3583 Ultrium Scalable Tape Library

SCSI Reference

WB1106-00

3583 Ultrium Scalable Tape Library

SCSI Reference

WB1106-00

Note!
Before using this information and the product it supports, read the information in “Appendix B. Notices” on page 107.

First Edition (October 2000)

This edition applies to the *IBM® 3583 Ultrium Scalable Tape Library SCSI Reference* and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

Tables

Preface

This guide describes how to program the IBM 3583 Ultrium Scalable Tape Library. It contains the following chapters:

"Chapter 1. Introduction" on page 1 describes the components of the 3583 Library, discusses supported servers, software, operating systems, and device drivers, and lists hardware specifications.

"Chapter 2. Library SCSI Commands" on page 13 describes each of the SCSI commands that are supported by the 3583 Library.

"Appendix A. General SCSI Information" on page 101 gives an overview of the 3583 Library's SCSI bus operations and messages.

Store this guide with your server's manuals.

Related Publications

- *IBM 3583 Ultrium Scalable Tape Library Quick Reference*, GX35-5057, illustrates how to configure and operate the 3583 Library.
- *IBM 3583 Ultrium Scalable Tape Library Setup, Operator, and Service Guide*, GA32-0411, tells how to install and run the 3583 Library. The guide also describes how to administer basic service procedures.
- *IBM 3583 Ultrium Scalable Tape Library Maintenance Information*, SA37-0425, tells how to administer basic service procedures for the 3583 Library.
- *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430, provides instructions for attaching IBM-supported hardware to open-systems operating systems. It indicates what devices and levels of operating systems are supported, gives the requirements for adapter cards, and tells how to configure hosts to use the device driver with the Ultrium family of devices.
- *IBM Ultrium Device Drivers Programming Reference*, WB1304, supplies information to application owners who want to integrate their open-systems applications with IBM-supported Ultrium hardware. The reference contains information about the application programming interfaces (APIs) for each of the various supported operating-system environments.

Chapter 1. Introduction

This chapter describes the 3583 Ultrium Scalable Tape Library and its functions.

Subsystem Description

The 3583 Library automates the retrieval, storage, and control of LTO Ultrium Tape Cartridges. Without operator intervention, the cartridges can be mounted and dismounted on tape drives by using supporting software from the host.

The 3583 Library has expandable configurations. It can be configured to operate with from one to six tape drives. The cartridge storage capacity can be configured with 18, 36, 54, or 72 storage slots.

The input/output (I/O) station contains a single storage slot. The maximum storage configuration contains a cartridge column with a multiple slot I/O station that holds 12 cartridges, and a 6-cartridge storage magazine. With the multiple slot I/O station, you can configure the library for 72 storage slots, or 60 storage slots and 12 I/O station slots.

The 3583 Library is a stand-alone unit. With the optional rack-mount feature, you can install the library into an ANSI/EIA-standard 19-inch rack.

All of the above configurations can be field upgraded to the maximum drive and storage configurations, and a redundant dc power module. See “Optional Features” on page 7 for additional information.

Figure 1 shows an example of a 3583 Library with a multiple slot I/O station and a redundant dc power module.

1	I/O Station	7	Casters
2	Front Door	8	Tape Drive Sled
3	Door Lock	9	Filler Plate
4	Door Handle	10	AC Input Power Module
5	Operator Panel	11	DC Power Module
6	Host Interface Board (SCSI)	12	Redundant DC Power Module

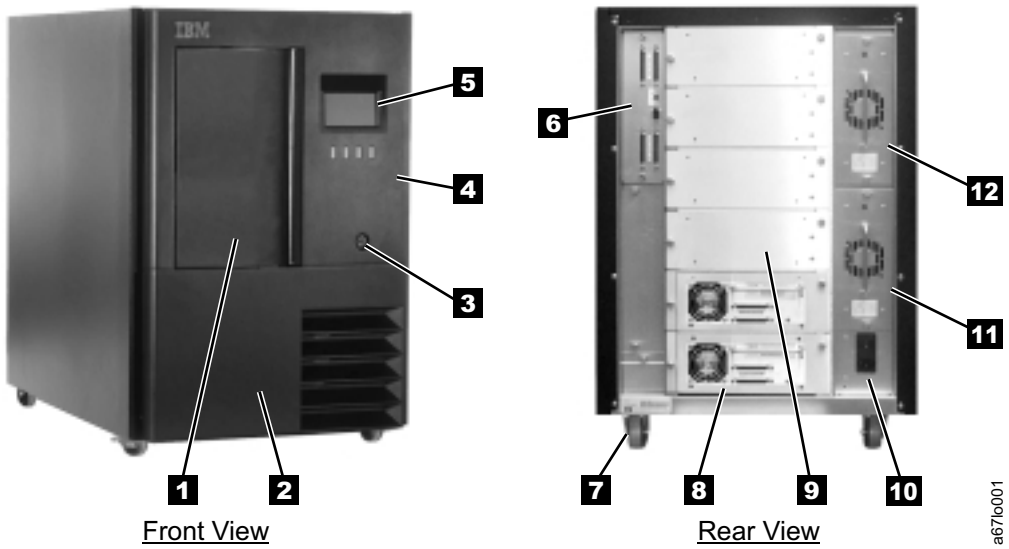

Figure 1. Tape Library Subsystem (Stand-Alone Configuration)

Host Attachment

Depending on its configuration, each 3583 Library can have between two and seven small computer systems interface (SCSI) target devices. The minimum configuration is one SCSI host interface board and one drive (for a total of two SCSI target devices). You can add up to five additional drives for a maximum total of seven SCSI target devices.

The SCSI host interface board has both Low Voltage Differential/Single Ended (LVD/SE) and High Voltage Differential (HVD/DIFF) connectors and a configuration switch. The switch must be set to whichever set of connectors (LVD/SE or HVD/DIFF) the host is attached to. Only one set of connectors may be used at any one time. Both sets of connectors are high density, 68-pin connectors that support a wide data transfer on the SCSI bus. The board itself is a narrow device on a wide bus, and its SCSI ID range is limited to from 0 to 7. On the SCSI bus, any initiator that communicates with the SCSI host interface board (such as a host adapter card) must also have its SCSI ID set to from 0 to 7.

Note: Although communication between the host and the library's SCSI host interface board is limited to a narrow data transfer, all communication between the host and the drives can be wide.

For maximum performance, the quantity of tape drives that you can attach to one SCSI bus is limited, and is based on the type of bus that you have and the amount of data compression achieved. Ultra SCSI buses have a bandwidth of 40 MB per second; Ultra-2 LVD SCSI buses have a bandwidth of 80 MB per second. The Ultrium Tape Drive is capable of data transfer rates of 15 MB per second with no compression and 30 MB per second at 2:1 compression. For these reasons, attach only one or two HVD/DIFF Ultrium Tape Drives to an Ultra SCSI bus and from one to three LVD/SE Ultrium Tape Drives to an Ultra-2 SCSI bus. In AS/400 applications (HVD only), two SCSI adapters cannot share the same library accessor; therefore, no more than two drives may be installed in a library that is attached to an AS/400 system.

Functional Description

The 3583 Library automates the IBM Ultrium Tape Drive. You can configure the library with from one to six Ultrium Tape Drives. Multiple drives offer enhanced functions, such as faster transfer of data, simultaneous backup, concurrent read and write operations, and fault tolerance.

You can use the 3583 Library to perform save and restore operations, program distribution, data interchange, automatic migration of data between disk storage and tape, and mass storage for data archives. Full interchange of data is supported with the Ultrium Tape Drive.

The tape library uses LTO Ultrium Tape Cartridges that provide 100 GB native capacity and up to 200 GB capacity with 2:1 hardware data compression. The library has a per drive native data rate up to 15 MB per second and up to 30 MB per second with 2:1 compression. The drive's burst data rate of the LVD/SE drive sled is 80 MB per second. The burst data rate of the HVD/DIFF drive sled is 40 MB per second.

The 3583 Library supports configurations with cartridge slot storage capacities of 18, 36, 54, and 72 cartridges, and provides total capacities of 1.8 TB, 3.6 TB, 5.4 TB and 7.2 TB of native data. With 2:1 compression, the largest model of the 3583 Library can store 14.4 TB of data.

The library includes an operator panel, and a bar code reader that allows positive tape cartridge identification and inventory.

When performing maintenance functions, you can access the cartridge storage slots and cartridge picker by opening the front door of the library. Open the back door to perform maintenance on the tape drives, power modules, and SCSI host interface board.

Functional Units

The 3583 Library consists of the following functional units:

- Tape drives in drive sleds
- Cartridge storage slots
- Tape cartridge
- I/O station
- Library control hardware
- Robotics system

Tape Drives

The 3583 Library currently supports the following tape drives:

- Ultrium Tape Drive with Low Voltage Differential/Single Ended (LVD/SE) Ultra-2 SCSI
- Ultrium Tape Drive with High Voltage Differential (HVD/DIFF) Ultra SCSI

All tape drives are packaged in a common drive sled that is a field replaceable unit (FRU). The sled is designed for quick removal and replacement.

Cartridge Storage

The 3583 Library can have up to five columns. One column contains tape drives, and one to four columns contain cartridges. The columns are numbered 1 to 5, starting at the I/O station column and continuing clockwise. Column 1 can be a single-slot I/O station or a multiple-slot I/O station. Column 2 is a cartridge storage column and is standard in all libraries. Column 3 is the drive column. Columns 4 and 5 are cartridge storage columns and may also be installed, depending on the configuration.

Storage Slot Numbering

The I/O station, the cartridge storage columns, and the drive column can have storage-slot number designations. Each cartridge column has three magazines that contain six storage slots. The magazines within each column are designated as A through C from top to bottom. The slots within each magazine are numbered 1 through 6 from top to bottom. The drives within the drive column are designated as A through F from bottom to top (see Figure 2).

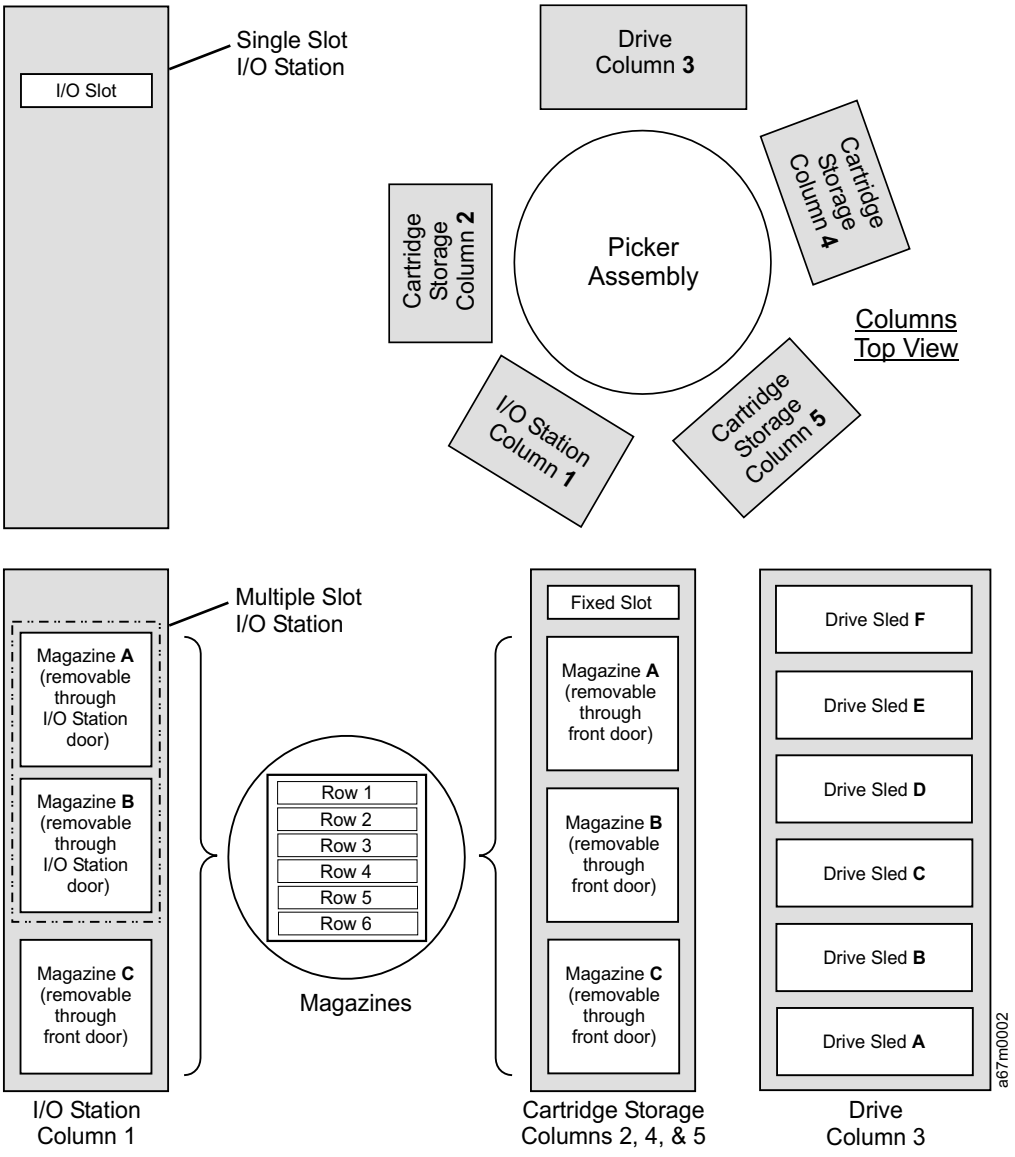

Figure 2. Storage Column Configurations and Coordinate System

To manipulate the media within the library, the host must reference each movement with source and target designations. The host does this by using element addressing, which specifies the slots to use.

The total number of slots available per storage column is 19; however, the host system only has access to 18. The nonaddressable slot located at the top of storage columns 2, 4, and 5 is reserved for future use. The bar code reader cannot read the label on the cartridge if it is stored in the nonaddressable slot.

Tape Cartridge

The 3583 Library automates the retrieval, storage, and control of LTO Ultrium Tape Cartridges.

To identify its volume serial number (volser), each tape cartridge in the 3583 Library **must** have an external bar code label that is machine readable. The external label contains up to eight characters for the volser. The first six positions can be uppercase A–Z or numerics 0–9, and the last two positions are reserved. If a cartridge in a storage or I/O station slot does not contain a label, the bar code reader will treat that slot as empty.

The external bar code labels on the cartridges identify the cartridges to the 3583 Library. Some software requires that the internal volser and the external bar code label be identical.

The write-protect switch also identifies the cartridge type. An LTO Ultrium Data Cartridge has a red write-protect switch; an LTO Ultrium Cleaning Cartridge has a gray write-protect switch.

Table 1 lists the cartridge types available for use in the 3583 Library.

Table 1. Cartridge Part Number Identification

Cartridge Type	Part Number Identification
LTO Ultrium Data Cartridge	08L9120
LTO Ultrium Cleaning Cartridge	08L9124

I/O Station

The I/O station allows you to insert and eject cartridges without interrupting the normal operation of the library. There are two models of the I/O station:

- The single-slot I/O station has a capacity of one LTO Ultrium Tape Cartridge. You can insert or eject the cartridge by opening the door of the I/O station.
- The multiple-slot I/O station has a capacity of 12 LTO Ultrium Tape Cartridges that are contained in two magazines. You can insert or remove the magazines by opening the door of the I/O station. There is also one fixed magazine that contains six storage slots inside the front door, below the I/O station door. You can also configure the multiple-slot I/O station for 12 additional storage slots. The configuration determines the number of cartridges that are available for data storage. Table 2 on page 7 presents all possible I/O storage combinations.

