LTO Standalone User's Guide

LTO 200D and LTO 400D

adic

Advanced Digital Information Corp

Copyright Notice

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Regulatory Notices

ADIC libraries are designed, tested, and classified for their intended electromagnetic environment. These electromagnetic environment classifications generally refer to the following harmonized definitions:

Class A is typically for business or industrial environments.

Class B is typically for residential environments.

To determine which classification (Class A or B) applies to your tape library, examine all registration labels located on the bottom, the back panel, or on the inside of the chassis below the magazines.

FCC Notices (USA Only)

To determine which classification applies to your library, examine all FCC registration labels located on the bottom or back panel of your library or on installable components. If any one of the labels carries a Class A rating, your entire system is considered to be a Class A digital device. If all labels carry either the Class B rating distinguished by either an FCC ID number or the FCC logo, (FC), your system is considered to be a Class B digital device.

Once you have determined your system's FCC classification, read the appropriate FCC notice. Note that FCC regulations provide that changes or modifications not expressly approved by ADIC could void your authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

This device may not cause harmful interference.

This device must accept any interference received, including interference that may cause undesired operation.

> **Note**
>
> Use only shielded cables for connecting peripherals to this device to reduce the possibility of interference with radio and television reception. Using shielded cables ensures that you maintain the appropriate FCC radio frequency emissions compliance (for a Class A device) or FCC Certification (for a Class A device) of this product.

The following information is provided on the device or devices covered in this document in compliance with FCC regulations:

Product Name:	LTO 200D or LTO 400D
Model number:	LTO 200D or LTO 400D
Company name:	Advanced Digital Information Corporation
	PO Box 97057
	Redmond, WA 98073-9757 USA
	(425) 881-8004

Class A

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

Class B

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 manufacturer's instruction manual, may cause interference with 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, you are 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 the receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/television technician for help.

IC Notice (Canada Only)

Most tape devices are classified by the Industry Canada (IC) Interference-Causing Equipment Standard #3 (ICES-003) as Class B digital devices. To determine which classification (Class A or B) applies to your tape device, examine all registration labels located on the bottom or the back panel of your device. A statement in the form of "IC Class A ICES-3" or "IC Class B ICES-3" will be located on one of these labels.

Note that Industry Canada regulations provide that changes or modifications not expressly approved by the tape device manufacturer could void your authority to operate this equipment.

This Class B (or Class A, if so indicated on the registration label) digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe B (ou Classe A, si ainsi indiqué sur l'étiquette d'enregistration) respecte toutes les exigences du Reglement sur le Materiel Brouilleur du Canada.

EN 55022 Compliance (Czech Republic Only)

This device belongs to category B devices as described in EN 55022, unless it is specifically stated that it is a category A device on the specification label. The following applies to devices in category A of EN 55022 (radius of protection up to 30 meters). The user of the device is obliged to take all steps necessary to remove sources of interference to telecommunication or other devices.

Pokud není na typovém štitku počítače uvedeno, že spadá do třídy A podle EN 55022, spadá automaticky do třídy B podle EN 55022. Pro zařízení zařazená do třídy A (ochranné pásmo 30m) podle EN 55022 platí následující. Dojde-li k rušení telekomunikačních nebo jiných zařízení, je uživatel povinen provést taková opatření, aby rušení odstranil.

CE Notice

Marking by the symbol $C\epsilon$ indicates compliance of this device to the EMC (Electromagnetic Compatibility) directive of the European Community. Such marking is indicative that this tape library meets or exceeds the following technical standards:

EN 55022 – "Limits and Methods of Measurements of Radio Interference Characteristics of Information Technology Equipment." This system is EN 55022 Class B device (CISPR 22).

EN 50081-1 – "Electromagnetic compatibility – Generic emission standard Part 1: Residential, commercial and light industry."

EN 55024:1998 – Information technology equipment – Immunity characteristics – Limits and methods of measurements.

IEC 60950:1991+A1/A2/A3/A4 – "Safety of Information Technology Equipment including Electrical Business Equipment".

Declaration of Conformity

The signed Declaration of Conformity is on file with Advanced Digital Information Corporation, 17275 NE 67th Court, Redmond, Washington 98052, and ADIC Europe, ZAC des Basses Auges 1, rue Alfred de Vigny, 78112 Fourqueux,

Safety Notices

Warnings

CAUTION

**RISK OF ELECTRIC SHOCK
DO NOT OPEN**

This symbol should alert the user to the presence of "dangerous voltage" inside the product that might cause harm or electric shock.

CAUTION : TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Caution

All safety and operating instructions must be read before this product is operated, and must be retained for future reference. This unit has been engineered and manufactured to assure your personal safety. Improper use can result in potential electrical shock or fire hazards. To maintain the safeguards, observe the following basic rules for its installation, use and servicing.

