



LL009F Tape Library SCSI I/F Specification

Revision 7
21 Oct 2013

Revision Information

1 Revision History

1.0 Revision 1 (29/May/2008)

- First edition.

1.1 Revision 2 (14/Nov/2008)

- Fixed 2.13.6 Data transfer element descriptor.

1.2 Revision 3 (8/Dec/2008)

- Fixed Table.2.15.5 Sense Key descriptions (page67)

1.3 Revision 4 (24/Feb/2009)

- Newly added Barcode Bit to Standard Inquiry Data (page9)

1.4 Revision 5 (28/Aug/2011)

- Removed First Element Address fields with Unit serial number page in Inquiry command (page13)

1.5 Revision 6 (10/Feb/2012)

- Added information of command timeout value to Chapter 2 SCSI Command.
- Changed value and description of Access bit field in the 2.13.6 Data transfer element descriptor
 - Table.2.13.8 Data Transfer Element Descriptor (DVCID=0).
- Changed value and description of Access bit field in the 2.13.6 Data transfer element descriptor
 - Table.2.13.9 Data Transfer Element Descriptor (DVCID=1).
- Updated section 2.15.2 Sense Key and sense code definitions.

1.6 Revision 7 (21/Oct/2013)

- Updated section 2.15.2 Sense Key and sense code definitions.

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Chapter 1 Introduction

1.1 Scope

This specification defines the SCSI interface specification for the library of the 1U library LL009F.

Chapter 2 SCSI Command

The library supports the following commands:

Section	Command	Operation Code	Timeout Value (in minutes)
2.1	INITIALIZE ELEMENT STATUS	07h	10
2.2	INQUIRY	12h	1
2.3	LOG SELECT	4Ch	1
2.4	LOG SENSE	4Dh	1
2.5	MODE SELECT (6)	15h	1
2.6	MODE SENSE (6)	1Ah	1
2.7	MODE SELECT (10)	55h	1
2.8	MODE SENSE (10)	5Ah	1
2.9	MOVE MEDIUM	A5h	10
2.10	POSITION TO ELEMENT	2Bh	10
2.11	PREVENT/ALLOW MEDIUM REMOVAL	1Eh	1
2.12	READ BUFFER	3Ch	1
2.13	READ ELEMENT STATUS	B8h	1
2.14	RELEASE	17h	1
2.15	REQUEST SENSE	03h	1
3.16	RESERVE	16h	1
3.17	SEND DIAGNOSTIC	1Dh	10
3.18	TEST UNIT READY	00h	1
3.19	WRITE BUFFER	3Bh	10

2.1 INITIALIZE ELEMENT STATUS Command (07h)

The Initialize Element Status command requests the library to initialize all the elements and their related statuses. This command is sent after the status has been changed by the operator, and is used to initialize the internal information.

Table.2.1.1 INITIALIZE ELEMENT STATUS command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (07h)							
1	Logical Unit Number (000b)			Reserved (0)				
2	Reserved (0)							
3	Reserved (0)							
4	Reserved (0)							
5	Control (0)							

2.2 Inquiry Command (12h)

The Inquiry command requests that library information be sent to the initiator. It also can request an additional library information as an option.

Table.2.2.1 Inquiry command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (12h)							
1	Logical Unit Number (0)			Reserved (0)				EVPD
2	Page or Operation code							
3	Reserved (0)							
4	Allocation length							
5	Control (0)							

When Enable Vital Product Data (EVPD) bit is one, the library reports the vital product data specified by the Page Code field. When EVPD bit is zero, the library reports the standard Inquiry data. If the EVPD bit is zero and the page code field is not zero the library shall return Check Condition status with the sense key set to Illegal Request and an additional sense code of Invalid Field in CDB.

The Page Code field specifies the page of vital product data information that the library shall report. (see Table 2.2.6.)

The Inquiry command shall return Check Condition status only when the library is unable to return the requested Inquiry data. If an Inquiry command is received from an initiator with a pending unit attention condition, the library shall perform the Inquiry command and shall not clear the unit attention condition.

2.2.1 Standard Inquiry Data

The Standard Inquiry data contains 56 bytes.

Table.2.2.2 Standard Inquiry data format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral qualifier			Peripheral device type				
1	RMB (1)	Device type modifier (0)						
2	ISO version (0)		ECMA version (0)			ANSI-approved version (3)		
3	ANEC (0)	TrmIOP (0)	Reserved (0)		Response data format (2)			
4	Additional length(35h)							
5	Reserved (0)							
6	BQue (0)	EncServ (0)	VS (1)	MULTIP (0)	MCHNGR (0)	Obsolete (0)	Obsolete (0)	ADDR16a (0)
7	RelAdr (0)	Wbus32 (0)	Wbus16 (0)	Sync (0)	Linked (0)	Reserv -ed(0)	CmdQue (1)	SftRe (0)
8-15	(MSB) Vender identification "NEC" (LSB)							
16-31	(MSB) Product identification "LL009F" (LSB)							
32-35	(MSB) Product revision level Library Fimrware Revision Level in ASCII (LSB)							
36-37	Reserved(0)							
38-49	Serial Number of Device							
50-54	Reserved (0)							
55	Reserved(0)							Barcode (1)
56-57	Reserved(0)							

Peripheral Qualifier and Peripheral Device Type fields identify the device currently connected to the logical unit. Since the library supports logical unit 0 only, the library returns "08h" for logical unit 0, and "7Fh" for others. (See Tables 2.2.3 and 2.2.4.)

When Barcode bit is one, it indicates that the barcode reader is available. If Barcode bit is zero, it indicates that the barcode reader is not available. The library supports a barcode reader, and this field must be one.

Table.2.2.3 Peripheral qualifier

Qualifier	Description
000b	The specified peripheral device type is currently connected to this logical unit.If the library cannot determine whether or not a physical device is currently connected,it shall also use this peripheral qualifier does not mean that the device is ready for access by the initiator.
001b	The library is capable of supporting the specified peripheral device type on this logical unit ; however,the physical device is not currently connected to this logical unit.
010b	Reserved
011b	The library is not capable of supporting a physical device on this logical unit.For this peripheral qualifier the peripheral device type shall be set to “1Fh”to provide compatibility with previous of SCSI.All other peripheral device type values are reserved for third peripheral qualifier.
1XXb	Vender specific

Table.2.2.4 Peripheral device type

Code	Description
00h	Direct-access device (e.g. magnetic disk)
01h	Sequential-access device (e.g. magnetic tape)
02h	Printer device
03h	Processor device
04h	Write-once device (e.g. some optical disks)
05h	CD-ROM device
06h	Scanner device
07h	Optical memory device (e.g. some optical disks)
08h	Medium changer device (e.g. jukeboxes)
09h	Communications device
0Ah-0Bh	Defined by ASC IT8 (Graphic arts pre-process devices)
0Ch-1Eh	Reserved
1Fh	Unknown or no device type

When Removable medium (RMB) bit is one, it indicates that the medium is removable. If RMB bit is zero, it indicates that the medium is not removable. The library supports a removable medium, and this field must be one.

For Device-type modifier field, 00h is reported.

The value to be entered in ISO version and ECMA version fields are defined by International Organization for Standardization and e European Computer Manufacturers Association.

ANSI-approved version field indicates the implemented version defined by International Standard, and must be 02h.

Table.2.2.5 ANSI-approved version

Code	Description
0h	The device might or might not comply to an ANSI-approved standard.
1h	The device complies to ANSI X3.131-1986 (SCSI-1).
2h	The device complies to this version of SCSI. This code is reserved to designate this standard upon approval by ANSI.
3h-7h	Reserved

An Asynchronous Event Notification Capability (AENC) bit of one indicates that the library supports the asynchronous event notification capability.

The library does not support Synchronous event notification capability, therefore, this field must be zero.

Terminate I/O process (TrmIOP) of one indicates that the library supports TERMINATE I/O PROCESS message. The library does not support TrmIOP, therefore, this field must be zero.

The library supports International Standard version of SCSI-2. The Response data format must be 02h.

The Additional Length field indicates the length in bytes of the parameters. The library has 51-byte parameters, therefore, this field must be 33h.

Relative Address (RelAdr) bit of one indicates that the library supports the relative addressing mode. The library does not support the relative addressing mode, therefore, this field must be zero.

A Wide Bus 32 (WBus32) bit of one indicates that the library supports 32-bit wide data transfers. The library does not support 32-bit wide data transfer, this field must be zero.

A Wide Bus 16 (WBus16) bit of one indicates that the library supports 16-bit wide data transfers. The library supports 16-bit wide data transfers, this field must be one.

A Synchronous Transfer (Sync) bit of one indicates that the library supports synchronous data transfer. The library supports synchronous data transfer, this field must be one.

A Linked Command (Linked) bit of one indicates that the library supports linked commands. The library does not support linked command, this field must be zero.

A Command Queuing (CmdQue) bit of one indicates that the library supports tagged command queuing. The library does not support the tagged command queuing, this field must be zero.

A Soft reset (SftRe) bit of one indicates that the library supports soft reset. The library supports hard reset only, therefore, this field must be zero.

The value between 20h through 7Eh shall be set to ASCII data field. ASCII space (20h) shall be added after the data if the field is left aligned, or before if the field is right aligned.

The Vendor Identification field contains eight bytes of ASCII data identifying the vendor of the product. This field shall be "NEC" for the library.

The Product Identification field contains 16 bytes of ASCII data giving the product name which is determined by the vendor. This field shall be "LL009F" for the library.

The Product Revision Level field contains the ASCII data giving the production revision level which is determined by the vendor.

2.2.2 Vital product data

The host requests the vital product data information by setting the EVPD bit to one. The type of Vital Product Data is determined by specifying the Page Code.

Table.2.2.6 Vital product data page codes

Page Code	Description
00h	Supported vital product data pages
80h	Unit serial number page
83h	Device identification Page
D0h	Vendor Specific Page

2.2.2.1 Supported vital product data pages

The library supports the following Vital Product Data pages.

Table.2.2.7 Supported vital Product Data Pages format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral qualifier			Peripheral device type				
1	Page Code (00h)							
2	Reserved (0)							
3	Page Length (n-3)							
4-n(6)	Supported Page List 00h,80h,83h							

The Peripheral Qualifier field and the Peripheral Device Type field are defined in Tables 3.2.2 and 3.2.3.

The Page Length field specifies the length of the Supported Page List. If the allocation length is too small to transfer all of the page, the page length shall not be adjusted to reflect the truncation.

The Supported Page List field shall contain a list of all vital product data page codes (see Table 3.2.6).

2.2.2.2 Unit Serial number page

This page provides a product serial number for the library.

Table.2.2.8 Unit serial number page

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral qualifier			Peripheral device type				
1	Page Code (80h)							
2	Reserved (0)							
3	Page Length (0Ch)							
4-15	Product Serial number							
16-19	First Storage Element Address							

The Peripheral Qualifier field and the Peripheral Device Type field are defined in Table Tables 2.2.2 and 2.2.3.

