current operation. This message shall not cause the Initiator to save the data pointer. After successfully sending this message, the LaserDrive goes to the BUS FREE phase by releasing BSY. The LaserDrive considers the message transmission to be successful when it detects the negation of ACK for the DISCONNECT message with the ATTN signal false.

NOTE

The LaserDrive will always send a SAVE DATA POINTER before each DISCONNECT message.

Initiator Detected Error 05H

This message is sent from an Initiator to inform the LaserDrive that an error (e.g., parity error) has occurred that does not preclude the LaserDrive from retrying the operation. Although present pointer integrity is not assured, a RESTORE POINTERS message shall cause the pointers to be restored to their defined prior state.

Abort 06H

This message is sent from the Initiator to the LaserDrive to clear the current operation. If a logical unit has been identified, all pending data and status for the issuing Initiator from that logical unit is cleared, and the LaserDrive goes to the BUS FREE phase. If a command from the Initiator is in progress, the LaserDrive creates sense data indicating an ABORTED COMMAND Sense Key. Pending data and status for other Initiators is not cleared. If a logical unit has not been identified, the LaserDrive goes to the BUS FREE phase. No status or ending message shall be sent for the operation.

It is not an error to issue this message to a logical unit that is not currently performing an operation for the Initiator.

Message Reject 07H

This message is sent from either the Initiator or the LaserDrive to indicate that the last message it received was inappropriate or has not been implemented.

In order to indicate its intentions of sending this message, the Initiator asserts the ATTN signal prior to its release of ACK for the REQ/ACK handshake of the message that is to be rejected. If the LaserDrive receives this message under any other circumstance, it rejects this message.

When the LaserDrive sends this message, it will change to MESSAGE IN phase and send this message prior to requesting additional message bytes from the Initiator. This provides an interlock so that the Initiator can determine which message is rejected.

No Operation 08H

This message is sent from an Initiator in response to the LaserDrive's request for a message when the Initiator does not currently have any other valid message to send.

Message Parity Error 09H

This message is sent from the Initiator to the LaserDrive to indicate that one or more bytes in the last message it received had a parity error.

In order to indicate its intentions of sending this message, the Initiator asserts the ATTN signal prior to its release of ACK for the REQ/ACK handshake of the message that has the parity error. This provides an interlock so that the LaserDrive can determine which message has the parity error.

If the LaserDrive receive this message under any other circumstance, it will signal a catastrophic error condition by releasing the BSY signal without any further information transfer attempt. Should this occur during the course of a command, the LaserDrive will create sense data with the ABORTED COMMAND Sense Key and an error code of Inappropriate Message Error.

Device Reset 0CH

This message is sent from an Initiator to direct the LaserDrive to clear all current commands on that SCSI device. This message forces the SCSI device to an initial state with no operations pending for any Initiator. Upon recognizing this message, the LaserDrive shall go to the BUS FREE phase.

Terminate I/O Process 11H

This message is sent from the Initiator to the LaserDrive to advise the LaserDrive to terminate the current I/O process without corrupting the media. Upon successful receipt of this message and after emptying the LaserDrive data buffer, the LaserDrive will terminate the I/O process and return a COMMAND TERMINATED status. The sense key will be set to NO SENSE and the additional sense code and qualifier will be set to I/O PROCESS TERMINATED.

Only commands that have data transfers associated with them will accept the TERMINATE I/O PROCESS message. The valid bit will be set to one and the information field will be set as follows:

1) If the command descriptor block specifies an allocation length or parameter list length in bytes, the information field will be set to the difference (residue) between the transfer length and the number of bytes transferred.

2) If the command descriptor block specifies a transfer length field, the information field will be as defined in the REQUEST SENSE command. The LaserDrive ignores the Terminate I/O Process message and terminates current I/O commands when any error is detected while emptying it's data buffer on a write, or when an internal controller error occurs. Current I/O commands are terminated with the appropriate error status and sense data for the error condition.

   The LaserDrive ignores the TERMINATE I/O PROCESS message and terminates the command in a normal manner, if the LaserDrive completes all processing (i.e. all data has been transferred to or from the Initiator) for the command and a TERMINATE I/O PROCESS message is received.

   If the LaserDrive receives a TERMINATE I/O PROCESS message before or during the Command Phase, the LaserDrive will set the valid bit in the sense data to zero and terminate the I/O process with COMMAND TERMINATED status. The sense key will be set to NO SENSE and the additional sense code and qualifier will be set to I/O PROCESS TERMINATED.

Identify 80H to FFH

These messages are sent by either the Initiator or the LaserDrive to establish the physical path connection between an Initiator and the LaserDrive for a particular logical unit. The logical unit number addresses one of up to eight physical or virtual devices attached to the LaserDrive as indicated in the following bit definitions.

Bit 7 This bit shall be set to one to distinguish these messages from other messages.

Bit 6 This bit is set to one by the Initiator to grant the LaserDrive the permission to initiate disconnection. If this bit is zero, the LaserDrive shall not disconnect.

Bits 5-3 Reserved

Bits 2-0 These bits specify a logical unit number in the LaserDrive.

Only one logical unit number shall be identified for any one selection sequence; a second IDENTIFY message with a new logical unit number shall not be issued before the bus has been released (BUS FREE phase). The Initiator may send one or more IDENTIFY messages during a selection sequence. However, the logical unit number in any additional IDENTIFY messages shall be the same as the logical unit number specified in the first IDENTIFY message sent by the Initiator. The LaserDrive can support logical unit number 0.

When sent from the LaserDrive to an Initiator during reconnection, an implied RESTORE POINTERS message shall be performed by the Initiator prior to completion of this message.

SYNCHRONOUS DATA TRANSFER REQUEST MESSAGE

A SYNCHRONOUS DATA TRANSFER REQUEST (SDTR) message exchange should be initiated by the initiator whenever a previously arranged data transfer agreement may have become invalid (refer to Table 2). Examples of the agreement becoming invalid are:

- after a hard reset condition
- after a BUS DEVICE RESET message
- after a power cycle
- after any condition which may leave the data transfer agreement in an indeterminate state

In addition, an Initiator may initiate an SDTR message exchange whenever it desires to negotiate a new data transfer agreement (either synchronous or asynchronous). SCSI devices that are capable of synchronous data transfers must not respond to an SDTR message with a MESSAGE REJECT message.

Table 2. Synchronous Data Transfer Request

BYTE	VALUE	DESCRIPTION
0	01H	Extended Message
1	03H	Extended Message Length
2	01H	SYNCHRONOUS DATA TRANSFER REQUEST Code
3	m	Transfer Period Factor
4	15 max	REQ/ACK Offset (0H - 0FH)

The SDTR message exchange establishes the permissible transfer periods and the REQ/ACK offsets for all logical units on the two devices.

The transfer period factor times 4 is the transfer period.

The transfer period is the minimum time allowed between leading edges of successive REQ pulses and of successive ACK pulses to meet the LaserDrive requirements for successful reception of data. The minimum transfer period is 25 or 100 nsec. The maximum transfer period is 193 or 772 nsec. Values outside of this range will be truncated to the nearest range value. All transfer periods are rounded up to the next increment of 25 nsec (e.g., 104 nsec is rounded up to 125 nsec and 772 nsec is rounded up to 775 nsec).

The REQ/ACK offset is the maximum number of REQ pulses allowed to be outstanding before the leading edge of the first corresponding ACK pulse is received at the LaserDrive. This value is chosen to prevent overflow conditions in the device's reception buffer and offset counter. The maximum REQ/ACK offset is 0FH. A REQ/ACK offset of 0 results in an asynchronous data transfer mode.

The Initiator sets its values according to the rules contained in the previous paragraphs to permit it to receive data successfully. If the LaserDrive can also receive data successfully with these values, it returns the same values in its SDTR message. If the LaserDrive requires a larger transfer period, a smaller REQ/ ACK offset, or both in order to receive data successfully, it substitutes values in its SDTR message as required, returning unchanged any value not required to be changed. When transmitting data, each device must respect the limits set by the other's SDTR message, but it is permitted to transfer data with larger transfer periods or smaller REQ/ACK offsets than specified in the other's SDTR message, or both. The successful completion of an exchange of SDTR messages implies an agreement as shown in Table 3.

Table 3. SDTR Agreement Responding Device

RESPONDING DEVICE SDTR RESPONSE	IMPLIED AGREEMENT
1) Nonzero REQ/ACK Offset	Each device transmits data with the agreed transfer period equal to or greater than and REQ/ACK offset equal to or less than the values received in the other device's SDTR message.
2) REQ/ACK Offset Equal to Zero	Asynchronous Transfer
3) MESSAGE REJECT Message	Asynchronous Transfer

If the Initiator recognizes that negotiation is required, it asserts the ATTN signal and sends an SDTR message to begin the negotiating process. After successfully completing the MESSAGE OUT phase, the LaserDrive respond with the proper SDTR message. If an abnormal condition prevents the LaserDrive from returning an appropriate response, both devices go to asynchronous data transfer mode for data transfers between the two devices.

The implied agreement for synchronous operation, following the LaserDrive response 1) in Table 3, is considered to be negated by both the Initiator and the LaserDrive if the Initiator asserts ATTN and the first message out is either MESSAGE PARITY ERROR or MESSAGE REJECT. In this case, both devices go to asynchronous data transfer mode for data transfers between each other. For the MESSAGE PARITY ERROR case, the implied agreement is re-instated if a retransmittal of the second of the pair of messages is successfully accomplished. If the LaserDrive receives a MESSAGE PARITY ERROR message after one retry attempt, it terminates the retry activity. This may be done by either changing to any other information transfer phase and transferring at least one byte of information or by going to the BUS FREE phase. The Initiator must accept such action as aborting the negotiation, and both devices will go to asynchronous data transfer mode for data transfers between the two devices.

If a parity error is detected during the receipt of an SDTR message sequence the LaserDrive will remain in the message out phase. One retry will be attempted.

The implied synchronous agreement remains in effect until a power cycle, BUS DEVICE RESET message is received, a hard RESET condition occurs or the initiator devices elect to modify the agreement. The default data transfer mode is asynchronous data transfer mode and is entered at power on, after a BUS DEVICE RESET message or after a hard RESET condition.

NOTE

A "hard RESET" condition occurs when the TEST switch is pressed, a bus-generated reset is received, or a message reset or a SEND DIAGNOSTIC command is received.

SCSI COMMANDS AND STATUS

This section defines the SCSI command and status structures, as they pertain to the LaserDrive, and provides several examples.

COMMAND IMPLEMENTATION REQUIREMENTS

The first byte of all SCSI commands contains an operation code as defined in this document. Three bits (bits 7 - 5) of the second byte of each SCSI command specify the logical unit if it is not specified using the IDENTIFY message. The last byte of all SCSI commands contains a control byte.

RESERVED

Reserved bits, fields, bytes and op codes are set aside for future use. A reserved bit, field or byte must be set to zero. A LaserDrive that receives a reserved bit, field or byte that is not zero, or receives a reserved op code, terminates the command with a CHECK CONDITION status and the Sense Key set to ILLEGAL REQUEST.

UNIT ATTENTION CONDITION

The Unit Attention Condition is entered by the LaserDrive to report events of interest to Initiators. These events include:

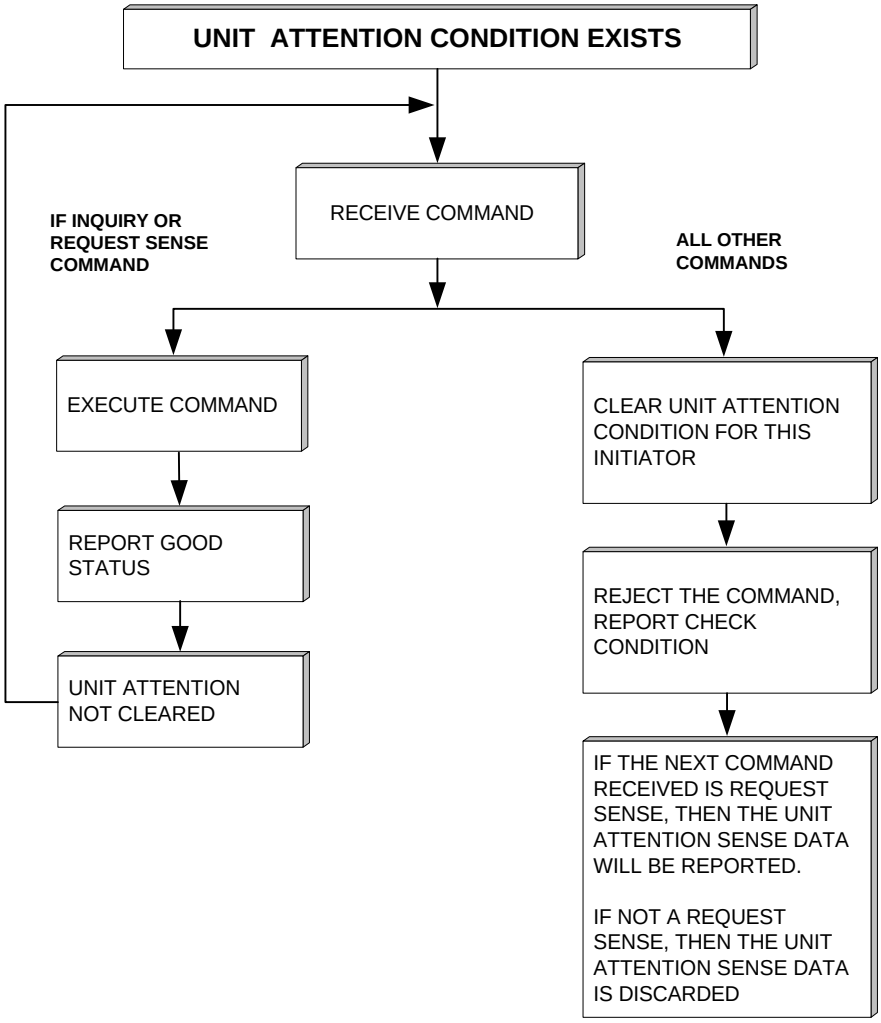
- Successful completion of a spin up
- BUS DEVICE RESET message
- SCSI bus reset
- Power on
- Self reset (due to controller-detected error)
- Change of vendor-unique mode select parameters
- SEND DIAGNOSTIC command
- LaserDrive executes selftest

The LaserDrive attempts to report a Unit Attention Condition by responding with a CHECK CONDITION status to the next command with the exception of the INQUIRY and REQUEST SENSE commands.

A Unit Attention Condition is pending for each Initiator until cleared by that Initiator. Clearing occurs following any command after a CHECK CONDITION status response (except INQUIRY and REQUEST SENSE).

An Initiator determines that a Unit Attention Condition has occurred because a UNIT ATTENTION Sense Key is found in the sense data returned in response to the REQUEST SENSE command, and REQUEST SENSE.

The Unit Attention Condition, relative to the handling of Initiator commands, is graphically explained in the following illustration.



Unit Attention Condition Handling

COMMAND DESCRIPTOR BLOCK

A request to a peripheral device connected on the SCSI bus is performed by sending a Command Descriptor Block (CDB) to the LaserDrive. For several commands, the request is accompanied by a list of parameters sent during a DATA OUT phase. See the specific commands for detailed information.

The CDB always has an operation code as the first byte of the command. This is followed by an optional logical unit number, command parameters (if any) and a control byte.

If there is an invalid parameter in a CDB, the command is terminated without altering the media.

OPERATION CODE

The operation code of the CDB has a group code field and a command code field. The 3-bit group code field provides for 8 groups of command codes. The 5-bit command code field provides for 32 command codes in each group. Thus, a total of 256 possible operation codes exist. Operation codes are defined in following section.

Operation Code

BIT / BYTE	7	6	5	4	3	2	1	0
00	Group Code			Command Code				

The group code specifies one of the following groups:

GROUP	BIT 7	BIT 6	BIT 5	NUMBER OF COMMAND BYTES
0	0	0	0	Six
1	0	0	1	Ten
2	0	1	0	Ten (new in SCSI-2)
3	0	1	1	Reserved
4	1	0	0	Reserved
5	1	0	1	Twelve
6	1	1	0	Vendor Specific (Six)
7	1	1	1	Vendor Specific (Ten)

Typical Command Descriptor Block for 6 - Byte Commands

BIT / BYTE	7	6	5	4	3	2	1	0
00	Operation Code							
01	Logical Number			Command Specific				
02								
03								
04								
05	Control Byte							

Typical Command Descriptor Block for 10 - Byte Commands

BIT / BYTE	7	6	5	4	3	2	1	0
00	Operation Code							
01	Logical Number			Command Specific				
02								
03								
04								
05								
06								
07								
08								
09	Control Byte							

LOGICAL UNIT NUMBER

The LaserDrive supports Logical Unit Number (LUN) 0. Refer to the IDENTIFY message section for a description of the LUN selection on the SCSI bus.

CONTROL BYTE

The control byte is the last byte of every CDB. A typical control byte is shown in the following figure. The control byte for the LaserDrive is Reserved.

Control Byte

BIT / BYTE	7	6	5	4	3	2	1	0
Last	Vendor Unique		Reserved					

BIT	DESCRIPTION
7-6	Vendor Unique - The LaserDrive uses these bits for the MEDIA SCAN command.
5-0	Reserved

STATUS

A status byte is sent from the LaserDrive to the Initiator during the STATUS phase at the termination of each command as specified in Table 4 unless the command is cleared by an ABORT message, by a BUS DEVICE RESET message, a hard RESET condition, or by an unexpected BUS FREE condition.

Table 4. Status Byte Values

STATUS BYTE VALUE	STATUS REPRESENTED
00H	GOOD
02H	CHECK CONDITION
04H	CONDITION MET
08H	BUSY
18H	RESERVATION CONFLICT
22H	COMMAND TERMINATED

GOOD — This status indicates that the LaserDrive has successfully completed the command.

CHECK CONDITION — Any error, exception or abnormal condition that causes sense data to be set will cause a CHECK CONDITION status. The REQUEST SENSE command should be issued following a CHECK CONDITION status to determine the nature of the condition.

CONDITION MET — The MEDIA SCAN command will return this status when the search condition is satisfied.

BUSY — The LaserDrive is busy. This status is returned whenever the LaserDrive is unable to execute a command from an otherwise acceptable Initiator. The LaserDrive responds to drive mechanism-accessing commands with BUSY while a spin up or spin down is in progress. BUSY is also returned when a command is in progress and this command cannot be stored for later execution (e.g.,disconnect not permitted). The normal recovery action is to re-issue the command later.

RESERVATION CONFLICT — This status is returned whenever a SCSI device attempts to access the LaserDrive while it is reserved for another SCSI device (see RESERVE and RELEASE UNIT commands). The normal Initiator recovery action is to re-issue the command later.

COMMAND TERMINATED — This status shall be returned whenever the LaserDrive terminates the current I/O process after receipt of a TERMINATE I/O PROCESS message.

COMMAND EXAMPLES

The following sections give examples of typical command processing in the SCSI environment.

SINGLE COMMAND EXAMPLE

A typical operation on the SCSI bus is likely to include a single READ command to a peripheral device. This operation is described in detail starting with a request from the Initiator. This example assumes that no linked commands and no malfunctions or errors occur.

The Initiator has active pointers and a set of stored pointers representing active disconnected SCSI devices (an Initiator without disconnect capability does not require stored pointers).

The Initiator sets up the active pointers for the operation requested, arbitrates for the SCSI bus and selects the LaserDrive. Once this process is completed, the LaserDrive assumes control of the operation.

The LaserDrive obtains the command from the Initiator (in this case, a READ command). The LaserDrive interprets the command and executes it. In this case, the LaserDrive gets the data from the peripheral device and sends it to the Initiator. At the completion of the READ command, the LaserDrive sends a status byte to the Initiator. To end the operation, the LaserDrive sends a COMMAND COMPLETE message to the Initiator.

DISCONNECT EXAMPLE

In the previously mentioned single command example, a time-consuming physical seek may be necessary. In order to improve system throughput, the LaserDrive may disconnect from the Initiator, freeing the SCSI bus for other device activity. To do this, the Initiator needs to be reselectable and capable of restoring the pointers upon reconnection. The LaserDrive is capable of arbitrating for the SCSI bus and reselecting the Initiator.

After the LaserDrive has received the READ command, it disconnects by sending SAVE DATA POINTERS message and a DISCONNECT message. If these messages are accepted, BSY is released.

When the LaserDrive is ready to transfer data it reconnects to the Initiator. As a result of this reconnection, the Initiator restores the pointers to their most recent saved values (which, in this case, are the initial values) and the LaserDrive continues (as in the single-command example) to finish the operation. The Initiator recognizes that the operation is complete when COMMAND COMPLETE message is received.

If the LaserDrive wishes to disconnect after transferring part of the data (e.g., when the Maximum Burst Length has been satisfied), it does so by sending a SAVE DATA POINTER message and a DISCONNECT message to the Initiator and then disconnecting. When reconnection is completed, the current data pointer value is restored to its value immediately prior to the SAVE DATA POINTER message.

COMMAND PROCESSING EXCEPTION CONDITIONS

The following sections describe some exceptions, errors associated with command processing and command sequencing.

REDUNDANT COMMANDS TO AN ACTIVE LOGICAL UNIT

An Initiator should never attempt to send a second command to the LaserDrive until the command in progress is terminated. The Initiator is normally informed that a command is terminated when the LaserDrive returns a COMMAND COMPLETE message. Termination may also result from a hard RESET condition.

If the LaserDrive receives a command from an Initiator and a command with the same LUN is already in progress for that Initiator, both commands will be aborted. The execution of both commands is stopped and CHECK CONDITION status is sent. Sense data is prepared with an ABORTED COMMAND Sense Key and an Error Code of Overlapped Commands Attempted.

SELECTION OF A LOGICAL UNIT

The logical unit for which a command is destined is specified by the IDENTIFY message or in the CDB if no IDENTIFY message was received. The LaserDrive supports LUN 0. If an invalid logical unit is selected, the LaserDrive takes the following action:

The CDB is accepted by the LaserDrive. If the command is a REQUEST SENSE command, the data returned will contain the Sense Data prepared for the previous command for this LUN. If the command is the INQUIRY command, the command will be executed normally. The Peripheral Device Type Code (Inquiry Data, Byte 0) will be 7FH - Device Not Present. Any other command will be immediately terminated with CHECK CONDITION Status. Sense data is generated with a Sense Key of ILLEGAL REQUEST and an Error Code of Invalid LUN.

DISCONNECT CONDITIONS

The LaserDrive disconnects from the SCSI bus when it cannot use the bus to transfer information without delay unless disconnects are disabled. Disconnects are disabled as described in the Identify message section. The following LaserDrive disconnect conditions assume that disconnects are enabled.

- The LaserDrive disconnects after accepting the command block if the command calls for physical action by the drive. This includes READ, SEEK and MOVE commands as well as START/STOP without the Immediate bit. WRITE commands do not disconnect before starting the transfer of data from the Initiator.

- The LaserDrive disconnects within the data transfer phase if the Maximum Burst Length value is greater than zero and less than the number of data blocks specified in the command. If the Mode Select parameter Maximum Burst Length is zero, disconnects will not be attempted during the data transfer.

- The LaserDrive disconnects after completing data transfers and when a delay is encountered before the completion of a command.

DRIVE COMMAND SET

This section defines the SCSI command set implemented by the LaserDrive. The LaserDrive commands supported are listed in Table 5. Each command in this section is listed in alphabetical order.