Table 2. Tape Library Configurations

Cartridge Storage Columns Installed	Single Slot I/O Station Installed	Multiple Slot I/O Station Installed	
		Configured as I/O	Configured as Storage
2	Storage Slots: 18 I/O Slots: 1	Storage Slots: 24 I/O Slots: 12	Storage Slots: 36 I/O Slots: 0
2, 4	Storage Slots: 36 I/O Slots: 1	Storage Slots: 42 I/O Slots: 12	Storage Slots: 54 I/O Slots: 0
2, 4, 5	Storage Slots: 54 I/O Slots: 1	Storage Slots: 60 I/O Slots: 12	Storage Slots: 72 I/O Slots: 0

Library Control Hardware

The library's control hardware controls all operations of the 3583 Library, including the interaction between the library and operators. The library's firmware creates and maintains the library's configuration, the physical location of the robotic system, and the inventory of cartridges. The database is kept in the flash memory of the library control hardware.

Robotic System

The robotic system identifies and moves cartridges between the storage slots, tape drives, and the I/O station. The robotic system has the following components:

- A picker assembly for mounting a cartridge picker and the bar code scanner.
- A cartridge picker for picking and placing cartridges in storage slots, tape drives, or the I/O station.
- A bar code scanner for reading the external labels on the cartridges. The bar code scanner is used during the inventory process to locate and categorize all cartridges installed in the library. The bar code scanner is also used during the teaching process where it reads the fiducial labels to identify the types of storage and tape drives installed in the library.
- A Y-axis drive for moving the picker assembly in a vertical position.
- An X-axis drive for moving the picker assembly in a rotary position.
- A Z-axis drive for moving the picker assembly in a forward and backward motion.

Optional Features

Table 3 lists optional features for the 3583 Library.

Table 3. Optional Features of the 3583 Library

Feature	Feature Code
Redundant DC power module	FC8008
Multiple-slot I/O station	FC8012
18-slot tape storage column	FC8007
6-cartridge magazine with cover	FC8013
Ultrium Tape Drive with Low Voltage Differential/Single Ended (LVD/SE) Ultra-2 SCSI	FC8003
Ultrium Tape Drive with High Voltage Differential (HVD/DIFF) Ultra SCSI	FC8004
Rackmount kit	FC8006

Supported Servers and Operating Systems

The 3583 Library is supported by a wide variety of servers (hosts) and operating systems, as well as adapters. These attachments can change throughout the product's life cycle. To determine the latest supported attachments, visit the Web at `http://www.ibm.com/storage/lto`.

Attachments to the 3583 Library include (but are not limited to) the following:

Server	Operating System
IBM AS/400®	IBM OS/400®
IBM RS/6000® and RS/6000 SP	IBM AIX®
HP	Hewlett-Packard HP-UX
Sun® SPARC™	Sun® Solaris®
IBM Netfinity® and Intel®-compatible servers	Microsoft® Windows NT® and Windows 2000®

Supported Software

The following products plan to provide software support for the 3583 Library. To get a comprehensive list of compatible software, visit the Web at `http://www.ibm.com/storage/lto`.

Note: IBM does not provide backup application software with the 3583 Library. To order software, contact your IBM marketing representative, IBM Business Partner, or an independent software provider.

- Tivoli Storage Manager™ (formerly IBM ADSTAR® Distributed Storage Manager (ADSM))
- Computer Associates ARCserveIT®, ARCserve2000®, and Sterling Software Alexandria®
- Dantz-Retrospect®
- Legato Systems NetWorker™
- SCH Technologies REELlibrarian® and REELbackup®
- VERITAS Media Librarian®, NetBackup®, and Backup Exec™

Supported Device Drivers

Device drivers are included in the ship group for the 3583 Library. IBM maintains the latest levels of device drivers and driver documentation for the 3583 Library on the Internet. You can access this material from your browser or through the IBM FTP site by doing the following:

- Using a browser, type one of the following:

  `http://www.ibm.com/storage`

  `ftp://ftp.software.ibm.com/storage/devdrvr`

  `ftp://207.25.253.26/storage/devdrvr`

- Using an IBM FTP site, enter the following specifications:

  FTP site: ftp.software.ibm.com

  IP Addr: 207.25.253.26

  Userid: anonymous

Password: (use your current e-mail address)

Directory: /storage/devdrvr

IBM provides Postscript and Portable Document Format (PDF) versions of its device driver documentation in the /storage/devdrvr directory:

- IBM_ultrium_tape_IUG.pdf and IBM_ultrium_tape_IUG.ps contain the current version of the *IBM Ultrium Device Drivers Installation and User's Guide*.
- IBM_ultrium_tape_PROGREF.pdf and IBM_ultrium_tape_PROGREF.ps contain the current version of the *IBM Ultrium Device Drivers Programming Reference*.

A list of device drivers for each supported server appear beneath /storage/devdrvr/ in the following directories (the device driver for the AS/400 is included in the OS/400 operating system).

- AIX/
- HPUX/
- Solaris/
- WinNT/
- Win2000/

For more information about device drivers, refer to any of the preceding device driver operating system directories.

Specifications

Table 4 lists the specifications for the 3583 Library.

Table 4. Specifications for the Tape Library

Physical Specifications			
Specification	**Dimension**		
Width	48.1 cm (18.9 in.)		
Depth	73.5 cm (28.9 in.)		
Height	68.5 mm (27.0 in.) (with casters)		
Weight	65.8 kg (145 lb) (minimum configuration, no cartridges) 99.8 kg (220 lb) (maximum configuration, no cartridges) 116.6 kg (257 lb) (maximum configuration, with cartridges)		
Rackmount height	14 EIA Units		
Power Specifications			
Voltage	100–240 V ac, 50–60 Hz		
Current for 100 V ac	6.0 amps		
Current for 240 V ac	3.0 amps		
Maximum electrical power	0.720 kV·A		
Inrush current	45 A at 120 V ac 90 A at 208 V ac		
Environment Specifications			
Environmental Factor	**Operating**	**Storage**	**Shipping**
Temperature	10 to 38°C* (50 to 100°F)	-40 to 60°C (-40 to 140°F)	-40 to 60°C (-40 to 140°F)
Heat output	542 W (483 Cal/Hr)		
Relative humidity	20 to 80%	10 to 90%	10 to 90%
Maximum wet bulb temperature	26°C (79°F)	Noncondensing	Noncondensing
Maximum noise level (operating/idle)	68/66 dB		
Maximum altitude	2500 m (8202 ft.)		
* The operating environment of the library must not conflict with the media storage requirements). While the library may be capable of operating at elevated temperatures for an extended period of time, the temperature could shorten the useful life of media that is stored in the library. If media is stored in the library for more than 10 hours, the storage temperature requirements for media should be met. It should be assumed that media stored in the library will be two degrees above ambient room temperature when the library is powered on.			

Product Environment

The 3583 Library is designed to operate in a general business environment.

The library is a precision computer peripheral. To ensure maximum longevity of your library, place it away from dust, dirt, and airborne particulates:

- Keep the library away from high-traffic areas, especially if the floor is carpeted. Carpeting harbors dust, and people walking on the carpet can cause the dust and carpet fibers to become airborne.
- Keep the library out of computer-printer rooms because of toner and paper dust. Additionally, do not store paper supplies next to the library.
- Keep the library away from moving air caused by doorways, open windows, fans, and air conditioners.

Ensure that the machine covers are always kept closed to minimize any contamination from airborne particles. Table 5 shows the particulate limits for Subclass P1, which is defined as a general business office environment. Table 6 shows the corrosive gas limits for Subclass G1, which is also defined as a general business office environment.

Table 5. Particulate Limits, Subclass P1

Particulate Limits	**Suspended Particulates ($\mu g/m^3$) Base Sampling Period 24 hours**	**Settleable Particulates ($\mu g/cm^2$) Sample Collection Time 30 days**
Annual Average	150	500
50% of values are less than:	138	460
84% of values are less than:	207	690

Table 6. Corrosive Gas Limits, Subclass G1

Typical Environment Pollutant	**Concentration Limits–Annual Arithmetic Mean ($\mu g/m^3$)**
Total Reduced Sulfur (S_x)	3.2
Acidic Chlorine Gases (Cl_x)	1.5
Sulfur Dioxide (SO_2)	100.0
Nitrogen Dioxide (NO_2)	140.0
Total Oxidant (O_3)	98.0

Chapter 2. Library SCSI Commands

Table 7 shows the SCSI Medium Changer commands that are supported by the 3583 Library. For detailed information about each command, see the indicated reference page in Table 7.

Table 7. SCSI Commands Supported by the 3583 Library

Command Name	Operation Code	Class*	See Page
INITIALIZE ELEMENT STATUS	07h	O	15
INITIALIZE ELEMENT STATUS WITH RANGE	E7h	Z	17
INQUIRY	12h	M	19
LOG SENSE	4Dh	O	29
MODE SENSE	1Ah	O	48
MOVE MEDIUM	A5h	M	63
POSITION TO ELEMENT	2Bh	O	66
PREVENT/ALLOW MEDIUM REMOVAL	1Eh	O	68
READ BUFFER	3Ch	Z	70
READ ELEMENT STATUS	B8h	O	73
RELEASE	17h	O	86
REQUEST SENSE	03h	M	88
RESERVE	16h	O	94
TEST UNIT READY	00h	M	97
WRITE BUFFER	3Bh	O	98
*O=optional, M=mandatory, Z=vendor-specific			

SCSI Command Format

The SCSI command format adheres to the SCSI-2 standard. Table 8 describes the Command Descriptor Block (CDB) fields that are common to all commands.

Table 8. CDB Fields Common to All Commands

Command Field	Description
Logical Unit Number Field	The 3583 Library has a single Logical Unit Number (LUN). The library is always LUN 0. If the LUN is specified in the IDENTIFY message, the LUN field in the CDB is ignored by the library.
Reserved Field	`Reserved` or `Rsvd` refers to a field defined by the SCSI standard as 0. The library checks the field for 0. If the field is not 0, the library returns a Check Condition status with a sense key of Illegal Request.
Control Byte Field	The vendor-unique portion of the Control Byte is defined in the specific command.
Field Not Implemented	A SCSI standard field that is not supported by the 3583 Library.

SCSI Command Status Byte

Unless a retry is requested by the initiator, the 3583 Library enters the status phase once per command. Table 9 shows the library's return status bytes.

Table 9. Status Bytes

Status	Value	Description
Good	00h	The library successfully completed the command.
Check Condition	02h	An error condition occurred during command processing. The REQUEST SENSE command responds with detailed error information.
Busy	08h	The target is busy. The device is unable to accept a command from an otherwise acceptable initiator. The initiator should reissue the command at a later time.
Reservation Conflict	18h	A SCSI initiator attempted to access the library after it was reserved by another initiator with a RESERVE command.

INITIALIZE ELEMENT STATUS (07h) Command

The INITIALIZE ELEMENT STATUS command causes the 3583 Library to look for tape cartridges in its storage slots. Bar code labels are always scanned. Use the READ ELEMENT STATUS command to return the information obtained by the INITIALIZE ELEMENT STATUS command.

Note: If the library operates in Auto Inventory Mode, the inventory is guaranteed and an INITIALIZE ELEMENT STATUS command does not cause any bar code scans, but returns successful status immediately.

The 3583 Library supports two INITIALIZE ELEMENT STATUS commands:

- INITIALIZE ELEMENT STATUS updates the entire cartridge inventory.
- INITIALIZE ELEMENT STATUS WITH RANGE updates a specific part of the cartridge inventory.

CDB Format of the INITIALIZE ELEMENT STATUS (07h) Command

The Command Descriptor Block (CDB) format of the INITIALIZE ELEMENT STATUS command is shown in Table 10.

Table 10. CDB Format of the INITIALIZE ELEMENT STATUS Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (07h)							
1	Logical Unit Number			Reserved				
2-4	Reserved							
5	NBL	Reserved						

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number
This field is always set to 0.

NBL This field is always set to 0.

Note: Unlabeled cartridges are not supported.

INITIALIZE ELEMENT STATUS (07h) Status

After processing the INITIALIZE ELEMENT STATUS command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- An unrecoverable hardware error was experienced.
- A reserved bit is set to 1 or a parameter is invalid in the CDB.
- A problem was encountered when the library scanned the cartridges.
- The library was not ready because the door or the I/O station is open, or the library is offline.

INITIALIZE ELEMENT STATUS WITH RANGE (E7h) Command

The INITIALIZE ELEMENT STATUS WITH RANGE command causes the 3583 Library to examine a range of storage slots for the presence of a tape cartridge. Bar code labels are always scanned. Use the READ ELEMENT STATUS command to return the information obtained by the INITIALIZE ELEMENT STATUS WITH RANGE command.

The 3583 Library supports two INITIALIZE ELEMENT STATUS commands:

- INITIALIZE ELEMENT STATUS updates the entire cartridge inventory.
- INITIALIZE ELEMENT STATUS WITH RANGE updates a specific part of the cartridge inventory.

CDB Format of the INITIALIZE ELEMENT STATUS WITH RANGE (E7h) Command

The command descriptor block (CDB) format of the INITIALIZE ELEMENT STATUS WITH RANGE command is shown in Table 11.

Table 11. CDB Format of the INITIALIZE ELEMENT STATUS WITH RANGE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (E7h)							
1	Logical Unit Number			Reserved				Range
2-3	MSB Starting Element Address LSB							
4-5	Reserved							
6-7	MSB Number of Elements LSB							
8	Reserved							
9	NBL	Reserved						

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number

This field is always set to 0.

Range

This field indicates which elements to check:

- 0 means initialize all elements
- 1 means initialize the range of elements specified by the Starting Element Address field and Number of Elements field

Starting Element Address
This field specifies the starting address of a set of Element Addresses. It is ignored if the Range field is 0.

Note: The Starting Element Address must be a valid address.

Number of Elements
This field specifies the number of elements to scan. It is ignored if the Range field is 0.

NBL This field is always set to 0.

Note: Unlabeled cartridges are not supported.

INITIALIZE ELEMENT STATUS WITH RANGE (E7h) Status

After processing the INITIALIZE ELEMENT STATUS WITH RANGE command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- An unrecoverable hardware error was experienced.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 12).
- A problem was encountered when the library scanned the cartridges.
- The library was not ready because the door or the I/O station is open, or the library is offline.

Table 12. Invalid Parameters in the CDB for the INITIALIZE ELEMENT STATUS WITH RANGE Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Element Address	5h	21h	01h	1	1	0	0	0002h

INQUIRY (12h) Command

The INQUIRY command causes the 3583 Library to return information about its device parameters.

Note: The library's mode of operation determines how it responds to the INQUIRY command. At present, only one mode selection (ULT3583-TL) is allowed.

CDB Format of the INQUIRY (12h) Command

The command descriptor block (CDB) of the INQUIRY command is shown in Table 13.

Table 13. CDB Format of the INQUIRY Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (12h)							
1	Logical Unit Number			Reserved				EVPD
2	Page Code							
3	Reserved							
4	Allocation Length							
5	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number

This field is always set to 0.

Enable Vital Product Data (EVPD)

This bit indicates which Vital Product Data Pages option to report. Set the EVPD bit to request the following:

- 0 means standard INQUIRY data (see Table 14 on page 21)
- 1 means vital product data, based on the Page Code field (see Table 15 on page 23)

Page Code

- If the EVPD bit is set to 1, this field contains the page number of the Vital Product Data Page to be returned for this INQUIRY command. The 3583 Library supports the following page codes:
  - 00h - Supported Vital Product Data Pages
  - 80h - Unit Serial Number Page
  - C0h - Firmware Revision Page
  - D0h - the contents of this page are not specified in this document
  - E0h - Implemented SCSI - Command Page
  - E1h - Implemented Vendor Specific Command Page
- If the EVPD bit is set to 0, the Page Code must be 00h.