Follow all Warnings–All warnings on the product and in the operating instructions should be followed.

Read Instructions–All operating and use instructions should be read and followed.

Ventilation–The product should be situated so that its location or position does not interfere with proper ventilation.

Heat–The product should be situated away from heat sources such as radiators, heat registers, furnaces, or other heat producing appliances.

Power Sources–The product should be connected to a power source only of the type directed in the operating instructions or as marked on the product.

Power Cord Protection–The AC line cord should be routed so that it is not likely to be walked on or pinched by items placed upon or against it, paying particular attention to the cord at the wall receptacle, and the point where the cord exits from the product.

Object and Liquid Entry–Care should be taken to insure that objects do not fall and liquids are not spilled into the product's enclosure through openings.

Servicing–The user should not attempt to service the product beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

Precautions

Do not use oil, solvents, gasoline, paint thinners or insecticides on the unit.

Do not expose the unit to moisture, to temperatures higher than 60ºC (140ºF) or to extreme low temperatures.

Keep the unit away from direct sunlight, strong magnetic fields, excessive dust, humidity and electronic/electrical equipment, which generate electrical noise.

Hold the AC power plug by the head when removing it from the AC source outlet; pulling the cord can damage the internal wires.

Use the unit on a firm level surface free from vibration, and do not place anything on top of unit.

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Chapter
1

Introduction

This Chapter. . .

❐ provides a physical description of the switches, indicators and connectors on the front and rear panels of the LTO standalone.

❐ describes other requirements (additional hardware and software) needed to use the LTO standalone device.

Equipment Description

The LTO standalone is a SCSI-compatible, high performance, tape cartridge device designed for storage of near-line and off-line data.

The LTO standalone is equipped with a 2-line by 20-character, back-lit LCD display (LCD). The LCD displays drive status messages, error messages, and drive Power-On Self-Test (POST) result messages. The LTO standalone uses a 7-segment single-character LED (single-character display) to communicate error conditions and informational messages. The LTO standalone also includes Flash EEPROM technology that allows you to easily update firmware onsite from tape or from the host.

Drive Technology and Capacity

Your LTO standalone is equipped with one of the following drives:

LTO 200D

- o Contains an IBM® TotalStorage™ Linear Tape Open (LTO) Ultrium 1 tape drive

- o When used with generation 1 tape cartridges, the native capacity is 100 GB (200 GB compressed, assuming 2:1 compression).

LTO 400D

- o Contains an IBM® TotalStorage™ LTO Ultrium 2 tape drive

- o When used with generation 2 tape cartridges, the native capacity is 200 GB (400 GB compressed, assuming 2:1 compression).

Options

SCSI Interface

The LTO standalone is available with either an Ultra-2 or Ultra-3, Low Voltage Differential/Single Ended (LVD/SE) SCSI interface, or an Ultra-2, High-Voltage Differential (HVD) SCSI interface. The LTO 200D uses Ultra-2 and is available either with LVD/SE or HVD SCSI connections. The LTO 400D uses Ultra-3 and is only available with LVD/SE connections.

> ### *Caution*
>
> Single-Ended (SE) and LVD/SE SCSI devices are not compatible with HVD SCSI devices. Equipment damage may occur if you connect your LTO standalone to an incompatible SCSI bus.