Table 5. LaserDrive Commands

COMMAND	OP CODE (HEX)	SCSI DOCUMENT COMPLIANCE	DISCONNECT ALLOWED
ACCESS EVENT LOG	EC	5	Yes
INQUIRY	12	4	No
MEDIA SCAN	38	3	Yes
MODE SELECT	15	4	No
MODE SENSE	1A	4	No
MOVE MEDIA	02	6	Yes
PARK BASEPLATES	C9	5	No
PREVENT/ALLOW MEDIA REMOVAL	1E	4	No
READ (10 BYTE)	28	4	Yes
READ BUFFER (10 BYTE)	3C	3(1)	Yes
READ CAPACITY	25	4	No
READ DIAGNOSTIC LONG	E8	5	Yes
READ DIAGNOSTIC PHYSICAL	E9	5	Yes
READ SECTOR LOCATION	E6	5	No
RELEASE	17	4	No
REQUEST SENSE	03	4	No
RESERVE	16	4	No
REZERO UNIT	01	4	Yes
SEEK (10 BYTE)	2B	4	Yes
SEND DIAGNOSTIC	1D	3	Yes
START/STOP UNIT	1B	4	Yes
TEST UNIT READY	00	4	No
VERIFY	2F	4	Yes
WRITE (10 BYTE)	2A	4(1)	Yes
WRITE AND VERIFY	2E	4	Yes
WRITE BUFFER	3B	3(2)	Yes(3)
Compliance Key: 1 - SCSI-1, 2 - CCS, 3 - SCSI-2, 4 - All, 5 - Vendor Unique, 6 - LF 6600/LF 6602 only Vendor Unique			

(1)Byte 9, Bit 6 invokes disable verify.

(2)Due to hardware limitations, the LaserDrive will transfer sector blocks rather than bytes in response to the Allocation Length of this command.

(3)Disconnects are allowed in Mode 2 only.

NOTE

The abbreviations, ASC and ASCQ, are used extensively throughout this document. ASC represents Additional Sense Code and ASCQ represents Additional Sense Code Qualifier.

ACCESS EVENT LOG (ECH)

The ACCESS EVENT LOG command provides a means to access and/or clear data accumulated in the LaserDrive log.

ACCESS EVENT LOG Command (ECH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	ACCESS EVENT LOG (ECH)							
01	LUN			Mode	CLR	OPT		
02	Page Code							
03	Reserved							
04	Reserved							
05	Log Offset (MSB)							
06	Log Offset (LSB)							
07	Allocation Length (MSB)							
08	Allocation Length (LSB)							
09	Reserved							

Mode

A Mode bit of one activates the Page Code field and puts the LaserDrive in 6000 log mode. A Mode bit of zero places the LaserDrive in 4000 log mode and the OPT field is activated with pages defined as they were in the LD 4100/LF 4500 SCSI Interface Specification.

CLR

If the CLR bit is set, all logs will be cleared except for the Drive Statistics Log and the Failure Analysis Log. The Log Offset field will be ignored.

OPT

The OPT bits select which portion of the 4000 log mode data is to be sent to the Initiator as indicated in Table 6.

If any value is placed in the Page Code field, the Mode field must be set. Otherwise, a CHECK CONDITION status will be returned with ILLEGAL REQUEST sense. The Page Code field is defined in Table 7.

Log Offset

The Log Offset field can be used by systems that cannot transfer a log because it is too long. By specifying an offset and an allocation length partial transfers of the log can be performed. This feature can only be used when individual logs are specified. Otherwise this field will be ignored. The Log Offset field value must be less than the individual log size. Otherwise, a CHECK CONDITION status will be returned with an ILLEGAL REQUEST sense key.

Allocation Length

The Allocation Length should be the number of bytes to be transferred during the DATA OUT phase for the pages requested in the Page Code field (6000 Log Mode) or OPT field (4000 Log Mode) and a 4-byte Event Log Header shown in Table 8. The data-out phase will end when either the allocation length has been reached or the number of bytes available for the requested page(s) plus a 4-byte header has been reached. An Allocation Length of zero means that no bytes will be transferred. An Allocation Length less than four and greater than zero will result in a CHECK CONDITION status with an ILLEGAL REQUEST sense key.

The format of 6000 log mode data is as described in Table 9 through Table 22. The format of 4000 log mode data is as described in Table 23 through Table 25.

By default, the System Event Log (Page Code A) is disabled. The recording of the System Event Log may be enabled by setting bit 6, byte 3, of the vendor unique Page 20 of the MODE SELECT command (see the SYSLOG section in the Vendor-Unique Parameters for a description).

Table 6. OPT Field Values (4000 Log Mode)

OPT VALUE	CAN BE CLEARED	CAN BE DISABLED	DESCRIPTION
0	Yes	(See Specific Option [OPT] Value in This Table)	Send Total Event Log Data (The data will be sent in the order of Predictive Maintenance Statistics, Read Data Log and then Write Data Log.)
1	Yes	Yes	Send Data Logged for Write Commands
2	Yes	Yes	Send Data Logged for Read Commands
3	Yes	No	Send Predictive Maintenance Statistics

Table 7. Page Code Definition (6000 Log Mode)

PAGE CODE VALUE (HEX)	CAN BE CLEARED	LOG RETURNED
0	Yes	Return Logs 0-A (18,336 Bytes)
1	No	Drive Statistics Log (100 Bytes)
2	Yes	Seek Statistics Log (32 Bytes)(1)
3	Yes	Shuttle, Motor and Baseplate Statistics Log (80 Bytes)(1)
4	Yes	DPC Statistics Log (192 Bytes)(1)
5	Yes	Write Statistics Log Side A (220 Bytes)(1)
6	Yes	Write Statistics Log Side B (220 Bytes)(1)
7	Yes	Read Statistics Log Side A (420 Bytes)(1)
8	Yes	Read Statistics Log Side B (420 Bytes)(1)
9	No	SCSI Activity Log (266 Bytes)(1)
A	Yes	System Event Log (16,386 Bytes)(1)
B	No	Failure Analysis Log (1566 Bytes)(1)
C	No	Media Management Log (372 Bytes)
D	No	Media Specific Disk Information (SDI) Side A Log (1024 Bytes)
E	No	Media Specific Disk Information (SDI) Side B Log (1024 Bytes)
F	No	Media Product Specific Information (PSI) Log (256 Bytes)

(1) Field values in these logs are circumstance-dependent. Interpretation of this data is intended for Plasmon LMS internal use.

Table 8. Event Log Header

BYTE	DESCRIPTION
0	Reserved
1	Reserved
2	Log Length (MSB)
3	Log Length (LSB)

Table 9. 6000 Log Mode Logs - Page 1: Drive Statistics Log (Size 100)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 4	Drive's Serial Number	0 - 4
5 - 10	Write Once Optical Drive Interface (WOODI) PCA Firmware Revision	5 - A
11 - 16	Read Write Servo (RWS) A PCA Firmware Revision	B - 10
17 - 22	RWS B PCA Firmware Revision	11 - 16
23 - 28	Drive Power Control PCA Firmware Revision	17 - 1C
29 - 31	WOODI PCA Serial Number	1D - 1F
32 - 34	RWS A Serial Number	20 - 22
35 - 37	RWS B Serial Number	23 - 25
38 - 40	Optical Mechanical Assembly (OMA) A Serial Number	26 - 28
41 - 43	OMA B Serial Number	29 - 2B
44 - 46	DPC PCA Serial Number	2C - 2E
47 - 49	WOODI PCA Part Number	2F - 31
50 - 52	RWS A PCA Part Number	32 - 34
53 - 55	RWS B PCA Part Number	35 - 37
56 - 58	DPC PCA Part Number	38 - 3A
59	Undefined	3B
60 - 63	Cumulative Time Powered On in Minutes	3C - 3F
64 - 67	Cumulative Time Spun Up in Minutes	40 - 43
68 - 71	Cumulative Number of Blocks Written on Side A	44 - 47
72 - 75	Cumulative Number of Blocks Written on Side B	48 - 4B
76	New RWS A PCA Installed	4C
77	New RWS B PCA Installed	4D
78	New DPC PCA Installed	4E
79	New OMA Installed On Side A	4F
80	New OMA Installed On Side B	50
81 - 99	Undefined	51 - 63

Table 10. 6000 Log Mode Logs - Page 2: Seek Statistics Log (Size 32)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Seek Errors Side A	0 - 3
4 - 7	Seek Operations Side A	4 - 7
8 - 11	Seek Retries Side A	8 - B
12 - 19	Undefined	C - 13
20 - 23	Seek Errors Side B	14 - 17
24 - 27	Seek Operations Side B	18 - 1B
28 - 31	Seek Retries Side B	1C - 1F

Table 11. 6000 Log Mode Logs - Page 3: Shuttle, Motor and Baseplate Statistics Log (Size 80)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of Disk Information Reads on Spin Up	0 - 3
4 - 7	Number of Time Focus Could Not Be Achieved on Spin Up	4 - 7
8 - 11	Number of Spin Ups	8 - B
12 - 15	Number of Spin-Up Failures	C - F
16 - 19	Number of 6600 Media Insertions	10 - 13
20 - 23	Number of DI Retries	14 - 17
24-35	Undefined	18 - 23
Valid for LF 6600/LF 6602 Only		
36 - 39	Number of Times the Door Was Opened	24 - 27
40 - 43	Number of Times the Shuttle Was Initialized	28 - 2B
44 - 47	Number of Shuttle Movements	2C - 2F
48 - 51	Number of Shuttle Movement Failures	30 - 33
52 - 55	Number of Media Insertion Failures	34 - 37
56 - 59	Address 1 Media Insertions	38 - 3B
60 - 63	Address 2 Media Insertions	3C - 3F
64 - 67	Address 3 Media Insertions	40 - 43
68 - 71	Address 4 Media Insertions	44 - 47
72 - 75	Address 5 Media Insertions	48 - 4B
76 - 79	Address 6 Media Insertions	4C - 4F

Table 12. 6000 Log Mode Logs - Page 4: Drive Power Control (DPC) Statistics Log, (Size 192)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of DPC Commands Not Completed	0 - 3
4 - 7	Number of Shuttle Door Faults	4 - 7
8 - 11	Number of Shuttle Unload Faults	8 - B
12 - 15	Number of Shuttle Load Faults	C - F
16 - 19	Number of Shuttle Position Faults	10 - 13
20 - 23	Number of Shuttle Initialization Faults	14 - 17
24 - 27	Number of Baseplate Open Faults	18 - 1B
28 - 31	Number of Baseplate Close Faults	1C - 1F
32 - 35	Number of Motor Speed Faults	20 - 23
36 - 39	Number of Right Fully Inserted Sensor Detection Faults	24 - 27
40 - 43	Number of Left Fully Inserted Sensor Detection Faults	28 - 2B
44 - 47	Number of Pin Park Sensor Faults	2C - 2F
48 - 51	Number of Home Position Sensor Faults	30 - 33
52 - 55	Number of Lower Baseplate Closed Sensor Faults	34 - 37
56 - 59	Number of Upper Baseplate Closed Sensor Faults	38 - 3B
60 - 63	Number of Lower Baseplate Open Sensor Faults	3C - 3F
64 - 67	Number of Upper Baseplate Open Sensor Faults	40 - 43
68 - 71	Number of Spindle Motor Commutation Not Detected Faults	44 - 47
72 - 75	Number of Hall 3 Sensor Faults	48 - 4B
76 - 79	Number of Hall 2 Sensor Faults	4C - 4F
80 - 83	Number of Hall 1 Sensor Faults	50 - 53
84 - 87	Number of Insert Sensor Not Detected Faults	54 -57
88 - 91	Number of Shuttle Stepper Not Detected Faults	58 - 5B
92 - 95	Number of Lower Baseplate Stepper Not Detected Faults	5C - 5F
96 - 99	Number of Upper Baseplate Stepper Not Detected Faults	60 - 63
100 - 103	Number of Spindle Motor Near Speed Flags	64 - 67
104 - 107	Number of Spindle Motor At Speed Flags	68 - 6B
108 - 111	Number of Shuttle Present Detections	6C - 6F

Table 12. 6000 Log Mode Logs - Page 4: Drive Power Control (DPC) Statistics Log, (Size 192) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
112 - 115	Number of Times Shuttle Door Was Opened	70 - 73
116 - 119	Number of Times Media Detected At Address 6	74 - 77
120 - 123	Number of Times Media Detected At Address 5	78 - 7B
124 - 127	Number of Times Media Detected At Address 4	7C - 7F
128 - 131	Number of Times Media Detected At Address 3	80 - 83
132 - 135	Number of Times Media Detected At Address 2	84 - 87
136 - 139	Number of Times Media Detected At Address 1	88 - 8B
140 - 143	Number of Times 6000 Media Detected	8C - 8F
144 - 147	Number of Times 4000 Media Detected	90 - 93
148 - 151	Number of Cartridge Insertions	94 - 97
152 - 155	Number of Times Media Write Protected Detected	98 - 9B
156 - 159	Number of Baseplate Close Commands Executed	9C - 9F
160 - 163	Number of Baseplate Open Commands Executed	A0 - A3
164 - 167	Number of Media A Side on Channel A Detections	A4 - A7
168 - 171	Number of DPR Interrupt Re-issues	A8 - AB
172 - 191	Undefined	AC - BF

Table 13. 6000 Log Mode Logs - Page 5: Side A Write Statistics Log, (Size 220)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of Drive Not Configured Errors	0 - 3
4 - 7	Number of Command Not Completed Errors	4 - 7
8 - 11	Number of Arbitrary Faults	8 - B
12 - 15	Number of Focus Faults	C - F
16 - 19	Number of Track Faults	10 - 13
20 - 23	Number of Transfer Faults	14- 17
24 - 27	Number of C Clock Faults	18 - 1B
28 - 31	Number of Motor Speed Faults	1C - 1F
32 - 35	Number of Writing Timing Faults	20 - 23
36 - 39	Number of Pulse Width Errors	24 - 27
40 - 43	Number of Write Power Too High Interrupts	28 - 2B
44 - 47	Number of Write Power Initialization Errors	2C - 2F
48 - 51	Number of Maximum Seek Retries Exhausted	30 - 33
52 - 55	Number of Lost Track Crossing Errors	34 - 37
56 - 59	Number of Track Crossing Errors	38 - 3B
60 - 63	Number of No Track Capture Errors	3C - 3F
64 - 67	Number of Header Errors	40 - 43
68 - 71	Number of General Seek Errors	44 - 47
72 - 75	Number of Phase Lock Loop Lost Interrupts	48 - 4B
76 - 79	Number of Focus Lost Interrupts	4C - 4F
80 - 83	Number of Track Out of Limit Interrupts	50 -53
84 - 87	Number of Synchronization Lost Interrupts	54 - 57
88 - 91	Number of Synchronization Error Interrupts	58 - 5B
92 - 95	Number of Write Sum Interrupts	5C - 5F
96 - 99	Undefined	60 - 63
100 - 103	Number of Media Certification During Write Failures	64 - 67
104 - 107	Number of RWS Spun Down Errors	68 - 6B
108 - 111	Number of Media Defect Interrupts	6C - 6F
112 - 115	Number of DSP Sample Bad Errors	70 - 73
116 - 119	Number of DSP Timeout Errors	74 - 77
120 - 123	Number of Preamble Interrupts	78 - 7B
124 - 127	Number of Write Timing Adjustments	7C - 7F
128	Reference Verify Level	80

Table 13. 6000 Log Mode Logs - Page 5: Side A Write Statistics Log, (Size 220) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
129	Inner Zone Write Timing Offset	81
130	Outer Zone Write Timing Offset	82
131 - 143	Undefined	83 - 8F
144 - 147	Number of Write Power Adjustments	90 - 93
148 - 151	Number of DPR Interrupt Retries	94 - 97
152 - 155	Number of Quad Sum Faults	98 - 9B
156 - 159	Averaged Maximum Data Amplitude	9C - 9F
160 - 163	Number of Static Relocations	A0 - A3
164 - 167	Number of Write Commands Executed by RWS	A4 - A7
168 - 171	Undefined	A8 - AB
172 - 175	Number of Sectors Written by RWS	AC - AF
176 - 179	Number of Host Command Aborts Received	B0 - B3
180 - 183	Number of Slow Host Occurrences	B4 - B7
184 - 187	Number of Attempted Overwrites	B8 - BB
188 - 191	Undefined	BC - BF
192 - 195	Number of DPR Verify Retries	C0 - C3
196 - 199	Number of RWS Timeouts	C4 - C7
200 - 203	Number of Access Relocations	C8 - CB
204 - 207	Number of Verify Pass Relocations	CC - CF
208 - 211	Number of Unable to Write Errors	D0 - D3
212 - 215	Number of Error Detection and Correction ASIC Parity Errors	D4 - D7
216 - 219	Number of Buffer Manager ASIC Parity Errors	D8 - DB

Table 14. 6000 Log Mode Logs - Page 6: Side B Write Statistics Log (Size 220)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of Drive Not Configured Errors	0 - 3
4 - 7	Number of Command Not Completed Errors	4 - 7
8 - 11	Number of Arbitrary Faults	8 - B
12 - 15	Number of Focus Faults	C - F
16 - 19	Number of Track Faults	10 - 13
20 - 23	Number of Transfer Faults	14- 17
24 - 27	Number of C Clock Faults	18 - 1B
28 - 31	Number of Motor Speed Faults	1C - 1F
32 - 35	Number of Writing Timing Faults	20 - 23
36 - 39	Number of Pulse Width Errors	24 - 27
40 - 43	Number of Write Power Too High Interrupts	28 - 2B
44 - 47	Number of Write Power Initialization Errors	2C - 2F
48 - 51	Number of Maximum Seek Retries Exhausted	30 - 33
52 - 55	Number of Lost Track Crossing Errors	34 - 37
56 - 59	Number of Track Crossing Errors	38 - 3B
60 - 63	Number of No Track Capture Errors	3C - 3F
64 - 67	Number of Header Errors	40 - 43
68 - 71	Number of General Seek Errors	44 - 47
72 - 75	Number of Phase Lock Loop Lost Interrupts	48 - 4B
76 - 79	Number of Focus Lost Interrupts	4C - 4F
80 - 83	Number of Track Out of Limit Interrupts	50 - 53
84 - 87	Number of Synchronization Lost Interrupts	54 - 57
88 - 91	Number of Synchronization Error Interrupts	58 - 5B
92 - 95	Number of Write Sum Interrupts	5C - 5F
96 - 99	Undefined	60 - 63
100 - 103	Number of Media Certification During Write Failures	64 - 67
104 - 107	Number of RWS Spun Down Errors	68 - 6B
108 - 111	Number of Media Defect Interrupts	6C - 6F
112 - 115	Number of DSP Sample Bad Errors	70 - 73
116 - 119	Number of DSP Timeout Errors	74 - 77
120 - 123	Number of Preamble Interrupts	78 - 7B
124 - 127	Number of Write Timing Adjustments	7C - 7F
128	Reference Verify Level	80

Table 14. 6000 Log Mode Logs - Page 6: Side B Write Statistics Log (Size 220) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
129	Inner Write Timing Offset	81
130	Outer Write Timing Offset	82
131 - 143	Undefined	83 - 8F
144 - 147	Number of Write Power Adjustments	90 - 93
148 - 151	Number of DPR Interrupt Retries	94 - 97
152 - 155	Number of Quad Sum Faults	98 - 9B
156 - 159	Averaged Maximum Data Amplitude	9C - 9F
160 - 163	Number of Static Relocations	A0 - A3
164 - 167	Number of Write Commands Executed by RWS	A4 - A7
168 - 171	Undefined	A8 - AB
172 - 175	Number of Sectors Written by RWS	AC - AF
176 - 179	Number of Host Command Aborts Received	B0 - B3
180 - 183	Number of Slow Host Occurrences	B4 - B7
184 - 187	Number of Attempted Overwrites	B8 - BB
188 - 191	Undefined	BC - BF
192 - 195	Number of DPR Verify Retries	C0 - C3
196 - 199	Number of RWS Timeouts	C4 - C7
200 - 203	Number of Access Relocations	C8 - CB
204 - 207	Number of Verify Pass Relocations	CC - CF
208 - 211	Number of Unable to Write Errors	D0 - D3
212 - 215	Number of Error Detection and Correction ASIC Parity Errors	D4 - D7
216 - 219	Number of Buffer Manager ASIC Parity Errors	D8 - DB

Table 15. 6000 Log Mode Logs - Page 7: Side A Read Statistics Log (Size 420)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of Drive Not Configured Errors	0 - 3
4 - 7	Number of Command Not Completed Errors	4 - 7
8 - 11	Number of Arbitrary Faults	8 - B
12 - 15	Number of Focus Faults	C - F
16 - 19	Number of Tracking Out of Limit Faults	10 - 13
20 - 23	Number of Transfer Faults	14 - 17
24 - 27	Number of C Clock Faults	18 - 1B
28 - 31	Number of Motor Speed Faults	1C - 1F
32 - 35	Number of Read Timing Faults	20- 23
36 - 39	Number of Read Power Too High Errors	24 - 27
40 - 43	Number of Read Power Initialization Errors	28 - 2B
44 - 47	Number of Maximum Seek Retries Exhausted	2C - 2F
48 - 51	Number of Lost Track Crossing Errors	30 - 33
52 - 55	Number of Track Crossing Errors	34 - 37
56 - 59	Number of No Track Capture Errors	38 - 3B
60 - 63	Number of Header Errors	3C - 3F
64 - 67	Number of General Seek Errors	40 - 43
68 - 71	Number of Phase Lock Loop Lost Interrupts	44 - 47
72 - 75	Number of Focus Interrupts	48 - 4B
76 - 79	Number of Tracking Out of Limit Interrupts	4C - 4F
80 - 83	Number of Synchronization Lost Interrupts	50 - 53
84 - 87	Number of Synchronization Error Interrupts	54 - 57
88 - 91	Number of Media Defect Interrupts	58 - 5B
92 - 95	Number of RWS Spun Down Errors	5C - 5F
96 - 99	Number of DTO Retries	60 - 63
100 - 103	Number of DSP Timeout Errors	64 - 67
104 - 107	Number of Read Retries with Optimization Disabled	68 - 6B
108 - 111	Number of Read Retries with Timing Value Adjustments	6C - 6F
112	Read Timing Average	70
113	Undefined	71
114 - 115	Number of CRC Uncorrectable Sectors	72 - 73
116 - 117	Number of Scan False DDets	74 - 75

Table 15. 6000 Log Mode Logs - Page 7: Side A Read Statistics Log (Size 420) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
118 - 123	Undefined	76 - 7B
124 - 127	Read Ahead Cache Misses	7C - 7F
128 - 131	Unused Cached Buffers	80 - 83
132 - 135	Number of Quad Sum Interrupts	84 - 87
136 - 139	Number of Successful Read Retries	88 - 8B
140 - 143	Number of Codeword Corrections	8C - 8F
144 - 147	Number of ECC Behind Occurrences	90 - 93
148 - 151	Number of Read Commands Executed by This RWS	94 - 97
152 - 155	Number of Read Qualify Command Retries	98 - 9B
156 - 159	Number of Sectors Read by This RWS(1)	9C - 9F
160 - 163	Number of Cached Reads	A0 - A3
164 - 167	Number of Cached DMA's	A4 - A7
168 - 171	Number of Slow Host Incidents	A8 - AB
172 - 175	Number of Host Aborts Received	AC - AF
176 - 179	Number of Access Retries	B0 - B3
180 - 183	Number of RWS Timeout Errors	B4 - B7
184 - 187	Number of Relocations Read	B8 - BB
188 - 191	Number of Wrong Control Record Type Errors	BC - BF
192 - 195	Number of Wrong Control Record Sequence Errors	C0 - C3
196 - 199	Number of Total Bytes Corrected	C4 - C7
200 - 391	Correction Array of 48 Entries, Each Entry is 4 Bytes (Each Entry Represents Number of Sectors Requiring N Bytes (1 - 48) of Correction	C8 - 187
392 - 395	Number of Sectors Requiring No Correction with ECC	188 - 18B
396 - 399	Number of Read Retries	18C - 18F
400 - 403	Number of Uncorrectable 4000 Control Records	190 - 193
404 - 407	Number of Error Detection and Correction ASIC Parity Errors	194 - 197
408 - 411	Number of Buffer Manager Parity Errors	198 - 19B
412 - 415	Number of ECC Uncorrectable Sectors	19C - 19F
416 - 419	Number of 4000 Control Records Requiring Correction	1A0 - 1A3

(1) If read ahead is enabled, this field will not reflect the number of sectors transferred to the host.