Allocation Length

This field specifies the maximum number of bytes that the initiator allocated for returned INQUIRY data. An Allocation Length of 0 means that no INQUIRY data is to be transferred. This condition is not considered an error. The 3583 Library terminates the Data In phase when it has transferred the

lesser of either the number of bytes specified by the Allocation Length field or all of the available INQUIRY data. The lengths for INQUIRY data returned by the library are:

- 38h (56) bytes for the standard INQUIRY data
- 09h (9) bytes for the Supported Vital Product Data Page
- 16h (22) bytes for the Unit Serial Number Page
- 1Ah (26) bytes for the Firmware Revision Page
- 10h (16) bytes for the Supported SCSI-2 Command Page
- 05h (5) bytes for the Vendor Specific Command Page

INQUIRY (12h) Response

For the INQUIRY command, the 3583 Library returns the following information:

- Standard INQUIRY Data (see Table 14 on page 21)
- Supported Vital Product Data (see Table 15 on page 23)
- Unit Serial Number (see Table 16 on page 24)

Standard INQUIRY Data Format

Table 14. Standard INQUIRY Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	RMB	Device-Type Modifier						
2	ISO Version		ECMA Version		ANSI-Approved Version			
3	AENC	TrmIOP	Reserved		Response Data Format			
4	Additional Length							
5-6	Reserved							
7	RelAdr	WBus32	WBus16	Sync	Linked	Rsvd	Cmd Que	SftRe
8-15	MSB Vendor Identification LSB							
16-31	MSB Product Identification LSB							
32-35	MSB Firmware Revision Level LSB							
36-54	MSB Full Firmware Revision Level LSB							
55	Vendor Specific							BarC

Peripheral Qualifier
The return value of 0 means that the 3583 Library is a single-LUN device. If a LUN other than 0 was specified, this field returns 011b which means that only LUN 0 is supported.

Peripheral Device Type
The value returned by this field is set to 01000b, which means a Medium Changer device. Any LUN other than 0 returns 11111b, which means that the device is unknown.

RMB The Removable Medium Bit (RMB) is set to 1, which means that media are removable.

Device-Type Modifier
Returned as 0000000b, which means no modification.

ISO Version
Returned as 00b.

ECMA Version
Returned as 00b.

ANSI (Approved Version)
Returned as 0010b, which means compliance with ANSI Version SCSI-2.

Asynchronous Event Notification Capability (AENC)
Returned as 0, which means that the AENC is not supported.

Terminate I/O Process (TrmIOP)
Returned as 0, which means that the TrmIOP message is not supported.

Response Data Format
Returned as 0010b, which means that the data is in SCSI-2 format.

Additional Length
Returned as 33h, which means that 51 additional bytes of data (exclusive of the Additional Length byte) are available to the initiator.

Relative Address (RelAdr)
Returned as 0, which means that the 3583 Library does not support relative addressing.

Wide Bus 32 (Wbus32)
Returned as 0, which means that 32-bit transfers are not supported.

Wide Bus 16 (Wbus16)
Returned as 0, which means that 16-bit transfers are not supported.

Synchronous Transfer (Sync)
Returned as 0, which means that synchronous transfers are not supported.

Linked Commands (Linked)
Returned as 0, which means that linked commands are not supported.

Command Queuing (CmdQue)
Returned as 0, which means that command queuing is not supported.

Soft Reset (SftRe)
Returned as 0, which means that the 3583 Library does not support a soft reset alternative to a reset condition.

Vendor Identification
Returned as `"IBM"` in ASCII.

Product Identification
Returned as `"ULT3583-TL"` in ASCII.

Firmware Revision Level
Returned as the ASCII representation of the firmware revision level. **Unused bytes are padded with the space character.**

Full Firmware Revision Level
Returned as the ASCII representation of the full firmware revision level. **Unused bytes are padded with the space character.**

Vendor Specific
Returned as 0000000b, which means no vendor-specific parameter.

Bar Code (BarC)
Returned as 1, which means that a bar code scanner is installed.

Supported Vital Product Data Page

Table 15 shows the format of the Supported Vital Product Data Page.

Table 15. Format of Supported Vital Product Data Page

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4	First Page Code Supported							
5	Second Page Code Supported							
6	Third Page Code Supported							
7	Fourth Page Code Supported							
8	Fifth Page Code Supported							
9	Sixth Page Code Supported							

Peripheral Qualifier

The return value of 0 means that the 3583 Library is a single-LUN device. If a LUN other than 0 was initially specified, this field returns 011b.

Peripheral Device Type

The value returned by this field is set to 01000b, which means a Medium Changer device. Any LUN other than 0 returns 11111b.

Page Code

Returned as 00h, which means the Supported Vital Product Data Page.

Page Length

Returned as 05h, which indicates the remaining bytes in this page, exclusive of the Page Length byte.

First Page Code Supported

Returned as 00h, which means support for the Supported Vital Product Data Page.

Second Page Code Supported

Returned as 80h, which means support for the Unit Serial Number Page.

Third Page Code Supported

Returned as C0h, which means support for the Firmware Revision Page.

Fourth Page Code Supported

Returned as D0h.

Fifth Page Code Supported

Returned as E0h, which means support for the Implemented SCSI-2 Command Page.

Sixth Page Code Supported

Returned as E1h, which means support for the Implemented Vendor Specific Command Page.

Unit Serial Number Page

Table 16 shows the format of the Unit Serial Number Page.

Table 16. Format of Unit Serial Number Page

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4-21	Serial Number							

Peripheral Qualifier

The return value of 0 means that the 3583 Library is a single LUN device. If a LUN other than 0 was initially specified, this field returns 011b.

Peripheral Device Type

The value returned by this field is set to 01000b, which means a Medium Changer device. Any LUN other than 0 returns 11111b.

Page Code

The value returned for this field is 80h, which is the Page Code for the Unit Serial Number Page.

Page Length

The value returned for this field is 12h, which indicates the number of remaining bytes in this page, exclusive of the Page Length byte.

Serial Number

Note: The serial number is padded with blank characters as needed.

The value returned for this field is the serial number for the 3583 Library, as read by the bar code scanner and prefixed with the vendor identification (for example, `IBM123456789AB`).

If the serial number cannot be read by the bar code scanner, the value returned for this field is the vendor identifier followed by `00000000000` in ASCII, followed by trailing blanks (for example, `IBM00000000000`).

Firmware Revision Page

Table 17 shows the format of the Firmware Revision Page.

Table 17. Format of Firmware Revision Page

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4-25	MSB Revision LSB							

Peripheral Qualifier

The return value of 0 means that the 3583 Library is a single LUN device. If a LUN other than 0 was specified, this field returns 011b which means that only LUN 0 is supported.

Peripheral Device Type

The value returned by this field is set to 01000b, which means a Medium Changer device. Any LUN other than 0 returns 11111b, which means that the device is unknown.

Page Code

The value returned for this field is C0h, which is the Page Code for the Firmware Revision Page.

Page Length

The value returned for this field is 16h, which means the number of remaining bytes in this page, exclusive of the Page Length byte.

Revision

Returned as the ASCII representation (22 bytes) of the firmware revision level in the form `Firmware Revision=x.xx`, where `x.xx` is equal to the firmware level.

Implemented SCSI-2 Command Page

Table 18 shows the format of the Implemented SCSI-2 Command Page.

Table 18. Format of Implemented SCSI-2 Command Page

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4	TEST UNIT READY							
5	REQUEST SENSE							
6	INITIALIZE ELEMENT STATUS							
7	INQUIRY							
8	MODE SENSE							
9	RESERVE							
10	RELEASE							
11	PREVENT/ALLOW MEDIUM REMOVAL							
12	POSITION TO ELEMENT							
13	LOG SENSE							
14	MOVE MEDIUM							
15	READ ELEMENT STATUS							

Peripheral Qualifier

The return value of 0 means that the 3583 Library is a single LUN device. If a LUN other than 0 was specified, this field returns 011b which means that only LUN 0 is supported.

Peripheral Device Type

The value returned by this field is set to 01000b, which means a Medium Changer device. Any LUN other than 0 returns 11111b, which means that the device is unknown.

Page Code

The value returned for this field is E0h, which is the Implemented SCSI-2 Command Page.

Page Length

The value returned for this field is 0Ch, which indicates the number of remaining bytes in this page, exclusive of the Page Length byte.

Implemented SCSI-2 Commands

Bytes 04 through 23 list the implemented SCSI-2 commands for the 3583 Library. For the operation code associated with each command, see Table 7 on page 13.

Implemented Vendor Specific Command Page

Table 19 shows the format of the Implemented Vendor Specific Command Page.

Table 19. Format of Implemented Vendor Specific Command Page

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4	INITIALIZE ELEMENT STATUS WITH RANGE							

Peripheral Qualifier

The return value of 0 means that the 3583 Library is a single-LUN device. If a LUN other than 0 was specified, this field returns 011b which means that only LUN 0 is supported.

Peripheral Device Type

The value returned by this field is set to 01000b, which means a Medium Changer device. Any LUN other than 0 returns 11111b, which means that the device is unknown.

Page Code

The value returned for this field is E1h, which is the Implemented Vendor Specific Command Page.

Page Length

The value returned for this field is 01h, which indicates the number of remaining bytes in this page, exclusive of the Page Length byte.

Implemented Vendor Specific SCSI-2 Command

Byte 04 lists the implemented vendor-specific SCSI commands for the 3583 Library. For the operation code associated with this command, see Table 7 on page 13.

INQUIRY (12h) Status

After processing the INQUIRY command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library never returns Busy status for the INQUIRY command.

Reservation Conflict
The library never returns Reservation Conflict status.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 20).

Table 20. Invalid Parameters in the CDB for the INQUIRY Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Page Code	5h	24h	00h	1	1	0	0	0002h

LOG SENSE (4Dh) Command

The LOG SENSE command causes the initiator to retrieve statistical information about the 3583 Library. It returns the following information:

- Statistics about operation
- History of recent events
- Condition of hardware
- Statistics about elements
- Number of cartridge scan retries
- Information about position of elements

CDB Format of the LOG SENSE (4Dh) Command

The command descriptor block (CDB) of the LOG SENSE command is shown in Table 21.

Table 21. CDB Format of the LOG SENSE Command

Bit Byte	7	6	5	4	3	2	1	0
0	0	1	0	0	1	1	0	1
1	Logical Unit Number			Reserved			PPC	SP
2	PC		Page Code					
3-4	Reserved							
5-6	MSB Parameter Pointer LSB							
7-8	MSB Allocation Length LSB							
9	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

PPC The Parameter Pointer Control (PPC) bit is always 0. It requests that the 3583 Library return data that starts with the parameter code specified in the Parameter Pointer field and return the number of bytes specified in the Allocation Length field in ascending order. A PPC bit of 0 and a Parameter Pointer field of 0 requests that the library return all available parameter data for that page code.

SP The Save Parameters (SP) bit is always set to 0. It means that the 3583 Library performs the LOG SENSE command and does not save the log parameters.

PC The Page Control (PC) field is always set to 01b. This value causes the 3583 Library to return cumulative values of any log parameter, rather than threshold or default values.

Page Code

This field identifies which log page is requested by the initiator. If the page is not supported, the command terminates with a Check Condition status and the sense key set to ILLEGAL REQUEST. The ASC is set to INVALID FIELD IN CDB. Table 22 shows the legal values for the Page Code field.

Table 22. Legal Values for Page Code Field

Page Code	Page Name	Page Description
00h	Supported Log Pages	Returns a list of the supported log pages
2Eh	TapeAlert Log	Returns the 64 TapeAlert flags
30h	System Statistics Log	Returns system statistics and retry counts
31h	State Log	Returns the hardware state of the library (including the sensors)
32h	History of Events Log	Returns the history of the most recent operational events
33h	Element Statistics Log	Returns element statistics and retry counts
34h	Cartridge Scan Retries Log	Returns the number of times that the library had to retry the scanning of a cartridge at a specific element address
35h	Element Position Log	Returns the vertical and horizontal axis positions and the picker position of the specified element
36h	Element Coordinate Log	Returns the vertical and horizontal axis information associated with a SCSI element address
38h	LCD Panel Button Log	Returns LCD Panel button settings information
3Ch	Drive Cleaning Log	Returns drive domain and drive type cleaning support
3Dh	Drive Information Log	Returns drive information

Parameter Pointer

The Parameter Pointer field allows the initiator to specify at which parameter (within a log page) the requested data should begin.

Note: A Parameter Pointer of 0 requests all available log parameters for the specified log page.

- When the initiator requests the System Statistic Log Page or State Log Page, the Parameter Pointer field specifies the first Log Parameter Code from which parameter data is to be sent. The library returns data for the specified code and all other codes in ascending order.
- When the initiator requests the History of Events Log Page, the Parameter Pointer field specifies an index value between -299 and 0. The library returns a history record for that index and all other indexes in order up to 250 events, where 0 is the index of the most recent event and -299 is the index of the oldest event.
- When the initiator requests the Element Statistics Log Page, the Cartridge Scan Retries Log Page, or the Element Position Log Page, the Parameter Pointer field specifies an element address value. The library returns the parameter data for that element and all other elements in ascending order. Data is returned until the value specified in the

Allocation Length field has been reached or until the library completes sending parameter data for the element with the highest element address.

Allocation Length

The Allocation Length field indicates the maximum amount of returned data. If the Allocation Length value exceeds the amount of transfer data, the library terminates the Data In phase after all of the data transfers. To include all available data, specify FFFFh.

LOG SENSE (4Dh) Response

The LOG SENSE command returns a single log page specified in the Page Code field of the CDB.

Format of Log Page

The sections that follow describe the log pages and their respective log page structures. Table 23 shows the 4-byte page header, which is followed by variable-length log parameters (or no parameters) and returned in ascending order.

Table 23. Format of the LOG SENSE Page Header

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code					
1	Reserved							
2-3	MSB Page Length (n-3) LSB							
4-n	Log Parameter (First) Log Parameter (Last)							

Page Code

This field identifies which log page is being transferred. For the legal values, see Table 22 on page 30.

Page Length

This field indicates the total number of bytes that follow the Page Length byte. The value returned for this field depends on the value specified for the Page Code and the Parameter Pointer in the CDB (see “CDB Format of the LOG SENSE (4Dh) Command” on page 29).

Log Parameters

Log Parameters are data structures that are contained in log pages as:

- Data counters that capture a count of a particular event
- A numeric value indicating the state of the 3583 Library's hardware
- A string that contains the history of library events

Format of Log Parameter

Following the 4-byte page header are one or more log parameters. Table 24 shows the format of the log parameter structure.

Table 24. Format of the Log Parameter

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

Parameter Code

This field identifies which log parameter was transferred. The valid values for this field depend on the type of requested log page.

Disabled Update (DU)

The DU parameter control bit is always 0, which means that the 3583 Library updates the log parameter value to reflect all events that should be recorded by that parameter.

Disable Save (DS)

The DS parameter control bit is always 1, which means that the 3583 Library does not save particular log parameters.

Target Save Disable (TSD)

The TSD parameter control bit is always 0, which means that the 3583 Library provides a self-defined method for saving log parameters.

Enable Threshold Comparison (ETC)

The ETC parameter control bit is always 0, which means that a comparison to the threshold value is not performed whenever the cumulative value is updated.

Threshold Met Criteria (TMC)

The TMC parameter control bit is always 0, which indicates the basis for comparison of the cumulative and threshold values.

List Parameter (LP)

The LP parameter control bit is set to 0 for counter data and to 1 for a list parameter.

Parameter Length

This field specifies the length (in bytes) of the Parameter Value field.

Parameter Value

This field can be designated by one of the following:

- A data counter for an event that can either be a 1-byte flag, or 2-byte or 4-byte value
- A value that indicates the state of a component of the library's hardware:
  - 1 means the state of the component is on
  - 0 means the state of the component is off
- A string that describes a history event

Supported Log Page

The Supported Log Page lists all log pages that the 3583 Library supports. Table 25 lists the format of the log page header and respective supported log pages.

Table 25. Format of the Supported Log Page

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code					
1	Reserved							
2-3	Page Length							
4	Supported Log Page							
5	TapeAlert Page							
6	System Statistics Log Page							
7	State Log Page							
8	History of Events Log Page							
9	Element Statistics Log Page							
10	Cartridge Scan Retries Log Page							
11	Element Position Page							
12	Element Coordinate Log Page							
14	LCD Panel Button Log Page							
15	Drive Cleaning Log Page							
16	Drive Information Log Page							

Page Code

This value is always 000000b for the Support Log Pages.

Page Length

This value is 0008h.

Supported Log Page

This value is 00h.

TapeAlert Log Page

This value is 2Eh.

System Statistics Log Page

This value is 30h.

State Log Page

This value is 31h.

History of Events Log Page
This value is 32h.

Element Statistics Log Page
This value is 33h.

Cartridge Scan Retries Log Page
This value is 34h.

