3580 Ultrium Tape Drive
Models L13 and H13

Setup and Operator Guide

GA32-0456-00

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Note!

Before using this information and the product it supports, read the information in “Safety and Environmental Notices” on page xi and “Notices” on page 101.

To ensure that you have the latest publications, visit the web at `http://www.ibm.com/storage/lto`.

First Edition (June 2002)

This edition applies to the *IBM 3580 Ultrium Tape Drive Models L13 and H13 Setup and Operator Guide* and to all subsequent releases and modifications until otherwise indicated in new editions.

The IBM® 3580 Ultrium Tape Drive Models L13 and H13 offers a 3-year warranty. Models L13 and H13 are supported by the Customer Element Exchange process (not the IBM on-site service provided for Models L11 and H11). The warranty for Models L13 and H13 is a parts-only warranty. For details about the Customer Element Exchange process and customer responsibilities, see the warranty that is included with your ship group.

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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 *IBM Externally Attached Devices Safety Information*, SA26-2004.

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....
	A hazardous condition due to the weight of the unit. Weight symbols are accompanied by an approximation of the product's weight.

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 Models L13 and H13. The 3580 Tape Drive Models L13 and H13 offers a 3-year warranty. Models L13 and H13 are supported by the Customer Element Exchange process (not the IBM on-site service provided for Models L11 and H11). The warranty for Models L13 and H13 is a parts-only warranty. For details about the Customer Element Exchange process and customer responsibilities, see the warranty that is included with your ship group.

This guide 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 17 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 25 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 39 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 43 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 47 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 69 gives the procedure for removing a stuck tape cartridge from the 3580 Tape Drive.

Appendix D, “Installing a Tape Drive into a Rack” on page 83 describes how to install the 3580 Tape Drive into a rack.

Appendix E, “TapeAlert Flags” on page 89 lists TapeAlert messages that are supported by the 3580 Tape Drive and that may aid during problem determination.

Appendix F, “Power Cords” on page 93 provides information about the power cords that are used in different countries or regions.

Appendix G, “Parts Lists” on page 97 lists parts and supplies that are used by the 3580 Tape Drive.

Store this guide with your server’s manuals.

Related Publications

Refer to the following publications for additional information. To ensure that you have the latest publications, visit the web at `http://www.ibm.com/storage/lto`.

- *IBM 3580 Ultrium Tape Drive Quick Reference*, GX35-5060, illustrates how to configure and operate the 3580 Ultrium Tape Drive.
- *IBM Ultrium Internal Tape Drive Models T200 and T200F and 3580 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 and for the SCSI and Fibre Channel versions of the IBM Ultrium Internal 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 servers to use the device driver with the Ultrium family of devices.
- *IBM Ultrium Device Drivers Programming Reference*, GC35-0483, 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. To order by using File Transfer Protocol (FTP), visit `ftp://ftp.software.ibm.com/storage/devdrvr`.
- *IBM Externally Attached Devices Safety Information*, SA26-2004, provides translation 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 servers. 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 up to 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.

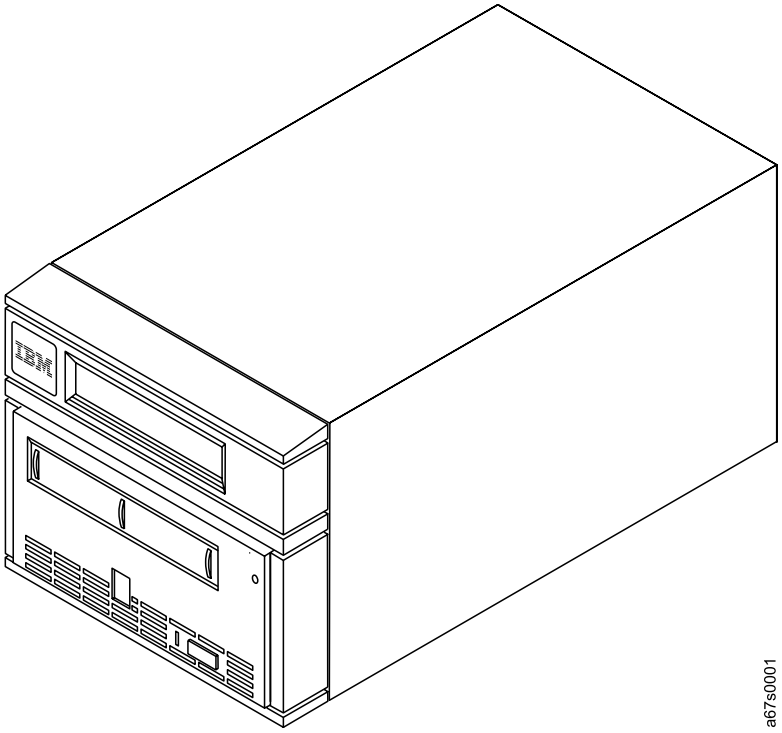

Figure 1. The IBM 3580 Tape Drive

Different 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 server:

- Model L13 uses the Ultra2, Low Voltage Differential/Single Ended (LVD/SE) interface
- Model H13 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/lto` and click on Technical Support.

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

Server	Operating System
IBM @server iSeries™ and AS/400®	IBM OS/400®
IBM @server pSeries™, RS/6000®, and RS/6000 SP™	IBM AIX®
IBM @server xSeries™ and Netfinity®	Microsoft® Windows NT® and Windows® 2000
HP	Hewlett-Packard HP-UX
Intel®-compatible servers	Microsoft Windows NT and Windows 2000, and Red Hat Linux 7.1 kernel 2.4.2-2
Sun	Sun Solaris

Important: The AS/400 and iSeries adapters are only HVD SCSI and support only one initiator per bus. In addition, tape drives must be attached on the same SCSI bus. For these and other tape drive performance reasons, a SCSI configuration must be a single drive and a single host when attached to the AS/400 or iSeries server.

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 the IBM FTP site by doing the following:

- Using a browser, type one of the following:

  `http://www.ibm.com/storage/lto` and click on Technical Support

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

  `ftp://207.25.253.26/storage/devdrvr`

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

  FTP site: `ftp.software.ibm.com`

  IP Addr: `207.25.253.26`

  Userid: `anonymous`

  Password: (use your current e-mail address)

  Directory: `/storage/devdrvr`

Note: If you do not have Internet access and you need information about device drivers, contact your IBM Marketing Representative.

IBM provides PDF- and PostScript- formatted versions of its documentation in the /storage/devdrvr directory:

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

Device drivers for each supported server are beneath /storage/devdrvr/ in the following directories (the device driver for the @server iSeries or AS/400 server is included in the OS/400 operating system).

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

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

TapeAlert Support

The 3580 Tape Drive is compatible with TapeAlert technology, which provides error and diagnostic information to the server. For more information, see Appendix E, “TapeAlert Flags” on page 89.

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 37.

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 Vac		
Line frequency	50 to 60 Hz		
Line current at 100 Vac	1.0 A		
Line current at 240 Vac	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

Attention:

1. The 3580 Tape Drive is a customer setup unit. It is the customer's responsibility to install this product.
2. The 3580 Tape Drive Models L13 and H13 offers a 3-year warranty. Models L13 and H13 are supported by the Customer Element Exchange process (not the IBM on-site service provided for Models L11 and H11). The warranty for Models L13 and H13 is a parts-only warranty. For details about the Customer Element Exchange process and customer responsibilities, see the warranty that is included with your ship group.

To ensure optimum performance, obtain the latest level of firmware from the web by visiting `http://www.ibm.com/storage/lto`. After you access the web site, select Technical Support to locate and download the firmware. Be sure to verify that you have the latest firmware installed on your machine before you contact IBM for any necessary technical support.

If you choose not to install this product yourself, IBM will install it for a fee. You can purchase installation services by contacting your local IBM Service office or your IBM Business Partner.

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.

__ 3. Tilt the 3580 Tape Drive on its side and locate the label that gives the machine type, model number and serial number of the unit (see **10** in Figure 2 on page 7). Make a note of these numbers and store them in an easily accessible place. Should you need to contact IBM Technical Support, you will be asked for these numbers.

Step 2. Using the Inventory Checklist

Ensure that you have received the following items:

__ 1. Power cord (for the appropriate cord for your country or region, see Appendix F, “Power Cords” on page 93)

__ 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. Optional rackmount kit (if ordered)

__ 8. The *IBM 3580 Ultrium Tape Drive Quick Reference*

__ 9. The *IBM 3580 Ultrium Tape Drive Models L13 and H13 Setup and Operator Guide* (this guide)

__ 10. The *IBM Externally Attached Devices Safety Information* manual

Step 3. Installing the Rackmount Kit

If you ordered the optional rackmount kit, refer to Appendix D, “Installing a Tape Drive into a Rack” on page 83 for installation instructions. If you did not order the optional rackmount kit, proceed to “Step 4. Inspecting the Power Cord and Outlet”.

Step 4. 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 93 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.

1 Message display
2 Cartridge load compartment
3 Single-character display
4 Status light
5 Unload button
6 External SCSI connectors
7 Power receptacle
8 Power switch
9 SCSI address switch
10 Machine type, model number, and serial number

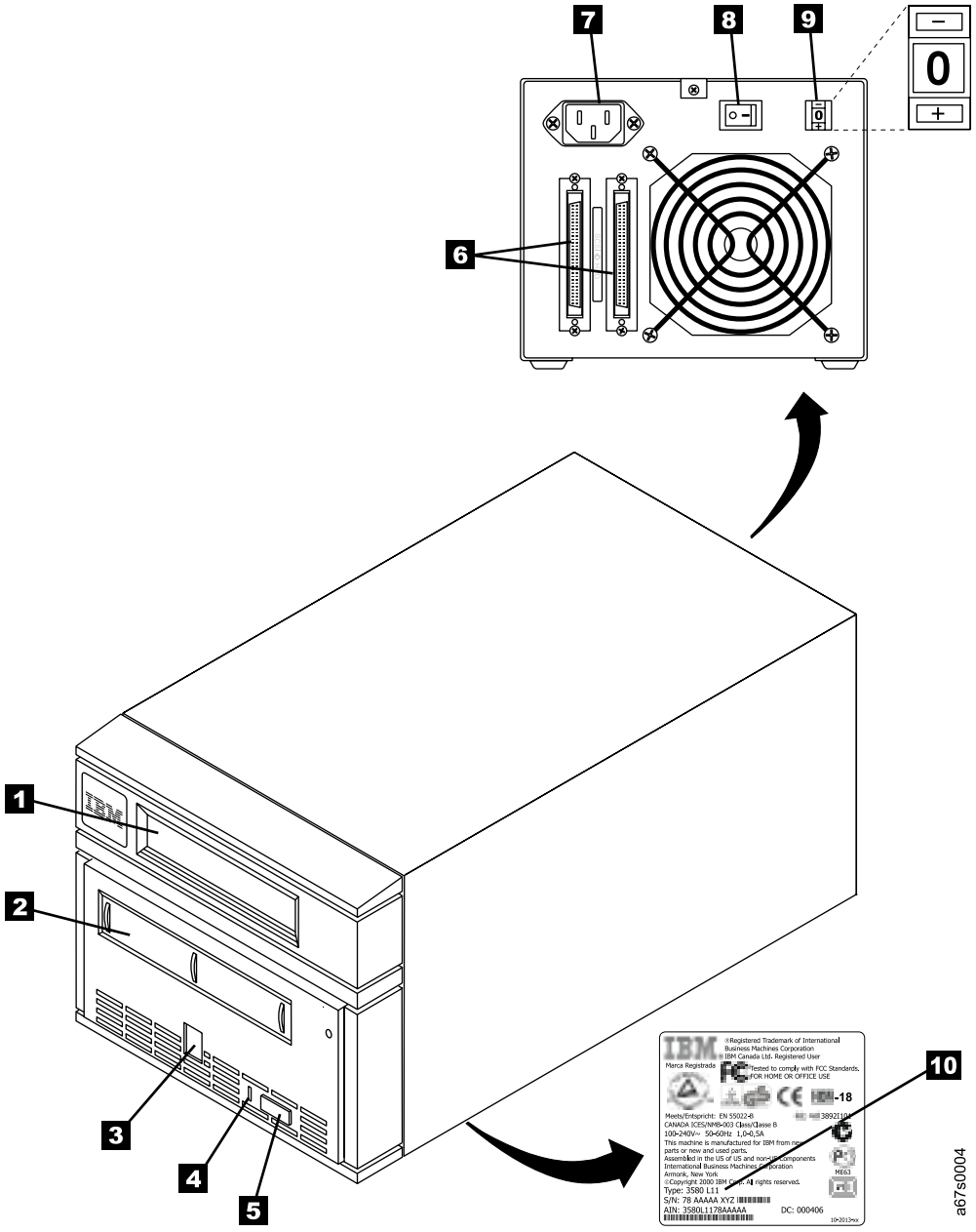

Figure 2. Components of the 3580 Tape Drive

Step 5. Setting the SCSI ID

The SCSI ID is a unique address that identifies the 3580 Tape Drive to the server. 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 7).

__ 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 6. Positioning the Tape Drive

Position the 3580 Tape Drive anywhere that is convenient to the server. 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 7. 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 7).