Front Panel Controls and Indicators

Figure 1-1 shows the controls and indicators located on the front panel of the LTO standalone. Table 1-1 provides a brief functional description of the front panel controls and indicators.
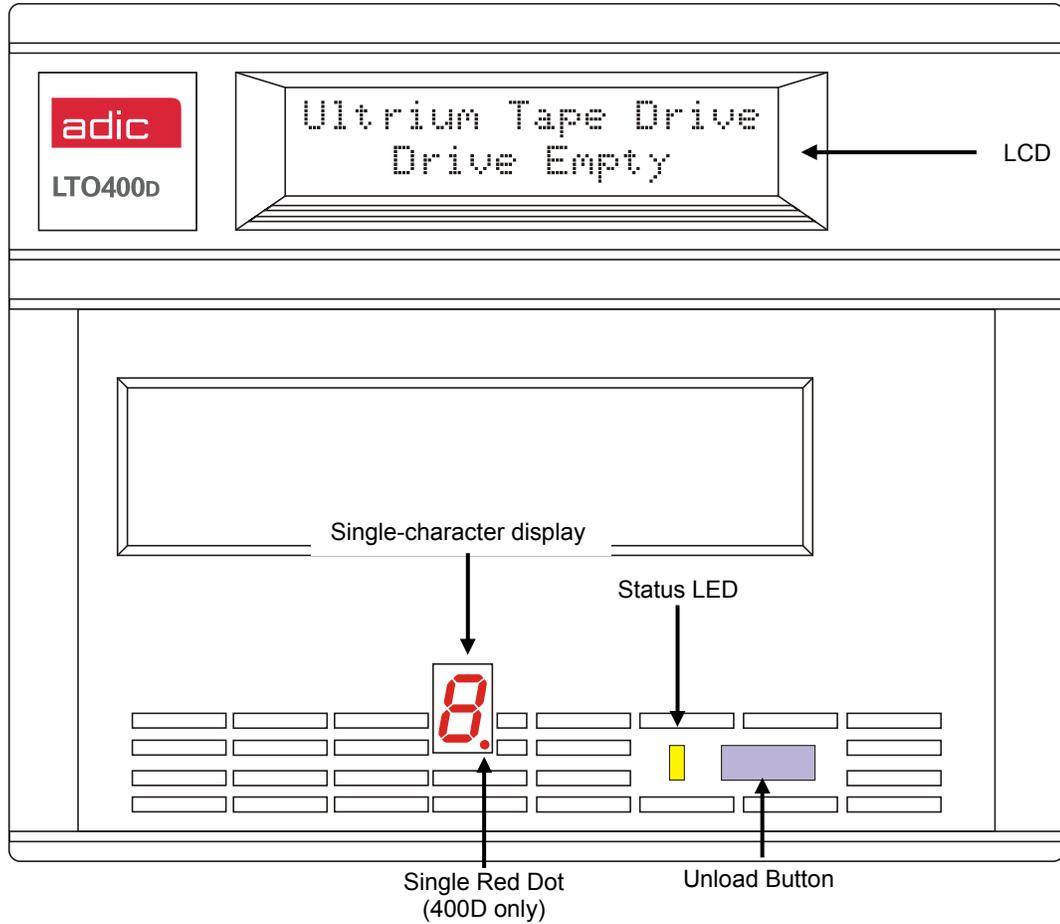
Figure 1-1 LTO Standalone Front Panel

Table 1-1 Front Panel Controls and Indicators

Control or Indicator	Purpose
LCD	2-line by 20-character LCD. Displays drive status, error messages, and POST results.
Status LED (green/amber)	Provides information about the state of the drive. The Status LED is either green or amber, and can be solid or flashing (refer to Table 3-2 in *Chapter 3 Operation and Maintenance* for a description of the **Status** LED states).
Single-Character Display	Blank (off) during normal operation, the single-character display presents a single-character code for: Diagnostic or maintenance functions Error conditions and informational messages
Single Red Dot	(LTO 400D only) The Single Red dot is located on the single-character display. When it is on, the drive has created a dump. For information on copying the dump to a tape, see *Maintenance Mode*.
Unload Button	The **Unload** button enables you to perform several functions. Press the **Unload** button once to start a manual unload of the tape. Note During a rewind and eject operation, your LTO standalone will not accept SCSI commands from your host. Press the **Unload** button three times within one second to place your LTO standalone in **Maintenance Mode** (refer to *Chapter 4 Troubleshooting and Diagnostics* for a description of **Maintenance Mode** functions and a description of the functions the **Unload** button can perform while in this mode). Note While in Maintenance Mode, your LTO standalone will not accept SCSI commands from your host. Press and hold the **Unload** button for 10 seconds while your LTO standalone is in normal operating mode, to force a drive dump (save a microcode trace). The drive places the dump data into a special dump area where it is retrievable (refer to *Chapter 4 Troubleshooting and Diagnostics* for a description of the **Force Drive Dump** function and information about retrieving the data.). Note After you force a drive dump, do not turn off power to your LTO standalone or you may lose the dump data.