The Page Length field specifies the length of the product serial number (0Ch). If the allocation length is too small to transfer all of the page, the page length shall not be adjusted to reflect the truncation.

The Product Serial Number field contains ASCII data that is NEC-assigned serial number. If the serial number is shorter than the required length, add ASCII "0" (30h). If the product serial number is not available, the library shall return ASCII spaces (20h) in this field.

The First Storage Element Address is the ASCII representation of four hexadecimal digits from Mode Page 1Dh, bytes 6-7

2.2.2.3 Device identification page

The Device Identification page returns the Identification Descriptor for the library. The following table shows the format of Device identification Page.

Table.2.2.9 Device identification page format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral qualifier			Peripheral device type				
1	Page Code(83h)							
2	(MSB) Page Length(n-3) (LSB)							
3								
4-	(MSB) Identification Descriptor(first) (LSB)							
-n	(MSB) Identification Descriptor(last) (LSB)							

The format of Identification Descriptor is shown in Table 2.2.10.

Table.2.2.10 Identification descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	Protocol Identifier(0)				Code set			
1	PIV(0)	RSV(0)	Association(0)		Identifier type			
2	Reserved (0)							
3	(MSB) Identifier length(n-3) (LSB)							
4-n	(MSB) Identifier (LSB)							

The Code Set field specifies the code set used for the Identifier field, as defined in Table 2.2.11.

Table.2.2.11 Code set

Value	Description
0h	Reserved
1h	The identifier field contains binary values
2h	The identifier field contains ASCII graphic codes
3-Fh	Reserved

The Identifier Type field specifies the type of information for the Identifier, as defined in Table 2.2.12. The library supports T10 vendor identification only, this field shall contain 1h.

Table.2.2.12 Identifier type

Value	Description
0h	No assignment authority was and consequently there is no guarantee that the identifier is globally unique.
1h	The first 8 byte of the identifier field are a Vender ID.
2h	The identifier field contains an IEEE Extended Unique Identifier,64 –bit (EUI-64).
3f	The identifier field contains a FC-PH 64-bit Name Identifier field.
4-Fh	Reserved

Table.2.2.13 shows the Device Identification page supported by the library.

Table.2.2.13 Device Identification page

Bit Byte	7	6	5	4	3	2	1	0
0	Protocol Identifier(0)				Code set(2h)			
1	PIV(0)	RSV(0)	Association(0)		Identifier type(1h)			
2	Reserved (0)							
3	Identifier length (24h)							
4-11	(MSB) Vendor Identification "NEC" (LSB)							
12-27	(MSB) Product Identification "LL009F" (LSB)							
28-39	(MSB) Product serial number "XXXXXXXXXXXX" (LSB)							

2.3. LOG SELECT Command (4Ch)

The Log Select command provides a means to manage statistical information maintained by the library.

Parameters within Log Pages are defined as a way to manage the log data. The Log Select command is used to send Log Page data via the Data Out phase.

Table.2.3.1 LOG SELECT command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (4Ch)							
1	Logical Unit Number (000b)			Reserved (0)			PCR	SP(0)
2	PC		Reserved (0)					
3	Reserved (0)							
4	Reserved (0)							
5	Reserved (0)							
6	Reserved (0)							
7-8	(MSB) Parameter list length							(LSB)
9	Control (0)							

A Parameter Code Reset (PCR) bit of one and a Parameter List Length of zero causes all implemented parameters to be set to the default values. If the PCR bit is one and the parameter list length is greater than zero, the command is terminated with a Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB. A PCR bit of zero specifies that the log parameters shall not be reset.

The library does not support the Save Parameter (SP) bit. This field must be zero.

The Page Control (PC) field defines the type of parameter. The Page Control field is defined in Table 2.3.2.

Table.2.3.2 Page control field

Type	LOG SELECT parameter values	LOG SENSE parameter values
00b	Current threshold values	Threshold values
01b	Current cumulative values	Cumulative values
10b	Default threshold values	Default threshold values
11b	Default cumulative values	Default cumulative values

The library does not support the Current threshold value and Current cumulative value. If any values are set in these fields, the command is terminated with a Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

To set the current threshold value to default values, set the PC field to 10b and Parameter List Length field to zero, and then issue the Log Select command. Note that the host is unable to set any value in the Current threshold value using the Log Select command. To set the current cumulative value to default values, set the PC field to 11b and Parameter List Length field to zero, and then issue the Log Select command.

The Parameter List Length specifies the length in bytes of the parameter list that shall be transferred from the host to the library through the Data Out phase. A Parameter List Length of zero indicates that no pages shall be transferred. The library does not allow the host to change the Log Parameter value, the Parameter List Length field must be zero. If the Parameter List Length is not zero, the library shall terminate the command with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ set to Invalid Field In CDB.

2.4. LOG SENSE Command (4Dh)

The Log Sense command reports log information maintained by the library to the host. This command is a complementary command to the Log Select command.

Table.3.4.1 LOG SENSE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (4Dh)							
1	Logical Unit Number (000b)			Reserved (0)			PPC(0)	SP(0)
2	PC		Page code					
3	Reserved (0)							
4	Reserved (0)							
5-6	(MSB) Parameter pointer (LSB)							
7-8	(MSB) Parameter list length (LSB)							
9	Control (0)							

A Parameter Pointer Control (PPC) bit is used to determine the type of parameter to be requested to library. The library does not support the PPC bit, therefore, this field must be zero. In this case, the log parameter data requested from the library is sent the number of bytes specified by the Allocation Length field according to the order of parameter codes specified by Log Page format, starting with the Parameter Code defined in the Parameter Pointer field.

A PPC bit of zero and a Parameter Pointer field of zero causes all available log parameters for the specified log page to be returned to the host subject to the allocation length.

The library does not implement the Saving Log Parameter. The library saves the log parameters according to its internal rules. If the Save Parameter (SP) bit is one, the library terminates the command with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

If the Save Parameters (SP) bit is zero, the library performs the specified Log Sense command and does not save any log parameters.

The Page Control (PC) field defines the type of parameter. See Table 2.4.2 for definition of this field. The parameter values reported by the Log Sense command are defined as follows:

- a) The parameter values of the last update (updated by Log Select command, Log Sense command or done automatically by the library for cumulative values).
- b) The saved values if an update has not occurred since last power-on, hard reset condition, or Bus Device Reset message.
- c) If saved values are not available, the default values are sent if an update has not occurred since the last power-on, hard reset condition, or Bus Reset message.

Table.2.4.2 Page control field

Type	LOG SELECT parameter value	LOG SENSE parameter value
00b	Current threshold values	Threshold values
01b	Current cumulative values	Cumulative values
10b	Default threshold values	Default threshold values
11b	Default cumulative values	Default cumulative values

The library updates Current Cumulative Value to reflect the number of events generated, and the host updates it using the Log Select command.

The library supports the Current Cumulative Value only. Therefore, the Page Control field must be 01h.

The Page Code field specifies the type of page data requested by the host. (See Table 2.4.5.) If a page code is sent that is not supported, the library terminates the command with Check Condition status. The sense key is set to Illegal Request with the ASC/ASCQ is set to Invalid Field In CDB.

The parameter Pointer field specifies the starting address of parameter data requested by the host. The library reports the value specified in Allocation Length field or maximum value supported by the library, whichever is less. If the value of the Parameter Pointer field is larger than the largest available parameter code that can be returned by the library on the specified page, the library terminates the command with a Check Condition status. The sense key is set to Illegal Request and the ASC/ASCQ is set to Invalid Field In CDB.

The Log Parameter in the specified Log Page is transferred according to the specification.

Table.2.4.1 LOG SENSE Command

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Parameter Code (LSB)							
2	DU(0)	DS(1)	TSD(0)	ETC	TMC	Reser- Ved(0)	LP	
3	Parameter Length (n-3)							
4-n	(MSB) Parameter Value (LSB)							

Each Log Parameter structure begins with a four-byte parameter header followed by one or more bytes of parameter data.

The Parameter Code field identifies the Log parameter that is being transferred with the Log Page.

DU, DS, TDS, ETC, TMC, and LP fields are used to control the parameters. These fields are defined as follows:

Disable Update (DU) bit shall always be zero. The library updates the Log Parameter according to its internal specification.

DS bit shall always be set to one. The library does not support saving the log parameter in response to a Log Select or Log Sense command with an SP bit of one.

Target Save Disable (TSD) bit shall always be zero. The TSD bit of one indicates that log parameters are saved using the library's saving method.

A Target Save Disable (TSD) bit of one indicates that a comparison to the threshold value is performed whenever the cumulative value is updated. A bit of zero indicates the comparison is not performed. The value of the ETC bit is the same for both the threshold and cumulative parameters. The parameter supported by this page does not support this feature, this bit must be 0.

The Threshold Met Criteria (TMC) field (see Table 2.4.4 below) defines the basis for comparison of the cumulative and threshold values. The TMC field is only valid when the ETC bit is one. The value of the TMC bit is the same for both the threshold and cumulative parameters. The library supports only 11b as TMC.

Table.2.4.4 Threshold met criteria

Code	Basis for comparison
00b	Every update of the cumulative value
01b	Cumulative value equal threshold value
10b	Cumulative value not equal threshold value
11b	Cumulative value greater than threshold value

If the ETC bit is one and the result of the comparison is true, a Unit Attention Condition is generated for all hosts. When reporting the Unit Attention Condition, the library sets the sense key to Unit Attention, and the ASC/ASCQ to Threshold Condition Met.

List Parameter (LP) bit indicates the format of Log Parameter. Zero indicates the parameter is a data counter. One indicates that the parameter is a list parameter.

2.4.1 Supported page code

The library supports the Log Page Codes as shown in Table 2.4.5.

Table.2.4.5 Log page codes

Page Code	Description
00h	Supported log page
06h	Non-medium error page
2Eh	Tape alert page
30h	Library statistics log page

2.4.2 Supported log pages

The Supported Log pages reports the list of log pages implemented by the library.

Table.2.4.6 Supported log pages

Bit Byte	7	6	5	4	3	2	1	0	
0	Reserved (0)		Page Code(00h)						
1	Reserved (0)								
2-3	(MSB)		Page Length(0006h)						(LSB)
4-9	(MSB)		Supported page code(00h 06h 2Eh 30h 31h 32h)						(LSB)

The Supported Log Pages reports the list of log pages supported by the library.

The Page Length field specifies the length in bytes of the subsequent Supported Log Page List.

The Supported Page List field contains a list of all Log Page Codes supported by the library in ascending order beginning with page code 00h.

2.4.3 Non-medium error page

Non-Medium Error page reports the error counts accumulated in the library.