__ 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 8. 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 redisplays.)

```
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 43. 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 9. Installing the SCSI Host Adapter Card (if required)

If there are no other devices attached to your server, you may need to install a SCSI host adapter card in the server. To determine whether your server 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 server needs an LVD/SE SCSI host adapter card.
- If  appears on the label, your server 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 server's documentation. For a list of supported adapters and required interposers, visit the web at `http://www.ibm.com/storage/lto`.

Although the LVD/SE hardware in the 3580 Tape Drive Model L1x is capable of operating in the single-ended (SE) mode, SE operation is not recommended or supported.

Step 10. Installing Device Drivers

A device driver is firmware that enables the 3580 Tape Drive to interact with a variety of servers. 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, 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 11. Connecting the SCSI Bus Cable

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 HVD 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 up to 15 MB per second with no compression and 30 MB per second at 2:1 compression. For these reasons, you can attach only one or two Model H1x 3580 Tape Drives to an Ultra SCSI bus and from two to four Model L1x 3580 Tape Drives to an Ultra2 SCSI bus.

Note: The AS/400 and iSeries adapters are for the HVD SCSI interface and support only one initiator per bus. Also, all tape drives must be attached to the same SCSI bus. For these and other drive performance reasons, a SCSI configuration must consist of a single drive and a single host when attached to an AS/400 or iSeries server.

The SCSI bus cable connects the 3580 Tape Drive to the server. 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 server'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 server's documentation).

__ 3. Determine the maximum allowable length of your bus cable. The maximum allowable length depends on the type of SCSI bus (LVD or HVD) that you are using and the number of devices on the bus:

- For an LVD bus with a single device, do not use a total cabling length that exceeds 25 m (82 ft).
- For an LVD bus with a multiple devices, do not use a total cabling length that exceeds 12 m (39 ft).
- For an HVD bus, do not use a total cabling length that exceeds 25 m (82 ft).

To determine whether your server uses an LVD or HVD SCSI bus, see "Step 9. Installing the SCSI Host Adapter Card (if required)" on page 12.

Attention:

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

b. Data transfer protocols for tape and disk drives are very dissimilar. For that reason, IBM strongly recommends that you avoid running tape and disk drives on the same host adapter. A configuration with tape and disk on a single host adapter gives a slow and unreliable performance.

__ 4. 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 server (see Figure 3).

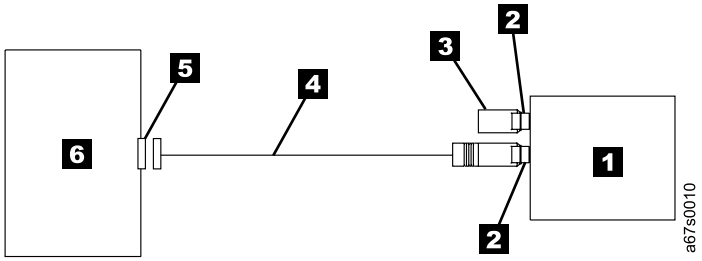

Figure 3. Example of connecting one SCSI device to the server. The view is from the top.

1. 3580 Tape Drive
2. SCSI connectors
3. Terminator
4. SCSI bus cable
5. SCSI host adapter card
6. Server

- **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 server:
  - For a server with an LVD/SE SCSI host adapter card, use a cable with a total length of 12 m (39 ft) or less.
  - For a server 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 server uses an LVD/SE or HVD/DIFF SCSI host adapter card, see “Step 9. Installing the SCSI Host Adapter Card (if required)” on page 12.

  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.

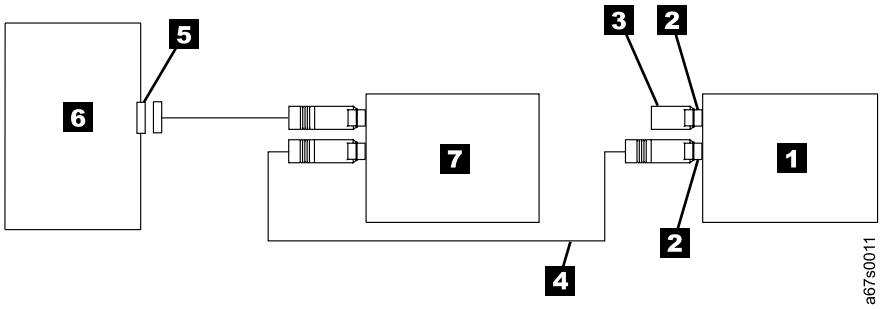

Figure 4. Example of connecting multiple SCSI devices to the server. The view is from the top.

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

Step 12. Configuring the 3580 Tape Drive to the Server

__ 1. Power-on the 3580 Tape Drive.

__ 2. To configure the 3580 Tape Drive for use, refer to the documentation for your server and application software.

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 7). 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 7).

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

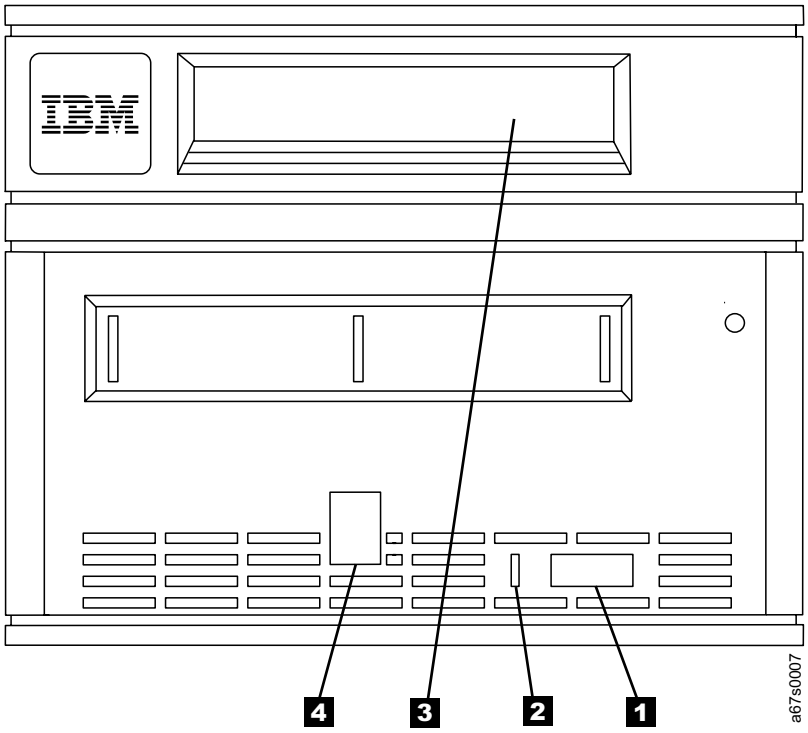

Figure 5. Front view of the 3580 Tape Drive

Unload Button

The unload push button (**1** in Figure 5 on page 17) 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. Note that (depending on its location on the reel) the tape may take as much as 20 minutes to completely rewind and eject.

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 server.
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 server.
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 47), 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 17) 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. The status light also flashes green if the tape drive contains a cartridge during the power-on cycle. In this case, the drive completes POST and slowly rewinds the tape (the process may take approximately 13 minutes). The light stops blinking when the drive completes the recovery and is ready for a read or write operation. To eject the cartridge, press the unload button.
Amber/Solid	The 3580 Tape Drive is powering on or is in maintenance mode.
Amber/Flashing	One of the following applies: • 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 43 to determine the action that is required. • 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 17) 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 17) 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 43 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 47 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 47.

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 28).
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 tape will reload.

   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...
   ```

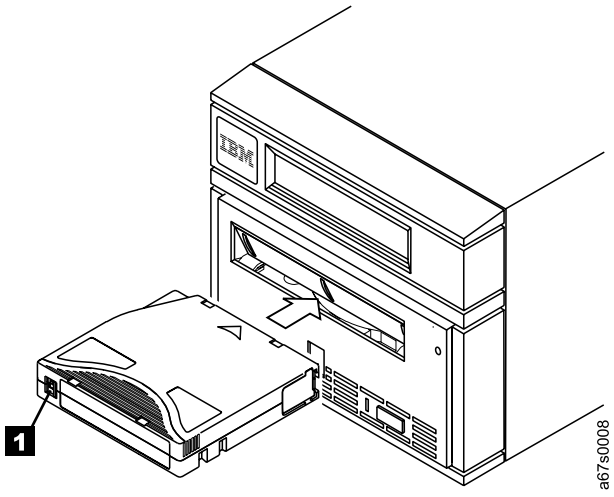

Figure 6. Inserting a cartridge into the 3580 Tape Drive

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.

Note: In the following step, the tape may take as much as 20 minutes to completely rewind and eject (depending on its location on the reel).

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 69.

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 47.

TapeAlert Flags

TapeAlert is a standard that defines status conditions and problems experienced by tape devices such as drives, autoloaders, and libraries. The standard enables a server to read TapeAlert flags from the tape drive over the SCSI bus. The server reads the flags from Log Sense Page 0x2E. For a list of TapeAlert flags that are supported by the 3580 Tape Drive, see Appendix E, “TapeAlert Flags” on page 89.

Updating the Drive Firmware

Attention: To ensure optimum performance from the 3580 Tape Drive, use the latest level of drive firmware. It is the customer's responsibility to obtain and install 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 over the SCSI interface
- Loading the firmware from a field microcode replacement (FMR) tape cartridge

To update the firmware over the SCSI bus, obtain the new firmware image and the installation instructions by visiting the web at `http://www.ibm.com/storage/lto`. For instructions about downloading firmware, see "Procedure 2" on page 41.

To update the firmware by using an FMR tape, visit the web at `http://www.ibm.com/storage/lto`.

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 21). 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 following cartridge types:

- 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		

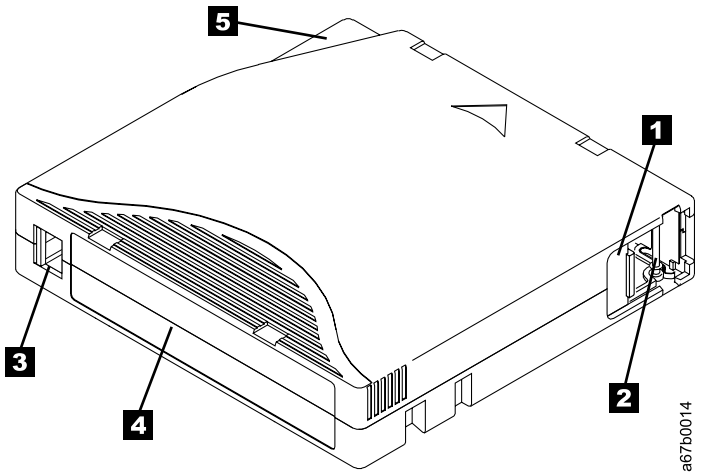

Figure 7. The IBM LTO Ultrium Data Cartridge

Attention: The IBM LTO Ultrium Tape Cartridge is a delicate component and requires care in handling. For more information, see "Handling the Cartridges" on page 29.

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 25) 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 38. The bar code and bar code label must meet predefined specifications. To determine the specifications, visit the web at `http://ssddom02.storage.ibm.com/tape/lto/documentation/labelspec` or contact your IBM Marketing Representative.

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

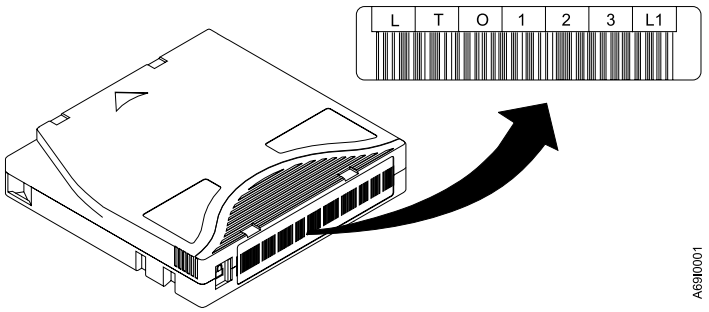

Figure 8. Sample bar code label on the LTO Ultrium Tape Cartridge. The volume serial number (LTO123) and bar code are printed on the label.

Guidelines for Using Bar Code Labels

Apply the following guidelines whenever you use 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 25).
- 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 21). 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 22. 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 (solid red), data cannot be written to the tape.
- If the switch is set to unlocked (black void), data can be written to the tape.

If possible, use your server's application software to write-protect your cartridges (rather than manually setting the write-protect switch). This allows the server's 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.

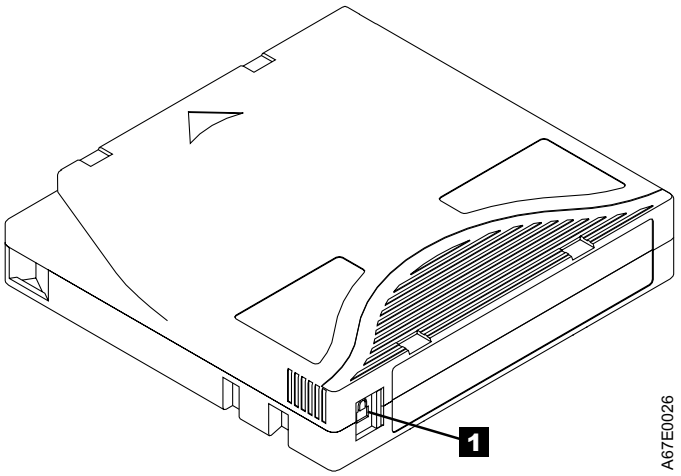

Figure 9. Setting the write-protect switch

Handling the Cartridges

Attention: Do not insert a damaged tape cartridge into your 3580 Tape Drive. A damaged cartridge can interfere with the reliability of the drive and may void the warranties of the drive and the cartridge. Before inserting a tape cartridge, inspect the cartridge case, cartridge door, and write-protect switch for breaks.

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:

- Do not drop the cartridge. If the cartridge drops, slide the cartridge door back and ensure that the leader pin is properly seated in the pin-retaining spring clips (see Figure 10 on page 30). Inspect the rear of the cartridge (the part that you load first into the tape load compartment) and ensure that there are no gaps in the seam of the cartridge case (see **4** in Figure 11 on page 31). If the leader pin has become dislodged or if there are gaps in the seam of the cartridge case, go to “Repositioning or Reattaching a Leader Pin” on page 30.
- Open only the cartridge door. Do not open any other part of the cartridge case. The upper and lower parts of the case are held together with screws; 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.
- Before you use a cartridge, let it acclimate for at least 24 hours to the normal operating environment.
- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not stack more than six cartridges.
- Do not expose the tape cartridge to moisture or direct sunlight.
- Do not degauss a tape cartridge that you intend to reuse. Degaussing makes the tape unusable.
- Do not expose recorded or blank tape cartridges to stray magnetic fields of greater than 100 oersteds (for example, terminals, motors, video equipment, X-ray equipment, or 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 37.

Repositioning or Reattaching a Leader Pin

Attention: 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.

If the leader pin in your cartridge becomes dislodged from its pin-retaining spring clips or detaches from the tape, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reposition or reattach it. (Do not reattach the pin if you must remove more than 3 meters (10 feet) of leader tape.) The sections that follow describe each procedure.

Repositioning a Leader Pin

A leader pin that is improperly seated inside a cartridge can interfere with the operation of the drive. Figure 10 shows a leader pin in the incorrect **1** and correct **2** positions.

To place the leader pin in its proper position, you will need the following tools:

- Plastic or blunt-end tweezers
- Cartridge manual rewind tool (from Leader Pin Reattachment Kit, part number 08L9129; to order the kit, see “Ordering Media Supplies” on page 38)

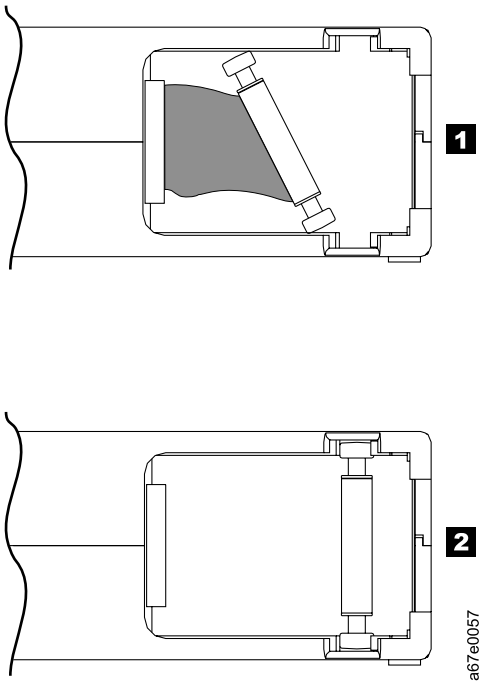

Figure 10. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

To reposition the leader pin, perform the following steps.