Rear Panel Controls and Connectors

Figure 1-2 shows the controls and connectors located on the rear panel of the LTO standalone.
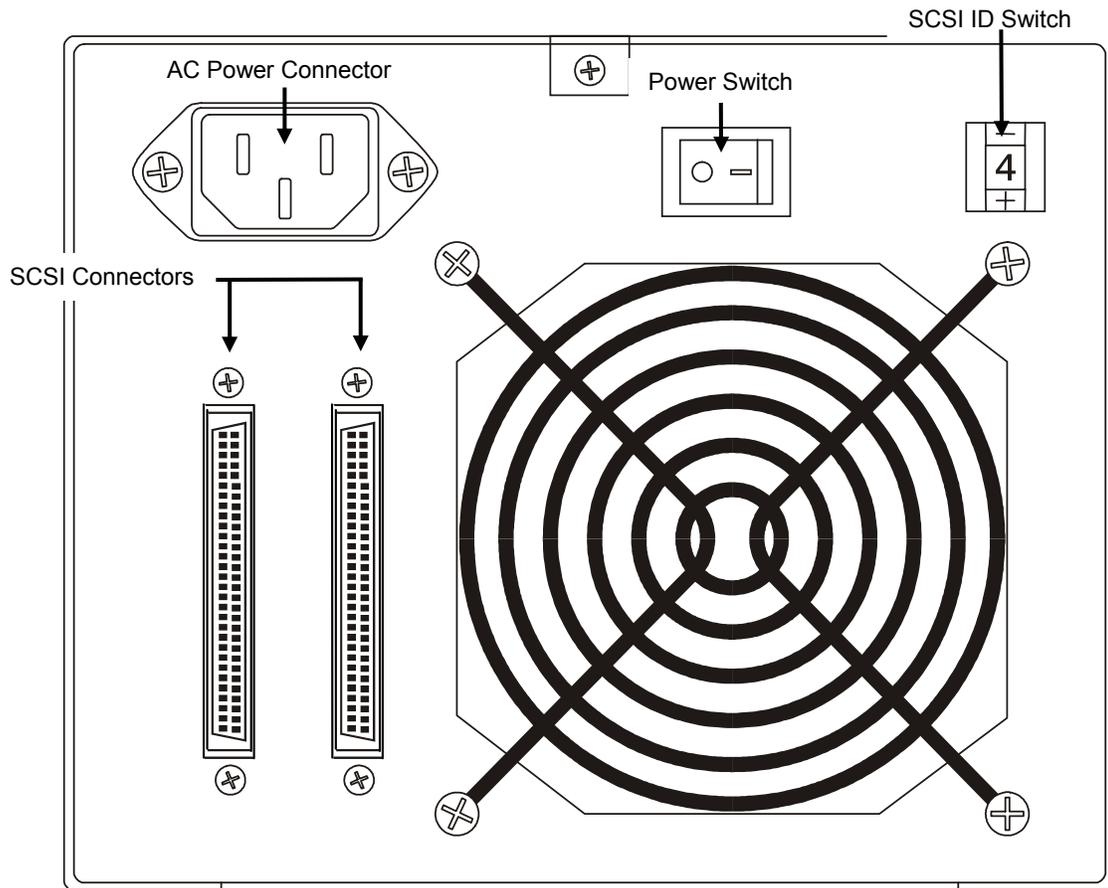
Figure 1-2 LTO Standalone Rear Panel

Table 1-2 Rear Panel Controls and Connectors

Control or Connector	Purpose
Power Switch	Turns power to the unit on and off.
AC Power Connector	Receptacle for AC power cord.
SCSI Connectors	Connections for the interface cable that connects the unit with the host computer and/or to other devices on the SCSI channel. The interface cable can be attached to either connector. Your LTO standalone is equipped with a 68-pin high density SCSI device connector.
SCSI ID Switch	Used to select the SCSI ID for the LTO drive. Factory set at 0.

LTO Tape Cartridges

To ensure that your LTO standalone conforms to ADIC specifications for reliability, use industry-approved LTO Ultrium tape cartridges. Other certified LTO Ultrium data cartridges supported by your LTO standalone include: 10GB, 30GB, and 50GB.

Environmental and Shipping Information

Whenever possible, store LTO Ultrium Tape Cartridges in the following room-environment conditions:

Temperature of 20°C, to 5°C (68°F, to 9°F)
Relative humidity of 50% (20%)

The best storage container for unused cartridges is the original shipping container. The plastic wrapping prevents dirt from accumulating on the cartridges and partially protects them from humidity changes.

You can store tape cartridges in the maximum environmental conditions for up to four weeks without damaging the data or the cartridge. Do not store cartridges for an extended time period in maximum temperature and humidity conditions.

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 1-3 lists the recommended environment for operating, storing, and shipping LTO Ultrium data cartridges.

Table 1-3 Recommended Operating, Storing, and Shipping Environment

Environmental Factor	Operating	Storage	Shipping
Temperature	10°C to 40°C (50°F to 104°F)	16°C to 32°C (61°F to 90°F)	-23°C to 49°C (-9°F to 120°F)
Relative humidity (noncondensing)	20% to 80%	20% to 80%	20% to 80%
Wet bulb temperature	26°C (79°F)	26°C (79°F)	26°C (79°F)

