

3580 Ultrium Tape Drive



Setup, Operator, and Service Guide

3580 Ultrium Tape Drive



Setup, Operator, and Service Guide

Note

Before using this information and the product it supports, read the information in “Safety and Environmental Notices” on page ix and “Notices” on page 79.

First Edition (August 2000)

This edition applies to the IBM® 3580 Ultrium Tape Drive Setup, Operator, and Service Guide and to all subsequent releases and modifications until otherwise indicated in new editions.

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Contents

Figures	v
Tables	vii
Safety and Environmental Notices	ix
Danger Notice	ix
Caution Notice	ix
Attention Notice	xi
Performing the Safety Inspection Procedure	xi
End of Life (EOL) Plan	xi
Preface	xiii
Related Publications	xiv
Chapter 1. Introduction	1
Supported Servers and Operating Systems	2
Supported Device Drivers	2
Specifications	3
Chapter 2. Installing the 3580 Tape Drive	5
Step 1. Unpacking the Tape Drive	5
Step 2. Using the Inventory Checklist	5
Step 3. Inspecting the Power Cord and Outlet	7
Step 4. Setting the SCSI ID	7
Step 5. Positioning the Tape Drive	7
Step 6. Connecting Power	8
Step 7. Running the Fast Read/Write Test	8
Step 8. Installing the SCSI Host Adapter Card (if required)	10
Step 9. Installing Device Drivers	11
Step 10. Connecting the SCSI Bus Cable	11
Step 11. Configuring the 3580 Tape Drive to the Host	13
Chapter 3. Operating the 3580 Tape Drive	15
Power Switch	15
Unload Button	16
Status Light	17
Message Display	18
Single-Character Display	18
Inserting a Tape Cartridge	19
Removing a Tape Cartridge	20
Performing Diagnostic and Maintenance Functions	20
Updating the Drive Firmware	21
Cleaning the Drive Head	21
Cleaning the 3580 Tape Drive	21
Chapter 4. Using the Media	23
Data Cartridge	24
Guidelines for Using Bar Code Labels	25
Cleaning Cartridge	25
Setting the Write-Protect Switch	26
Reattaching a Leader Pin	27
Handling the Cartridges	32
Environmental and Shipping Specifications for Tape Cartridges	33

Disposing of Tape Cartridges	33
Ordering Media Supplies	34
Ordering Bar Code Labels	34
Chapter 5. Troubleshooting	35
Procedure 1	36
Procedure 2	37
Procedure 3	37
Appendix A. Codes on the Single-Character Display	39
Appendix B. Performing Diagnostic and Maintenance Functions	41
Placing the Tape Drive in Maintenance Mode	43
Performing a Diagnostic or Maintenance Function	44
Function Code 1: Run Tape Drive Diagnostics	44
Function Code 2: Update Tape Drive Firmware from FMR Tape	45
Function Code 3: Create FMR Tape	47
Function Code 4: Force a Drive Dump	48
Function Code 5: Copy the Drive Dump to Tape (at Beginning of Tape)	49
Function Code 6: Run SCSI Wrap Test	51
Function Code 7: Run RS-422 Wrap Test	52
Function Code 8: Unmake FMR Tape	52
Function Code 9: Display Error Code Log	54
Function Code A: Clear Error Code Log	55
Function Code C: Insert Cartridge into Tape Drive	55
Function Code E: Test Cartridge & Media	56
Function Code F: Fast Read/Write Test	57
Function Code H: Test Head	59
Function Code 0: Exit Maintenance Mode	61
Appendix C. Manually Removing a Tape Cartridge	63
Appendix D. SCSI Commands	67
Appendix E. TapeAlert Flags	69
Appendix F. Power Cords	73
Appendix G. Parts Lists	77
Parts for 3580 Tape Drive with LVD/SE SCSI Interface	77
Parts for 3580 Tape Drive with HVD/DIFF SCSI Interface	78
Notices	79
How to Send Your Comments	80
Trademarks	81
Electronic Emission Notices	81
IBM 3580 Ultrium Tape Drive	81
Statement of Limited Warranty	84
Glossary	87
Index	95

Figures

1. The IBM 3580 Tape Drive	1
2. Components of the 3580 Tape Drive	6
3. Example of Connecting One SCSI Device to the Host	12
4. Example of Connecting Multiple SCSI Devices to the Host	13
5. Front View of the 3580 Tape Drive	15
6. Inserting a Cartridge into the 3580 Tape Drive	19
7. The IBM LTO Ultrium Data Cartridge	23
8. Sample Bar Code Label on the LTO Ultrium Tape Cartridge	24
9. Setting the Write-Protect Switch	26
10. Attaching the Leader Pin Attach Tool to the Cartridge	28
11. Winding the Tape Out of the Cartridge	29
12. Removing the C-Clip From the Leader Pin	30
13. Attaching the Leader Pin to the Tape	31
14. Flowchart for Analyzing Maintenance Problems.	35
15. Checking the Setting on the SCSI Address Switch	36
16. Removing the Screw from the Access Hole	63
17. Determining Whether the Tape is Broken	64
18. Moving the Leader Pin Block into the Cartridge.	65
19. Types of Receptacles	75

Tables

1. Specifications for the 3580 Tape Drive	3
2. Functions That the Unload Button Performs	16
3. Meaning of Status Light Activity	17
4. Environment for Operating, Storing, and Shipping the LTO Ultrium Tape Cartridge	33
5. Ordering Media Supplies for the 3580 Tape Drive	34
6. Codes on the Single-Character Display of the 3580 Tape Drive	39
7. Diagnostic and Maintenance Functions of the 3580 Tape Drive	41
8. Power Cable Information	74
9. Parts for the 3580 Tape Drive with LVD/SE SCSI Interface	77
10. Parts for the 3580 Tape Drive with HVD/DIFF SCSI Interface	78

Safety and Environmental Notices

When using this product, observe the danger, caution, and attention notices contained in this guide. The notices are accompanied by symbols that represent the severity of the safety condition.

Most danger or caution notices contain a reference number (RSFTDxxx or RSFTCxxx). Use the reference number to check the translation in *Translated Safety Notices for External Storage Devices, SA26-7197*.

The sections that follow define each type of safety notice and give examples.

Danger Notice

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people. A lightning bolt symbol always accompanies a danger notice to represent a dangerous electrical condition. A sample danger notice follows:




DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)

Caution Notice

A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition. A caution notice can be accompanied by one of several symbols:

If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
 Class II	A hazardous condition due to the use of a laser in the product. Laser symbols are always accompanied by the classification of the laser as defined by the U. S. Department of Health and Human Services (for example, Class I, Class II, and so forth).
	A hazardous condition due to mechanical movement in or around the product.

If the symbol is...	It means....
	<p>A hazardous condition due to the weight of the unit. Weight symbols are accompanied by an approximation of the product's weight.</p>

Sample caution notices follow:



CAUTION:
The controller card contains a lithium battery. To avoid possible explosion, do not burn, exchange, or charge the battery. Discard the controller card as instructed by local regulations for lithium batteries. (RSFTC228)



CAUTION:
Do not attempt to use the handle on the module to lift the entire device (module and enclosure) as a unit. First remove the module; then, use two hands to lift the enclosure. (72XXC356)



CAUTION:
This product complies with the performance standards set by the U.S. Food and Drug Administration for a Class II and IEC825 Laser Product. Avoid prolonged staring into the laser beam.



CAUTION:
The weight of this part or unit is between 18 and 32 kilograms (39.7 and 70.5 pounds). It takes two persons to safely lift this part or unit. (RSFTC204)



CAUTION:
This assembly contains mechanical moving parts. Use care when servicing this assembly.

Attention Notice

An attention notice indicates the possibility of damage to a program, device, or system, or to data. An exclamation point symbol may accompany an attention notice, but is not required. Sample attention notices follow:



Attention: If you use a power screwdriver to perform this procedure it could destroy the tape.

Attention: Do not operate the 3580 Tape Drive in a poor air-quality environment.

Performing the Safety Inspection Procedure

Before you service the 3580 Tape Drive, perform the following safety inspection procedure:

1. Stop all activity on the SCSI bus.
2. Turn off the power to the tape drive.
3. Disconnect the SCSI cable and check the SCSI bus terminator for damage.
4. Unplug the tape drive's power cord from the electrical outlet.
5. Check the tape drive's power cord for damage, such as a pinched, cut, or frayed cord.
6. Check the tape drive's SCSI bus (signal) cable for damage.
7. Check the cover of the tape drive for sharp edges, damage, or alterations that expose its internal parts.
8. Check the cover of the tape drive for proper fit. It should be in place and secure.
9. Check the product label on the bottom of the tape drive to make sure that it matches the voltage at your outlet.

End of Life (EOL) Plan

This box is a purchased unit. Therefore, it is the sole responsibility of the purchaser to dispose of it in accordance with local laws and regulations at the time of disposal.

This unit contains recyclable materials. The materials should be recycled where facilities are available and according to local regulations. In some areas IBM may provide a product take-back program that ensures proper handling of the product. For more information, contact your IBM representative.

Preface

This guide describes how to install and use the IBM 3580 Ultrium Tape Drive. It contains the following chapters:

“Chapter 1. Introduction” on page 1 describes the 3580 Tape Drive, discusses supported servers, operating systems, and device drivers, and lists hardware specifications.

“Chapter 2. Installing the 3580 Tape Drive” on page 5 tells how to unpack and set up the 3580 Tape Drive.

“Chapter 3. Operating the 3580 Tape Drive” on page 15 describes the power switch, unload button, and status light on the 3580 Tape Drive. It explains the function of the message display and the single-character display. It tells how to insert and remove a tape cartridge, describes methods of updating drive firmware, and explains how to clean the tape drive. It also lists the diagnostic and maintenance functions that the 3580 Tape Drive can perform.

“Chapter 4. Using the Media” on page 23 describes the types of tape cartridges to use in the 3580 Tape Drive and defines the conditions for storing and shipping them. It also tells how to handle the cartridges, how to set a cartridge’s write-protect switch, and how to order additional cartridges.

“Chapter 5. Troubleshooting” on page 35 gives tips for solving problems with the 3580 Tape Drive and includes a flowchart that analyzes when the tape drive requires maintenance.

“Appendix A. Codes on the Single-Character Display” on page 39 describes the error and informational codes that appear on the single-character display of the 3580 Tape Drive.

“Appendix B. Performing Diagnostic and Maintenance Functions” on page 41 describes the procedures that you can use to identify and correct problems with the 3580 Tape Drive.

“Appendix C. Manually Removing a Tape Cartridge” on page 63 gives the procedure for removing a stuck tape cartridge from the 3580 Tape Drive.

“Appendix D. SCSI Commands” on page 67 lists SCSI commands that are supported by the 3580 Tape Drive. Unsupported commands are also listed.

“Appendix E. TapeAlert Flags” on page 69 lists TapeAlert messages that are supported by the 3580 Tape Drive and that may aid during problem determination.

“Appendix F. Power Cords” on page 73 provides information about the power cords that are used in different countries.

“Appendix G. Parts Lists” on page 77 lists parts and supplies that are used by the 3580 Tape Drive.

Store this guide with your server’s manuals.

Related Publications

- *IBM 3580 Ultrium Tape Drive Quick Reference*, GX35-5060, illustrates how to configure and operate the 3580 Ultrium Tape Drive.
- *IBM 3580, TX200, and T200 Ultrium Tape Drive SCSI Reference*, WB1109, gives information about the supported SCSI commands and protocol that govern the behavior of the SCSI interface for the IBM 3580 Ultrium Tape Drive, the StorageSmart by IBM Ultrium External Tape Drive TX200 Machine Type 3585, and the StorageSmart by IBM Ultrium Tape Drive T200.
- *StorageSmart by IBM Ultrium External Tape Drive TX200 and Ultrium Tape Drive/IBM 3580 Ultrium Tape Drive SCSI Reference*, WB1109, provides the supported SCSI commands and protocol that govern the behavior of the SCSI interface for the StorageSmart by IBM Ultrium External Tape Drive TX200, StorageSmart by IBM Ultrium Tape Drive, and IBM 3580 Ultrium Tape Drive.
- *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.
- *Translated Safety Notices for External Devices*, SA26-7197, provides translations of danger and caution notices.

Chapter 1. Introduction

The IBM 3580 Ultrium Tape Drive is a high-performance, high-capacity data-storage device that connects to and provides additional storage for supported hosts. Designed to perform unattended backups as well as to retrieve and archive files, the 3580 Tape Drive features:

- Native storage capacity of 100 GB per cartridge (200 GB at 2:1 compression)¹
- Native sustained data transfer rate of 15 MB per second (30 MB at 2:1 compression)²
- Burst data transfer rate of 40 MB per second

The 3580 Tape Drive is equipped internally with the IBM Ultrium Tape Drive.

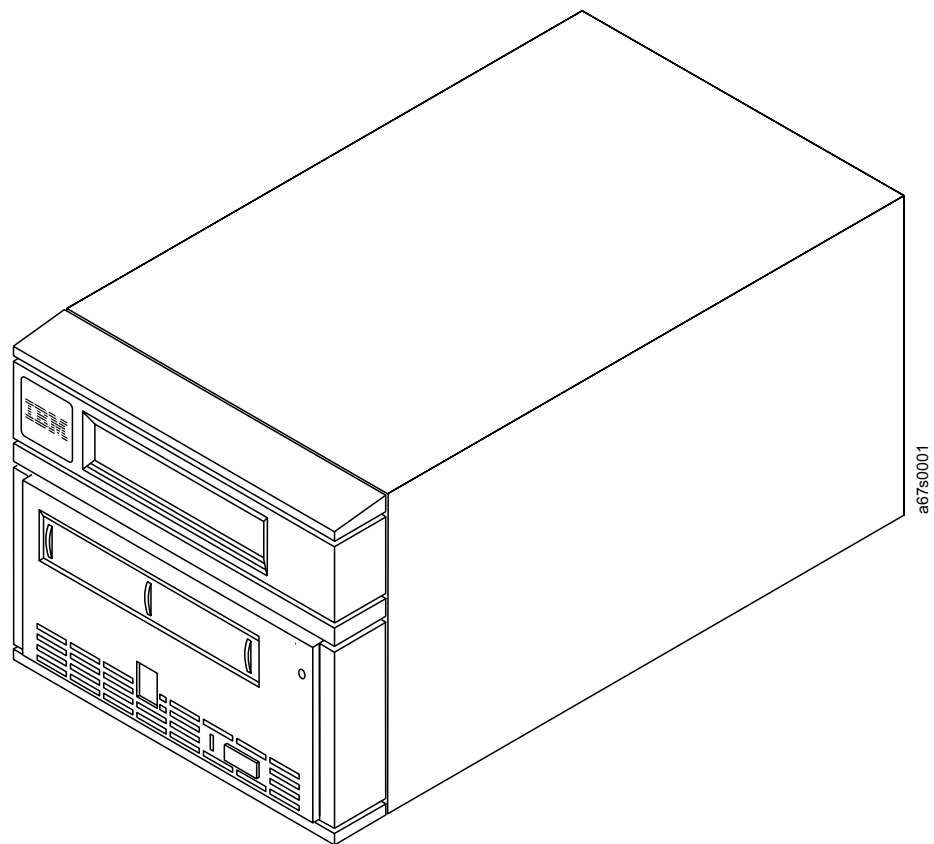


Figure 1. The IBM 3580 Tape Drive

Two models of the 3580 Tape Drive are available and vary according to the type of Small Computer Systems Interface (SCSI) each uses to communicate with the host:

- Model L11 uses the Ultra2, Low Voltage Differential/Single Ended (LVD/SE) interface
- Model H11 uses the Ultra, High Voltage Differential (HVD/DIFF) interface

1. 1 GB = one gigabyte or 1 000 000 000 bytes

2. 1 MB = one megabyte or 1 000 000 bytes

Supported Servers and Operating Systems

The 3580 Tape Drive 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/1to>.

Attachments to the 3580 Tape Drive include (but are not limited to) the following:

Server

IBM AS/400®
IBM RS/6000® and RS/6000 SP
HP
Sun® SPARC™
Intel®-compatible servers

Operating System

IBM OS/400®
IBM AIX®
Hewlett-Packard HP-UX
Sun® Solaris®
Microsoft® Windows NT® and Windows 2000®

Supported Device Drivers

IBM maintains the latest levels of device drivers and driver documentation for the 3580 Tape Drive on the Internet. You can access this material from your browser or via 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/devdrv>
 - <ftp://207.25.253.26/storage/devdrv>
- Using an IBM FTP site, enter the following specifications:
 - FTP site: [ftp.software.ibm.com](ftp://ftp.software.ibm.com)
 - IP Addr: 207.25.253.26
 - Userid: anonymous
 - Password: (use your current e-mail address)
 - Directory: /storage/devdrv

IBM provides PostScript- and PDF-formatted versions of its documentation in the /storage/devdrv 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*.

Device drivers for each supported server are beneath /storage/devdrv/ 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

The following are specifications for the 3580 Tape Drive. Specifications for tape cartridges are given in “Environmental and Shipping Specifications for Tape Cartridges” on page 33.

Table 1. Specifications for the 3580 Tape Drive

Physical Specifications			
Specification	Dimensions		
Width	17.1 cm (6.74 in.)		
Length	33.3 cm (13.11 in.)		
Height	14.6 cm (5.75 in.)		
Weight	6.59 kg (14.3 lbs)		
Power Specifications			
AC line voltage	100 to 240 V _{ac}		
Line frequency	50 to 60 Hz		
Line current at 100 V _{ac}	1.0 A		
Line current at 240 V _{ac}	0.5 A		
Other Specifications			
Maximum altitude	2500 m (8202 ft)		
Environmental 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)
Relative humidity	20 to 80%	10 to 90%	10 to 90%
Maximum wet bulb temperature	26°C (79°F)	Noncondensing	Noncondensing

Chapter 2. Installing the 3580 Tape Drive

To install the 3580 Tape Drive, complete the following steps.



DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)

Step 1. Unpacking the Tape Drive

- ___ 1. Unpack the 3580 Tape Drive.
- ___ 2. Inspect the 3580 Tape Drive for shipping damage. If there is damage, do not install the tape drive. Report the damage immediately by contacting your place of purchase.

