English

# User's Guide

## Using Ultrium Tape Drives in an Automation Environment

**January 2005**

English

# Table of Contents

English

# 1 The Utrium Tape Drive

## Introduction

This is the User's Guide for the full-height, high-performance Ultrium internal tape drive. It describes how to use your Ultrium drive within an automation environment, whereby Ultrium tape drives are pre-installed into a tape library.

It provides generic information relative to Ultrium tape drives and Ultrium media (data and cleaning cartridges) and must be read in conjunction with the specific tape library documentation supplied with your library.

For full details of how to operate and maintain your tape library, please refer to the documentation supplied with your library.

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| **NOTE** | Ultrium tape drives are not customer installable or replaceable. Any servicing, adjustment, maintenance or repair, or the upgrading of a library by the installation of additional tape drives, must only be performed by service-trained personnel authorized by your tape library supplier. As such, these procedures are not covered within this manual. |

## Features and Benefits

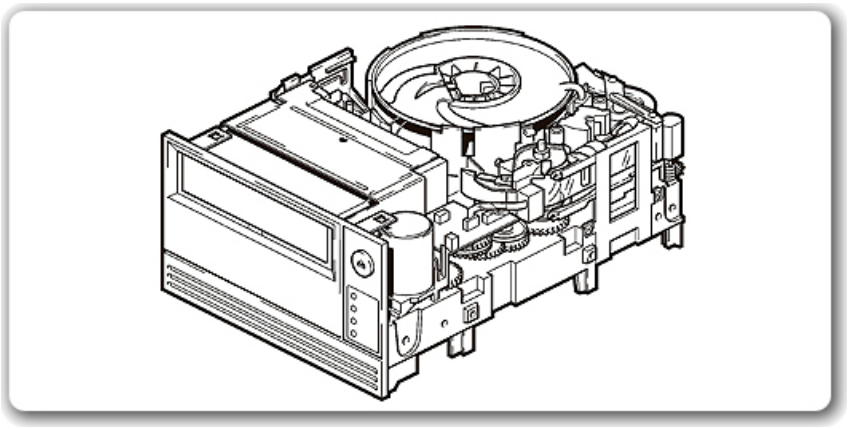


**Figure 1 The Ultrium internal tape drive**

The Ultrium internal tape drive is designed for installation either as a single, stand-alone unit that can be fitted into a suitable drive bay of a server or, in conjunction with other tape drive units, can be fitted within an automated tape library. This User's Guide relates specifically to tape drives fitted within a tape library.

The Ultrium tape drive combines capacity and performance with reliability and low cost of ownership, making it the ideal choice for network backup. Your new tape drive provides the following key features:

- Latest Ultrium technology
- Built-in read-after-write verification for a high level of data integrity
- Data Rate Matching (DRM)
- Intelligent LTO-DC dual-mode compression algorithm

- Failsafe leader capture mechanism
- LTO-Cartridge Memory
- TapeAlert support for worry-free backup
- Library & Tape Tools software to verify successful installation and troubleshoot problems
- Ultra 3 Wide SCSI interface
- SCAM-1 compliant

Capacity and transfer rate varies according to model.

All the reliability and performance benefits of the stand-alone drive are carried into automation applications. The tape cassettes include standard notches for automation picker arms. The precision soft load-unload functionality can be customized to suit the application. Ultrium drives have an Automation Control Interface (ACI) to facilitate better integration in automation products.

# Controls and Indicators

## Front Panel

Two front panels have been designed:

- The default panel, used for stand-alone drives
- An automation panel for use when the drive is embedded in automation applications

The drive is not designed to operate without a front panel (even in automation applications).

### The Default Panel

The default front panel contains a hinged door over the cartridge opening, four LEDs, an eject cartridge button and an emergency reset. There is an indent on the left under the door for a label.

### The Automation Panel

The automation panel is very similar to the default front panel except in the following points:

- There is no door. Instead there are two fixed guides to guide the cartridge into the drive.
- The Ultrium logo is printed on the body of the drive, just below the cartridge opening.
- The indent for a label on the left just under the cartridge opening is left blank, exposing two holes. These can be used to locate sighting features to allow library robotics to locate the cartridge opening accurately.
- There are additional holes around the cartridge opening to allow a throat to be fitted if required. This may be fitted by your tape library supplier to help the smooth loading of cartridges.
- There is an indent for labels just to the left of the LED lights.