Write-Protect Switch
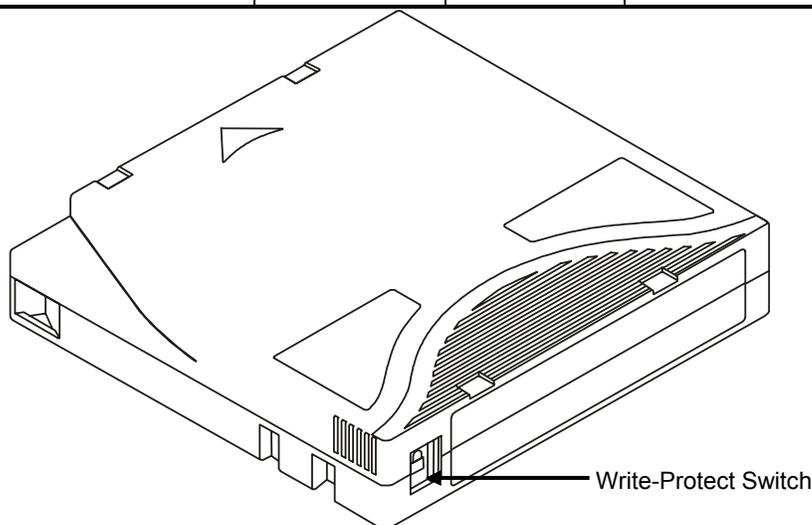
Figure 1-3 LT0 Data Cartridge

Write-Protect Switch

The write-protect switch is used to prevent recording over existing data. To prevent recording or deleting, set the write-protect switch to the closed position (🔒). The drive senses the position of the switch and will not allow writing in this position. When installing cartridges in your LTO standalone, place the switch in the open position (🔓), unless you do not wish to record on a specific cartridge. To set the write-protect switch, slide it left or right to the desired position.

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

If the switch is set to 🔓 data can be written to and read from the tape.

Cautions

Always remove **any** cartridge from the drive before turning off the host system power. Failure to remove a cartridge can result in cartridge and drive damage.

When a cartridge is removed from the drive, return it to the plastic case to prolong the cartridge life.

Handling the Cartridges

Incorrect handling or an incorrect environment can damage the magnetic tape or the cartridges. To avoid damage to your tape cartridge and to ensure the continued high reliability of your LTO standalone, pay attention to the following guidelines.

Before using a cartridge, let it acclimate to the normal operating environment for at least 24 hours.

Ensure that all surfaces of a cartridge are dry before inserting it into drive.

Do not insert a damaged cartridge into the drive. A damaged cartridge can interfere with the reliability of the drive. Before inserting a cartridge, inspect the cartridge case, cartridge door, and write-protect switch for cracks and breaks. If you need to recover data from a damaged cartridge, call your service representative.

Do not open the cartridge case at any time. The upper and lower parts of the case are welded; separating them destroys the usefulness of the cartridge.

Do not handle tape that is outside the cartridge. Handling the tape can damage the tape surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge case can damage the tape and the brake mechanism in the cartridge.

Do not stack more than six cartridges. Although cartridges are shipped and should be stored with the reel in the vertical position, you can temporarily lay the cartridges flat when moving them. The bottom of each cartridge has four raised areas that fit into the indented areas on the top of another cartridge. This construction helps prevent the cartridges from sliding while you move them.

Do not expose the cartridge to moisture or direct sunlight.

Do not expose recorded or blank tape cartridges to stray magnetic fields greater than 100 oersteds (such as those existing near high-current cables or power supplies). Such exposure can cause loss of recorded data or make the blank cartridge unusable.

Other Requirements

SCSI Host Adapter

Your LTO standalone must be connected to either an integrated SCSI host or a separate SCSI interface (host adapter) card installed in the computer–either directly to the I/O connector on the card or as part of an existing SCSI bus. The host adapter you choose must support the same SCSI interface as your LTO standalone (LVD/SE or HVD). The need for additional host adapter features will depend on your host system requirements. If you are not sure about your host adapter requirements, please call the ADIC Technical Assistance Center (ATAC) and ask for assistance.

Caution

SE and LVD/SE SCSI devices are not compatible with HVD SCSI devices. Equipment damage may occur if you connect your ADIC LTO standalone to an incompatible SCSI bus.

Note
In the United States and Canada, call ATAC at (800) 827-3822. In Europe, call ATAC at +800.9999.3822.

Application Software

A variety of backup and data storage software is available for use with your LTO standalone. The software you use will depend upon your storage needs and the system you are using. Please check with ADIC Sales or Customer Assistance if you have a question concerning the compatibility of a particular software package.

Now you are ready to connect the LTO standalone to your host computer. Follow the instructions provided in the next chapter.

Chapter
2

Installation

This Chapter. . .

❒ Explains the steps necessary to install and test the LTO standalone devices.

❒ Provides a ✔symbol next to each step verified as correct.

Unpacking and Inspecting

> **Caution**
>
> If the operating environment differs from the storage environment by 15°C (30°F) or more, let the unit acclimate to the surrounding environment for at least 12 hours.

Unpack all items from the carton. Save the packing materials in case you need to move or ship the system in the future.