Table 16. 6000 Log Mode Logs - Page 8: Side B Read Statistics Log (Size 420)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of Drive Not Configured Errors	0 - 3
4 - 7	Number of Command Not Completed Errors	4 - 7
8 - 11	Number of Arbitrary Faults	8 - B
12 - 15	Number of Focus Faults	C - F
16 - 19	Number of Tracking Out of Limit Faults	10 - 13
20 - 23	Number of Transfer Faults	14 - 17
24 - 27	Number of C Clock Faults	18 - 1B
28 - 31	Number of Motor Speed Faults	1C - 1F
32 - 35	Number of Read Timing Faults	20- 23
36 - 39	Number of Read Power Too High Errors	24 - 27
40 - 43	Number of Read Power Initialization Errors	28 - 2B
44 - 47	Number of Maximum Seek Retries Exhausted	2C - 2F
48 - 51	Number of Lost Track Crossing Errors	30 - 33
52 - 55	Number of Track Crossing Errors	34 - 37
56 - 59	Number of No Track Capture Errors	38 - 3B
60 - 63	Number of Header Errors	3C - 3F
64 - 67	Number of General Seek Errors	40 - 43
68 - 71	Number of Phase Lock Loop Lost Interrupts	44 - 47
72 - 75	Number of Focus Interrupts	48 - 4B
76 - 79	Number of Tracking Out of Limit Interrupts	4C - 4F
80 - 83	Number of Synchronization Lost Interrupts	50 - 53
84 - 87	Number of Synchronization Error Interrupts	54 - 57
88 - 91	Number of Media Defect Interrupts	58 - 5B
92 - 95	Number of RWS Spun Down Errors	5C - 5F
96 - 99	Number of DTO Retries	60 - 63
100 - 103	Number of DSP Timeout Errors	64 - 67
104 - 107	Number of Read Retries with Optimization Disabled	68 - 6B
108 - 111	Number of Read Retries with Timing Value Adjustments	6C - 6F
112	Read Timing Average	70
113	Undefined	71
114 - 115	Number of CRC Uncorrectable Sectors	72 - 73
116 - 117	Number of Scan False DDets	74 - 75

Table 16. 6000 Log Mode Logs - Page 8: Side B Read Statistics Log (Size 420) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
118 - 123	Undefined	76 - 7B
124 - 127	Read Ahead Cache Misses	7C - 7F
128 - 131	Unused Cached Buffers	80 - 83
132 - 135	Number of Quad Sum Interrupts	84 - 87
136 - 139	Number of Successful Read Retries	88 - 8B
140 -143	Number of Codeword Corrections	8C - 8F
144 - 147	Number of ECC Behind Occurrences	90 - 93
148 - 151	Number of Read Commands Executed by This RWS	94 - 97
152 - 155	Number of Read Qualify Command Retries	98 - 9B
156 - 159	Number of Sectors Read by This RWS(1)	9C - 9F
160 - 163	Number of Cached Reads	A0 - A3
164 - 167	Number of Cached DMA's	A4 - A7
168 - 171	Number of Slow Host Incidents	A8 - AB
172 - 175	Number of Host Aborts Received	AC - AF
176 - 179	Number of Access Retries	B0 - B3
180 - 183	Number of RWS Timeout Errors	B4 - B7
184 - 187	Number of Relocations Read	B8 - BB
188 - 191	Number of Wrong Control Record Type Errors	BC - BF
192 - 195	Number of Wrong Control Record Sequence Errors	C0 - C3
196 - 199	Number of Total Bytes Corrected	C4 - C7
200 - 391	Correction Array of 48 Entries, Each Entry is 4 Bytes (Each Entry Represents Number of Sectors Requiring N Bytes (1-48) of Correction.)	C8 - 187
392 - 395	Number of Sectors Requiring No Correction with ECC	188 - 18B
396 - 399	Number of Read Retries	18C - 18F
400 - 403	Number of Uncorrectable 4000 Control Records	190 - 193
404 - 407	Number of Error Detection and Correction ASIC Parity Errors	194 - 197
408 - 411	Number of Buffer Manager Parity Errors	198 - 19B
412 - 415	Number of ECC Uncorrectable Sectors	19C - 19F
416 - 419	Number of 4000 Control Records Requiring Correction	1A0 - 1A3

(1) If read ahead is enabled, this field will not reflect the number of sectors transferred to the host.

The SCSI Activity Log is composed of two parts: a Mode Sense Parameters section and a 256-byte FIFO buffer reflecting SCSI activity.

Table 17. 6000 Log Mode Logs - Page 9: SCSI Activity Log (Size 266)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0	Mode Sense Header Byte 2	0
1	Mode Sense Page 20 Byte 2	1
2	Mode Sense Page 20 Byte 3	2
3	Mode Sense Page 21 Byte 2	3
4	Mode Sense Page 1 Byte 2	4
5	Mode Sense Page 1 Byte 3	5
6 - 7	Mode Sense Page 2 Bytes 10 -11	6 - 7
8 - 9	SCSI Log Index indicates last log entry	8 - 9
10 - 265	SCSI Log (Size 256)	A - 109

SCSI Log

Data will be entered into the SCSI log in the following order:

- A Reset will be a two-byte entry. The first byte is a reset type listed in Table 18; the second byte is always an FFH with a Reset Entry).

Table 18. Reset Description

BYTE	RESET TYPE
03	Power on
04	Selftest Switch or SEND DIAGNOSTIC Command
06	SCSI Bus Reset
07	Bus Device Reset Message
08	CDE Reset (There will be a 2 byte embedded code reference number between the "08" and the "FF" bytes).

- SCSI Opcode will be a one byte entry for any command
- Additional bytes to follow Opcode depending on command are:

  - LBA - 4 bytes - (If command was a READ, SEEK, WRITE, VERIFY or MEDIA SCAN)

  - Length - 2bytes - (If command was a READ, WRITE or VERIFY)

  - Prevent - 1 byte - (0=allow, 1=prevent) if command was PAMR (1E)

  - Blank - 1 byte - (0=written, 4=blank) if command was VERIFY (2F)

  - Start - 1 byte - (0=stop, 1=start) if command was START/STOP (1B)

- MMinfo - 1 byte - (bit 7: 0=unload, 1=load
  bit 6: 0=nonimmed, 1=immed
  bits 5-0: CDB Media Number) if command was MOVE MEDIA (02)

- SDinfo - 1 byte - (bit 7: 0 = not pf, 1 = pf
  bit 2: 0 = not selftest, 1 = selftest) if command was a SEND DIAGNOSTIC (1D)

- AELinfo - 1 byte - (bit 7: 0 = not clear, 1 = clear
  bit 4: 0 = not mode, 1 = mode
  bits 3-0 = page number) if command was an ACCESS EVENT LOG (EC)

- For REQUEST SENSE commands (03):

  - Valid bit and sense data format code
    (F0) If set, Information bytes and Command specific information bytes will be entered in the Log, total of 13 bytes.
    (70) If not set, Information bytes and Command specific information bytes will not be entered in the Log, total of 5 bytes.

  - Sense key.

  - Information bytes.

  - Command specific information bytes.

  - Additional sense code.

  - Additional sense code qualifier.

  - LaserDrive status byte

- The SCSI status -1 byte - will be entered into log after every command, most significant bit will always be set.

  Example: 80 - good status / 82 - check condition

There may be asynchronous (duplicate) entries in the SCSI Activity Log due to MCLI action. These can be decoded with the following information:

0XFE	MCLI spin-up request
0XFE	
0XFD	MCLI spin-down request
0XFD	
0XFB	RCBM abort due to MCLI interrupt
0XFB	
0XFC	DPRTASK abort due to MCLI interrupt
0XFC	
0XAA	Autospin was used to spin up
0XAA	

There may be asynchronous (duplicate) entries in the SCSI Activity Log due to SCSI messages. These can be decoded with the following information:

0XE5	SCSI Initiator Detected Error Message
0XE5	
0XE6	SCSI Abort Message
0XE6	
0XE7	SCSI Message Reject Message
0XE7	
0XE9	SCSI Message Parity Error Message
0XE9	
0XEC	SCSI Bus Device Reset Message
0XEC	

6000 Log Mode Logs - Page A: System Event Log (Size 16,386)

The System Event Log contains information that is decodable only by Plasmon LMS engineering. This log information is for Plasmon use only.

Table 19. 6000 Log Mode Logs - Page B: Failure Analysis Log (Size 1566)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0	CDE Log Index	0
1	Undefined	1
2 - 101	CDE LOG	2 - 65
102 - 105	Undefined	66 - 69
106	DIAG Fail Index	6A
107	Undefined	6B
108 - 171	DF LOG	6C - AB
172 - 173	Sense Log Index	AC - AD
174 - 398	SENSE LOG	AE - 18E
399	Undefined	18F
400 - 403	Total Number of Host 2E Write Failures	190 - 193
404 - 407	Total Number of Host 2A Write Failures	194 - 197
408 - 443	Undefined	198 - 1BB
444 - 447	Last RTPM Media Serial # (BCD)	1BC - 1BF
448	Last RTPM Side	1C0
449 - 571	Undefined	1C1 - 23B
572	Busy Disable	23C
573 - 577	Side A Media ID	23D - 241
578 - 581	Side A Raw Left	242 - 245
582 - 585	Side A Relocations Left	246 - 249
586	Mode Select Read Ahead Enable	24A
587 - 591	Side B Media ID	24B - 24F
592 - 595	Side B Raw Left	250 - 253
596 - 599	Side B Relocations Left	254 - 257
600 - 609	Undefined	258 - 261
610	Disconnect Permission	262
611	Fast Mode Status	263
612	Period Register	264
613	Offset Register	265
614 - 618	Undefined	266 - 26A
619	DIR Read Only	26B
620 - 621	RTPM Hits	26C - 26D
622 - 623	Current RTPM Side	26E - 26F

Table 19. 6000 Log Mode Logs - Page B: Failure Analysis Log (Size 1566) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
624 - 631	Current RTPM Media Serial Number	270 - 277
632 - 633	Side A Reloc Log Index	278 - 279
634 - 783	Side A RELOC LOG	27A - 30F
784 - 785	Side B Reloc Log Index	310 - 311
786 - 935	Side B RELOC LOG	312 - 3A7
936 - 939	Undefined	3A8 - 3AB
940 - 1205	CDE SCSI Activity Log	3AC - 4B5
1206 - 1471	SCSI Bus Reset SALOG	4B6 - 5BF
1472 - 1517	Side A Dynamic RELOC Log	5C0 - 5ED
1518 - 1563	Side B Dynamic RELOC Log	5EE - 61B
1564 - 1565	Init DPC Executions	61C - 61D

The log index is used to determine the last entry into the log as each log when filled will wrap back to the top and overwrite existing entries.

Each CDE LOG entry for a system CDE is a 2 byte value consisting of a CDE reference number (designated by an ’0’ in the most significant nibble).

Each CDE log entry for an exception CDE is a 10 byte entry with a 2 byte entry containing the vector offset followed by 4 bytes containing the PC address, followed by 4 bytes containing the fault address.

When multiple CDEs occur before the drive can report back to the host, the CDE log entries will be as follows:

the first CDE is logged as normal
all subsequent CDEs will logged with an ’8’ as the most significant nibble

Each DIAG FAIL LOG entry is a 2 byte value consisting of a failed diagnostic test number in hex.

Each SENSE LOG entry is 9 bytes of SCSI data information in the following order:

- OPCODE BYTE
- Sense Data Bytes 2, 12, 13, and 18,
- Media Serial number - 4 bytes.

Only Sense Keys of 03, 04, or 0B will be recorded in the SENSE LOG as well as RCBM Faults which are identified by a Sense Data Byte 18 value in the range of 0X4D through 0X64.

For SCSI failures with Sense Key data values of 03, 04, or 0B the following format applies to each SENSE LOG entry:

Byte 1: OPCODE Byte
Byte 2: Sense Data Byte 2
Byte 3: Sense Data Byte 12
Byte 4: Sense Data Byte 13
Byte 5: Sense Data Byte 18
Bytes 6-9: Media Serial Number

For all RCBM Faults the following format applies to each SENSE LOG entry:

Byte 1: DPC Extended Status BYTE 153d
Byte 2: DPC Extended Status BYTE 154d
Byte 3: DPC Extended Status BYTE 155d
Byte 4: DPC Extended Status BYTE 156d
Byte 5: Sense Data Byte 18
Byte 6: DPC Status BYTE 125d
Byte 7: DPC Status BYTE 135d
Byte 8: DPC Status BYTE 132d
Byte 9: WOODI copy of DPC Status BYTE 132d

Each RELOC LOG entry is 3 bytes of information in the following order:

Byte 1: Relocation Cause

RELOCATION CAUSE	DEFINITION
DO	CRC UNCORRECTABLE ERROR
EX	VERIFY FAILURE WHERE X = BYTES IN ERROR
F0	RESERVED
F1	PLL ERROR
F2	SEEK ERROR
F3	DEFECT ERROR
F4	FOCUS ERROR
F5	TRACKING ERROR
F6	WRITE SUM ERROR
F7	MCDW ERROR
F8	SYNC LOST ERROR
F9	SYNC ERROR
FA	HEADER ERROR
FB	DMA START ERROR
FC	BOS SYNC ERROR
FD	LASER POWER ERROR
FE	EDC HARDWARE ERROR
FF	RESERVED

Byte 2: Sector Amplitude
Byte 3: Sector Timing

NOTE

Sector Amplitude and Timing are general reference numbers and do not have upper or lower control limits.

The CDE SCSI Activity Log follows the exact format of the SCSI Activity Log (AEL page 9).

The SCSI Bus Reset SALOG follows the exact format of the SCSI Activity Log (AEL page 9).

Each Dynamic RELOC Log is 46 bytes of information in the following format:

Byte 1- 4:	Rate
Byte 4 - 23:	Number of Sectors Written Array (10words)
Byte 24 - 43:	Number of Sectors Relocated Array(10 words)
Byte 44 - 45:	Index

Table 20. 6000 Log Mode Logs - Page C: Media Management Statistics Logs (Size 372)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
SIDE A Media Management Layout		
0 - 8	Media ID	0 - 8
9	Undefined	9
10 - 13	Raw Media Management Sectors Left	A - D
14 - 17	Relocations Left	E - 11
18 - 127	Undefined	12 - 7F
SIDE B Media Management Layout		
128 - 136	Media ID	80 - 88
137	Undefined	89
138 - 141	Raw Media Management Sectors Left	8A - 8D
142 -145	Relocations Left	8E - 91
146 - 371	Undefined	92 - 173

Table 21. 6000 Log Mode Logs - Page D / E: Media Side A / B Specific Disk Information Log (Size 1024)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 8	Media ID	0 - 8
9 - 11	Date Media Was Tested	9 - B
12	Media Testbed Number	C
13 - 15	OMA Serial Number Used for Test	D - F
16 - 17	Write Energy Threshold (WETH) for Inner Radius	10 - 11
18 - 19	WETH for Middle Radius	12 - 13
20 - 21	WETH for Outer Radius	14 - 15
22 - 23	Bad Sector Map (bsm) Count	16 - 17
24 - 1019	bsm Entries (up to 166 entries formatted as follows) 0: Track of Bad Sector 2: Number of Bad Sectors 4: Sector Where Bad Sectors Start 5: Error Type Code	18 - 3FB
1020	Sector Alignment	3FC
1021	Undefined	3FD
1022 - 1023	SDI Checksum	3FE - 3FF

Table 22. 6000 Log Mode Logs - Page F: Media Product Specific Information Log (Size 256)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0	Media Family	0
1	LM 6000 Identifier	1
2	Sector Length	2
3 - 4	Sectors per Track	3 - 4
5	Write Verify Level	5
6	Maximum Read Power	6
7	Modulation Depth	7
8	Data Mark Polarity	8
9	Data Mark Amplitude	9
10	Ic Minimum/Maximum	A
11	Write Energy Factor	B
12 - 15	Undefined	C - F
16 - 17	Variable Track Pitch (VTP) Zone 1 Start Track	10 - 11
18	VTP Zone 1 Start Pitch	12
19	VTP Zone 1 End Pitch	13
20 - 21	VTP Zone 2 Start Track	14 - 15
22	VTP Zone 2 Start Pitch	16
23	VTP Zone 2 End Pitch	17
24 - 25	VTP Zone 3 Start Track	18 - 19
26	VTP Zone 3 Start Pitch	1A
27	VTP Zone 3 End Pitch	1B
28 - 29	VTP Zone 4 Start Track	1C - 1D
30	VTP Zone 4 Start Pitch	1E
31	VTP Zone 3 End Pitch	1F
32 - 33	End Track T Gain 1	20 - 21
34 - 35	End Track T Gain 2	22 - 23
36 - 37	End Track T Gain 3	24 - 25
38 - 39	End Track T Gain 4	26 - 27
40 - 41	End Track T Gain 5	28 - 29
42 - 43	End Track T Gain 6	2A - 2B
44 - 45	End Track T Gain 7	2C - 2D
46 - 47	End Track T Gain 8	2E - 2F
48 - 49	End Track T Gain 9	30 - 31
50 - 51	End Track T Gain 10	32 - 33

Table 22. 6000 Log Mode Logs - Page F: Media Product Specific Information Log (Size 256) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
52 - 53	End Track T Gain 11	34 - 35
54 - 55	End Track T Gain 12	36 - 37
56 - 57	End Track T Gain 13	38 - 39
58 - 59	End Track T Gain 14	3A - 3B
60 - 61	End Track T Gain 15	3C - 3D
62 - 63	End Track T Gain 16	3E - 3F
64	Tracking Gain 1	40
65	Tracking Gain 2	41
66	Tracking Gain 3	42
67	Tracking Gain 4	43
68	Tracking Gain 5	44
69	Tracking Gain 6	45
70	Tracking Gain 7	46
71	Tracking Gain 8	47
72	Tracking Gain 9	48
73	Tracking Gain 10	49
74	Tracking Gain 11	4A
75	Tracking Gain 12	4B
76	Tracking Gain 13	4C
77	Tracking Gain 14	4D
78	Tracking Gain 15	4E
79	Tracking Gain 16	4F
80 - 81	End Track F Gain 1	50 - 51
82 - 83	End Track F Gain 2	52 - 53
84 - 85	End Track F Gain 3	54 - 55
86 - 87	End Track F Gain 4	56 - 57
88 - 89	End Track F Gain 5	58 - 59
90 - 91	End Track F Gain 6	5A - 5B
92 - 93	End Track F Gain 7	5C - 5D
94 - 95	End Track F Gain 8	5E - 5F
96	Focus Gain 1	60
97	Focus Gain 2	61
98	Focus Gain 3	62
99	Focus Gain 4	63

Table 22. 6000 Log Mode Logs - Page F: Media Product Specific Information Log (Size 256) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
100	Focus Gain 5	64
101	Focus Gain 6	65
102	Focus Gain 7	66
103	Focus Gain 8	67
104 - 111	Undefined	68 - 6F
112 - 113	End Track Write Energy (WE) Zone 1	70 - 71
114 - 115	End Track WE Zone 2	72 - 73
116 - 117	End Track WE Zone 3	74 - 75
118 - 119	End Track WE Zone 4	76 - 77
120 - 121	End Track WE Zone 5	78 - 79
122 - 123	End Track WE Zone 6	7A - 7B
124 - 125	End Track WE Zone 7	7C - 7D
126 - 127	End Track WE Zone 8	7E - 7F
128	Primary Pulse Width Zone 1	80
129	Primary Pulse Width Zone 2	81
130	Primary Pulse Width Zone 3	82
131	Primary Pulse Width Zone 4	83
132	Primary Pulse Width Zone 5	84
133	Primary Pulse Width Zone 6	85
134	Primary Pulse Width Zone 7	86
135	Primary Pulse Width Zone 8	87
136	Secondary Pulse Width Zone 1	88
137	Secondary Pulse Width Zone 2	89
138	Secondary Pulse Width Zone 3	8A
139	Secondary Pulse Width Zone 4	8B
140	Secondary Pulse Width Zone 5	8C
141	Secondary Pulse Width Zone 6	8D
142	Secondary Pulse Width Zone 7	8E
143	Secondary Pulse Width Zone 8	8F
144 - 147	First User Track Zone 1	90 - 93
148 - 151	Last User Track Zone 1	94 - 97
152 - 155	First User Track Zone 2	98 - 9B
156 - 159	Last User Track Zone 2	9C - 9F
160 - 163	Inner Zone Write Calibration Area Start Track	A0 - A3

Table 22. 6000 Log Mode Logs - Page F: Media Product Specific Information Log (Size 256) (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
164 - 167	Inner Zone Write Calibration Area End Track	A4 - A7
168 - 171	Outer Zone Write Calibration Area Start Track	A8 - AB
172 - 175	Outer Zone Write Calibration Area End Track	AC - AF
176 - 253	Undefined	B0 - FD
254 - 255	PSI Checksum	FE - FF

Table 23. 4000 Log Mode Logs - OPT Value 1: Data Logged During Write Commands

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0 - 3	Number of Peripheral Buffer Manager Parity Errors	0 - 3
4 - 7	Number of EDAC Parity Errors	4 - 7
8 - 11	Number of Unable to Write Errors	8 - B
12 - 15	Number of RWS Write Spin Downs	C - F
16 - 19	Number of MCDW Errors	10 - 13
20 - 23	Number of Verify Pass Relocations	14 - 17
24 - 27	Number of Access Relocations	18 - 1B
28 - 31	Number of RWS Write Timeouts	1C - 1F
32 - 35	Number of RWS DPR Verify Retries	20 - 23
36 - 39	Undefined	24 - 27
40 - 43	Number of Attempted Overwrites	28 - 2B
44 - 47	Number of Slow Host Incidents	2C - 2F
48 - 51	Number of Host Aborts	30 - 33
52 - 55	Number of Sectors Written during Writes	34 - 37
56 - 59	Undefined	38 - 3B
60 - 63	Number of Write Commands Executed	3C - 3F
64 - 67	Number of Servo Defect Interrupts	40 - 43
68 -71	Number of Write Power Interrupts	44 -47
72 - 75	Number of Sync Error Interrupts	48 - 4B
76 - 79	Number of Sync Lost Interrupts	4C - 4F
80 - 83	Number of Tracking Interrupts	50 - 53
84 - 87	Number of Focus Interrupts	54 - 57
88 - 91	Number of PLL Interrupts	58 - 5B
92 - 95	Number of Generic Seek Errors	5C - 5F
96 - 99	Number of Header Errors	60 - 63
100 - 103	Number of No Track Capture Errors	64 - 67
104 - 107	Number of Track Crossing Errors	68 - 6B
108 - 111	Number of Lost Track Crossing Errors	6C - 6F
112 - 115	Number of Seeks Failed After Maximum Retries	70 -73
116 - 119	Number of Write Power Initialization Errors	74 - 77
120 - 123	Number of Write Power too High Errors	78 - 7B
124 - 127	Number of Pulse Width Errors	7C - 7F
128 - 131	Number of Write Timing Faults	80 - 83