## Front Panel LEDs

There are four LEDs on the front panel. When the tape drive is installed within a tape library, these LEDs cannot normally be seen, and you should refer instead to the operating controls and LEDs on the front operating panel of your tape library. These controls and LEDs will be described in your tape library documentation.

However, it can be useful to confirm the sequence of the LEDs on the tape drive's front panel when verifying the correct operation of individual drives.

The lights on the front panel have the following meanings:

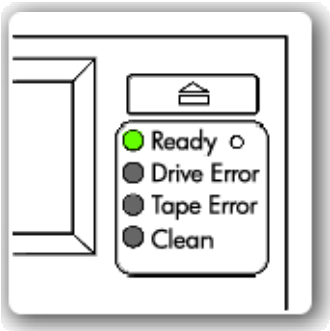
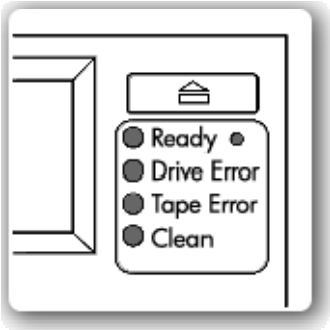
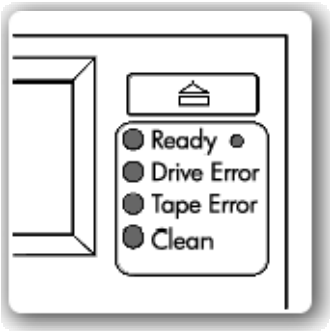
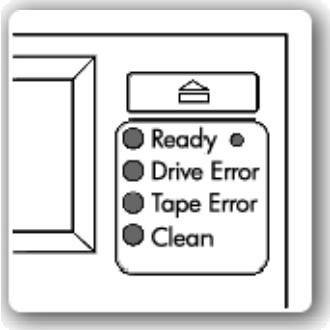
| | | |
|---|---|---|
|  | **Ready** | The Ready light indicates power and activity:<br>*Lit* - The drive is powered on but no activity is occurring.<br>*Flashing* - The drive is engaged in activity, such as responding to a Read, Write or Space command, performing a self-test or downloading firmware. |
|  | **Drive Error** | The Drive Error light indicates a problem with the drive:<br>*Flashing* - An unrecoverable hardware failure has occurred. A power cycle or successful tape load will turn the light off, but is will start flashing again if the same operation is performed and the hardware fault is still present. |
|  | **Tape Error** | The Tape Error light indicates a problem with the tape:<br>*Flashing* - The drive thinks the tape currently in the drive is faulty, for example, it cannot be read or is of a type that is not supported by the drive. The light will go out when the tape is unloaded. |
|  | **Clean** | If the Clean light is flashing, the drive considers that it needs cleaning. It will stay flashing until a supported cleaning tape is used, even if power is cycled. While cleaning is in progress, the light will be lit steadily and the Ready light will flash. |

**Figure 2 The front panel lights**

## Rear Panel

The rear panel contains the connector interface that allows the tape drive to communicate with the tape library and host computer system. The panel consists of a 3-part SCSI connector and an Automation Control Interface (ACI) connector.

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| **CAUTION** | Ultrium tape drives are not customer installable or replaceable. Therefore, the attachment or removable of SCSI, power and ACI cables between the tape drive and the tape library should only be carried out be service-trained personnel authorized by the tape library supplier. |

A brief explanation is given below of the function of these connections and of how the tape drive and tape library communicates with each other.

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| **NOTE** | This is for information only, and may vary in detail according to the specific tape library installed. Under all normal operating conditions, the end user should not disturb these connections or attempt to remove a tape drive from a library. |

### The SCSI Connector

The Ultrium SCSI tape drive uses a straddle-mounted three-part SCSI peripheral connector. This incorporates a 68-pin high density SCSI connector, a 4-pin power connector and a 12-pin auxiliary connector.