1. Slide open the cartridge door (1 in Figure 11) and locate the leader pin 2 (you may need to shake the cartridge gently to roll the pin toward the door).
2. With plastic or blunt-end tweezers, grasp the leader pin and position it in the pin-retaining spring clips 3 .
3. Press the leader pin gently into the clips until it snaps into place and is firmly seated. Ensure that there are no gaps in the seam of the cartridge 4 .

   Attention: If gaps exist, do not continue with this procedure and do not use the cartridge.
4. Close the cartridge door.

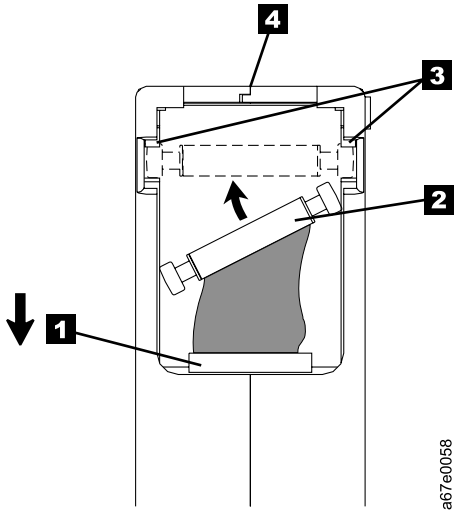

Figure 11. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

5. To rewind the tape, insert the cartridge manual rewind tool (1 in Figure 12) into the cartridge's hub 2 and turn it clockwise until the tape becomes taut.

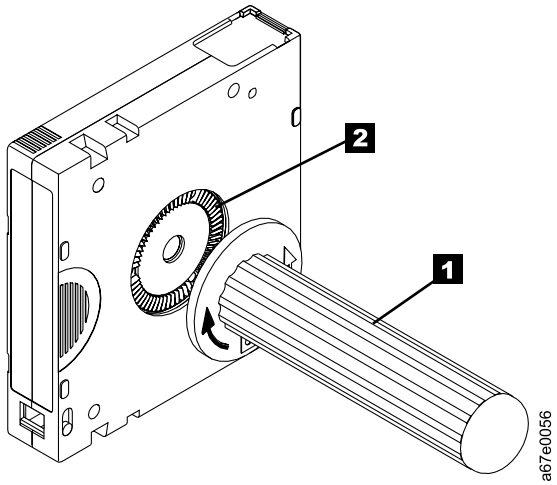

Figure 12. Rewinding the tape into the cartridge

6. Remove the rewind tool by pulling it away from the cartridge.

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 3 meters (10 feet) of leader tape.

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.

To order the Leader Pin Reattachment Kit or other media supplies, see "Ordering Media Supplies" on page 38.

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 13) 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** .

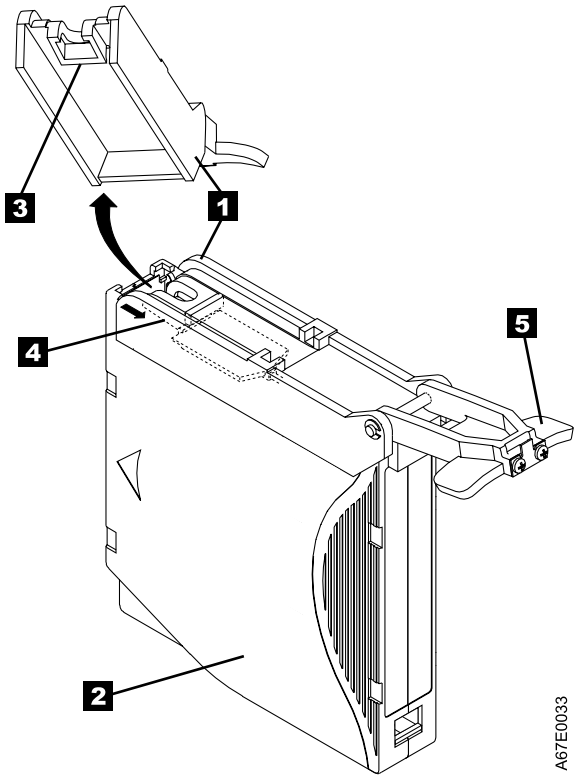

Figure 13. Attaching the leader pin attach tool to the cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (**1** in Figure 14) 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.

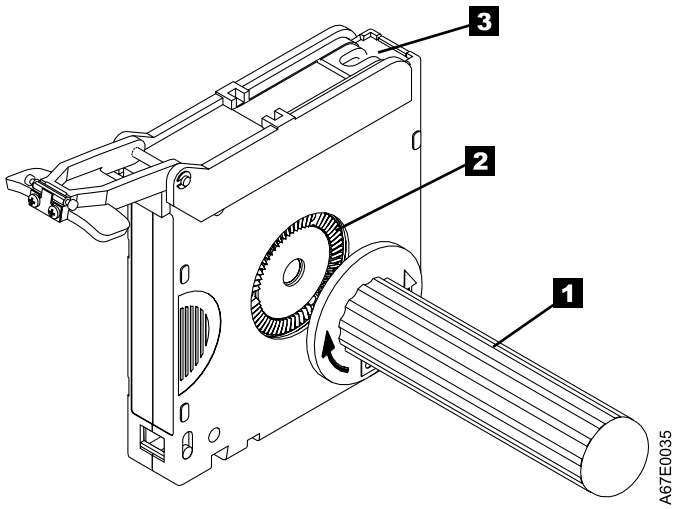

Figure 14. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the door.

5. On the leader pin (**1** in Figure 15), 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.

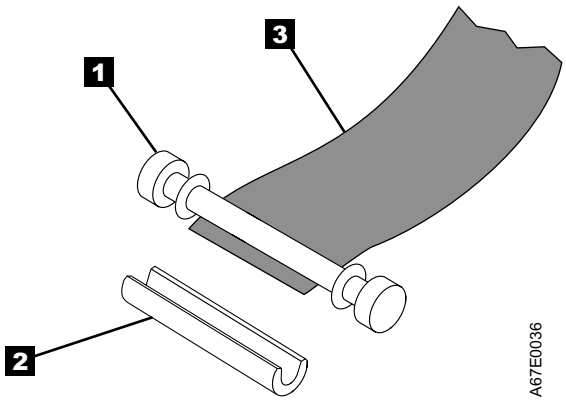

Figure 15. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure 16 on page 36).
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.

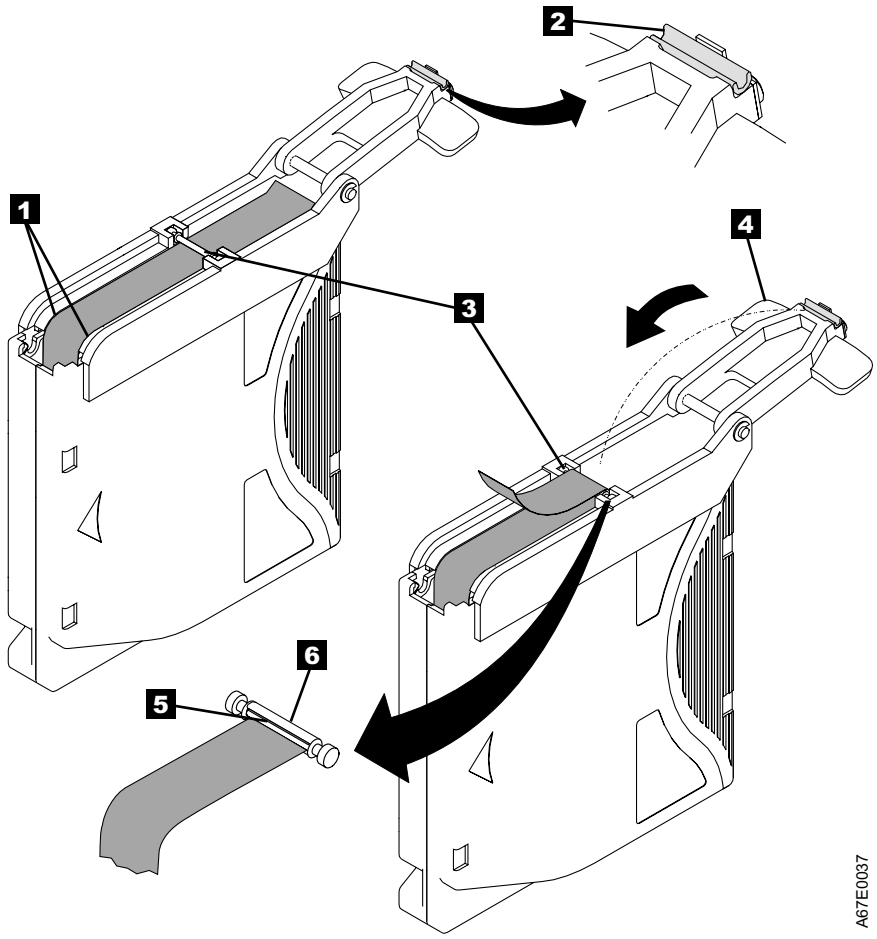

Figure 16. Attaching the leader pin to the tape

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). Ensure that the leader pin is latched by the pin-retaining spring clips on each end of the leader pin.
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.

Environmental and Shipping Specifications for Tape Cartridges

Before you use a tape cartridge, acclimate it to the operating environment for 24 hours or the time necessary to prevent condensation in the drive (the time will vary, depending on the environmental extremes to which the drive was exposed).

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)	10 to 80%	20 to 80%	20 to 50%	5 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, country (non-U.S.A.), or regional 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 Marketing 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 Marketing Representative by specifying Machine Type 3589 Model 002.
Standard IBM LTO Ultrium Cleaning Cartridge Includes human-writable labels.	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 Marketing 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 Business Partner or IBM Marketing Representative.

Ordering Bar Code Labels

If you want to place bar code labels on your LTO Ultrium Tape Cartridges, you can order them directly from the following authorized label supplier:

In America and Asia
Colorflex
697 South Pierce Street
Louisville, CO 80027
U. S. A.
Telephone: 1-888-438-8362
Fax: 303-266-2166
`http://www.colorflex.com/tri-optic`

In Europe
EDP Europe, Ltd.
43 Redhills Road
South Woodham Ferrers
Chelmsford, Essex CM3 5UL
U. K.
Telephone: +44-1245-322380
Fax: +44-1245-323484
`http://www.colorflex.com/tri-optic`

Chapter 5. Troubleshooting

If you encounter problems when running the 3580 Tape Drive, refer to the flowchart in Figure 17. Should the drive need to be replaced, go to “Replacing the Tape Drive” on page 42. If a problem requires a call to IBM Technical Support, prior to placing the call review the pre-call checklist on page 42.

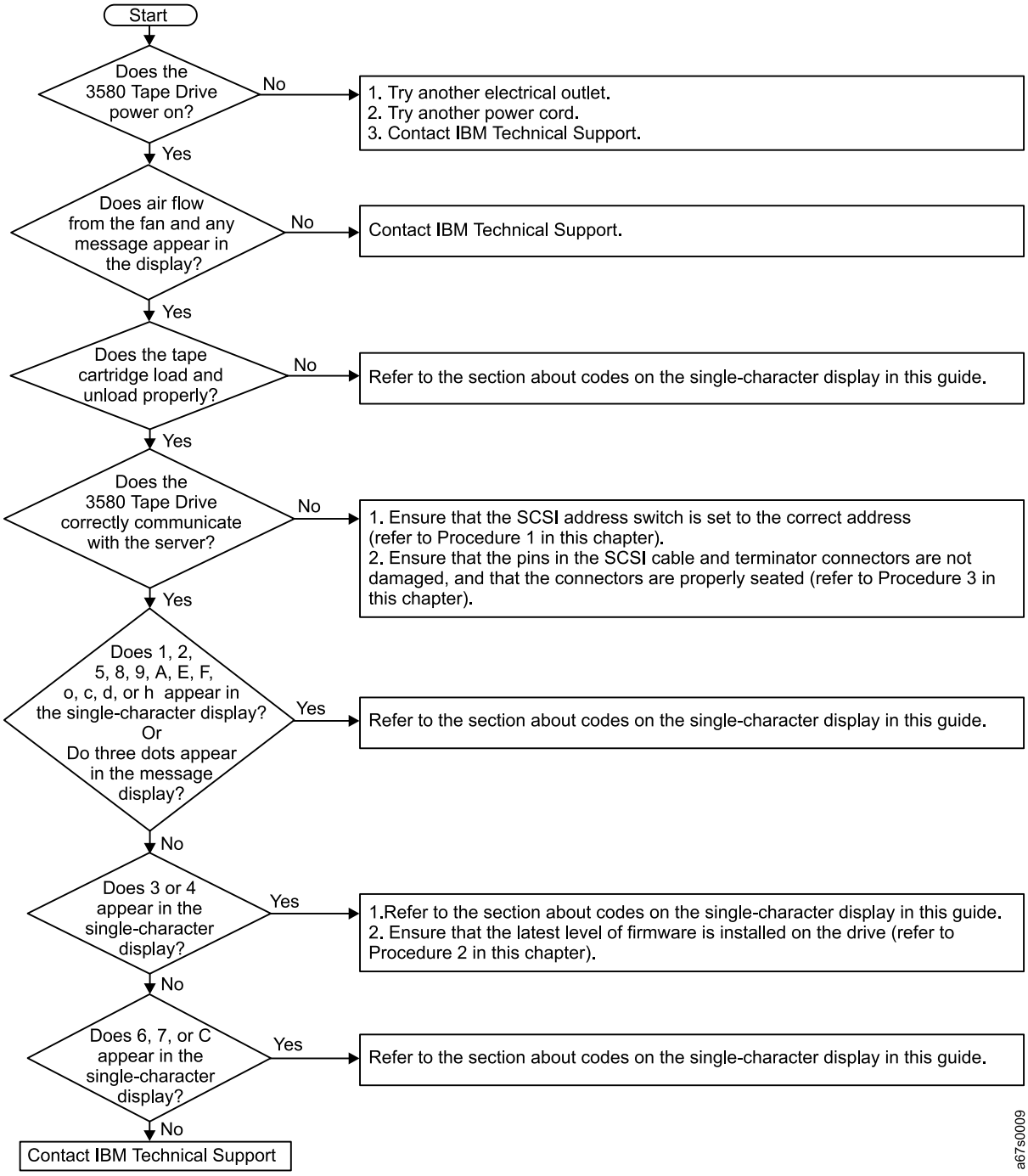

Figure 17. Flowchart for analyzing maintenance problems

Procedure 1

If your server 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 18) to ensure that it is set to the SCSI ID that you chose in "Step 5. Setting the SCSI ID" on page 8.
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.