Table.2.4.7 Non-Medium error page

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code(06h)					
1	Reserved (0)							
2-3	(MSB) Page Length(n-3)							(LSB)
4-n	Non-medium error list							

Table 3.4.8 shows the Non-medium error event parameter codes supported by the library.

Table.2.4.8 Non-Medium error event parameter codes

Parameter code	Description
0000h	Non-medium error counts
8001h	Pick & Place error counts
8002h	X movement error counts
8101h	Drive loading error counts
8102h	Drive unload error counts
8103h	Drive Fan error counts

Table 2.4.9 shows the format of Non-Medium error page.

Table.2.4.9 Non-Medium erro page Format

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Parameter Code							(LSB)
2	DU(0)	DS(1)	TSD(0)	ETC(0)	TMC(0)		RSV(0)	LP(0)
3	Parameter Length (04h)							
4-7	(MSB) Parameter Value							(LSB)

2.4.4 TapeAlert page

TapeAlert is reported by the LOG SENSE page that contains 64 one-byte Alert flag via the SCSI bus. The library determines whether to set or cancel these flags.

Table.2.4.10 TapeAlert page

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code(2Eh)					
1	Reserved (0)							
2-3	(MSB) Page Length(140h) (LSB)							
5n-1 - 5n	(MSB) Parameter code(n) (LSB)							
5n+1	DU(0)	DS(1)	TSD(0)	ETC(0)	TMC(00)		RSV(0)	LP(0)
5n+2	Parameter length(01h)							
5n+3	Value of flag (set when bit0=1)							

The library reports the detailed error information to the host by using the following flags.

Each flag is cleared to zero by the following conditions.

- On/off of power supply
- When returning by the recovery operation
- When the host reads Alert Log Page

There are three types of TapeAlert flags. Table.3.2.11 shows the flags in order of service. Three types are as follows.

"I": Information. Information for user

"W" Warning: Action to be taken. This may include the library performance degradation and the data loss.

"C" Critical: Needs immediate action.

Table.2.4.11 TapeAlert page Specification (1/5)

N0.	Flag	Type	Required Host Message	Cause
01	Library Hardware A	C	The library mechanism is having difficulty communicating with the tape drive. 1. Turn the library off then on. 2. Restart the operation. 3. If the problem persists, call the NEC helpline.	The library mechanism is having trouble communicating with the tape drive.
02	Library Hardware B	W	There is a problem with the library mechanism.	The library mechanism has a hardware fault.
03	Library Hardware C	C	The Library has a hardware fault: 1. Reset the library 2. Restart the operation. Check the library users manual for device specific instructions on resetting the device.	Library mechanism has a hardware fault that requires a reset to recover.
04	Library Hardware D	C	The library has a hardware fault: 1. Turn the library off and then on again. 2. Restart the operation. 3. If the problem persists, call the NEC helpline. Check the library users manual for device specific instructions on turning the device power on and tests.	The library mechanism has a hardware fault that is not mechanism related, or requires power cycle to recover.
05	Library Diagnostics Required	W	The library mechanism may have a hardware fault. Run extended diagnostics to verify and diagnose the problem. Check the library users manual for device specific instructions on running extended diagnostic test. The library does not supported this flag.	The library mechanism may a hardware fault which would be identified by extended diagnostics(eg. SCSI Send Diagnostics)
06	Library Interface	C	The library has a problem with the host interface: 1. Check the cables and cable connections. 2. Restart the operation.	The library has identified an interfacing fault.
07	Library Predictive Failure	W	A hardware failure of the library(drive) is predicated. Call the NEC helpline. The library does not support this flag.	Predictive failure of library hardware.

Table.2.4.11 TapeAlert page Specification (2/5)

N0.	Flag	Type	Required Host Message	Cause
08	Library Maintenance	W	Preventative maintenance of the library is required. Check the library users manual for device specific preventative maintenance tasks,or call NEC helpline.	Library preventative maintenance required.
09	Library Humidity Limits	C	General environmental conditions inside the library are outside the specified humidity range. The library does not support this flag.	Library humidity limits exceeded.
10	Library Temperature Limits	C	General environmental conditions inside the library are outside the specified temperature range. The library does not support this flag.	Library temperature limit exceeded.
11	Library Voltage Limits	C	The voltage supply to the library is outside the specified range. There is a potential problem with the power supply or failure of a redundant power supply. The library does not support this flag.	Library voltage limits exceeded.
12	Library Stray Tape	C	A cartridge has been left in a drive inside the library by a previous hardware fault: 1.Insert an empty magazine to clear the fault. 2.If the fault does not clear,turn the library off and then on again. 3.If the problem persists,call the NEC helpline. The library does not support this flag.	Stray cartridge left in library after previous error recovery.
13	Library Pick Retry	W	There is a potential problem with a drive ejecting cartridge short or with the library mechanism picking a cartridge from a slot. 1.No action needs to be taken at this time. 2.If the problem persists,call the NEC supplier helpline. The library does not support this flag.	Operation to pick a cartridge from a slot had to perform an excessive number of retries before succeeding.

Table.2.4.11 TapeAlert page Specification (3/5)

N0.	Flag	Type	Required Host Message	Cause
14	Library Place Retry	W	There is a potential problem with the library mechanism placing a cartridge into a slot. 1.No action needs to be taken at this time. 2.If the problem persists,call the NEC helpline. The library does not support this flag.	Operation to place a cartridge into a slot had to excessive number of retires before succeeding.
15	Library Load Retry	W	There is a potential problem with a drive or library mechanism loading cartridges, or an incompatible cartridge. The library does not support this flag.	Operation to load a cartridge into a drive had to perform an excessive number of retries before succeeding.
16	Library door	C	The operation has failed because the library door is open: 1.Clear any obstructions from the library door. 2.Close the library door. 3.If the problem persists,call the NEC helpline. The library does not support this flag.	Changer door open prevents library functioning.
17	Library Mailslot	C	There is a mechanical problem with the library media import/export mailslot.	Mechanical problem with import/export mailslot.
18	Library Magazine	C	The library cannot operate without the magazine. 1.Insert the magazine into the library. 2.Restart the operation.	Library magazine not present.
19	Library Security	W	Library security has been compromised. door is open. The library does not support this flag.	Library door opened then closed during operation.
20	Library Security Mode	I	The security mode of the library has been changed. The library has either been put into secure mode,or library has exited the secure mode. This is for information purposes only.No action is required. The library does not support this flag.	Library security mode changed.

Table.2.4.11 TapeAlert page Specification (4/5)

N0.	Flag	Type	Required Host Message	Cause
21	Library Offline	I	The library has been manually turned offline and is unavailable for use.	Library manually turned offline.
22	Library Drive Offline	I	A drive inside the library has been taken offline. This is for information purposes only.No action is required.	Library turned internal drive offline.
23	Library Scan Retry	W	There is a potential problem with the barcode label or the scanner hardware in the library mechanism. 1.No action needs to be taken at this time. 2.If the problem persists, call the NEC helpline. The library does not support this flag.	Operation to scan the barcode on a cartridge had to perform an excessive number of retries before succeeding.
24	Library Inventory	C	The library has detected a inconsistency in its inventory. 1.Redo the library inventory to correct inconsistency. 2.Restart the operation. Check the applications users manual or the hardware users manual for specific instructions on redoing the library inventory. The library does not support this flag.	Inconsistent media inventory.
25	Library Illegal Operate	W	A library operation has been attempted that is invalid at this time. The library does not support this flag.	Illegal operation detected.
26	Dual-Port Interface Error	W	A redundant interface port on the library has failed. The library does not support this flag.	Failure of one interface port in a dual-port configuration, e.g.Fibrechannel.
27	Cooling Fan Failure	W	A library cooling fan has failed. The library does not support this flag.	One or more fans inside the library have failed. Internal flag state only cleared when all fans are working again.

Table.2.4.11 TapeAlert page Specification (5/5)

N0.	Flag	Type	Required Host Message	Cause
28	Power Supply	W	A redundant power supply has failed inside the library. Check the library users manual for instructions on replacing the failed power supply.	Redundant PSU failure inside the library subsystem.
29	Power Consumption	W	The library power consumption is outside the specified range. The library does not support this flag.	Power consumption of one or more devices inside the library is outside specific range.
30	Pass-through mechanism failure	C	A failure has occurred in the cartridge pass-through mechanism between two library modules. The library does not support this flag.	Error occurred in pass-through mechanism during self test or while attempting to transfer a cartridge between library modules.
31	Cartridge in pass-through mechanism	C	A cartridge has been left in the library pass-through mechanism from a previous hardware fault. Check the library users guide for instructions on clearing this fault. The library does not support this flag.	Cartridge left in the pass-through mechanism between two library modules.
32	Unreadable bar code labels	I	The library was unable to read the barcode on a cartridge. The library does not support this flag.	Unable to read a barcode label on a cartridge during library inventory/scan.

2.4.5 Library Statistics Log page

This page (page code 30h) reports the operation count of robotics in library.

Table.2.4.12 Library Log page

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)		Page Code(30h)					
1	Reserved (0)							
2-3	(MSB) Page Length(n-3)							(LSB)
4-n	Support page list							

Table 2.4.13 shows the Mechanical Movement parameter codes supported by the library.

Table.2.4.13 Mechanical Movement parameter codes

Parameter code	Description
0000h	Non-medium error counts
8001h	Pick & Place movement counts
8002h	X movement counts

Mechanical Movement parameter is defined as shown in Table 2.4.14.

Table.2.4.14 Mechanical Movement parameter Format

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Parameter code(n)							(LSB)
2	DU(0)	DS(1)	TSD(0)	ETC(0)	TMC(00)		RSV(0)	LP(0)
3	Parameter length(04h)							
4-7	(MSB) Parameter Value							(LSB)

2.5. MODE SELECT(6) Command (15h)

The Mode Select (6) command provides a means for the host to specify various parameters to the library. The host should issue Mode Sense command prior to Mode Select to determine supported pages, page lengths, and other parameters.

Table.2.5.1 MODE SELECT(6) command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (15h)							
1	Logical Unit Number (000b)			PF (1b)	Reserved (0)			SP (0)
2	Reserved (0)							
3	Reserved (0)							
4	Parameter List Length							
5	Control (0)							

The library supports the same page for all hosts.

If the host sends a Mode Select command that changes any parameters that apply to other hosts, the library generates a Unit Attention condition for all hosts except the one that issued the Mode Select command. The library sets the ASC/ASCQ to Mode Parameters Changed.

When the PF bit is one, the Mode Select parameters are sent after the Parameter List Header.

The Save Pages (SP) bit, when set to zero, requests the library not to save the data transferred during the Data Out phase into non-volatile memory.

The Parameter List Length specifies the length in bytes of the Mode Parameter List that shall be transferred during the Data Out phase. A Parameter List Length of zero indicates that no data shall be transferred.

If the Parameter List Length causes discontinuation of Mode Parameter Header or Mode Page, the library terminates the command with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Parameter List Length Error.