Table 23. 4000 Log Mode Logs - OPT Value 1: Data Logged During Write Commands (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
132 - 135	Number of Motor Speed Faults	84 - 87
136 - 139	Number of Tracking Faults	88 - 8B
140 - 143	Number of Focus Faults	8C - 8F
144 - 147	Number of Arbitrary Faults	90 - 93
148 - 151	Number of Command not Complete Errors	94 - 97
152 - 155	Number of Drive Configuration Errors	98 - 9B
156 - 159	Number of DSP Sample Bad Errors	9C - 9F
160 - 163	Number of DSP Timeout Errors	A0 - A3
164 - 167	Number of Preamble Interrupts	A4 - A7
168 - 171	Number of Write Timing Adjustments	A8 - AB
172	Reference Verify Level	AC
173	Inner Zone Write Timing Offset	AD
174	Outer Zone Write Timing Offset	AE
175	Undefined	AF
176 - 179	Number of Write Power Adjustments	B0 - B3
180 - 183	Number of DPR Interrupt Retries	B4 - B7
184 - 187	Number of Quad Sum Interrupts	B8 - BB
188 - 191	Averaged Maximum Data Amplitude	BC - BF
192 - 219	Undefined	C0 - DB

Table 24. 4000 Log Mode Logs - OPT Value 2: Data Logged During Read Commands

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0-3	Number of Read Timing Retries	0 - 3
4-7	Number of Peripheral Buffer Manager Parity Errors	4-7
8-11	Number of EDAC Parity Errors	8-B
12-15	Number of Read Retries	C-F
16-19	Undefined	10-13
20-23	Number of Uncorrectable Sectors	14-17
24-27	Number of Sectors Requiring 48 Bytes of Correction	18-1B
28-31	Number of Sectors Requiring 47 Bytes of Correction	1C-1F
32-35	Number of Sectors Requiring 46 Bytes of Correction	20-23
36-39	Number of Sectors Requiring 45 Bytes of Correction	24-27
40-43	Number of Sectors Requiring 44 Bytes of Correction	28-2B
44-47	Number of Sectors Requiring 43 Bytes of Correction	2C-2F
48-51	Number of Sectors Requiring 42 Bytes of Correction	30-33
52-55	Number of Sectors Requiring 41 Bytes of Correction	34-37
56-59	Number of Sectors Requiring 40 Bytes of Correction	38-3B
60-63	Number of Sectors Requiring 39 Bytes of Correction	3C-3F
64-67	Number of Sectors Requiring 38 Bytes of Correction	40-43
68-71	Number of Sectors Requiring 37 Bytes of Correction	44-47
72-75	Number of Sectors Requiring 36 Bytes of Correction	48-4B
76-79	Number of Sectors Requiring 35 Bytes of Correction	4C-4F
80-83	Number of Sectors Requiring 34 Bytes of Correction	50-53
84-87	Number of Sectors Requiring 33 Bytes of Correction	54-57
88-91	Number of Sectors Requiring 32 Bytes of Correction	58-5B

Table 24. 4000 Log Mode Logs - OPT Value 2: Data Logged During Read Commands (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
92-95	Number of Sectors Requiring 31 Bytes of Correction	5C-5F
96-99	Number of Sectors Requiring 30 Bytes of Correction	60-63
100-103	Number of Sectors Requiring 29 Bytes of Correction	64-67
104-107	Number of Sectors Requiring 28 Bytes of Correction	68-6B
108-111	Number of Sectors Requiring 27 Bytes of Correction	6C-6F
112-115	Number of Sectors Requiring 26 Bytes of Correction	70-73
116-119	Number of Sectors Requiring 25 Bytes of Correction	74-77
120-123	Number of Sectors Requiring 24 Bytes of Correction	78-7B
124-127	Number of Sectors Requiring 23 Bytes of Correction	7C-7F
128-131	Number of Sectors Requiring 22 Bytes of Correction	80-83
132-135	Number of Sectors Requiring 21 Bytes of Correction	84-87
136-139	Number of Sectors Requiring 20 Bytes of Correction	88-8B
140-143	Number of Sectors Requiring 19 Bytes of Correction	8C-8F
144-147	Number of Sectors Requiring 18 Bytes of Correction	90-93
148-151	Number of Sectors Requiring 17 Bytes of Correction	94-97
152-155	Number of Sectors Requiring 16 Bytes of Correction	98-9B
156-159	Number of Sectors Requiring 15 Bytes of Correction	9C-9F
160-163	Number of Sectors Requiring 14 Bytes of Correction	A0-A3
164-167	Number of Sectors Requiring 13 Bytes of Correction	A4-A7
168-171	Number of Sectors Requiring 12 Bytes of Correction	A8-AB
172-175	Number of Sectors Requiring 11 Bytes of Correction	AC-AF

Table 24. 4000 Log Mode Logs - OPT Value 2: Data Logged During Read Commands (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
176-179	Number of Sectors Requiring 10 Bytes of Correction	B0-B3
180-183	Number of Sectors Requiring 9 Bytes of Correction	B4-B7
184-187	Number of Sectors Requiring 8 Bytes of Correction	B8-BB
188-191	Number of Sectors Requiring 7 Bytes of Correction	BC-BF
192-195	Number of Sectors Requiring 6 Bytes of Correction	C0-C3
196-199	Number of Sectors Requiring 5 Bytes of Correction	C4-C7
200-203	Number of Sectors Requiring 4 Bytes of Correction	C8-CB
204-207	Number of Sectors Requiring 3 Bytes of Correction	CC-CF
208-211	Number of Sectors Requiring 2 Bytes of Correction	D0-D3
212-215	Number of Sectors Requiring 1 Byte of Correction	D4-D7
216-219	Number of Sectors Requiring No Correction with ECC	D8-DB
220-223	Number of 4000 Control Records Requiring Correction	DC-DF
224-227	Number of Total Bytes Corrected	E0-E3
228-231	Number of Record Sequence Errors	E4-E7
232-235	Number of Control Record Type Mismatch	E8-EB
236-239	Number of Relocated Sectors Read	EC-EF
240-243	Number of RWS Read Timeouts	F0-F3
244-255	Undefined	F4-FF
256-259	Number of RWS Read Spin Downs	100-103
260-263	Number of Retries Due to Access Errors	104-107
264-267	Number of Slow Host Incidents	108-10B
268-271	Number of Cached Sectors Sent to Host	10C-10F
272-275	Number of Cached Sectors Read	110-113
276-279	Read Ahead Cache Misses	114-117
280-283	Unused Cached Buffers	118-11B
284-287	Number of Sectors Read	11C-11F
288-291	Number of Qualify Read Retries	120-123
292-295	Number of Logical Read Commands Executed	124-127

Table 24. 4000 Log Mode Logs - OPT Value 2: Data Logged During Read Commands (Continued)

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
296-299	Number of Servo Defect Interrupts	128-12B
300-303	Number of Sync Error Interrupts	12C-12F
304-307	Number of Sync Lost Interrupts	130-133
308-311	Number of Tracking Interrupts	134-137
312-315	Number of Focus Interrupts	138-13B
316-319	Number of PLL Interrupts	13C-13F
320-323	Number of Generic Seek Errors	140-143
324-327	Number of Header Errors	144-147
328-331	Number of No Track Capture Errors	148-14B
332-335	Number of Track Crossing Errors	14C-14F
336-339	Number of Lost Track Crossings	150-153
340-343	Number of Seeks Failed After Maximum Retries	154-157
344-347	Number of Read Initialization Errors	158-15B
348-351	Number of Read Power Too High Faults	15C-15F
352-355	Number of Read Timing Faults	160-163
356-359	Number of Motor Speed Faults	164-167
360-363	Number of Tracking Faults	168-16B
364-367	Number of Focus Faults	16C-16F
368-371	Number of Arbitrary Faults	170-173
372-375	Number of Aborts	174-177
376-379	Number of Command Not Complete Errors	178-17B
380-383	Number of Drive Configuration Errors	17C-17F
384-387	Number of DSP Timeout Errors	180-183
388-391	Number of DSP Sample Bad ERrors	184-187
392	Read Timing Average	188
393-396	Number of Read Retries of Optimization Disabled	189-18C
397-400	Number of Quad Sum Interrupts	180-190
401-404	Number of Codeword Corrections	191-194
405-408	Number of ECC Behind Occurrences	195-198
409-412	Number of Uncorrectable 4000 Control Records	199-19C
413-419	Undefined	19D-1A3

Table 25. 4000 Log Mode Logs - OPT Value 3: Predictive Maintenance Statistics

BYTE (DECIMAL)	DESCRIPTION	BYTE (HEX)
0-5	The Drive Serial Number (ASCII)	0 - 5
6-11	DPC Firmware Revision Level (ASCII)	6 - B
12-17	RWS B Firmware Revision Level (ASCII)	C - 11
18-23	RWS A Firmware Revision Level (ASCII)	12 - 17
24-29	WOODI Firmware Revision Level (ASCII)	18 -1D
30-35	Undefined	1E -23
36-41	Number of Spin Up Cycles	24 - 29
42-47	Number of Media Insertions	2A - 2F
48-53	Number of Seek Retries	30 -35
54-59	Number of Seek Operations	36 - 3B
60-65	Number of Seek Errors	3C - 41
66-71	Number of Nonoptimum Focus Adjustments	42 - 47
72-77	Number of Relocation Sectors Left on Side A	48 - 4D
78-83	Number of Relocation Sectors Left on Side B	4E - 53
84-89	Number of MM Raw Empty Sectors on Side A	54 - 59
90 - 95	Number of MM Raw Empty Sectors on Side B	5A - 5F

INQUIRY (12H)

The INQUIRY command requests parameter information about the LaserDrive be sent to the Initiator.

INQUIRY Command (12H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	INQUIRY (12H)							
01	LUN 0			Reserved				
02	Reserved							
03	Reserved							
04	Allocation Length							
05	Reserved							

Allocation Length

The Allocation Length is the number of bytes that the LaserDrive will return to the Initiator during the data phase. The drive will return the allocation length or the maximum number of bytes of Inquiry Data available, whichever is less. An Allocation Length of zero will result in no Inquiry Data being transferred and is not considered an error.

The INQUIRY command returns CHECK CONDITION status only when the target cannot return the requested INQUIRY data.

If an INQUIRY command is received from an Initiator with a pending Unit Attention condition, the INQUIRY command is executed and the Unit Attention condition will not be cleared.

The LaserDrive will return one of two types of INQUIRY data. The data specified in Table 26 will be returned for a LD 6100. The data specified in Table 27 will be returned for an LF 6600/LF 6602.

The Peripheral Device Type field (byte 0) is made up of a Peripheral Qualifier field (bits 5 - 7) and a Peripheral Device Type field (bits 0 - 4). These two fields identify the device currently connected to the logical unit.

If the target is not capable of supporting a device on this logical unit, this byte shall be set to 7FH (Peripheral Qualifier set to 011b and Peripheral Device Type set to 1FH).

The LaserDrive will return 04 in byte 0 in response to an inquiry to LUN 0 and 7FH in response to an inquiry to LUN's 1 - 7.

Table 26. LD 6100 INQUIRY Data

BIT / BYTE	7	6	5	4	3	2	1	0
00	Peripheral Device Type (04)							
01	RMB (1)	Reserved						
02	ISO Version (0)		ECMA Version (0)			ANSI Approved Version (2)		
03	Reserved	Termio (1)	Reserved		Response Data Format (2)			
04	Additional Length (1FH)							
05	Reserved							
06	Reserved							
07	Reserved			Sync (1)	Reserved			
08	Vendor Identification (MSB) ‘L’							
09	Vendor Identification ‘M'							
10	Vendor Identification ‘S							
11	Vendor Identification ‘ '							
12	Vendor Identification ‘ '							
13	Vendor Identification ‘ '							
14	Vendor Identification ‘ '							
15	Vendor Identification (LSB) ‘ '							
16	Product Identification (MSB) ‘L’							
17	Product Identification ‘D’							
18	Product Identification ‘ ’							
19	Product Identification ’6’							
20	Product Identification ‘1’							
21	Product Identification ‘0'							
22	Product Identification ‘0'							
23	Product Identification ‘S'							
24	Product Identification ‘E'							
25	Product Identification ‘R'							
26	Product Identification ‘ . '							
27	Product Identification ‘ '							
28	Product Identification ‘ '							
29	Product Identification ‘ '							
30	Product Identification ‘ '							
31	Product Identification (LSB) ‘ '							
32	Product Revision Level (MSB) 'A'							
33	Product Revision Level '0'							
34	Product Revision Level '0'							
35	Product Revision Level (LSB) 'A'							

NOTE

"A00A", bytes 32 - 35, are just an example of a Product Revision Level value that may be returned.

Product Revision Level will be an alpha character followed by two numeric characters. The last field will either be blank or will display another alpha character.

Table 27. LF 6600/LF 6602 INQUIRY Data

BIT / BYTE	7	6	5	4	3	2	1	0
00	Peripheral Device Type (04)							
01	RMB (1)	Reserved						
02	ISO Version (0)		ECMA Version (0)			ANSI Approved Version (2)		
03	Reserved	Termio (1)	Reserved		Response Data Format (2)			
04	Additional Length (1FH)							
05	Reserved							
06	Reserved							
07	Reserved			Sync (1)	Reserved			
08	Vendor Identification ‘L							
09	Vendor Identification ‘M'							
10	Vendor Identification ‘S’							
11	Vendor Identification ‘ ’							
12	Vendor Identification ‘ ’							
13	Vendor Identification ‘ ’							
14	Vendor Identification ‘ ’							
15	Vendor Identification (LSB) ‘ '							
16	Product Identification (MSB) ‘L’							
17	Product Identification ‘F’							
18	Product Identification ‘ ’							
19	Product Identification ‘6’							
20	Product Identification ‘6’							
21	Product Identification ‘0'							
22	Product Identification ‘0'							
23	Product Identification ‘S'							
24	Product Identification ‘E'							
25	Product Identification ‘R'							
26	Product Identification ‘ . '							
27	Product Identification ‘ '							
28	Product Identification ‘ '							
29	Product Identification ‘ '							
30	Product Identification ‘ '							
31	Product Identification ‘ '							
32	Product Revision Level (MSB) 'A'							
33	Product Revision Level '0'							
34	Product Revision Level '0'							
35	Product Revision Level (LSB) 'A'							

NOTE

"A00A", bytes 32 - 35, are just an example of a Product Revision Level value that may be returned.

Product Revision Level will be an alpha character followed by two numeric characters. The last field will either be blank or will display another alpha character.

MEDIA SCAN (38H)

The MEDIA SCAN command requests the Target to scan the media for a contiguous set of written or blank logical blocks.

MEDIA SCAN Command (38H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	MEDIA SCAN (38H)							
01	LUN 0			WBS	ASA	Reserved	PRA	Reserved
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Reserved							
08	Parameter List Length							
09	Reserved	Ignore Errors	Reserved					

Written Block Search (WBS)

A Written Block Search (WBS) bit of zero indicates that the scan is for blank blocks. A WBS bit of one indicates that the scan is for written blocks.

Advanced Scan Algorithm (ASA)

An Advanced Scan Algorithm (ASA) bit of zero indicates that the scan area is scanned in sequential order beginning with the address specified in the Logical Block Address field. An ASA bit of one indicates that a modified binary scan algorithm will be used. This binary search can be used over a "mixed area" of blank and written blocks as long as the requested size of blank or written blocks (Number of Blocks Requested field) is not satisfied within the mixed area.

The ASA assumes sequential use of the LBA space and is best suited for finding the high water mark in a user data area. Directory and other media mapping areas should use the sequential scan, provided the area size does not produce a significant increase in execution overhead.

Partial Results Acceptable (PRA)

A Partial Results Acceptable (PRA) bit of zero indicates that the scan will not be satisfied until a contiguous set of blocks is found within the scan area, which is greater than or equal in size to the number of blocks requested, and meets the other criteria for the scan.

A PRA bit of one indicates that the scan may be satisfied by a contiguous set of blocks within the scan area, which is less than the number of blocks requested, and meets the other criteria for the scan. In this case, the LaserDrive will report the largest contiguous set of blocks in the scan area. When the PRA bit is set, the ASA bit cannot be set.

Ignore Errors

If the Ignore Errors field is set to one, the LaserDrive will treat media errors as nonblank and access errors as blank. If this field is not set, all errors will be reported when they are encountered.

The following Media Scan examples with the ASA mode bit will report incorrectly for cases 1 and 2, and correctly for case 3.

Media Scan parameters:

- Start LBA - 0
- Written block search - 0 (search for blank)
- Number of blocks requested - 2
- Number of blocks to scan - 10

Case 1

Binary Search Result:

			(B)			(A)				
	W	B	B	W	W	B	B	W	B	B
LBA	0	1	2	3	4	5	6	7	8	9

(A) Condition met. Move scan in for written to blank boundary.

(B) Condition not met. Mixed area.

Result: Incorrect. LBA 5 will be returned instead of 1.

Case 2:

Binary Search Result

						(A)		(B)		
	W	B	B	W	W	W	W	B	B	B
LBA	0	1	2	3	4	5	6	7	8	9

(A) Condition not met. Move scan out for written to blank boundary.

(B) Condition met.

Result: Incorrect. LBA 7 will be returned instead of 1.

Case 3:

Binary Search Result

		(C)	(B)			(A)				
	W	B	B	B	B	B	B	B	B	B
LBA	0	1	2	3	4	5	6	7	8	9

(A) Condition met. Move scan in for written to blank boundary.

(B) Condition met. Move scan in for written to blank boundary.

(C) Condition met.

Result: Correct.

The logical block address specifies the first logical block of the scan area.

The Parameter List Length specifies the length in bytes of the parameter list that shall be transferred during the DATA OUT phase. A parameter list length of zero indicates that the number of blocks requested field has a value of one and the number of blocks to scan field has a value of zero. This condition shall not be considered an error.

MEDIA SCAN Parameter List

BIT / BYTE	7	6	5	4	3	2	1	0
00	Number of Blocks Requested (MSB)							
01	Number of Blocks Requested							
02	Number of Blocks Requested							
03	Number of Blocks Requested (LSB)							
04	Number of Blocks to Scan (MSB)							
05	Number of Blocks to Scan							
06	Number of Blocks to Scan							
07	Number of Blocks to Scan (LSB)							

Number of Blocks Requested

The Number of Blocks Requested field specifies the number of blocks needed to meet the specified requirements. The Number of Blocks Requested field, if set to zero, indicates that the scan shall not take place. This shall not be considered an error condition.

Number of Blocks to Scan

The Number of Blocks to Scan field specifies the length in blocks of the area to be scanned on the media. The Number of Blocks to Scan field, if set to zero, specifies the length of the scan area to extend to the maximum LBA of the media.

If the scan is satisfied, the command is terminated with a CONDITION MET status. A REQUEST SENSE command should then be issued.

A REQUEST SENSE command following a satisfied MEDIA SCAN command shall:

1) Return a Sense Key of EQUAL if the scan was satisfied by a contiguous set of blocks equal in size to the number of blocks requested. Return a Sense Key of NO SENSE if the PRA bit is set and the scan was satisfied by less than the Number of Blocks Requested.

2) Return the valid bit set to one.

3) Return the logical block address of the first logical block of the contiguous set of blocks that satisfied the scan criteria in the information bytes.

4) Return the number of contiguous logical blocks meeting the scan criteria in the command specific information bytes.

If the scan is not satisfied and no error occurs, the command is terminated with GOOD status. A REQUEST SENSE command may then be issued.

A REQUEST SENSE command following an unsatisfied MEDIA SCAN command shall:

1) Return a Sense Key of NO SENSE if no errors occurred during the command execution

2) Return the valid bit set to zero

MODE SELECT (15H)

The MODE SELECT command provides a means for the Initiator to specify LaserDrive operational parameters. The parameter settings can be determined with the MODE SENSE command. In auto-configuring systems, the MODE SENSE command should be issued before MODE SELECT to determine supported pages, page lengths and other parameters.

MODE SELECT Command (15H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	MODE SELECT (15H)							
01	LUN 0			PF	Reserved			SP
02	Reserved							
03	Reserved							
04	Parameter List Length							
05	Reserved							

Page Format (PF)

A Page Format (PF) bit of one indicates that the MODE SELECT parameters are structured as pages of related parameters. A MODE SELECT command received with the PF bit set to zero will only accept the 4 byte header.

Save Pages (SP)

A Save Pages (SP) bit of zero indicates the LaserDrive will perform the specified MODE SELECT operation and not save any pages. Therefore, upon a subsequent reset or power cycle, these parameters may be changed. An SP bit of one indicates that the LaserDrive will perform the specified MODE SELECT operation and save, to nonvolatile RAM, all the savable pages including any page changes sent during the DATA OUT phase.

The LaserDrive rejects any MODE SELECT that attempts to change a parameter that is not changeable. The LaserDrive rejects a MODE SELECT that sends a parameter value out of the range supported by the LaserDrive. These command rejections cause the LaserDrive to return a completion status of CHECK CONDITION. The ILLEGAL REQUEST Sense Key and Invalid Field in Parameter List Error Code is set in the Sense Data.

Parameter List Length

The Parameter List Length specifies the length in bytes of the MODE SELECT parameter list that is transferred from the Initiator to the LaserDrive. A Parameter List Length of zero indicates that no data is transferred. The LaserDrive accepts and validates mode select parameters up to the Parameter List Length specified in the CDB and according to the Page Specific Parameter Length in each page header. Any multiple-byte parameter field not completely supplied is in error. The Sense Key is set to INVALID REQUEST, the Error Code is set to Invalid Field in Parameter List and no pages are changed.

The MODE SELECT parameter list shown in Table 28 contains a 4-byte header, followed by zero or more pages of parameters or an 8-byte block descriptor, followed by zero or more pages of parameters.

If a MODE SELECT command is terminated with a completion status other than GOOD, the LaserDrive does not modify operating parameters.

The contents of the media-type field is 02H. This indicates a WORM-media type. The default media type value of zero will also be accepted. However, any subsequent Mode Sense will always report Media Type as 02.

Table 28. MODE SELECT Parameter List

BIT / BYTE	7	6	5	4	3	2	1	0
00	Reserved							
01	Media Type (00H or 02H)							
02	WP	Reserved						EBC
03	Block Descriptor Length (0 or 8)							
BLOCK DESCRIPTOR								
00	Reserved							
01	Number of Blocks (00H) (MSB)							
02	Number of Blocks (00H)							
03	Number of Blocks (00H) (LSB)							
04	Reserved							
05	Block Length (MSB) (00H)							
06	Block Length (04H)							
07	Block Length (LSB) (00H)							
PAGE(S)								

Write Protect (WP)

A Write Protect (WP) bit of one or zero may be entered. If zero, the Laser Drive will be write enabled. If set, the Laser Drive will be write protected.

Enable Blank Check (EBC)

An Enable Blank Check (EBC) of one or zero may be entered. The EBC default value is zero. If set, the LaserDrive will execute a pre-read before a write operation to ensure the first block being written to is blank.