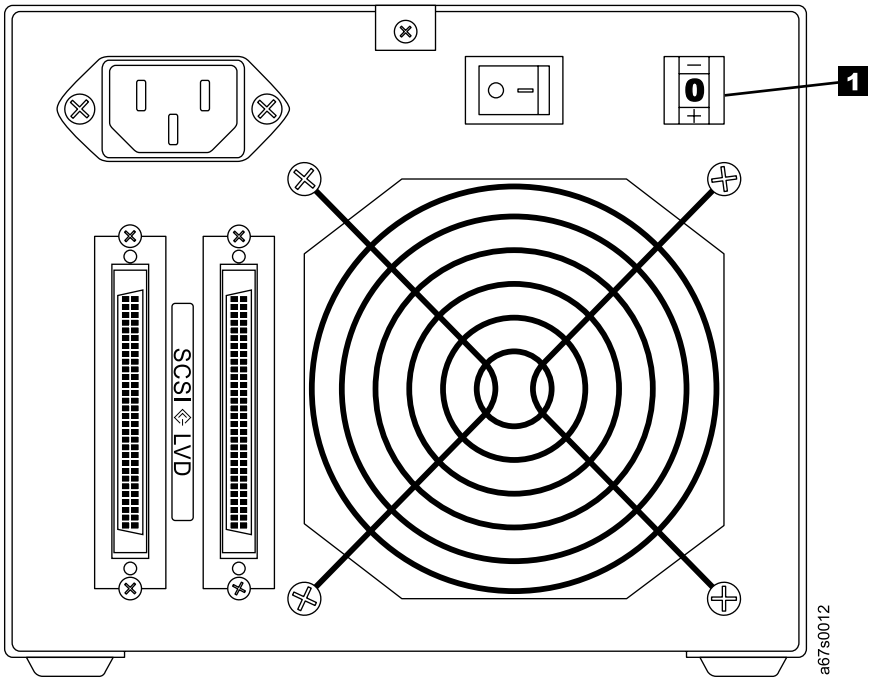

Figure 18. Checking the setting on the SCSI address switch. The switch is located at the rear of the 3580 Tape Drive.

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. 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.
2. Determine the latest level of firmware available by visiting the web at `http://www.ibm.com/storage/lto`.
   - 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, contact IBM Technical Support for additional problem determination. If IBM Technical Support determines that the machine should be replaced, it will send you a replacement. To install the replacement machine, refer to “Replacing the Tape Drive” on page 42.

Procedure 3

If your server 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 57). If the test succeeds, the problem may be with the cables or SCSI host adapter. Refer to your server’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.

Pre-Call Checklist

If you have questions or problems concerning the 3580 Tape Drive, perform the following steps before you place a call to IBM Technical Support. Where instructions refer you to the web, visit `http://www.ibm.com/storage/lto`.

__ 1. Verify that the drive's firmware is at the most recent level. To determine the latest release of firmware, visit the web.

__ 2. Verify that your device drivers are at the most recent level:
   - For IBM device drivers, visit the web.
   - For the device drivers of independent software vendors (ISVs), visit the appropriate third-party web site.

__ 3. Verify whether your hardware and software configuration is supported. To determine the latest supported attachments, visit the web.

__ 4. Review "Most Frequently Asked Questions With Answers" on the web.

__ 5. Perform a general checkup of the hardware and connections:
   - Ensure that you are using the correct SCSI terminator (LVD/HVD) and that you are not mistakenly using a SCSI wrap plug (used for the diagnostic SCSI wrap test).
   - Before attaching the SCSI cables, ensure that the connector does not contain bent or recessed pins.
   - Ensure that all retention screws for the SCSI cable and terminator are securely tightened.

Replacing the Tape Drive

To replace your 3580 Tape Drive, perform the following steps:

1. Remove the replacement drive from its packaging.
2. Locate the repair tag (included with the replacement drive).
3. Write down the serial number of the failed drive on the repair tag.
4. Affix the repair tag to the replacement drive (near to, but not covering, the serial number on the drive).
5. Place the failed drive into the packaging of the replacement drive.
6. Follow the instructions (included with the replacement drive) for returning the failed drive to IBM.

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 39 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 47.

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

Code	Cause and Action
0	No error occurred and no action is required. This code displays: • When power is cycled (turned off, then on) to the tape drive. • When diagnostics have finished running and no error occurred. **Note:** The single-character display is blank during normal operation of the tape drive.
1	Cooling problem. The tape drive detected that the recommended operating temperature was exceeded. Perform one or more of the following actions: • Ensure that the cooling fan is rotating and is quiet. If not, replace the 3580 Tape Drive. • Remove any blockage that prevents air from flowing freely through the tape drive. • Ensure that the operating temperature and airflow is within the specified range (see “Specifications” on page 4). • If the operating temperature is within the specified range and the problem persists, replace the 3580 Tape Drive. The error code clears when you power-off the tape drive or place it in maintenance mode.
2	Power problem. The tape drive detected that the externally supplied power is approaching the specified voltage limits (the tape drive is still operating) or is outside the specified voltage limits (the tape drive is not operating). Perform the following action: 1. Ensure that the power connector is properly seated. 2. Ensure that the proper dc voltages are being applied within the tolerances allowed (see “Specifications” on page 4). 3. If the proper voltages are being applied but the problem persists, replace the 3580 Tape Drive. The error code clears when you power-off the tape drive or place it in maintenance mode.

Table 6. Codes on the single-character display of the 3580 Tape Drive (continued). The display clears if you power-off the tape drive.

Code	Cause and Action
3	Firmware problem. The tape drive determined that a firmware error occurred. Perform the following action: 1. Collect a drive dump from one of the following: **Note:** Do not force a new dump; the tape drive has already created one. • Server's SCSI interface by using a device driver utility or system tool (for instructions about reading a drive dump from tape, visit the Web at `http://www.ibm.com/storage/lto`) • Ultrium Tape Drive (to copy and read a drive dump, use Function Code 5 in Table 7 on page 47) 2. Power the tape drive off and on, then retry the operation that produced the error. 3. If the problem persists, download new firmware and retry the operation. 4. If the problem persists, send the drive dump that you collected in step 1 to your IBM Support Center. The error code clears when you power-off the tape drive or place it in maintenance mode.
4	Firmware or tape drive problem. The tape drive determined that a firmware or tape drive hardware failure occurred. Perform the following action: 1. Collect a drive dump from one of the following: **Note:** Do not force a new dump; one already exists. • Server's SCSI interface by using a device driver utility or system tool (for instructions about reading a drive dump from tape, visit the Web at `http://www.ibm.com/storage/lto`) • Ultrium Tape Drive (to copy and read a drive dump, use Function Code 5 in Table 7 on page 47) 2. Power the tape drive off and on, then retry the operation that produced the error. The error code clears when you power-off the tape drive or place it in maintenance mode. 3. If the problem persists, download new firmware and retry the operation; if new firmware is not available, replace the 3580 Tape Drive.
5	Tape drive hardware problem. The drive determined that a tape path or read/write error occurred. To prevent damage to the drive or tape, the tape drive will not allow you to insert a cartridge if the current cartridge was successfully ejected. If the problem persists, replace the 3580 Tape Drive. The error code may clear when you cycle power to the tape drive or place it in maintenance mode.

Table 6. Codes on the single-character display of the 3580 Tape Drive (continued). The display clears if you power-off the tape drive.

Code	Cause and Action
6	Tape drive or media error. The tape drive determined that an error occurred, but it cannot isolate the error to faulty hardware or to the tape cartridge. Perform the following action: **For Problems with Writing Data:** If the problem occurred while the tape drive was writing data to the tape, and if you know the volume serial number (located on the cartridge label) of the tape cartridge that was loaded in the drive when the problem occurred, retry the operation with a different cartridge: • If the operation succeeds, the original cartridge was defective. Copy data from the defective cartridge and discard it. • If the operation fails and another tape drive is available, insert the cartridge into the other unit and retry the operation. – If the operation fails, discard the defective cartridge. – If the operation succeeds, insert a scratch cartridge into the first unit and run the tape drive diagnostics (see Function Code 1 in Table 7 on page 47). - If the diagnostics fail, replace the 3580 Tape Drive. - If the diagnostics succeed, the error was temporary. • If the operation fails and another tape drive is not available, insert a scratch cartridge into the unit and run the tape drive diagnostics (see Function Code 1 in Table 7 on page 47). – If the diagnostics fail, replace the 3580 Tape Drive. – If the diagnostics succeed, discard the cartridge. If the problem occurs with multiple tape cartridges or if you do not know the tape cartridge's volume serial number, run the tape drive diagnostics (see Function Code 1 in Table 7 on page 47): • If the diagnostics fail, replace the 3580 Tape Drive. • If the diagnostics succeed, run the Test Head diagnostic (see Function Code H in Table 7 on page 47). – If the Test Head diagnostic fails, replace the 3580 Tape Drive. – If the Test Head diagnostic succeeds, replace the cartridges that caused the problem. The error code clears when you remove the tape cartridge or place the tape drive in maintenance mode. **For Problems with Reading Data:** If the problem occurred while the tape drive was reading data from the tape, and if you know the volume serial number of the tape cartridge, perform one of the following procedures: • If another tape drive is available, insert the cartridge into the other unit and retry the operation: – If the operation fails, discard the defective cartridge. – If the operation succeeds, insert a scratch cartridge into the first unit and run the tape drive diagnostics (see Function Code 1 in Table 7 on page 47): - If the diagnostics fail, replace the 3580 Tape Drive. - If the diagnostics succeed, the error was temporary. • If another tape drive is not available, insert a scratch cartridge into the unit and run the tape drive diagnostics (see Function Code 1 in Table 7 on page 47): – If the diagnostics fail, replace the 3580 Tape Drive. – If the diagnostics succeed, discard the cartridge. If the problem occurs with multiple tape cartridges or if you do not know the tape cartridge's volume serial number, run the tape drive diagnostics (see Function Code 1 in Table 7 on page 47): • If the diagnostics fail, replace the 3580 Tape Drive. • If the diagnostics succeed, run the Test Head diagnostic (see Function Code H in Table 7 on page 47). – If the Test Head diagnostic fails, replace the 3580 Tape Drive. – If the Test Head diagnostic succeeds, replace the cartridges that caused the problem. The error code clears when you remove the tape cartridge or place the tape drive in maintenance mode.

Table 6. Codes on the single-character display of the 3580 Tape Drive (continued). The display clears if you power-off the tape drive.

Code	Cause and Action
7	A high probability of media error. The tape drive determined that an error occurred because of a faulty tape cartridge. Try another tape cartridge. If the problem occurs with multiple tape cartridges, use the following procedure: **Attention:** When you run the Test Cartridge & Media diagnostic, data on the suspect tape is overwritten. Use only a scratch data cartridge to run the test. 1. If possible, run the tape cartridge in a different tape drive. If the operation in the other unit fails and **6** or **7** displays, replace the media. If the operation succeeds, run the Test Cartridge & Media diagnostic (see Function Code E in Table 7 on page 47). 2. If the Test Cartridge & Media diagnostic fails, replace the media. If it runs successfully, clean the drive head and run the tape drive diagnostics (see "Cleaning the Drive Head" on page 23 and Function Code 1 in Table 7 on page 47). 3. If the tape drive diagnostics fail, replace the 3580 Tape Drive. If the tape drive diagnostics run successfully, perform the operation that produced the initial media error. The error code clears when you remove the tape cartridge or place the tape drive in maintenance mode.
8	Tape drive or SCSI bus failure. The tape drive determined that a failure occurred in the tape drive's hardware or in the SCSI bus. See "Procedure 3" on page 41. The error code clears 10 seconds after the drive detected the error or when you place the drive in maintenance mode.
9	Tape drive or RS-422 error. The tape drive determined that a failure occurred in the tape drive's hardware or in the RS-422 connection. Replace the 3580 Tape Drive. The error code clears 10 seconds after the drive detected the error or when you place the tape drive in maintenance mode.
o, c, b, h, E, or F	No error or message assigned. There may be a problem with the single-character display. Turn the power off, then on and determine whether all segments on the single-character display are lit. If so, you may have a down-level version of your 3580 Tape Drive's firmware or this book. Refer to the latest version of the firmware or this book.
A	Tape drive hardware problem. The tape drive determined that a problem occurred which degraded the operation of the tape drive, but it did not restrict continued use. If the problem persists, replace the 3580 Tape Drive. The drive is usable, though the single-character display continues to indicate an error and the status light flashes amber. The error code may clear when you cycle power to the tape drive or place it in maintenance mode.
B	No error or message is assigned. See error code 8 in this table.
C	The tape drive needs to be cleaned. Clean the tape drive. See "Cleaning the Drive Head" on page 23. The error code clears when you clean the tape drive or place it in maintenance mode.
D	No error or message assigned. See error code 0 in this table.
...	The message display has lost communication with the 3580 Tape Drive. This message appears on line 2 of the message display. The three dots may occasionally display during normal processing.