2.5.1 Parameter List Header

If one or more Parameter Pages are sent by MODE SELECT command, a Parameter List Header must be sent. However, Parameter List Header is unnecessary if no Parameter Page is transferred. There are two kinds of Parameter List Header depending on the value of the PF bit as shown below.

Table.2.5.2 Parameter List Header (PF=1)

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)							
1	Reserved (0)							
2	Reserved (0)							
3	Reserved (0)							

All fields in Parameter List Header have been reserved. All fields shall be set to zero.

Mode Parameter Block Descriptor sent at this time is as follows.

Table.2.5.3 Mode Parameter block descriptor

Bit Byte	7	6	5	4	3	2	1	0
4	Density code (00h)							
5-7	(MSB) Number of blocks (0000h)							(LSB)
8	Reserved (0)							
9-11	(MSB) Block length (0000h)							(LSB)

Density Code shall be zero for the library.

Number of Blocks field shall be zero for the library.

Block Length shall be zero for the library.

The library terminates the Mode Select commands with Check Condition status, sets the sense key to Illegal Request and sets the ASC/ASCQ to Invalid Field In Parameter List for the following conditions:

- a) If the host attempts to change any field that is not changeable by the host as reported by the library.
- b) If the host attempts to set a value that is outside the range supported by the library to the fields in Mode Parameter Header or Block Descriptor.
- c) If the host attempts to set a value for a Mode Sense command that is outside the range supported by the library. (The library shall not round the parameter transferred.)
- d) If the host attempts to set a value other than zero to the reservation field of Mode Parameter List.

If the host sends a value for a Mode parameter that is outside the range supported by the library, the command is terminated with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in Parameter List.

The library checks if the Mode Parameter is changeable before executing the Mode Select command.

2.5.2 Information Exceptions Control Page

The Informational Exceptions Control page defines the methods used by the library to control the reporting and the operations of specific informational exception conditions.

Table.2.5.4 Information Exception Control Page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code(1Ch)					
1	Page length(0Ah)							
2	PERF(0)	RSV(0)	EBF(0)	EWasc(0)	DExcpt	test	RSV(0)	LogErr(0)
3	Reserved (0)				MRIE			
4-7	(MSB) Interval timer(00000000h)							(LSB)
8-11	(MSB) Report count							(LSB)

Parameters Savable (PS) bit must be zero.

Performance Bit (Pref) bit must be zero.

A Disable Exception Control (Dexcpt) bit of zero indicates the Information Operation is enabled. The method of reporting the Information Exception Condition is determined from the Method of Reporting Informational Exceptions field. A DExcpt bit of one indicates the Information Operation is disabled. The Method of Reporting Informational Exceptions field is ignored when DExcpt is set to one.

The Test bit permits Information Exceptions. The Test bit shall be cleared after the False Exception is reported. If the Dexcept bit is set to one, this bit cannot be set.

Log Error Bit (Log Err) bit is not supported by the library. Therefore, this field must be zero.

The Method of Reporting Informational Exceptions (MRIE) bit indicates the methods that is used by the library to report information exception conditions. The library supports 0h and 4h.

If the Information Exception Condition is generated due to the factor that causes the true CHECK CONDITION, the true CHECK CONDITION discards the CHECK CONDITION set in MRIE mode.

When 0h is set in MRIE, this Method does not report the Information Exception Condition to the library. When MRIE is set to 4h, which unconditionally generates the RECOVERED ERROR, the library generates the requested Information Exception Condition with the Sense Key of 0h (NO SENSE) and the ASC/ASCQ of 5Dh/00h.

The Interval Timer field is not supported by the library, therefore, this field must be zero.

The Report/Count/Test Flag Number field is used for two purposes. If the TEST bit is set to zero, the data of this field of the MODE SELECT command indicates the Report Count.

The Report Count field is not supported by the library. If any value is set in this field, the library completes the command with Check Condition status. The Sense Key shall be set to Illegal Request. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

If the TEST bit is set to one, the data of this field of the MODE SELECT command indicates the Test Flag Number. The Test Flag Number is not reported according to the MODE SELECT command. The valid value of Test Number is between -64 and 64, and 32767 (7FFFh). The negative number is expressed by the complement of 2.

If the value of Test Flag Number is not valid, the MODE SELECT command terminates with the CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Parameter List.

When the valid Test Flag Number is specified, set the Tape Alert Flag if it is a positive number, clears the Tape Alert Flag if it is a negative number.

Where, the Test Flag Number indicates the Tape Alert number of the LOG SENSE command. Set the Tape Alert Flag if it is a positive number, clears the Tape Alert Flag if it is a negative number. If the value is set to 32767, all Tape Alert Flags shall be cleared.

2.6. MODE SENSE(6) Command (1Ah)

The Mode Sense (6) command provides a means for the library to report its parameters to the host. It is a command complementary to the Mode Select (6) command.

Table.2.6.1 MODE SENSE(6) command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (1Ah)							
1	Logical Unit Number (000b)			RSV(0)	DBD	Reserved (0)		
2	PC		Page code					
3	Reserved (0)							
4	Allocation Length							
5	Control (0)							

A Disable Block Descriptors (DBD) bit of zero indicates that the library may return the Mode Parameter Block Descriptor in the returned Mode Sense data. A DBD bit of one specifies that the library shall not return any block descriptors in the returned Mode Sense data.

2.6.1 Page Control

Page Control (PC) field defines the type of Mode Parameter of the Mode Page to be reported. Page Control field is defined in Table.2.6.2.

Table.2.6.2. Page control field

PC	Description	Sub clause
00b	Current values	2.6.1.1
01b	Changeable values	2.6.1.2
10b	Default values	2.6.1.3
11b	Saved values	2.6.1.4

*The Page Control field affects the Mode Parameter in Mode Page. It does not affect the PS bit, Page Code, and Page Length field. As for the Mode Parameter Header and the Mode Parameter Descriptor, the current value is reported.

2.6.1.1 Current values

If the PC field is set to 00b, the library reports the current value as a Mode Parameter. The following current values shall be reported.

- a) The Current value of a mode parameter updated by the last successful Mode Select command
- b) The Current value of a mode parameter saved in the library if no Mode Select command completes successfully after a Power On Reset, a Hard Reset, or a Bus Device Reset message.
- c) The default value maintained by library if the saved values in the library (in non-volatile memory) are not valid.

2.6.1.2 Changeable values

When PC field is 01b, the library reports the mask information that indicates the changeable mode parameter. Each returned parameter byte shall contain ones where a field may be changed and zeros where a field or bit may not be changed.

2.6.1.3 Default values

When PC field is 10b, the library reports the default value. The Mode Parameter that is not supported by the library shall contain zero.

2.6.1.4 Saved values

When PC field is 11b, the library reports the value saved in non-volatile memory. The Mode Parameter that is not supported by the library shall contain zero.

2.6.1.5 Initial responses

The library performs the following tasks immediately after a power-on reset or the hard reset.

- a) Reports the default Mode Parameter value if the default value is requested.
- b) Reports the valid Mode parameter value saved in the library if the saved value is requested.
If the library fails to read the requested Mode Parameter value from the non-volatile memory, the library completes the command with Check Condition status. The Sense Key shall be set to Not Ready.
- c) If the current value is requested and the current Mode Parameter value is not transferred from the host, the library reports the saved Mode Parameter value. If the current value is transferred from the host, the library reports it.

2.6.2 The Mode Page Code

Table 2.6.3 defines the Mode Page Codes supported by the library.

Table.2.6.3 Mode page codes

Page Code	Description	Sub clause
1Fh	Device capabilities	2.6.3.2
1Dh	Element address assignment	2.6.3.3
1Eh	Transport geometry parameters	2.6.3.4
1Ch	Information Exception Control page	2.6.3.5
3Fh	Return all pages	-

The host requests an entire Mode Page, or a part of it that are supported by the library.
 If the host specifies the Page Code that is not supported by the library and attempts to send MODE SENSE command, the library terminates the command with Check Condition status.
 The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

When the Page Code is set to 3Fh, the library reports to the host all Mode Pages implemented by the library. The Mode Page 00h is reported after all other Mode Pages are reported. (The Mode Pages are reported in ascending order of Page Code excluding Mode Page 00h.)

* The Mode Pages are reported in ascending order of Page code.

2.6.3 Mode Parameters

The structure and contents of Mode Data Page supported by the library is described below. The MODE SENSE command reports the single Mode Data Page specified by the Page Code field in CDB. Each Mode Data Page begins with four-byte of Page List Header. Following the Page List Header, a variable-length Mode Data Parameter length of zero or more in the specified Mode Page is reported.

Table.2.6.4 Parameter List Header

Bit Byte	7	6	5	4	3	2	1	0
0	Mode Data Length							
1-2	Reserved (0)							
3	Block descriptor length (0 or 8)							

The Mode Data Length reports the number of bytes of Parameter information on which the library reports as a result of the MODE SENSE command. The information does not contain the Mode Data Length byte, but contains all other information.

The Block Descriptor Length specifies the total number of Block Descriptor bytes. This value shall be eight times the number of Block Descriptor. The Block Descriptor Length of zero indicates that the Block Descriptor is not contained in the Mode Parameter List. Table 2.6.5 shows the Mode Parameter Block Descriptor.

Table.2.6.5 Mode Parameter block descriptor

Bit Byte	7	6	5	4	3	2	1	0
4	Density code (00h)							
5-7	(MSB) Number of blocks (0000h)							(LSB)
8	Reserved (0)							
9-11	(MSB) Block length (0000h)							(LSB)

Density Code shall be zero for the library.
 Number of Blocks field shall be zero for the library.
 Block Length shall be zero for the library.

2.6.3.2 Device capabilities page

The Device Capabilities Page (see Table 2.6.7) defines the characteristic of each Element Type that has been implemented by the library. This information provides the function which has been permitted to the MOVE MEDIUM command for the host. In this library, the mail slot can be enabled or disabled according to the setting. The page shall be generated for each setting.

Table.2.6.7 Device capabilities page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code (1Fh)					
1	Parameter length(0Eh)							
2	Reserved (0)				StorDT	StorI/E	StorST	StorMT
3	Reserved (0)							
4	Reserved (0)				MT->DT	MT->I/E	MT->ST	MT->MT
5	Reserved (0)				ST->DT	ST->I/E	ST->ST	ST->MT
6	Reserved (0)				I/E->DT	I/E->I/E	I/E->ST	I/E->MT
7	Reserved (0)				DT->DT	DT->I/E	DT->ST	DT->MT
8-11	Reserved (0)							
12	Reserved (0)				MT<>DT	MT<>I/E	MT<>ST	MT<>MT
13	Reserved (0)				ST<>DT	ST<>I/E	ST<>ST	ST<>MT
14	Reserved (0)				I/E<>DT	I/E<>I/E	I/E<>ST	I/E<>MT
15	Reserved (0)				DT<>DT	DT<>I/E	DT<>ST	DT<>MT

The Parameter Savable (PS) bit of one indicates that the library has a capability to store the Mode Page into non-volatile memory. The data of this Mode Page is fixed, therefore, the PS bit in the library shall always be zero.