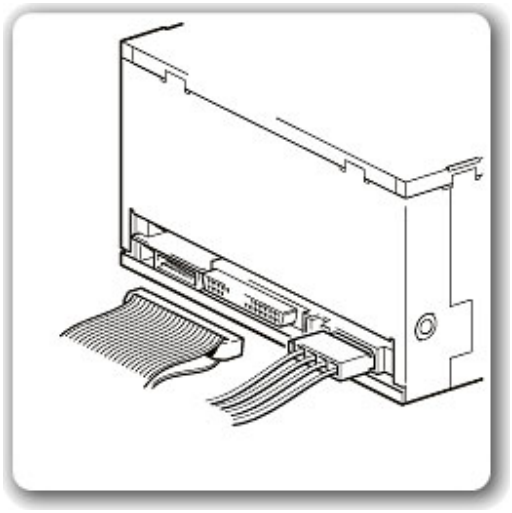

**Figure 3 The SCSI and power connectors**

The SCSI and power connectors interface with appropriate cables connected to the library bulkhead. The SCSI cables may be installed in a daisy-chain configuration linking two or more Ultrium tape drives within the library together on the same SCSI bus.

The auxiliary connector is used for setting the SCSI address.

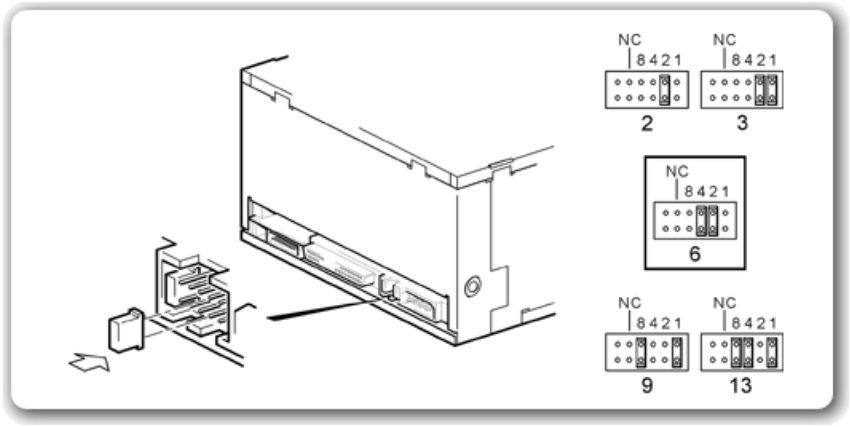


**Figure 4 Setting the SCSI ID**

Your tape library supplier will have set the SCSI jumpers to 3 before your tape drive is installed. This will be overridden by the tape library. Each device on the SCSI bus must have a unique SCSI ID set by the library.

Ultrium drives are Ultra 3 wide, SCAM-1 compliant SCSI devices designed to operate on a low voltage differential (LVD) SCSI bus. They use a 68-pin SCSI interface to communicate with the tape library and host computer system. To get optimum performance from your tape drive you need a SCSI bus that can transfer data at a rate that supports the tape drive's maximum burst transfer speed.

The following table summarizes the sustained transfer rates for different Ultra SCSI bus types:

| **scsi bus type** | **sustained transfer rate** |
|---|---|
| LVD, wide, Ultra | 40 MB/s |
| LVD, wide, Ultra 2 | 80 MB/s |
| LVD, wide, Ultra 3 (160) | 160 MB/s |
| LVD, wide, Ultra 4 (320) | 320 MB/s |

Although the drives may be connected to single-ended and/or narrow SCSI bus types, this is not recommended as it will severely restrict performance. For example, an LVD narrow bus will reduce the transfer rate to half of the above values; single-ended, wide will reduce it to a quarter and single-ended, narrow to an eighth of the above values.

If the drive is configured to run in HVD mode, the sustained transfer rate is restricted to 40 MB/s. This jumper is next to the SCSI address jumpers and will be marked as HVD on the label at the top of the drive.

### The Automation Controller Interface

The Automation Controller Interface (ACI) is a serial bus with additional control lines, designed to connect the Ultrium tape drive to an Automation Controller in a tape library. Each tape drive position has a separate Automation Controller.

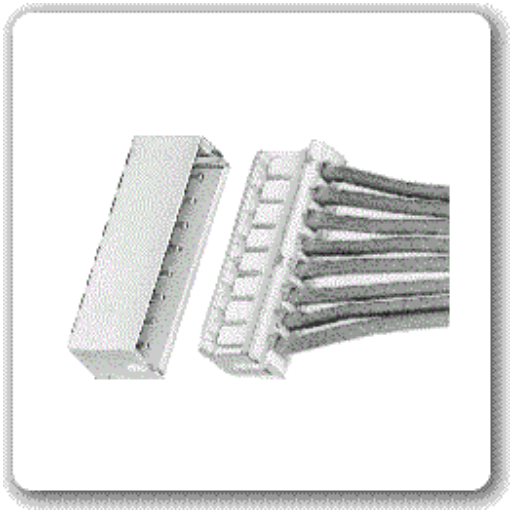

**Figure 5 The ACI connector**

It provides the following fundamental functions:

- Coordination of the Automation Controller and the tape drive for LOAD and UNLOAD operations.
- Retrieval of information from the tape drive by the Automation Controller.
- Setting tape drive configuration information

In addition, the following functions may be supported dependant upon the tape library configuration:

- Providing upload and download of firmware images
- Providing access to Cartridge Memory contents
- Providing a protocol for passing SCSI commands to the tape drive over the interface.