Step 2. Using the Inventory Checklist

Ensure that you have received the following items:

- ___ 1. Power cord (for the appropriate cord for your country, see "Appendix F. Power Cords" on page 73)
- ___ 2. IBM LTO Ultrium Data Cartridge
- ___ 3. IBM LTO Ultrium Cleaning Cartridge
- ___ 4. Single-connector SCSI wrap tool
- ___ 5. Device driver kit that includes:
 - CD that contains the device driver, the *IBM Ultrium Device Drivers Installation and User's Guide*, and the *IBM Ultrium Device Drivers Programming Reference*
 - Published copy of the *IBM Ultrium Device Drivers Installation and User's Guide*
- ___ 6. A host-to-device SCSI bus (signal) cable and a terminator
- ___ 7. The *IBM 3580 Ultrium Tape Drive Quick Reference*
- ___ 8. The *IBM 3580 Ultrium Tape Drive Setup, Operator, and Service Guide* (this guide)
- ___ 9. The *Translated Safety Notices for External Devices* manual

- | | | | |
|----------|----------------------------|-----------|--------------------------|
| 1 | Message display | 6 | External SCSI connectors |
| 2 | Cartridge load compartment | 7 | Power receptacle |
| 3 | Single-character display | 8 | Power switch |
| 4 | Status light | 9 | SCSI address switch |
| 5 | Unload button | 10 | Serial number |

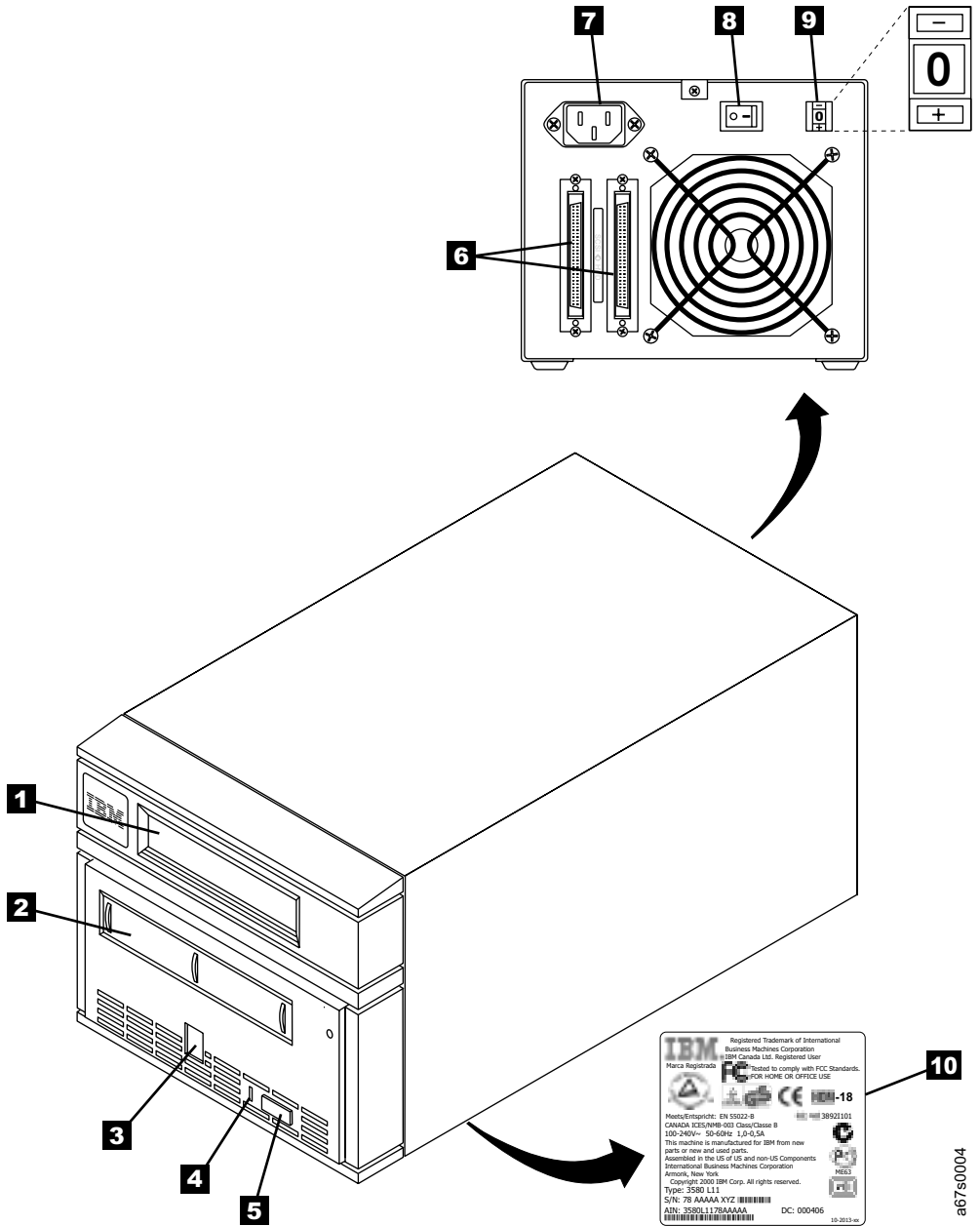


Figure 2. Components of the 3580 Tape Drive

Step 3. Inspecting the Power Cord and Outlet

- ___ 1. Inspect the power cord plug to ensure that it matches the power receptacle. If it does not match, see “Appendix F. Power Cords” on page 73 to determine the appropriate power cord.
- ___ 2. Ensure that the electrical outlets that you use are properly grounded and that the circuit breaker is turned on.

Step 4. Setting the SCSI ID

The SCSI ID is a unique address that identifies the 3580 Tape Drive to the host. To set the SCSI ID:

1. Refer to the following notes and decide what ID you want to assign to the 3580 Tape Drive.

Notes:

- a. The range of SCSI IDs is 0 through 15. The priority of SCSI IDs is: 7, 6, 5, 4, 3, 2, 1, 0, 15, 14, 13, 12, 11, 10, 9, 8.
 - b. Do not select an ID that is already in use by any device on the SCSI bus.
 - c. Do not select the SCSI ID of the SCSI host adapter card. The priority of this ID is usually higher than any device on the SCSI bus. Generally, the SCSI ID for the host adapter is set to 7.
2. Locate the SCSI address switch at the rear of the 3580 Tape Drive (see **9** in Figure 2 on page 6).
 3. With a small, pointed object (such as a ballpoint pen), press the + or – push button until the ID that you want displays on the switch.
 4. To activate the new SCSI ID, cycle the power (turn it off, then on again).

Step 5. Positioning the Tape Drive

Position the 3580 Tape Drive anywhere that is convenient to the host. The only restrictions are the length of the power cord and the length of the SCSI cable. Recommended locations are:

- Away from high-traffic areas, especially if the floor is carpeted.
- Out of computer rooms to avoid toner and paper dust. Do not store paper supplies next to any unit.
- Away from moving air, such as doorways, open windows, fans, and air conditioners.
- Off the floor.
- In a horizontal position.
- Where the tape cartridge can be easily inserted.

The 3580 Tape Drive should not be stacked. Do not place anything on top of the unit. To minimize any contamination from airborne particles, ensure that the cover is always closed.

Step 6. Connecting Power

- ___ 1. Ensure that the power switch on the 3580 Tape Drive is set to off by pressing 0 on the switch (see **8** in Figure 2 on page 6).
- ___ 2. Plug the power cord into the 3580 Tape Drive **7**, then plug the other end into a grounded electrical outlet.
- ___ 3. Because the 3580 Tape Drive may not complete the Power-On Self Test (POST) without SCSI termination, ensure that a terminator (or SCSI bus with termination) is connected to one of the two SCSI connectors at the rear of the unit.

Note: LVD/SE and HVD/DIFF terminators cannot be intermixed.

- ___ 4. Power-on the 3580 Tape Drive by pressing | on the power switch. The tape drive runs the POST, which checks all hardware except the drive head. During the test, the following message appears in the message display for 90 seconds:

```
Power On Self Test
In Progress
```

- If the test succeeds, the following message appears in the message display for 5 seconds:

```
Drive FW   xxxx
Display FW  xxxx
```

followed by:

```
Ultrium Tape Drive
Drive Empty
```

- If a failure occurs, the following message appears in the message display:

```
ERROR!
SELF TEST FAILURE
```

Contact your place of purchase for problem determination or machine replacement.

Step 7. Running the Fast Read/Write Test

The Fast Read/Write Test performs procedures to ensure that the drive can read from and write to tape. The diagnostic takes approximately 5 minutes to complete and loops continually until you halt it. To halt the diagnostic, press the unload button. The diagnostic will continue to the end of its loop and then stop.

Attention: For this test, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear).


```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **F** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Fast R/W Diagnostic
```

5. Press and hold the unload button for 2 or more seconds, then release it to select the function. Immediately after the following message displays, insert a scratch (blank) data cartridge that is not write-protected (or the tape drive exits maintenance mode).

```
Fast R/W Diagnostic
Load Scratch Tape
```

6. After you insert the scratch data cartridge, the flashing **C** in the single-character display changes to **F**, and one or more of the following messages display:

```
Fast R/W Diagnostic
Tape Loading   = = = >
```

```
Fast R/W Diagnostic
Locating      = = = >
```

```
Fast R/W Diagnostic
Rewinding     = = = >
```

followed by:

```
Fast R/W Diagnostic
Writing       = = = >
```

and:

```
Fast R/W Diagnostic
Reading       = = = >
```

The tape drive runs the tests.

Note: If you inserted an invalid or write-protected tape cartridge, **7** appears in the single-character display. The 3580 Tape Drive unloads the cartridge and exits maintenance mode.

- If no error is detected, the test will loop and begin again. To stop the loop, press and hold the unload button for several seconds. When the loop ends, 0 temporarily appears in the single-character display. The drive rewinds and unloads the tape, partially ejects the cartridge, then exits maintenance mode. The solid amber status light turns off and the following message displays:

Passed!
Tape Unloading

followed by:

Cartridge Unloading
In Progress

then:

Ultrium Tape Drive
Drive Empty

- If an error is detected, the status light flashes amber, a message similar to the following displays, and the tape drive posts an error code to the single-character display.

ERROR!
Drive/Media Error

To determine the error, locate the code in Table 6 on page 39. The tape drive unloads the tape cartridge, exits maintenance mode, and displays the following message:



Ultrium Tape Drive
Drive Empty

Note: To reset the drive after an error occurs, cycle power (turn it off, then on again).

7. Power-off the 3580 Tape Drive.

Step 8. Installing the SCSI Host Adapter Card (if required)

If there are no other devices attached to your host, you may need to install a SCSI host adapter card in the host. To determine whether your host needs an LVD/SE or HVD/DIFF SCSI host adapter card, examine the label between the two SCSI connectors at the rear of the 3580 Tape Drive:

- If  appears on the label, your host needs an LVD/SE SCSI host adapter card.
- If  appears on the label, your host needs an HVD/DIFF SCSI host adapter card.

To install an adapter, refer to the instructions that accompany it, as well as to the section about SCSI card installation in your host's documentation. For a list of supported adapters and required interposers, visit the Web at <http://www.ibm.com/storage/1to>.

Step 9. Installing Device Drivers

A device driver is host firmware that enables the 3580 Tape Drive to interact with a variety of hosts. Install device drivers for the 3580 Tape Drive as follows:

Note: If you intend to use the 3580 Tape Drive with a commercial software application, IBM recommends that you do not install any device driver from the CD that was shipped with the tape drive, as conflicts could occur over which driver controls the drive. Only install a device driver from the CD if the instructions from your commercial software application tell you to do so.

- If you intend to use the 3580 Tape Drive with an existing or new commercial software application (such as Tivoli Storage Manager, Computer Associates ARCserve/IT, VERITAS Backup Exec, or Legato NetWorker), refer to that application's installation instructions to install the device driver and configure the 3580 Tape Drive.
- If you do not intend to use the 3580 Tape Drive with a commercial software application, install the device driver from the CD that was shipped with the drive. Refer to the installation instructions in the *IBM Ultrium Device Drivers Installation and User's Guide*, which is on the CD and also included in published form. The CD contains drivers and installation instructions for supported operating systems.

Step 10. Connecting the SCSI Bus Cable

Note: 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; Ultra2 LVD SCSI buses have a bandwidth of 80 MB per second. The 3580 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, you should attach only 1 or 2 Model H11 3580 Tape Drives to an Ultra SCSI bus and from 2 to 4 Model L11 3580 Tape Drives to an Ultra2 SCSI bus.

The SCSI bus cable connects the 3580 Tape Drive to the host. You can connect the SCSI bus cable (and the terminator) to either SCSI connector on the 3580 Tape Drive.

- ___ 1. Ensure that the 3580 Tape Drive is powered off and plugged into the electrical outlet.
- ___ 2. If the host's SCSI bus is in operation, stop all activity on the bus that you are connecting to (for instructions about how to stop SCSI bus activity, see your host's documentation).

- ___ 3. Configure your 3580 Tape Drive similar to one of the following examples:
- **If the 3580 Tape Drive Is the Only Device On the SCSI Bus:** connect the SCSI bus cable to the host (see Figure 3). The cable can be up to 25 m (82 ft) long when the 3580 Tape Drive is the only device on the bus.

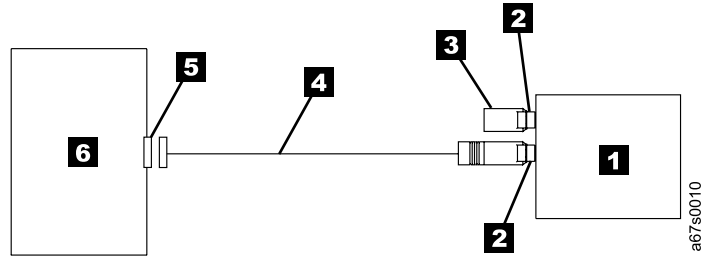


Figure 3. Example of Connecting One SCSI Device to the Host. The view is from the top.

- | | | | |
|----------|-----------------|----------|------------------------|
| 1 | 3580 Tape Drive | 5 | SCSI host adapter card |
| 2 | SCSI connectors | 6 | Host |
| 3 | Terminator | | |
| 4 | SCSI bus cable | | |

• **If the 3580 Tape Drive Is One of Multiple Devices On the SCSI Bus:**

connect the SCSI bus cable to the next device on the bus, move the terminator to the last device on the bus, then issue the host command to resume operation (see Figure 4). The maximum allowable length of your bus cable depends on the type of SCSI host adapter card (LVD/SE or HVD/DIFF) that is installed in your host:

- For a host with an LVD/SE SCSI host adapter card, use a cable with a total length of 12 m (39 ft) or less.
- For a host with an HVD/DIFF SCSI host adapter card, use a cable with a total length of 25 m (82 ft) or less.

To determine whether your host uses an LVD/SE or HVD/DIFF SCSI host adapter card, see “Step 8. Installing the SCSI Host Adapter Card (if required)” on page 10.

Attention: Do not mix LVD/SE and HVD/DIFF SCSI host adapters, tape drives, or terminators on the same bus, as they could become damaged.

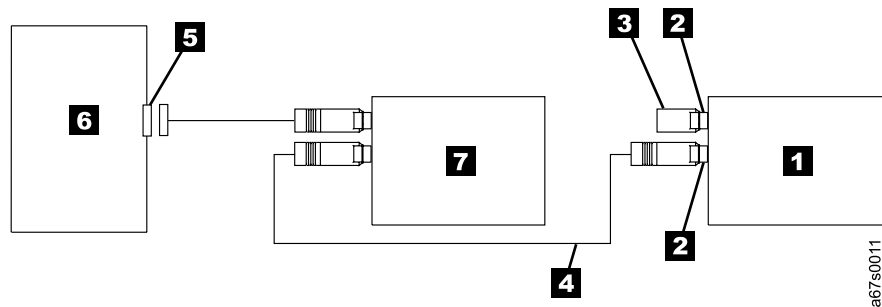


Figure 4. Example of Connecting Multiple SCSI Devices to the Host. The view is from the top.

- | | | | |
|----------|-----------------|----------|------------------------|
| 1 | 3580 Tape Drive | 5 | SCSI host adapter card |
| 2 | SCSI connectors | 6 | Host |
| 3 | Terminator | 7 | Another device |
| 4 | SCSI bus cable | | |

Step 11. Configuring the 3580 Tape Drive to the Host

- ___ 1. Power-on the 3580 Tape Drive.
- ___ 2. Refer to your host and application software manuals to configure the 3580 Tape Drive for use.

Chapter 3. Operating the 3580 Tape Drive

Power Switch



The power switch is a toggle switch that lets you turn the 3580 Tape Drive on or off. The switch is located on the rear panel (see **8** in Figure 2 on page 6). To power the tape drive on, push the power switch to |; to power it off, push the switch to 0. When you place the power switch in the off (0) position, the primary electrical power within the enclosure is still active. If you do not want electrical power to be present in the enclosure, unplug the 3580 Tape Drive's power cord from the receptacle at the rear of the drive (see **7** in Figure 2 on page 6).

When the 3580 Tape Drive is powered-on but idle, the status light is off (see **2** in Figure 5); when the unit is performing a function, the status light is on.

- | | | | |
|----------|---------------|----------|--------------------------|
| 1 | Unload button | 3 | Message display |
| 2 | Status light | 4 | Single-character display |

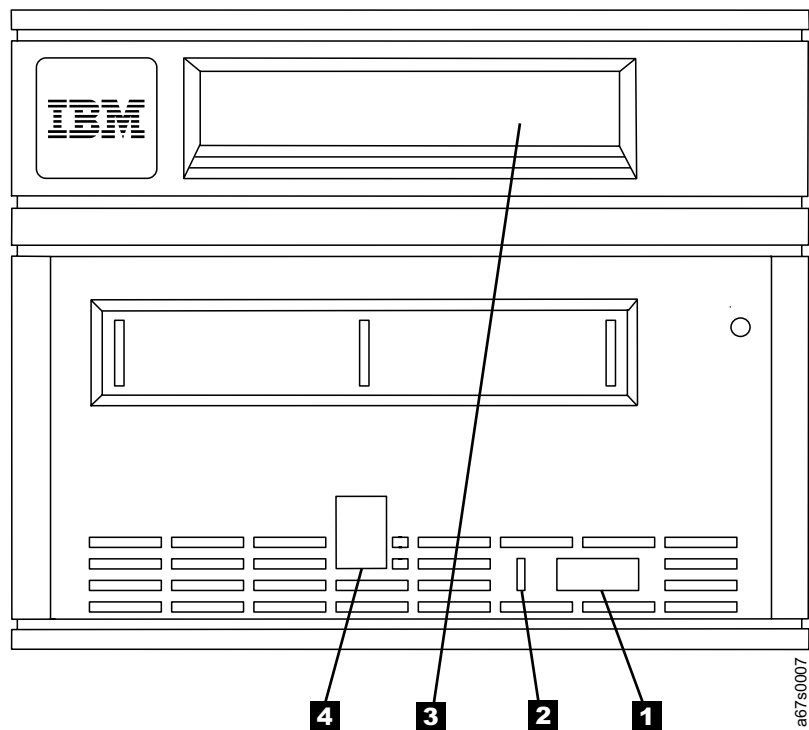


Figure 5. Front View of the 3580 Tape Drive

Unload Button

The unload push button (**1** in Figure 5 on page 15) enables you to perform several functions. Table 2 lists the functions and explains how to initiate them.

Note: If you press the Unload button during operation, the 3580 Tape Drive ends the command that is being processed, and unloads and ejects the tape cartridge.

Table 2. Functions That the Unload Button Performs

Function	How to Initiate the Function
Rewind the tape into a cartridge and eject the cartridge from the tape drive	Press the unload button once. Note: During a rewind and eject operation, the 3580 Tape Drive will not accept SCSI commands from the host.
Place the tape drive in maintenance mode	Ensure that the tape drive is unloaded. Then, within two seconds push the unload button 3 times. The drive is in maintenance mode when the status light becomes solid amber and 0 appears in the single-character display. Note: While in maintenance mode, the 3580 Tape Drive will not accept SCSI commands from the host.
Scroll through the maintenance functions	While in maintenance mode, push the unload button once per second to increment the characters on the single-character display by one. When you reach the character of the diagnostic or maintenance function that you want (see Table 7 on page 41), press and hold the unload button for 3 seconds.
Exit maintenance mode	Press the unload button once per second until 0 displays. Then press and hold the unload button for 3 seconds. The drive has exited maintenance mode when the status light becomes solid green and the single-character display becomes blank.