Block Descriptor Length

The Block Descriptor Length specifies the length, in bytes, of the block descriptor. This value must be zero if the drive is not ready. If the drive is ready, this value must be zero or eight. A Block Descriptor Length of zero indicates that no block descriptor is included in the parameter list. This is not considered an error. The LaserDrive supports one block descriptor.

Number of Blocks

The Number of Blocks field value must be zero. This specifies that the Block Length specification that follows applies to the entire media.

Block Length

The Block Length field specifies the length in bytes of each logical block of the LaserDrive logical unit. The block length specified must be 1024 bytes (400H).

Each page descriptor specifies parameters for the LaserDrive to use for subsequent operations. The selectable page codes for the LaserDrive are given in Table 29. The Parameter Length field specifies the length in bytes of the parameters that follow for the specified page.

Table 29. Page Codes for the LaserDrive

PAGE CODE (HEX)	DESCRIPTION
00	Reserved
01	Read-Write Error Recovery Parameters
02	Disconnect-Reconnect Control Parameters
03 - 1F	Reserved
20	Vendor-Unique Parameters
21	LaserFile Media Status Page
22 - 3E	Reserved
3F	Reserved (Defined for MODE SENSE Only)

READ-WRITE ERROR RECOVERY PAGE

The Read-Write Error Recovery page specifies the error recovery parameters the LaserDrive uses during any command that performs a read or write operation to the media.

Read-Write Error Recovery Page (01H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	Reserved		Page Code (01H)					
01	Parameter Length (2)							
02	AWRE (1)	Reserved			EER (1)	PER	DTE	Reserved
03	Read Retry Count (Default 16)							

AWRE

The Automatic Write Reallocation Enabled (AWRE) bit of one cannot be changed and indicates that the LaserDrive shall enable automatic reallocation of defective data blocks during write operation. The automatic reallocation is always performed by the LaserDrive. For system evaluation, the information that would be available when this bit is disabled can be obtained from the EVENT LOG command.

EER

Enable Early Recovery (EER) must be set to one since Error Correction cannot be disabled.

PER

If the Post Error (PER) is set, the LaserDrive will report recovered errors. If the PER bit is not set, recovered errors will not be reported.

For read commands, a recovered error will be posted when any of the following occur:

- Error correction is applied during the read.
- A system retry was required during the read.
- A relocated block was retrieved during the read.

The SCSI sense information bytes point to the last block within the read extent that required any of the recovery described previously. The ACCESS EVENT LOG command can be used to determine the nature of the recovery.

For write commands, a recovered error will be posted when a relocation is required in the write extent. The SCSI sense information bytes will point to the last block relocated in the write extent. In the absence of a relocation in the write extent, a Spares Full Warning, Sense Key 01, ASC 32 and ASCQ 00, may be posted to the host. This will occur if the number of relocation sectors left on the side of media that is being written to is 100 or less.

Refer to the REQUEST SENSE command description for the relevant Sense Key and Error Code definitions.

DTE

If the Disable Transfer on Error (DTE) bit is set, the LaserDrive will terminate the data phase when a recovered error is detected. If the DTE bit is not set, the LaserDrive will not terminate the data phase when a recovered error is detected. The PER bit must be set if the DTE bit is set.

Read Retry Count

The Read Retry Count fields specify the number of times that the LaserDrive shall attempt its recovery algorithm during read operations. This value is 16 and cannot be modified; however, values of 4 and 8 will not be rejected.

NOTE

If an invalid mode for the error recovery combination is sent by the Initiator, the Target shall return CHECK CONDITION status with the Sense Key set to ILLEGAL REQUEST and the Additional Sense Code set to Invalid Field In Parameter List.

DEVICE DISCONNECT/RECONNECT PARAMETERS

This page specifies the parameters that control the LaserDrive's SCSI bus usage during data transfer operations.

Disconnect/Reconnect Parameters Page (02H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	Reserved		Page Code (02H)					
01	Parameter Length (0AH)							
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							
06	Reserved							
07	Reserved							
08	Reserved							
09	Reserved							
10	Maximum Burst Length (MSB)							
11	Maximum Burst Length (LSB)							

Parameter Length

The Parameter Length must be set to 10 (0AH).

Maximum Burst Length

The Maximum Burst Length gives the number of blocks the LaserDrive transfers on the SCSI bus before attempting to disconnect. The LaserDrive transfers exactly this number of blocks on all but the final transfer of a command. A value of zero indicates that the LaserDrive will not disconnect during the data transfer phase of commands.

The default value is 2304 (900H). Since burst length is expressed in increments of 512 bytes and the LaserDrive must transfer on 1024-byte boundaries, the value must be an even number. If an odd number is selected, the LaserDrive will respond with a CHECK CONDITION status with the Sense Key set to ILLEGAL REQUEST and the ASC set to Invalid Field in Parameter List.

VENDOR-UNIQUE PARAMETERS

This page gives the parameters specific to the LaserDrive.

Vendor-Unique Mode Select Page (20H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	Reserved		Page Code (20H)					
01	Parameter Length (02H)							
02	MMSU	SEW		DEFDIS	DPDIS	Language		
03	RTPM	SYSLOG	RA	Reserved	SUA	AutoSpin	SDTR	SSDIS

NOTE

On an LF 6600/LF 6602, AutoSpin cannot be disabled; however, a value of zero in this bit will not be rejected. The AutoSpin bit only affects an LD 6100.

MMSU

The Media Management Recovery on Spin Up (MMSU) field can be set to configure the LaserDrive to read necessary media management information during spin up. If not set, media management information will be recovered on the first media access command.

SEW

For the Spares Early Warning (SEW) field, the Initiator can select one of the values indicated here. If one of these values is selected, CHECK CONDITION status will be reported based on the following criteria:

SEW Value	Criteria
0	Will not report Spares Full Error until spares are full.
1	Report Spares Full Error at 50% full ASCQ 80.
2	Report Spares Full Error at 70% full ASCQ 81.
3	Report Spares Full Error at 90% full ASCQ 82.

A subsequent request sense will indicate the following information:

Sense Key 03H	MEDIA ERROR
ASC 32H	Spares Full
ASCQ 8xH	The x is set as indicated previously (ASCQ 80, 81 or 82)

When a SEW value has been selected (1-3), the appropriate CHECK CONDITION will be reported during a WRITE or WRITE AND VERIFY command if a logical block must be relocated.

The default will be zero.

If the SEW value is not set, the drive will not report a CHECK CONDITION with Spares Full Sense Key 3, ASC 32, ASCQ 00, when no more map entries are available on a side of media.

DEFDIS

If Defect Reporting Disable (DEFDIS) is set to one, access errors will not be reported during a VERIFY command with the BLKVFY (Blank Verify) option bit set. If DEFDIS is set to zero, access errors will be reported during the VERIFY command. The DEFDIS default is zero.

DPDIS

If the DOC Panel Disable (DPDIS) is set to one, the DOC panel will be disabled and no Unit Attention will be generated when any of the switches are pressed. However, "Denied" will be displayed on the DOC panel. If DPDIS is set to zero, the DOC panel will be enabled. The DPDIS default is zero.

NOTE

When the DPDIS bit is set to one, both the LOAD and TEST switches will be disabled and the user will not be able to load or unload media, enter test mode or enter the Configuration mode via the DOC panel.

If this bit is saved on a MODE SELECT command with SP = 1, the bit's status will be retained after a reset but will always be cleared after a power up or a SEND DIAGNOSTIC command.

Language

The Language Field specifies which language will be displayed on the DOC display. The following options are available:

OPTION	LANGUAGE
0	English
1	French
2	German

The default language value is zero (English).

RTPM

The Real Time Performance Monitor (RTPM) will enable the LaserDrive to monitor write performance on-the-fly. This monitor cannot be disabled. However, setting this field to zero will clear any existing violation and re-enable write capability.

If the RTPM bit is set and the percentage of relocations is high, the LaserDrive will return a CHECK CONDITION status on the first poor performance write with the Sense Key set to HARDWARE ERROR, the ASC set to Controller Hardware/Parity Error and byte 18 set to 39H. This condition can be caused by a drive hardware failure or contaminated media.

After the 04/44/39 is returned to the host, any further write commands to the drive will return CHECK CONDITION status with the Sense Key set to HARDWARE ERROR, the ASC set to Controller Hardware/ Parity Error and byte 18 set to 38H until the RTPM condition is cleared.(1)

(1)This condition may be cleared via the DOC through the Clear RTPM or the Clear NvRAM options. This condition may also be cleared via mode select by setting the RTPM bit to zero.

The default RTPM value is zero.

The LaserDrive will inform the host of poor write performance via the RTPM if either of the following conditions occur:

- when $7 < x \leq 40$ decimal and $y > 4$
- when $x > 40$ decimal and $y > 0.1x$

where x = the number of sectors written on a given side during one write verify extent

y = the number of sectors dynamically relocated on a given side during one write verify extent

SYSLOG

The SYSLOG bit can be set to enable system logging when a problem occurs in the field. If this log is enabled, it will slow down system performance. The default SYSLOG value is zero.

RA

The Read Ahead (RA) bit enables or disables the read ahead function. One enables data read ahead. The default value is zero. When Read Ahead is enabled, the LaserDrive will continue reading sequentially after a READ command has completed until one of the following events occur:

1) The data buffer is full.

2) An empty sector is encountered.

3) Another access command is received.

An RA bit of one with either PER or DTE bit(s) of one is invalid and will be rejected.

NOTE

The Mode Select Read Ahead function can be disabled through the DOC. Refer to the User Manual for more information.

SUA

The Suppress Unit Attention (SUA) field is used to configure the LaserDrive to not report unit attentions when the DOC panel switches are pressed and a prevent media removal is active, or a media is loaded by a MOVE MEDIA command in an LF 6600. If set these unit attention will not be reported. If not set these unit attentions will be reported. The default is not set.

AutoSpin

The Automatic Spin Up (AutoSpin) bit controls whether the LD 6100 drive spins up automatically when a media is present after a reset, power up or selftest. If set to one, the LD 6100 will automatically spin up. If set to zero, the LD 6100 will not spin up automatically. The default AutoSpin value is one.

NOTE

On an LF 6600/LF 6602, AutoSpin cannot be disabled; however, a value of zero in this bit will not be rejected.

SDTR

The Synchronous Data Transfer Request (SDTR) field is used to configure the LaserDrive to initiate an SDTR negotiation after a reset, power up, self test, or send diagnostic command. If set, this negotiation will be initiated by the LaserDrive. If not set the LaserDrive will never initiate an SDTR negotiation. Default is not set.

SSDIS

The START/STOP Switch Disable (SSDIS) bit reports whether the front panel switch on the DOC will be ignored (refer to the LD 6100/LF 6600LF 6602 Product Specification). An SSDIS bit of one indicates that the Start/Stop switch on the LaserDrive front panel will be ignored. Also, a Unit Attention will be generated only when the TEST switch is pressed. "Denied" will be displayed when either switch is pressed.

An SSDIS bit of zero indicates that the Start/Stop switch will be honored. The action of the START/STOP command is not affected. The default SSDIS value is zero.

LASERFILE MEDIA STATUS PAGE (LF 6600/LF 6602 ONLY)

The Mode Select Media Status page allows selection of a media which will be loaded into the drive after a reset, a power up or after the door is opened. If the home position is selected, then no media will be inserted into the drive. The shuttle will then move to the home position and await a MOVE MEDIA command.

Mode Select/Media Status Page (21H) - LF 6600/LF 6602 Only

BIT / BYTE	7	6	5	4	3	2	1	0
00	Reserved		Page Code (21H)					
01	Parameter Length (02H)							
02	Reserved	AutoLoad Selection			Reserved			
03	Reserved							

AutoLoad Selection (ALS)

The AutoLoad Selection (ALS) field is a numeric field indicating which media is selected for auto load, as indicated in the following list. The default is 1 (slot 1).

BITS 4 - 6	ADDRESS
0	Home Position
1	Slot 1
2	Slot 2
3	Slot 3
4	Slot 4
5	Slot 5
6	Slot 6
7	MRU (Most Recently Used)

MODE SENSE (1AH)

The MODE SENSE command provides a means for the LaserDrive to report parameters to the Initiator. It is a complementary command to the MODE SELECT command.

MODE SENSE Command (1AH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	MODE SENSE (1AH)							
01	LUN 0			Reserved				
02	Page Control (PC)		Page Code					
03	Reserved							
04	Allocation Length							
05	Reserved							

The Page Control (PC) field, as shown in Table 30, defines the type of parameter values to be returned.

Table 30. Page Control Field Definition

DB(7)	DB(6)	TYPE OF PARAMETER VALUES
0	0	Current Values
0	1	Changeable Values
1	0	Default Values
1	1	Saved Values

Page Code

The Page Code specifies which page or pages to return. Page Codes are defined in Table 31. The format of supported pages are specified with the MODE SELECT command.

Table 31. Page Codes for MODE SENSE

PAGE CODE (HEX)	DESCRIPTION
00	Reserved
01	Read-Write Error Recovery Parameters
02	Disconnect/Reconnect Control Parameters
03 - 1F	Reserved
20	Vendor-Unique Parameters
21	LaserFile Media Sense Page
22 - 3E	Reserved
3F	Return All Supported Pages

Allocation Length

The Allocation Length specifies the maximum number of bytes that the Initiator has allocated for returned MODE SENSE data. The LaserDrive terminates the DATA IN phase when Allocation Length bytes have been transferred or when all available MODE SENSE data has been transferred to the Initiator, whichever is less. An Allocation Length of zero indicates that no MODE SENSE data is transferred. The LaserDrive Mode Sense Allocation Length must be 36 bytes or greater to return all supported pages (3FH option).

MODE SENSE DATA

The Mode Sense data returned by the LaserDrive consists of a 4-byte header, followed by an 8-byte block descriptor, followed by one or more pages.

The Sense Data Length specifies the length in bytes of the following MODE SENSE data that is available to be transferred during the DATA IN phase. The Sense Data Length count does not include this byte.

The contents of the Media Type field is two. This indicates the WORM media type.

MODE SENSE Data

BIT / BYTE	7	6	5	4	3	2	1	0
00	Sense Data Length							
01	Media Type (02H)							
02	WP	Reserved						EBC
03	Block Descriptor Length (0 or 8)							
BLOCK DESCRIPTOR								
00	Reserved							
01	Number of Blocks (00H) (MSB)							
02	Number of Blocks (00H)							
03	Number of Blocks (00H) (LSB)							
04	Reserved							
05	Block Length (MSB) (00H)							
06	Block Length (04H)							
07	Block Length (LSB) (00H)							
PAGE(S)								

Write Protect (WP)

A Write Protect (WP) bit of zero indicates that the LaserDrive or media is write enabled. A WP bit of one indicates that the LaserDrive or media is write protected or that an RTPM condition is present.

Enable Blank Check (EBC)

An Enable Blank Check (EBC) of one indicates that blank checking during write operations is enabled.

Block Descriptor Length

The Block Descriptor Length specifies the length in bytes of the block descriptor. The LaserDrive supports one block descriptor; thus the value in this field is either a zero or eight.

The LaserDrive will return a block descriptor in a MODE SENSE command only when the media is ready and available for access. If not ready, the Block Descriptor Length will be zero and the block descriptor fields will be omitted.

Number of Blocks

The Number of Blocks field value is zero for the LaserDrive. This specifies that the block length specification that follows applies to the entire media.

Block Length

The Block Length field specifies the length in bytes of each logical block of the LaserDrive logical unit. The Block Length returned is 400H (1024) bytes.

Blocks of parameters called pages follow the block descriptor. Each page is preceded by a header of 2 bytes defining the Page Code and the length of the parameters that follow.

The PS bit indicates the page can be saved to nonvolatile RAM. Following the header, pages consist of a number of fields of related flags and/or values. The PS bit in the first byte of each page indicates that the page can be saved to nonvolatile RAM, if set. Savable pages are optional and identified by the PS bit that is returned in the page header by the MODE SENSE command. The Parameter Length indicates the number of bytes that the LaserDrive supports in each Page. The Parameter Length value does not include the 2-byte header. The LaserDrive returns, in the pages of the MODE SENSE commands, the entire page as defined in this document.

Valid Page codes are described in the next section.

MODE SENSE PAGES

The following pages can be returned for a MODE SENSE command as specified by the PF bit and Page Control (PC) field.

READ-WRITE ERROR RECOVERY PAGE

The Read-Write Error Recovery page specifies the error recovery parameters the Target uses during any command that performs a Read or Write operation to the media.

Read-Write Error Recovery Page

BIT / BYTE	7	6	5	4	3	2	1	0
00	PS (1)	Reserved	Page Code (01H)					
01	Parameter Length (2)							
02	AWRE (1)	Reserved			EER (1)	PER	DTE	Reserved
03	Read Retry Count (Default 16)							

PS

The PS bit is set to indicate this page can be saved. The default value for byte 2 is 88H.

Read Retry Count

The Read Retry Count field will always return 16.

Refer to MODE SELECT, Read-Write Error Recovery Page section for the selectable field definitions.

Device Disconnect/Reconnect Page

This page specifies the parameters that control the LaserDrive's SCSI bus usage during data transfer operations.

Disconnect/Reconnect Parameters Page (02H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	PS (1)	Reserved	Page Code (02H)					
01	Parameter Length (0AH)							
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							
06	Reserved							
07	Reserved							
08	Reserved							
09	Reserved							
10	Maximum Burst Length (MSB)							
11	Maximum Burst Length (LSB)							

PS

The PS bit is set to indicate this page can be saved. The default value for maximum burst length is 900H; this value is expressed in 512-byte blocks.

Refer to MODE SELECT, Device Disconnect/Reconnect Parameters section for selectable field definitions.

VENDOR-UNIQUE PAGE

This page gives the parameters specific to the LaserDrive.

Vendor-Unique Page (20H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	PS (1)	Reserved	Page Code (20H)					
01	Parameter Length (02H)							
02	MMSU	SEW		DEFDIS	DPDIS	Language		
03	RTPM	SYSLOG	RA	WPS	SUA	AutoSpin	SDTR	SSDIS

NOTE

On an LF 6600/LF 6602, AutoSpin cannot be disabled, regardless of the value of the AutoSpin bit. The AutoSpin bit only applies to an LD 6100.

Refer to the MODE SELECT, Vendor-Unique Parameters section for definitions of these fields: MMSU, SEW, DEFDIS, DPDIS, Language, SYSLOG, RA, SUA, AutoSpin, SDTR, SSDIS.

Real Time Performance Monitor (RTPM)

The Real Time Performance Monitor (RTPM) bit is set to one if the LaserDrive is in a read-only state due to a current RTPM condition. This condition will also set the WP bit.

Write Protect Status (WPS)

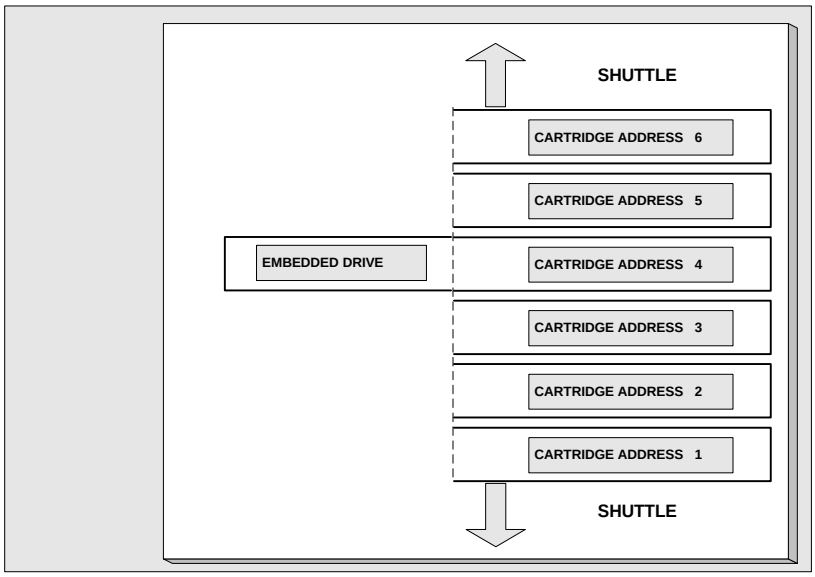
The Write Protect Status bit (WPS) is set to one if the Initiator selected Write Protect mode in a previous Mode Select. This bit will be a zero if Write Protect was not selected by a previous MODE SELECT command. This bit can be used to determine if a drive is write protected or a media is write protected. In the following list, WP is the Write Protect status reported in byte 2 of the Mode Sense Data header and WPS is found in byte 3 of page 20.

WP	RTPM	WPS	Definition
1	0	0	Write Protect Invoked Via the Media Cartridge Switch
0	0	0	Write Protection Disabled
1	0	1	Write Protect Invoked Via the Host or DOC Panel
0	X	1	Invalid State
1	1	0	Write Protect due to RTPM Failure
1	1	1	Write Protect due from (the Host or Doc Panel) and RTPM

The default for byte 2 of Vendor Unique page 20 is zero. The default for byte 3 of Vendor Unique page 20 is 04H.

LASERFILE MEDIA STATUS PAGE (LF 6600/LF 6602 ONLY)

Each LF 6600's shuttle can hold up to six LM 6000 media cartridges. This shuttle and the mechanisms that position and insert/extract media from the embedded drive make up the shuttle portion of the LF 6600/LF 6602. The location where a media cartridge is stored in the shuttle is referred to as a storage address. Addresses are assigned to each media cartridge storage location in the shuttle as shown in the following figure.



LF 6600 Top View

The presence of media at the various addresses in the shuttle can be sensed. This data is available to an Initiator using the Media Sense page as shown in Table 32 for the MODE SENSE command. This page will not be returned for the LD 6100 MODE SENSE command.

Table 32. Mode Sense/Media Status Page (21H) - LF 6600/LF 6602 Only

BIT / BYTE	7	6	5	4	3	2	1	0
00	PS (1)	Reserved	Page Code (21H)					
01	Parameter Length (02H)							
02		AutoLoad Selection			Reserved	Media Loaded Field		
03	Door Open	Reserved	Storage Address Field					

AutoLoad Selection

The AutoLoad Selection field is defined in Mode Select. The default is 1 (slot 1).

BITS 4 - 6	ADDRESS
0	Home Position
1	Slot 1
2	Slot 2
3	Slot 3
4	Slot 4
5	Slot 5
6	Slot 6
7	MRU (Most Recently Used)

Media Loaded Field

The Media Loaded Field indicates which media is currently loaded. A value of 0 indicates that no media is loaded in the drive.

Door Open

If the Door Open bit is set, the Storage Address Field will not contain valid information.

Storage Address

The Storage Address field is a bit significant field indicating which storage addresses contain media, as indicated here:

BIT	ADDRESS
0	1
1	2
2	3
3	4
4	5
5	6

If a bit is set, media is present at that address. If a media is loaded into the baseplates, it will still be shown as present in this field, as well as in the Media Loaded Field.

CURRENT VALUES

A PC field value of zero requests that the LaserDrive return the current values for the page code specified. The current values returned are:

- parameters set in the last successful MODE SELECT command
- saved values if a MODE SELECT command has not been executed

If the Page Code is 3FH, all implemented pages are requested to be returned by the LaserDrive. Supported pages (01H, 02H and 20H, 21H [LF 6600/LF 6602 only]) are returned in ascending order.

Parameters not supported by the LaserDrive are set to zero. The parameter length of each page indicates the length of the parameters that are supported.