> **Caution**
>
> You must ship the LTO standalone in the original or equivalent packing materials or your warranty may be invalidated.

Installing the Host Adapter

At this point if your host computer system does not have native SCSI capability and the host adapter you are using is not installed, please install it. Refer to the manual that came with your host adapter for specific directions.

When the host adapter card is installed, return to this point in the manual.

Connecting the Interface Cable

Attach an interface cable between the host adapter and the LTO standalone. The type of cable needed depends on the type of SCSI bus connector on the host adapter. The LTO standalone has two SCSI device connectors on the rear panel. It does not matter which connector is used.

> **Note**
> The jackscrews at the ends of the SCSI cable must be securely fastened to ensure communications between the LTO standalone and the host computer.

✔ Make sure that the SCSI cable between the host adapter and the LTO standalone is secure and the connections are fastened correctly.

Connecting More than One LTO Standalone Unit

If connecting to more than one LTO standalone unit on the same SCSI bus, connect each unit to the previous unit with an interface cable. The connection sequence between the units is not critical. Refer to Figure 2-1 on the following page to see a configuration setup.

> **Note**
> Don't forget to install the SCSI terminator on the last device in the chain.

Unit 4 SCSI ID 3

SCSI Terminator

Unit 3 SCSI ID 2

SCSI Cables

Unit 2 - SCSI ID 1

Host Computer

Unit 1 - SCSI ID 0
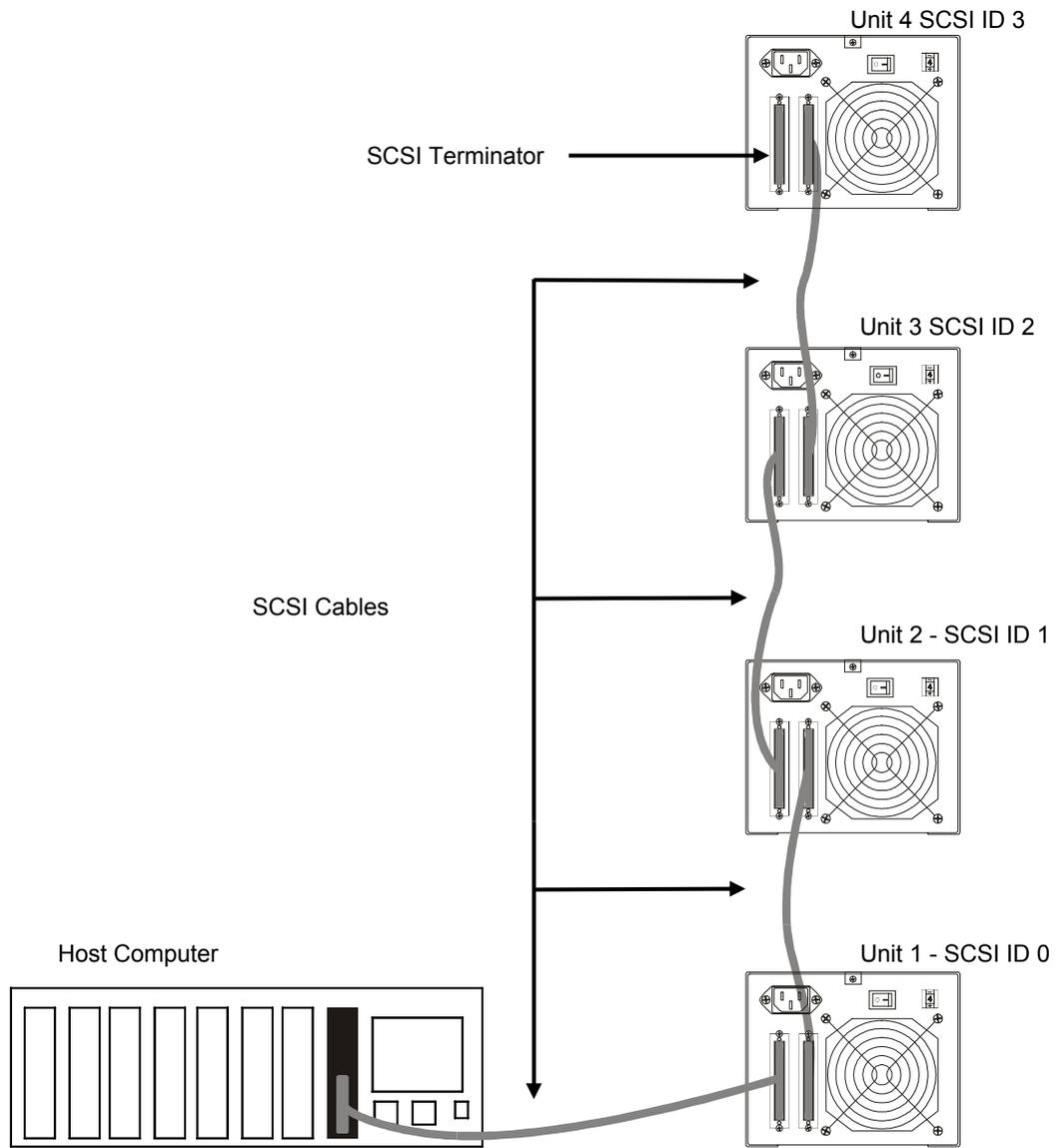
Figure 2-1 Cable Diagram for Four LTO Standalone Units