Status Light

The status light (**2** in Figure 5 on page 15) provides information about the state of the 3580 Tape Drive. The light can be green or amber, and (when lit) solid or flashing. Table 3 lists the conditions of the status light and provides an explanation of what each condition means.

Table 3. Meaning of Status Light Activity

Color and Condition of Status Light	Meaning
Off	The 3580 Tape Drive has no power or is powered off.
Green/Solid	The 3580 Tape Drive is powered on or (if a solid C displays simultaneously in the single-character display) needs cleaning.
Green/Flashing	The 3580 Tape Drive is reading from the tape, writing to the tape, rewinding the tape, locating data on the tape, loading the tape, or unloading the tape.
Amber/Solid	The 3580 Tape Drive is powering on or is in maintenance mode.
Amber/Flashing	One of the following applies: <ul style="list-style-type: none">• If the light flashes once per second, an error occurred and the tape drive or media may require service. Note the code on the single-character display, then go to Table 6 on page 39 for its meaning.• If the light flashes twice per second, the tape drive is updating firmware.• If the light flashes four times per second, the tape drive detected an error and is performing a firmware recovery. It resets automatically.

Message Display

The message display (**3** in Figure 5 on page 15) is a liquid crystal display (LCD) that provides information about the status of the 3580 Tape Drive and any error conditions. The message display consists of two rows, with 20 characters available in each row. During operation, the message display processor continuously queries the drive and updates the display with status messages. When in an idle (nonoperating) state, the tape drive displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

If the message display processor loses communication with the 3580 Tape Drive, the unit displays the following message (where xxxx equals the message that was present when the processor lost contact):

```
xxxx
...
```

Note: The preceding message may occasionally display during normal processing.

Single-Character Display

The 3580 Tape Drive features a light-emitting diode (LED) (**4** in Figure 5 on page 15) that presents a single-character code for:

- Error conditions and informational messages
- Diagnostic or maintenance functions (while in maintenance mode only)

Table 6 on page 39 lists the codes for error conditions and informational messages. If multiple errors occur, the code with the highest priority (represented by the lowest number) displays first. When the error is corrected, the code with the next highest priority displays, and so on until no errors remain.

Table 7 on page 41 lists the single-character codes that represent diagnostic or maintenance functions. To initiate a function you must be in maintenance mode. For more information, see “Appendix B. Performing Diagnostic and Maintenance Functions” on page 41.

The single-character display is blank during normal operation of the 3580 Tape Drive.

Inserting a Tape Cartridge

To insert a tape cartridge:

1. Ensure that the 3580 Tape Drive is powered-on.
2. Ensure that the write-protect switch (**1** in Figure 6) is properly set (see “Setting the Write-Protect Switch” on page 26).
3. Grasp the cartridge so that the write-protect switch faces you.
4. Slide the cartridge into the tape load compartment (see Figure 6). The cartridge loader draws the cartridge into the tape drive and the following message appears on the message display:

Cartridge Loading In Progress

followed by:

Volume Loaded DC
Ready...

The status light flashes green, then becomes solid green. The single-character display remains blank.

Notes:

- a. If the cartridge is already in an ejected position and you want to reinsert it, remove the cartridge then insert it again.
- b. If the cartridge is already loaded and you cycle the power (turn it off, then on), the drive ejects then reloads the cartridge.
- c. If you set the write-protect switch so that data cannot be written to it, the message reads as follows (where WP equals write protect):

Volume Loaded DC WP
Ready...

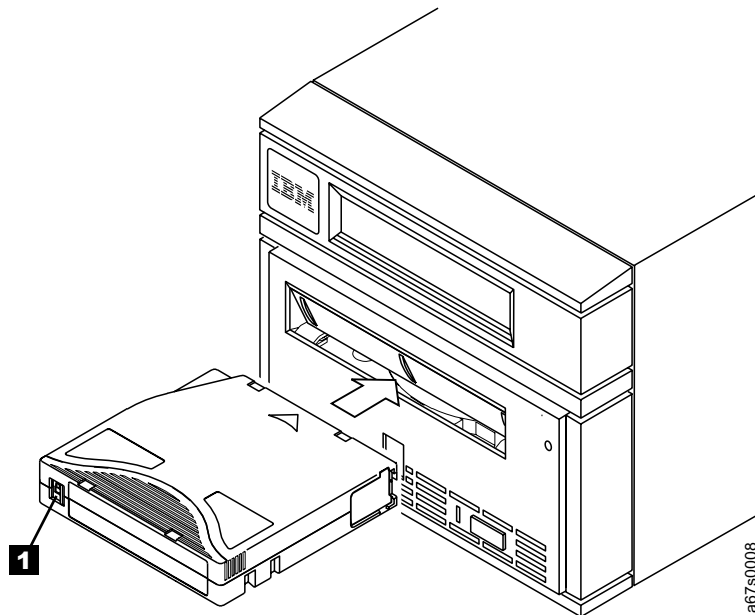


Figure 6. Inserting a Cartridge into the 3580 Tape Drive

Removing a Tape Cartridge

Attention: Remove any cartridge from the 3580 Tape Drive before turning off its power. Failure to remove a cartridge may result in damage to the cartridge or to the tape drive.

To remove a tape cartridge:

1. Ensure that the 3580 Tape Drive is powered on.
2. Press the unload button. The status light flashes green for approximately 30 seconds while the tape rewinds. The drive then partially ejects the cartridge, and the status light goes out.
3. After the cartridge partially ejects, grasp the cartridge and remove it.

If you are unable to remove the cartridge, see “Appendix C. Manually Removing a Tape Cartridge” on page 63.

Performing Diagnostic and Maintenance Functions

The 3580 Tape Drive can:

- Run tape drive diagnostics
- Update tape drive firmware from a field microcode replacement (FMR) tape
- Create an FMR tape
- Force a drive dump
- Copy the drive dump to tape
- Run a SCSI wrap test
- Convert an FMR tape to a blank tape
- Display the error code log
- Clear the error code log
- Test the tape cartridge and media
- Test the read/write function
- Test the drive head

To perform the preceding diagnostic and maintenance functions, you must place the tape drive in maintenance mode. For complete instructions about performing each operation, see “Appendix B. Performing Diagnostic and Maintenance Functions” on page 41.

Updating the Drive Firmware

You can update the drive firmware in the 3580 Tape Drive by:

- Obtaining the new firmware image and downloading it to the tape drive via the SCSI interface
- Loading the firmware from a field microcode replacement (FMR) tape cartridge

To update the firmware via the SCSI bus, obtain the new firmware image and the installation instructions by visiting the Web at <http://www.ibm.com/storage/1to..> For instructions about downloading firmware, see “Procedure 2” on page 37.

Visit the same Web site for information about obtaining an FMR tape. To load the firmware from the tape, see “Function Code 2: Update Tape Drive Firmware from FMR Tape” on page 45.

Cleaning the Drive Head

Attention: When cleaning the drive head in the 3580 Tape Drive, use the IBM LTO Ultrium Cleaning Cartridge (part number 08L9124). You may use another LTO cleaning cartridge, but it may not meet the standards of reliability established by IBM.

Clean the drive head in the 3580 Tape Drive whenever **C** displays on the single-character display and the status light is solid green. IBM does not recommend that you clean the drive head on a periodic basis; only when **C** displays.

To clean the head, insert the cleaning cartridge into the tape load compartment (see Figure 6 on page 19). The tape drive performs the cleaning automatically. The cleaning cycle takes less than 2 minutes. When the cleaning is finished, the drive ejects the cartridge.

Note: If you insert a cleaning cartridge when the drive does not need to be cleaned or if you insert a cleaning cartridge that has expired, the drive will automatically eject the cartridge.

The IBM LTO Ultrium Cleaning Cartridge is valid for 50 uses.

Cleaning the 3580 Tape Drive

Clean the exterior surface of the 3580 Tape Drive with a damp towel. If you use a liquid all-purpose cleaner, apply it to the towel. Do not spray the enclosure.

Chapter 4. Using the Media

The 3580 Tape Drive uses the:

- IBM LTO Ultrium Data Cartridge
- IBM LTO Ultrium Cleaning Cartridge

To ensure that your 3580 Tape Drive conforms to IBM's specifications for reliability, use only the preceding cartridges. You may use other LTO-certified data cartridges, but they may not meet the standards of reliability established by IBM. The IBM LTO Ultrium Data Cartridge cannot be interchanged with the media used in other IBM non-LTO Ultrium tape products.

In addition to using LTO Ultrium Tape Cartridges with up to 100 GB capacity, the 3580 Tape Drive reads and writes to certified LTO Ultrium Tape Cartridges that have capacities of 50 GB, 30 GB, and 10 GB.

Figure 7 shows the IBM LTO Ultrium Data Cartridge and its components.

- | | | | |
|----------|----------------------|----------|-----------------|
| 1 | Cartridge door | 4 | Label area |
| 2 | Leader pin | 5 | Insertion guide |
| 3 | Write-protect switch | | |

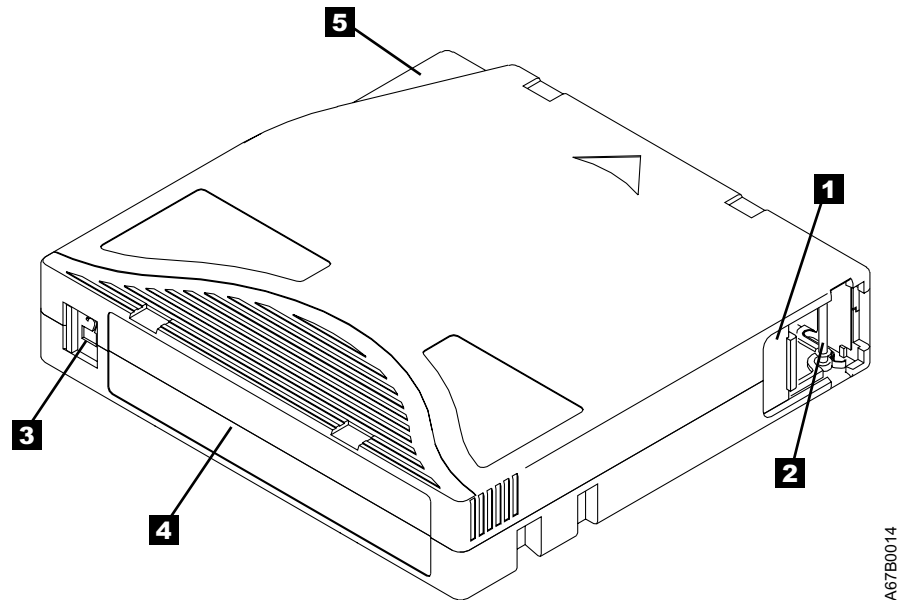


Figure 7. The IBM LTO Ultrium Data Cartridge

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Data Cartridge

The IBM LTO Ultrium Data Cartridge contains 1/2-inch, metal-particle tape that has a native data capacity of 100 GB, and a compressed capacity of 200 GB (assuming 2:1 compression). When processing the tape, the 3580 Tape Drive uses a linear, serpentine recording format, and reads and writes data on 384 tracks, 8 tracks at a time. The first set of 8 tracks is written from near the beginning of the tape to near the end of the tape. The head then repositions to the next set of 8 tracks for the return pass. This process continues until all tracks are written and the tape is full, or until all data is written.

The IBM LTO Ultrium Data Cartridge includes a Linear Tape-Open Cartridge Memory (LTO-CM) chip, which contains information about the cartridge and the tape (such as the name of the manufacturer that created the tape), as well as statistical information about the cartridge's use. Whenever you unload a tape cartridge, the 3580 Tape Drive writes any pertinent information to the cartridge memory.

The cartridge door (**1** in Figure 7 on page 23) protects the tape from contamination when the cartridge is out of the drive. Behind the door, the tape is attached to a leader pin **2**. When you insert the cartridge into the drive, a threading mechanism pulls the pin (and tape) out of the cartridge, across the drive head, and onto a non-removable takeup reel. The head can then read or write data from or to the tape.

The write-protect switch **3** prevents data from being written to the tape cartridge. On the IBM LTO Ultrium Data Cartridge, the switch is red; on the IBM LTO Ultrium Cleaning Cartridge, the switch is gray. The label area **4** provides a location for you to place a label. Affix only a bar code label or a human-writable label. When affixing a label, place it only in the recessed label area. A label that extends outside of the recessed area can cause loading problems in the internal drive or in the 3580 Tape Drive itself. The insertion guide **5** is a large, notched area that prevents you from inserting the cartridge incorrectly.

You can order tape cartridges with the bar code labels included, or you can order custom labels. To obtain tape cartridges and bar code labels, see "Ordering Media Supplies" on page 34. The bar code and bar code label must meet predefined specifications. To determine the specifications, visit the Web at <http://www.ibm.com/storage/lto> or contact your IBM Sales Representative.

The IBM LTO Ultrium Data Cartridge has a nominal cartridge life of 5000 load and unload cycles.

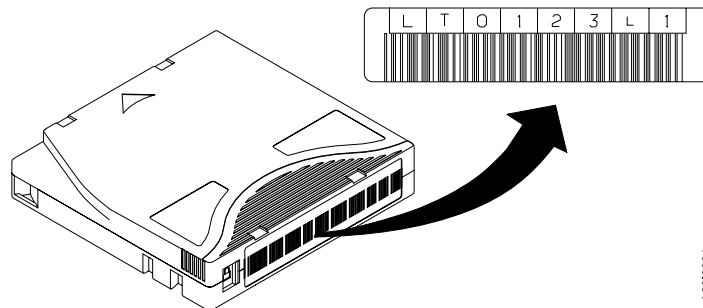


Figure 8. Sample Bar Code Label on the LTO Ultrium Tape Cartridge. The volume serial number (LTO123) and bar code are printed on the label.

Guidelines for Using Bar Code Labels

- Use only IBM-approved bar code labels.
- Do not reuse a label or reapply a used label over an existing label.
- Before you apply a new label, remove the old one by slowly pulling it at a right angle to the cartridge case. If there is glue residue on the cartridge, remove it by gently rubbing it with your finger; do not use a sharp object, water, or a chemical to clean the label area.
- Examine the label before you apply it to the cartridge. Do not use the label if it has voids or smears in the printed characters or bar code (an application software's inventory operation will take much longer if the bar code label is not readable).
- Position the label within the recessed label area (see **4** in Figure 7 on page 23).
- With light finger pressure, smooth the label so that no wrinkles or bubbles exist on its surface.
- Verify that the label is smooth and parallel, and has no roll-up or roll-over. The label must be flat to within 0.5 mm (0.02 in.) over the length of the label and must have no folds, missing pieces, or smudges.
- Do not place other machine-readable labels on other surfaces of the cartridge.

Cleaning Cartridge


With each 3580 Tape Drive, a specially labeled IBM LTO Ultrium Cleaning Cartridge is supplied to clean the drive heads. The drive itself determines when a head needs to be cleaned. It alerts you by displaying **C** on the single-character display and turning off the status light. To clean the head, insert the IBM LTO Ultrium Cleaning Cartridge into the tape load compartment (see Figure 6 on page 19). The tape drive performs the cleaning automatically. When the cleaning is finished, the drive ejects the cartridge.

Note: If you insert a cleaning cartridge when the drive does not need to be cleaned or if you insert a cleaning cartridge that has expired, the drive will automatically eject the cartridge.

To remove a cleaning cartridge, see "Removing a Tape Cartridge" on page 20. The IBM LTO Ultrium Cleaning Cartridge is valid for 50 uses. The cartridge's LTO-CM chip tracks the number of times that the cartridge is used.

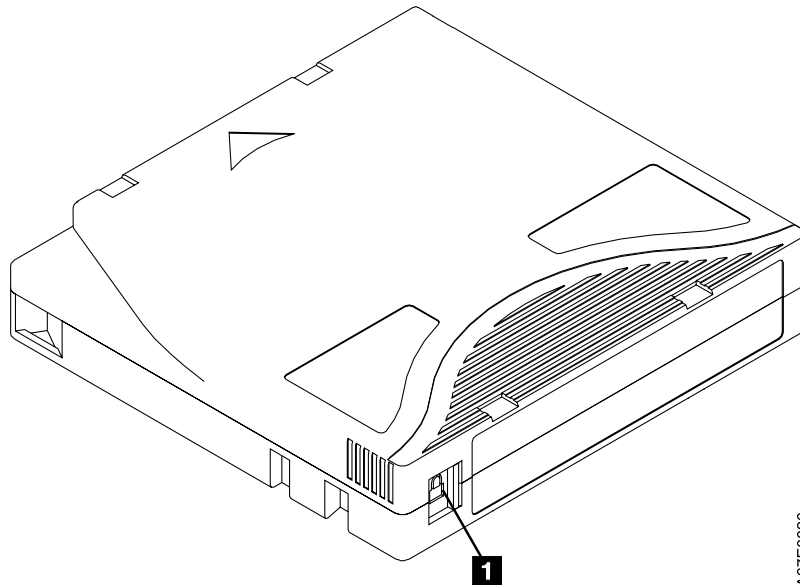
Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 9) determines whether you can write to the tape:

- If the switch is set to  data cannot be written to the tape.
- If the switch is set to  data can be written to the tape.

If possible, use your host's application software to write-protect your cartridges (rather than manually setting the write-protect switch). This allows the host software to identify a cartridge that no longer contains current data and is eligible to become a scratch cartridge. Do not write-protect scratch (blank) cartridges; the tape drive will not be able to write new data to them.

If you must manually set the switch, slide it left or right to the desired position.



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Figure 9. Setting the Write-Protect Switch

Reattaching a Leader Pin

If the leader pin detaches from the tape in your cartridge, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reattach it.

Note: Do not reattach the pin if you must remove more than 8 meters (26 feet) of leader tape; instead, contact your IBM Service Representative.

The Leader Pin Reattachment Kit contains three parts:

- **Leader pin attach tool** - A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** - A device that fits into the cartridge's hub and lets you wind the tape into and out of the cartridge.
- **Pin supplies** - Leader pins and C-clips.

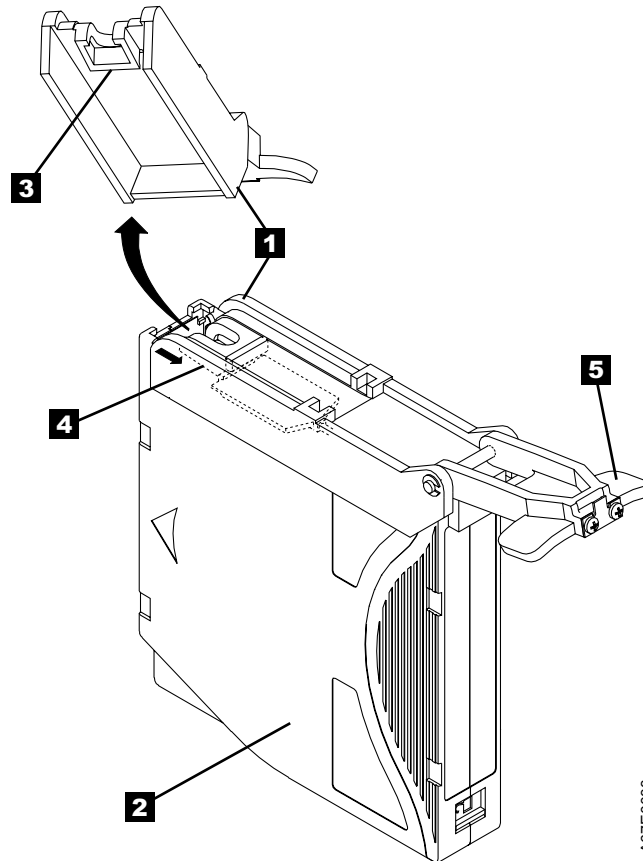
Attention:

- Use only the IBM Leader Pin Reattachment Kit to reattach the leader pin to the tape. Other methods of reattaching the pin will damage the tape, the drive, or both.
- Use this procedure on your tape cartridge only when the leader pin detaches from the magnetic tape and you must copy the cartridge's data onto another cartridge. Destroy the damaged cartridge after you copy the data. This procedure may affect the performance of the leader pin during threading and unloading operations.
- Touch only the end of the tape. Touching the tape in an area other than the end can damage the tape's surface or edges, which may interfere with read or write reliability.