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
Run Tape Drive Diagnostics Causes the 3580 Tape Drive to run tests to determine whether it can properly load and unload cartridges, and read and write data.	1	Page 50
Update Tape Drive Firmware from FMR Tape Causes the 3580 Tape Drive to load updated firmware from a field microcode replacement (FMR) tape.	2	Page 52
Create FMR Tape Causes the 3580 Tape Drive to copy its field microcode replacement (FMR) data to a scratch (blank) data cartridge.	3	Page 53
Force a Drive Dump Causes the 3580 Tape Drive to perform a dump of data (also known as saving a microcode trace).	4	Page 55
Copy the Drive Dump to Tape (at Beginning of Tape) Causes the 3580 Tape Drive to copy data from a drive dump (captured by using Function Code 4) to the beginning of a scratch (blank) data cartridge.	5	Page 56
Run SCSI Wrap Test Causes the 3580 Tape Drive to perform a check of the SCSI circuitry from and to the SCSI connector.	6	Page 57
Run RS-422 Wrap Test Not available.	7	Not available
Unmake FMR Tape 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.	8	Page 59
Display Error Code Log 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).	9	Page 60
Clear Error Code Log Causes the 3580 Tape Drive to erase the contents of the error code log.	A	Page 61

Table 7. Diagnostic and maintenance functions of the 3580 Tape Drive (continued)

Diagnostic or Maintenance Function	Function Code	Location of Instructions
Insert Cartridge into Tape Drive 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.	C	Page 62
Test Cartridge & Media Causes the 3580 Tape Drive to perform tests to ensure that a suspect cartridge and its magnetic tape are acceptable.	E	Page 62
Fast Read/Write Test Causes the 3580 Tape Drive to perform tests to ensure that the drive can read from and write to tape.	F	Page 64
Test Head Causes the 3580 Tape Drive to perform tests to ensure that the tape drive's head and tape-carriage mechanics are working correctly.	H	Page 66
Exit Maintenance Mode Causes the 3580 Tape Drive to become available for reading and writing data.	0	Page 68

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 server.

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 redisplays.)

   ```
   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 the unload button for one second and release. 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 43. 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 redisplays.)

   ```
   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
```

  The 3580 Tape Drive automatically reboots. Ignore the messages that appear on line 2 of the message display (such as **Load Drv FMR Tape**) and wait until the reboot is finished. The following message displays:

```
Ultrium Tape Drive
Drive Empty
```

- 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 43. The drive then unloads the FMR tape, exits maintenance mode, and displays the following message:

```
Ultrium Tape Drive
Drive Empty
```

  Contact IBM Technical Support 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 redisplays.)

```
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 43. 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 redisplays.)

```
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 redisplays.)

   ```
   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 43. 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 server. 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 redisplays.)

```
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 the unload button for one second and release. 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 43. To clear the error, turn the power off, then on again.

Function Code 7: Run RS-422 Wrap Test

This test is not available and cannot be performed.

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 redisplays.)

```
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 43.

  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 redisplays.)

```
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 to 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 redisplays.)

```
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 redisplays.)

```
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 the unload button for one second and release. 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 43. 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 redisplays.)