CHANGEABLE VALUES

A PC field value of 1H requests that the LaserDrive return the changeable values for the page code specified. The page requested is returned with the bits that are allowed to be changed set to one. Parameters that are not changeable are set to zero. If any part of a field is changeable, all bits in that field are set to one. If the page code is 3FH, all implemented pages requested are returned by the LaserDrive.

DEFAULT VALUES

A PC field value of 2H requests the LaserDrive return the default values for the page code specified. The page requested is then returned with the default parameters set. Parameters not supported by the LaserDrive are set to zero. If the page code is 3FH, all implemented pages are returned by the LaserDrive.

SAVED VALUES

A PC field value of 3H requests the LaserDrive return the saved values for the page code specified. The page requested will be returned with the parameters set to their saved values. Parameters not supported by the LaserDrive will be set to zero. All savable pages can be considered saved when a MODE SELECT command issued with the SP bit set to one has returned a GOOD status.

MOVE MEDIA (02H - LF 6600/LF 6602 ONLY)

The MOVE MEDIA command moves media between the LF 6600/LF 6602 shuttle and the embedded drive. The design of the LF 6600/LF 6602 prevents the shuttle from moving if a media cartridge is inserted in the drive. Because of this design, a loaded media cartridge must always be returned to the original storage address before the shuttle can move. Because a media cartridge will always be returned to the original storage address, this operation is transparent for the MOVE MEDIA command. In addition, the implied spin up or spin down is also assumed and transparent for this command. The addresses which contain a media cartridge can be determined via the MODE SENSE command.

MOVE MEDIA Command (02H) (LF 6600/LF 6602 Only)

BIT / BYTE	7	6	5	4	3	2	1	0
00	MOVE MEDIA (02H)							
01	LUN 0			Reserved			Load	Immed
02	Reserved							
03	Reserved							
04	Storage Address							
05	Reserved							

Load

If the Load bit is set, the LF 6600/LF 6602 will load the media specified by the Storage Address byte. If a media from a different storage address is in the embedded drive, it will automatically be unloaded.

If the Load bit is not set, the media in the embedded drive will be returned to its original storage location and the shuttle will be positioned to the storage address. If the Storage Address field is zero, the shuttle will be moved to the Home position and the MRU (Most Recently Used) AutoLoad selection option will be updated if applicable (see previous section, LaserFile Media Status Page in MODE SENSE).

Immediate (Immed)

An Immediate (Immed) bit of one indicates that ending status is to be returned as soon as the command has been received and validated. If the Immed bit is set, all nonaccess commands will be accepted and executed. Access commands will be accepted, but will report a check condition until the drive is ready. The TEST UNIT READY command should be used to determine if the drive is ready before issuing an access command. An Immed bit of zero indicates that status will not be returned until after the operation is completed.

If disconnect is allowed, the LF 6600/LF 6602 will disconnect after validating the command and reconnect when the MOVE MEDIA command has completed.

Storage Address

The Storage Address specifies the address in the shuttle that contains media to be loaded into the embedded drive (values 1 - 6).

If this command is received and the shuttle storage address is empty, or not in the range of addresses assigned (1-6), the LF 6600/LF 6602 will return CHECK CONDITION status and set the Sense Key to ILLEGAL REQUEST.

PARK BASEPLATES (C9H)

The PARK BASEPLATES command is a vendor unique command that will park the baseplates and prepare the drive for shipment.

PARK BASEPLATES Command (C9H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	PARK BASEPLATES (C9H)							
01	LUN 0			Reserved				
02	0x50 ('P')							
03	0x52 ('R')							
04	0x4B ('K')							
05	Reserved							

If media is inserted between the baseplates when this command is received, the command will be rejected and a CHECK CONDITION will be reported with a Sense Key of ILLEGAL REQUEST (05), with ASQ of ILLEGAL FUNCTION (22).

If this command is executed on an LF6600, the baseplates will be parked and the shuttle will be moved to the HOME position.

Once the PARK BASEPLATES command is executed, the drive must be powered down and prepared for shipment. If the PARK BASEPLATES command is successfully executed and further use of the drive is desired, the drive must be power cycled before continuation.

PREVENT/ALLOW MEDIA REMOVAL (1EH)

The PREVENT/ALLOW MEDIA REMOVAL command enables or disables the removal of media from the LaserDrive.

PREVENT/ALLOW MEDIA REMOVAL Command (1EH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	PREVENT/ALLOW MEDIA REMOVAL (1EH)							
01	LUN 0			Reserved				
02	Reserved							
03	Reserved							
04	Reserved							Prevent
05	Reserved							

Prevent

A Prevent bit of one prevents removal of the media. A Prevent bit of zero allows removal of the media. If any Initiator has issued this command with the Prevent bit set, then the media will not be allowed to be removed. This is true even if other Initiators issue the command with a Prevent bit of zero. If set by multiple Initiators, the lock will be enforced until released by all Initiators. The default state is to allow media removal (zero).

If the Prevent bit has been set by any Initiator, the user will be prevented from accessing Test mode or Configuration mode via the DOC panel. If the LOAD and/or TEST switches on the DOC are pressed, the

DOC panel will display "Denied". A UNIT ATTENTION with ASC equal to 5A and ASCQ equal to 00 will be generated.

However, if the DPDIS bit is set in the Vendor Unique page 20H, no UNIT ATTENTION will be generated when either switch is pressed. If the SSDIS bit is set in the Vendor Unique page 20H, a UNIT ATTENTION will be generated when the TEST switch is pressed and "Denied" will be displayed if either switch is pressed.

For the LD 6100, if media is not installed when this command is received, the command will be rejected and a NOT READY Sense Key with an error code of Cartridge Not Installed posted.

For the LF 6600/LF 6602, setting the Prevent bit will not allow movement of the shuttle to the home position, thus preventing removal of the media. If the Prevent bit is set and the Initiator attempts to move the shuttle to the home position, a CHECK CONDITION will be reported with Sense Key 5, ASC 53 and ASCQ 2. This bit does not prevent the loading and unloading of cartridges that are stored in the shuttle.

PREVENT MEDIA REMOVAL can only be cleared by an ALLOW MEDIA REMOVAL command, a SCSI bus reset or a power-on cycle, and can only be invoked in an LD 6100 when a cartridge is inserted and Ready in the drive. For an LF 6600/LF 6602, the PREVENT MEDIA REMOVAL command can only be invoked if a media is in the drive, the door is closed and the shuttle is not at the HOME position. If a LaserDrive fault occurs when PREVENT MEDIA REMOVAL is enabled, no intervention will be possible via the DOC.

READ (28H - 10 BYTE)

The READ command requests a transfer of data from the media to the Initiator.

READ Command (28H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	READ (28H)							
01	LUN 0			Reserved				
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Transfer Length (MSB)							
08	Transfer Length (LSB)							
09	Reserved	RA	Reserved					

Logical Block Address

The Logical Block Address specifies the logical block where the read operation will begin. The Transfer Length specifies the number of contiguous logical blocks of data to be transferred. For this command, a Transfer Length of zero indicates that no data is to be transferred.

Read Ahead (RA)

If the RA bit is set, the LaserDrive will perform a read ahead operation when the read command that is being executed is complete. This read ahead feature is only active following the read command in which this field is set. If the read ahead option is enabled in a previous MODE SELECT command a read ahead will always follow a read regardless of the state of this field.

If any of the conditions as shown in Table 33 occur, this command is terminated with a CHECK CONDITION status and the Sense Key is set. This table is not exhaustive.

Table 33. Read Check Condition Sense Keys

CONDITION	SENSE KEY (HEX)
Unrecoverable Read Error	MEDIA ERROR (03)
Unable to Read	HARDWARE ERROR (04)
Invalid Logical Block Address	ILLEGAL REQUEST (05)
Reset or Media Changed since the Last Command from this Initiator	UNIT ATTENTION (06)
Attempt to Read an Unwritten Block	BLANK CHECK (08)
Message Protocol or SCSI Data Transfer Error	ABORTED COMMAND (0B)

On a successful read, the sense information bytes are set to the logical block address of the first block not read.

On an unsuccessful read, the sense information bytes will report the failing logical block address.

READ BUFFER (3CH - 10 BYTE)

The READ BUFFER command requests a transfer of data from the read/write buffer to the Initiator. This command is used in conjunction with the WRITE BUFFER command as a diagnostic tool.

READ BUFFER Command (3CH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	READ BUFFER (3CH)							
01	LUN 0			Reserved		Mode (2)		
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							
06	Reserved							
07	Allocation Length (MSB)							
08	Allocation Length (LSB)							
09	Reserved							

Mode

The Mode field must be a 2 (data only).

Allocation Length

The Allocation Length field represents the number of sector blocks to be transferred from the buffer. This value must be within the range of 0 to 3EFH. Any other Allocation Length value will result in a CHECK CONDITION status with a sense key of ILLEGAL REQUEST.

NOTE

Due to hardware limitations, the LaserDrive will transfer sector blocks rather than bytes in response to the Allocation Length of this command. This is not SCSI-2 compliant.

READ CAPACITY (25H)

The LaserDrive supports the READ CAPACITY command and provides a means for the Initiator to request information regarding the capacity of the currently spinning media. Because the capacity is not known until the disk spins, a NOT READY condition will cause this command to be rejected with a CHECK CONDITION status, Sense Key of 02 and an ASC of 04.

READ CAPACITY Command (25H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	READ CAPACITY (25H)							
01	LUN 0			Reserved				
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							
06	Reserved							
07	Reserved							
08	Reserved							
09	Reserved							

The READ CAPACITY command returns the Maximum Logical Block Address and Block Length (in bytes) of the logical unit.

The Block Length is always 400H (1024d). The Maximum Logical Address value returned is B1F755H (11663189d).

The 8 bytes of READ CAPACITY data, shown in Table 34, are sent by the LaserDrive during the DATA IN phase of the command.

Table 34. READ CAPACITY Data

BYTE	DESCRIPTION
0	Maximum Logical Block Address (MSB)
1	Maximum Logical Block Address
2	Maximum Logical Block Address
3	Maximum Logical Block Address (LSB)
4	Block Length (MSB)
5	Block Length
6	Block Length
7	Block Length (LSB)

READ DIAGNOSTIC LONG (E8H)

The READ DIAGNOSTIC LONG command requests the LaserDrive transfer data, plus Control and ECC bytes. READ DIAGNOSTIC LONG is implemented as a vendor-unique command.

READ DIAGNOSTIC LONG Command (E8H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	READ DIAGNOSTIC LONG (E8H)							
01	LUN 0			Reserved				
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Transfer Length (MSB)							
08	Transfer Length (LSB)							
09	Reserved							

Logical Block Address

The Logical Block Address specifies the block where the read operation begins.

A valid Logical Block Address is in the range of 0 to the Maximum Logical Block Address (MAXLBA) of a media.

Transfer Length

The Transfer Length specifies the number of blocks of data to be read and transferred by the operation. Each block is 2048 bytes in length. A transfer length of zero indicates that no data be transferred. The data passed during the READ LONG command is specified in Table 35. No ECC correction is performed on the data.

Table 35. READ DIAGNOSTIC LONG Command Data

BYTE	FIELD
0-3FF	User Data
ECC Data for 6000 Media	
400-40F	Control Record
410-413	CRC Bytes
414-473	ECC Parity Bytes
474-477	CRC Syndromes
478-4D7	Syndromes
4D8-4D9	Codeword Syndromes Map
ECC Data for 4000 Media	
400-403	CRC Bytes
404-453	ECC Parity Bytes
454-461	Control Record
462-46D	Control Record Parity Bytes
46E-471	Unused
472-475	CRC Syndromes
476-4D5	Syndromes
4D6-4D7	Codeword Syndromes Map
4D8-4D9	Unused
System Control Data	
4DA-7EF	Undefined
7F0-7FF	Buffer Pointers

READ DIAGNOSTIC PHYSICAL (E9H)

The READ DIAGNOSTIC PHYSICAL Command is similar to READ (28H), except a Physical Block Address is specified in the command instead of a logical block.

READ DIAGNOSTIC PHYSICAL Command (E9H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	READ DIAGNOSTIC PHYSICAL (E9H)							
01	LUN 0			Reserved				
02	Physical Address (MSB)							
03	Physical Address							
04	Physical Address							
05	Physical Address (LSB)							
06	Reserved							
07	Transfer Length (MSB)							
08	Transfer Length (LSB)							
09	Reserved							

Physical Block Address

The Physical Block Address is 4-byte 'signed' hexadecimal number which specifies the PHYSICAL BLOCK (contrasted with LOGICAL BLOCK).

A valid Physical Address is in the range of 0 to the Maximum Physical Address of a media (MAXPHYS). Use the READ SECTOR LOCATION with Maximum Logical Block Address (MAXLBA) to determine MAXPHYS.

Transfer Length

The Transfer Length is the number of 2048-byte Physical Blocks that the Initiator wants to transfer.

The READ PHYSICAL Command will return 2048 bytes per sector in the same format as the READ DIAGNOSTIC LONG command.

Data will be transferred unless the sector cannot be accessed. If the sector is blank or not correctable, the data will be followed by a check condition and the appropriate sense key is set. A Transfer Length of zero indicates that no data be transferred.

READ SECTOR LOCATION (E6H)

This command will provide the location of a sector in three formats. The formats provided are:

- Logical Block Address (LBA)
- Physical Block Address (PBA)
- Track Sector Address (TSA)

In addition, the side and zone of each sector will be provided.

The sector location input can also be in the three formats addressed above.

READ SECTOR LOCATION Command (E6H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	Read Sector Location Command (E6H)							
01	LUN 0			Reserved		Side	Input Form	
02	Location Field							
03	Location Field							
04	Location Field							
05	Location Field							
06	Reserved							
07	Reserved							
08	Reserved							
09	Reserved							

Side

The Side bit is only used if Input Form is track/sector. Side indicates which side the sector location is on. Media side A is zero and media side B is 1.

Input Form

Input Form tells the LaserDrive which form the location field is in.

VALUE	FORM
0	SCSI Logical Block Address (LBA)
1	Media Physical Block Address (PBA)
2	Media Track/Sector Address (TSA)

Location Field

Three formats for Location Field are accepted, based on Input Form value.

LBA Form:

Byte 2	LBA most significant byte.
Byte 3	LBA next byte.
Byte 4	LBA next byte.
Byte 5	LBA least significant byte.

PBA Form:

Byte 2	PBA most significant byte.
Byte 3	PBA next byte.
Byte 4	PBA next byte.
Byte 5	PBA least significant byte.

TSA Form:

Byte 2	Track most significant byte.
Byte 3	Track Least significant byte.
Byte 4	Reserved.
Byte 5	Sector

If the sector location being asked for is beyond the access range of the LaserDrive a CHECK CONDITION status will be returned. The Request Sense data will indicate invalid LBA.

If the location being asked for is valid, the LaserDrive will go to data in phase and return information about the sector location in the Sector Location Page format as indicated in Table 36.

Table 36. Sector Location Page

BIT / BYTE	7	6	5	4	3	2	1	0
00	LBA MSB							
01	LBA Next Byte							
02	LBA Next Byte							
03	LBA LSB							
04	PBA MSB							
05	PBA Next Byte							
06	PBA Next Byte							
07	PBA LSB							
08	Track MSB							
09	Track LSB							
10	Reserved							
11	Sector							
12	Media Side (0 - A; 1 - B)							
13	Media Zone (0 - inner; 1 - outer)							
14 - 21	Reserved							

RELEASE (17H)

The RELEASE command is used to release previously reserved units.

RELEASE Command (17H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	RELEASE (17H)							
01	LUN 0			3rd Party	Third Party Device ID			Reserved
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							

This command causes the LaserDrive to terminate any active reservation from the Initiator. It is not an error for an Initiator to attempt to release a reservation that is not currently active. In this case, the drive returns GOOD status.

REQUEST SENSE (03H)

The REQUEST SENSE command requests that the LaserDrive transfer sense data to the Initiator.

REQUEST SENSE Command (03H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	REQUEST SENSE (03H)							
01	LUN 0			Reserved				
02	Reserved							
03	Reserved							
04	Allocation Length							
05	Reserved							

The sense data indicates the status or error conditions existing at the termination of the previous SCSI command. This sense data is preserved for the Initiator until retrieved by the REQUEST SENSE command or until the another command is received from the Initiator. The LaserDrive stores sense data independently for each SCSI Initiator. It is recommended that all 255 bytes of sense data be preserved for errors requiring failure analysis.

Allocation Length

The Allocation Length specifies the maximum number of sense bytes to be returned. The LaserDrive terminates the DATA IN phase when allocation length bytes have been transferred or when all available sense data have been transferred to the Initiator, whichever is less. An Allocation Length of zero means that zero bytes will be returned.

The LaserDrive creates a Sense Data block of 255 bytes (FFH).

The REQUEST SENSE command returns CHECK CONDITION status only to report fatal errors. Examples include:

1) The LaserDrive receives a nonzero reserved bit in the Command Descriptor Block.

2) An unrecovered parity error occurs on the DATA BUS.

3) A LaserDrive malfunction prevents return of the sense data.

Following a fatal error on a REQUEST SENSE command, the previously generated sense data is replaced by new sense data indicating the reason REQUEST SENSE failed. If a nonfatal error occurs during the execution of the REQUEST SENSE command, sense data is returned with GOOD status. The Sense Data Format Code (70H) indicates the LaserDrive returns Sense Data in the extended format.

Valid bit of zero indicates that the contents of the information bytes are not defined. Valid bit of one indicates the information bytes contain valid information as defined in this specification. The sense data format for the LaserDrive is given in Table 37.

NOTE

Field values from byte 19 decimal and beyond are circumstance-dependent and subject to change with any given code revision. Interpretation of this data is intended for Plasmon LMS internal use.

Table 37. Sense Data Format

BIT / BYTE DECIMAL	7	6	5	4	3	2	1	0	BYTE (HEX)
00	Valid	Sense Data Format Code (70H)							0
01	Reserved								1
02	Reserved				Sense Key				2
03	Information Byte (MSB)								3
04	Information Byte								4
05	Information Byte								5
06	Information Byte (LSB)								6
07	Additional Sense Length (F7H)								7
08	Command Specific Information Byte (MSB)								8
09	Command Specific Information Byte								9
10	Command Specific Information Byte								A
11	Command Specific Information Byte (LSB)								B
12	Additional Sense Codes								C
13	Additional Sense Code Qualifier								D
14	Reserved								E
15	Reserved								F
16	Reserved								10
17	Reserved								11
18	LaserDrive Status Byte								12

Table 38. Extended Sense Format

BIT / BYTE (DECIMAL)	7	6	5	4	3	2	1	0	BYTE (HEX)
WOODI Extended Status									
19 - 20	Controller Detected Error (CDE) Type (1 - System Fault; 3 - Bus Exception)								13 - 14
21 -36	CDE data. ASCII string and line number or exception registers								15 - 24
37 - 40	Undefined								25 - 28
41	BDR Msg	SCSI Bus Reset	Failed Get DI	Send Diag/ Selftest	Power Up	Baseplates Parked	Undefined		29
42	Auto Spin	Unload Button	RCBM Fault	MCLI Abort	PSI/SDI Mismatch	MCLI Spin Down	SCSI Spin Down	CDE Reset	2A
43 - 44	CDE Ref Number								2B - 2C
45	RTPM Side								2D
46 - 49	Media Serial Number								2E - 31
50	Undefined								32
RWS A Status									
51	Last Command Status								33
52	RWS Spun up	Invalid Command	Command Not Completed	Security Bit Set	Stop Line Active	Undefined			34
53	Clock Watch Dog Timer Fault	RPP Cal Fault	Read Timing Fault	Tracking Fault	Focus Faults	Motor Speed Fault	Transfer Off Track Has Occurred	General Fault Bit	35
54	Laser High Power Fault	Laser Status Power Supply Fault	Laser Status Forward Sense Fault	Laser Status Write Power Init Failed	Laser Status Write Power Too High	Laser Status Pulse Width Error	Laser Status Read Power Too High	Laser Status Read Power Init Failed	36
55	Drive Configured	Data PLL in Sync	Undefined			12 V Supply Change	5 V Supply Change	Tempera-ture Changed	37
56	Max Seek Retries	No Header	No Track Capture	Undefined	Seek Error	Undefined	Tracking Initialized	Seek Completed	38
57	Undefined	RWS Spun Up	RWS Calibrated	Sector Interrupts Valid	Undefined	Headers Valid	No DMA Start	Undefined	39
58	DSP Servo Disqualify	DSP Timeout	Undefined				BOS Sync Error	Write Timing Adjusted	3A

Table 38. Extended Sense Format (Continued)

BIT / BYTE (DECIMAL)	7	6	5	4	3	2	1	0	BYTE (HEX)
59	Write Power Sum Interrupt	Servo Defect Interrupt	Sync Error Interrupt	Sync Lost to Media	MCDW Interrupt	Tracking Interrupt	Focus Interrupt	PLL Interrupt	3B
60	Number of Seek Retries								3C
61	Last Command Completed								3D
62	Last Command Received								3E
63 - 66	Undefined								3F - 42
RWS A Extended Status									
67	Transfer Start Track MSB								43
68	Transfer Start Track LSB								44
69	Transfer Start Sector								45
70	Transfer End Track MSB								46
71	Transfer End Track LSB								47
72	Transfer End Sector								48
73	Last Header MSB								49
74	Last Header LSB								4A
75	Last Header Sector								4B
76	Last Fault								4C
77	Fault Recovery in Progress								4D
78	Last DSP Command								4E
79	DSP Command Failure								4F
80	RPP Average								50
81	TPP Average								51
82	Mirror Bias								52
83	Mirror Bias Residual								53
84	Preamble Read Timing								54
85	Reference Track Amplitude								55
86	Average Read Amplitude								56
87	QSUM Regulated Fwd Sense								57
RWS B Status									
88	Last Command Status								58
89	RWS Spun Up	Invalid Command	Command Not Completed	Security Bit Set	Stop Line Active	Undefined			59
90	Clock Watch Dog Timer Fault	RPP Cal Fault	Read Timing Fault	Tracking Fault	Focus Faults	Motor Speed Fault	Transfer Off Track Has Occurred	General Fault Bit	5A

Table 38. Extended Sense Format (Continued)

BIT / BYTE (DECIMAL)	7	6	5	4	3	2	1	0	BYTE (HEX)
91	Laser High Power Fault	Laser Status Power Supply Fault	Laser Status Forward Sense Fault	Laser Status Write Power Init Failed	Laser Status Write Power Too High	Laser Status Pulse Width Error	Laser Status Read Power Too High	Laser Status Read Power Init Failed	5B
92	Drive Configured	Data PLL in Sync	Undefined			12 V Supply Change	5 V Supply Change	Tempera-ture Changed	5C
93	Max Seek Retries	No Header	No Track Capture	Undefined	Generic Seek Error	Undefined	Tracking Initialized	Seek Completed	5D
94	Undefined	RWS Spun Up	RWS Calibrated	Sector Interrupts Valid	Undefined	Headers Valid	No DMA Start	Undefined	5E
95	DSP Servo Disqualify	DSP Timeout	Undefined				BOS Sync Error	Write Timing Adjusted	5F
96	Write Power Sum Interrupt	Servo Defect Interrupt	Sync Error Interrupt	Sync Lost to Media	MCDW Interrupt	Tracking Interrupt	Focus Interrupt	PLL Interrupt	60
97	Number of Seek Retries								61
98	Last Command Completed								62
99	Last Command Received								63
100 - 103	Undefined								64 - 67
RWS B Extended Status									
104	Transfer Start Track MSB								68
105	Transfer Start Track LSB								69
106	Transfer Start Sector								6A
107	Transfer End Track MSB								6B
108	Transfer End Track LSB								6C
109	Transfer End Sector								6D
110	Last Header MSB								6E
111	Last Header LSB								6F
112	Last Header Sector								70
113	Last Fault								71
114	Fault Recovery in Progress								72
115	Last DSP Command								73
116	DSP Command Failure								74
117	RPP Average								75
118	TPP Average								76
119	Mirror Bias								77
120	Mirror Bias Residual								78