Each field name of the Mode Page is shown by the abbreviation of Element Type shown below.

MT a medium transport element
 ST a storage element
 I/E an import export element
 DT a data transfer element

In the description, XX and YY are the abbreviations of each Element type.

The STtoXX bit of one indicates that the Element Type XX has the capability to store the tape cartridge independently. STtoXX bit of zero indicates that the Element Type XX can store the tape cartridge of other Element Type temporarily, but cannot store it independently. Accordingly, StorST shall be one.

The XX->YY bit of one indicates that the Element Type XX can be specified as a Source Element Address, and Element Type YY can be specified as a Destination Element Address using the function of MODE MEDIUM command supported by the library. The XX->YY bit of zero indicates that the Element Type XX cannot be specified as a Source Element Address, and Element Type YY cannot be specified as a Destination Element Address. If this combination is used, the MOVE MEDIUM command assumes that it received an invalid parameter, and terminates with Illegal Request status.

The XX<>YY bit of one indicates that the Element Type XX can be specified as a Source Element Address, and Element Type YY can be specified as a Destination Element Address 1 and Destination Element Address 2 (the both shall be the same address) using the function of EXCHANGE MEDIUM command. The library does not support the EXCHANGE MEDIUM command, therefore the all XX<>YY bits must be zero. Table 2.6.8 shows the Device Capabilities Page in the library.

Table.2.6.8 Device capabilities page (when Mail Slot is disabled)

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code (1Fh)					
1	Parameter length(0Eh)							
2	Reserved (0)				1	0	1	0
3	Reserved (0)							
4	Reserved (0)				0	0	0	0
5	Reserved (0)				1	0	1	0
6	Reserved (0)				0	0	0	0
7	Reserved (0)				1	0	1	0
8-11	Reserved (0)							
12	Reserved (0)				0	0	0	0
13	Reserved (0)				0	0	0	0
14	Reserved (0)				0	0	0	0
15	Reserved (0)				0	0	0	0

Table.2.6.9 Device capabilities page (when Mail Slot is enabled)

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code (1Fh)					
1	Parameter length(0Eh)							
2	Reserved (0)				1	1	1	0
3	Reserved (0)							
4	Reserved (0)				0	0	0	0
5	Reserved (0)				1	1	1	0
6	Reserved (0)				1	1	1	0
7	Reserved (0)				1	1	1	0
8-11	Reserved (0)							
12	Reserved (0)				0	0	0	0
13	Reserved (0)				0	0	0	0
14	Reserved (0)				0	0	0	0
15	Reserved (0)				0	0	0	0

2.6.3.3 Element address assignment page

The Element Address Assignment Page shows the allocation of Element Address supported by the library. The Element Address Assignment Page also reports the number of Element Types supported by the library.

This page (Element Address Assignment Page) responds to the request from the host during Becoming Ready and reports the page data.

Table.2.6.10 Element address assignment page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code (1Dh)					
1	Parameter length(12h)							
2	(MSB)	First medium transport element address						(LSB)
3								
4	(MSB)	Number of medium transport elements						(LSB)
5								
6	(MSB)	First storage element address						(LSB)
7								
8	(MSB)	Number of storage elements						(LSB)
9								
10	(MSB)	First import/export element address						(LSB)
11								
12	(MSB)	Number of import/export elements						(LSB)
13								
14	(MSB)	First data transfer element address						(LSB)
15								
16	(MSB)	Number of data transfer elements						(LSB)
17								
18	Reserved (0)							
19	Reserved (0)							

Parameter Savable (PS) bit of one indicates that the library has capability to store the Mode Page into the non-volatile memory. The data of this Mode Page is fixed, therefore, the PS bit in the library shall always be zero.

The First Medium Transport Element Address field indicates the address of First Medium Element in the library. (Usually, the Medium Transport Element address is zero.) This field shall be set to 0001h for the library. The Number of Medium Transport Elements field indicates the number of Medium Transport Elements in the library. The library contains only one Medium Transport Element, therefore, this field must always be set to 0001h.

The First Storage Element Address field indicates the address of First Storage Element in the library. The Number of Medium Storage Elements field indicates the number of Storage Elements in the library. This field shall be set to 0008h for the library if MAIL SLOT is enabled, and 0009h if disabled.

The First Import Export Element Address field indicates the address of First Import Export Element in the library. The library specifies 0011h if MAIL SLOT is enabled, and 0000h if disabled. Number of Import Export Element indicates the number of Import Export Elements in the library. The library specifies 0001h if MAIL SLOT is enabled, and 0000h if disabled.

The First Data Transfer Element Address field indicates the address of First Data Transfer Element in the library. This field shall be set to 0101h for the library. Number of Data Transfer Element indicates the number of Data Transfer Elements in the library. The number of Data Transfer Element (Tape Drive) is set to 0001h.

Table.2.6.11 Element address assignment page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code (1Dh)					
1	Parameter length(12h)							
2	(MSB)	First medium transport element address(0001h)						(LSB)
3								
4	(MSB)	Number of medium transport elements(0001h)						(LSB)
5								
6	(MSB)	First storage element address(1001h)						(LSB)
7								
8	(MSB)	Number of storage elements(0008h) ^{*1}						(LSB)
9								
10	(MSB)	First import/export element address(0011h)						(LSB)
11								
12	(MSB)	Number of import/export elements(0001h) ^{*2}						(LSB)
13								
14	(MSB)	First data transfer element address(0101h)						(LSB)
15								
16	(MSB)	Number of data transfer elements(0001h)						(LSB)
17								
18	Reserved (0)							
19	Reserved (0)							

*1 This field shall be set to 0009h if Mail Slot is not used.

*2 Only when the Mail Slot is used. This field shall be set to 0000h if not used.

2.6.3.4 Transport geometry parameters page

The Transport Geometry Parameter Page indicates whether to contain the Medium Transport Element that shares the robotics of library, and whether to provide the function to reverse the tape cartridge. As for a single Transport Geometry Descriptor, the information on Medium Transport Element that begins with the First Medium Element is transferred.

Table.2.6.12 Transport geometry parameters page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code(1Eh)					
1	Page length							
2	Reserved (0)							Rotate
3	Member number of transport element set							

The Parameter Savable (PS) bit of one indicates that the library has a capability to store the Mode Page into non-volatile memory. The data of this Mode Page is fixed, therefore, the PS bit in the library shall always be zero.

The Parameter Length specifies the subsequent Transport Geometry Descriptor in bytes. The Medium Transport Element Descriptor is composed of two bytes.

The Rotate bit of one indicates that the Medium Transport Element has a capability to rotate a two-sided medium. The library does not support this function, therefore, this field must always be zero.

The Member Number indicates the position of this Medium Transport Element in the Medium Transport Element that shares the robotics mechanism. The library has only one Medium Transport Element, therefore, this field must always be set to 0h.

Table.2.6.13 Transport geometry parameters page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(0)	RSV(0)	Page code(1Eh)					
1	Page length(02h)							
2	Reserved (0)							0
3	Member number of transport element set(00h)							

2.6.3.5 Information Exception Control Page

The Information Exception Control page defines the methods used by the library to control the reporting and the operations of specific informational exception conditions.

Table.2.6.14 Information Exceptions Control Page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(1)	RSV(0)	Page code(1Ch)					
1	Page length(0Ah)							
2	PERF(0)	RSV(0)	EBF(0)	EWasc(0)	DExcpt	test	RSV(0)	LogErr(0)
3	Reserved (0)				MRIE			
4-7	(MSB) Interval timer(00000000h) (LSB)							
8-11	(MSB) Report count/Test flag Number (LSB)							

The Parameters Savable (PS) bit of one indicates that the library has a feature to save the Mode Page into non-volatile memory. The Mode Page data is variable, therefore, the PS bit must always be set to one.

The library does not support the Performance Bit (Pref) bit. This bit must always be zero.

A Disable Exception Control (Dexcpt) bit of zero indicates the Information Operation is enabled. If Dexcpt bit is set to zero, reporting of Information Exception Condition depends on value specified in Method of Reporting Information Exception field.

A DExcpt bit of one indicates the Information Exception Operation is disabled. The Method of Reporting Information Exception (MRIE) field is ignored.

A Test bit shall be cleared after the False Exception is reported. The Interval Timer is permanently set to 00000000h, zero shall be reported.

A Log Error (LogErr) bit is not supported by the library, therefore, this bit must always be zero.

The Method of Reporting Informational Exception (MRIE) field indicates the methods that is used by the library to report information exception conditions. The library supports 0h and 4h. If the Information Exception Condition is generated due to the factor that causes the true CHECK CONDITION, the true CHECK CONDITION discards the CHECK CONDITION set in MRI E mode. When MRIE is set to 4h, which unconditionally generates the RECOVERED ERROR, the library generates the requested Information Exception Condition. In response to the REQUEST SENSE command, the Sense Key shall be set to 0h (NO SENSE) and the ASC/ASCQ shall be set to 5Dh/00h. Default value for this area is 4h.

The Interval Timer field is not supported by the library. This field must always be zero.

The Report/Count/Test Flag Number field is used for two purposes. If the TEST bit is set to zero, the data of this field of the MODE SELECT command indicates the Report Count. The Report Count field is not supported by the library. If any value is set in this field, the library completes the command with Check Condition status. The Sense Key shall be set to Illegal Request. If the TEST bit is set to one, the data of this field of the MODE SELECT command indicates the Test Flag Number. The Test Flag Number is not reported according to the MODE SELECT command. The valid value of Test Number is between -64 and 64, and 32767 (7FFFh). The negative number is expressed by the complement of 2. If the value of Test Flag Number is not valid, the MODE SELECT command terminates with the CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Parameter List.

2.7. MODE SENSE(10) Command (5Ah)

The Mode Sense (10) command provides a means for the library to report its parameters to the host. It is a command complementary to the Mode Select (10) command.

Table.2.7.1 MODE SENSE(10) command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (1Ah)							
1	Logical Unit Number (000b)			LLBAA(0)	DBD	Reserved (0)		
2	PC		Page code					
3	Subpage Code (0)							
4	Reserved(0)							
5	Reserved(0)							
6	Reserved(0)							
7	Allocation Length							
8								
9	Control (0)							

See the Mode Sense(6) (2.6) Command for descriptor of the other fields and operation of this command.

2.8. MODE SELECT(10) Command (55h)

The Mode Select (10) command provides a means for the host to specify various parameters to the library. The host should issue Mode Sense command prior to Mode Select to determine supported pages, page lengths, and other parameters.