Setting the SCSI ID

The SCSI ID of the LTO standalone may need to be changed, depending upon factors in the setup, operating system, and number of SCSI devices on the bus. Each device on the bus must have its own address. See Figure 2-2.

> **Notes**
> The SCSI ID has been factory preset to 0.
>
> All devices on a SCSI bus must be set to a unique ID.
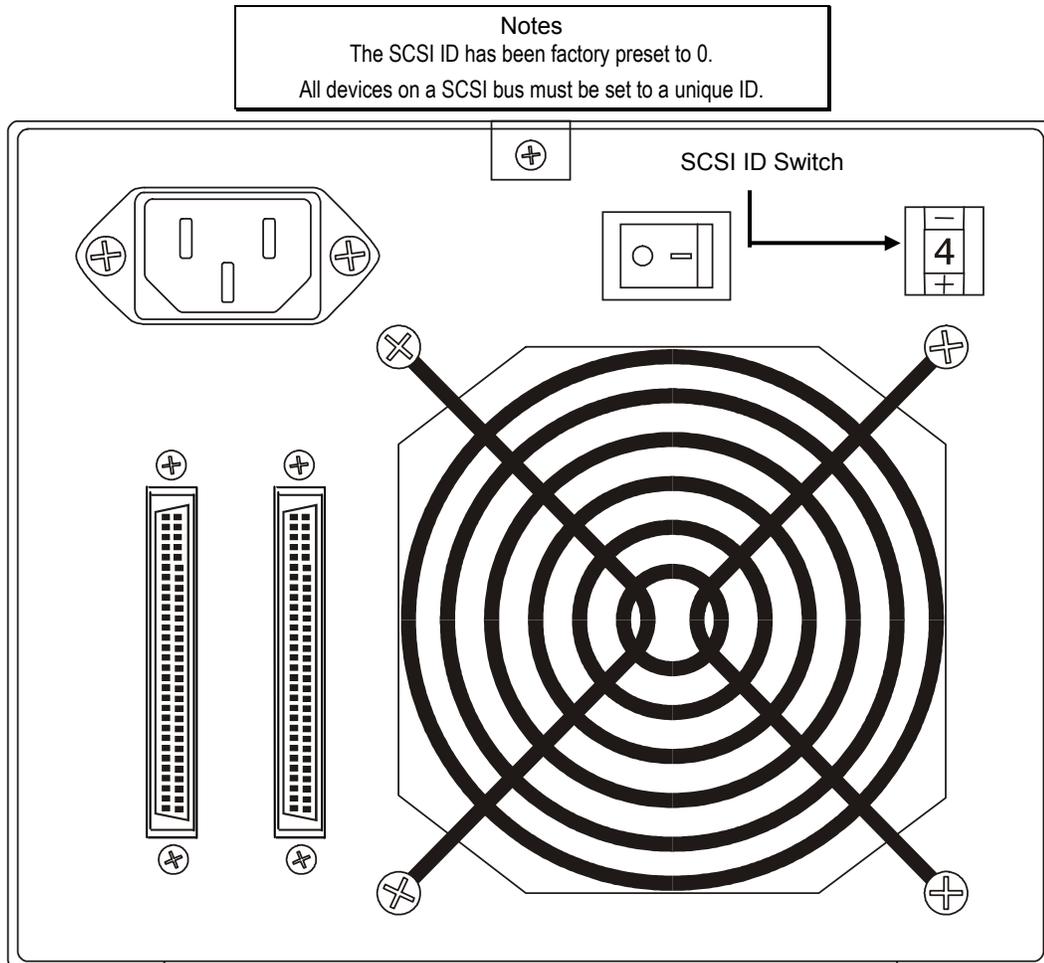
Figure 2-2 SCSI ID Switch

> **Note**
> The LTO standalone can be set to any SCSI ID between 0 and 15.

The SCSI ID switch is located on the rear of the LTO standalone (see Figure 2-2). Use a small pointed object to press either the + button on the bottom, or the minus button on the top of the switch to select the proper ID.

Count the SCSI ID on each device in order from 0 to 15 on each SCSI bus to confirm that no two devices have the same ID number assigned.