Element Position Log Page
This value is 35h.

Element Coordinate Log Page
This value is 36h.

LCD Panel Button Log Page
This value is 38h.

Drive Cleaning Support Log Page
This value is 3Ch.

Drive Information Log Page
This value is 3Dh.

TapeAlert Log Page

The TapeAlert Log Page returns all 64 TapeAlert flags. Each flag is reported in the following format:

Table 26. Format of the TapeAlert Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	Parameter Code							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4	Reserved							TA Flag

Parameter Code
This field is set to the currently reported TapeAlert flag.

Parameter Length
This field is set to 01h.

TA Flag
If set, this field is set to 1.

Flags 1, 2, 3, 4, 7, 8, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24, 28, and 32 are supported by the 3583 Library.

System Statistics Log Page

The System Statistics Log Page returns the cumulative library system statistics from nonvolatile RAM. Table 27 shows the statistics that are returned (the format of the page is shown in Table 24 on page 32). These values are not reset after power cycles or resets.

Table 27. System Statistics Saved in Nonvolatile RAM

Log Parameter Function	Log Parameter Code	DU	DS	TSD	ETC	TMC	LP	Parameter Length
Total Number of Moves	0000h	0	1	0	0	0	0	4
Total Number of Pick Retries	0001h	0	1	0	0	0	0	4
Total Number of Put Retries	0002h	0	1	0	0	0	0	4
Total Number of Scans	0003h	0	1	0	0	0	0	4
Total Number of Scan Retries	0004h	0	1	0	0	0	0	4
Reserved	0005h	0	1	0	0	0	0	4
Total Number of I/O Station Insert Cycles	0006h	0	1	0	0	0	0	4
Reserved	0007h	0	1	0	0	0	0	4

State Log Page

The State Log Page returns log parameters that indicate the current state of the 3583 Library's hardware digital sensors. Table 28 shows the parameters. For each sensor, there is a corresponding log parameter that shows the value for that sensor. The value of 1 in the parameter field means that the sensor corresponding to the log parameter is on; the value of 0 means that the sensor is off.

Table 28. Log Parameters for Digital Sensors

Log Parameter Function	Log Parameter Code	DU	DS	TSD	ETC	TMC	LP	Parameter Length
Door Open	0000h	0	1	0	0	0	0	1
Reserved	0001h	0	1	0	0	0	0	1
Retract Complete	0002h	0	1	0	0	0	0	1
Cartridge Present	0003h	0	1	0	0	0	0	1
Reserved	0004h	0	1	0	0	0	0	1
Horizontal Axis Home	0005h	0	1	0	0	0	0	1
Reserved	0006h	0	1	0	0	0	0	1
Reserved	0007h	0	1	0	0	0	0	1
Vertical Axis Home	0008h	0	1	0	0	0	0	1
I/O Station Locked	0009h	0	1	0	0	0	0	1
I/O Station Open	000Ah	0	1	0	0	0	0	1

History of Events Log Page

The History of Events Log Page returns a history of the most recent events in the 3583 Library. The library's history buffer contains 50 entries. The library is able to receive up to 50 events from the history buffer in response to each LOG SENSE command. For all 50 entries, use two LOG SENSE commands.

Each of the events is a string that consists of two fields:

- A description of the event
- A time stamp that indicates the time and date

Table 29 shows the format of the History of Events Log Page.

Table 29. Format of the History of Events Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Parameter Code LSB							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4-83	80 Characters of Events							

Parameter Code

This field indicates the index of the history record as follows:

- 0 is the index of the most recent event
- −49 is the index of the oldest event

The library keeps 50 of the most recent events. The event history that the library maintains includes information about SCSI commands and phases, motion commands, retries and errors, diagnostics, and system status.

Parameter Length

This field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 80.

Element Statistics Log Page

The Element Statistics Page returns cumulative statistics of total cartridge puts, put retries, and pick retries. These values are stored in nonvolatile RAM for each element.

The value specified for the Parameter Pointer field of the CDB determines the value that is returned in the Parameter Code field of the Element Statistics Log Page. This value specifies the first element for the returned information.

An Element Statistics Page is returned in ascending order for all subsequent elements until the allocation length specified is reached or all information elements are returned.

Note: The Starting Element Address specified in the CDB must be a valid element address.

Table 30 shows the format of the Element Statistics Log Page.

Table 30. Format of the Element Statistics Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Parameter Code (Element Address) LSB							
2	0	1	0	0	0	0	0	0
3	Parameter Length							
4-7	MSB Total Puts LSB							
8-9	MSB Total Put Retries LSB							
10-11	MSB Total Pick Retries LSB							

Parameter Code
This field indicates the element address for the returned statistical information.

Parameter Length
This field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 8.

Total Puts
This field indicates the total number of cartridge puts to the element location.

Total Put Retries
This field indicates the total number of retry puts to the element indicated by the element address.

Total Pick Retries
This field indicates the number of retry pick operations from the element address.

Cartridge Scan Retries Log Page

The Cartridge Scan Retries Page returns the total number of retried cartridge scans of the element address. This value is reset whenever the 3583 Library is reset or powered on, or when the door is opened.

The value specified for the Parameter Pointer field of the CDB determines the value that is returned in the Parameter Code field of the Cartridge Scan Retries Page. This value specifies the first element for the returned information.

A Cartridge Scan Retries Page is returned for all subsequent elements until the allocation length specified is reached or all elements are returned.

Note: The Element Starting Address specified in the CDB must be a valid element address.

Table 31 shows the format of the Cartridge Scan Retries Log Page.

Table 31. Format of the Cartridge Scan Retries Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Parameter Code LSB							
2	0	1	0	0	0	0	0	0
3	Parameter Length							
4-5	MSB Total Scan Retries LSB							

Parameter Code
This field indicates the element address for the returned statistical information.

Parameter Length
This field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 2.

Total Scan Retries
This field indicates the total number of retried scans of the cartridge in the element address. Scan retries are kept with the cartridge and are reset each time that the library is reset or powered on, or when the door is opened.

Element Position Log Page

The Element Position Log Page returns the axis positions of the specified element.

The value specified for the Parameter Pointer field of the CDB determines the value returned in the Parameter Code field of the Element Position Page. This value specifies the first element for the returned information.

An Element Position Page is returned in ascending order for all subsequent elements until the allocation length specified is reached or all element information is returned.

Note: The Starting Element Address specified in the CDB must be a valid element address.

Table 32 shows the format of the Element Position Log Page.

Table 32. Format of the Element Position Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Parameter Code (Element Address) LSB							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4-5	MSB Vertical Axis Position LSB							
6-7	MSB Picker Position LSB							
8-9	MSB Horizontal Axis Position LSB							

Parameter Code

The Parameter Code field indicates the element address for the returned statistical information.

Parameter Length

The Parameter Length field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 6.

Vertical Axis Position

The Vertical Axis Position field indicates the distance the picker must move vertically from the home position to the specified element.

Picker Position

The Picker Position field indicates the distance the picker must move from its home position to touch a cartridge in a specified storage slot.

Horizontal Axis Position

The Horizontal Axis Position field indicates the distance the picker must move horizontally from the home position to the specified element.

Element Coordinate Log Page

The Element Coordinate Log Page returns library coordinate information to indicate the locations of the SCSI element addresses.

Table 33 shows the format of the Element Coordinate Log Page.

Table 33. Format of the Element Coordinate Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Parameter Code (Element Address) LSB							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4-5	Rack Location							
6-7	Section Location							
8-9	Column Location							
10-11	Row Location							

Parameter Code

This field is the element address.

Parameter Length

This field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 08h.

Rack Location

This field indicates the rack in which the element address is located.

Section Location

This field indicates the section of the rack in which the element address is located.

Column Location

This field indicates the column of the section within the rack in which the element address is located.

Row Location

This field indicates the row of the column and section within the rack in which the element address is located.

LCD Panel Button Log Page

The LCD Panel Button Log Page returns parameters that indicate if a button is pressed.

Table 34 shows the format of the LCD Panel Button Log Page.

Table 34. Format of the LCD Panel Button Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	Parameter Code (Button Number)							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4	Reserved							Pressed

Parameter Code

This field is the button number. Valid button numbers are 80h, 81h, 82h, and 83h.

Parameter Length

This field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 01h.

Pressed

If the button is pressed, this field is set to 1; if the button is not pressed, this field is set to 0.

Drive Cleaning Support Log Page

The Drive Cleaning Support Log Page returns parameters that indicate whether the library is capable of initiating drive cleaning for a specific drive domain or type.

Table 35 shows the format of the Drive Cleaning Support Log Page.

Table 35. Format of the Drive Cleaning Support Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	Parameter Code (Domain/Type)							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4	Reserved							Clean

Parameter Code

This field is set to the drive domain (LTO) or the drive type (0301h).

Parameter Length

This field indicates the number of bytes that follow, exclusive of the Parameter Length field. The value is 01h.

Clean If the 3583 Library is capable of library-initiated drive cleaning operations for the specified drive domain or type, this field is set to 1.

Drive Information Log Page

The Drive Information Log Page returns drive information for configuration and error analysis.

Table 36 shows the format of the Drive Information Log Page.

Table 36. Format of the Drive Information Log Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	Parameter Code (Element Address)							
2	DU	DS	TSD	ETC	TMC		RSVD	LP
3	Parameter Length							
4-5	Drive Domain/Type							
6	SCSI ID							
7-14	Vendor ID							
15-30	Product ID							
31-46	Serial Number							
47-62	Firmware Levels							
63	Reserved				CP	CN	CA	CS
64-67	MSB Drive Load Count LSB							
68-69	MSB Drive Clean Count LSB							
70	TapeAlert Major Revision							
71	TapeAlert Minor Revision							
72	Flag 8	Flag 7	Flag 6	Flag 5	Flag 4	Flag 3	Flag 2	Flag 1
73	Flag 16	Flag 15	Flag 14	Flag 13	Flag 12	Flag 11	Flag 10	Flag 9
74	Flag 24	Flag 23	Flag 22	Flag 21	Flag 20	Flag 19	Flag 18	Flag 17
75	Flag 32	Flag 31	Flag 30	Flag 29	Flag 28	Flag 27	Flag 26	Flag 25

Table 36. Format of the Drive Information Log Page (continued)

76	Flag 40	Flag 39	Flag 38	Flag 37	Flag 36	Flag 35	Flag 34	Flag 33
77	Flag 48	Flag 47	Flag 46	Flag 45	Flag 44	Flag 43	Flag 42	Flag 41
78	Flag 56	Flag 55	Flag 54	Flag 53	Flag 52	Flag 51	Flag 50	Flag 49
79	Flag 64	Flag 63	Flag 62	Flag 61	Flag 60	Flag 59	Flag 58	Flag 57
80	Reported Error Length							
81-255	Raw Drive Error Information							

Parameter Code
This field indicates the drive element address.

Parameter Length
This field indicates the length of the parameter day, which may be from 76 bytes up to 251 bytes.

Drive Domain/Type
This field indicates the drive domain (LTO) or the drive type (0301h).

SCSI ID
This field indicates the current SCSI ID of the drive (0-15). If not available, the field is set to FFh.

Vendor ID
This field is an 8-character vendor identification number. If not present, it is filled with blanks.

Product ID
This field is a 16-character product identification number. If not present, it is filled with blanks.

Firmware Levels
This field is a 16-character drive and controller firmware level, as defined in the drive serial communication specifications. If not present, it is filled with blanks.

CP If set, the CP bit indicates that the library can clean this drive.

CN If set, the CN bit indicates that cleaning is requested by this drive.

CA If set, the CA bit indicates that automatic library-initiated cleaning is activated for this drive.

CS If set, the CS bit indicates that cleaning is supported for this drive.

Drive Load Count
This field reports the current drive load count, as stored in the drive's NVRAM. If not present, it is set to 0.

Drive Clean Count
This field reports the current number of cleaning operations, as stored in the drive's NVRAM. If not present, it is set to 0.

TapeAlert Major Revision
This field is set to the TapeAlert major revision number. If not present, it is set to 0.

TapeAlert Minor Revision

This field is set to the TapeAlert minor revision number. If not present, it is set to 0.

Flag 1 - Flag 64

These fields are set according to the drive's TapeAlert Flag specifications.

Reported Error Lengths

This field indicates how much RAW drive error information follows. It is set in the range of 0-179.

RAW Drive Error Information

This field indicates RAW drive error bytes, as defined by the drive's serial communication interface specification.

Log Sense (4Dh) Status

After processing the LOG SENSE command, the 3583 Library returns the status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 37).

Table 37. Invalid Parameters in the CDB for the LOG SENSE Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
A Reserve Bit is set in the CDB. The bit error is contained in the pointer field.	5h	24h	00h	1	1	1	--	--
The PC field is not set to 01b.	5h	24h	00h	1	1	1	7	0002h
Invalid page code	5h	24h	00h	1	1	1	5	0002h
Invalid Parameter Pointer	5h	24h	00h	1	1	0	0	0005h

MODE SENSE (1Ah) Command

The MODE SENSE command causes the library to report one or all mode parameter pages to the initiator. The transfer data includes 4 bytes of parameter list header and the specific number of the requested page bytes. Byte counts are:

- 4 bytes for the Parity Page
- 12 bytes for the TapeAlert Page
- 20 bytes for the Element Address Assignment Page
- 4 bytes for the Transport Geometry Descriptor Page
- 16 bytes for the Device Compatibilities Page
- 4 bytes for the LCD Mode Page
- 56 bytes for the LCD Panel and Soft Key Configuration Page
- 6 bytes for the Auto Cleaning Page
- 5 bytes for the Operating Mode Page
- 131 bytes for All pages

CDB Format of the MODE SENSE (1Ah) Command

The command descriptor block (CDB) of the MODE SENSE command is shown in Table 38.

Table 38. CDB Format of the MODE SENSE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (1Ah)							
1	Logical Unit Number			Rsvd	DBD	Reserved		
2	PC		Page Code					
3	Reserved							
4	Allocation Length							
5	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number
This field is always set to 0.

DBD The Disable Block Descriptor (DBD) bit is not used and must be set to 1.

PC This field indicates the type of page parameter values to be returned to the host. Table 39 on page 49 shows the values.

Table 39. Definition of MODE SENSE Page Control

Page Control		Description
Bit 7	**Bit 6**	
0	0	Report Current Parameter Values which are the default values, if no saved values exist). **Note:** Issue a MODE SENSE command with the PC parameter set to 1 and the Page Code parameter set to 3Fh. This returns an indication of the supported pages, changeable parameters in the pages, and the supported length of the page.
0	1	Report Changeable Values
1	0	Report Default Values
1	1	Report Saved Values (default values, if no pages are previously saved)

Page Code

This field determines which pages should be reported. Table 40 shows the pages.

Table 40. Supported Pages for the MODE SENSE Command

Page Code	Description
1Ch	TapeAlert Page
1Dh	Element Address Assignment Page
1Eh	Transport Geometry Descriptor Page
1Fh	Device Compatibilities Page
00h	Parity Page
22h	LCD Mode Page
23h	LCD Panel and Softkey Configuration Page
2Ch	Auto Cleaning Page
2Dh	Operating Mode Page
3Fh	All pages

Allocation Length

This field specifies the number of bytes that the host allocated for returned MODE SENSE data. An Allocation Length of 0 means that the 3583 Library returns no MODE SENSE data. This is not considered an error, and Good status is returned.

MODE SENSE (1Ah) Response

The MODE SENSE Response consists of a Parameter List Header, followed by additional or no pages.

Parameter List Header: Table 41 shows the format of the Parameter List header.

Table 41. Parameter List Header for the MODE SENSE Response

Bit Byte	7	6	5	4	3	2	1	0
0	Sense Data Length							
1	Reserved							
2	Reserved							
3	Reserved							

Sense Data Length

The Sense Data Length specifies the length (in bytes) that is available to be transferred during the DATA IN phase. The Sense Data Length does not include itself, but does include the remaining 3 bytes of parameter list header.

TapeAlert Page (1Ch): Table 42 shows the format of the TapeAlert Page.