```
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 the unload button for one second and release. 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 43. 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 redisplays.)

```
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 the unload button for one second and release. 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 43. 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 43.

     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

Attention: Perform this procedure only after you have attempted to remove the tape cartridge by pressing the unload button (see “Removing a Tape Cartridge” on page 22). Note that (depending on its location on the reel) the tape may take as much as 20 minutes to completely rewind and eject.

If a tape cartridge fails to eject from the 3580 Tape Drive, you can manually remove the cartridge. The procedure to do so, however, requires care. Success depends on your ability to maintain constant and appropriate tension on the tape while rewinding it into the cartridge and disengaging it from the drive’s leader block. Apply too much tension and the tape may break; apply too little tension and the leader pin may fall from the leader block. IBM recommends that you read the complete instructions before starting the task, then perform the steps slowly and carefully to avoid complications.

Required Tools

The following tools are required to manually remove a tape cartridge:

- #3 Phillips screwdriver
- 2.5-mm allen wrench
- Small-blade screwdriver or potentiometer
- Needle-nose pliers
- Flashlight (optional)

Performing the Removal

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

Attention: Before performing this procedure, note the following:

- 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.
- If you use a power screwdriver to perform this procedure it could destroy the tape.
- Never touch the head or electronic components within the 3580 Tape Drive. Touching may cause contamination or damage by electrostatic discharge.

To manually remove a tape cartridge you must first rewind the tape into the cartridge and disengage it from the drive’s leader block. Then you must move the cartridge out of the drive. The sections that follow describe each operation.

Rewinding the Tape into the Cartridge

1. Turn off the power to the 3580 Tape Drive and disconnect the power cord from the electrical outlet.
2. Disconnect the SCSI cables located at the back of the unit (to determine the location of the SCSI connectors, see Figure 2 on page 7).
3. Place the 3580 Tape Drive on its side and locate the access hole at the bottom of the unit (see **1** in Figure 19).
4. With a small-blade screwdriver or potentiometer, remove the screw **2** from the access hole.

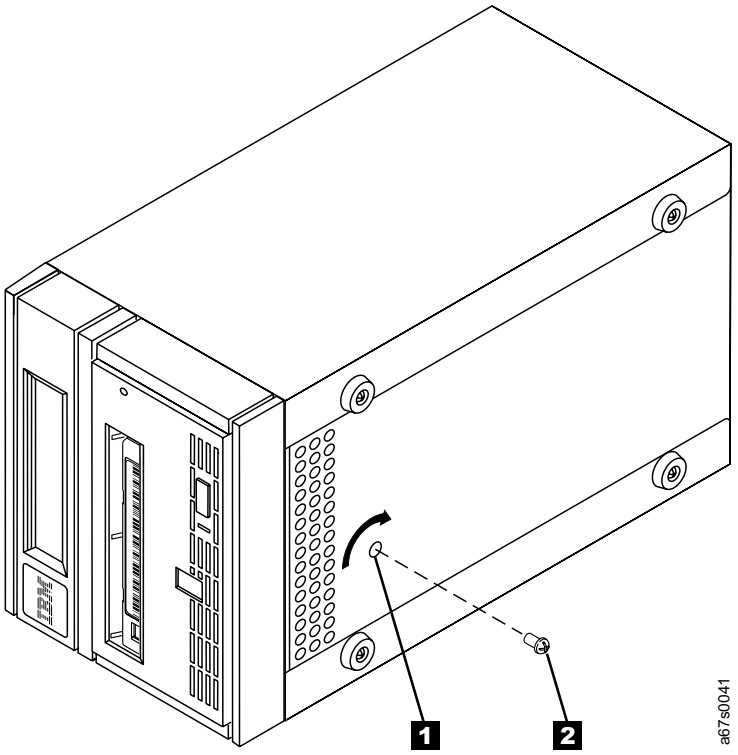

Figure 19. Removing the screw from the access hole

Attention: In the following step, rotate the allen wrench clockwise, not counterclockwise. A counterclockwise motion may damage the tape. If you cannot freely rotate the allen wrench clockwise, the tape may be jammed, broken or detached from the tape drive's leader block. Go to "Fixing a Jammed, Broken, or Detached Tape" on page 74.

5. Insert a 2.5-mm allen wrench (see **1** in Figure 20) into the access hole and position the wrench so that it is seated in the access screw (not visible).
6. Push open the door of the tape load compartment **2** and locate the black flag **3** on the cartridge's takeup reel. The flag is positioned behind the tape cartridge and near the rear of the drive.
7. 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 this procedure.
   - If the flag does not move or if you cannot see the flag, the tape is jammed, broken or detached from the leader block. Contact IBM Technical Support.

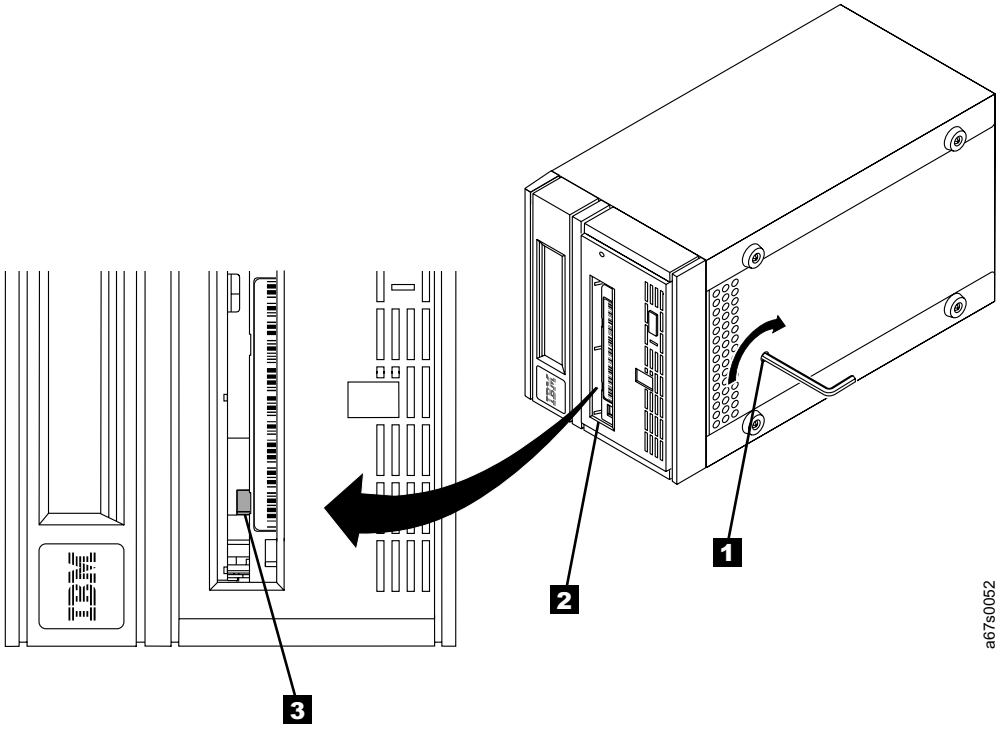

Figure 20. Determining whether the tape is broken

8. 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.

Disengaging the Leader Pin from the Leader Block

1. Insert a small-blade screwdriver potentiometer into the access hole for the loader motor gear (see **1** in Figure 21).
2. 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.
3. 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.

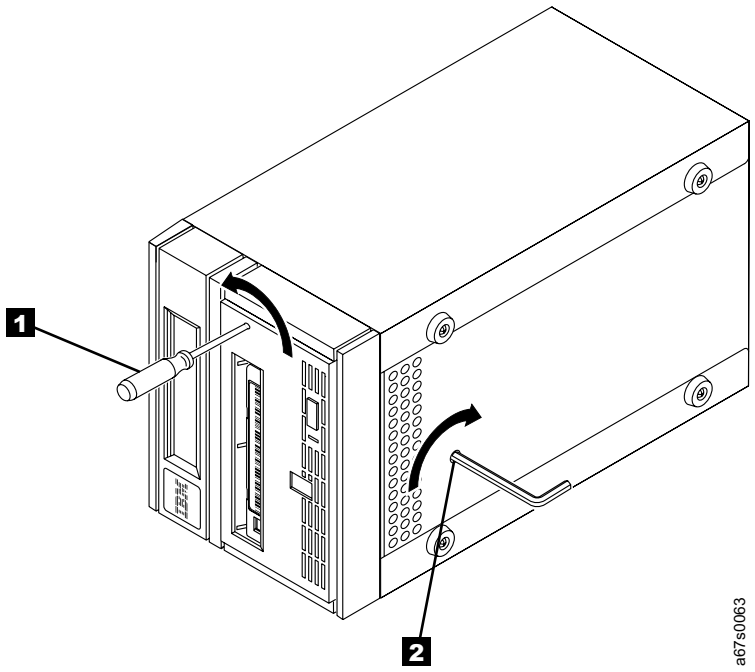

Figure 21. Moving the leader pin block into the cartridge. When the leader pin block reaches the cartridge, it disengages the leader pin.

Unloading the Cartridge from the Drive

1. With the small-blade screwdriver, continue to rotate the loader motor gear in the unload direction (counterclockwise) (see **1** in Figure 21 on page 72). The cartridge moves slowly out of the tape load compartment.
2. Remove the tape cartridge.
3. 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.
4. Remove the small-blade screwdriver.
5. If you choose to replace the 3580 Tape Drive, return it in its original packaging or in the packaging from its replacement.
6. To reassemble the 3580 Tape Drive, reverse the preceding steps.

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

Fixing a Jammed, Broken, or Detached Tape

Attention: This procedure must be performed only by a trained IBM service provider.

Use the following procedure if, in step 7 on page 71, it was determined that the tape is jammed, broken or detached from the tape drive's leader block.

Attention: The procedure that follows may result in damage to the tape cartridge. Perform it only if you are prohibited by the customer from sending the drive and the stuck cartridge to an off-site location. If you use this procedure, you must replace the stuck cartridge after removing it and copying its data to another cartridge. If the customer chooses to return the drive and cartridge to IBM for drive maintenance, the cartridge will be scrapped. If the customer requests that the data be recovered, contact IBM Technical Support.

If the tape cartridge did not load or unload properly, you must remove the internal drive and its cover to determine and fix the problem. Then, you must move the cartridge out of the drive. The sections that follow describe each operation.

Removing the Internal Drive

1. Remove the cover (see **1** in Figure 22 on page 75) of the 3580 Tape Drive by performing the following steps:
   a. Place the 3580 Tape Drive on its side and use a Phillips screwdriver to remove the four feet **2** from the bottom.
   b. Return the 3580 Tape Drive to an upright position and use a Phillips screwdriver to remove the screw **3** at the top rear of the unit.

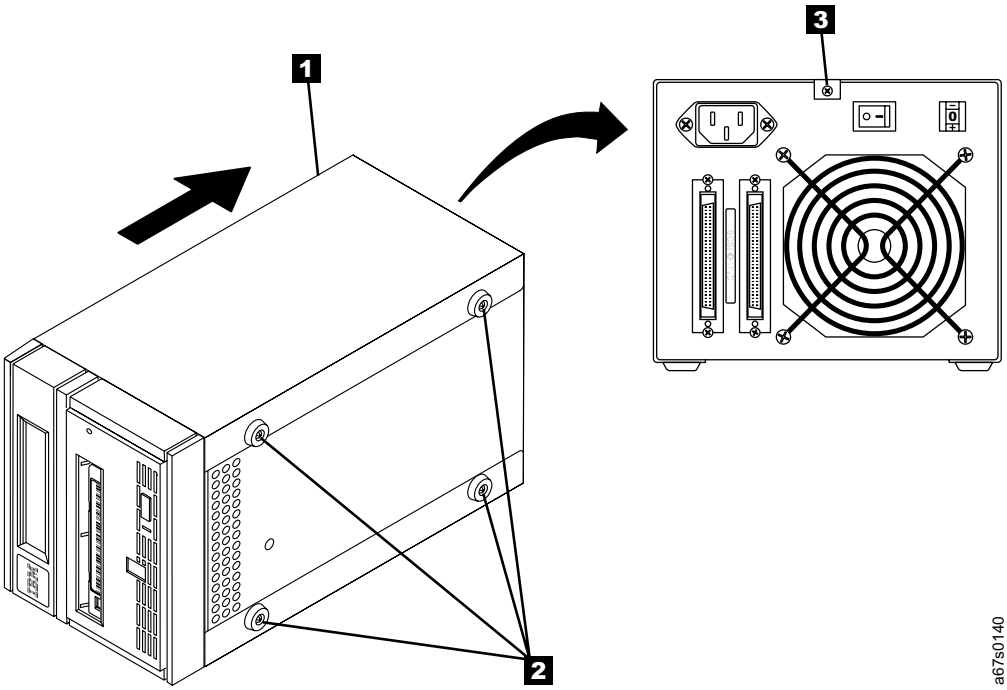

Figure 22. Removing the cover from the 3580 Tape Drive

c. Remove the cover by grasping its top and sliding it to the rear.

2. Remove the internal drive (see **1** in Figure 23) from the chassis **2** by performing the following steps:
   a. Remove the internal power cable **3** from the front-panel display board by pulling it away from the connector.
   b. Remove the internal RS-422 cable **4** from the front-panel display board by pulling it away from the connector.

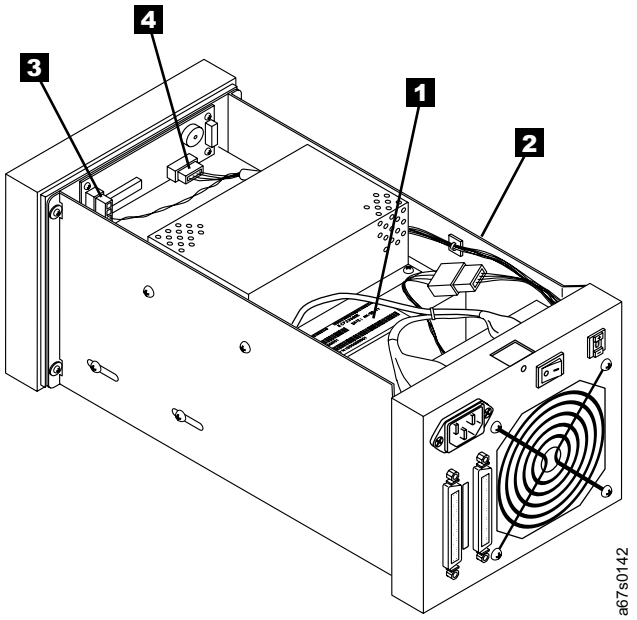

Figure 23. Removing the internal drive from the 3580 Tape Drive

c. Place the 3580 Tape Drive on its face (bezel side down) and use a Phillips screwdriver to remove the four bezel screws and washers (two on each side) (see **1** in Figure 24).

   Note: This procedure requires that you remove two bezels: one at the front of the 3580 Tape Drive and one at the front of the internal tape drive.

d. Remove the 3580 Tape Drive's bezel **2** by lifting the unit up and away from the bezel. Set the bezel aside and save any foam packing pieces for possible repackaging.

e. Place the drive so that the front faces you.

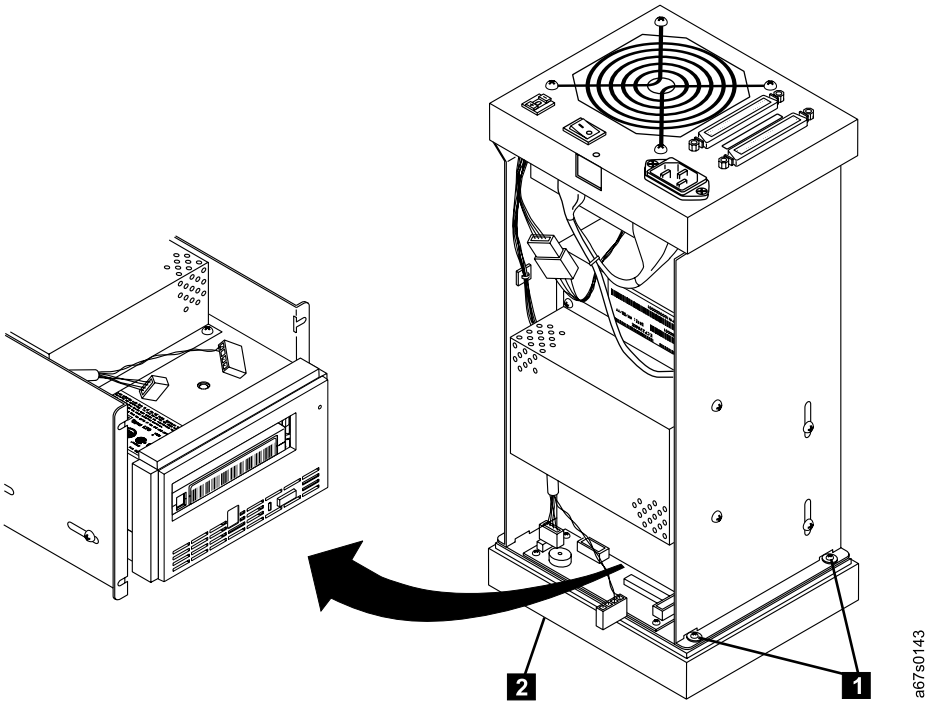

Figure 24. Removing the bezel from the 3580 Tape Drive

f. Remove the four screws that secure the drive to the chassis (two screws on each side; see **1** in Figure 25).

g. Grasp the front of the drive **2** and pull it partially forward.

h. (Optional) For better access to the drive's connectors, remove the four screws (two screws on each side; see **3** in Figure 25) that secure the power supply **4** and gently move power supply aside.

i. Remove the internal SCSI cable **5** by pulling it away from the drive.

j. Remove the internal SCSI address cable **6** by pulling it away from the drive.

k. Gently remove the internal RS-422 cable **7** by grasping its wires and pulling straight back toward the rear of the chassis.

l. Remove the internal power cable **8** by pulling it away from the drive.

m. Grasp the drive and pull it forward again to free it completely from the chassis.

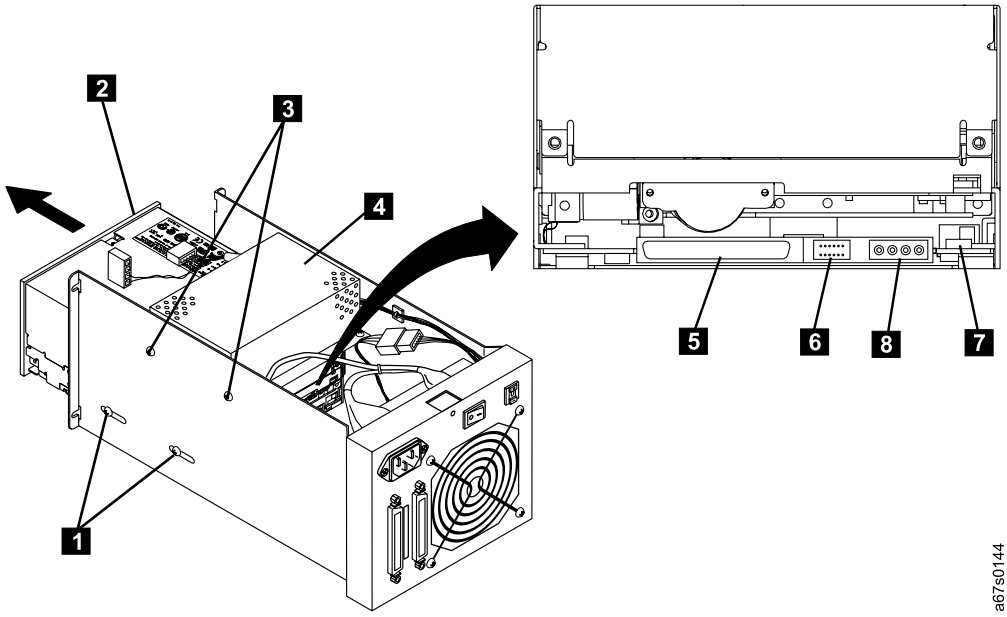

Figure 25. Removing the internal drive from the 3580 Tape Drive. The figure that is indicated by the arrow depicts the rear of the internal tape drive.

Removing the Cover of the Internal Drive

1. Using a Phillips screwdriver, remove the three screws and washers (see **1** in Figure 26) that secure the bezel **2** to the internal drive **3**, then remove the bezel.
2. Remove the cover of the internal drive by performing the following steps:
   a. Remove the four cover-mounting screws and washers **4**.
   b. Remove the cover **5** by lifting it up.

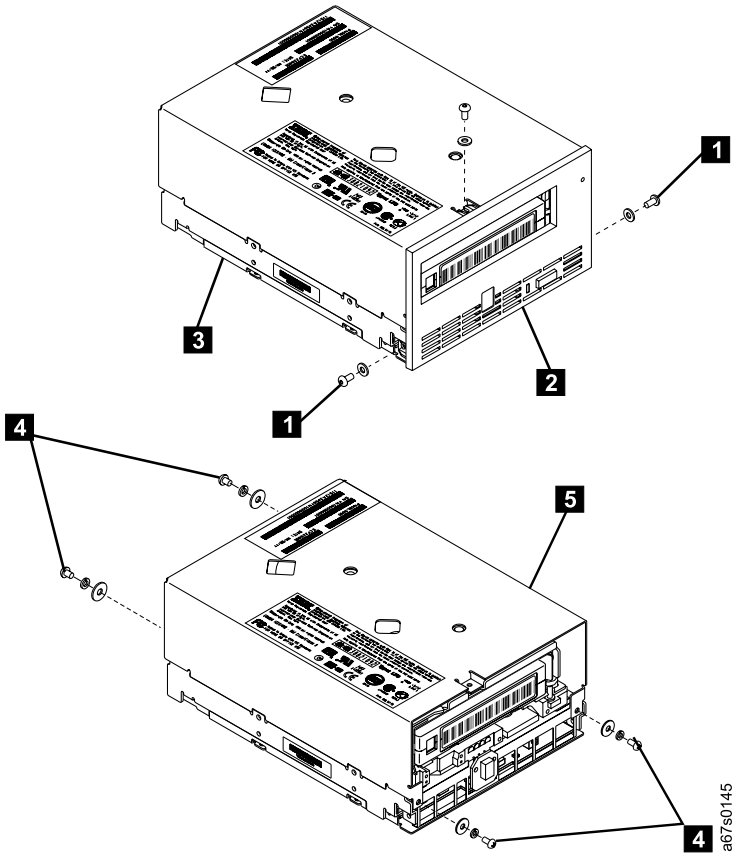

Figure 26. Removing the cover from the internal drive

Fixing the Problem

1. Place the tape drive on its side as shown in Figure 27 on page 80.
2. Examine the tape to determine the source of the problem:
   - If the leader pin is jammed in the cartridge, go to the Note contained in step 4 on page 80.
   - If the leader pin has become detached from the leader block and is lying in the tape path, go to step 3 on page 80.
   - If the leader pin has broken away from the tape, go to “Reattaching a Leader Pin” on page 32.
   - If the tape has broken between the supply reel and the takeup reel, contact IBM Technical Support.

3. If necessary, use needle-nose pliers to grasp the end of the leader pin and pull it out of the cartridge so that you can grip it with your fingers (see **1** in Figure 27).

Reminder: The following step requires care. Success depends on your ability to maintain constant and appropriate tension on the tape while rewinding it into the cartridge. Apply too much tension and the tape may break; apply too little tension and the leader pin may fall from the leader block. Perform the steps slowly and carefully to avoid complications.

4. While keeping the tape taut with your fingers, rotate the allen wrench clockwise **2** to wind the excess tape into the cartridge. Guide the leader pin toward the cartridge and drop it deep inside the cartridge door; do not attempt to seat the leader pin. Remove the allen wrench.

   Note: Ensure that the leader pin drops into the opened cartridge door, falls deeply into the cartridge, and does not jam near the cartridge door. Do not seat the pin into the cartridge's clips; this will interfere with the motion of the leader pin block (you can seat the pin after you have removed the cartridge from the drive). If the tape did not load because the leader pin was wedged in the clip area, grasp the leader pin with needle-nose pliers to free it and drop it into the cartridge.

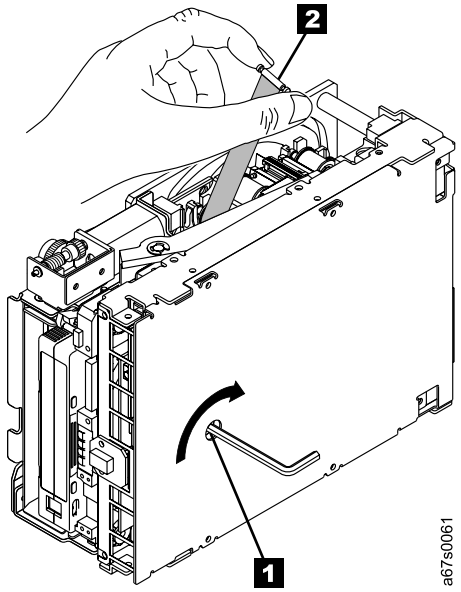

Figure 27. Rewinding the leader pin into the tape cartridge

Removing the Cartridge from the Drive

1. Manually rotate the loader motor gear (see **1** in Figure 28) in the unload (counterclockwise) direction until the leader pin block **2** reaches the last roller **3** .

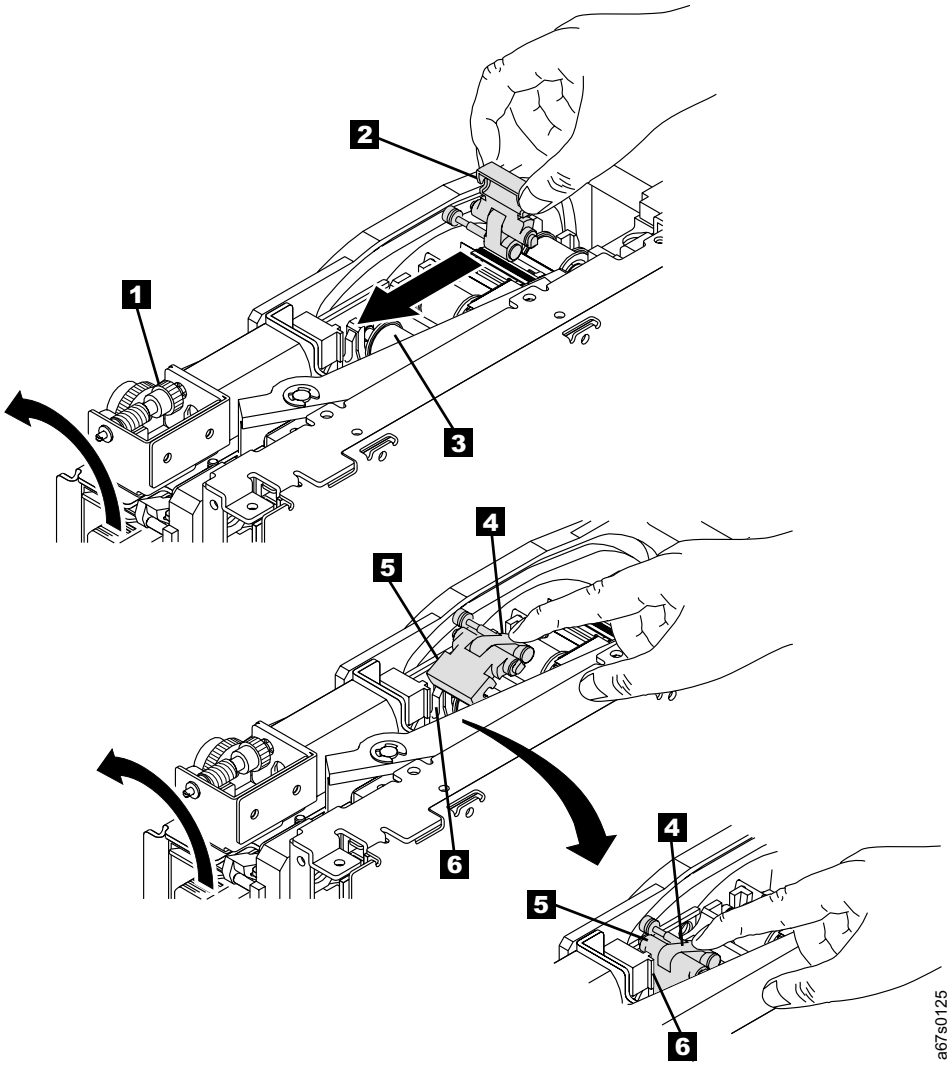

Figure 28. Guiding the leader pin into the tape cartridge