The following procedure describes how to reattach a leader pin.

To reattach a leader pin by using the IBM Leader Pin Reattachment Kit:

1. Attach the leader pin attach tool (**1** in Figure 10) to the cartridge (**2**) so that the tool's hook (**3**) latches into the cartridge's door (**4**). Pull the tool back to hold the door open, then slide the tool onto the cartridge. Open the tool's pivot arm (**5**).



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Figure 10. Attaching the Leader Pin Attach Tool to the Cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (**1** in Figure 11) to the cartridge's hub (**2**) by fitting the tool's teeth between the teeth of the hub. Turn the tool clockwise until you can see the end of the tape inside the cartridge. Then, slowly turn the rewind tool counterclockwise to bring the tape edge toward the cartridge door.
3. Continue to turn the rewind tool counterclockwise until approximately 12.7 cm (5 in.) of tape hangs from the cartridge door. If necessary, grasp the tape and pull gently to unwind it from the cartridge.
4. Remove the rewind tool by pulling it away from the cartridge. Set the tool and the cartridge aside.

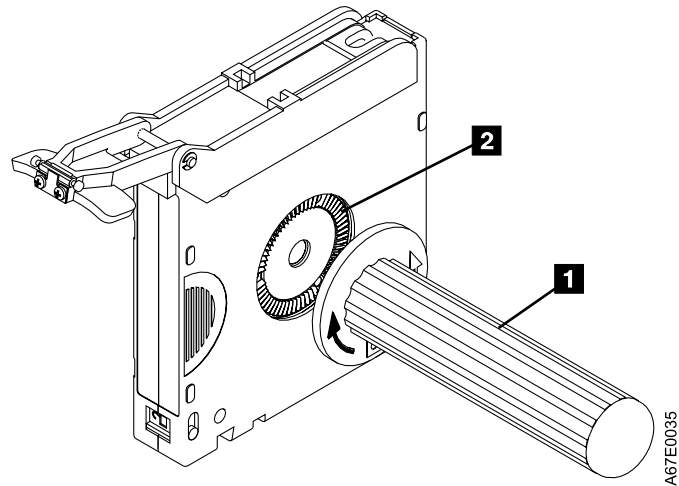


Figure 11. Winding the Tape Out of the Cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the door.

5. On the leader pin (**1** in Figure 12), locate the open side of the C-clip **2** . The C-clip is a small black part that will secure the tape **3** to the pin.
6. Remove the C-clip from the leader pin by using your fingers to push the clip away from the pin. Set the pin aside and discard the clip.

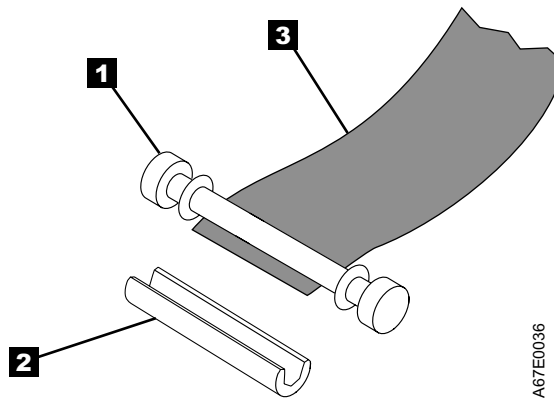


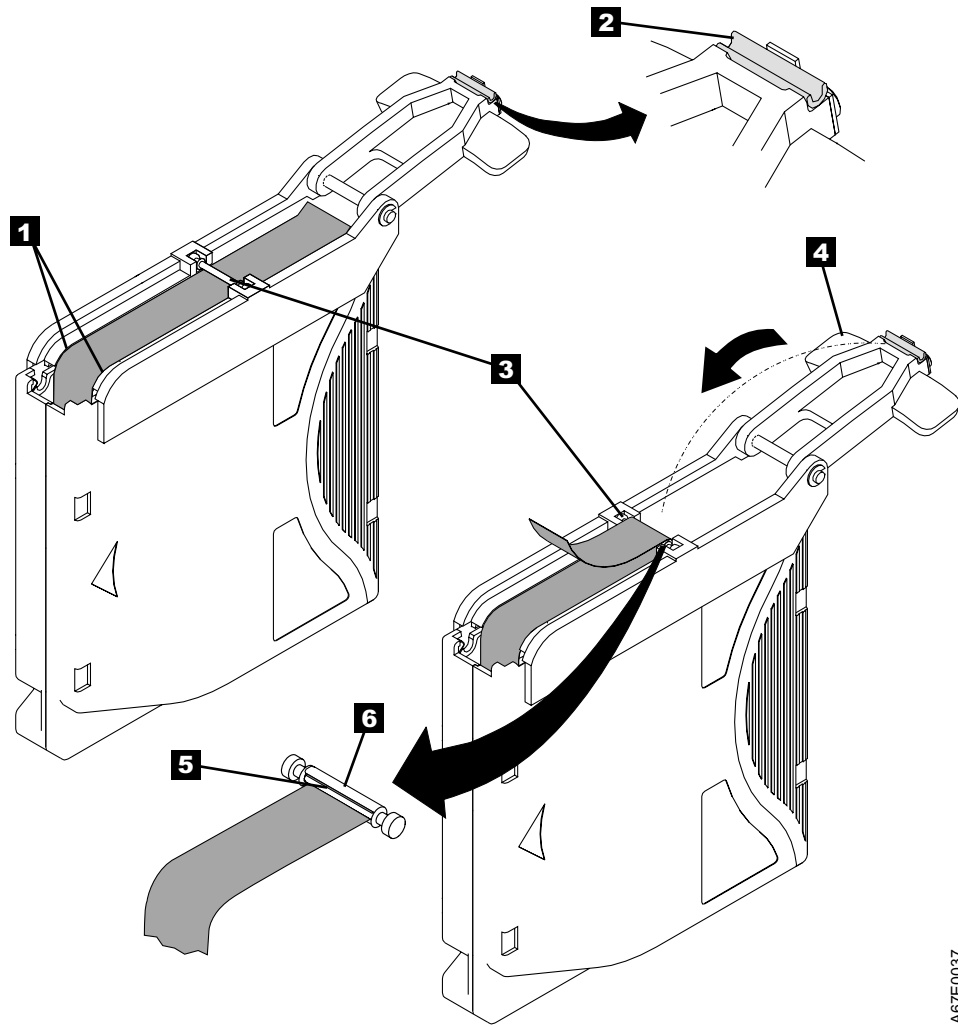
Figure 12. Removing the C-Clip From the Leader Pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure 13 on page 31).
8. Place a new C-clip into the retention groove **2** on the leader pin attachment tool and make sure that the clip's open side faces up.
9. Place the leader pin (from step 6) into the cavity **3** of the leader pin attach tool.

Attention: To prevent the leader pin from rolling into the cartridge, in the following step use care when folding the tape over the pin.

10. Fold the tape over the leader pin and hold it with your fingers.

Note: Use care to ensure that the tape is centered over the leader pin. Failure to properly center the tape on the leader pin will cause the repaired cartridge to fail. When the tape is properly centered, a 1.9-mm (0.075-in.) gap exists on both sides of the pin.



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Figure 13. Attaching the Leader Pin to the Tape

11. Close the pivot arm **4** of the leader pin attach tool by swinging it over the leader pin so that the C-clip snaps onto the pin and the tape.
12. Swing the pivot arm open and trim the excess tape **5** so that it is flush with the reattached leader pin **6**.
13. Use your fingers to remove the leader pin from the cavity **3** in the leader pin attach tool.
14. Use the cartridge manual rewind tool to wind the tape back into the cartridge (wind the tape clockwise).
15. Remove the rewind tool.
16. Remove the leader pin attach tool by lifting its end up and away from the cartridge.

Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

Handling the Cartridges

Incorrect handling or an incorrect environment can damage the LTO Ultrium Tape Cartridge or its magnetic tape. To avoid damage to your tape cartridges and to ensure the continued high reliability of your 3580 Tape Drive, use the following guidelines:

- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not load a damaged tape cartridge into the 3580 Tape Drive. A damaged cartridge can interfere with the reliability of the unit. Before loading a tape cartridge, inspect the cartridge case, cartridge door, and write-protect switch for cracks or breaks. If you need to recover data from a damaged cartridge, call your IBM Service Representative.

Note: IBM charges you for the time and materials that are used during the service call.

- Do not open the cartridge case at any time. The upper and lower parts of the case are welded; separating them destroys the usefulness of the cartridge.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape's surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge can damage the tape and the brake mechanism in the cartridge.
- Do not stack more than six cartridges. Although cartridges are shipped and should be stored with the reel in the vertical position, you can temporarily lay the cartridges flat when moving them. The bottom of each cartridge has four raised areas that fit into the indented areas on the top of another cartridge. This construction helps prevent the cartridges from sliding when you move them.
- Do not expose the tape cartridge to moisture or direct sunlight.
- Do not degauss a tape cartridge that you intend to reuse. Degaussing will make the tape unusable.
- **Do not perform bulk erasure of the tape.** Bulk erasure will make the cartridge unusable.
- Do not expose recorded or blank tape cartridges to stray magnetic fields of greater than 100 oersteds (for example, fields that exist near high-current cables or power supplies). Such exposure can cause the loss of recorded data or make the blank cartridge unusable.
- Maintain the conditions that are described in "Environmental and Shipping Specifications for Tape Cartridges" on page 33.

Environmental and Shipping Specifications for Tape Cartridges

Before you use a tape cartridge, acclimate it to the operating environment for a time equal to the time it was out of the operating environment, up to a maximum of 24 hours.

The best storage container for the cartridges (until they are opened) is the original shipping container. The plastic wrapping prevents dirt from accumulating on the cartridges and partially protects them from humidity changes.

When you ship a cartridge, place it in a sealed, moisture-proof bag to protect it from moisture, contaminants, and physical damage. Ship the cartridge in a shipping container that has enough packing material to cushion the cartridge and prevent it from moving within the container.

Table 4 gives the environment for operating, storing, and shipping LTO Ultrium Tape Cartridges.

Table 4. Environment for Operating, Storing, and Shipping the LTO Ultrium Tape Cartridge

Environmental Specifications				
Environmental Factor	Operating	Operational Storage	Archival Storage	Shipping
Temperature	10 to 45°C (50 to 113°F)	16 to 32°C (61 to 90°F)	16 to 25°C (61 to 77°F)	-23 to 49°C (-9 to 120°F)
Relative humidity (noncondensing)	20 to 80%	20 to 80%	20 to 50%	20 to 80%
Wet bulb temperature	26°C (79°F)	26°C (79°F)	26°C (79°F)	26°C (79°F)
Notes: 1. Operational storage equals less than 1 year. 2. Archival storage equals 1 to 10 years.				

Disposing of Tape Cartridges

Under the current rules of the U.S. Environmental Protection Agency (EPA), regulation 40CFR261, the LTO Ultrium Tape Cartridge is classified as non-hazardous waste. As such, it may be disposed of in the same way as normal office trash. These regulations are amended from time to time, and you should review them at the time of disposal.

If your local, state, or country (non-U.S.A.) regulations are more restrictive than EPA 40CFR261, you must review them before you dispose of a cartridge. Contact your account representative for information about the materials that are in the cartridge.

If a tape cartridge must be disposed of in a secure manner, you can erase the data on the cartridge by using a high-energy ac degausser (use a minimum of 1200 oersted peak field over the entire space that the cartridge occupies). Degaussing makes the cartridge unusable.

If you burn the cartridge and tape, ensure that the incineration complies with all applicable regulations.

Ordering Media Supplies

Table 5 lists the data cartridges and media supplies that you can order for the 3580 Tape Drive.

Table 5. Ordering Media Supplies for the 3580 Tape Drive

Supply Item	Method of Ordering
Standard LTO Ultrium Data Cartridge Includes human-writable labels.	Order as part number 08L9120 through an IBM-authorized distributor (for the closest distributor, visit the Web at http://www.ibm.com/storage/media). If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 003.
Labeled IBM LTO Ultrium Data Cartridge Includes bar code labels that are pre-applied by the manufacturer.	Order through an IBM-authorized distributor (for the closest distributor, visit the Web at http://www.ibm.com/storage/media). If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 002.
Standard IBM LTO Ultrium Cleaning Cartridge	Order as part number 08L9124 through an IBM-authorized distributor (for the closest distributor, visit the Web at http://www.ibm.com/storage/media). If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 004.
Leader Pin Reattachment Kit	Order through an IBM-authorized distributor (for the closest distributor, visit the Web at http://www.ibm.com/storage/media). If you do not have Internet access, order as IBM part number 08L9129 from your IBM Service Representative.
2.5-mm Allen Wrench	Procure locally.

Ordering Bar Code Labels

Bar code labels are required for cartridges read by the 3580 Tape Drive. You can order bar code labels directly from the following authorized label supplier:

Engineered Data Products Corporation
2550 West Midway Boulevard
Broomfield, CO 80020
U. S. A.
Telephone: 800 4321 EDP
<http://www.edp-usa.com/pdf/labelmi.pdf>

Chapter 5. Troubleshooting

If you encounter problems when running the 3580 Tape Drive, refer to the flowchart in Figure 14. For frequently asked questions and other information, visit the Web at <http://www.ibm.com/storage/1to>.

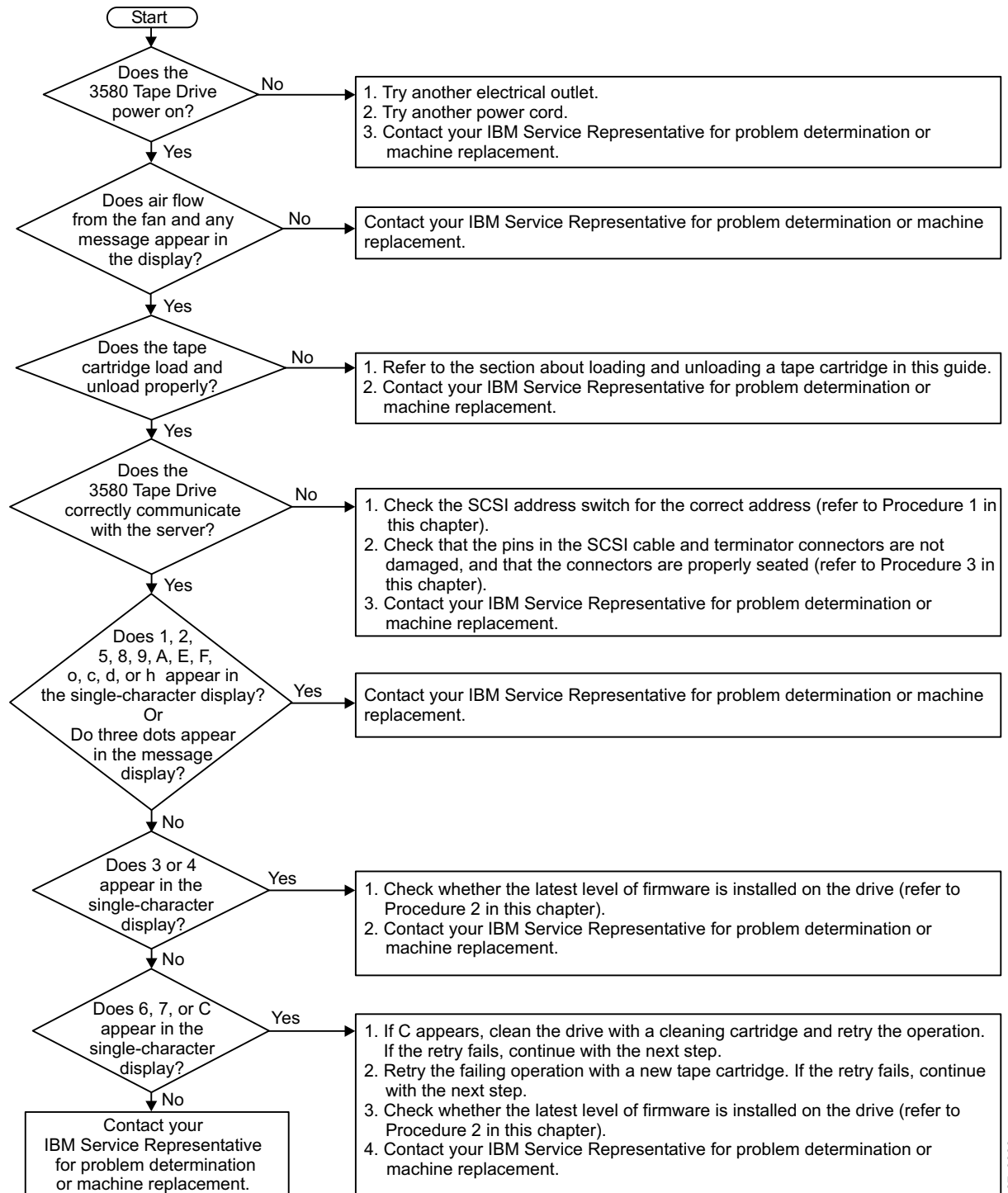


Figure 14. Flowchart for Analyzing Maintenance Problems

Procedure 1

If your host is not communicating with the 3580 Tape Drive, the drive's SCSI address switch may be set incorrectly:

1. Check the SCSI address switch (**1** in Figure 15) to ensure that it is set to the SCSI ID that you chose in "Step 4. Setting the SCSI ID" on page 7.
2. Make sure that the ID is not one that is used by another device or the SCSI host adapter (note that because ID 7 is the highest priority ID on the SCSI bus, it is usually reserved for the primary SCSI host adapter).
3. If you change a SCSI ID, power-off the 3580 Tape Drive, then power it back on to effect the change.