The ACI can receive “packetized” SCSI commands from the attached controller and submit them to the tape drive as if they were received on the drive’s own SCSI bus. For example, the ACI can receive load/unload commands from a specially defined automation command set to cause drive action. This ability enables the attached controller to access and control the drive in exactly the same way as it would via the SCSI bus.

Most tape libraries need to be able to do this because they need to have close control over any mechanical operations of the drive that could interfere with the operation of the picker arm. For instance, in a soft load device such as the Ultrium tape drive, the picker must let go of the cartridge at the exact moment that the drive starts to pull it into the drive.

This degree of control over synchronization cannot be achieved though the host's backup software; it must be controlled directly by the library controller. Most tape libraries work this way today. The process is transparent to the backup software.

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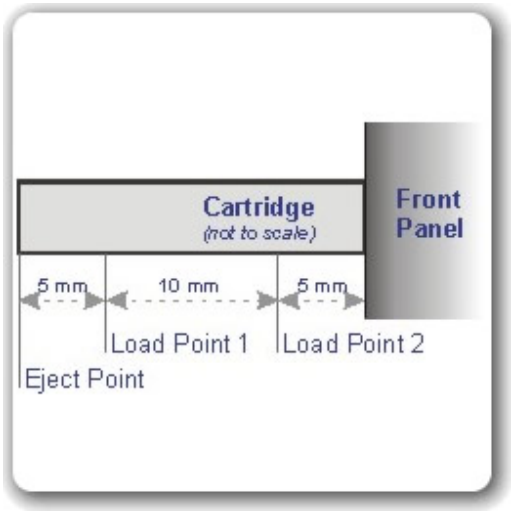
|---|---|
| **NOTE** | Ultrium SCSI Parallel drives implement a limited subset of the SCSI commands, including Inquiry, Log Sense, Log Select and Mode Sense. |

## The Load/Unload Mechanism

Ultrium tape drives incorporate a sophisticated, electronically-controlled load/unload mechanism. Your tape library supplier will have configured the system to control the load and unload operations by determining whether automatic or ACI-controlled loads and unloads occur.

The following diagram shows the positions of importance during load/unload.




| | |
|---|---|
| **Load Point 1** | Auto-load starts at this point. The cartridge must be between Load Point 1 and Load Point 2 to trigger an ACI command load. |
| **Load Point 2** | The maximum insertion distance for command or automatic loading. |
| **Eject Point** | Cartridges are ejected to this point. It is 20 mm beyond the front panel and 25 mm beyond the front of the mechanism. |

**Figure 6 The load/unload positions**

There is one other point of note- the Hold Point. If AUTO_EJECT is not set then when an unload command is received by the drive, the tape will be rewound and unthreaded. The drive will then wait at this point until it is commanded to eject the cartridge by the ACI Unload command.

The following scenarios describe the operation during the various types of load.

### Load Scenario 1: Normal

1. The host sends a Move Medium command to the robotics.
2. The picker gets a cartridge from a storage slot.
3. The picker inserts the cartridge into the drive aperture.
4. The picker pushes the cartridge to at least Load Point 1.
5. The drive automatically takes the cartridge, loads it and threads it.

### Load Scenario 2: ACI Controlled

1. The library sends an ACI Set Configuration command to turn AUTO_LOAD off.
2. The host sends a Move Medium command to the robotics.
3. The picker gets a cartridge from a storage slot.
4. The picker inserts the cartridge to between Load Point 1 and Load Point 2.
5. The picker lets go of the cartridge.
6. The library sends an ACI Load command to the drive.
7. The drive takes the cartridge, then loads and threads it.

### Unload Scenario 1: Normal

1. The host sends a SCSI Unload command to the tape drive.
2. The drive rewinds, unthreads and ejects the cartridge to Eject Point.
3. The host sends a Move Medium command to the robotics.
4. The picker takes the cartridge from the tape drive and places it in its storage slot.