Table 42. Format of the TapeAlert Page (1Ch)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	RSVD	Page Code					
1	Parameter List Length							
2	Perf	Reserved			DExcpt	Test	RSVD	LogErr
3	Reserved				MRIE			
4-7	Interval Timer							
8-11	Report Count/Test Flag Number							

PS The Page Savable (PS) field is set to 0 to indicate that the 3583 Library does not save parameters.

Page Code

The Page Code identifies the TapeAlert Mode Page. The value of this field must be 1Ch.

Parameter List Length

This field is set to 0Ah (10), which means that 10 additional bytes follow.

Perf Set to 0 to indicate that the exception information can cause delays that are acceptable.

DExcpt
Set to 1 to indicate that the reporting of information about exception operations is disabled. The MRIE field is ignored. The software must poll the TapeAlert Log Page.

Test Set to 0 to indicate that false information about exception conditions will not be generated.

LogErr
Set to 0 if log information about exception conditions is vendor specific.

MRIE Set to 0 to indicate that exception conditions are not reported.

Interval Timer
Set to 0 to indicate that the target only reports the informational exception condition once.

Report Count
Set to 0 to indicate that this value is not supported.

Element Address Assignment Page (1Dh): Table 43 shows the format of the Element Address Assignment Page.

Table 43. Format of the Element Address Assignment Page (1Dh)

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

PS The value of the Page Savable (PS) field is 1. This means that the page can be saved.

Page Code
The Page Code identifies the Element Address Assignment Page. The value of this field is 1Dh.

Parameter List Length

This field indicates the length of the Element Address Assignment parameter list. The value of the field is 12h, which means 18 additional bytes of parameter data.

Transport Geometry Descriptor Page (1Eh): Table 44 shows the format of the Transport Geometry Descriptor Page.

Table 44. Format of the Transport Geometry Descriptor Page (1Eh)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Rsvd	Page Code					
1	Parameter Length							
2	Reserved							Rotate
3	Member Number in Transport Element Set							

PS The value of the Page Savable (PS) field is 0. This means that the 3583 Library cannot save this page to nonvolatile memory.

Page Code

The Page Code identifies the Transport Geometry Descriptor Page. The value of this field is 1Eh.

Parameter Length

This field indicates the length of the Transport Geometry Descriptor parameter list. The value of the field is 02h, which means 2 additional bytes of parameter data.

Rotate

The Rotate bit identifies the ability of the accessor to handle two-sided media. Because the 3583 Library uses only one-sided media, the value for this field is 0.

Member Number in Transport Element Set

This field identifies the specific accessor in the system to which this descriptor applies. Because the 3583 Library has only one transport element, the value for this field is 0.

Device Compatibilities Page (1Fh): Table 45 shows the format of the Device Compatibilities Page.

Table 45. Format of the Device Compatibilities Page (1Fh)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Rsvd	Page Code					
1	Parameter List Length							
2	Reserved				DT 1	I/E 1	ST 1	MT 0
3	Reserved							
4	Reserved				MT to DT 0	MT to I/E 0	MT to ST 0	MT to MT 0
5	Reserved				ST to DT 1	ST to I/E 1	ST to ST 1	ST to MT 0
6	Reserved				I/E to DT 1	I/E to I/E 1	I/E to ST 1	I/E to MT 0
7	Reserved				DT to DT 1	DT to I/E 1	DT to ST 1	DT to MT 0
8-15	Reserved							

PS The value returned for the Page Savable (PS) field is 0. The 3583 Library cannot save this page to nonvolatile memory.

Page Code
This field identifies the page code for the Device Compatibilities Page. The returned value is 1Fh.

Parameter Length
The Parameter Length is 0Eh (14), which means 14 additional bytes of device compatibilities data.

Data Transfer (DT)
The value returned for this field is 1. The tape drives can store cartridges.

Import/Export (I/E)
The value returned for this field is 1. The Input/Output station can store cartridges.

Storage Location (ST)
The value returned for this field is 1. The storage slots can store cartridges.

Medium Transport (MT)
The value returned for this field is 0. The accessor cannot store cartridges.

MT to DT

The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is the accessor and the destination is a tape drive.

MT to I/E

The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is the accessor and the destination is the Input/Output station.

MT to ST

The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is the accessor and the destination is a storage slot.

MT to MT

The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is the accessor and the destination is the accessor.

ST to DT

The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is a storage slot and the destination is a tape drive.

ST to I/E

The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is a storage slot and the destination is the I/O station.

ST to ST

The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is a storage slot and the destination is a storage slot.

ST to MT

The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is a storage slot and the destination is the accessor.

I/E to DT

The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is the I/O station and the destination is a tape drive.

I/E to I/E

The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is the I/O station and the destination is the I/O station.

I/E to ST

The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is the I/O station and the destination is a storage slot.

I/E to MT

The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is the I/O station and the destination is the accessor.

DT to DT
The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is a tape drive.

DT to I/E
The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is the I/O station.

DT to ST
The value returned for this field is 1. The 3583 Library supports the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is a storage slot.

DT to MT
The value returned for this field is 0. The 3583 Library does not support the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is the accessor.

Parity Page (00h): Table 46 shows the format of the Parity Page.

Table 46. Format of the Parity Page (00h)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Rsvd	Page Code					
1	Parameter List Length							
2	Reserved		Parity	Reserved				
3	Maximum Parity Retries							

PS The value returned for the Page Savable (PS) field is 1, which specifies the ability to save this page to nonvolatile memory.

Page Code
The return value of 00h identifies the Parity Page.

Parameter List Length
The Parameter Length is 02h (2), which means 2 additional bytes of data.

Parity This field enables or disables parity checking of the SCSI bus. Two values are available:

- 0 means disable parity checking
- 1 means enable parity checking

The Parity bit may also be enabled by choosing the Parity option from the operator panel. Use the same method to disable the parity bit.

Maximum Parity Retries
This field designates the maximum number of times to retry the message out, command out, or data out phase after a parity error. The valid values for this field range from 0 to 255.

- 0 means no retries are performed
- 255 means the maximum retries are performed

The default value for this field is 1.

LCD Mode Page (22h): Table 47 shows the format of the LCD Mode Page.

Table 47. Format of the LCD Mode Page (22h)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Rsvd	Page Code					
1	Parameter List Length							
2	Rsvd	LCD Security	Reserved					
3	Reserved							

PS The value returned for the Page Savable (PS) field is 1. The 3583 Library can save this page to nonvolatile memory.

Page Code
The value of this field is 22h.

Parameter List Length
The Parameter List Length is 2 additional bytes of data.

LCD Security
This bit controls the LCD Security:

- 0 means LCD Security is disabled
- 1 means LCD Security is enabled

Note: You can enable LCD Security by using the operator panel.
If LCD Security is enabled, the following functions are disabled:

- Performing diagnostics from the operator panel
- Performing all Setup options
- Changing the mode or state
- Issuing commands (from the operator panel) that involve cartridge movement

An attempt to perform any of the preceding functions will result in an error message.

LCD Panel and Softkey Configuration Page (23h): Table 48 shows the format of the LCD Panel and Softkey Configuration Page. This page returns information regarding any supported softkeys that are selectable on the display.

Table 48. Format of the LCD Panel and Softkey Configuration Page (23h)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Rsvd	Page Code					
1	Parameter List Length							
2	Graphic Mode							
3	Color Mode							
4	Bits Per Pixel							
5	Data Format							
6-7	Width							
8-9	Height							
10	Notify On Update							
11	Update Period							
12	Reserved							
13	Reserved							
14	Reserved							
15	Number of Softkeys							
15+s+1	Softkey Button Number							
15+s+2	Reserved							
15+s+3 - 15+s+4	Left Edge (in pixels)							
15+s+5 - 15+s+6	Right Edge (in pixels)							
15+s+7 - 15+s+8	Top Edge (in pixels)							
15+s+9 - 15+s+10	Bottom Edge (in pixels)							

PS The value of the Page Savable (PS) field is 0. This means that the page cannot be saved.

Page Code
The Page Code identifies the LCD and Softkey Configuration Mode Page. The value of this field is 23h.

Parameter List Length

If no soft button is configured, the Parameter List Length is a minimum of 16 bytes. The length increases by 10 bytes for each configured softkey (represented as s in the following):

s = 0 for the first softkey

s = 10 for the second softkey

s = 20 for the third softkey

s = 30 for the fourth softkey

Graphic Mode

This field indicates whether the LCD Panel is in text mode or graphic mode:

- 0 means text mode
- 1 means graphic mode

Color Mode

Reserved until color displays are supported.

Bits Per Pixel

This field indicates the bits per pixel:

- In text mode:
  - 8 bits equals ASCII
  - 16 bits equals UNICODE
- In graphics mode, the field is set to the number of bits used for each pixel.

Data Format

This field indicates the format of the data that the panel returns. Currently it is reserved and set to 0.

Width This field indicates the width of an object displayed on the panel:

- In text mode, the width is the number of characters
- In graphics mode, the width is the number of pixels

Height

This field indicates the height of an object displayed on the panel:

- In text mode, the height is the number of characters
- In graphics mode, the height is the number of pixels

Notify On Update

This field indicates whether the library notifies the SCSI host about panel updates:

- 1 means that the library asynchronously notifies the host about panel updates
- 0 means the that library does not asynchronously notify the host about panel updates

Update Period

This field indicates how often the panel can be changed (in seconds).

Number of Softkeys

Set to 0. No bytes follow at this time.

Softkey Button Number

This parameter is not supported.

Left Edge
The pixel number of the left edge for each softkey (minimum X). Currently not supported.

Right Edge
The pixel number of the right edge for each softkey (maximum X). Currently not supported.

Top Edge
The pixel number of the top edge for each softkey (minimum Y). Currently not supported.

Bottom Edge
The pixel number of the bottom edge for each softkey (maximum Y). Currently not supported.

Auto Cleaning Page (2Ch): Table 49 shows the format of the Auto Cleaning Page.

Table 49. Format of the Auto Cleaning Page (2Ch)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	RSVD	Page Code					
1	Parameter List Length							
2	Reserved						AC	DC
3	Hour							
4	Minute							
5	Reserved							

PS The value of the Page Savable (PS) field is 1. This means that the page can be saved.

Page Code
The Page Code identifies the Auto Cleaning Page. The value of this field is 2Ch.

Parameter List Length
This field indicates the length of the Auto Cleaning parameter list. The value of the field is 04h, which means 4 additional bytes of parameter data.

AC This field indicates whether autocleaning (AC) is active or not active:
- 0 means that autocleaning is not active
- 1 means that autocleaning is active

DC This field indicates whether delayed cleaning (DC) is active or not active:
- If the AC field is 0, the DC field is ignored
- If the AC field is 1, the entry in the DC field has the following meaning:
  - 0 means that Delayed Cleaning is not active
  - 1 means that Delayed Cleaning is active

Hour If Delayed Cleaning is activated, the Hour field indicates at which hour Delayed Cleaning is scheduled (00-23).

Minute
If Delayed Cleaning is activated, the Minute field indicates at which minute within the hour Delayed Cleaning is scheduled (00-59).

Operating Mode Page (2Dh): Table 50 shows the format of the Operating Mode Page.

Table 50. Format of the Operating Mode Page (2Dh)

Bit Byte	7	6	5	4	3	2	1	0
0	PS	RSVD	Page Code					
1	Parameter List Length							
2	Reserved						AT	AI
3	Op-Mode							
4	Reserved							

PS The value of the Page Savable (PS) field is 1. This means that the page can be saved.

Page Code
The Page Code identifies the Operating Mode Page. The value of this field is 2Dh.

Parameter List Length
This field indicates the length of the Operating Mode parameter list. The value of the field is 03h, which means 3 additional bytes of parameter data.

AT This field indicates whether Auto-Teach (AT) is activated:

- 1 means that Auto-Teach is activated
- 0 means that Auto-Teach is not activated

AI This field indicates whether Auto-Inventory (AI) is activated:

- 1 means that Auto-Inventory is activated
- 0 means that Auto-Inventory is not activated

Op-Mode
Settings for Op-Mode are as follows:

- 0 (normal mode of operation)
- 1 (a Get operation performed on an Ultrium Tape Drive is delayed 3 seconds after detecting that a tape was ejected)
- 2 (the 3583 Library can issue an UNLOAD command to the drive if the cartridge is not ejected by the host)
- 3 (options 1 and 2 are activated)
- 4 (automatic cartridge recovery on PUT Failures is disabled)
- 5 (options 1 and 4 are activated)
- 6 (options 2 and 4 are activated)
- 7 (options 3 and 4 are activated)

Mode Sense (1Ah) Status

After processing the MODE SENSE command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 51).

Table 51. Invalid Parameters in the CDB for the MODE SENSE Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Value for Allocation Length	5h	1Ah	00h	1	1	0	0	0004h
Invalid Value for DBD Field	5h	24h	00h	1	1	1	3h	0001h
Invalid Page Code	5h	24h	00h	1	1	1	5h	0002h

MOVE MEDIUM (A5h) Command

The MOVE MEDIUM command causes the initiator to request the accessor to move a cartridge from one element address to another specific element address. For a matrix with the valid source and destination element address combinations, see “Device Compatibilities Page (1Fh)” on page 54.

Note: If you attempt to move a cartridge from a tape drive while the tape remains inside the tape drive and is busy, the drive returns a Check Condition status. To resolve the problem, see the Check Condition section in “MOVE MEDIUM (A5h) Status” on page 64.

When you issue the MOVE MEDIUM command and the source and destination addresses are set to the same tape drive, the accessor pushes the cartridge back into the drive. If a move from the drive failed because the cartridge was not ejected far enough to allow the initiator to eject the cartridge again, repeat the MOVE MEDIUM command.

Prior to issuing a MOVE MEDIUM command, the host application should issue an UNLOAD command to the drive and verify completion of the logical unload.

CDB Format of the MOVE MEDIUM (A5h) Command

The command descriptor block (CDB) format of the MOVE MEDIUM command is shown in Table 52.

Table 52. CDB Format of the MOVE MEDIUM Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (A5h)							
1	Logical Unit Number			Reserved				
2-3	MSB Transport Element Address LSB							
4-5	MSB Source Address LSB							
6-7	MSB Destination Address LSB							
8-9	Reserved							
10	Reserved							Invert
11	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number
This field is always set to 0.

Transport Element Address
This field should be 0 or the element address of the accessor.

Source Address
This field specifies the address of the element from which the cartridge is to be removed.

Destination Address
This field specifies the address of the element into which the cartridge is to be placed.

Invert This field indicates whether the medium needs to be flipped. The 3583 Library does not support the Invert function. The value of this field must be 0.

MOVE MEDIUM (A5h) Status

After processing the MOVE MEDIUM command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while the library processed the command.
- A Unit Attention condition is pending for the initiator.
- The command was issued to an invalid LUN.
- The library experienced an unrecoverable hardware error.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 53 on page 65).
- The cartridge inventory indicated that the move operation could not be performed.
- After a move attempt, the library found that the source was empty or the destination was occupied.
- The library is not ready because it is offline, a door is open, or the Input/Output station is open.
- A drive may have reported an error.

Table 53. Invalid Parameters in the CDB for the MOVE MEDIUM Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Transport Element Address	05h	21h	01h	1	1	0	0	0002h
Invalid Source Element Address	05h	21h	01h	1	1	0	0	0004h
Invalid Destination Element Address	05h	21h	01h	1	1	0	0	0006h
Invalid Invert Field	05h	24h	00h	1	1	1	0	000Ah
Destination Element Full	05h	3Bh	0Dh	0	0	0	0	0000h
Source Element Empty	05h	3Bh	0Eh	0	0	0	0	0000h
Source Cartridge is Loaded, Not Accessible	05h	3Bh	90h	0	0	0	0	0000h
Destination for Move Operation Cannot be Accessor	05h	3Bh	85h	0	0	0	0	0000h
Source for Move Cannot be Accessor	05h	3Bh	86h	0	0	0	0	0000h
Cartridge Stuck in Tape Drive	05h	3Bh	87h	0	0	0	0	0000h
Media is Not Compatible with Destination	05h	3Bh	A0h	0	0	0	0	0000h
Bar Code Label and Full Status is Questionable	05h	83h	03h	0	0	0	0	0000h
Incompatible Media Installed	05h	30h	00h	0	0	0	0	0000h
I/O Station is Open	05h	53h	81h	0	0	0	0	0000h

POSITION TO ELEMENT (2Bh) Command

The POSITION TO ELEMENT command causes the initiator to move the accessor to a specific element address position.