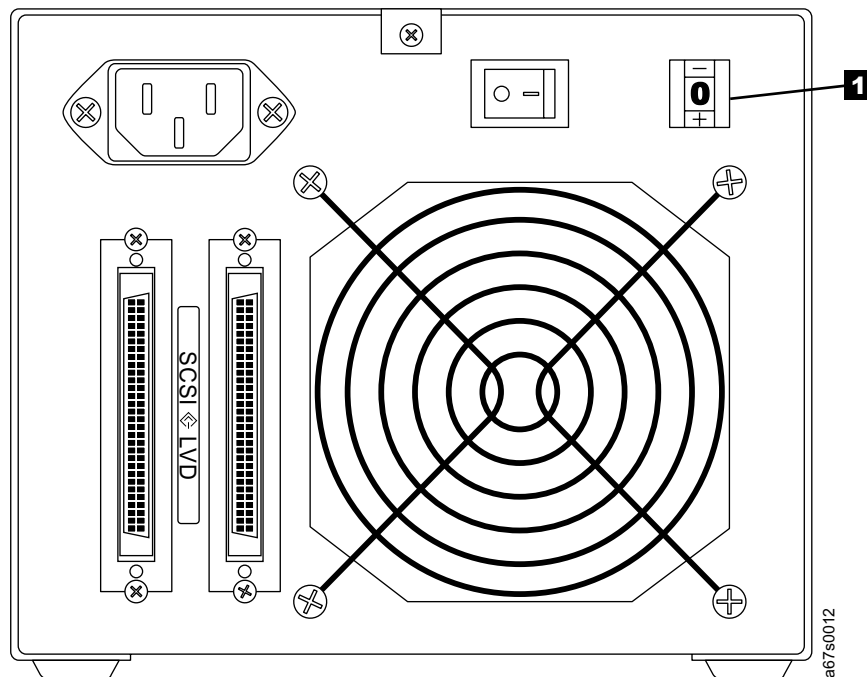


Figure 15. Checking the Setting on the SCSI Address Switch. The switch is located at the rear of the 3580 Tape Drive.

Procedure 2

If 3 or 4 appears in the single-character display, a firmware failure may have occurred. Perform the following to capture any drive dump information and to determine the current level of firmware that is installed on the drive:

1. Perform Maintenance Function 5 (“Function Code 5: Copy the Drive Dump to Tape (at Beginning of Tape)” on page 49), then set aside the cartridge that contains the dump (it may be needed later for problem determination).
2. Determine the current level of firmware on the 3580 Tape Drive by watching for the message Drive FW xxxx (where xxxx is the firmware level) to display while you power the drive off, then back on.
3. Determine the latest level of firmware available by visiting the Web at <http://www.ibm.com/storage/1to>.
 - If the firmware on your 3580 Tape Drive is outdated, download the latest firmware from the Web site (instructions for downloading are available at the site).
 - If the firmware on your 3580 Tape Drive is at the latest level or if you have had trouble with the preceding procedure, contact your IBM Service Representative for problem determination or machine replacement. Have the dump tape from step 1 available for the problem determination process.

Procedure 3

If your host is not communicating with the 3580 Tape Drive, the SCSI cable or terminator connector pins may be damaged or not seated correctly, or the SCSI bus length may be incorrect.

1. Check that the SCSI connectors are properly seated (this includes the interposer (if used), terminator, and cable connectors). Push the connectors into their receptacle connectors, and (if applicable) tighten the retention screws until firmly seated. Then, retry the operation.
2. If communication still fails, check all connector pins for damage. Remove the interposer, terminator, and cable connectors, and inspect them for bent, recessed, or missing pins. If necessary, replace the damaged component and ensure that all connectors are properly seated, then retry the operation.
3. If communication still fails, check the length of the SCSI bus cable:
 - If your 3580 Tape Drive uses an LVD/SE SCSI interface and it is the **only** device on the SCSI bus, ensure that the total bus length does not exceed 25 m (82 ft). If there are other devices on the bus, ensure that the total length does not exceed 12 m (39 ft).
 - If your 3580 Tape Drive uses an HVD/DIFF SCSI interface, ensure that the total SCSI bus length does not exceed 25 m (82 ft).
4. If communication still fails, run the SCSI wrap test (see “Function Code 6: Run SCSI Wrap Test” on page 51). If the test succeeds, the problem may be with the cables or SCSI host adapter. Refer to your host’s documentation and exercise a host utility to isolate the location of the problem. If the test fails, replace the terminator and run the test again.
5. If communication still fails, contact your IBM Service Representative for problem determination or machine replacement.

Appendix A. Codes on the Single-Character Display

Errors and informational messages that pertain to the 3580 Tape Drive are presented by the single-character display. If an error code displays, refer to “Chapter 5. Troubleshooting” on page 35 to troubleshoot the problem. Table 6 describes the messages and codes.

Note: The codes on the 3580 Tape Drive’s single-character display have different meanings, depending on whether they display during normal operation or while the tape drive is in maintenance mode. Codes that occur during normal operations are defined in Table 6. Codes that occur while in maintenance mode are defined in Table 7 on page 41.

Table 6. Codes on the Single-Character Display of the 3580 Tape Drive. The display clears if you power-off the tape drive.

If the code is this....	It means this....
0	No error. This code displays: <ul style="list-style-type: none"> • When power is cycled (turned off, then on) to the 3580 Tape Drive. • When diagnostics have finished running and no error occurred. Note: The single-character display is blank during normal operation of the 3580 Tape Drive.
1	Cooling problem. The tape drive detected that it exceeded the recommended operating temperature. The error clears when the tape drive cools.
2	Power problem. The tape drive detected that the externally supplied power is approaching the specified voltage limits (the drive is still operating) or is outside the specified voltage limits (the drive is not operating).
3	Firmware problem. The tape drive determined that a firmware error occurred.
4	Firmware or tape drive problem. The tape drive determined that a firmware or tape drive hardware failure occurred.
5	Tape drive problem. The drive determined that a tape drive hardware failure occurred.
6	Tape drive or media error. The drive determined that an error occurred, but it cannot isolate the error to faulty hardware or to the tape cartridge.
7	Media error. The tape drive determined that an error occurred because of a faulty tape cartridge.
8	Tape drive or SCSI bus error. The tape drive determined that a failure occurred in the tape drive hardware or in the SCSI bus.
9	Tape drive or RS-422 error. The tape drive determined that a failure occurred in the tape drive hardware or in the RS-422 connection.
A, E, F, o, c, b, d, or h	No error or message assigned. There may be a problem with the single-character display.
B	No error or message assigned.
C	The tape drive needs to be cleaned. See “Cleaning the Drive Head” on page 21.
D	No error or message assigned.

Appendix B. Performing Diagnostic and Maintenance Functions

Table 7 describes each diagnostic and maintenance function that the 3580 Tape Drive can perform, gives its function code (which appears on the single-character display), and directs you to the instructions for performing the function.

Table 7. Diagnostic and Maintenance Functions of the 3580 Tape Drive

Diagnostic or Maintenance Function	Function Code	Location of Instructions
<p>Run Tape Drive Diagnostics</p> <p>Causes the 3580 Tape Drive to run tests to determine whether it can properly load and unload cartridges, and read and write data.</p>	1	Page 44
<p>Update Tape Drive Firmware from FMR Tape</p> <p>Causes the 3580 Tape Drive to load updated firmware from a field microcode replacement (FMR) tape.</p>	2	Page 45
<p>Create FMR Tape</p> <p>Causes the 3580 Tape Drive to copy its field microcode replacement (FMR) data to a scratch (blank) data cartridge.</p>	3	Page 47
<p>Force a Drive Dump</p> <p>Causes the 3580 Tape Drive to perform a dump of data (also known as saving a microcode trace).</p>	4	Page 48
<p>Copy the Drive Dump to Tape (at Beginning of Tape)</p> <p>Causes the 3580 Tape Drive to copy data from a drive dump (captured via Function Code 4) to the beginning of a scratch (blank) data cartridge.</p>	5	Page 49
<p>Run SCSI Wrap Test</p> <p>Causes the 3580 Tape Drive to perform a check of the SCSI circuitry from and to the SCSI connector.</p>	6	Page 51
<p>Run RS-422 Wrap Test</p> <p>Not available.</p>	7	Not available
<p>Unmake FMR Tape</p> <p>Causes the 3580 Tape Drive to erase the FMR data on a scratch (blank) data cartridge and rewrite the cartridge memory on the tape. This turns the cartridge into a valid scratch data cartridge.</p>	8	Page 52
<p>Display Error Code Log</p> <p>Causes the 3580 Tape Drive to display the last 10 error codes, one at a time (the codes are ordered; the most recent is presented first and the oldest (tenth) is presented last).</p>	9	Page 54
<p>Clear Error Code Log</p> <p>Causes the 3580 Tape Drive to erase the contents of the error code log.</p>	A	Page 55

Table 7. Diagnostic and Maintenance Functions of the 3580 Tape Drive (continued)

Diagnostic or Maintenance Function	Function Code	Location of Instructions
<p>Insert Cartridge into Tape Drive</p> <p>This function cannot be selected by itself, but is a part of other maintenance functions (such as Run Tape Drive Diagnostics and Create FMR Tape) that require a tape cartridge to be loaded.</p>	C	Page 55
<p>Test Cartridge & Media</p> <p>Causes the 3580 Tape Drive to perform tests to ensure that a suspect cartridge and its magnetic tape are acceptable.</p>	E	Page 56
<p>Fast Read/Write Test</p> <p>Causes the 3580 Tape Drive to perform tests to ensure that the drive can read from and write to tape.</p>	F	Page 57
<p>Test Head</p> <p>Causes the 3580 Tape Drive to perform tests to ensure that the tape drive's head and tape-carriage mechanics are working correctly.</p>	H	Page 59
<p>Exit Maintenance Mode</p> <p>Causes the 3580 Tape Drive to become available for reading and writing data.</p>	0	Page 61

Placing the Tape Drive in Maintenance Mode

The 3580 Tape Drive must be in maintenance mode to run tape drive diagnostics or maintenance procedures. To place the unit in maintenance mode:

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within 1-second interval, press the unload button 3 times. The status light becomes solid amber, **0** appears in the single-character display, and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

Maintenance functions cannot be performed concurrently with read or write operations. While in maintenance mode, the 3580 Tape Drive does not receive SCSI commands from the host.

Performing a Diagnostic or Maintenance Function

The sections that follow describe each diagnostic and maintenance function of the 3580 Tape Drive.

Function Code 1: Run Tape Drive Diagnostics

Function Code 1 runs tests that determine whether the 3580 Tape Drive can properly load and unload cartridges, and read and write data. The diagnostic takes approximately 20 minutes to complete and loops continually until you halt it. To halt the diagnostic, press the unload button. The diagnostic will continue to the end of its loop and then stop. The drive then exits maintenance mode.

Attention: For this test, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **1** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Drive R/W Diagnostic
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert a scratch (blank) data cartridge that is not write-protected (or the tape drive exits maintenance mode).

Note: Due to the Power-On Self Test that is running, the message may take 90 seconds to display.

```
Drive R/W Diagnostic
Load Scratch Tape
```

After you insert the scratch data cartridge, the flashing **C** in the single-character display changes to **1**, and one or more of the following messages display:

```
Drive R/W Diagnostic
Tape Loading   = = = >
```

```
Drive R/W Diagnostic
Locating   = = = >
```

```
Drive R/W Diagnostic
Rewinding  = = = >
```

followed by:

```
Drive R/W Diagnostic
Writing    = = = >
```

The tape drive runs the tests.

Note: If you inserted an invalid or write-protected tape cartridge, **7** appears in the single-character display. The tape drive unloads the cartridge and exits maintenance mode.

- If no error is detected, the diagnostic will loop and begin again. To stop the loop, press and hold the unload button for several seconds. When the loop ends, **0** temporarily appears in the single-character display. The drive rewinds and unloads the cartridge, then exits maintenance mode. The solid amber status light turns off and the following message displays:

```
Passed!
Tape Unloading
```

followed by:

```
Ultrium Tape Drive
Drive Empty
```

- If an error is detected, the status light flashes amber, a message similar to the following displays, and the drive posts an error code to the single-character display.

```
ERROR!
Drive/Media Error
```

To determine the error, locate the code in Table 6 on page 39. The tape drive unloads the tape cartridge, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

To clear the error, turn the power off, then on again.

Function Code 2: Update Tape Drive Firmware from FMR Tape

Attention: When updating drive firmware, do not power-off the 3580 Tape Drive until the update is complete or the firmware may be lost.

Function Code 2 loads updated drive firmware from a field microcode replacement (FMR) tape. After the update is complete, activate the new firmware by turning the power off, then on again.

1. Make sure that no cartridge is in the drive.

2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **2** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Update Drive FW
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert the FMR tape cartridge (or the tape drive exits maintenance mode).

```
Update Drive FW
Load Drv FMR Tape
```

After you insert the FMR tape cartridge, the flashing **C** in the single-character display changes to **2** and the following message displays:

```
Update Drive FW
Tape Loading  = = = >
```

followed by:

```
Update Drive FW
Reading      = = = >
```

The tape drive loads the updated firmware from the FMR tape into its erasable programmable read-only memory (EPROM) area.

- If the update completes successfully, the tape drive rewinds and unloads the FMR tape, resets itself, and is ready to use the new firmware. The following message displays:

```
Update Drive FW
Completed!
```

followed by:

```
Cartridge Unloading
In Progress
```

then:

```
Ultrium Tape Drive
Drive Empty
```

To activate the new firmware, turn the power off, then on again.

- If the update fails, a message similar to the following displays and the tape drive posts an error code to the single-character display.

```
ERROR!
Mcode/Drive Error
```

To determine the error, locate the code in Table 6 on page 39. The drive then unloads the FMR tape, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

Contact your IBM Service Representative for problem determination or machine replacement.

Function Code 3: Create FMR Tape

Function Code 3 copies the drive's field microcode replacement (FMR) data to a scratch data cartridge.

Attention: For this test, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until 3 appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Create FMR Tape
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert a scratch (blank) data cartridge that is not write protected (or the tape drive exits maintenance mode).

```
Create FMR Tape
Load Scratch Tape
```

After you insert the scratch data cartridge, the flashing **C** in the single-character display changes to **3** and the following message displays:

```
Create FMR Tape
Tape Loading   = = = >
```

followed by:

```
Create FMR Tape
Writing       = = = >
```

The tape drive copies the FMR data to the scratch data cartridge.

Note: If you inserted an invalid or write-protected tape cartridge, **7** appears in the single-character display. The tape drive unloads the cartridge and exits maintenance mode.

- If the tape drive creates the FMR tape successfully, it rewinds and unloads the new tape, exits maintenance mode, and is ready to use the tape. The following message displays:

```
Create FMR Tape
Completed!
```

followed by:

```
Cartridge Unloading
In Progress
```

then:

```
Ultrium Tape Drive
Drive Empty
```

- If the tape drive fails to create the FMR tape, it displays an error code. To determine the error, see Table 6 on page 39. The tape drive then unloads the FMR tape, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

Function Code 4: Force a Drive Dump

Function Code 4 performs a dump of data collected by the drive (this process is also known as saving a microcode trace).

1. Make sure that no cartridge is in the drive.

2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until 4 appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Force Drive Dump
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. The 3580 Tape Drive performs the dump and displays the following message:

```
Force Drive Dump
Completed!
```

The single-character display shows 0, then goes blank. The following message displays, and the tape drive exits maintenance mode.

```
Ultrium Tape Drive
Drive Empty
```

To access the contents of the dump, see “Function Code 5: Copy the Drive Dump to Tape (at Beginning of Tape)”.

Note: You can also force a drive dump when the tape drive is in normal operating mode. Simply press and hold the unload button for 10 seconds.

Function Code 5: Copy the Drive Dump to Tape (at Beginning of Tape)

Function Code 5 copies data from a drive dump (captured in Function Code 4) to the beginning of a scratch (blank) data cartridge.

Attention: For this test, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **5** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Copy Dump To Tape
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert a scratch (blank) data cartridge that is not write protected (or the tape drive exits maintenance mode).

```
Copy Dump To Tape
Load Scratch Tape
```

After you insert the scratch data cartridge, the flashing **C** in the single-character display changes to **5** and the following message displays:

```
Copy Dump to Tape
Tape Loading   = = = >
```

followed by:

```
Copy Dump to Tape
Writing       = = = >
```

The tape drive writes the dump data to the tape (at the beginning of the tape).

Note: If you inserted an invalid or write-protected tape cartridge, **7** appears in the single-character display. The tape drive unloads the cartridge and exits maintenance mode.

- If the copy operation completes successfully, the tape drive rewinds and unloads the tape, and exits maintenance mode. The following message displays:

```
Copy Dump to Tape
Passed!
```

followed by:

```
Cartridge Unloading  
In Progress
```

then:

```
Ultrium Tape Drive  
Drive Empty
```

- If the copy operation fails, a message similar to the following displays, and an error code appears in the single-character display.

```
ERROR!  
Cooling Problem
```

To determine the error, locate the code in Table 6 on page 39. The tape drive unloads the tape cartridge, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive  
Drive Empty
```

Function Code 6: Run SCSI Wrap Test

Function Code 6 performs a check of the SCSI circuitry from and to the SCSI connector.

Note: This test requires that the drive be terminated by either the terminator on the connector or at the end of the bus. Before you select this function, disconnect the SCSI cable of the 3580 Tape Drive that is closest to the host. Then, attach the SCSI wrap plug to that SCSI connector.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive  
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select  
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **6** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select  
SCSI Wrap [Inst Plug}
```

5. Make sure that the SCSI wrap plug is connected to one of the SCSI connectors at the rear of the 3580 Tape Drive.

6. Make sure that the 3580 Tape Drive is terminated at one of its SCSI connectors or at the SCSI bus.
7. Press and hold the unload button for 3 or more seconds, then release it to select the function. The 3580 Tape Drive automatically starts the test (one loop of which lasts for less than one second) and displays the following message:

```
SCSI Wrap [Inst Plug]
Running!
```

- If no error is detected, the test will loop and begin again. To stop the loop, press and hold the unload button for several seconds. When the loop ends, **0** temporarily appears in the single-character display. The following message displays:

```
SCSI Wrap [Inst Plug]
Passed!
```

The drive then exits maintenance mode and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

Disconnect the SCSI wrap plug.

- If an error is detected, the test stops, **8** appears in the single-character display, and the following message displays:

```
ERROR!
Drive/SCSI Bus Error
```

To determine the error, locate **8** in Table 6 on page 39.

To clear the error, turn the power off, then on again.

Function Code 7: Run RS-422 Wrap Test

Unavailable.

Function Code 8: Unmake FMR Tape

Function Code 8 erases the field microcode replacement (FMR) data and rewrites the cartridge memory on the tape. This converts the cartridge into a valid scratch (blank) data cartridge.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **8** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Unmake FMR Tape
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert the FMR data cartridge (or the tape drive exits maintenance mode).

```
Unmake FMR Tape
Load Drv FMR Tape
```

After you insert the FMR cartridge, the flashing **C** in the single-character display changes to **8** and the following message displays:

```
Unmake FMR Tape
Tape Loading   = = = >
```

followed by:

```
Unmake FMR Tape
Writing       = = = >
```

The tape drive erases the firmware on the tape and rewrites the header in the cartridge memory to change the cartridge to a valid scratch (blank) data cartridge:

- If the operation is successful, the tape drive displays **0**, rewinds and unloads the newly converted scratch data cartridge, and exits maintenance mode. The following message displays:

```
Unmake FMR Tape
Completed!
```

followed by:

```
Cartridge Unloading
In Progress
```

then:

```
Ultrium Tape Drive
Drive Empty
```

- If the operation is not successful, an error code displays. To determine the error, locate the code in Table 6 on page 39. To clear the error, turn the power off, then on again.

Function Code 9: Display Error Code Log

Function Code 9 displays the last 10 error codes, one at a time (the codes are ordered; the most recent is presented first and the oldest is presented last). If there are no errors in the log, 0 displays on the single-character display.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until 9 appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Display Err Code Log
```

5. To view the most recent error code (the errors are numbered from 0 to 9, with 0 the most recent and 9 the oldest), press and hold the unload button for 3 or more seconds, then release it to select the function. A message similar to the following displays:

```
Display Err Code Log
0. Cooling Problem
```

6. Press the unload button again to view successive error codes. Messages similar to the following display:

Note: To view another error code, wait 2 seconds before pressing the unload button again.