### Unload Scenario 2: ACI Controlled

1. The library sends an ACI Set Configuration command to turn AUTO_EJECT off.
2. The host sends a SCSI Unload command to the drive.
3. The drive rewinds and unthreads the tape. It then pauses at Hold Point.
4. The library sends an ACI Unload command to eject the cartridge.
5. The drive ejects the tape to Eject Point.
6. The picker takes the cartridge from drive.

# Backup Software

For optimum performance it is important to use a backup application that supports your Ultrium drive and tape library. For the latest list of backup packages that support your Ultrium drives, please contact your tape library supplier. Make sure you have a backup application that supports your specific Ultrium tape drive model and download any upgrades or patches, if required.

Suitable backup applications will include driver software that establishes the interface between the tape drive and the software.

# Operating Instructions

The tape library operator panel is used to automatically control all operations of your Ultrium tape drive. Refer to your tape library documentation for full details.

# 2 Ultrium Media

## Compatibility

The capacity and transfer rate of Ultrium drives vary according to the particular model installed. Ensure you use LTO Ultrium format cartridges that match the capacity of your drives.

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| **CAUTION** | Only use LTO Ultrium format cartridges with your Ultrium tape drive, as specified in the LTO Ultrium standard. Do not use DLTIIItape or DLTIVtape cartridges. |

It is critical to ensure that the media you use matches the format of your tape drive. Cleaning cartridges and formatted data cartridges are unique for each drive technology. Damage may occur if inappropriate media is used in tape drives.

Compatible media can be recognized by the Ultrium logo, which is the same as the logo on the front of your drive. The Ultrium format trademark indicates that the media has passed Ultrium format compliance testing.

## Caring for Cartridges

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|---|---|
| **CAUTION** | Ensure that only one label is stuck to the label area of the cartridge. Never use non-standard labels, and never stick anything to the cartridge other than in the label area. |

### Using Cartridges

Only use LTO Ultrium cartridges in temperatures in the tape drive's operating range from 10C to 35C (50°F to 95°F) and 20 to 80% relative humidity (non condensing). If you expose cartridges to temperatures outside the operating limits, stabilize them before you use them. To do this, leave the cartridges in the operating environment for 24 hours.

### Storing Cartridges

- Store cartridges at temperatures between 16°C and 32°C (61°F and 90°F) with a relative humidity between 20% and 80%.
- Always keep the cartridges in a clean environment.
- Always store cartridges in their plastic cases when not in use.

### Maximizing Tape Life

- Do not touch the tape surface.
- Do not attempt to clean the tape path or tape guides inside the cartridge.
- Do not leave cartridge tapes in excessively dry or humid conditions.
- Do not leave cartridges in direct sunlight or in places where magnetic fields are present (for example, under telephones, next to monitors or near transformers).
- Do not drop cartridges or handle them roughly.

- Stick labels onto the label area only.
- Do not bulk erase LTO Ultrium format cartridges.
- See the insert included with the tape cartridge for storage conditions.

### Avoiding Condensation

Condensation can be a problem for tape drives and cartridges. To minimize the chance of condensation, stay within the specifications for using and storing cartridges above and observe the following guidelines:

- Position the library where the temperature is relatively stable -- away from open windows, heat sources and doors.
- Avoid leaving cartridges in severe temperature conditions, for example, in a car standing in bright sunlight.
- Avoid transferring data (reading from and writing to cartridges) when the temperature is changing by more than 10°C (18°F) per hour.
- If you bring a cold tape cartridge into a warm room, allow time for it to warm to room temperature before using it. For example, if you have moved the cartridge from a cold car to a warm room, allow time for the cartridge to reach room temperature (up to 24 hours if the temperature change is extreme).

## To Write-Protect a Cartridge

If you want to protect the data on a cartridge from being altered or overwritten, you can write-protect the cartridge. Do this before you insert the cartridge in the library. If you write-protect the cartridge after it has been inserted in the drive, the change will not take effect until the cartridge is removed and reinserted.

| | |
|---|---|
| **CAUTION** | Write-protection will not prevent a cartridge being erased by bulk-erasure or degaussing. Do not bulk erase Ultrium format cartridges. This will destroy pre-recorded servo information and render the cartridge unusable. |

Using write-protect will ensure data safety for files that have been previously written to tape, and will prevent additional files from be written to the tape.