Table.2.8.1 MODE SELECT(10) command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (55h)							
1	Reserved(000b)			PF	Reserved(000b)			SP
2	Reserved(0)							
3	Reserved(0)							
4	Reserved(0)							
5	Reserved(0)							
6	Reserved(0)							
7	Parameter List Length							
8								
9	Control (0)							

See the Mode Select(6) (2.5) Command for descriptor of the other fields and operation of this command.

2.9. MOVE MEDIUM Command (A5h)

The MOVE MEDIUM command is used to direct the library to transport the medium from the source element to the destination element.

Table.2.9.1 MOVE MEDIUM command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (A5h)							
1	Logical Unit Number (000b)			Reserved (0)				
2-3	(MSB) Transport element (LSB)							
4-5	(MSB) Source address (LSB)							
6-7	(MSB) Destination address (LSB)							
8	Reserved (0)							
9	Reserved (0)							
10	Reserved (0)							Invert(0)
11	Control (0)							

Transport Element Address indicates the transportation system of the library. The library supports only one transportation system, and the Element Address of it is fixed to 0h. If this field is not zero, the command terminates with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Element Address.

Source Address specifies the location of the tape cartridge to be transported. Destination Address specifies the destination to transport the tape cartridge.

The Storage Element Address and the Data Transfer Element Address in the library can be used for the Source Address and Destination Element Address. If any other value is specified, the command terminates with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Element Address.

If the library receives this command and the Source Element does not contain the tape cartridge, or the Destination Element (not identical with the Source Element) contains a tape cartridge, the library terminates the command with CHECK CONDITION status.

If the Source Element does not contain the tape cartridge, the sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to MEDIUM SOURCE ELEMENT EMPTY. If the Destination Element contains a tape cartridge, the sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to MEDIUM DESTINATION ELEMENT FULL.

If the Source Element Address and the Destination Element Address are the same location and the Element does not contain a tape cartridge, the command terminates with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to MEDIUM SOURCE ELEMENT EMPTY. If the Element contains a tape cartridge, the library normally terminates the command without operating robotics.

The matrix concerning the Source Element that can be transported by the MOVE MEDIUM command and the Destination Element is provided in the MODE SENSE page.

The Invert bit of one indicates that the tape cartridge is rotated before it is transported to Destination Element. The library does not support the rotate function, therefore, the Invert bit must always be zero. If the Invert bit is not zero, the command terminates with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

2.10. POSITION TO ELEMENT Command (2Bh)

The POSITION TO ELEMENT command moves the Transport Element to ahead of the specified element.

Table.2.10.1 POSITION TO ELEMENT command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (2Bh)							
1	Logical Unit Number (000b)			Reserved				
2-3	(MSB) Transport element							(LSB)
4-5	(MSB) Destination address							(LSB)
6	Reserved (0)							
7	Reserved (0)							
8	Reserved (0)							Invert(0)
9	Control (0)							

The Transport Element Address indicates the transportation system in the library. The library supports only one transportation system and its Element Address is fixed to 0h. If this field is not one, the command terminates with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Element Address.

The Destination Element Address shares all Element Addresses in the library (Transfer Element Address, Storage Element Address, and Data Transfer Element Address). If the Destination Element Address is the Transport Element Address, the library normally terminates the command without operating robotics. If any other value than described above is specified in this field, the library terminates the command with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Element Address.

When the Invert bit is set to one, the Transport Element rotates and moves to the specified element. The library does not support the rotate function, therefore, the Invert bit must always be zero.

If the Invert bit is not zero, the command terminates with CHECK CONDITION status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

2.11. PREVENT ALLOW MEDIUM REMOVAL Command (1Eh)

The PREVENT ALLOW MEDIUM REMOVAL command requests that the library enable or disable the removal of the tape cartridge in the library. This mechanism is independent of device reservations. The library does not eject the tape cartridge if removal of it is prevented.

Table.2.11.1 PREVENT ALLOW MEDIUM REMOVAL command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (1Eh)							
1	Logical Unit Number (000b)			Reserved (0)				
2	Reserved (0)							
3	Reserved (0)							
4	Reserved (0)							Prevent
5	Control (0)							

The prevention of tape cartridge removal shall begin when host issues a PREVENT ALLOW MEDIUM REMOVAL command with a Prevent bit of one. The prevention of tape cartridge removal for the library shall terminate:

- a) Upon receipt of a PREVENT ALLOW MEDIUM REMOVAL commands with a Prevent bit of zero from all hosts that have cartridge removal prevented
- b) Upon the receipt of a BUS DEVICE RESET message from the host
- c) Upon a hard reset condition (including cycle power)

While a prevention of tape cartridge removal condition is in effect the library shall inhibit removal of the tape cartridge by an operator.

2.12. READ BUFFER Command (3ch)

The Read Buffer command is used in conjunction with the Write Buffer command as a diagnostic function for testing library memory and the SCSI bus integrity.

Table.2.12.1 READ BUFFER command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (3Ch)							
1	Logical Unit Number (000b)			mode				
2	Buffer ID							
3-5	(MSB)			Buffer offset				(LSB)
6-8	(MSB)			Allocation length				(LSB)
9	Reserved (0)							

The function of this command and fields in Command Descriptor Block depend on the value of Mode field. The library supports the following Mode field as shown in Table 2.12.2.

Table 2.12.2 READ BUFFER mode field

mode	Description
00000b	Combined header and data mode
00010b	Data mode

2.12.1 Combined header and data mode (00000b)

In this mode, a four byte header followed by the data bytes are sent to the host during the Data In phase. The Buffer ID and the Buffer Offset fields are reserved in this mode.

The four-byte read buffer header is followed by data bytes and transferred from the library's data buffer. A four-byte Read Buffer header is defined as shown in Table 2.12.3.

Table.2.12.3 READ BUFFER header

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved (0)							
1-3	Buffer capacity (MSB)							(LSB)

The Buffer Capacity field specifies the total number of data bytes that are available in the library's data buffer.

This number is not affected by the Allocation Length nor the actual number of bytes written using the Write Buffer command. Following the Read Buffer header, the library shall transfer data from its data buffer.

The library terminates the Data In phase when allocation length bytes of header plus data have been transferred or when all available header and buffer data have been transferred to the host.

2.12.2 Data mode (00010b)

In the Data mode, the library transfers the buffer data from the library during DATA IN phase.

2.12.3 Buffer offset

The buffer offset field indicates the data offset within the specified data buffer from which data shall be transferred from. The host should conform to the offset boundary requirements specified by the library. If the library is unable to accept the specified buffer offset, it shall return CHECK CONDITION status, shall set the Sense Key to ILLEGAL REQUEST, and set the ASC/ASCQ to ILLEGAL FIELD IN CDB.

2.13. READ ELEMENT STATUS Command (B8h)

The READ ELEMENT STATUS command reports the element status in the library to the host.

Table.2.13.1 READ ELEMENT STATUS command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (B8h)							
1	Logical Unit Number (000b)			VolTag	Element type code			
2-3	(MSB) Starting element address							(LSB)
4-5	(MSB) Number of elements							(LSB)
6	Reserved (0)					CURDATA	DVCID	
7-9	(MSB) Allocation length							(LSB)
10	Reserved (0)							
11	Control (0)							

If the Volume Tag (VolTag) bit is one, the library reports the Volume Tag information.

The Element Type Code field is specified when to select an element containing the information to be reported. When this field is zero, information on all elements is reported.

Table 2.13.2 defines the Element Type Code.

Table.2.13.2 Element type code

Element type code	Description
0h	All element types reported
1h	Medium transport element
2h	Storage element
3h	Import export element
4h	Data transfer element

The Starting Element Address specifies the youngest Element Address to be reported. Information on the element having the Element Type Code and the larger Element Address than defined in the table above is reported. Element Descriptor Block shall not be generated for the undefined Element Address.

The Number of Elements field specifies the maximum number of Element Descriptor which the library generates with this command. The value in this field does not specify the range of Element Address to be reported, but specify the number of elements to be reported. If the Allocation Length is insufficient to transfer all Element Descriptor, the library transfers the available descriptors only, and does not generate an error.

The library reports the current data even either zero or one is set to CURDATA (same processing for both).

If the DVCID is set to one and the Element Type is Data Transfer Element (Drive), the Device Identifier shall be reported. If the Element Type is not Data Transfer Element (Drive), the library terminates the command with the sense key of Illegal Request and the ASC/ASCQ of Invalid Field in CDB. (This is the same information as Device Identification Page (VPD 83h page).)

2.13.1 Element status data

Table 2.13.3 defines the data to be reported by the READ ELEMENT STATUS command. The Element Status data is composed of eight-byte header followed by one or more Element Status Page.

Table.2.13.3 Element status data

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) First element address reported							(LSB)
2-3	(MSB) Number of element available							(LSB)
4	Reserved (0)							
5-7	(MSB) Byte count of report available (all pages,n-7)							(LSB)
8-n	Element status page(s)							

The First Element Address Reported field is set to the youngest Element Address that agrees with the Element Address requested by CDB.

The Number of Element Available field is set to the element that agrees with the Element Address requested by CDB. If the Allocation Length is long enough, the status of these elements are reported.

The Byte Count of Report Available field is set to the number of bytes required to transfer the Element Status Page of all the elements that agree with the request from CDB. This value shall not be adjusted to match the Allocation Length.

2.13.2 Element status page

Table 2.13.4 defines the Element Status Page.

The Element Status Page contains eight-byte header followed by one or more Element Descriptor Block. The header contains the Element Type Code, length of each Descriptor Block, and the number of bytes of Element Descriptor information that follows the Element Type header.

Table.2.13.4 Element status page

Bit Byte	7	6	5	4	3	2	1	0
0	Element type code							
1	PVolTag	AVolTag	Reserved (0)					
2-3	(MSB) Element Descriptor length							(LSB)
4	Reserved (0)							
5-7	(MSB) Byte count Descriptor data available (this page,n-7)							
8-n	Element descriptor(s)							

The Element Type Code field indicates the Element Type to be reported by this page.

The Primary Volume Tag (PVolTag) bit is set to the value defined by CDB. The Alternate Volume Tag (AVOLTAG) bit shall be zero because it is not supported by the library.

The Element Descriptor Length field indicates the number of bytes of each Element Descriptor.

The Byte Count of Descriptor Data Available field indicates the number of bytes of valid Element Descriptor Data of the element of this Element Type that agrees with the request from the CDB. This value shall not be adjusted to agree with the Allocation Length.

Each Element Descriptor contains the Element Address and the Status Flags. The Status Flag contains Sense Code information as well as the information on each Element Type.

2.13.3 Medium transport element descriptor

Table 2.13.5 shows the contents of Medium Transport Element Descriptor.

Table.2.13.5 Medium transport element descriptor

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Element address (LSB)							
2	Reserved (0)					Except	Reserved	Full
3	Reserved (0)							
4	Additional sense code							
5	Additional sense code qualifier							
6-8	Reserved (0)							
9	SValid	Invert (0)	Reserved (0)					
10-11	(MSB) Source storage element address (LSB)							
12-47	(MSB) Primary volume tag information (LSB)							
48-51	Reserved (0)							

The Element Address field indicates the address in the library of the status reported by this Element Descriptor Block.