CDB Format of the POSITION TO ELEMENT (2Bh) Command

The command descriptor block (CDB) format of the POSITION TO ELEMENT command is shown in Table 54.

Table 54. CDB Format of the POSITION TO ELEMENT Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (2Bh)							
1	Logical Unit Number			Reserved				
2-3	MSB Transport Element Address LSB							
4-5	MSB Destination Address LSB							
6-7	Reserved							
8	Reserved							Invert
9	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number
This field is always set to 0.

Transport Element Address
This field contains 0 or the element address of the accessor.

Destination Element Address
This field contains the element address for the move. Specifying the accessor address positions the accessor in the home position. This address allows easy access to cartridges.

Invert This field indicates whether the medium needs to be flipped. The 3583 Library does not support the invert function. The value for this field must be 0.

POSITION TO ELEMENT (2Bh) Status

After processing the POSITION TO ELEMENT command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- The command was issued to an invalid LUN.
- An unrecoverable parity error occurred while receiving the CDB.
- The library experienced an unrecoverable hardware error.
- A Unit Attention condition is pending for the initiator.
- The library is not ready because it is offline, a door is open, or the Input/Output station is open.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 55).
- The library encountered a problem during the positioning operation.

Table 55. Invalid Parameters in the CDB for the POSITION TO ELEMENT Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Transport Element Address	05h	21h	01h	1	1	0	--	0002h
Invalid Destination Element Address	05h	21h	01h	1	1	0	--	0004h
Invalid Invert Field	05h	24h	01h	1	1	1	0	0008h

PREVENT/ALLOW MEDIUM REMOVAL (1Eh) Command

The PREVENT/ALLOW MEDIUM REMOVAL command enables or disables the opening of the Input/Output station. This command also prevents the operator from inserting or removing a cartridge.

If any initiator issues this command, no other initiator can perform the listed functions.

CDB Format of the PREVENT/ALLOW MEDIUM REMOVAL (1Eh) Command

The command descriptor block (CDB) format of the PREVENT/ALLOW MEDIUM REMOVAL command is shown in Table 56.

Table 56. CDB Format of the PREVENT/ALLOW MEDIUM REMOVAL Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (1Eh)							
1	Logical Unit Number			Reserved				
2-3	Reserved							
4	Reserved							Prevent
5	P/A Options		Reserved					

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number

This field is always set to 0.

Prevent

The Prevent bit indicates the following:

- 0 allows the opening of the I/O station.
- 1 prevents the opening of the I/O station. This field is applicable until a power-on reset or command reset is performed, or until all initiators have issued an ALLOW MEDIUM REMOVAL command by setting the Prevent field to 0.

P/A Options

The P/A Options field is present for compatibility with other libraries. It is ignored.

PREVENT/ALLOW MEDIUM REMOVAL (1Eh) Status

After processing the PREVENT/ALLOW MEDIUM REMOVAL command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 57).
- The value of a field in the P/A Options field is invalid.

Table 57. Invalid Parameters in the CDB for the PREVENT/ALLOW MEDIUM REMOVAL Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid P/A 2 Bit in P/A Options Field	05h	24h	00h	1	1	1	6h	0005h

READ BUFFER (3Ch) Command

Used in conjunction with the WRITE BUFFER command, the READ BUFFER command is a diagnostic for testing the library's memory, SCSI bus integrity, ability to upload trace information, and log information. This command does not alter the behavior of the library.

CDB Format of the READ BUFFER (3Ch) Command

The command descriptor block (CDB) format of the READ BUFFER command is shown in Table 58.

Table 58. CDB Format of the READ BUFFER Command

Bit Byte	7	6	5	4	3	2	1	0
0	0	0	1	1	1	1	0	0
1	Logical Unit Number			Reserved		Mode		
2	Buffer ID							
3-5	MSB Buffer Offset LSB							
6-8	MSB Allocation Length LSB							
9	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Mode The function of the READ BUFFER command and the meaning of fields within the CDB depend on the contents of the Mode field. Table 59 shows potential values in the Mode field.

Table 59. Definition of the Mode Fields

Mode			Description
Bit 2	**Bit 1**	**Bit 0**	
0	1	0	Data
0	1	1	Descriptor

Data Mode

In Data Mode, the Data In phase contains buffer data from the buffer identified in the Buffer ID field.

Descriptor Mode

In Descriptor Mode, the 3583 Library returns a maximum of 4 bytes of READ BUFFER descriptor information. It returns the information for the buffer that is specified by the Buffer ID field. If there is no buffer associated with the specified Buffer ID field, the library returns all zeros in the READ BUFFER descriptor. The Buffer Offset field is reserved in this mode. Set the

Allocation Length field to 4 or greater. The library transfers the lesser of the allocation length or 4 bytes of READ BUFFER descriptor. Table 60 defines the READ BUFFER descriptor.

Table 60. Definition of the READ BUFFER Descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	Offset Boundary							
1-3	MSB Buffer Length LSB							

The Offset Boundary field returns the boundary alignment within the selected buffer for subsequent WRITE BUFFER commands. The value contained in the Offset Boundary field is interpreted as a power of 2. Table 61 shows the potential values in the Offset Boundary field.

The Buffer Length field returns the size (in bytes) of the selected buffer.

Table 61. Boundaries in the Offset Boundary Field

Offset Boundary	2^{x*} Offset Boundary	Buffer Offsets
0	$2^0 = 1$	Byte boundaries
1	$2^1 = 2$	Even-byte boundaries
2	$2^2 = 4$	4-byte boundaries
3	$2^3 = 8$	8-byte boundaries
4	$2^4 = 16$	16-byte boundaries
05h - FFh	Not applicable	Not applicable
FFh	Not applicable	0 is the only supported buffer offset
* Where x is a power of 2		

Buffer ID

Buffer ID code assignments for the READ BUFFER command are the same as for the WRITE BUFFER command. If an unsupported buffer ID code is selected, the 3583 Library returns a Check Condition status, sets the sense key to ILLEGAL REQUEST, and sets the additional sense code to ILLEGAL FIELD in the CDB. The library terminates the Data In phase when it transfers allocation length bytes to the host or when it reaches the end of the buffer, whichever amount is less. Table 62 gives the supported buffer IDs and their descriptions.

Table 62. Description of Buffer IDs

Buffer ID	Description	R/W	Modes
0 - 8	Reserved		
9	Command Log (ASCII)	RW	2, 3
A	Error Log (ASCII)	RW	2, 3

Buffer Offset

The Buffer Offset field contains the byte that is offset within the specified buffer from which the 3583 Library transfers data. The host conforms to the

offset boundary requirements that are returned in the READ BUFFER descriptor. If the library is unable to accept the specified buffer offset, it returns a Check Condition status, sets the sense key to ILLEGAL REQUEST, and sets the additional sense code to ILLEGAL FIELD in the CDB.

Allocation Length
The value in the Allocation Length field is determined by the mode and buffer ID.

READ BUFFER (3Ch) Response

The buffer response is determined by the mode and buffer ID.

READ BUFFER (3Ch) Status

After processing the READ BUFFER command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 or a parameter is invalid in the CDB.

READ ELEMENT STATUS (B8h) Command

The READ ELEMENT STATUS command causes an initiator to request the status of the element addresses. This command returns the data created by the INITIALIZE ELEMENT STATUS command or INITIALIZE ELEMENT STATUS WITH RANGE command.

CDB Format of the READ ELEMENT STATUS (B8h) Command

The command descriptor block (CDB) format of the READ ELEMENT STATUS command is shown in Table 63.

Table 63. CDB Format of the READ ELEMENT STATUS Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (B8h)							
1	Logical Unit Number			VolTag	Element Type Code			
2-3	MSB Starting Element Address LSB							
4-5	MSB Number of Elements LSB							
6	Reserved						CurData	DVCID
7-9	MSB Allocation Length LSB							
10	Reserved							
11	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number

This field is always set to 0.

VolTag

This field indicates whether information about the volume tag (bar code label) is returned:

- 0 means do not return volume tag information
- 1 means return volume tag information

Element Type Code

This field specifies the selected element types for the return information. Table 64 on page 74 lists the selected element types.

Note: The accessor transfers a cartridge from one element location to another and does not retain a cartridge. If the VolTag bit is set to 1 and the Element Type Code is 0001b, the 3583 Library returns element status information only. It returns NULLs for the volume tag information.

Table 64. Selected Element Types for Return Information

Bit 3	Bit 2	Bit 1	Bit 0	Selected Element Type
0	0	0	0	All element types reported (from starting address)
0	0	0	1	Accessor
0	0	1	0	Storage
0	0	1	1	I/O Station
0	1	0	0	Tape Drives

Starting Element Address

This field indicates the Starting Element Address. Elements with equal or greater addresses are returned.

Note: The Starting Element Address field must indicate a valid element, but does not have to match the Element Type Code field.

Number of Elements

This field specifies the maximum number of element descriptors to return.

CurData

This field is ignored.

DVCID

This field indicates whether device identifiers for a specified range are returned:

- 0 means do not return device identifiers
- 1 means return the device identifiers if they are available

Allocation Length

This field specifies the byte length for returned element descriptors. Only complete element descriptors are returned. The 3583 Library returns element descriptors until one of the following conditions are met:

- All available element descriptors are returned.
- The number of element descriptors specified in the Number of Elements field are returned.
- The number of bytes of complete element descriptors specified in the Allocation Length field are returned.
- There is less allocation length space available than is required by the next complete element descriptor.

READ ELEMENT STATUS (B8h) Response

Element Status Header

Table 65 provides the format of the element status header. The 3583 Library returns one header for each READ ELEMENT STATUS command.

Table 65. Element Status Header

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB First Element Address Reported LSB							
2-3	MSB Number of Elements Reported LSB							
4	Reserved							
5-7	MSB Byte Count of Report Available LSB							

First Element Address Reported

This field indicates the lowest element address found.

Number of Elements Reported

This field indicates the number of elements found.

Byte Count of Report Available

This field indicates the number of available element status bytes that meet the CDB requirements. The value does not include the 8-byte element status header, and is not adjusted to match the value specified in the Allocation Length field of the CDB.

Element Status Page

Table 66 shows the format of the Element Status Page header. The 3583 Library returns one Element Status Page header for each group of element descriptors of the same type.

Table 66. Format of the Element Status Page Header

Bit Byte	7	6	5	4	3	2	1	0
0	Element Type Code							
1	PVolTag	AVolTag	Reserved					
2-3	MSB Element Descriptor Length LSB							
4	Reserved							
5-7	MSB Byte Count of Descriptor Data Available LSB							

Element Type Code

This field indicates the specific element type being returned by the element descriptor (for a description of element types, refer to Table 64 on page 74).

PVolTag

This field indicates whether information about the primary volume tag (bar code label) is present:

- 0 means that the volume tag bytes are omitted
- 1 means that the volume tag bytes are included

AVolTag

Alternate volume tags are not supported. The return value for this bit field is 0.

Element Descriptor Length

This field indicates the number of bytes contained in a single element descriptor. Table 67 lists the length.

Table 67. Length of Element Descriptor

Mode	PVolTag Field	DVCID Field	Value
3583 Library Default	0	0	10h all
	0	1	10h non-drives
			1Ah drives
	1	0	34h all
	1	1	34h non-drives
			3Eh drives

Byte Count of Descriptor Data Available

This field indicates the number of element descriptor data bytes available for the elements (of this element type) that met the CDB requirements. This value represents the Element Descriptor Length field multiplied by the number of element descriptors for this element type. The value does not include the 8-byte Element Status Page header.

Element Descriptors

Element descriptors are as follows:

- The Medium Transport Element is the accessor.
- A Storage Element is a storage slot.
- An Import/Export Element is an I/O station slot.
- A Data Transfer Element is a tape drive.

Each element descriptor includes the element address and status flags. Sense code and other information depends on the element type. The sections that follow describe each element descriptor.

Medium Transport Element Descriptor: Only one Medium Transport element, the accessor, exists. Table 68 shows the format of the Medium Transport Element Descriptor.

Table 68. Format of the Medium Transport Element Descriptor

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Element Address LSB							
2	Reserved					Except	Reserved	Full
3	Reserved							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6-8	Reserved							
9	SValid	Invert	Reserved					
10-11	MSB Source Storage Element Address LSB							
12-47	Primary Volume Tag Information (Field omitted if PVolTag = 0)							
48-51	Reserved (Field moved up if Primary Volume Tag Information field is omitted)							

Element Address
This field contains the element address of the accessor.

Except
This field is set to 0.

Full This field is set to 0.

Additional Sense Code
This field is set to 0.

Additional Sense Code Qualifiers
This field is set to 0.

SValid This field is set to 0.

Invert This field is set to 0.

Source Storage Element Address
This field is set to 0.

Primary Volume Tag
This field is set to 0.

Storage Element Descriptor: Each storage slot is a storage element. Table 69 shows the format of the Storage Element Descriptor.

Table 69. Format of the Storage Element Descriptor

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Element Address LSB							
2	Reserved				Access	Except	Reserved	Full
3	Reserved							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6-8	Reserved							
9	SValid	Invert	Reserved					
10-11	MSB Source Element Address LSB							
12-47	Primary Volume Tag Information (Field omitted if PVolTag = 0)							
48-51	Reserved (Field moved up if Primary Volume Tag Information field is omitted)							

Element Address
This field contains the address of the cartridge storage slot.

Access
This field indicates that the accessor can access the storage slot. The value of this field is 1.

Except
This field indicates the current condition of the cartridge storage slot:

- 0 means that the slot is in a normal condition
- 1 means that the slot is in an abnormal condition as specified in the Additional Sense Code (ASC) and Additional Sense Code Qualifier (ASCQ) fields (see “ASC and ASCQ Values for Abnormal States” on page 84)

Full This field indicates whether a storage slot contains a cartridge:

- 0 means that the slot does not contain a cartridge
- 1 means that the slot contains a cartridge

Additional Sense Code (ASC)
Table 72 on page 84 shows the supported ASC values.

Additional Sense Code Qualifier (ASCQ)
Table 72 on page 84 shows the supported ASCQ values.

SValid This bit field indicates the validity of the Source Element Address field:

- 0 means that the field is invalid
- 1 means that the field is valid

Invert Double-sided media are not supported. This field is 0.

Source Element Address
This field indicates the previous element address of the cartridge.

Primary Volume Tag Information
When the PVolTag field in the CDB is set to 1, this field contains the volume tag (bar code label) information for the element address. Only 6 or 8 bytes of volser information is returned, depending on the 3583 Library’s operating mode parameters MM Enable and Volser Enable.

Import/Export Element Descriptor: One I/O station is supported. Each slot in the I/O station has an element address. Table 70 shows the format of the Import/Export Element Descriptor.

Table 70. Format of the Import/Export Element Descriptor

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Element Address LSB							
2	Reserved		InEnab	ExEnab	Access	Except	Imp/Exp	Full
3	Reserved							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6-8	Reserved							
9	SValid	Invert	Reserved					
10-11	MSB Source Element Address LSB							
12-47	Primary Volume Tag Information (Field omitted if PVolTag = 0)							
48-51	Reserved (Field moved up if Primary Volume Tag Information field is omitted)							

Element Address
This field contains the address of the I/O station element slot.

InEnab
This field indicates that the I/O station supports the cartridge loading mechanism to enable accessor access (the I/O station is closed). The value for this field is 1.

ExEnab
This field indicates that the I/O station supports the cartridge unloading mechanism to disable accessor access (the I/O station is open). The value for this field is 1.