2. To prevent the leader pin block from jamming, press down on the linkage of the leader pin block **4** to force the hinged section of the block upward.
3. While manually rotating the loader motor gear in the unload direction, guide the end of the leader pin block **5** into the white block guide **6** .
4. Continue to rotate the loader motor gear counterclockwise until you feel resistance and the cartridge ejects.
5. Remove the tape cartridge.
6. 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.
7. Remove the small-blade screwdriver.

8. Return the 3580 Tape Drive in its original packaging or in the packaging from its replacement.
9. To reassemble the 3580 Tape Drive, reverse the preceding steps.

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

Appendix D. Installing a Tape Drive into a Rack

Before you begin, read these instructions to familiarize yourself with the installation procedure. IBM recommends that two people install this option.

This option consists of:

- 1 fixed shelf
- 2 shelf extenders
- 1 shelf safety bar
- 6 clip nuts and two cage nuts
- 10 screws
- 2 cable ties
- IBM Rack Shelf Installation Instruction Feature 8723

You need a Phillips screwdriver, a standard screwdriver, and a 10-mm, open-end wrench to install the rack.

Safety Considerations

- Do not install this unit in a rack where the internal rack ambient temperatures will exceed 38° C.
- Do not install this unit in a rack where the airflow is compromised. Any side, front, or back of the unit used for airflow through the unit must not be in indirect contact with the rack.
- Care should be taken to insure that a hazardous condition is not created due to uneven mechanical loading when installing this unit in a rack. If the rack has a stabilizer, it must be firmly attached before installing or removing this unit.
- Consideration should be given to the connection of the equipment to the supply circuit, such that the overloading of circuits does not compromise the supply wiring or the overcurrent protection.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.
- Rack shelf feature 8723 is approved for use in pSeries, standard-sized racks for holding up to four external storage devices.
- Products weighing more than 18 kg (39.7 lbs) are not approved for installation on the rack shelf. The total weight of devices on the rack mount shelf must not exceed 45.4 kg (100 lbs).

1. Remove the side panels, if they are installed and designed to be removed.
   a. If the side panel is locked, unlock it.
   b. Slide the two side panel latches down to release the top of the side panel.
   c. Tilt the top of the sides away from the rack and lift the side panel off the rack.
2. Decide at what level you want to install the shelf.

   Note: All vertical rack measurements are given in rack units (U). One U is equal to 4.45 cm (1.75 in.). The U levels are marked on labels on one front mounting rail and one rear mounting rail.

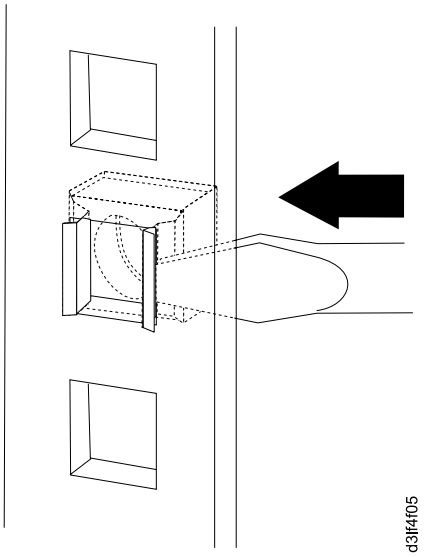

Figure 29. Installing a cage nut in the mounting rail

3. Install one cage nut on each front mounting rail. Install the cage nuts in the bottom hole of the U level (just above the U-level mark), with the nuts toward the rear of the rack. Make sure that you install the cage nuts at the same level on the two mounting rails.
   a. Hook one side of the cage nut clip into the square hole of the rackmount rail.
   b. Hold the cage nut in one hand and compress the cage nut clip with a flat screwdriver blade.
   c. With the cage nut clip compressed, push the cage nut clip into the square hole.
   d. Release the screwdriver's pressure on the clip. The cage nut is now locked in the square hole.
4. Some racks are large and require extender brackets to be installed on the shelf. Perform one of the following:
   - If you are installing the shelf in a rack that does not require extender brackets, skip steps 5 through 11 on page 85.
   - If you are installing the shelf in a rack that requires extender brackets, go to step 5 on page 85.

5. If you are installing the shelf with the extender brackets, attach the two brackets to the back corners of the shelf by using a single screw on each bracket (see **1** in Figure 30).

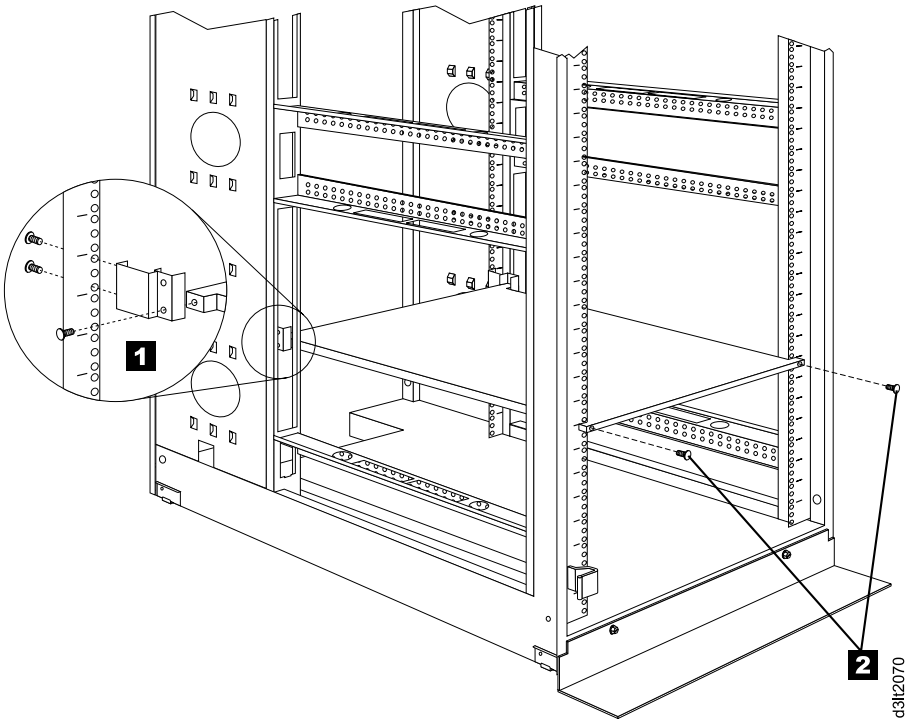

Figure 30. Attaching the shelf extender brackets

6. Carefully lift the shelf into the rack.
7. Holding the shelf level, insert the locating tabs of the shelf extender brackets into the appropriate holes in the rear mounting rails.

   Note: The shelf extender bracket locating tabs must be inserted into the holes that are one hole higher on the rear rails than the holes where the cage nuts are installed on the front rails.
8. Hold the shelf level and line up the shelf front flanges with the cage nuts that were installed in step 3 on page 84.
9. Insert two screws through the holes in the front flanges. Loosely thread the screws into the cage nuts in the front mounting rails (see **2** in Figure 30.
10. Hold the shelf level and line up the threaded holes on the shelf extender brackets with the appropriate holes on the rear mounting rails.
11. Insert two screws through the holes in each rear mounting rail and loosely thread the screws into the threaded holes on the shelf extender brackets (see **1** in Figure 30). Skips steps 12 through 16 and go to step 17 on page 86.

12. Carefully lift the shelf into the rack.
13. Hold the shelf level and line up the shelf front flanges with the cage nuts that were installed in step 3 on page 84.
14. Insert two screws through the holes in the front flanges. Loosely thread the screws into the cage nuts in the front mounting rails.

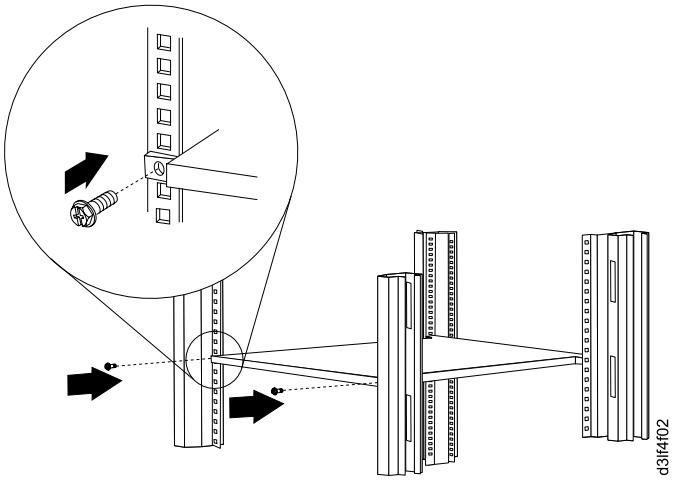

Figure 31. Attaching the front of the shelf to the mounting rails

15. Hold the shelf level and line up the threaded holes on the rear of the shelf with the appropriate holes on the rear mounting rails.

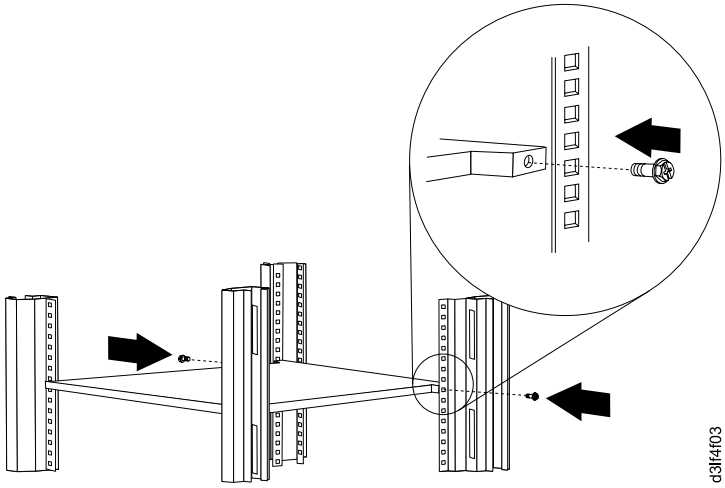

Figure 32. Attaching the rear of the shelf to the rear mounting rails

16. Insert a screw through the holes in each rear mounting rail and loosely thread the screws into the threaded holes on the rear of the shelf.
17. Check that the shelf is at the same level on the four mounting rails.

18. Tighten all mounting screws. The shelf with extender brackets will have six screws: one on each front rail and two on each rear rail. The shelf without extender brackets will have four screws: one on each of the four mounting rails. If you do not have enough room to use a screwdriver to tighten the screws, use the 10-mm, open-end wrench.
19. After the shelf is installed, you must install the front safety bar. The safety bar helps prevent equipment on the shelf from being accidentally pushed or slid off the front of the shelf. To install the safety bar:
    a. Install one clip nut in each front mounting rail. Install the nuts in the holes just above where the shelf is mounted, with the nuts toward the rear of the rack. Make sure that you install the nuts at the same level on the two mounting rails.
    b. Hold the shelf safety bar level across the front of the rack.
    c. Line up the holes on the ends of the bar with the holes in which the nuts are installed.
    d. Insert two screws through the holes in the front flanges. Loosely thread the screws into the nuts in the front mounting rails.
    e. Tighten the two mounting screws.

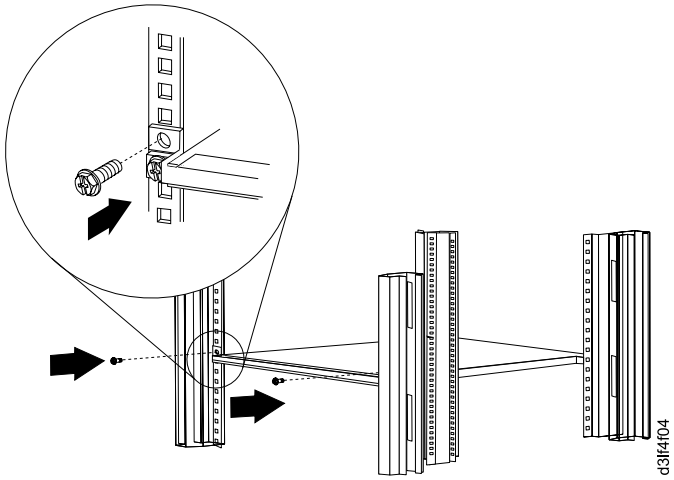

Figure 33. Attaching the front safety bar to the mounting rails

20. Reinstall the side panels, if they were removed.

The shelf installation is complete. You can now install your equipment on the shelf. Attach the cable tie clips and cable ties after you have installed your equipment on the shelf.

Removing the Shelf from the Rack

To remove the shelf from the rack, reverse the steps in the installation procedure.

Appendix E. TapeAlert Flags

TapeAlert is a patented technology and standard of the American National Standards Institute (ANSI) that defines conditions and problems that are experienced by tape drives. The technology enables a server to read TapeAlert flags from a tape drive through the SCSI, Fibre Channel, or RS-422 interface. The server 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 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 error code 6 in Table 6 on page 43.
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 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see “Setting the Write-Protect Switch” on page 28). If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see error code 6 in Table 6 on page 43.
8	Not data grade	Set when severe servo errors occur while loading a tape cartridge.	Replace the tape cartridge. If this error occurs with multiple tapes, see error code 6 in Table 6 on page 43.
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 28).
10	No removal	Set when the tape drive receives an UNLOAD command after the server prevented the tape cartridge from being removed.	Refer to the documentation for your server’s 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**
14	Unrecoverable snapped tape	Set when the tape split apart.	Manually remove the tape cartridge (see Appendix C, “Manually Removing a Tape Cartridge” on page 69).
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the cartridge. If this error occurs on multiple tapes, see error code 6 in Table 6 on page 43.
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 all data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive. See “Cleaning the Drive Head” on page 23.
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon. See “Cleaning the Drive Head” on page 23.
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 drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs which requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see Table 6 on page 43 for the appropriate instructions.
31	Hardware B	Set when the tape drive fails its internal self tests.	Note the error code on the single-character display and see Table 6 on page 43 for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI, Fibre Channel, or RS-422 interface.	Locate error code 8 or 9 in Table 6 on page 43.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive.	Unload and reload the tape cartridge.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive through the SCSI or Fibre Channel interface.	Ensure that it is the correct image. Download the FMR image again.
36	Drive temperature	Set when the drive’s temperature sensor indicates that the drive’s temperature is exceeding the recommended temperature of the enclosure (see Table 1 on page 4).	See error code 1 in Table 6 on page 43.

TapeAlert Flags Supported by the 3580 Tape Drive			
Flag Number	**Flag**	**Description**	**Action Required**
37	Drive voltage	Set when the drive detects that the externally supplied voltages are either approaching the specified voltage limits or are outside the voltage limits (see Table 1 on page 4).	See error code 2 in Table 6 on page 43.
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics to isolate the problem.	See error code 6 in Table 6 on page 43.
51	Tape directory invalid at unload	For the tape that was unloaded, set when the tape directory on the cartridge memory is corrupted.	If the problem continues after successive loads, replace the cartridge. If the problem persists, replace the drive.
52	Tape system area write failure	Set when the tape that was unloaded could not write its system area (FID) successfully.	1. Copy the data to another tape cartridge. 2. Discard the old cartridge.

Appendix F. Power Cords

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