```
Display Err Code Log
1. Cooling Problem
```

followed by:

```
Display Err Code Log
2. Media Error
```

7. To exit this function and maintenance mode, press the unload button until the tenth error code displays (Error 9). Let 2-3 seconds pass between each depression. Press the unload button again. The tape drive exits maintenance mode and the following message displays:

Display Err Log
Exit Maint Mode

followed by:

Ultrium Tape Drive
Drive Empty

Function Code A: Clear Error Code Log

Function Code A erases the contents of the error code log.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

Ultrium Tape Drive
Drive Empty

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

Maint Mode: Select
Exit Maint Mode

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **A** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

Maint Mode: Select
Clear Error Log

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. **A** flashes in the single-character display, followed by **0**. The tape drive erases all errors from the error code log, and displays the following message:

Clear Error Log
Completed!

The tape drive exits maintenance mode and displays the following message:

Ultrium Tape Drive
Drive Empty

Function Code C: Insert Cartridge into Tape Drive

This function cannot be selected by itself, but is part of other maintenance functions (such as Run Tape Drive Diagnostics and Create FMR Tape) that require a tape cartridge to be inserted.

Function Code E: Test Cartridge & Media

Function Code E performs tests that determine whether a suspect cartridge and its magnetic tape are acceptable. The diagnostic takes approximately 15 minutes to complete and loops continually until you halt it. To halt the diagnostic, press the unload button. The diagnostic will continue to the end of its loop, then stop. The drive then exits maintenance mode.

Attention: When you perform this test, data on the suspect tape will be overwritten.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until E appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Test Media
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, ensure that the write-protect switch on the suspect cartridge is off, then insert the cartridge (or the tape drive exits maintenance mode).

```
Test Media
Load Scratch Tape
```

After you insert the cartridge, the flashing **C** in the single-character display changes to **E** and one or more of the following messages display:

```
Test Media
Tape Loading  = = = >
```

```
Test Media
Locating     = = = >
```

```
Test Media
Rewinding    = = = >
```

followed by:


```
Test Media
Writing  = = = >
```

and:

```
Test Media
Reading  = = = >
```

The tape drive runs the tests.

- If no error is detected, the test will loop and begin again. To stop the loop, press and hold the unload button for several seconds. When the loop ends, **0** temporarily appears in the single-character display. The drive rewinds the tape, unloads the cartridge, and exits maintenance mode. The following message displays:

```
Test Media
Passed!
```

followed by:

```
Cartridge Unloading
In Progress
```

then:

```
Ultrium Tape Drive
Drive Empty
```

- If an error is detected the test stops, **6** or **7** appears in the single-character display (another code could appear), and the following message displays:

```
ERROR!
Drive/Media Error
```

To determine the error, locate **6** or **7** in Table 6 on page 39. The drive unloads the tape cartridge, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

To clear the error, turn the power off, then on again.

Function Code F: Fast Read/Write Test

Function Code F performs tests to ensure that the drive can read from and write to tape. The diagnostic takes approximately 5 minutes to complete and loops continually until you halt it. To halt the diagnostic, press the unload button. The diagnostic will continue to the end of its loop, then stop. The drive then exits maintenance mode. The Fast Read/Write Test performs fewer tests than the Run Tape Drive Diagnostics test (Function Code 1).

Attention: For this test, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.

1. Make sure that no cartridge is in the drive.

2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **F** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Fast R/W Diagnostic
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert a scratch (blank) data cartridge that is not write-protected (or the tape drive exits maintenance mode).

```
Fast R/W Diagnostic
Load Scratch Tape
```

6. After you insert the scratch data cartridge, the flashing **C** in the single-character display changes to **F** and one or more of the following messages display:

```
Fast R/W Diagnostic
Tape Loading   = = = >
```

```
Fast R/W Diagnostic
Locating      = = = >
```

```
Fast R/W Diagnostic
Rewinding     = = = >
```

followed by:

```
Fast R/W Diagnostic
Writing       = = = >
```

and:

```
Fast R/W Diagnostic
Reading       = = = >
```

The tape drive runs the tests.

Note: If you inserted an invalid or write-protected tape cartridge, **7** appears in the single-character display. The tape drive unloads the cartridge and exits maintenance mode.

- If no error is detected, the test will loop and begin again. To stop the loop, press and hold the unload button for several seconds. When the loop ends, 0 temporarily appears in the single-character display. The drive rewinds and unloads the tape, partially ejects the cartridge, then exits maintenance mode. The solid amber status light turns off and the following message displays:

```
Passed!
Tape Unloading
```

followed by:

```
Cartridge Unloading
In Progress
```

then:

```
Ultrium Tape Drive
Drive Empty
```

- If an error is detected, the status light flashes amber, a message similar to the following displays, and the tape drive posts an error code to the single-character display.

```
ERROR!
Drive/Media Error
```

To determine the error, locate the code in Table 6 on page 39. The tape drive unloads the cartridge, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

To clear the error, turn the power off, then on again.

Function Code H: Test Head

Function Code H performs tests to ensure that the tape drive's head and tape-carriage mechanics work correctly. The diagnostic takes approximately 10 minutes to complete and loops continually until you halt it. To halt the diagnostic, press the unload button. The diagnostic will continue to the end of its loop, then stop. The drive then exits maintenance mode.

Attention: For this test, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

```
Ultrium Tape Drive
Drive Empty
```

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

```
Maint Mode: Select
Exit Maint Mode
```

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until **H** appears in the single-character display and the following message displays. (If you cycle past the desired code, press the unload button once per second until the code redisplay.)

```
Maint Mode: Select
Test Head
```

5. Press and hold the unload button for 3 or more seconds, then release it to select the function. Immediately after the following message displays, insert a scratch (blank) data cartridge that is not write-protected (or the tape drive exits maintenance mode).

```
Test Head
Load Scratch Tape
```

After you insert the scratch data cartridge, the flashing **C** in the single-character display changes to **H** and one or more of the following messages display:

```
Test Head
Tape Loading
```

```
Test Head
Locating  = = = >
```

```
Test Head
Rewinding  = = = >
```

followed by:

```
Test Head
Writing  = = = >
```

The tape drive runs the tests.

- If no error is detected, the test will loop and begin again. To stop the loop, press and hold the unload button for several seconds. When the loop ends, **0** temporarily appears in the single-character display. The drive rewinds the tape, unloads the cartridge, and displays the following message:

```
Passed!
Tape Unloading
```

The drive then exits maintenance mode and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

- If an error is detected the test stops, **5** appears in the single-character display, and the following message displays:

ERROR!
Drive/Media Error

To determine the error, locate 5 in Table 6 on page 39. The drive unloads the tape cartridge, exits maintenance mode, and displays the following message:

Ultrium Tape Drive
Drive Empty

To clear the error, turn the power off, then on again.

Function Code 0: Exit Maintenance Mode

Function Code 0 makes the 3580 Tape Drive available for reading and writing data.

1. Make sure that no cartridge is in the drive.
2. Make sure that the following message appears on the message display (you may need to turn the power off, then on again for the message to appear):

Ultrium Tape Drive
Drive Empty

3. Within two seconds, press the unload button 3 times. The status light becomes solid amber and the following message displays (indicating that the tape drive is in maintenance mode):

Maint Mode: Select
Exit Maint Mode

Note: If a cartridge is in the tape drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

4. Press the unload button once per second until 0 appears in the single-character display.
5. Press and hold the unload button for 3 or more seconds to take the 3580 Tape Drive out of maintenance mode. The solid amber status light turns off (indicating that the tape drive is no longer in maintenance mode) and the following message displays.

Maint Mode: Select
Exit Maint Mode

followed by:

Ultrium Tape Drive
Drive Empty

- If no error is detected, 0 temporarily appears in the single-character display, then goes blank. The drive then exits maintenance mode.
- If an error is detected, the single-character display shows an error code but still exits maintenance mode. To determine the error, locate the code in Table 6 on page 39.

To clear the error, turn the power off, then on again.

The 3580 Tape Drive also exits maintenance mode automatically after it completes a maintenance function or after 10 minutes if no action has occurred.

Appendix C. Manually Removing a Tape Cartridge

If a tape cartridge fails to eject from the 3580 Tape Drive, you can manually remove the cartridge. The following tools are required for the procedure:

- #3 Phillips screwdriver
- 2.5-mm allen wrench
- Small-blade screwdriver or pot-setting tool
- Flashlight (optional)

Attention: The procedure that follows may result in damage to your tape cartridge. If you use this procedure, you must replace the stuck tape cartridge after removing it and copying its data to another cartridge. If you choose to return the drive and the stuck tape to IBM for maintenance, the tape cartridge will be scrapped.

To manually remove a tape cartridge:

1. Turn off the power to the 3580 Tape Drive and disconnect the power cord from the electrical outlet.
2. Place the 3580 Tape Drive on its side and locate the access hole at the bottom of the unit (**1** in Figure 16).
3. With a small-blade screwdriver or pot-setting tool, remove the screw **2** from the access hole.

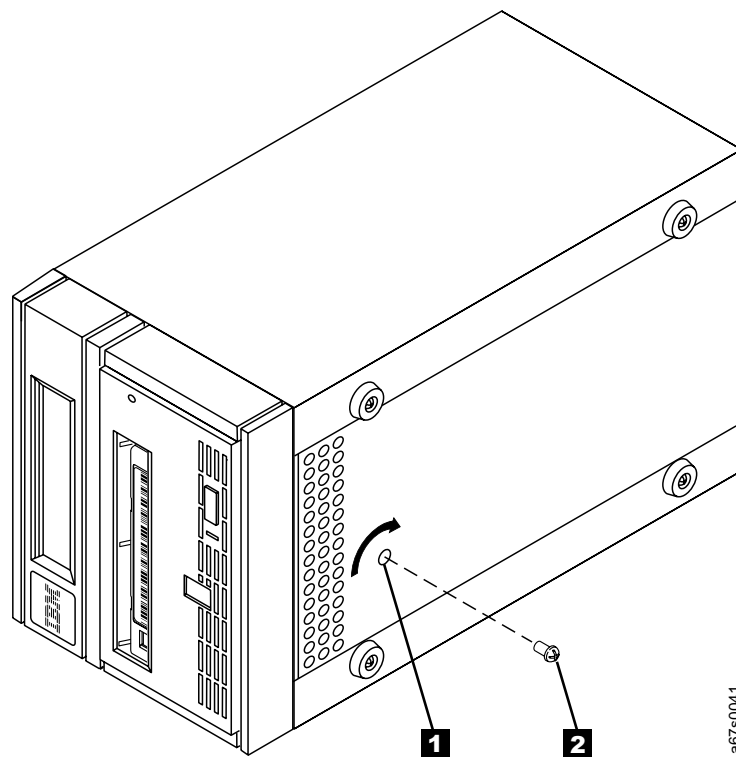


Figure 16. Removing the Screw from the Access Hole

Attention: In the following step, rotate the allen wrench clockwise, not counterclockwise. A counterclockwise motion may damage the tape.

4. Insert a 2.5-mm allen wrench (**1** in Figure 17) into the access hole and position the wrench so that it is seated in the access screw (not visible).
5. Push open the door of the tape load compartment (**2**) and locate the flag (**3**) on the cartridge's takeup reel.
6. To ensure that the tape is not broken, watch the flag on the takeup reel while you rotate the allen wrench clockwise (do not let the allen wrench move counterclockwise):
 - If the flag moves, the tape is not broken. Continue with step 7.
 - If the flag does not move, the tape is broken. Contact your IBM Service Representative.
7. Continue to rotate (but do not remove) the allen wrench until you feel resistance. The tape has been rewound as far as it can go without unthreading.

Note: The number of rotations required depends on where the beginning of the tape is on the takeup reel. You may have to rotate the allen wrench for a lengthy period.

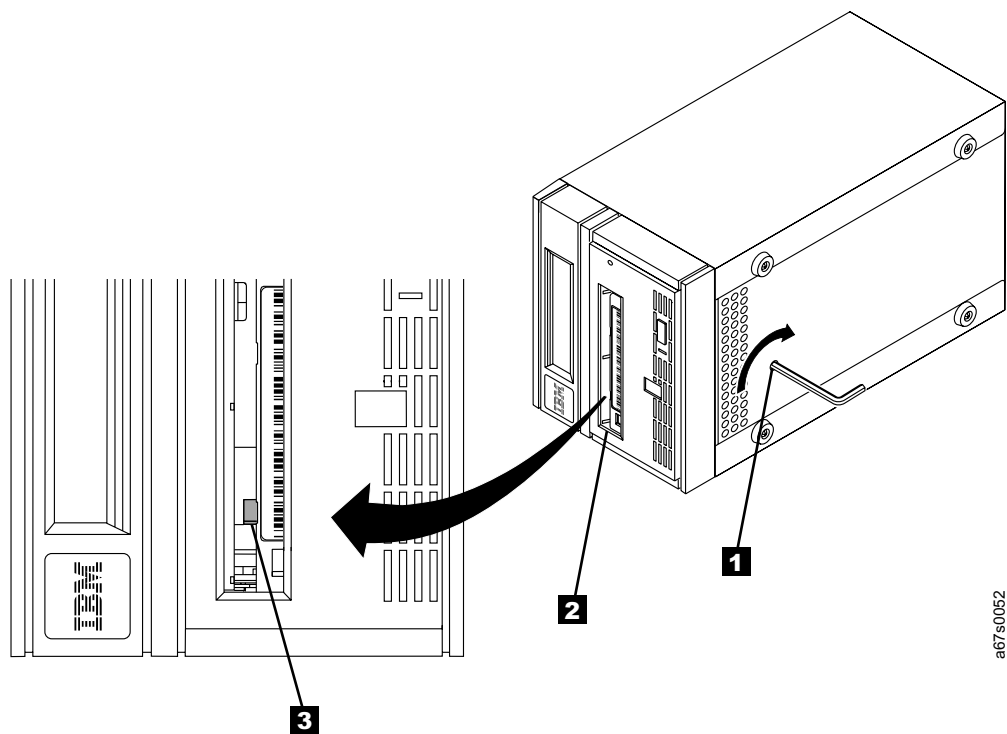


Figure 17. Determining Whether the Tape is Broken

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8. Insert a small-blade screwdriver or pot-setting tool into the access hole for the loader motor gear (see **1** in Figure 18).
9. While applying torque to the access screw and rotating it clockwise with the allen wrench **2**, rotate the loader motor gear with the small-blade screwdriver in a counterclockwise direction (see arrow). The rotation of the loader motor gear causes the leader pin block to move into the cartridge and disengage the leader pin. As you rotate the screwdriver, the allen wrench moves slightly.
10. Continue to rotate the screwdriver until you feel no resistance to the allen wrench (you may have to rotate the screwdriver for a lengthy period). When the wrench moves freely, the leader pin has disengaged from the leader block. Remove the allen wrench.

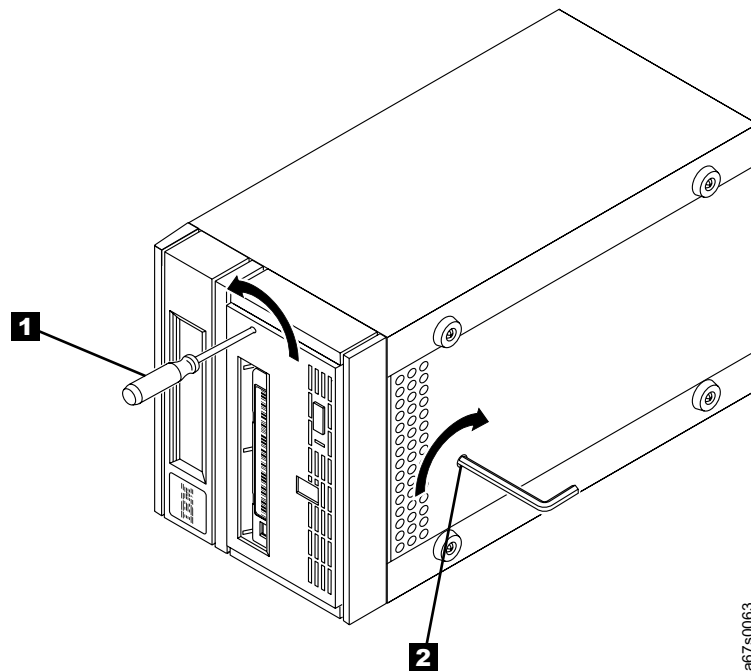


Figure 18. Moving the Leader Pin Block into the Cartridge. When the leader pin block reaches the cartridge, it disengages the leader pin.

11. With the small-blade screwdriver, continue to rotate the loader motor gear in the unload direction (counterclockwise). The cartridge moves slowly out of the tape load compartment.
12. Remove the tape cartridge.
13. To reuse the 3580 Tape Drive, you must raise the drive's loader so that it is able to accept a cartridge. To raise the loader, continue to wind the loader motor gear counterclockwise with the screwdriver until you feel resistance.
14. Remove the small-blade screwdriver.
15. Return the 3580 Tape Drive in its original packaging or in the packaging from its replacement.

After you remove the stuck tape cartridge, copy the data on the tape to another tape. Then, discard the stuck tape cartridge.

Appendix D. SCSI Commands

The following is a list of SCSI commands supported by the 3580 Tape Drive. For detailed descriptions of the supported SCSI commands, see the *StorageSmart by IBM Ultrium External Tape Drive TX200 and Ultrium Tape Drive/IBM 3580 Ultrium Tape Drive SCSI Reference*.

Command Name	Operation Code	Class (see Note)	LTO Specification
ERASE	19h	M	Supported
INQUIRY	04h	M	Supported
LOAD UNLOAD	1Bh	O	Supported
LOCATE	2Bh	O	Supported
LOG SELECT	4Ch	O	Supported
LOG SENSE	4Dh	O	Supported
MODE SELECT (6)	15h	Z	Supported
MODE SELECT (10)	55h	Z	Supported
MODE SENSE (6)	1Ah	Z	Supported
MODE SENSE (10)	5Ah	Z	Supported
PREVENT ALLOW MEDIUM REMOVAL	1Eh	O	Supported
READ	08h	M	Supported
READ BLOCK LIMITS	05h	M	Supported
READ BUFFER	3Ch	O	Supported
READ POSITION	34h	M	Supported
RECEIVE DIAGNOSTIC RESULTS (tape must be loaded)	1Ch	O	Supported
RELEASE UNIT (6)	17h	M	Supported
RELEASE UNIT (10)	57h	M	Supported
REPORT DENSITY SUPPORT	44h	M	Supported
REPORT LUNs	A0h	M	Supported
REQUEST SENSE	03h	M	Supported
RESERVE UNIT (6)	16h	M	Supported
RESERVE UNIT (10)	56h	M	Supported
REWIND	01h	M	Supported
SEND DIAGNOSTIC (tape must be loaded)	1Dh	M	Supported
SPACE	11h	M	Supported
TEST UNIT READY	00h	M	Supported
VERIFY	13h	O	Supported
WRITE	0Ah	M	Supported
WRITE BUFFER	3Bh	O	Supported
WRITE FILEMARKS	10h	M	Supported
Note: M = Mandatory O = Optional Z = Vendor-specific			

Appendix E. TapeAlert Flags

TapeAlert is a standard that defines various status conditions and problems experienced by such devices as tape drives, tape autoloaders, and tape libraries. Developed by Hewlett-Packard, the standard enables a host to read TapeAlert flags from a tape drive via the SCSI bus. The host reads the flags from Log Sense Page 0x2E. This appendix lists the TapeAlert flags that are supported by the 3580 Tape Drive.

TapeAlert Flags Supported by the 3580 Tape Drive			
Flag Number	Flag	Description	Action Required
3	Hard error	Set for any unrecoverable read, write, or positioning error. (This flag is set in conjunction with flags 4, 5, or 6.)	See the Action Required column for Flag Number 4, 5, or 6 in this table.
4	Media	Set for any unrecoverable read, write, or positioning error that is due to a faulty tape cartridge.	Replace the tape cartridge.
5	Read failure	Set for any unrecoverable read error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see "Chapter 5. Troubleshooting" on page 35.
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see "Chapter 5. Troubleshooting" on page 35.
9	Write protect	Set when the tape drive detects that the tape cartridge is write protected.	Make sure that the cartridge's write-protect switch is set so that the tape drive can write data to the tape (see "Setting the Write-Protect Switch" on page 26).
10	No removal	Set when the tape drive receives an unload command after the host prevented the tape cartridge from being removed.	Refer to the documentation for your host operating system.
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
12	Unsupported format	Set when you load an unsupported cartridge type into the drive or when the cartridge format has been corrupted.	Use a supported tape cartridge.

TapeAlert Flags Supported by the 3580 Tape Drive

Flag Number	Flag	Description	Action Required
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	If Flag Number 4 is also set, the problem could be caused by defective media. Replace the cartridge. If Flag Number 4 is not also set, retry the job using a different tape cartridge. If the retry was successful, the original tape cartridge is defective. Copy any data from the tape and discard it. If the retry was not successful, contact your IBM Service Representative for problem determination or machine replacement.
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read data from the tape to rebuild the tape directory.
19	Nearing media life	Set when you load a cartridge that is nearing its specified end of life (that is, the number of expected passes will soon be exceeded).	Replace the tape cartridge.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive. See "Cleaning the Drive Head" on page 21.
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive. See "Cleaning the Drive Head" on page 21.
22	Expired clean	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
23	Invalid cleaning tape	Set when the tape drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
24	Retension requested	Set when the tape drive requested a retension operation.	Load the tape and locate it to the end of data. Then rewind the tape and unload the tape cartridge.
26	Cooling fan failure	Set when the tape drive's cooling fan failed.	Check that the fan is operating and that the airflow is not blocked. Contact your IBM Service Representative for problem determination or machine replacement.
27	Power supply failure	Set when power supply failed inside the drive's enclosure.	Contact your IBM Service Representative for problem determination or machine replacement.
30	Hardware A	Set when a hardware failure occurs which requires that you reset the tape drive to recover.	Contact your IBM Service Representative for problem determination or machine replacement.

TapeAlert Flags Supported by the 3580 Tape Drive			
Flag Number	Flag	Description	Action Required
31	Hardware B	Set when the tape drive fails its internal Power-On Self Test (POST).	Retry the job using a different tape cartridge. If the retry was successful, the original tape cartridge is defective. Copy any data from the tape and discard it. If the retry was not successful, contact your IBM Service Representative for problem determination or machine replacement.
32	Interface	Set when the tape drive detects a problem with the SCSI or RS-422 interface.	Contact your IBM Service Representative for problem determination or machine replacement.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive and discard it.	Unload and discard the tape cartridge.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive via the SCSI interface.	Download the FMR image again (ensure that it is the correct image).
36	Drive temperature	Set when the drive temperature sensor indicates that the drive is too hot.	Ensure that the operating temperature is within the specified range (see "Specifications" on page 3). If the operating temperature is within the specified range, contact your IBM Service Representative for problem determination or machine replacement.
37	Drive voltage	Set when the drive detects that the externally supplied voltages are outside of the specified voltage limits.	Contact your IBM Service Representative for problem determination or machine replacement.
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics for isolation.	Contact your IBM Service Representative for problem determination or machine replacement.

Appendix F. Power Cords



To avoid electrical shock, a power cord with a grounded attachment plug has been provided. Use only properly grounded outlets.

Power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA). The power cords consist of:

- Electrical cords, type SVT or SJT.
- Attachment plugs complying with National Electrical Manufacturers Association (NEMA) 5-15P, that is:
 - “For 115 V operation use a UL Listed Cable Set consisting of a minimum 18 AWG, Type SVT or SJT three conductor cord a maximum of 15 feet in length and a parallel blade, grounding type attachment plug rated at 15 A, 125 V.”
 - “For 230 V operation in the United States use a UL Listed Cable Set consisting of a minimum 18 AWG, Type SVT or SJT three conductor cord a maximum of 15 feet in length, and a tandem blade, grounding type attachment plug rated at 15 A, 250 V.”
- Appliance couplers complying with International Electrotechnical Commission (IEC) Standard 320, Sheet C13.

Power cords used in other countries consist of:

- Electrical cords, type HD21.
- Attachment plugs approved by the appropriate testing organization for the specific countries where they are used.
 - “For units set at 230 V (outside of U. S.): Use a Cable Set consisting of a minimum 18 AWG cord and grounding type attachment plug rated 15 A, 250 V. The Cable Set should have the appropriate safety approvals for the country in which the equipment is to be installed and marked 'HAR'.”

Table 8 on page 74 lists the power cord part number, the country where the power cord can be used, and an index number to be matched with the receptacles shown in Figure 19 on page 75. If your power cord does not match this information, contact your local dealer.

Table 8. Power Cable Information

Part Number	Country	Index
1838574 Japan	Bahamas, Barbados, Bolivia, Brazil, Canada, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Netherlands Antilles, Panama, Peru, Philippines, Taiwan, Thailand, Tobago, Trinidad, U.S.A. (except Chicago), Venezuela	1
6952300 US/Canada	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Puerto Rico, Saudi Arabia, Suriname, Taiwan, Trinidad, U.S.A. (except Chicago), Venezuela	2
6952301 6 ft Chicago	Chicago, U.S.A.	2
13F9940 Australia	Argentina, Australia, New Zealand	3
13F9979 France	Abu Dhabi, Austria, Belgium, Bulgaria, Botswana, Egypt, Finland, France, Germany, Greece, Iceland, Indonesia, Korea (South), Lebanon, Luxembourg, Macau, Netherlands, Norway, Portugal, Saudi Arabia, Spain, Sudan, Sweden, Turkey, Yugoslavia	4
13F9997 Denmark	Denmark	5
14F0015 South Africa	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	6
14F0033 United Kingdom	Bahrain, Bermuda, Brunei, Channel Islands, Cyprus, Ghana, Hong Kong, India, Iraq, Ireland, Jordan, Kenya, Kuwait, Malawi, Malaysia, Nigeria, Oman, People's Republic of China, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Arab Emirates (Dubai), United Kingdom, Zambia	7
14F0051 Switzerland	Liechtenstein, Switzerland	8
14F0069 Italy	Chile, Ethiopia, Italy	9
14F0087 Israel	Israel	10
6952291 Uruguay	Columbia, Paraguay, Uruguay	11

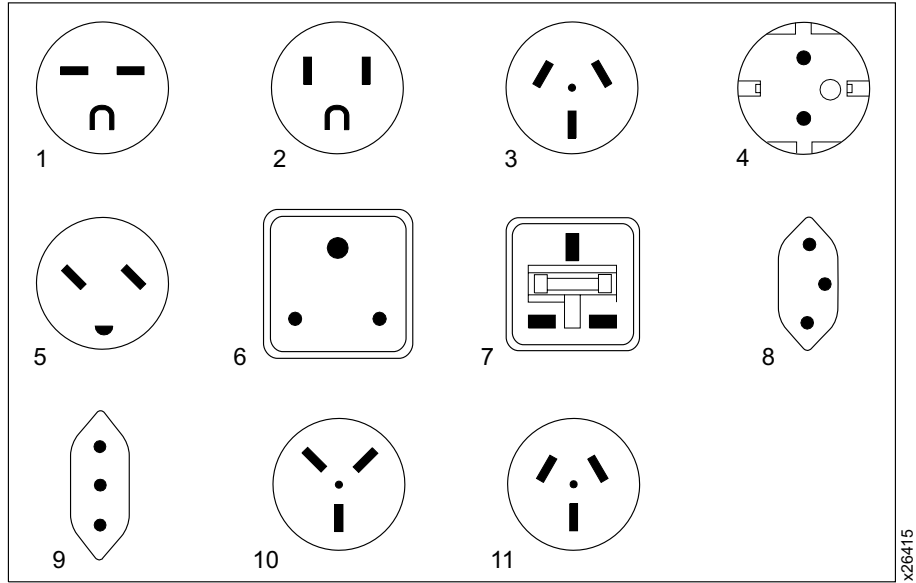


Figure 19. Types of Receptacles

x26415

Appendix G. Parts Lists

This appendix lists the parts and accompanying part numbers for a 3580 Tape Drive with an LVD/SE or HVD/DIFF SCSI Interface.

Parts for 3580 Tape Drive with LVD/SE SCSI Interface

Table 9. Parts for the 3580 Tape Drive with LVD/SE SCSI Interface

IBM Part Number	Product Description	Source for Ordering
35L1220	3580 Tape Drive with LVD/SE SCSI interface	IBM Sales Representative or Business Partner
19P0872	0.4 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
35L1307	2.5 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0052	5 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0053	10 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0097	18 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0054	25 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0279	2.5 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0050	4.5 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0048	10 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0049	20 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
35L1977	25 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0481	LVD single-connector SCSI wrap tool	IBM Service Representative
19P0874	LVD/SE multi-mode terminator	IBM Service Representative
19P0482	VHDCI to HD68 interposer cable	IBM Sales Representative or Business Partner
08L9129	Leader pin reattachment kit	http://www.ibm.com/storage/media
- -	2.5-mm allen wrench	Procure locally
08L9120	IBM LTO Ultrium Data Cartridge	http://www.ibm.com/storage/media or your IBM Sales Representative or Business Partner by specifying Machine Type 3589 Model 003
08L9124	IBM LTO Ultrium Cleaning Cartridge	http://www.ibm.com/storage/media or your IBM Sales Representative or Business Partner by specifying Machine Type 3589 Model 004

Parts for 3580 Tape Drive with HVD/DIFF SCSI Interface

Table 10. Parts for the 3580 Tape Drive with HVD/DIFF SCSI Interface

IBM Part Number	Product Description	Source for Ordering
35L1217	3580 Tape Drive with HVD/DIFF SCSI interface	IBM Sales Representative or Business Partner
19P0872	0.4 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
35L1307	2.5 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0052	5 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0053	10 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0097	18 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0054	25 m Universal HD68 to HD68 cable	IBM Sales Representative or Business Partner
19P0279	2.5 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0050	4.5 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0048	10 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
19P0049	20 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
35L1977	25 m Universal VHDCI to HD68 cable	IBM Sales Representative or Business Partner
05H9163	HVD single-connector SCSI wrap tool	IBM Service Representative
61G8324	HVD terminator	IBM Service Representative
19P0482	VHDCI to HD68 interposer cable	IBM Sales Representative or Business Partner
05H3834	AS/400 feature #6501 to HD68 interposer cable	IBM Sales Representative or Business Partner
08L9129	Leader pin reattachment kit	http://www.ibm.com/storage/media
- -	2.5-mm allen wrench	Procure locally
08L9120	IBM LTO Ultrium Data Cartridge	http://www.ibm.com/storage/media or your IBM Sales Representative or Business Partner by specifying Machine Type 3589 Model 003
08L9124	IBM LTO Ultrium Cleaning Cartridge	http://www.ibm.com/storage/media or your IBM Sales Representative or Business Partner by specifying Machine Type 3589 Model 004

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IBM 3580 Ultrium Tape Drive

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Responsible Party:

International Business Machines Corporation
Old Orchard Road
Armonk, NY 10504
Telephone: 1-919-543-2193

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Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication.

Numbers

2:1 compression. The relationship between the quantity of data that can be stored with compression as compared to the quantity of data that can be stored without compression. In 2:1 compression, twice as much data can be stored with compression as can be stored without compression.

3580 Ultrium Tape Drive. A device that can be attached to a supported server (host) and used to write data to and from magnetic tape. The 3580 Tape Drive can process a tape cartridge with a capacity of 100 GB at a data transfer rate of 15 MB per second. The drive within the device is the IBM Ultrium Tape Drive.

A

A. Ampere.

ac. Alternating current.

adapter card. A circuit board that adds function to a computer.

alternating current (ac). An electric current that reverses its direction at regularly recurring intervals.

amp. Ampere.

ampere (A, amp). A unit of measure for electric current that is equivalent to a flow of one coulomb per second, or to the current produced by one volt applied across a resistance of one ohm.

archive. To collect and store files in a designated place.

B

bar code. A code representing characters by sets of parallel bars of varying thickness and separation which are read optically by transverse scanning.

bar code label. A specially coded label that can be affixed to a tape cartridge and which enables a device to identify the cartridge and its volume serial number.

bit. Either of the digits 0 or 1 when used in the binary numbering system.

browser. A client program that initiates requests to a Web server and displays the information that the server returns.

British thermal unit (Btu). The quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit at a specified temperature.

Btu. British thermal unit.

bus. See *SCSI bus*.

byte. A string consisting of a certain number of bits (usually 8) that are treated as a unit and represent a character. A fundamental data unit.

C

capacity. The amount of data that can be contained on storage media and expressed in bytes of data.

cartridge. See *tape cartridge*.

cartridge door. On a tape cartridge, a barrier that can be opened to access, or closed to protect, the magnetic tape within the cartridge.

cartridge load compartment. On the front of the 3580 Tape Drive, the opening into which you insert a tape cartridge.

cartridge memory. See *LTO cartridge memory*.

cartridge manual rewind tool. A device that can be fitted into the reel of a cartridge and used to rewind tape into or out of the cartridge.

CD. Compact disc.

centimeter (cm). One one-hundredth of a meter (0.01 m). Approximately 0.39 inch.

circuit breaker. A switch that automatically interrupts an electric circuit under an infrequent abnormal condition.

cleaning cartridge. A tape cartridge that is used to clean the heads of a tape drive. Contrast with *data cartridge*.

cm. Centimeter.

compact disc (CD). A disc, usually 4.75 inches in diameter, from which data is read optically by means of a laser.

compression. The process of eliminating gaps, empty fields, redundancies, and unnecessary data to shorten the length of records or blocks.

configure. To describe to a system the devices, optional features, and programs installed on the system.

current. The quantity of charge per unit of time, measured in Amperes (Amps, A).

D

data. Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

data cartridge. A tape cartridge dedicated to storing data. Contrast with *cleaning cartridge*.

data compression. See *compression*.

data transfer rate. The average number of bits, characters, or blocks per unit of time passing between corresponding equipment in a data transmission system. The rate is expressed in bits, characters, or blocks per second, minute, or hour.

dc. Direct current.

degauss. To make a magnetic tape nonmagnetic by means of electrical coils carrying currents that neutralize the magnetism of the tape.

degausser. A device that makes magnetic tape nonmagnetic.

device. Any hardware component or peripheral, such as a tape drive or tape library, that can receive and send data.

device driver. A file that contains the code needed to use an attached device.

diagnostic. A software program that is designed to recognize, locate, and explain faults in equipment or errors in programs.

differential. See *High Voltage Differential (HVD/DIFF)*.

direct current (dc). An electric current flowing in one direction only and substantially constant in value.

download. To transfer programs or data from a computer to a connected device, typically a personal computer.

drive. See *IBM Ultrium Tape Drive*.

drive dump. The recording, at a particular instant, of the contents of all or part of one storage device into another storage device.

drive head. The component that records an electrical signal onto magnetic tape, or reads a signal from tape into an electrical signal.

E

eject. To remove or force out from within.

electronic mail. Correspondence in the form of messages transmitted between user terminals over a computer network.

e-mail. See *electronic mail*.

error code log. A repository within a tape drive's firmware that contains a history of errors experienced by the drive.

F

field microcode replacement (FMR) tape. A tape cartridge that contains new or revised firmware (microcode) for the *IBM Ultrium Tape Drive*.