Access
This field indicates whether the accessor can access the cartridge in the I/O station:

- 0 means that the I/O station is open and the accessor cannot access cartridges
- 1 means that the I/O station is closed and the accessor can access the cartridge

Except

This field indicates the current condition of the I/O station slot:

- 0 means that the I/O station slot is in a normal state
- 1 means that the I/O station slot is in an abnormal state as specified in the Additional Sense Code (ASC) and Additional Sense Code Qualifier (ASCQ) fields (see “ASC and ASCQ Values for Abnormal States” on page 84)

Imp/Exp

This field indicates how the cartridge was placed in the I/O station slot:

- 0 means that the accessor placed the cartridge in the I/O station
- 1 means that an operator placed the cartridge in the I/O station

Full This field indicates whether this I/O station slot contains a cartridge:

- 0 means that the slot does not contain a cartridge
- 1 means that the slot contains a cartridge

Additional Sense Code (ASC)

If the I/O station slot is in an abnormal state, this field contains 83h (131). Table 72 on page 84 shows the supported ASC values.

Additional Sense Code Qualifier (ASCQ)

Table 72 on page 84 shows the supported ASCQ values.

SValid This bit field indicates the validity of the Source Element Address field:

- 0 means that the field is invalid
- 1 means that the field is valid

Invert Double-sided media are not supported. This field is 0.

Source Element Address

This field indicates the previous element address of the cartridge.

Primary Volume Tag Information

When the PVolTag field in the CDB is set to 1, this field contains the volume tag (bar code label) information for the element address. Only 6 or 8 bytes of volser information is returned, depending on the 3583 Library’s operating mode parameters MM Enable and Volser Enable.

Data Transfer Element Descriptor Page: The Data Transfer Elements are the tape drives. Table 71 shows the format of the Data Transfer Element Descriptor Page.

Table 71. Format of the Data Transfer Element Descriptor Page

Bit Byte	7	6	5	4	3	2	1	0
0-1	MSB Element Address LSB							
2	Reserved				Access	Except	Reserved	Full
3	Reserved							
4	Additional Sense Code							
5	Additional Sense Code Qualifier							
6	NotBus	Reserved	IDValid	LUValid	Reserved	Logical Unit Number		
7	SCSI Bus Address							
8	Reserved							
9	SValid	Invert	Reserved					
10-11	MSB Source Element Address LSB							
12-47	Primary Volume Tag Information (Omitted if PVolTag = 0)							
48	Reserved				Code Set			
49	Reserved				Identifier Type			
50	Reserved							
51	Identifier Length							
52-61	Identifier (Omitted if DVCID = 0)							

Element Address

This field contains the element address of the tape drive.

Access

This field indicates whether the accessor can pick or place a cartridge at the tape drive location:

- 0 means that the cartridge at the drive is not accessible to the accessor (the cartridge is not unloaded)
- 1 means that the cartridge at the drive is accessible by the accessor (the cartridge is unloaded or not present)

Except

This field indicates the current condition of the tape drive:

- 0 means that the drive is in a normal condition
- 1 means that the drive is in an abnormal condition as specified in the Additional Sense Code (ASC) and Additional Sense Code Qualifier (ASCQ) fields (see “ASC and ASCQ Values for Abnormal States” on page 84)

Full This field indicates whether a tape drive contains a cartridge:

- 0 means that the drive does not contain a cartridge
- 1 means that the drive contains a cartridge

Additional Sense Code (ASC)

If the tape drive is in an abnormal state, this field contains the value 83h (131) or 42h (66). Table 72 on page 84 shows the supported ASC values.

Additional Sense Code Qualifier (ASCQ)

Table 72 on page 84 shows the supported ASCQ values.

NotBus

This field is not supported and is set to 0.

IDValid

This field indicates whether the drive SCSI ID (byte 7) is valid:

- 0 means that the SCSI ID is not valid
- 1 means that the SCSI ID is valid

LUValid

This field is not supported and is set to 0.

Logical Unit Number

This field is not supported and is set to 0.

SCSI Bus Address

This field contains the tape drive’s SCSI address (0 to F).

SValid This bit field indicates the validity of the Source Element Address field:

- 0 means that the field is invalid
- 1 means that the field is valid

Invert Double-sided media are not supported. This field is 0.

Source Element Address

This field indicates the previous element address of a cartridge.

Primary Volume Tag Information

When the PVolTag field in the CDB is set to 1, this field contains the volume tag (bar code label) information for the element address. Only 6 or 8 bytes of volser information is returned, depending on the 3583 Library’s operating mode parameters MM Enable and Volser Enable.

Note: If the Except field is set to 1, the Primary Volume Tag Information could be invalid due to an inaccurate cartridge inventory. Scan the bar code label with the INITIALIZE ELEMENT STATUS or INITIALIZE ELEMENT STATUS WITH RANGE command.

Code Set

This field is set to 2h to indicate that ASCII values are returned. If no device identifier is available or if the DVCID bit in the CDB is 0, this field is 0h.

Identifier Type

This field is set to 0h.

Identifier Length

This field contains the length (in bytes) of the Identifier field, and is set to 0Ah. If no device identifier is available or if the DVCID bit in the CDB is 0, the Identifier Length is 0h and the Code Set and Identifier Type are also 0h.

Identifier

This field provides the serial number of the device associated with the Data Transfer Element. If no device identifier is available for the element or if the DVCID bit in the CDB is 0, this field is omitted.

ASC and ASCQ Values for Abnormal States

Table 72 describes the ASC and ASCQ values, and the corrective actions for an abnormal element descriptor condition.

Table 72. ASC and ASCQ Values

ASC	ASCQ	Description	Action
83h	00h	Label Questionable	The bar code label is questionable. Issue an INITIALIZE ELEMENT STATUS (07h) or INITIALIZE ELEMENT STATUS WITH RANGE (E7h) command.
83h	03h	Label and Full Status Questionable	The library was powered on or a front door was opened. Either action could invalidate the cartridge inventory.
83h	0Ah	Unable to Calibrate Offset	Reteach the 3583 Library from the operator panel.
42h	00h	Drive Status Error	The tape requires intervention to become operational. If the tape is unloaded, issue a MOVE MEDIA command to initialize the tape drive.

READ ELEMENT STATUS (B8h) Status

After processing the READ ELEMENT STATUS command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 73).
- The 3583 Library is not ready because it is offline, a door is open, or the Input/Output station is open.

Table 73. Invalid Parameters in the CDB for the READ ELEMENT STATUS Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Start Element Address	05h	21h	01h	1	1	0	0	0002h
Invalid Element Type Code	05h	24h	00h	1	1	1	3h	0001h

RELEASE (17h) Command

The RELEASE command causes the initiator to release a previous reservation. It is not an error to issue the RELEASE command when no previous reservation was made. The RELEASE command is initiator-dependent. Only the initiator that previously reserved the library may release the library.

CDB Format of the RELEASE (17h) Command

The command descriptor block (CDB) format of the RELEASE command is shown in Table 74.

Table 74. CDB Format of the RELEASE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (17h)							
1	Logical Unit Number			3rdPty	Third Party Device ID			Element
2	Reservation ID							
3-4	Reserved							
5	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number
This field is always set to 0.

3rdPty
The third-party (3rdPty) field is not supported. This value must be set to 0.

Third Party Device ID
The Third Party Device ID is not supported. This field must be set to 0.

Element
This field indicates the types of elements that were previously reserved by the initiator and are to be released:

- 0 means release any elements previously reserved by the initiator
- 1 means release elements previously reserved by the initiator with matching Reservation Identification

Reservation Identification
This field indicates the initiator-established value to identify a specific reservation request. If the Element field is set to 0, this field is ignored.

RELEASE (17h) Status

After processing the RELEASE command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
Never returned.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- A Unit Attention condition is pending for the initiator.
- The command was issued to an invalid LUN.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 75).

Table 75. Invalid Parameters in the CDB for the RELEASE Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Error in Third Party Field	05h	24h	00h	1	1	1	4h	0001h
Error in Third Party ID Field	05h	24h	00h	1	1	1	3h	0001h

REQUEST SENSE (03h) Command

The REQUEST SENSE command causes the initiator to request sense data from the target. Sense data (18 bytes) is provided in extended sense data format. The sense data is saved for each individual initiator. The data is preserved for each initiator until the REQUEST SENSE command or any other command is received.

CDB Format of the REQUEST SENSE (03h) Command

The command descriptor block (CDB) format of the REQUEST SENSE command is shown in Table 76.

Table 76. CDB Format of the REQUEST SENSE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (03h)							
1	Logical Unit Number			Reserved				
2-3	Reserved							
4	Allocation Length							
5	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number

This field is always set to 0.

Allocation Length

This field specifies the number of sense bytes requested by the initiator.

REQUEST SENSE (03h) Response

Sense Information Format

Table 77 shows the Sense Information format.

Table 77. Sense Information Format

Bit / Byte	7	6	5	4	3	2	1	0
0	Valid	Error Code						
1	Reserved							
2	Reserved				Sense Key			
3-6	MSB Information Bytes LSB							
7	Additional Sense Length							
8-11	MSB Command Specific Bytes LSB							
12	Additional Sense Code (ASC)							
13	Additional Sense Code Qualifier (ASCQ)							
14	Service Action Code							
15	SKSV	C/D	Reserved		BPV	Bit Pointer		
16-17	MSB Field Pointer LSB							

Valid The Valid field is set to 0 to indicate that the information field does not contain valid information.

Error Code

The Error Code field is set to 70h to indicate that the 3583 Library will return only current errors.

Sense Key

Table 78 describes the Sense Key values.

Table 78. Values of the Sense Keys

Sense Key	Description
0h	No Sense. No specific sense key information to report.
2h	Not Ready. The library is not ready to perform motion commands.
4h	Hardware Error. A hardware error was detected and operator intervention may be required.
5h	Illegal Request. The CDB or supplied parameter data contains an unsupported or illegal parameter.
6h	Unit Attention. The 3583 Library's operating status changed. The cartridge inventory may be invalid.
Bh	Command Aborted. The library aborted a command. The initiator may try the command again.

Information Bytes
This field is not supported and is set to 0.

Additional Sense Length
This field specifies the number of additional sense bytes to follow after this byte. The value returned is 0Ah (10) to indicate that 10 more bytes of sense data are available.

Command Specific Bytes
Command Specific Bytes is not supported by the library. The value returned is 0.

Additional Sense Code (ASC)
This field denotes a specific error condition. Values for this field are listed in Table 79 on page 91. Additional information is provided in the Additional Sense Code Qualifier (ASCQ).

Additional Sense Code Qualifier (ASCQ)
This field provides additional information for the ASC. Values for this field are listed in Table 79 on page 91.

Service Action Code
This field contains a service action code that indicates to a Service Representative what problem to fix.

Note: It is possible for the Service Action Code to change after a SCSI command or when an operation that was initiated from the operator panel completes.

Sense Key Specific Value (SKSV)
The SKSV returns the following values:

- 0 means that the information in bytes 15 through 17 are not valid.
- 1 means that the information in bytes 15 through 17 are valid for a Sense Key of Illegal Request (05h) only.

Command/Data (C/D)
The C/D byte indicates which parameter (command or data) caused the Check Condition status:

- 0 means that the illegal parameter was detected in the Parameter List supplied by the initiator
- 1 means that the illegal parameter was detected in the CDB

Bit Pointer Valid (BPV)
This field indicates whether the Bit Pointer field is valid:

- 0 means that the Bit Pointer field is not valid
- 1 means that the Bit Pointer field is valid

Bit Pointer
This field indicates which bit of the byte designated by the field pointer is in error. For a multi-bit field, it points to the most significant bit of the field.

Field Pointer
This field indicates which byte of the CDB or Parameter List (starting with 00) was in error. For a multi-byte field, the Field Pointer points to the most significant byte.

Returned Error Codes
Table 79 on page 91 lists the additional Sense Codes (ASC) and Additional Sense Code Qualifiers (ASCQ) associated with the particular Sense Keys.

Table 79. Additional Sense Codes and Qualifiers

Sense Key	Condition	ASC	ASCQ	Description
00h	No Sense	00h	00h	No Additional Sense Code.
02h	Not Ready	04h	00h	Due to an unknown cause, the 3583 Library is not ready.
			01h	The 3583 Library is becoming ready.
			03h	The 3583 Library is not ready and a manual intervention is required.
			83h	Aisle power is disabled; a door could be open.
			8Dh	Offline.
			90h	The 3583 Library needs teaching.
04h	Hardware Error	15h	01h	A mechanical positioning error occurred.
			80h	The accessor dropped a cartridge.
			81h	The accessor could not pick a cartridge.
			83h	The accessor could not put a cartridge.
		3Bh	0Dh	The destination element is full.
			0Eh	The source element is empty.
		3Fh	80h	Could not erase the electrically erasable programmable read-only memory (EEPROM).
			84h	Could not program the EEPROM.
		40h	01h	Cartridge in gripper at power-on.
			80h	Component (number - 80) failure.
			91h	Gripper error.
			A0h	The accessor could not move on the vertical (Y) axis.
			A1h	Could not home the vertical (Y) axis.
			B0h	The accessor could not move on the horizontal (X) axis.
			B1h	Could not home the horizontal (X) axis.
			C0h	The accessor could not move.
			E0h	The accessor lost power.
		44h	00h	Internal target failure.
		53h	00h	A drive did not load or unload a tape.
			82h	Cannot lock the I/O station.
			83h	Cannot unlock the I/O station.
		83h	00h	Label too short, too long, or duplicate.
			01h	Due to scanner problem, cannot read a bar code label.
		84h	00	Firmware error.

Table 79. Additional Sense Codes and Qualifiers (continued)

Sense Key	Condition	ASC	ASCQ	Description
05h	Illegal Request	1Ah	00h	Parameter list length error.
		20h	00h	Illegal op code in CDB.
		21h	01h	Invalid element address in CDB.
		24h	00h	Invalid field in CDB.
			80h	Attempt to write a read-only buffer.
		25h	00h	Illegal LUN.
		26h	00h	Invalid field in Parameter List.
			02h	Invalid parameter in Parameter List.
			80h	Parameter data checksum failure.
		30h	00h	Incompatible media installed.
		3Bh	0Dh	Destination element full for MOVE MEDIUM command.
			0Eh	Source element empty for MOVE MEDIUM command.
			85h	Destination of MOVE MEDIUM command cannot be accessor.
			86h	Source of MOVE MEDIUM command cannot be accessor.
			87h	Cartridge stuck in tape drive.
			90h	Source cartridge loaded into tape drive and not accessible.
			A0h	Media type does not match destination media type.
		3Dh	00h	Invalid bit in “Identify” message.
		3Eh	00h	Incorrect LUN configuration.
		44h	00h	Firmware detected an internal logic failure.
05h	Illegal Request	53h	01h	A drive did not unload a tape.
			80h	Cartridge rejected in the I/O station because it was not properly loaded.
			81h	I/O station is open.
		83h	02h	Cartridge magazine not installed.
			03h	Slot status and bar code questionable.
			04h	Drive not installed.
06h	Unit Attention	28h	00h	Door(s) opened and closed.
			01h	I/O station opened.
		29h	00h	Power-on, SCSI bus reset, or bus device reset occurred.
			80h	Reset for permanent error occurred.
			81h	Reset into degraded mode of operation.
		2Ah	01h	Mode parameters have been changed.
		3Fh	01h	New firmware loaded.

Table 79. Additional Sense Codes and Qualifiers (continued)

Sense Key	Condition	ASC	ASCQ	Description
0Bh	Abort	43h	00h	Message received at inappropriate time.
		45h	00h	Host-rejected “Identify” message sent for reselection.
		47h	00h	The message system was disabled during parity error detection on the SCSI bus, or the message system was enabled but the initiator rejected the “Restore Data Pointer,” or all parity error retries were exhausted.
		48h	00h	Received an “Initiator Detected Error” or initiator rejected “Restore Data Pointer” in response to an “Initiator Detected Error.”
		4Eh	00h	Disconnect during command processing.

REQUEST SENSE (03h) Status

After processing the REQUEST SENSE command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy Never returned.

Reservation Conflict
Never returned.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- An unrecoverable parity error occurred while receiving the CDB.
- A reserved bit is set to 1 or a parameter is invalid in the CDB.

RESERVE (16h) Command

The RESERVE command causes the initiator to reserve the entire 3583 Library or specific elements. The reservation remains in effect until:

- The initiator that made the reservation sends another RESERVE command with the same Reservation Identification number (this supersedes any previous reservation).
- The initiator that made the reservation sends a RELEASE command.
- A reset or a power-on of the library is performed.