The Exception (Except) bit of one indicates that this element is in abnormal status. The Exception (Except) bit of zero indicates that this element is in normal status. When this bit is set to one, the Additional Sense Code and the Additional Sense Code Qualifier byte are set to indicate the details of abnormal state.

The Full bit of one indicates that the element contains a tape cartridge. The Full bit of zero indicates that the element does not contain any tape cartridge.

The Additional Sense Code field and the Additional Sense Code Qualifier field are the same as those defined in the REQUEST SENSE command.

The Source Valid (Svalid) bit of one indicates that the Source Storage Element Address field and Invert bit information are valid. The Source Valid (Svalid) bit of zero indicates that those fields contain invalid values.

The Invert bit of one indicates that the tape cartridge currently exists in this element can be inverted from the position where the cartridge is placed in the Source Storage Element by using the MOVE MEDIUM command. The library does not support this function, therefore, the Invert bit must always be zero.

The Source Storage Element Address field is set to the address in the Storage Element where the tape cartridge currently placed in this element was placed last. The Medium Transport Element fields shall be set to zero, because the Medium Transport Element in the library has no capability to store the tape cartridge.

When the VolTag bit is set to one, the Volume Tag of the medium existing in this element is set in the Primary volume tag information field.

If the value exceeding 36 bytes is set to the Primary volume tag information field, the lower bytes shall be rounded down. If the value is less than 36 bytes, the values shall be top aligned and the remaining shall be filled with zeroes.

2.13.4 Storage element descriptor

Table 2.13.6 defines the Storage Element Descriptor.

Table.2.13.6 Storage element descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB) Element address (LSB)							
1								
2	Reserved (0)				Access (1)	Except	RSV(0)	Full
3	Reserved (0)							
4	Additional sense code							
5	Additional sense code qualifier							
6-8	Reserved (0)							
9	SValid	Invert (0)	Reserved (0)					
10-11	(MSB) Source storage element address (LSB)							
12-47	(MSB) Primary volume tag information (LSB)							
48-51	Reserved (0)							

The Access bit of one indicates that an access to this element from the Medium Transfer Element is granted. The Access bit of zero indicates that an access to this element from the Medium Transfer Element is prohibited. The library is granted to access all Storage Elements, therefore, this bit shall always be set to one.

In the Source Storage Element Address field, the Storage Element Address where the tape cartridge currently in this element was placed last before transportation to this element, is set. The current Storage Element Address is specified in this field for the library. This field is valid only when the Svalid bit is one.

2.13.5 Import export element descriptor

Table 2.13.7 defines the Storage Element Descriptor. If the Mail Slot is not specified in the library, this data shall not be reported.

Table 2.13.7 Import export element descriptor

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Element address (LSB)							
2	Reserved (0)	InEnab	ExEnab	Access	Except	ImpExp	Full	
3	Reserved (0)							
4	Additional sense code							
5	Additional sense code qualifier							
6-8	Reserved (0)							
9	SValid	Invert (0)	Reserved (0)					
10-11	(MSB) Source storage element address (LSB)							
12-47	(MSB) Primary volume tag information (LSB)							
48-51	Reserved (0)							

InEnab of one indicates that the library supports the medium insertion mechanism. The library reports one when Mail Slot is enabled, and zero when disabled.

The ExEnab of one indicates that the library supports the medium ejection mechanism. The library reports one when Mail Slot is enabled, and zero when disabled.

The Access bit of one indicates that the medium transport mechanism is allowed to access the medium insertion/ejection mechanism. The Access bit of zero indicates that an access is prohibited.

The ImpExp reports the state of the medium in medium insertion/ejection element. The ImpExp bit of one indicates that the medium is inserted by an operator, zero indicates that the medium is ejected by the medium transport element.

2.13.6 Data transfer element descriptor

Table.2.13.8 defines the Data Transfer Element Descriptor.

There are two kinds of statuses, DVCID=0 or DVCID=1.

Table.2.13.8 Data Transfer Element Descriptor (DVCID=0)

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Element address (LSB)							
2	Reserved (0)				Access	Except	RSV(0)	Full
3	Reserved (0)							
4	Additional sense code							
5	Additional sense code qualifier							
6	Obsolete	RSV(0)	Obsolete	Obsolete	RSV(0)	Obsolete		
7	Obsolete							
8	Reserved (0)							
9	SValid	Invert (0)	Reserved (0)					
10-11	(MSB) Source storage element address (LSB)							
12-47	(MSB) Primary volume tag information (LSB)							
48-51	Reserved (0)							

An Access bit of one indicates that an access to this element by Medium Transfer Element is enabled. An Access bit of zero indicates that an access to this element by Medium Transfer Element is disabled.

The Access bit of one indicates that the medium transport mechanism is allowed to access the medium insertion/ejection mechanism. The Access bit of zero indicates that an access is prohibited.

If the VolTag bit of CDB is zero, no Primary volume tag information is added.

Table.2.13.9 Data Transfer Element Descriptor (DVCID=1)

Bit Byte	7	6	5	4	3	2	1	0
0-1	(MSB) Element address (LSB)							
2	Reserved (0)				Access	Except	RSV(0)	Full
3	Reserved (0)							
4	Additional sense code							
5	Additional sense code qualifier							
6	Obsolete	RSV(0)	Obsolete	Obsolete	RSV(0)	Obsolete		
7	Obsolete							
8	Reserved (0)							
9	SValid	Invert (0)	Reserved (0)					
10-11	(MSB) Source storage element address (LSB)							
12 47	(MSB) Primary volume tag information (LSB)							
48	Protocol Identifier (0)				Code set(2h)			
49	PIV(0)	RSV(0)	Association(0)		Identifier type(1h)			
50	Reserved (0)							
51	Identifier length(22h)							
52-59	(MSB) Vendor Identification"XXXXXXXXXX" (LSB)							
60-75	(MSB) Product Identification"XXXXXXXXXXXXXXXXXXXX" (LSB)							
76-85	(MSB) Product serial number"XXXXXXXXXXXX" (LSB)							

* An information on the drive is given in Byte #48 and the subsequent bytes with the same format as VPD 83h page (T10 Identification page).

The Access bit of one indicates that the medium transport mechanism is allowed to access the medium insertion/ejection mechanism. The Access bit of zero indicates that an access is prohibited.

If the VolTag bit of CDB is zero, no Primary volume tag information is added.

2.14. RELEASE Command (07h)

The Release command is used to release previously reserved library or element unit. It is not an error for a host to attempt to release a reservation that is not currently active. In this case, the library returns Good status without altering any other reservation.

Table.2.14.1 RELEASE command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (17h)							
1	Logical Unit Number (0)			3rdPty (0)	Third party device ID(0)			Element (0)
2	Reservation identification							
3	Reserved (0)							
4	Reserved (0)							
5	Control (0)							

2.14.1 Logical unit release

If the Element bit is zero, this command terminates the active library and element reservations within the logical unit specified by the host.

2.14.2 Element release

The library does not support the Element release (Element) bit. This field must be zero.

2.14.3 Third party release

The library does not support the Third Part Reservation. Therefore, the 3rdPty bit and the Third Party device ID field must always be zero. If they are not zero, the command shall be terminated with Check Condition Status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

2.15. REQUEST SENSE Command (03h)

The Request Sense command requests that the library transfer sense data to the host in the format shown in Table 2.14.1.

Table.2.15.1 REQUES SENSE command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (03h)							
1	Logical Unit Number (0)			Reserved (0)				
2	Reserved (0)							
3	Reserved (0)							
4	Allocation length							
5	Control (0)							

The library reports the command the Check Condition so that the library may report an error using the Request Sense command. If the library has no other sense data available to return, it shall return a sense key of No Sense and ASC/ASCQ of No Additional Sense Information.

The sense data is maintained by the library until it is reported by Request Sense command. However, the sense data shall be cleared if any other command is received from the host. If the Allocation Length is less than the length of valid sense data, the Additional Sense Length shall not be adjusted.

The library does not support Information field, therefore, the Valid bit must always be zero.

The library does not support Segment Number field and ILI bit, they must always be zero.

The Sense Key, Additional Sense Code and Additional Sense Code Qualifier fields provide a hierarchy of information. The intention of the hierarchy is to provide a top-down approach to determine information relating to the error or other conditions. The sense key indicates categories of errors occurred. The Additional Sense Code provides more detailed information than Sense Key. The Additional Sense Code Qualifier provides more detailed information than Additional Sense Code.

The Sense Key field is mandatory. The Sense Key is generated when an error occurs. The Sense Keys are defined in Table 2.15.2.

Table.2.15.2 Error codes 70h and 71h sense data format

Bit Byte	7	6	5	4	3	2	1	0
0	Valid	Error code (70h)						
1	Segment number (00h)							
2	Reserved (0)		ILI(0)	RSV(0)	Sense Key			
3-6	(MSB) Reserved (0)							(LSB)
7	Additional sense length (0Ah)							
8-11	(MSB) Reserved (0)							(LSB)
12	Additional sense code							
13	Additional sense code qualifier							
14	Field replaceable unit code							
15	SKSV							
16-17	Sense-Key specific							

The Additional Sense Length field indicates the number of additional sense bytes to follow. If the allocation length of the command descriptor block is too small to transfer all of the additional sense bytes, the additional sense length is not adjusted to reflect the truncation.

The Additional Sense Code (ASC) field indicates further information related to the error reported in the sense key field. The library shall support the Additional Sense Code field. A list of additional sense codes is in Table 3.15.5. If the library does not have further information related to the error to report, the additional sense code is set to No Additional Sense Information.

The Additional Sense Code Qualifier (ASCQ) field indicates detailed information related to errors reported by the additional sense code. If the error is reportable by the library, the value returned shall be as specified in Table 3.15.5. If the library does not have detailed information related to the error, the additional sense code qualifier is set to No Additional Sense Information.

Library does not support the Field Replaceable Unit Code field, therefore, this field must be zero.

The Sense-key Specific field is defined as follows:

2.15.1 Sense-key specific

The Sense Key Specific field as defined by this manual when the value of the Sense Key Specific Valid (SKSV) bit is one. The library supports SKSV bit and Sense Key Specific field. The definition of this field is determined by the value of the Sense Key field.

If the Sense Key field is set to Illegal Request and the SKSV bit is set to one, the Sense Key Specific field shall be as defined as shown in Table 2.15.3. The Field Pointer field indicates data byte in which illegal parameters is contained in the command descriptor block, or unacceptable data parameter is sent to the library during the Data Out phase.

Table.2.15.3 Field pointer bytes

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

A Command Data (C/D) bit of one indicates that the illegal parameter is in the command descriptor block. C/D bit of zero indicates that the illegal parameter is in the data parameters sent by the host in the Data Out Buffer.