Table 8 lists the power cord part number, feature code, the country or region where the power cord can be used, and the plug's standard reference. The last column in the table contains an index number that you can match to a specific receptacle type in Figure 34 on page 95.

All power cords use an appliance coupler that complies with the International Electrotechnical Commission (IEC) Standard 320, Sheet C13.

If the power cord that you receive does not match your receptacle, contact your local dealer.

Power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL), are certified by the Canadian Standards Association (CSA), and comply with the plug standards of the National Electrical Manufacturers Association (NEMA). For other worldwide geographies, plug standards are listed in Table 8.

Power Cable Information

Table 8. Power cable information

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 34 on page 95
US/Canada 2.8 m, 125V FC 9800 PN 6952300 (See Note)	NEMA 5-15P	Bolivia, Brazil, Canada, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Japan, Mexico, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Taiwan, Thailand, Venezuela, US	1
Chicago 1.8 m, 125 V FC 9986 PN 6952301	NEMA 5-15P	Chicago, U.S.A.	1
US/Canada 2.8 m, 250 V FC 9833 PN 1838574	NEMA 6-15P	Bolivia, Brazil, Canada, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Japan, Mexico, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Taiwan, Thailand, Venezuela, US	2
Australia 2.8 m, 250V FC 9831 PN 13F9940	AS/NZSC112	Australia, New Zealand	3

Table 8. Power cable information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 34 on page 95
France 2.8 m, 250V FC 9820 PN 13F9979	CEE 7 - VII	Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbadjian, Belarus, Belgium, Benin, Bosnia, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Republic of), Congo (Democratic Republic of), Croatia, Czech Republic, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Gabon, Georgia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Kazakhstan, Korea, Kyrgyzstan, Latvia, Lebanon, Lithuania, Luxumbourg, Macedonia, Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldavia, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russia, Rwanda, Sao Tome, Senegal, Serbia, Slovakia, Slovenia, Somalia, Spain, Sweden, Syria, Tajikistan, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Vanuatu, Wallis and Futana, Vietnam	4
Denmark 2.8 m, 250V FC 9821 PN 13F9997	DK2-5a	Denmark	5
South Africa 2.8 m, 250V FC 9829 PN 14F0015	SABS 164	India, Lesotho, Nambia, Pakistan, South Africa, Sri Lanka, Swaziland, Uganda	6
United Kingdom 2.8 m, 250V FC 9825 PN 14F0033	BS 1363/A	Bahrain, Botswana, Cyprus, Gambia, Ghana, China (Hong Kong S.A.R.), Ireland, Jordan, Kenya, Kuwait, Liberia, Malaysia, Malawi, Malta, Nigeria, Oman, Quatar, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania, UK, United Arab Emirate (Dubai), Yemen, Zambia, Zimbabwe	7
Switzerland 2.8 m, 250V FC 9828 PN 14F0051	1011-S24507	Liechtenstein, Switzerland	8
Italy 2.8 m, 250V FC 9830 PN 14F0069	CEI 23- 16	Chile, Italy	9
Israel 2.8 m, 250V FC 9827 PN 14F0087	SI 32	Israel	10

Table 8. Power cable information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 34
Uruguay 2.8 m, 250V FC 9834 PN 36L8880	IRSM 2073	Argentina, Paraguay, Uruguay	11
China 2.8 m, 250V FC 9840 PN 02K0546	GB 2099.1	People's Republic of China	12
Note: Part number 6952300 is the default power cord for the countries or regions listed. If you do not specify a power cord when you place your order, IBM provides this power cord.			

Types of Receptacles

Figure 34 shows the receptacles that are used by the power cables in Table 8 on page 93. Match the index number that is beside each receptacle to the index number in the table.

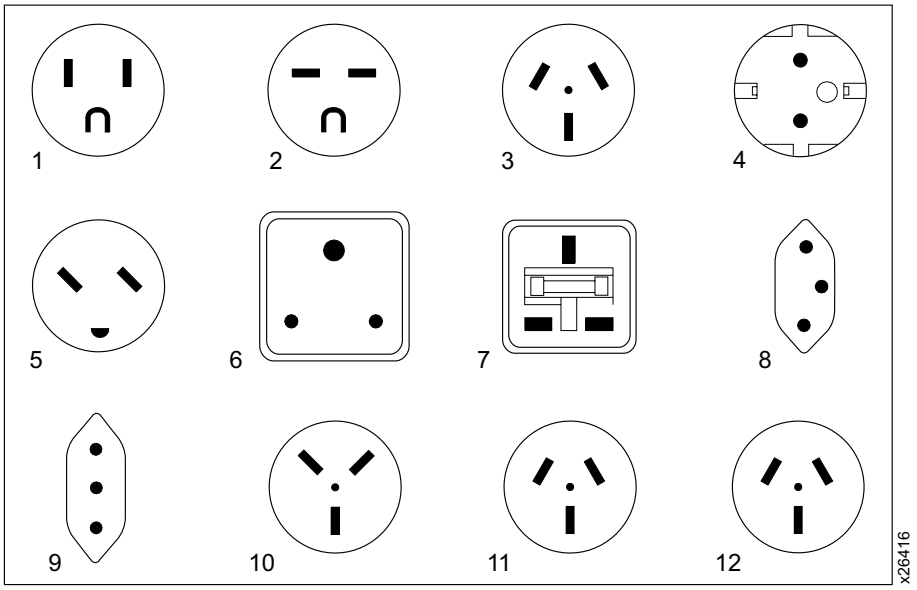

Figure 34. Types of receptacles

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	Feature Code (FC)	Product Description	Source for Ordering
19P5862	N/A	3580 Tape Drive Model L13 with LVD/SE SCSI interface (CRU part number 19P5928)	IBM Marketing Representative or Business Partner
19P0872	5301	0.4 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
35L1307	5302	2.5 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
19P0052	5305	5 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
19P0053	5310	10 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
19P0279	5602	2.5 m Universal VHDCI to HD68 cable	IBM Marketing Representative or Business Partner
19P0050	5604	4.5 m Universal VHDCI to HD68 cable	IBM Marketing Representative or Business Partner
19P0048	5610	10 m Universal VHDCI to HD68 cable	IBM Marketing Representative or Business Partner
19P0481	N/A	LVD single-connector SCSI wrap tool	IBM Marketing Representative
19P0874	N/A	LVD/SE multi-mode terminator	IBM Marketing Representative
19P0482	N/A	VHDCI to HD68 interposer cable	IBM Marketing Representative or Business Partner
08L9129	N/A	Leader pin reattachment kit	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 Business Partner or IBM Marketing Representative.
N/A	8723	Rackmount kit	IBM Marketing Representative or Business Partner
N/A	N/A	2.5-mm allen wrench	Procure locally
08L9120	N/A	IBM LTO Ultrium Data Cartridge	`http://www.ibm.com/storage/media` or your IBM Marketing Representative or Business Partner by specifying Machine Type 3589 Model 003
08L9124	N/A	IBM LTO Ultrium Cleaning Cartridge	`http://www.ibm.com/storage/media` or your IBM Marketing Representative or Business Partner by specifying Machine Type 3589 Model 004
19P5980	N/A	*IBM 3580 Ultrium Tape Drive Models L13 and H13 Setup and Operator Guide*, GA32-0456	`http://www.ibm.com/storage/lto` or your IBM Marketing Representative or Business Partner

Table 9. Parts for the 3580 Tape Drive with LVD/SE SCSI interface (continued)

IBM Part Number	Feature Code (FC)	Product Description	Source for Ordering
35L2013	N/A	*IBM 3580 Ultrium Tape Drive Quick Reference*, GX35-5060	`http://www.ibm.com/storage/lto` or your IBM Marketing Representative or Business Partner
35L0858	N/A	*IBM Externally Attached Devices Safety Information*, SA26-2004	`http://www.ibm.com/storage/lto` or your IBM Marketing Representative or Business Partner
N/A = not applicable			

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	Feature Code (FC)	Product Description	Source for Ordering
19P5861	N/A	3580 Tape Drive Model H13 with HVD/DIFF SCSI interface (CRU part number 19P5929)	IBM Marketing Representative or Business Partner
19P0872	5301	0.4 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
35L1307	5302	2.5 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
19P0052	5305	5 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
19P0053	5310	10 m Universal HD68 to HD68 cable	IBM Marketing Representative or Business Partner
19P0097	5318	18 m Universal HD68 to HD68 cable (available only with Model H1x)	IBM Marketing Representative or Business Partner
19P0054	5325	25 m Universal HD68 to HD68 cable (available only with Model H1x)	IBM Marketing Representative or Business Partner
19P0279	5602	2.5 m Universal VHDCI to HD68 cable	IBM Marketing Representative or Business Partner
19P0050	5604	4.5 m Universal VHDCI to HD68 cable	IBM Marketing Representative or Business Partner
19P0048	5610	10 m Universal VHDCI to HD68 cable	IBM Marketing Representative or Business Partner
19P0049	5620	20 m Universal VHDCI to HD68 cable (available only with Model H1x)	IBM Marketing Representative or Business Partner
35L1977	5625	25 m Universal VHDCI to HD68 cable (available only with Model H1x)	IBM Marketing Representative or Business Partner
19P1213	N/A	HVD single-connector SCSI wrap tool	IBM Marketing Representative
61G8324	N/A	HVD terminator	IBM Marketing Representative
19P0482	N/A	VHDCI to HD68 interposer cable	IBM Marketing Representative or Business Partner

Table 10. Parts for the 3580 Tape Drive with HVD/DIFF SCSI interface (continued)

IBM Part Number	Feature Code (FC)	Product Description	Source for Ordering
05H3834	N/A	AS/400 feature #6501 to HD68 interposer cable	IBM Marketing Representative or Business Partner
08L9129	N/A	Leader pin reattachment kit	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 Business Partner or IBM Marketing Representative.
N/A	8723	Rackmount kit	IBM Marketing Representative or Business Partner
N/A	N/A	2.5-mm allen wrench	Procure locally
08L9120	N/A	IBM LTO Ultrium Data Cartridge	`http://www.ibm.com/storage/media` or your IBM Marketing Representative or Business Partner by specifying Machine Type 3589 Model 003
08L9124	N/A	IBM LTO Ultrium Cleaning Cartridge	`http://www.ibm.com/storage/media` or your IBM Marketing Representative or Business Partner by specifying Machine Type 3589 Model 004
19P5980	N/A	*IBM 3580 Ultrium Tape Drive Models L13 and H13 Setup and Operator Guide*, GA32-0456	`http://www.ibm.com/storage/lto` or your IBM Marketing Representative or Business Partner
35L2013	N/A	*IBM 3580 Ultrium Tape Drive Quick Reference*, GX35-5060	`http://www.ibm.com/storage/lto` or your IBM Marketing Representative or Business Partner
35L0858	N/A	*IBM Externally Attached Devices Safety Information*, SA26-2004	`http://www.ibm.com/storage/lto` or your IBM Marketing Representative or Business Partner
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IBM 3580 Ultrium Tape Drive

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Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

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vcci-b

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 up to 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.

CRU. See *customer replaceable unit*.

customer replaceable unit (CRU). A part that a customer (rather than a service representative) replaces.

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 server 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 Accelis 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 server 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 L1x. One of two versions of the 3580 Tape Drive. The Model L1x uses the Ultra2, Low Voltage Differential/Single Ended (LVD/SE) SCSI interface. Contrast with *Model H1x*.

Model H1x. One of two versions of the 3580 Tape Drive. The Model H1x uses the Ultra, High Voltage Differential (HVD/DIFF) SCSI interface. Contrast with *Model L1x*.

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 abamper 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 (by 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 server.

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 (server). 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 server 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 (servers). 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:

- Fast/Wide SCSI: Uses a 16-bit bus, and supports data rates of up to 20 MBps.
- 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- or 16-bit bus, and supports data rates of 20 or 40 MBps.

- Ultra2 SCSI: Uses an 8- or 16-bit bus and supports data rates of 40 or 80 MBps.
- Ultra3 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 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

U. Pertaining to the rack that houses a 3580 Tape Drive, the amount of space between two holes in a mounting rail. One U is equal to 4.45 cm (1.75 in.).

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.

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

Vac. Volts of alternating current.

Vdc. 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.

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Models L13 and H13
Setup and Operator Guide

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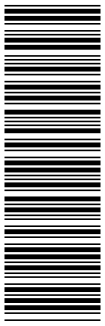

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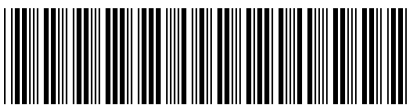

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