Note: After the initiator reserves the entire 3583 Library, only the INQUIRY, RELEASE, REQUEST SENSE, and ALLOW MEDIUM REMOVAL commands are accepted from other initiators. All other commands result in a Reservation Conflict status.

CDB Format of the RESERVE (16h) Command

The command descriptor block (CDB) format of the RESERVE command is shown in Table 80.

Table 80. CDB Format of the RESERVE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (16h)							
1	Logical Unit Number			3rdPty	Third Party Device ID			Element
2	Reservation Identification							
3-4	MSB Element List Length LSB							
5	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Logical Unit Number
This field is always set to 0.

3rdPty
The third-party (3rdPty) field is not supported. This value must be set to 0.

Third Party Device ID
The Third Party Device ID is not supported. This field must be set to 0.

Element
This field indicates what elements are reserved:

- 0 means that the entire 3583 Library is reserved
- 1 means that a sequence of elements are reserved, as identified in the Reservation Identification field and specified in the Element List Descriptor

Reservation Identification

This field allows an assignment of a 1-byte identification number for this element's reservation request. The identification number can be used with a subsequent RELEASE command to release the reserved elements associated with the Reservation Identification.

Element List Length

This field specifies the total length of the Element List Descriptors. Each Element List Descriptor is 6 bytes long. A length of 0, 6, or a multiple of 6 may be specified. If the element field is 0, this field is ignored.

Element List Descriptors: Table 81 shows the format of the Element List Descriptor.

Table 81. Format of the Element List Descriptor

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

Number of Elements

This field specifies the number of elements to reserve. Specifying 0 for this field reserves all elements, from the starting element address through the last element address.

Element Address

This field specifies the starting address of elements to reserve.

Note: The Starting Element Address must be a valid address.

RESERVE (16h) Status

After processing the RESERVE command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library was reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- The library detects an unrecoverable parity error while receiving the CDB or the element descriptor data.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see the invalid parameters in Table 82).

Table 82. Invalid Parameters in the CDB for the RESERVE Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Invalid Element List Length	05h	1Ah	00h	1	1	0	0	0003h
Error in 3rdPty Field	05h	24h	00h	1	1	1	4h	0001h
Error in Third Party Device Field	05h	24h	00h	1	1	1	3h	0001h
Reserved Field, Not 0	05h	26h	00h	1	0	0	0	0000h[1]
Reserved Field, Not 0	05h	26h	00h	1	0	0	0	0001h[1]
Invalid Element Address	05h	26h	02h	1	0	0	0	0004h[1]
Overlapping Element Address	05h	26h	02h	1	0	0	0	--[2]

Notes:

1. Because more than one element can be sent, add 6 to this number for each following descriptor.
2. The field pointer is set to the element address of the first descriptor that overlaps.

TEST UNIT READY (00h) Command

The TEST UNIT READY command causes the initiator to verify that the 3583 Library is ready to accept all commands.

Note: The 3583 Library does not check whether a different initiator reserved any or all of the library. A Check Condition status (which indicates a Reservation Conflict) may be returned for the next command.

CDB Format of the TEST UNIT READY (00h) Command

The command descriptor block (CDB) format of the TEST UNIT READY command is shown in Table 83.

Table 83. CDB Format of the TEST UNIT READY Command

Bit Byte	7	6	5	4	3	2	1	0
0	Op Code (00h)							
1	Logical Unit Number			Reserved				
2-4	Reserved							
5	Reserved							

Parameter in the CDB Format

The Logical Unit Number is the only parameter in the CDB format. This field is always set to 0, and bytes 1 to 5 are also set to 0.

TEST UNIT READY (00h) Status

After processing the TEST UNIT READY command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library never returns a Reservation Conflict.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- The library detects an unrecoverable parity error while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library detected an unrecoverable hardware error.
- The 3583 Library is not ready because a door is open, the library is offline, or the library has not been taught and initialized.
- A reserved bit is set to 1 or a parameter is invalid in the CDB.

WRITE BUFFER (3Bh) Command

The WRITE BUFFER command causes the 3583 Library's firmware to be updated.

CDB Format of the WRITE BUFFER (3Bh) Command

The command descriptor block (CDB) format of the WRITE BUFFER command is shown in Table 84.

Table 84. CDB Format of the WRITE BUFFER Command

Bit Byte	7	6	5	4	3	2	1	0
0	0	0	1	1	1	0	1	1
1	Logical Unit Number			Reserved		Mode		
2	Buffer ID							
3-5	MSB Buffer Offset LSB							
6-8	MSB Parameter List Length LSB							
9	Reserved							

Parameters in the CDB Format

The parameters in the CDB include:

Mode This field specifies how the 3583 Library interprets the function of the command. Table 85 defines the format of the Mode field.

Table 85. Format of the Mode Field

Mode			Description
Bit 2	**Bit 1**	**Bit 0**	
1	0	1	Download microcode and save

The Download Microcode and Save mode specifies that the drive write microcode to the control memory space of the 3583 Library. The drive writes the data as a single file or in 64 KB segments to Buffer ID 0 (starting at Buffer Offset 0) until all of the data is written. The last command returns after the new code is running. The data remains valid after the library is reset.

Note: When the Download Microcode and Save mode completes successfully, a Unit Attention condition with the additional sense code set to New Firmware Loaded returns to all initiators, except the one that issued the WRITE BUFFER command.

Buffer ID

This field specifies the buffer identifier for the transfer data. The value for this field is 0.

Buffer Offset

This field indicates the buffer offset where the write operation should begin:

- For a single file, the value is 0.

- For segmented 64 KB blocks over multiple WRITE BUFFER commands, the value is the 64 KB offset into the full file size for the first byte sent as data.

Parameter List Length
This field specifies the data length of the buffer that is being transferred. Microcode may be written in 64 KB blocks. Each data block length is specified until all data blocks have been written. The last data block length may contain less than 64 KB.

WRITE BUFFER (3Bh) Status

After processing the WRITE BUFFER command, the 3583 Library returns a status byte as follows:

Good The library processed the command without errors.

Busy The library processed a command for a different initiator or a motion command is in the process of being aborted.

Reservation Conflict
The library never returns Reservation Conflict status when it is reserved by a different initiator.

Check Condition
The library returned a Check Condition status for the following reasons:

- The message system is enabled and a message error occurred during the command processing.
- The library detects an unrecoverable parity error while receiving the CDB.
- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library detected an unrecoverable hardware error.
- A reserved bit is set to 1 or a parameter is invalid in the CDB (see Table 86).

Table 86. Invalid Parameters in the CDB for the WRITE BUFFER Command

Error	Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer
Flash Erase Fail	04h	3Fh	80h	0	0	0	0	0000h
Flash Program Fail	04h	3Fh	84h	0	0	0	0	0000h
Attempt to Write a Read Only Buffer	05h	24h	80h	0	0	0	0	0000h
Parameter Checksum Fail	05h	26h	80h	0	0	0	0	0000h

Appendix A. General SCSI Information

The small computer systems interface (SCSI) is a standard that enables hosts to communicate with peripheral devices. The 3583 Library is considered a peripheral device. The components of the SCSI interface include the initiator (host), target (library), and physical connection (SCSI bus) between the initiator and target devices.

Initiator Operation

A SCSI host adapter card in a host acts as the initiator of SCSI operations. The host can initiate commands and messages, and send data to the target. The initiator can also receive messages, data, and status from the target.

Target Operation

The target medium changer (tape drive) receives commands, messages, and data from the host initiator. Because the 3583 Library cannot act as an initiator, it cannot perform the following:

- Generate unsolicited interrupts to the host
- Initiate its own SCSI commands
- Assert bus resets

The 3583 Library responds with data, messages, and status.

SCSI Bus

The SCSI cables that connect the host initiator and target peripheral devices form the SCSI bus. The bus provides the pathway for exchanges between the host initiator and the target peripheral. Up to 16 devices, either single ended or differential, connect to the bus. The SCSI bus must be terminated at both ends.

Element Addressing

A host initiator references a storage location with element addresses. The 3583 Library has a default addressing scheme, which is shown in Table 87. Storage slots are addressed from the top to bottom, column by column. Drives are addressed from bottom to top. The I/O station is addressed from top to bottom. All addresses must be consecutive within their type.

Table 87. Default Addressing Scheme for SCSI Elements

Addressing Range	Element Definition
4096 to 4168 (1000h to 1048h)	Storage slot (Storage Elements)
16 to 28 (10h to 1Ch)	I/E station (Import/Export Elements)
256 to 262 (100h to 106h)	Tape drive (Data Transport Elements)
1 (01h)	Picker (Medium Transport Element)

SCSI Communications

Communications to and from the 3583 Library are implemented across the SCSI bus. Table 88 describes each bus phase.

Bus Phases

The 3583 Library conforms to the bus state transition table (*Phase Sequences*) of the SCSI-2 standard. Bus phases determine the type and direction of information on the interface. Table 88 lists the phases of the bus.

Table 88. Phases of the SCSI Bus

Phase	Description
Bus Free	Indicates that the bus is idle.
Arbitration	Allows devices to compete for bus access.
Selection	Allows the host initiator to select the target destination for communication.
Reselection	Allows the target to reconnect to the host initiator after a disconnect.
Transfer	The 3583 Library supports asynchronous data transfer phases with differential and single-ended communications. Odd parity is generated during all information-transfer phases from the library. Parity is checked during all information-transfer phases to the library. Parity checking can be disabled. The information transfer phases are: **Message In/Message Out Phases** Messages that manage the physical path between the host initiator and target destination. Message In is a message to the host initiator; Message Out is a message to the target destination. **Command Out Phase** A command from the host initiator to the target destination. **Data In/Data Out Phases** Data that is sent from the target to the host initiator (Data In) or data that is sent from the host initiator to the target destination (Data Out). **Status In Phase** A target status byte response to a host-initiated command.

SCSI Message System

The SCSI message system (Message In/Message Out) allows communication between an initiator and a target for the purpose of physical path management. The 3583 Library supports the messages shown in Table 89 (the messages travel between the host and the library, and do not appear on the library's display).

When the host sends an ATN signal over the SCSI bus, when parity detection is enabled, and when the library detects a parity error during an information transfer bus phase, the library switches to the Message In phase and sends a Restore Pointers message prior to responding to the ATN.

Table 89. Supported SCSI Messages

Type of Message and Description	Operation Code in Message	Direction of Data To and From the Initiator
COMMAND COMPLETE Sent from a target to an initiator to indicate that a command was completed and that valid status was sent to the initiator.	00h	In
SAVE DATA POINTERS Following a Data In or Data Out phase, a message that is issued before every disconnect message. The message is not sent when disconnecting after a Command Descriptor Block (CDB) that did not transfer data.	02h	In
RESTORE POINTERS Sent from a target to direct the initiator to continue sending data.	03h	In
DISCONNECT Sent by a target to inform an initiator that the present data transfer will be suspended. The target reselects the initiator at a later time to continue the current operation.	04h	In
INITIATOR DETECTED ERROR Sent from an initiator to inform a target that an error occurred. This allows the target to retry the operation.	05h	Out
ABORT Sent from the initiator to the target to clear the current or pending operation. The target goes directly to the BUS FREE phase after receiving this message.	06h	Out
MESSAGE REJECT Sent from the initiator or target to indicate that the last message received was inappropriate or not implemented.	07h	Both
NO-OP In response to the target's request for a message, sent from the initiator to inform the target that no message is valid.	08h	Out
MESSAGE PARITY ERROR Sent from the initiator to the target to indicate that one or more bytes in the last message received contained a parity error.	09h	Out

Table 89. Supported SCSI Messages (continued)

Type of Message and Description	Operation Code in Message	Direction of Data To and From the Initiator
BUS DEVICE RESET Sent from an initiator to clear all commands, data, and status at the target. When the target recognizes this message, it aborts the command currently being executed, proceeds to the BUS FREE state, and executes a hard reset.	0Ch	Out
IDENTIFY Sent by the initiator or the target to establish (or re-establish) the logical connection path between an initiator and target for a particular logical unit. The 3583 Library only supports a logical unit of 0.	80h or C0h	Both

SCSI Operations

The following sections describe SCSI communication behavior for the 3583 Library.

Parity Checking

To enable parity checking on information received by the 3583 Library, set the parity bit by using the operator panel.

Disconnection

The 3583 Library disconnects from the SCSI bus whenever a command requires a lengthy time to complete. The library receives permission to disconnect from the initiator. The initiator grants permission by:

- Selecting the library with the Attention signal
- Sending an Identify message with the DiscPriv bit set to 1

After the command processing completes, the library reselects the initiator and sends the Identify message.

Resetting the Tape Library

The 3583 Library is reset by a Power-On Reset (POR) or a SCSI Device Reset.

Power-On Behavior

- The library goes to the Bus Free phase.
- The checksum of the flash EEPROM is validated.
- All library parameters are loaded with saved or default values.
- A Power-On Self Test is performed.
- Within 10 seconds of power-on, the 3583 Library responds to the SCSI bus.

SCSI Device Reset Behavior

- The library goes to the Bus Free phase.
- All library parameters are returned to their saved or default values.
- A Self Test is performed.
- Within 250 milliseconds, the 3583 Library responds to the SCSI bus.

Other SCSI Functionality

Unit Attention Condition

Unit Attentions are reported under the following circumstances:

- A reset occurred.
- An update to the firmware (microcode) completes.
- A library door closes.
- The I/O station closes.
- The element status possibly changed.

Appendix B. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area.

Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Some states do not allow disclaimer of express or implied warranties in certain transactions; therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been

estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

If you are viewing this information in softcopy, the photographs and color illustrations may not appear.

How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have comments or suggestions for improving this publication, you can send us comments electronically by using these addresses:

- Internet: starpubs@vnet.ibm.com (or starpubs at vnet.ibm.com)
- IBMLink from U.S.A.: STARPUBS at SJEVM5
- IBMLink from Canada: STARPUBS at TORIBM
- IBM Mail Exchange: USIB3VVD at IBMMAIL
- Fax from U.S.A., Canada, and other countries: 520 799-2906

You can also mail your comments to:

IBM Corporation
Information Development, Department GZW
9000 South Rita Road
Tucson, AZ 85744-0001 U.S.A.

Trademarks

The following are trademarks of International Business Machines Corporation in the United States, other countries, or both:

- ADSTAR
- AIX
- AS/400
- IBM
- OS/400
- RS/6000/SP
- RS/6000

The following are U. S. trademarks of Hewlett-Packard Company, International Business Machines Corporation Corporation, and Seagate Technology.

- Linear Tape-Open
- LTO
- Ultrium Tape Drive

Intel is a registered trademark of Intel Corporation in the United States, or other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are registered trademarks of Microsoft Corporation in the United States, or other countries, or both.

Solaris and Sun are registered trademarks of Sun Microsystems Incorporated.

Other company, product, and service names may be trademarks or service marks of others.

Index

Numerics

A

B

C

D

E

F

G

H

I

L

M

N

O

Readers' Comments — We'd Like to Hear from You

3583 Ultrium Scalable Tape Library
SCSI Reference

Publication No. WB1106-00

Overall, how satisfied are you with the information in this book?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall satisfaction	☐	☐	☐	☐	☐

How satisfied are you that the information in this book is:

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Accurate	☐	☐	☐	☐	☐
Complete	☐	☐	☐	☐	☐
Easy to find	☐	☐	☐	☐	☐
Easy to understand	☐	☐	☐	☐	☐
Well organized	☐	☐	☐	☐	☐
Applicable to your tasks	☐	☐	☐	☐	☐

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? ☐ Yes ☐ No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name _____ Address _____

Company or Organization _____

Phone No. _____

Readers' Comments — We'd Like to Hear from You
WB1106-00

Cut or Fold
Along Line

Fold and Tape **Please do not staple** Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
Information Development
Department 61C
9000 South Rita Road
Tucson, Arizona 85775-4401

Fold and Tape **Please do not staple** Fold and Tape

Cut or Fold
Along Line

Printed in the United States of America
on recycled paper containing 10%
recovered post-consumer fiber.

Spine information:

3583 Ultrium Scalable Tape Library

IBM 3583 Library