A Bit Pointer Valid (BPV) bit of zero indicates that the value in the Bit Pointer field is not valid. A BPV bit of one indicates that the Bit Pointer field specifies which bit of the byte designated by the Field Pointer field is in error. When a multiple-byte field is in error, the field pointer shall point to the most significant (left-most) byte of the field.

The Field Pointer field indicates which byte of the command descriptor block or of the parameter data was in error. Bytes are numbered starting from zero, as shown in the tables describing the command descriptors and parameters. When a multiple-byte field is in error, the field pointer shall point to the most significant (left-most) byte of the field.

If the Sense Key is other than Illegal Request, and if the SKSV bit is one, the Sense Key Specific field is defined as shown in Table 2.15.4.

Table.2.15.4 Error Code and Status Bytes

Bit Byte	7	6	5	4	3	2	1	0
15	SKSV	Reserved (0)						
16	Runtime Error Code							
17	Status Byte (00h)							

Runtime Error Code : A library-specific internal code is set in this field, independently from the Sense Key and ASC/ASCQ shown in Table 2.15.5.

Status Byte: The library does not support this field, therefore, this field must be zero.

2.15.2 Sense Key and sense code definitions

The Sense Key, Additional Sense Code, and Additional Sense Code Qualifier are defined as shown below.

Table.2.15.5 Sense Key descriptions

Sense Key	ASC/ASCQ	Description
00 No Sense	0000	NO SENSE.
01 Recovered Error	5B02	LOG COUNTER AT MAXIMUM.
02 Not Ready	0400	LOGICAL UNIT NOT READY, CAUSE NOT REPORTABLE.
	0401	LOGICAL UNIT IS IN PROCESS OF BECOMING READY.
	0403	MANUAL INTERVENTION REQUIRED.
	3A02	MEDIUM NOT PRESENT- TRAY OPEN.
	8005	DURING REPROGRAMMING MODE.*b
04 Hardware Error	1501	MECHANICAL POSITION ERROR.
	40nn	DIAGNOSTIC FAILURE ON COMPONENT nn (80H-FFH).
	4400	INTERNAL TARGET FAILURE.
	5300	MEDIA LOAD OR EJECT FAILED.
	8007	NVRAM FAILURE.
05 Illegal Request	1A00	PARAMETER LIST LENGTH ERROR.
	2000	INVALID COMMAND OPERATION CODE.
	2101	INVALID ELEMENT ADDRESS.
	2400	INVALID FIELD IN CDB.
	2500	LOGICAL UNIT NOT SUPPORTED.
	2600	INVALID FIELD IN PARAMETER LIST.
	3000	INCOMPATIBLE MEDIUM INSTALLED.
	3B0D	MEDIUM DESTINATION ELEMENT FULL.
	3B0E	MEDIUM SOURCE ELEMENT EMPTY.
	3B83	SORCE DRIVE NOT UNLOADED.
	5302	MEDIUM REMOVAL PREVENTED.
	8010	DRIVE FAILURE.
	8020	EXCHANGE SLOT FULL.*a
	8021	CARTRIDGE WRONG INSERTION.*a
06 Unit Attention	2800	NOT READY TO READY TRANSITION, MEDIUM MAY HAVE CHANGED.
	2801	IMPORT OR EXPORT ELEMENT ACCESSED.
	2900	POWER ON OCCURRED.
	2A01	MODE PARAMETER CHANGED.
	2A02	LOG PARAMETER CHANGED.
	3F01	MICROCODE HAS BEEN CHANGED.
0B Aborted Command	41xx	LDI COMMAND FAILURE.*a
<p>Note:</p> <p>a. This code is preserved only in the library log. This is not reported to the host server.</p> <p>b. When Library (Robot) firmware is downloading ,it is reported.</p>		

2.16 RESERVE Command (16h)

The Reserve command is used for the host to reserve the library for exclusive use. The Reserve command provides the basic mechanism for contention resolution in multiple initiator systems.

Table.2.16.1 RESERVE command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (16h)							
1	Logical Unit Number (0)			3rdPty (0)	Third party device ID(0)			Element (0)
2	Reservation identification							
3	(MSB) Element List Length (LSB)							
4								
5	Control (0)							

2.16.1 Logical unit reservation

If the Element bit is zero, this command requests the unit be reserved for exclusive use of the host that made the reservation. Release is performed by:

- 1) A valid Release command from the host that made the reservation,
- 2) Bus Device Reset message from any host,
- 3) A hard reset, or
- 4) Power on/off.

A Unit Reservation is not granted if any unit or element is reserved by another host. It is permissible for a host to reserve a unit that is currently reserved by that host. If the Element bit is zero, the Reservation Identification and the Element List Length are ignored.

If the unit or element within the library is reserved by any other host, the library reports Reservation Conflict status.

If, after honoring the reservation, any other host subsequently attempts to perform a command other than an Inquiry, a Request Sense, a Prevent Allow Medium Removal Reserve, or a Release command, the command is rejected with Reservation Conflict status.

2.16.2 Element reservation

The library does not support the Element reservation (Element) bit. This field must be zero.

2.17 SEND DIAGNOSTIC Command (1Dh)

The Send Diagnostic command requests the library to perform diagnostic operations on the library. The Status byte of this command shows the results.

Table.2.17.1 SEND DIAGNOSTIC command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (1Dh)							
1	Logical Unit Number (0)			PF (0)	RSV(0)	SelfTest (1)	DevOfL (0)	UnitOfL (0)
2	Reserved (0)							
3	(MSB) Parameter list length (0000h) (LSB)							
4								
5	Control (0)							

A Page Format bit of one specifies that the Send Diagnostic parameters are transferred with the structure conforming to SCSI-2 standard. The library performs self-test only, therefore, no parameters are to be transferred. This bit shall be zero. If this field is set to one, the command terminates with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

A Self-test (SelfTest) bit of one directs the library to complete the library's default self-test. If the self-test successfully passes, the command shall be terminated with Good status; otherwise, the command shall be terminated with Check Condition status and the sense key shall be set to Hard Error. The library supports self-test only, this bit shall always be one. If zero is set in this field, no diagnostic operation is performed and the command shall be terminated with Good Status.

A Device Off-Line (DevOfL) and a Unit-OFF-Line (UNITOFL) fields shall be zero because they are not supported by the library.

The Parameter List Length field specifies the length in bytes of the parameter list that shall be transferred from the host to the library. A parameter list length of zero indicates that no data shall be transferred. This field shall be 0000h because the library supports self-test only.

2.18 TEST UNIT READY Command (00h)

The Test Unit Ready command provides a means to verify the library unit is ready. This is not a request for a self-test. If the library unit can accept an appropriate medium access command without returning Check Condition status, the library unit returns a Good status. If the library unit is not ready, the library reports Check Condition status with sense key Not Ready.

Table.2.18.1 TEST UNIT READY command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (1Dh)							
1	Logical Unit Number (0)			Reserved (0)				
2	Reserved (0)							
3	Reserved (0)							
4	Reserved (0)							
5	Control (0)							

Table.2.18.2 shows responses for TEST UNIT READY command. The responses of high priority (BUSY, RESERVARION CONFLICT) is permitted.

Table.2.18.2 Preferred TEST UNIT READY responses

Status	Sense Key	ASC and ASCQ
GOOD	NO SENSE	NO ADDITIONAL SENSE INFORMATION OR OTHER VALID ADDITIONAL SENSE CODE
CHECK CONDITION	ILLEGAL REQUEST	LOGICAL UNIT NOT SUPPORTED
CHECK CONDITION	NOT READY	LOGICAL UNIT IS IN PROCESS OF BECOMING READY
CHECK CONDITION	NOT READY	IMPORT OR EXPORT ELEMENT ACCESSED

2.19 WRITE BUFFER Command (3Bh)

The Write Buffer command is used in conjunction with the Read Buffer command as a diagnostic function for testing the library's memory and the SCSI bus integrity. This command is also used for updating the library's firmware code.

Table.2.19.1 WRITE BUFFER command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (3Bh)							
1	Logical Unit Number (000b)			Mode				
2	Buffer ID							
3	(MSB) Buffer offset (LSB)							
4								
5								
6	(MSB) Parameter list length (LSB)							
7								
8								
9	Control (0)							

2.19.1 mode Field

The function of this command and the meaning of the fields within the Command Descriptor Block depend on the mode field. The Mode field is defined in the following table.

Table.2.19.2 WRITE BUFFER mode field

mode	Description
00000b	Write Combined header and data mode
00010b	Write Data mode
00101b	Download microcode and save

2.19.2 Combined header and data mode (00000b)

In this mode, data to be transferred is preceded by a four-byte header. The four-byte header consists of all reserved bytes. The Buffer ID and the Buffer Offset fields shall be zero. The Parameter List Length field specifies the number of bytes that shall be transferred from the Data Out phase. This number includes four bytes of header, so the data length to be transferred to the library's buffer is parameter list length minus four.

The host should ensure that the parameter list length is not greater than four plus the buffer capacity value that is returned in the header of the Read Buffer command (mode 000b). If the parameter list length exceeds the buffer capacity, the library terminates the command with Check Condition status and shall set the sense key to Illegal Request.

2.19.3 Data mode (00010b)

In this mode, the Data Out phase contains buffer data. Data are written to the library's buffer starting at the location specified by the Buffer Offset field. The host should conform to the offset boundary requirements of the library. If the library is unable to accept the specified buffer offset, the library terminates the command with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB. The firmware code of the library shall be transferred in this mode.

2.19.4 Download microcode and save mode (00101b)

In this mode, the library firmware code previously transferred in Data mode shall be saved in a non-volatile memory space. When the firmware code is successfully transferred, the command terminates with Good status. After the downloaded code is saved, the library generates a Unit Attention Condition. The ASC/ASCQ shall be set to Microcode Has Been Changed. If the Buffer Offset and Parameter List Length is not zero in this mode, the Check Condition shall be reported.

2.19.5 Buffer ID

The library supports Buffer ID code of 0 only. If an unsupported buffer ID code is specified, the library shall return Check Condition status and shall set the sense key to Illegal Request

2.19.6 Buffer Offset

The Buffer Offset field is used to set the buffer to write the transferred data. The host sends commands that conform to the library's offset boundary requirements. If the library is unable to accept the specified buffer offset, the library terminates the command with Check Condition status. The sense key shall be set to Illegal Request and the ASC/ASCQ shall be set to Invalid Field in CDB.

2.19.7 Parameter List Length

The Parameter List Length field specifies the maximum number of bytes that shall be transferred in the Data Out phase. The host should ensure that the parameter list length does not exceed the capacity of the buffer capacity of the library. If the Parameter List Length fields specify a transfer in excess of the buffer capacity, the library terminates the command with Check Condition status. The sense key shall be set to Illegal Request.