Table 38. Extended Sense Format (Continued)

BIT / BYTE (DECIMAL)	7	6	5	4	3	2	1	0	BYTE (HEX)
121	Preamble Read Timing								79
122	Reference Track Amplitude								7A
123	Average Read Amplitude								7B
124	QSUM Regulated Fwd Sense								7C
DPC Status									
125	Last Command Status								7D
126	Undefined	Invalid Command	Command Not Completed	Undefined					7E
127	Shuttle Door Lock Fault	Shuttle Unload Fault	Shuttle Load Fault	Shuttle Position Fault	Shuttle Initialization Fault	Baseplate Open Fault	Baseplate Close Fault	Motor Speed Fault	7F
128	Lower Guide Fully Inserted Sensor Not Detected	Upper Guide Fully Inserted Sensor Not Detected	Pin Parked Sensor Not Detected	Home Sensor Not Detected	Lower Baseplate Closed Sensor Not Detected	Upper Baseplate Closed Sensor Not Detected	Lower Baseplate Open Sensor Not Detected	Upper Baseplate Open Sensor Not Detected	80
129	Spin Commuta-tion Not Detected	Hall 3 Not Detected	Hall 2 Not Detected	Hall 1 Not Detected	Insert Motor Current Not Detected	Shuttle Stepper Not Detected	Lower Baseplate Stepper Not Detected	Upper Baseplate Stepper Not Detected	81
130	Undefined					Motor Not Stopped	Motor Near Full Speed	Motor at Full Speed	82
131	LF 6600 Shuttle Status	Shuttle Door is Open	Cartridge 6 Present	Cartridge 5 Present	Cartridge 4 Present	Cartridge 3 Present	Cartridge 2 Present	Cartridge 1 Present	83
132	LM 6000 Media Present	LM 4000 Media Present	Undefined	Cartridge Inserted	Cartridge Write Protected	Baseplates are Closed	Baseplates are Open	A Side on A Channel	84
133	Undefined								85
134	Undefined								86
135	Last DPC Command Completed								87
136	Last DPC Command Received								88
137 - 140	Undefined								89 - 8C
DPC Extended Status									
141	Upper Baseplate Position MSB								8D
142	Upper Baseplate Position LSB								8E
143	Lower Baseplate Position MSB								8F
144	Lower Baseplate Position LSB								90
145	Upper Baseplate Stroke MSB								91

Table 38. Extended Sense Format (Continued)

BIT / BYTE (DECIMAL)	7	6	5	4	3	2	1	0	BYTE (HEX)
146	Upper Baseplate Stroke LSB								92
147	Lower Baseplate Stroke MSB								93
148	Lower Baseplate Stroke LSB								94
149	Insert Position MSB								95
150	Insert Position LSB								96
151	Shuttle Position MSB								97
152	Shuttle Position LSB								98
153	Undefined	Lower Cartridge Guide 0 = side A	Upper Cartridge Guide Write Protect	Upper Baseplate Open	Upper Baseplate Closed	Lower Baseplate Fully Open	Lower Baseplate Fully Closed	Lower Cartridge Guide Write Protect	99
154	Upper Cartridge Guide 0 = side B	Lower Cartridge Full In	Spin Control 0 = fault	Shuttle Present	Commuta-tion Pulse	Motor Hall 3	Motor Hall 2	Motor Hall 1	9A
155	Door Open 2	Door Open 1	Shuttle Door Lock	Insert Vcmd Balanced	Insert Pin Parked	Lower Door Lock	Upper Door Lock	Home	9B
156	Sensor Decode Image								9C
157 -254	Undefined								9D- FE

Table 39. Sense Key Descriptions

HEX	SENSE KEY	DESCRIPTION
0	NO SENSE	Indicates that there is no specific sense key information to be reported for the designated logical unit. This would be the case for a successful command.
1	RECOVERED ERROR	Indicates last command completed successfully with some recovery action performed by the Target.
2	NOT READY	Indicates that the logical unit addressed cannot be accessed. The error code bytes enable a system to determine if operator action is necessary.
3	MEDIA ERROR	Indicates that the command terminated with a nonrecovered error condition probably caused by a media flaw or an error in the recorded data. This Sense Key may also be returned if the Target is unable to distinguish between a flaw in the media and a specific hardware failure (Sense Key 4H).
4	HARDWARE ERROR	Indicates that the Target detected an unrecoverable hardware failure while performing the command or during a self test.
5	ILLEGAL REQUEST	Indicates that there was an illegal parameter in the command descriptor block or in the additional parameters supplied as data. If the LaserDrive detects an invalid parameter in the command descriptor block, or in the additional parameters, it terminates the command without altering the media.
6	UNIT ATTENTION	Indicates that the removable media may have been changed or the LaserDrive has been reset.
7	DATA PROTECT	Indicates that a command to read or write the media was attempted on a block that is protected from this operation. The read or write operation is not performed.
8	BLANK CHECK	Indicates that the LaserDrive encountered a blank sector while reading or a nonblank sector while writing. For a VERIFY command, this indicates that the LaserDrive encountered a blank sector during a Verify for written data (BLKVFY = 0) or a nonblank sector during a Verify for blank (BLKVFY = 1).
9	Reserved	Reserved
A	Reserved	Reserved
B	ABORTED COMMAND	Indicates that the LaserDrive aborted the command. (Possibly due to receiving an ABORT message.) The Initiator may be able to recover by trying the command again.
C	EQUAL	Indicates Media Scan condition parameters were satisfied.
D - F	Reserved	Reserved

After successful READ or WRITE commands, the Information Bytes give the Logical Block Address of the next block to be read or the next sequential block not written. If an error occurs in processing the first block of a command, the Information Bytes contain the Logical Block Address requested in the command.

The Additional Sense Length specifies the number of additional sense bytes to follow. For the LaserDrive this value is F7H.

Additional Sense Error codes are defined in Table 40. These bytes provide additional information about the condition that caused CHECK CONDITION status.

Table 40. Additional Sense Codes(1)

ADDITIONAL SENSE CODES (BYTE 12)	QUALIFIERS (BYTE 13)	DESCRIPTION	SENSE KEY (BYTE 2)
0	0	No Additional Sense Information	0
0	0	Reservation Conflict	0
0	6	Term IO Message Received	0
0	0	Read Recovery Required	1
0C	0	Write Relocation Required	1
32	0	Spare Full Warning	1
04	0	Drive Not Ready	2
04	3	Door Open (LF 6600/LF6602 Only)	2
04	40	Diagnostics Failure	2
04	80	Drive Not Ready -- Baseplates Parked	2
30	0	Incompatible Cartridge	2
31	0	Media Format Corrupted	2
3A	0	Media Not Present	2
03	0	Media Write Fault	3
09	0	Track Following Error	3
09	02	Focus Servo Error	3
10	0	ECC Error On Read	3
11	0	Unrecoverable Read Error	3
11	6	Unrecoverable Read Error Due to Control Record Invalid	3
19	0	Alternate List Error	3
30	0	Attempted Write on 4000 Media	3
30	01	Attempted Invalid Command (nonwrite) on 4000 Media	3
31	0	Media Format Corrupted	3
31	1	Media Management Area Not Recovered	3
31	2	Disk Information Recovery Read Only Mode	3
32	0	Spares Full	3
32	80	Maps 50% Full	3
32	81	Maps 70% Full	3
32	82	Maps 90% Full	3
02	0	Seek Did Not Complete	4

Table 40. Additional Sense Codes[1] (Continued)

ADDITIONAL SENSE CODES (BYTE 12)	QUALIFIERS (BYTE 13)	DESCRIPTION	SENSE KEY (BYTE 2)
03	0	Write Fault	4
1B	0	Synchronous Transfer Error	4
40	0	Diagnostics Failure	4
44	0	Controller Hardware/Parity Error	4
44	80	Controller Detected Error	4
45	0	Reselection Failed	4
46	0	Soft Reset Failed	4
47	0	SCSI Bus Parity Error	4
53	0	Load/Eject Failure	4
81	0	Invalid Reload Command (SCSI Download)	4
81	3	RWS PCA Type Unknown (SCSI Download)	4
81	4	DPC PCA Type Unknown (SCSI Download)	4
81	82	Nonredundant Reload (SCSI Download)	4
83	0	Write Calibration Required	4
89	0	Baseplate/Shuttle Error	4
1A	0	Parameter List Length Error	5
20	0	Invalid Op Code	5
21	0	Invalid LBA	5
22	0	Illegal Function	5
22	83	Illegal SCSI Download Attempt (new hardware)	5
24	0	Illegal Bit/Byte in CDB	5
25	0	Invalid LUN	5
26	0	Invalid Field in Parameter List	5
3D	0	Invalid Field in ID Message	5
53	2	Media Removal Prevented	5
28	0	Media Change May Have Occurred	6
29	0	Drive Reset Occurred	6
2A	0	Mode Select Parameters May Have Changed	6
3F	1	Microcode Changed	6
3F	2	Operating Conditions May Have Changed	6
44	80	Controller Detected Error Reset Occurred	6
5A	0	Operator Request	6
27	0	Write Protected	7

Table 40. Additional Sense Codes[1] (Continued)

ADDITIONAL SENSE CODES (BYTE 12)	QUALIFIERS (BYTE 13)	DESCRIPTION	SENSE KEY (BYTE 2)
0	0	Blank Check	8
0	0	Command Aborted by Host	B
48	0	Initiator Detected Error	B
49	0	Illegal Message	B
4E	0	Overlapped Commands Attempted	B
0	0	Equal Condition on Media Scan	C

[1] All values are hexadecimal

NOTE

An ASC of 44, ASCQ 80, will be reported when the LaserDrive performs a reset to recover from a controller detected error.

Additional Sense Code Drive Not Ready (ASC 04) will be reported for MEDIA ACCESS commands and Busy Status will be reported for the START/STOP command until the reset has completed.

At that time, Sense Key 6 (UNIT ATTENTION) will be reported with ASC 44, ASCQ 80.

If AutoSpin was enabled from the DOC or by Mode Select, the drive will become ready when the AutoSpin has completed. If AutoSpin was not enabled, the drive must be spun up before it will become ready.

The LaserDrive Status Byte (byte 18) is defined in Table 41.

Table 41. 6000 - Byte 18 Error Codes

BYTE 18 ERROR CODES	DESCRIPTION
0	Command OK
1	Command Aborted
2	DPR Fault
3	Timeout
4	Buffer Manager Parity Error
5	ECC Hardware Error
6	Uncorrectable
7	Control Record Invalid
8	Unreadable
9	Recovered Error
A	Blank Check
B	Blank Sector Detected
C	No Data Detected
D	Data Detected
E	Access Error
F	Scan Exhausted
10	Overwrite Detected
11	General Hardware Error
12	Illegal Request
13	Focus Adjust Error 1
14	Focus Adjust Error 2
15	Focus Adjust Error 3
16	Focus Adjust Error 4
17	Focus Adjust Error 5
18	Focus Adjust Error 6
19	Focus Adjust Error 7
1A	Focus Adjust Error 8
1B	Focus Adjust Error 9
1C	Focus Adjust Error 10
1D	Internal Hardware Error with Reading Disk SDI/PSI (Channel A)
1E	Internal Hardware Error with Reading Disk SDI/PSI (Channel B)
1F	Data Transfer Count Error
20	Processing

Table 41. 6000 - Byte 18 Error Codes (Continued)

BYTE 18 ERROR CODES	DESCRIPTION
21	DI Recovery Error - Read Only
22	Media Management Read Map Failure (LM 4000 only)
23	Alternate Write Failure (Channel A)
24	Alternate Write Failure (Channel B)
25	Map Write Failure (Channel A)
26	Map Write Failure (Channel B)
27	Undefined
28	Cannot Read SDI/PSI
29	SDI/PSI Checksum Failure
2A	Parms Failure
2B	Relocation Area Is Full
2C	Alternate Area Is Full
2D	Map and Alternate Write Failure (Channel A)
2E	Map and Alternate Write Failure (Channel B)
2F	Undefined
30	Map Recovery Failure
31	Undefined
32	Alternate Recovery Failure
33	Excessive Unmapped Alternates
34	Undefined
35	Scan Condition Met
36	No Laserdrive Status
37	Four Consecutive Map Write Failures On This Laserdrive
38	Unable To Write Due To Previous Performance Monitor Failure
39	Performance Monitor Failure 10% of Write Extent Failed
3A	Unknown Control Record Failure
3B	EDC ASIC Transfer Error
3C	Diagnostic Failure
3D	Primary/Secondary Map Mismatch
3E	This Media Read Only Due to Failed Media Management Recovery
3F	Undefined
40	SDI/PSI RWS Data Failure
41	Spares 50% Full Side A
42	Spares 70% Full Side A

Table 41. 6000 - Byte 18 Error Codes (Continued)

BYTE 18 ERROR CODES	DESCRIPTION
43	Spares 90% Full Side A
44	Spares 50% Full Side B
45	Spares 70% Full Side B
46	Spares 90% Full Side B
47	Spares 50% Full Side A and Side B
48	Spares 70% Full Side A and Side B
49	Spares 90% Full Side A and Side B
4A	DPR Protocol Error
4B	RWS Calibration Fault
4C	RWS Parameter Fault
4D	RCBM Fault 00
4E	RCBM Fault 01
4F	RCBM Fault 02
50	RCBM Fault 03
51	RCBM Fault 04
52	RCBM Fault 05
53	RCBM Fault 06
54	RCBM Fault 07
55	RCBM Fault 08
56	RCBM Fault 09
57	RCBM Fault 0A
58	RCBM Fault 0B
59	RCBM Fault 0C
5A	RCBM Fault 0D
5B	RCBM Fault 0E
5C	RCBM Fault 0F
5D	RCBM Fault 10
5E	RCBM Fault 11
5F	RCBM Fault 12
60	RCBM Fault 13
61	RCBM Fault 14
62	RCBM Fault 15
63	RCBM Fault 16
64	RCBM Fault 17

Table 41. 6000 - Byte 18 Error Codes (Continued)

BYTE 18 ERROR CODES	DESCRIPTION
65	PSI Mismatch
66	SDI Mismatch
67	Data Transfer Timeout 1
68	Data Transfer Timeout 2
69	Data Transfer Timeout 3
6A	Data Transfer Timeout 4
6B	Data Transfer Timeout 5
6C	Data Transfer Timeout 6
6D	Data Transfer Timeout 7
6E	Data Transfer Count Error 1
6F	Data Transfer Count Error 2
70	Data Transfer Count Error 3
71	Data Transfer Count Error 4
72	Data Transfer Count Error 5
73	Data Transfer Count Error 6
74	Data Transfer Count Error 7
75	Data Transfer Count Error 8
76	Data Transfer Count Error 9
77	Data Transfer Count Error 10
78	Data Transfer Count Error 11
79	Data Transfer Count Error 12
7A	Data Transfer Count Error 13
7B	Data Transfer Count Error 14
7C	Data Transfer Count Error 15
7D	LM 4000/LM 8000 Media detected when Enable 4K is off
FF	Controller Detected Error (reference Sense Bytes 43D - 44D)

RESERVE (16H)

The RESERVE command is used to reserve the LaserDrive for the exclusive use of the Initiator.

This command requests that the LaserDrive be reserved for the exclusive use of the Initiator until released. A unit reservation is released by a RELEASE command (17H) from the same Initiator that made the reservation, by a BUS DEVICE RESET message from any Initiator, a RESET condition or a power off/on cycle.

A logical unit reservation is not allowed if the unit is reserved by another Initiator. In this case, the drive responds by returning RESERVATION CONFLICT status. It is permissible for an Initiator to reserve a logical unit that is currently reserved by that Initiator.

RESERVE Command (16H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	RESERVE (16H)							
01	LUN 0			3rd Party	Third Party Device ID			Reserved
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							

Third Party Reservation (3rd Party)

When the Third Party Reservation bit (3rd Party) is set to zero, a third party reservation is not requested. If set to one, this field reserves the LUN for the Third Party Device and causes any subsequent command issued by the Third Party Device to be executed according to the mode parameters in effect for the Initiator sending this command.

Third Party Device ID

Third Party Device ID is the SCSI Bus ID of the device referred to, if the Third Party Reservation bit is set to one.

After the LaserDrive responds with GOOD status to a RESERVE, any command (other than an INQUIRY, a REQUEST SENSE command, a RELEASE command, or a PREVENT ALLOW Media Removal command with the Prevent bit set to 0) from another initiator is rejected with RESERVATION CONFLICT status unless that initiator set the Third Party Device and Third Party Reservation bit.

REZERO UNIT (01H)

The REZERO UNIT command requests an operation equivalent to seeking to logical block address zero and one.

REZERO UNIT Command (01H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	REZERO UNIT (01H)							
01	LUN 0			Reserved				
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							

SEEK (10 BYTE)

The SEEK command, 10 byte, requests a seek to the track which contains the specified logical block address.

SEEK Command (10 Byte) (2BH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	EXTENDED SEEK (2BH)							
01	LUN 0			Reserved				
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Reserved							
08	Reserved							
09	Side		Reserved					

Side

If the Side field is set to zero, a logical seek will be executed.

If the Side field is set to either 1 (Side A) or 2 (Side B), a physical seek will take place on only the specified side of the media. In these cases, the address in bytes 2-5 must be a valid physical address. Use the Read Sector Location command to determine valid physical addresses on a media side.

If the Side field is set to a 3, the command will be terminated with CHECK CONDITION status and the Sense Key shall be set to ILLEGAL REQUEST. The ASC will be 24 and the ASCQ will be 0.

SEND DIAGNOSTIC (1DH)

The SEND DIAGNOSTIC command requests the LaserDrive to perform a self diagnostic test.

SEND DIAGNOSTIC Command (1DH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	SEND DIAGNOSTIC (1DH)							
01	LUN 0			PF	Reserved	SelfTest	Reserved	
02	Reserved							
03	Parameter List Length (MSB)							
04	Parameter List Length (LSB)							
05	Reserved							

If the selftest (SelfTest) bit is set, it directs the LaserDrive to complete its default selftest.

NOTE

When a SEND DIAGNOSTIC command is sent to the LaserDrive, any pending status mode selection options or sense may be cleared.

If the Initiator does not allow disconnects, the LaserDrive will report a CHECK CONDITION with Sense Key 5 and ASC 22.

On any SEND DIAGNOSTIC command execution, if the selftest is successful, the command shall be terminated with GOOD status. If the selftest is unsuccessful, the command shall be terminated with CHECK CONDITION status and the "Selftst Fail" message will be displayed on the DOC. A subsequent REQUEST SENSE command will yield a Sense Key of HARDWARE ERROR. The ASC will be 40 and the ASCQ will be zero. The Command Specific Information bytes will contain the failed diagnostic test number.

If a drive fails the SEND DIAGNOSTIC command, the recommended action is to discontinue use of the drive until it can be properly serviced. If a user chooses to continue to use a failed drive, the SCSI host will be required to reset the failed drive via a SCSI Bus Reset, a Bus Device Reset Message or power cycle.

If the SelfTest bit is set along with any nonzero Parameter List Length value, the command will be terminated with CHECK CONDITION status and the Sense Key shall be set to ILLEGAL REQUEST. The ASC will be 24 and the ASCQ will be 0.

Page Format (PF)

If the Page Format (PF) bit is set the self test bit cannot be set. The LaserDrive will go to a data out phase to receive a Diagnostic Page in the following format. The Allocation Length must be set to 4 if the PF bit is set.

Table 42. Diagnostic Tests Page

BYTE	DESCRIPTION
0	Diagnostic Tests Page (80H)
1	Page Length (04)
2	Start Test Number
3	End Test Number (Inclusive)

Tests will always start at the Start Test Numbers and continue through the End Test Number indicated in Table 42. The only valid test numbers for bytes 2 and 3 are 0 through 7 and they are defined in Table 43. An invalid test number will result in CHECK CONDITION status with the Sense Key set to ILLEGAL REQUEST. The ASC will be 26 and the ASCQ will be 0.

All tests require full magazines and doors closed on LF 6600's, and Ready LD 6100's (GOOD status on TEST UNIT READY command).

Table 43. Diagnostic Selftests

TEST #	DESCRIPTION OF TEST
0	Power-on selftest.
1	PCA Selftests, DPR Communication
2	Read/Write Data Path
3	OMA
4	No op
5	Baseplate and Spindle Motor Operation (LF 6600 only)
6	Servo Control Systems
7	Read Performance

START/STOP UNIT (1BH)

The START/STOP UNIT command requests the LaserDrive to spin up and initialize for operation or spin down.

START/STOP UNIT Command (1BH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	START/STOP UNIT (1BH)							
01	LUN 0			Reserved				Immed
02	Reserved							
03	Reserved							
04	Reserved						LoEj	Start
05	Reserved							

Immediate (Immed)

An Immediate (Immed) bit of one indicates that ending status is to be returned as soon as the command has been received and validated. If the Immed bit is set, all nonaccess commands will be accepted and executed. Access commands will be accepted but will report a check condition until the drive is ready. The TEST UNIT READY command should be used to determine if the drive is ready before issuing an access command. An Immed bit of zero indicates that status will not be returned until after the operation is completed.

Load Eject (LoEj)

The Load Eject (LoEj) bit is used by the LF 6600/LF 6602 and ignored by the LD 6100. The bit will cause a START/STOP command to operate like the LOAD switch. A Load Eject bit of zero requests that no action be taken to load or eject the media from or to the shuttle. A Load Eject bit of one requests the media be unloaded, if the Start bit is zero. If the Start bit is one, the media selected via the MODE SELECT command or DOC for Auto Load will be loaded into the LaserDrive.

Start

A Start bit of one requests the LaserDrive spindle be brought up to speed. A Start bit of zero requests that the LaserDrive spindle be stopped.

TEST UNIT READY (00H)

The TEST UNIT READY command determines if the LaserDrive is ready. In this case, Ready means the media is inserted, spun up and is capable of performing media access commands. If the drive is not ready, then CHECK CONDITION status is returned.

TEST UNIT READY Command (00H)

BIT / BYTE	7	6	5	4	3	2	1	0
00	TEST UNIT READY (00H)							
01	LUN 0			Reserved				
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							

The response of the LaserDrive to TEST UNIT READY is shown in Table 44. This table is not exhaustive.

Table 44. LaserDrive Test Unit Ready Response

CONDITION	DRIVE RESPONSE
Media present and up to speed.	Command Ending Status: GOOD Sense Key: NO SENSE (00H) Error Code: No Additional Sense (00H) Usual System Response: Send Access Command
UNIT ATTENTION condition yet to be reported.	Command Ending Status: CHECK CONDITION Sense Key: UNIT ATTENTION (06H) Error Code: Varies Usual System Response: Note LaserDrive State Changes using System Byte, Re-issue TEST UNIT READY command
No media present.	Command Ending Status: CHECK CONDITION Sense Key: NOT READY (02H) Error Code: Media Not Installed (3AH) Usual System Response: Issue Operator Prompt
Drive is not ready.	Command Ending Status: CHECK CONDITION (02H) Sense Key: NOT READY (02H) Error Code: Drive Not Ready (04H) Usual System Response: Re-issue TEST UNIT READY command
Drive is busy.	Command Ending Status: BUSY (08H) Sense Key: Not Available Error Code: Not Available Usual System Response: Re-issue TEST UNIT READY command

VERIFY (2FH)

The VERIFY command requests that the LaserDrive verify the data on the media.