**Figure 7 Write-protecting a cartridge**

Most cartridges have a red tab over the write-protect hole and a lock indicator that indicates whether the cartridge is write-protected or not. In the above example, the closed red tab with the padlock icon indicates that the cartridge is write-protected.

Refer to the cartridge manufacturer's documentation for specific instructions about write-protecting the cartridge.

# Labeled Cartridges

| | |
|---|---|
| **CAUTION** | Use approved LTO Ultrium format cartridges with your drive. Never use non-standard labels, and never stick anything to the cartridge other than in the label area. Never apply multiple labels onto the cartridge, as extra labels can cause the cartridge to jam in the tape drive. |

Labeled cartridges may be ordered from your tape library supplier. The library vendor sells only labeled cartridges.

The following table gives a typical bar code specification:

| Description | Specification |
|---|---|
| Data Cartridge Message | 8-character (nnnnnnnXY)<br>• 6 alphanumeric (user preference)<br>• 2 alphanumeric (media identification – "L1 = LTO 1st Generation) |
| Cleaning Cartridge Message<br>(see page 17 for more information about cleaning the drive) | 8-character (CLNHnnXY)<br>• CLN denotes cleaning cartridge<br>• 1 alpha (represents the drive manufacturer – example "H" = Hewlett-Packard<br>• 2 numeric (user preference)<br>• 2 alphanumeric (media identification – "L1 = LTO 1st Generation) |
| Diagnostic label | 8-character (DG{space}vnnXY)<br>• DG{space} denotes Diagnostic cartridge identifier<br>• v is the drive type identifier<br>• nn is a sequence of numbers |
| Dimensions | 7.8 cm x 1.7 cm (3.07 in x 0.67 in) |
| Symbology | Code 39 without check digit |
| Start/Stop Characters | */* |
| Short bar<br>Long bar | 6.0 mm (0.24 in)<br>8.5 mm (0.33 in) |
| Ratio | 2.75:1 |
| Print Quality | ANSI Grade "A" |

LTO Ultrium cartridges have a recessed area located on the face of the cartridge, next to the write-protect switch. Use this area for attaching the bar code label. Do not apply labels to the cartridge except in this designated area.

**Figure 8 Labeling a cartridge**

# Cartridge Memory

A contact less, non-volatile EEPROM memory is embedded in the LTO Ultrium tape data cartridge. This is part of the LTO standard, so every Ultrium cartridge contains LTO-Cartridge Memory.

The intelligent memory chip, embedded into the cartridge, uses a radio frequency coupling interface that eliminates the need for a physical power or signal connection between the cartridge and drive.

Cartridge Memory has been added to the Ultrium cartridge for the following main reasons:

- It speeds up load and unload times by removing the need to read system areas.
- It speeds up movement around the tape by storing the tape directory (physical to logical mapping).
- It increases tape reliability because fewer tape passes are needed.
- It stores diagnostic and log information for tracking purposes.

Most of these uses are invisible to applications and are handled internally by the drive.

## Structure

Ultrium Cartridge Memory provides for the storage and access of information held as a set of pre-defined and user-definable attributes. These are divided into six main sections:

- Media Common Section - hard coded by the media manufacturer. For example: manufacturer’s name, cartridge serial number, length, media type.
- Drive Common Section - updated by the drive every time it accesses the media. For example: maximum and remaining tape capacity, TapeAlert flags.
- Host Common Section - updated by the host’s software application every time it uses the media. For example: software application vendor’s name and version, media text label, date last written.

- Media Vendor Unique Section - optional information written by the media vendors for their own purposes. Unique to the media vendor.
- Drive Vendor Unique Section - optional information written by the tape drive vendor for its own purposes. Unique to the drive vendor.
- Host Vendor Unique Section—space reserved for use by software applications for their own purposes. This is unique to the software vendor.

### Host Vendor Applications

Although Cartridge Memory is primarily designed to speed up internal operations in the drive, free space has also been provided for use by the application software, as described above. Of the 4 kilobyte memory, about 1 kilobyte is free and available to the host. This can be used to store “common” information (shared by all software vendors) and “vendor-unique” information (specific to the application). A SCSI access method has been defined to allow hosts to use this free space.

How this facility is actually utilized depends on your tape library supplier and application software supplier. Ultrium tape drive vendors are working with all the major tape library vendors and Independent Software Vendors (ISVs) to ensure that the full potential of these features are realized.