file. A named set of records stored or processed as a unit.

file transfer protocol (FTP). In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts.

firmware. Proprietary code that is usually delivered as firmware as part of an operating system. Firmware is more efficient than software loaded from an alterable medium and more adaptable to change than pure hardware circuitry. An example of firmware is the Basic Input/Output System (BIOS) in read-only memory (ROM) on a PC motherboard.

FMR tape. See *field microcode replacement tape*.

FTP site. Any electronic repository of information that uses the File Transfer Protocol (FTP) for transferring files to and from servers. Use of an FTP site requires a user ID and possibly a password.

G

GB. Gigabyte.

gigabyte (GB). 1 000 000 000 bytes.

grounded. Having or making an electrical connection with the earth.

H

head. See *drive head*.

hertz (Hz). A unit of frequency equal to one cycle per second.

High Voltage Differential (HVD/DIFF). A logic signaling system that enables data communication between a supported host and another device, such as the 3580 Tape Drive. HVD/DIFF signaling uses a paired plus and minus signal level to reduce the effects of noise on the SCSI bus. Any noise injected into the

signal is present in both a plus and minus state, and is thereby canceled. Synonymous with *differential*.

host. The controlling or highest-level system in a data communication configuration. Synonymous with *server*.

HVD/DIFF. High voltage differential.

Hz. Hertz.

I

IBM Ultrium Tape Drive. Located within the 3580 Tape Drive, a data-storage device that controls the movement of the magnetic tape in an LTO Ultrium Tape Cartridge. The drive houses the mechanism (drive head) that reads and writes data to the tape. The drive is the first of four drives planned for the Ultrium format. Its native data capacity is 100 GB per cartridge; with 2:1 compression, its capacity is up to 200 GB.

ID. Identifier.

insert. Pertaining to the 3580 Tape Drive, to place a tape cartridge into the tape drive.

install. To set up for use or service. The act of adding a product, feature, or function to a system or device either by a singular change or by the addition of multiple components or devices.

Internet. The worldwide collection of interconnected networks that use the Internet suite of protocols and permit public access.

interposer. An adapter-like device that allows a connector of one size and style to connect to a mating connector of a different type and style.

K

kg. Kilogram.

kilogram (kg). One thousand grams (approximately 2.2 pounds).

L

label. A slip of paper with an adhesive backing that can be written on and affixed to a tape cartridge as a means of identification or description.

label area. On the LTO Ultrium Tape Cartridge, a recessed area next to the write-protect switch where a label may be affixed.

LCD. See *liquid crystal display*.

leader pin. Within the LTO Ultrium Tape Cartridge, a small metal column attached to the end of the magnetic tape. During tape processing the leader pin is grasped by a threading mechanism, which pulls the pin and the

tape out of the cartridge, across the drive head, and onto a takeup reel. The head can then read or write data from or to the tape.

LED. Light-emitting diode.

light-emitting diode (LED). A semiconductor chip that gives off visible or infrared light when activated. Used to illuminate the single-character display on the 3580 Tape Drive.

Linear Tape-Open (LTO). A type of tape storage technology developed by the IBM Corporation, Hewlett-Packard, and Seagate. LTO technology is an "open format" technology, which means that its users will have multiple sources of product and media. The "open" nature of LTO technology enables compatibility between different vendors' offerings by ensuring that vendors comply with verification standards. The LTO technology is implemented in two formats: the Accellis format focuses on fast access; the Ultrium format focuses on high capacity. The Ultrium format is the preferred format when capacity (rather than fast access) is the key storage consideration. An Ultrium cartridge has a compressed data capacity of up to 200 GB (at 2:1 compression) and a native data capacity of up to 100 GB. The Ultrium format is designed with a 4-generation road map that provides for up to 1.6 TB per cartridge (at 2:1 compression) in Generation 4, with a compressed transfer rate of up to 320 MB per second.

liquid crystal display (LCD). A low-power display technology used in computers and other I/O devices.

load. Following insertion of a tape cartridge into a tape drive, the act (performed by the tape drive) of positioning the tape for reading or writing by the drive head.

load and unload cycle. The act of inserting a cartridge into a tape drive, loading the tape to load point, rewinding the tape into the cartridge, and ejecting the cartridge from the drive.

Low Voltage Differential/Single Ended (LVD/SE). A low-noise, low-power, and low-amplitude electrical signaling system that enables data communication between a supported host and another device, such as the 3580 Tape Drive. LVD/SE signaling uses two wires to drive one signal over copper wire. The use of wire pairs reduces electrical noise and crosstalk. This method of data transmission requires a cable that is no longer than 25 meters (82 ft).

LTO. Linear Tape-Open.

LTO-CM. LTO cartridge memory.

LTO cartridge memory (LTO-CM). Within each IBM LTO Ultrium Data Cartridge, an embedded electronics and interface module that can store and retrieve a cartridge's historical usage and other information.

LVD/SE. Low voltage differential/single ended.

M

m. Meter.

magnetic tape. A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

maintenance mode. The state of operation in which the 3580 Tape Drive must be before it can run tape drive diagnostics or maintenance procedures.

MB. Megabyte.

MBps. Megabytes per second.

media. The plural of *medium*.

media capacity. See *capacity*.

medium. A physical material (such as magnetic tape) in or on which data may be represented.

megabyte (MB). 1 000 000 bytes.

message display. Located on the front of the 3580 Tape Drive, an LCD display that provides information about the status of the tape drive and any error conditions.

metal particle tape. In the LTO Ultrium Tape Cartridge, tape that uses very small, pure metal particles (rather than oxide coatings) in the magnetic layer.

meter. In the Metric System, the basic unit of length; equal to approximately 39.37 inches.

Model L11. One of two versions of the 3580 Tape Drive. The Model L11 uses the Ultra2, Low Voltage Differential/Single Ended (LVD/SE) SCSI interface. Contrast with *Model H11*.

Model H11. One of two versions of the 3580 Tape Drive. The Model H11 uses the Ultra, High Voltage Differential (HVD/DIFF) SCSI interface. Contrast with *Model L11*.

N

native data capacity. The amount of data that can be stored without compression on a tape cartridge.

O

oersted. The unit of magnetic field strength in the unrationalized centimeter-gram-second (cgs) electromagnetic system. The oersted is the magnetic field strength in the interior of an elongated, uniformly

wound solenoid that is excited with a linear current density in its winding of one ampere per 4π centimeters of axial length.

operating environment. The temperature, relative humidity rate, and wet bulb temperature of the room in which the 3580 Tape Drive routinely conducts processing.

operating system. The master computer control program that translates the user's commands and allows software application programs to interact with the computer's hardware.

P

PDF. Portable Document Format.

Portable Document Format (PDF). A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents. PDF files are compact, can be distributed globally (via e-mail, the Web, intranets, or CD-ROM), and can be viewed with the Acrobat Reader, which is software from Adobe Systems that can be downloaded at no cost from the Adobe Systems home page.

POST. Power-On Self Test.

PostScript. A standard specified by Adobe Systems, Incorporated, that defines how text and graphics are presented on printers and display devices.

pot-setting tool. Normally used on a potentiometer to adjust resistance, a tool that slides over the shaft of the loader motor gear in the 3580 Tape Drive and holds the shaft for easy turning.

power cord. A cable that connects a device to a source of electrical power.

power-off. To remove electrical power from a device.

power-on. To apply electrical power to a device.

Power-On Self Test (POST). A series of diagnostic tests that are run automatically by a device when the power to that device is turned on.

power cord plug. On a power cord, the male fitting for making an electrical connection to a circuit by insertion into a receptacle.

power receptacle. The mounted female electrical fitting that contains the live parts of the circuit.

power switch. Located at the rear of the 3580 Tape Drive, a toggle switch that lets you turn the power to the tape drive on or off. To power the tape drive on, push the switch to |; to power it off, push the switch to 0.

R

read. To acquire or interpret data from a storage device, from a data medium, or from another source.

relative humidity. The ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature.

remove. Pertaining to the 3580 Tape Drive, to take an ejected tape cartridge from the tape drive.

reset. To restore to the original state of operation.

retention screws. Pertaining to the connector on a cable, two screws on either side of the connector that secure it to its mating connector.

RS-422 interface. Between the 3580 Tape Drive and the message display processor, the standard interface approved by the Electronic Industries Association (EIA) for connecting serial devices. The interface includes the cable, connectors, and firmware for the drive. The RS-422 interface supports multipoint connections.

S

scratch cartridge. A data cartridge that contains no useful data, but can be written to with new data. Synonymous with *blank cartridge*.

SCSI. Small computer systems interface.

SCSI-2. Small computer systems interface-2.

SCSI address switch. Located at the rear of the 3580 Tape Drive, a switch that, when pressed, increments or decrements to a unique numeric ID (address) that identifies the tape drive to the host.

SCSI bus. (1) A collection of wires through which data is transmitted from one part of a computer to another. (2) In networking, a central cable that connects all devices on a local-area network (LAN). (3) A generic term that refers to the complete set of signals that define the activity of the Small Computer Systems Interface (SCSI). Synonymous with *SCSI bus cable* and *SCSI cable*.

SCSI bus cable. See *SCSI bus*.

SCSI cable. See *SCSI bus*.

SCSI command. An operation performed by a target (tape drive) for an initiator (host). The command is initiated by the operator from the host console.

SCSI connector. One of the set of all female and male connectors on the SCSI bus.

SCSI device. Anything that can connect into the SCSI bus and actively participate in bus activity.

SCSI host adapter card. The logic card that connects a host to the SCSI bus cable. Synonymous with *SCSI controller*.

SCSI ID. The hexadecimal representation of the unique address (0-F) which a user assigns to the 3580 Tape Drive and which is used in SCSI protocols to identify or select the drive. The user normally assigns and sets the SCSI ID when installing the drive.

SCSI wrap tool. A device that attaches to the SCSI connector on the 3580 Tape Drive and enables internal tests on the SCSI interface.

seat, seated. (1) To fit to. (2) To ensure that one object is fitted to another object.

server. A functional unit that provides services to one or more clients over a network. Examples include a file server, a print server, and a mail server. The RS/6000, AS/400, HP, and Sun are servers. Synonymous with *host*.

ship group. The group of supplies, cords, or documentation that is shipped with the 3580 Tape Drive.

shipping environment. The temperature, relative humidity rate, and wet bulb temperature of the environment to which the 3580 Tape Drive is exposed when being transferred from one location to another.

single-character display. Located on the front of the 3580 Tape Drive, an LED that presents a single-character code which represents error conditions, informational messages, diagnostic functions, or maintenance functions. The single-character display is blank during normal operation of the tape drive.

Small Computer Systems Interface (SCSI). A standard used by computer manufacturers for attaching peripheral devices (such as tape drives, hard disks, CD-ROM players, printers, and scanners) to computers (hosts). Pronounced "scuzzy" Variations of the SCSI interface provide for faster data transmission rates than standard serial and parallel ports (up to 80 megabytes per second). The variations include:

- SCSI-1: Uses an 8-bit bus, and supports data rates of 4 MBps.
- SCSI-2: Same as SCSI-1, but uses a 50-pin connector instead of a 25-pin connector, and supports multiple devices.
- Ultra SCSI: Uses an 8-bit bus, and supports data rates of 20 MBps.
- SCSI-3: Uses a 16-bit bus and supports data rates of 40 MBps. Also called Ultra Wide SCSI.
- Ultra2 SCSI: Uses an 8-bit bus and supports data rates of 40 MBps.

Small Computer Systems Interface-2 (SCSI-2). See *Small Computer Systems Interface (SCSI)*.

status light. Located on the front of the 3580 Tape Drive, a light-emitting diode (LED) which represents information about the state of the tape drive. The light can be green or amber, and (when lit) solid or flashing.

storage environment. The temperature, relative humidity rate, and wet bulb temperature of the environment in which the 3580 Tape Drive is nonoperational and being kept for future use.

T

TapeAlert. A patented technology from Hewlett-Packard that monitors the status of a tape device and media, and detects problems as they occur.

TapeAlert flags. Status and error messages that are generated by the TapeAlert utility and display on the host console.

tape cartridge. A removable storage device that consists of a housing containing belt-driven magnetic tape wound on a supply reel and a takeup reel.

tape drive. See *IBM Ultrium Tape Drive*.

terminator. (1) A part used to end a SCSI bus. (2) A single-port, 75- Ω device that is used to absorb energy from a transmission line. Terminators prevent energy from reflecting back into a cable plant by absorbing the radio frequency signals. A terminator is usually shielded, which prevents unwanted signals from entering or valid signals from leaving the cable system.

toggle switch. A device that can alternate between two modes.

track. A linear or angled pattern of data written on a tape surface.

transfer rate. See *data transfer rate*.

U

Ultra SCSI. See *Small Computer Systems Interface (SCSI)*.

Ultra-2 SCSI. See *Small Computer Systems Interface (SCSI)*.

Ultrium Tape Drive. See *IBM Ultrium Tape Drive*.

unattended backup. The act of copying files without operator assistance.

uniform resource locator (URL). The address of an item on the World Wide Web. It includes the protocol followed by the fully qualified domain name (sometimes called the host name) and the request. The Web server typically maps the request portion of the URL to a path and file name. For example, if the URL is <http://www.networking.ibm.com/nsg/nsgmain.htm>, the

protocol is http; the fully qualified domain name is www.networking.ibm.com; and the request is [/nsg/nsgmain.htm](http://www.networking.ibm.com/nsg/nsgmain.htm).

unload. Following insertion of a tape cartridge into a tape drive, the act (performed by the tape drive) of rewinding the tape into the cartridge and ejecting the cartridge from the drive.

unload button. Located on the front of the 3580 Tape Drive, a multi-purpose push button that (depending on how it is pressed) can rewind and unload a tape cartridge, place the tape drive in maintenance mode, scroll through maintenance functions, or exit maintenance mode.

URL. Uniform resource locator.

V

V_{ac}. Volts of alternating current.

V_{dc}. Volts of direct current.

void. In character recognition, the inadvertent absence of ink within a character outline.

volt. The SI (international) unit of potential difference and electromotive force, formally defined to be the difference of electric potential between two points of a conductor carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt.

voltage. The electric potential or potential difference expressed in volts.

W

W. Watts.

watt. A metric unit of measure of power; the power required to keep a current of one ampere flowing under a potential drop of one volt; about 1/736 of one horsepower.

Web. See *World Wide Web*.

wet bulb temperature. The temperature at which pure water must be evaporated adiabatically at constant pressure into a given sample of air in order to saturate the air under steady-state conditions. Read from a wet-bulb thermometer.

World Wide Web. A network of servers that contain programs and files. Many of the files contain hypertext links to other documents available through the network.

write. To make a permanent or transient recording of data in a storage device or on a data medium.

write protected. A tape cartridge is write protected if some logical or physical mechanism causes the device that is processing the tape to prevent the program from writing on the tape.

write-protect switch. Located on the LTO Ultrium Tape Cartridge, a switch that prevents accidental erasure of data. Pictures of a locked and unlocked padlock appear on the switch. When you slide the switch to the picture of the locked padlock, data cannot be written to the tape. When you slide the switch to the picture of the unlocked padlock, data can be written to the tape.

Index

A

acclimating the tape drive 32
adapter card, installing SCSI host 10
altitude specification 3
AS/400, requirements for attaching tape drive to 2
attaching leader pin to tape, procedure 27
attaching tape drive to host 2, 11
attention notice, definition xi

B

bar code, specifications 24
bar code label
 guidelines for using 25
 ordering 34
 placement on cartridge 24
 specifications 24
bulk erasure 32

C

cable, SCSI bus
 in ship group 5
 installing 11
 lengths 12
capacity 1, 24
cartridge memory 24
caution notice, definition ix
cleaning cartridge
 description 25
 ordering 34
cleaning the drive head 21
clearing error code log 41, 55
commands, supported SCSI 67
compressed capacity 1, 24
configuring tape drive to host 13
connections
 power 8
 SCSI bus cable 11
 terminator 11
contents of ship group 5
converting FMR tape to blank tape 41, 52
copying drive dump to tape 41, 49
creating FMR tape 41, 47
current, specification 3

D

damage to tape drive, how to report 5
danger notice, definition ix
data cartridge
 description 24
 ordering 34
data transfer rate 1
degaussing a tape cartridge 33
description of 3580 Tape Drive 1
device driver
 installing 11

device driver (*continued*)
 supported 2
device driver kit 5
diagnostics
 Fast Read/Write Test 8, 20, 57
 SCSI wrap test 20, 41, 51
 selecting 44
 Tape Drive Diagnostics 20, 41, 42, 44
 Test Cartridge & Media 20, 34, 42, 56
 Test Head 20, 42, 59
displaying error code log 41, 54
disposing of a tape cartridge 33
disposing of the 3580 Tape Drive xi
drive dump
 copying to tape 41, 49
 forcing 41, 48, 49

E

electronic emissions 81
end of life (EOL) plan xi
environmental notice xi
environmental specifications
 for media 33
 for tape drive 3
EOL plan xi
erasing tape 32
error code log, displaying and clearing 41, 54
errors
 error codes 39
 resetting the tape drive 10, 45, 59
 TapeAlert flags 69
exiting maintenance mode 42, 61

F

Fast Read/Write Test 8, 20, 57
FCC statement 81
Federal Communications Commission (FCC)
 statement 81
firmware, updating drive from FMR tape 21, 41
FMR tape
 converting to blank tape 41, 52
 creating 41, 47
 updating drive firmware from 41, 45
forcing a drive dump 41, 48, 49

G

getting help 35

H

head, testing drive 42, 59
height of 3580 Tape Drive 3
help, getting 35
host
 configuring tape drive to 13

host (*continued*)
 supported 2
host adapter card, installing SCSI 10
HP, requirements for attaching tape drive to 2
HVD/DIFF SCSI host adapter card 11

I

IBM Ultrium Tape Drive 1
ID, setting SCSI 7
inserting a tape cartridge 19
installing
 3580 Tape Drive 5
 SCSI host adapter card 10
Intel-compatible servers, requirements for attaching tape drive to 2
interposers, list of required 10
inventory of ship group 5

L

label, for LTO Ultrium Tape Cartridge 24
label area, on LTO Ultrium Tape Cartridge 24
LCD, in message display 18
leader pin, in tape cartridge 24
leader pin, reattaching to tape 27
leader pin reattachment kit, ordering 34, 77, 78
LED
 in single-character display 18
 in status light 17
length of 3580 Tape Drive 3
light, status 17
line frequency specification 3
Linear Tape-Open (LTO) Cartridge Memory (CM) 24
liquid crystal display (LCD), in message display 18
load and unload cycles, for data cartridge 24
low voltage differential/single-ended (LVD/SE) SCSI interface 1
LVD SCSI host adapter card 1, 11

M

maintenance functions
 clearing error code log 41, 55
 converting FMR tape to blank tape 41, 52
 copying drive dump to tape 41, 49
 creating FMR tape 41, 47
 displaying error code log 41, 54
 forcing drive dump 41, 48
 inserting cartridge into tape drive 41, 55
 updating firmware from FMR tape 45
maintenance mode
 exiting 42, 61
 placing the tape drive in 43
manually removing a tape cartridge 63
media, using 23
message display, description 18
messages and error codes 39

O

operating systems, supported 2
ordering 34

ordering 34 (*continued*)
 parts 77, 78

P

parts lists 77, 78
performing a diagnostic or maintenance function 44
placing the tape drive in maintenance mode 43
POST, performing 8
power
 applying 15
 connecting 3580 Tape Drive to 8
 removing 15
 specifications 3
power cord 5, 7, 73
Power-On Self Test (POST), performing 8
power receptacles 74
power switch 15

R

read/write capability, testing 8, 20, 57
recording method 24
recycling of 3580 Tape Drive xi
relative humidity specifications
 for media 33
 for tape drive 3
removing a tape cartridge 20
requirements for attaching tape drive to host 2
resetting the tape drive after an error 10, 45, 59
RS/6000, requirements for attaching tape drive to 2
RS/6000 SP, requirements for attaching tape drive to 2

S

safety inspection procedure xi
safety notices
 manual of translated notices 5
 understanding ix
SCSI bus cable
 connecting 11
 in ship group 5
 lengths 12
SCSI commands, supported 67
SCSI host adapter card, installing 10
SCSI ID, setting 7
SCSI wrap tool
 in ship group 5
 using 51
security of data on cartridge 33
serial number, location of 6
servers, supported 2
setting the write-protect switch 26
signal cable, SCSI 5, 11, 12
single-character display
 description 18
 meaning of codes 39
small computer systems interface (SCSI)
 bus cable 5, 11, 12
 connecting between tape drive and bus 11, 12
 host adapter card, installing 10

small computer systems interface (SCSI) *(continued)*

- HVD/DIFF signaling system 1, 10
- LVD/SE signaling system 1, 10
- supported commands 67
- wrap test, running 41, 51

specifications

- for bar code and bar code label 24
- for media 33
- for tape drive 3

stacking tape cartridges 32

stacking the 3580 Tape Drive 7

status light 17

storage capacity 1

stuck tape, manually removing from drive 63

Sun, requirements for attaching tape drive to 2

supplies, ordering media 34

support centers, IBM 35

supported SCSI commands 67

supported TapeAlert flags 69

T

tape cartridge

- bar code label
 - guidelines for using 25
 - ordering 34
 - specifications 24
- capacity 24
- cartridge door 24
- cleaning cartridge 5, 23, 25
- data cartridge 5, 23, 24
- data security 33
- degaussing 32, 33
- description 24
- dimension of tape 24
- disposing of 33
- inserting 19
- labels 24
- leader pin 24
- Linear Tape-Open cartridge memory (LTO-CM) 24
- load and unload cycles 24
- manually removing 63
- ordering 34
- recording method 24
- removing 20
- specifications 33
- stacking 32
- Test Cartridge & Media diagnostic 34
- tips for handling 32
- write-protect switch 24, 26

tape drive, description 1

Tape Drive Diagnostics, running 41, 42, 44

TapeAlert flags, supported 69

temperature specification

- for media 33
- for tape drive 3

terminator 5, 11

Test Cartridge & Media diagnostic 42, 56

Test Head diagnostic 42, 59

troubleshooting 35

turning the tape drive on and off 15

U

unload button 16

unpacking the tape drive 5

updating drive firmware from FMR tape 41, 45

V

viewing latest supported attachments 2

voltage, specification 3

W

warranty 5, 84

weight of 3580 Tape Drive 3

wet bulb temperature specifications

- for media 33
- for tape drive 3

width of 3580 Tape Drive 3

Windows NT and Windows 2000, requirements for attaching tape drive to 2

wrap test, running SCSI 41, 51

write-protect switch

- location 24
- setting 26



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