VERIFY Command (2FH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	VERIFY (2FH)							
01	LUN 0			Reserved		BLKVFY	Reserved	
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Verify Length (MSB)							
08	Verify Length (LSB)							
09	Reserved							

Blank Verify (BLKVFY)

A Blank Verify (BLKVFY) bit of zero indicates that the blocks will be subjected to ECC. If the verify encounters a blank sector, the command terminates with a CHECK CONDITION status and the Sense Key is BLANK CHECK. If the verify encounters a sector that cannot be corrected, the command terminates with a CHECK CONDITION and the Sense Key is MEDIA ERROR.

A Blank Verify (BLKVFY) bit of one indicates that the blocks are attempted to be verified as blank. If the verify is unsuccessful, the command is terminated with a CHECK CONDITION status and the Sense Key is BLANK CHECK.

Logical Block Address

The Logical Block Address specifies the logical block to begin the verify.

Verify Length

The Verify Length specifies the number of contiguous logical blocks to be verified.

WRITE (2AH - 10 BYTE)

This WRITE command requests the LaserDrive to write to the media all data transferred from the Initiator.

WRITE Command (2AH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	WRITE (2AH)							
01	LUN 0			Reserved				
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Transfer Length (MSB)							
08	Transfer Length (LSB)							
09	Reserved	DISVFY	Reserved					

Logical Block Address

The Logical Block Address specifies the logical block where the write operation begins.

Transfer Length

The Transfer Length specifies the number of contiguous logical blocks of data to be transferred. For this command, a transfer length of zero indicates that no data is to be transferred or written on the media. This is not considered an error condition. Any other value indicates that number of logical blocks will be transferred.

Disable Verify (DISVFY)

The Disable Verify (DISVFY) field will prevent a verify pass from being performed if set, otherwise a verify pass will always be performed for a write command giving it the same functionality as the Write with Verify command.

NOTE

Since there is no verify pass performed if this option is selected, the unrecoverable read error rate specified in the Product Specification is not supported.

If any of the following conditions occur, this command is terminated with a CHECK CONDITION status and the Sense Key is set as indicated in Table 45. This table is not exhaustive.

Table 45. Write Sense Key Return

CONDITION	SENSE KEY (HEX)
Invalid Logical Block Address	ILLEGAL REQUEST (05)
Target Reset, Media Change or Controller Detected Error since the Last Command from this Initiator	UNIT ATTENTION (06)
Unable to Write or Controller Detected Error	HARDWARE ERROR (04)
Message Protocol or SCSI Data Transfer Error	ABORTED COMMAND (0B)
Attempt to Write a Previously Written Block	BLANK CHECK (08)

NOTE

Changes to the IB and CSIB in REQUEST SENSE data:
On failed WRITE commands, the Information Bytes (bytes 3-6) will report the highest sequential LBA written during that WRITE command, plus one. The next WRITE can be started at this LBA. When the Sense Key is BLANK CHECK, the information bytes will be set to the first non-blank block detected.

The Command Specific Information Bytes (bytes 8-11) will equal the highest sequential LBA written AND verified during that command, plus one. All data from the CSIB to the end of the current extent has not been verified. All data from the starting LBA up to, but not including, the CSIB has been verified.

NOTE

Byte 9, Bit 6 invokes disable verify.

WRITE AND VERIFY (2EH)

The WRITE AND VERIFY command requests the LaserDrive to write on the media all data transferred from the Initiator and then verify that the data is correctly written.

WRITE AND VERIFY Command (2EH)

BIT / BYTE	7	6	5	4	3	2	1	0
00	WRITE AND VERIFY (2EH)							
01	LUN 0			Reserved				
02	Logical Block Address (MSB)							
03	Logical Block Address							
04	Logical Block Address							
05	Logical Block Address (LSB)							
06	Reserved							
07	Transfer Length (MSB)							
08	Transfer Length (LSB)							
09	Reserved							

Logical Block Address

The Logical Block Address specifies the logical block where the write/verify operation will begin.

Transfer Length

The Transfer Length specifies the number of contiguous logical blocks of data to be transferred. A Transfer Length of zero indicates no data to be transferred. This is not considered an error condition. Any other value indicates that number of logical blocks will be transferred.

The errors and conditions for the WRITE AND VERIFY command are the same as those for WRITE. Refer to Table 45 in the WRITE Command section and the NOTE that follows the table.

WRITE BUFFER (3BH)
(10 BYTE WITH FIRMWARE DOWNLOAD OPTION)

The WRITE BUFFER command is used for diagnostics or for downloading microcode to the LaserDrive, depending on the value of the Mode field in byte 1.

WRITE BUFFER - DIAGNOSTICS

When implemented as a diagnostic tool, the WRITE BUFFER command requests a transfer of data from the Initiator to the read/write buffer and is used in conjunction with the READ BUFFER command.

WRITE BUFFER Command (3BH) - Diagnostics

BIT / BYTE	7	6	5	4	3	2	1	0
00	WRITE BUFFER (3BH)							
01	LUN 0			Reserved		Mode		
02	Reserved							
03	Reserved							
04	Reserved							
05	Reserved							
06	Reserved							
07	Allocation Length (MSB)							
08	Allocation Length (LSB)							
09	Reserved							

Mode

The Mode field must be a 2 (data only).

Allocation Length

The Allocation Length field represents the number of sector blocks to be transferred to the buffer. This value must be within the range of 0H to 3EFH. Any other Allocation Length value will result in a CHECK CONDITION status with a sense key of ILLEGAL REQUEST.

NOTE

Due to hardware limitations, the LaserDrive will transfer sector blocks rather than bytes in response to the Allocation Length of this command. This is not SCSI-2 compliant.

WRITE BUFFER - DOWNLOAD OPERATION

The download microcode function is implemented using the vendor-specific mode and the download microcode mode of the WRITE BUFFER command.

WRITE BUFFER Command (3BH) - Download

BIT / BYTE	7	6	5	4	3	2	1	0
00	WRITE BUFFER (3BH)							
01	LUN 0			Reserved		Mode		
02	Buffer ID							
03	Reserved							
04	Reserved							
05	Reserved							
06	Reserved							
07	Reserved							
08	Reserved							
09	Reserved							

The download microcode operation is a two-step process consisting of one or more data downloads followed by a microcode download. The data download will transfer all of the required firmware data to the data buffer on the WOODI using multiple WRITE BUFFER commands transferring one 32K file at a time. The data download process must be successfully completed prior to executing the microcode download. Then, using a single WRITE BUFFER command, the microcode download will download all required PCA's of the LaserDrive using the firmware information contained in the WOODI data buffer.

The previous process may be required more than once depending upon which PCA's need upgrading.

Mode

This field must be programmed to one of the two values shown in the following list. Any other value will result in a CHECK CONDITION Status with an ILLEGAL REQUEST sense key reported on a subsequent REQUEST SENSE command.

Mode	Value
Vendor-Specific Data Download	1
Microcode Download	5

Buffer ID

This field has two definitions determined by the value selected in the mode field. If the mode field is set to five, the buffer ID field is reserved (i.e., all zero's). If the mode field is a one, the buffer ID is defined as shown here:

BIT / BYTE	7	6	5	4	3	2	1	0
02	Reload	Reserved			WOODI	RWS(A)	RWS(B)	DPC

Field	Definition
Reload:	Set this bit to one to download microcode that is at the same firmware revision level. The LaserDrive will not download a firmware revision that is the same as the one already in the LaserDrive unless this bit is set. If this bit is not set, bits 0 - 3 must be zero.
WOODI	Set this bit to download firmware to the WOODI PCA.
RWS (A):	Set this bit to download firmware to the RWS PCA on side A.
RWS (B):	Set this bit to download firmware to the RWS PCA on side B.
DPC:	Set this bit to download firmware to the Drive Power Control (DPC) PCA.

NOTE

In mode one (Data Download Mode), the buffer ID field cannot be changed once a download procedure has started.

The total download microcode package is always greater than 32K bytes, so it will be segmented into 32K files to accommodate initiator buffer limitations. The download microcode package will be contained in N data files, each exactly 32K bytes, on a floppy disk. The files will be named by the following convention:

- Each file will be named the series code of the released firmware.
- The file extensions will be equal to values 1 through N, where N is some value less than FEH.

Example: The firmware series code is "C01". The download floppy disk for series code C01 would contain the following 32k files:

C01.1	C01.B	C01.15	C01.34
C01.2	C01.C	C01.16	C01.35
C01.5	C01.F	C01.17	C01.36
C01.6	C01.10	C01.18	C01.37
C01.7	C01.11	C01.19	C01.38
C01.8	C01.12	C01.1A	C01.39
C01.9	C01.13	C01.30	C01.3A
C01.A	C01.14	C01.31	C01.3B

WRITE BUFFER DOWNLOAD PROCEDURE

1) Place the file with extension ".1" in the initiator buffer. In the previous example, this would be file "C01.1"

2) Issue a WRITE BUFFER command with the mode field set to one. The buffer ID should specify the PCA's that are being downloaded if a reload is desired; otherwise, the buffer ID field must be all zero's. The buffer ID field must be the same for each WRITE BUFFER command issued with the mode field set to one. The LaserDrive will return GOOD status when the file has been transferred successfully. If GOOD status is not returned, return to step 1).

3) The initiator should issue a REQUEST SENSE command and obtain the least significant byte of the CSIB's. This byte will provide information about the next file to be transferred.

4) If the least significant byte of the CSIB is an FFH proceed to step 5). If the least significant byte of the CSIB's is an FEH, the LaserDrive is already at the desired series code level and a microcode download is not required. If the least significant byte of the CSIB's is not an FEH or FFH, it indicates the extension of the next file required for the download process to continue. (For example, if this byte is "03", The next file to send from the example download microcode package above would be "C01.3"). Load that file from the download microcode package into the initiator data buffer and return to step 2).

5) The LaserDrive has all of the required download microcode data in its buffer. Issue a WRITE BUFFER command with the mode field set to 5. Ensure the buffer ID field is all zero's.

6) The LaserDrive will utilize the download data in the buffer and reprogram the EEPROM(s) of the appropriate PCA's. When this process is complete, the LaserDrive will return status. If GOOD status is returned, the microcode download is successful; proceed to step 7). If nonGOOD status is returned, proceed to step 8).

7) A TEST UNIT READY command and subsequent REQUEST SENSE command shall return a CHECK CONDITION status and the Sense Key shall be UNIT ATTENTION. The ASC will be 3F and the ASCQ will be 1, indicating that the microcode has changed. If the CSIB's are equal to 0xFFFFFFFF, then another download cycle is required; return to step 1). Otherwise, the download is complete. A SCSI SEND DIAGNOSTIC command is required to restart the newly upgraded drive.

8) The failing PCA should be displayed in an error message on the DOC. If the failing PCA was not the WOODI, return to step 1) and retry the download.

   If the failing PCA was the WOODI, the EEPROM's must be replaced or downloaded using the Auxiliary Diagnostic Port (ADP). Refer to the specific Hardware Maintenance Manual for instructions on these procedures.

REQUEST SENSE DATA

After a WRITE BUFFER command completes in the download microcode mode, the CSIB's have a LaserDrive-specific definition.

The least significant nibble of each CSIB is encoded as follows:

Binary	Hex	Definition
1000	8	WOODI
0100	4	DPC
0010	2	RWS(B)
0001	1	RWS(A)
0000	0	No PCA's

Each CSIB in the request sense data is defined as follows:

Location	Definition
Byte 8	Scheduled PCA's
Byte 9	Attempted PCA's
Byte 10	Failed PCA
Byte 11	Retry PCA's or Failure Code

Scheduled PCA's: Are the PCA's that were identified for download.

Attempted PCA's: Are the PCA's that actually had a download attempted.

Failed PCA's: Are the PCA's that were attempted but failed after 3 retries.

Retry PCA's: Only valid if there were no failed PCA's. Shows which PCA's required a retry.

Failure Code: Only valid if there is a failed PCA. Give the reason for the download failure as defined in the following failure codes:

Code (Hex)	Definition
2	WOODI detected file byte count error
3	End of File not found
4	WOODI detect PCA byte count error
6	Data record count to large
7	Number of program records mismatch
9	Firmware revision mismatch (RWS/DPC)
A	EEPROM failed to erase
B	RWS or DPC failed record program
C	Invalid command to RWS or DPC
D	Checksum error from RWS or DPC

CSIB EXAMPLES

GOOD Status:

After a successful microcode download, the following 18 bytes of request sense data are returned:

F0 00 00 00 00 00 00 F7 03 03 00 01 00 00 00 00 00 00

This indicates that both RWS PCA's were successfully downloaded, but the RWS A PCA just required more than one attempt. The drive internally will retry a failed RWS or DPC download.

CHECK CONDITION Status:

After a failed microcode download, the following 18 bytes of request sense data are returned:

F0 00 00 00 00 00 00 F7 07 03 04 0A 00 00 00 00 00 00

This indicates that three PCA's were scheduled. Both RWS PCA's downloaded successfully; however, the DPC PCA was attempted and failed because the EEPROM could not be erased.

DRIVER PROGRAM NOTES

The following individual paragraphs cover specific details and are unrelated to one another:

In all cases, the Data Download Mode must be successfully completed prior to the Drive Download Mode. The Data Download Mode is considered successfully complete when the drive returns GOOD status and a subsequent request sense obtains a command specific information LSB of FFH. Then and only then is the drive ready to accept a Drive Download Mode WRITE BUFFER command.

Once a Drive Download Mode WRITE BUFFER command is issued, any returned CHECK CONDITION status nullifies the previous Data Download Mode operation. This means that the Drive Download Mode WRITE BUFFER command retry will never be successful if just the one command is re-issued. To attempt a retry of an unsuccessful Drive Download Mode WRITE BUFFER command, the user must first successfully complete the Data Download Mode and then execute the Drive Download Mode WRITE BUFFER command.

Immediately after sending out the very first WRITE BUFFER command, the expected value of the command specific least significant byte would be in the range of 2 through FDH. There is an exception case. If a user has entered the Data Download Mode and the LaserDrive is already at the exact desired series code, the drive will return GOOD status but on a subsequent request sense, the command specific information least significant byte will be equal to FEH. This value indicates that no downloads are required and the driver program should abort the SCSI download attempt.

If a user has entered the Data Download Mode and the Reload bit (as well as at least one PCA bit) is asserted, the drive checks to ensure that the attempt is truly a redundant download. If the user-chosen PCA is at a different firmware revision than the upgrade firmware revision contained in the SCSI download package, the drive will respond with a CHECK CONDITION status to the WRITE BUFFER command.

GLOSSARY

The glossary included in this section is intended to provide convenient access to state-of-the-art terminology as well as product-specific terminology. Presented in this glossary are terms, acronyms and abbreviations which apply to the optical disk drive technology as well as the 6000 product line and the entire set of documents for that product line. This means that, although some terms found in this glossary may not be mentioned in this document, they do apply to the product line.

NOTE

The term LaserDrive is used to refer to the LD 6100, LF 6600 and LF 6602.

Actuator	The electromechanical device which positions the laser beam to access the data on the media.
Adverse Environment	Environmental conditions not in the range of specified limits.
Bus	One or more conductors used for transmitting signals or power.
Bus bits	Bit 7 is the most significant. Bits 0-7.
Byte	Eight bits of binary information; two nibbles.
Cartridge	The protective enclosure for the LM 6000 optical disk.
Code Word	A portion of the bytes of a field treated as a group for error detection and correction purposes.
Command Descriptor Block (SCSI-2)	The structure used to communicate requests from an Initiator to a Target.
Completion Status (SCSI-2)	One byte of information sent from the Target to the Initiator on completion of one command or a set of linked commands.
Connect (SCSI-2)	The function that occurs when an Initiator (host) selects a Target (LaserDrive) to start an operation.
CRC	Cyclic Redundancy Check
Customer Engineer	A qualified, Plasmon LMS-trained person capable of servicing and repairing Plasmon LMS optical products.
Daisy chained	Serial connection of multiple peripherals, with interrupt priority, which requires termination of the last unit in the string.
DAC	Digital-to-Analog Converter. A functional unit that converts data from digital to analog representation.
Data Buffer	The memory used for temporary storage of all data to and from the host plus all data to and from the disk. This buffer allows the controller module to conduct data transfers with the host at an instantaneous rate that is different from the disk rate.
Defective Sector	A sector containing a surface or imbedded irregularity. The sector will be relocated during a write.
Detector	Converts data and servo information from the disk into electrical signals.
Disconnect (SCSI-2)	This function occurs when a Target releases control of the SCSI-2 Bus, allowing it to go to the BUS FREE phase.
Disk	The optical disk media.

DOC	Drive Operator Console. Complete functional control panel for drive operations without need for host control or connection. Interactive panel with LED readout used for operation and diagnostics.
DPC	Drive Power Control PCA.
DPR	Dual Port Random Access Memory
Drive ID	Drive Identification. The assigned SCSI-2 address to which
the LaserDrive will respond.	
DVDW	Data Verification During Write
ECC	Error Correction Code. An algorithm constructed to permit correction of certain errors occurring in an acceptable expression.
EDAC	Error Detection and Correction.
EMI	Electromagnetic Interference. Operational interference of a device caused by electromagnetic field generated by another device or coil.
EPROM	Electrically Programmable Read-Only Memory. A type of read only memory.
ESD	Electrostatic Discharge. A sudden transfer of static electricity. Damage can occur to static sensitive components (printed circuit assemblies) if a handler does not eliminate the ESD potential before touching components.
Error	An abnormal and correctable condition that occurs during normal operation.
External Interface	Any controlling interface connecting a host to the LaserDrive.
Fault	A malfunction from which the LaserDrive cannot recover without manual intervention.
Firmware	Control software residing in read only memory.
FRU	Field Replaceable Unit. A subassembly or component which can (if malfunctioning) be removed and replaced in the field.
Header	The preformatted area of each sector on a disk.
Hex	Suffix used to denote hexadecimal values (e.g., 7FH is a hex value).
Host	Host computer
Host Adapter	The hardware (printed circuit assembly) and software necessary to interface the host central processing unit to an external device.
ID	Sector identification preformatted in the media header field.
Internal Controller	This is the portion of the LaserDrive which consists of the WOODI PCA.
Initiator (SCSI-2)	A SCSI-2 device (usually a host system) which requests an operation to be performed by a Target.
IPB	Illustrated Parts Breakdown. Located in the Hardware Maintenance Manual and consisting of illustrations of all FRU's with an accompanying parts list.
Jump back	Controlled seek during which the tracking actuator moves to the previous track at a specific sector, once per rotation, making the spiral track logically appear to be concentric circles.
Laser Diode	A forward-biased semiconductor junction used as the active (injection) medium.
LaserDrive	Used for references that apply to the LD 6100, LF 6600 and LF 6602.
Laser Pen	Assembly including laser diode and lenses.
LBA (SCSI-2)	Logical Block Address. A means to reference the blocks of the media. A contiguous block numbering from 0 to the maximum address. The addressing in SCSI-2 commands.

LD 6100	The high-performance dual actuator optical disk drive designed for standalone implementation or use within a jukebox.
LED	Light Emitting Diode
LF 6600	The LF 6600 is an LD 6100 optical disk drive specifically modified to accept media cartridges and operate as a cartridge autochanger.
LF 6602	The LF 6602 is a cabinet, housing two LF 6600 drives.
Logical Unit	A SCSI-2 physical or virtual device addressable through a Target.
Logical Unit Number (LUN)	A SCSI-2 encoded 3-bit identifier for a Logical Unit.
LSB	Least Significant Byte
LSD	Least Significant Digit
MCDW	Media Certification During Write
Media	The physical medium (optical disk) where data is stored.
Media Cartridge	Consists of a 300-mm (12-in.) diameter glass sandwich disk (media) within a protective enclosure.
Modulation Code	The technique used to map bytes onto the media using a special code to ensure data integrity. The LaserDrive employs a 4/15 modulation code for LM 4000 media and 1,7 RLL for the LM 6000 media.
MPU	Microprocessor Unit. An integrated circuit that accepts and executes instructions with the capacity of delivering signals describing the status of those instructions.
MSB	Most Significant Byte
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
Nibble	A 4-bit binary pattern representing half a byte of information.
NVRAM	Nonvolatile Random Access Memory. That part of memory responsible for retaining some specific information when power is removed from the drive.
Objective Lens	A lens system used to focus the laser beam on the media and direct the reflected beam to the quad detector.
OMA	Opto Mechanical Assembly which includes the actuator, optics module and EEPROM that stores the servo parameters.
One	A true signal value.
Parity	Odd Parity. The sum of true bits including parity is odd.Even Parity. The sum of true bits including parity is even.
PCA	Printed Circuit Assembly, consisting of all active components mounted on a printed circuit board.
Peripheral Device (SCSI-2)	A peripheral which can be attached to and can respond on the SCSI-2 bus (e.g., magnetic or optical disk drive, printer or similar device).
Physical Block Address	A means to reference the location of a sector by a count of sectors starting with sector zero.
PLL	Phase Locked Loop. A circuit which provides timing signals for the Read/Write and Servo Channels.
Ports	The addressable access to a device, (e.g., SCSI-2, MPU ports).
PROM	Programmable Read Only Memory
RAM	Random Access Memory
Read/Write Channel	The paths taken by read and write data signals through the LaserDrive electronics.

Reconnect (SCSI-2)	The function that occurs when a Target selects an Initiator to continue an operation after a Disconnect.
RFI	Radio Frequency Interference. Operational interference of electric devices caused by a strong, uncontrolled electromagnetic field.
ROM	Read Only Memory
RWS PCA	Read Write Servo (RWS) PCA. That part of the LaserDrive responsible for performing the servo, read/write and control functions of the drive.
Sampled Servo	Tracking and clocking information embedded in the disk.
SCSI-2	Small Computer System Interface. American National Standards Institute (ANSI) defined interface.
SCSI-2 Address	The unique address (0 - 7) assigned to a SCSI-2 Device. This address is assigned and set in the SCSI-2 Device during system installation.
SCSI-2 Device	A host adapter, peripheral controller or intelligent peripheral, such as the LD 6100 or LF 6600, which can be attached to and respond on the SCSI-2 Bus.
SCSI-2 ID	The bit-significant representation of the SCSI-2 Address referring to one of signal lines DB7 through DB0.
Signal Assertion	A signal driven to the true state.
Signal Negation	A signal either driven to the false state or biased to the false state by cable terminators.
Signal Release	A signal that is not driven to the false state but is biased to that state by cable terminators.
Sync	Synchronize. Timing and location control of more than one event during a single time period.
Target (SCSI-2)	A SCSI-2 device (usually referred to as the LaserDrive) that performs an operation requested by an Initiator.
Terminator Assembly (SCSI-2)	Electrical terminator required at each end of the SCSI-2 bus to terminate the bus.
Transfer Period (SCSI-2)	The Synchronous Data Transfer Period is the minimum time allowed between leading edges of successive REQ pulses and successive ACK pulses to meet LaserDrive requirements for successful data transfer.
WOODI PCA	Write Once Optical Drive Interface PCA. Embedded controller.
Zero	A false signal value.


Plasmon