#### Potential for Media Tracking

The Cartridge Memory free space area can, for example, provide an ‘electronic barcode’ facility to allow media tracking. This means that Cartridge Memory offers possibilities for use in libraries as an adjunct to or replacement for physical barcode labels.

If this facility is utilized by your application, refer to your backup software and tape library documentation for full details.

## Cleaning Cartridges

Ultrium tape drives have been developed to have a minimal cleaning requirement. Only insert a cleaning cartridge into the tape library when the library’s front operating panel indicates that cleaning is required – for details, refer to your tape library documentation. (The “Clean” orange LED on the front panel of the individual tape drive will also flash when the drive needs cleaning.) Only clean when indicated by the drive. The drive will complete its cleaning cycle and eject the cartridge on completion (which can take up to 5 minutes).

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|---|---|
| **CAUTION** | It is essential to use only Ultrium cleaning cartridges with Ultrium tape drives as other format cleaning cartridges will not load and run.<br><br>We recommend the orange colored Ultrium Universal cartridge. Unlike some earlier Ultrium cleaning cartridges, the orange colored Ultrium Universal cleaning cartridge is designed to work with any Ultrium compliant drive. If you do not use the Ultrium Universal cartridge, to prevent possible head damage during the cleaning cycle use only a cleaning cartridge from the same manufacturer as that of the drive manufacturer. |

You must use only approved Ultrium cleaning cartridges to clean the tape heads.

Do not use swabs or other means of cleaning the heads. The cleaning cartridge uses a special tape to clean the tape heads.

A cleaning cartridge can be used up to 15 times. If the cleaning cartridge is ejected immediately then it has expired or it is not an approved Ultrium cleaning cartridge. Discard it and use a new one.

# 3 Troubleshooting

This chapter describes general troubleshooting information for Ultrium tape drives, and should be read in conjunction with the specific troubleshooting information provided in your tape library documentation.

If you experience problems when using your tape drive within an automation environment, you need to isolate the cause of the problem. For example, if you have just installed a new SCSI host bus adapter in your host system and your system will not start, the cause of the problem is likely to be the adapter.

The first step in problem-solving is establishing whether the problem lies with the cartridge, the drive, the tape library, the host computer and its connections, the operating system or backup application on the host, or operator error.

If none of the following advice helps you solve the problem, contact your tape library supplier.

## Interpreting the LEDs on Individual Drives

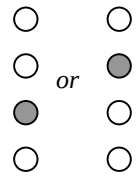
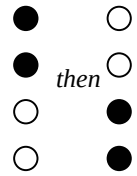
Your Ultrium tape drive has four LEDs (light emitting diodes) on the front panel that indicate drive status. If you suspect that the trouble lies with the individual tape drive, you may be able to view these LEDs.

The tape drive performs a power on self-test whenever power is applied or the drive is reset. The test takes about 5 seconds. The green 'Ready' light and the three orange lights for the other LEDs flash briefly and then go out. The green 'Ready' LED flashes and then remains on if the drive passes the self-test. If the self-test fails, the 'Drive Error' and ‘Tape Error’ LEDs flash, while the ‘Ready’ and ‘Clean’ LEDs are off. This continues until the drive is reset.

Use the following table to interpret the LED sequences and the appropriate action to take:

| LED Sequence | Cause | Action |
|---|---|---|
| ○<br>○<br>○<br>○ | *All LEDs OFF.*<br>Drive may not have power, may be faulty or may have been power cycled or reset during a firmware upgrade. | Make sure the server is switched on. If this is not on, check the internal power cable connection and replace the cable if necessary.<br>If the power supply is present and all LEDs remain off, press emergency reset or power cycle the server. If it still fails, contact your tape library supplier. |
| ○<br>●<br>●<br>○ | *Ready and Clean OFF. Drive Error and Tape Error FLASHING.*<br>The drive has failed to execute power-on self test (POST). | Power cycle or reset the server.<br>If the error condition reappears, contact your tape library supplier. |

| | | |
|---|---|---|
| ● ○ ○ ○ | *Ready is ON.*<br>The drive is ready for operation. | None. This is normal. |
| ◉ ○ ○ ○ | *Ready is FLASHING.*<br>The drive is carrying out a normal activity (read, write). | None.<br>If the drive is upgrading firmware, do not reset or power cycle it. |
| ◉ ○ ○ ○ | *Ready is FLASHING fast.*<br>The drive is downloading firmware. | None.<br>Do not reset or power cycle the drive. |
| ○ ● ● ● | *Ready is OFF, others are ON.*<br>Firmware is being reprogrammed. | None.<br>Do not reset or power cycle the drive. |
| ○ ○ ○ ◉ | *Clean is FLASHING.*<br>The drive requires cleaning. | Load the Ultrium cleaning cartridge.<br>If the clean LED is still flashing when you load a new or known data cartridge after cleaning, contact your tape library supplier. |
| ◉ ○ ○ ● | *Ready is FLASHING and Clean is ON.*<br>Cleaning is in progress. | None. The cleaning cartridge will eject on completion.<br>The cleaning cycle can take up to 5 minutes to complete. |
| ○ ○ ◉ ○ | *Tape Error is FLASHING.*<br>The drive believes the current tape or the tape just ejected is faulty. | Unload the tape cartridge. Make sure that you are using the correct format cartridge; an Ultrium data cartridge or Ultrium Universal cleaning cartridge.<br>Reload the cartridge. If the 'Tape Error' LED still flashes or starts flashing during the next backup, load a new or known, good cartridge.<br>If the 'Tape Error' LED is now off, discard the 'suspect' tape cartridge. If it is still on, contact your tape library supplier. |

| | | |
|---|---|---|
|  | *The tape is ejected immediately and Tape Error is FLASHING, or Drive Error FLASHES on unloading tape.*<br>The tape cartridge memory (CM) may be faulty. | Write-protect the cartridge by sliding the red switch on the tape cartridge. The tape can be loaded and the data read. Once the data is recovered, the cartridge must be discarded. |
|  | *Drive Error FLASHING.*<br>The drive mechanism has detected an error. | Load a new cartridge. If the error persists, power cycle or reset the drive. If the 'Drive Error' LED remains on, contact your tape library supplier. |
|  | *Drive Error, Tape Error and Ready FLASHING.*<br>There is a firmware download problem. | Insert a cartridge to clear the LED sequence. If the condition persists, contact your tape library supplier. |
|  | *Drive Error and Ready ON with Tape Error and Clean OFF. Sequence alternates repeatedly.*<br>The drive has a firmware error. | Power cycle or reset the drive. Upgrade the firmware. If the condition persists, contact your tape library supplier. |

# Ultrium Cleaning Issues

Use the following table to resolve cleaning problems:

| Problem | Solution |
|---|---|
| Recurring cleaning message. | Clean the drive as instructed by your tape library documentation. If the message reappears, replace the cleaning cartridge with a new one.<br>If the message reappears when a particular data cartridge is used, verify that the data cartridge is readable by clearing the message and reading the tape again.<br>If the data cartridge can be read, backup the data to another cartridge and then discard the damaged one. |
| A brand new data cartridge is used, and the library operator panel indicates that cleaning is required. | Clean the outside of the data cartridge with a barely damp, clean, lint-free cloth. Clean the drive as instructed by your tape library documentation.<br>If the operator panel indicates cleaning is required within a short period of time, replace the data cartridge. |
| The cleaning cartridge is ejected immediately after loading. | Make sure that you are using an approved Ultrium cleaning cartridge. We recommend the Ultrium Universal cartridge. |

# LTO-Cartridge Memory Issues

The LTO-Cartridge Memory stores identification and usage information such as the number of times the cartridge has been loaded, when it was last cleaned, and error logs. In the unlikely event of the Cartridge Memory becoming damaged, you may experience difficulty with the cartridge.

Use the following table to resolve LTO-Cartridge Memory problems:

| Problem | Cause | Solution |
|---|---|---|
| A new data cartridge that is write-enabled is rejected by the drive. | LTO-Cartridge Memory has failed or is damaged. | Replace data cartridge. |
| A new data cartridge that is write-protected is rejected in multiple known good drives. | LTO-Cartridge Memory has failed and the drive has found no data to recover. | Replace data cartridge. |
| A cartridge that has data written to it and is write-enabled is rejected by the drive. | LTO-Cartridge Memory has failed or is damaged. | The data can still be recovered. Contact your tape library supplier for more information. After data recovery, replace the cartridge. |
| A cartridge that has data written to it and is write-protected restores very slowly. | LTO-Cartridge Memory has failed and the drive cannot use the tape directory information to recover the data. | The data can still be recovered but may take longer than normal. |

English

# Index