> **Note**
> The SCSI Host Adapter is normally set to SCSI ID 7, so this ID is usually not available for a device.

Check the SCSI Bus Termination

SCSI buses require termination at each end for proper operation. A typical external subsystem installation would be terminated at the SCSI host adapter and at the last device in the chain.

If an external device is being used with an internal device (on the same channel), the SCSI host adapter would now be in the middle of the bus rather than at the end. In this case, the termination would be at the internal device and at the last drive in the external chain. Remove the terminators on the SCSI host adapter. Refer to the SCSI host adapter manual for directions on removing the terminators on the board.

Connecting Power and Turning the Autoloader On

1. Plug the power cord into the back of the LTO standalone.

2. Plug the power cord from the LTO standalone into a GROUNDED electrical outlet.

3. Plug the power cord from the host system into the same GROUNDED electrical circuit if possible. Computers and peripherals should always share the same grounds.

4. Turn power on.

5. After the LTO standalone completes its Power on Self Test (POST), turn on the power to the host system.

Installing the Host Software

Refer to the host software installation guide and install the software, if necessary.

After completing installation of the LTO standalone unit and the host software, run a small backup/restore test and compare the results to confirm that the unit is working correctly. Refer to the software installation guide for additional information.

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Chapter
3

Operation and Maintenance

This Chapter . . .

❒   describes normal operating features of the LTO standalone.

❒   explains how, and when to clean the tape head.

❒   describes how to clean the enclosure.

Power-on Self-Test and Initialization

When the system power is turned on, the drive performs a Power-on Self-Test (POST) and initialization. POST is completed in approximately three minutes and the drive will respond normally to all commands. However, it may take longer for the media to be ready. Following POST completion, the **Status** LED will be solid green.

Drive Status

LCD Messages

Table 3-1 describes the messages displayed on the LCD during and immediately after the POST:

Table 3-1 POST LCD Messages

Drive State	Message
POST is executing.	**Power On Self Test In Progress** Will be displayed for several minutes, followed by: **Drive FW X.X.X** **Display FW X.X.X** "DRIVE FW" is the firmware version of the drive. "DISPLAY FW" is the firmware version of the LCD controller.
POST completed and no cartridge is present.	**Ultrium Tape Drive Drive Empty**
POST completed and a cartridge is present.	**Volume Loaded DC WP** **Ready...** "DC" indicates that drive data compression is enabled "WP" indicates that cartridge is write-protected.
The drive detects an error condition.	**Error!** **Selftest Failure**

LED Indicators

Status LED

After initialization, the **Status** LED will be in one of the five states listed in Table 3-2:

Table 3-2 Status LED States

LED State	LTO 200D	LTO 400D
Off	The drive has no power, is powered off, or (if C is displayed simultaneously in the single-character display) needs cleaning.	The drive has no power or is powered off.
Green/Solid	The LTO standalone is powered on.	The LTO standalone is powered on.
Green/Flashing	The Status LED flashes anytime there is tape motion. For example, drive is reading from, or writing to the cartridge, rewinding the cartridge, locating data on the cartridge, or unloading the cartridge.	If the LED flashes less than once per second the drive is in sleep mode. If the LED flashes once per second there is tape motion. For example, drive is reading from, or writing to the cartridge, rewinding the cartridge, locating data on the cartridge, or unloading the cartridge.
Amber/Solid	The drive is in Maintenance Mode or performing the POST.	The drive is performing a selected operation, the drive is displaying the drive error log, or the drive is in Maintenance Mode.
Amber/Flashing	One of the following applies: If the LED flashes once per second, an error occurred and the drive and media may require service. Note the code on the single-character display, then go to Table 4-2 Error Codes for its meaning. If the LED flashes twice per second, the drive is updating firmware via the FMR tape or the SCSI interface. If the LED flashes four times per second, the drive detected an error and is performing a firmware recovery. It resets automatically.	One of the following applies: If the LED flashes less than once per second, the drive is updating firmware (via the FMR tape or the SCSI interface) or the maximum drive temperature was exceeded. If the LED flashes once per second, an error occurred, and the drive may require service. Note the message on the LCD Message Display and the code on the Single Character Display. If the LED flashes twice per second, the tape drive has detected an error is performing a firmware recovery. It resets automatically.

Single-Character Display

After initialization, the single-character display will be blank (off) during normal operation of the drive. However, it will display a single-character code when:

> Executing certain diagnostic or maintenance functions.

> Displaying error conditions and informational messages.

Also, a single red dot on the single-character display will be lit if the drive has created a dump (LTO 400Ds only). To copy the dump to a tape, see *Maintenance Mode*.

Normal Drive Operating Conditions

LCD Messages

Table 3-3 describes the messages displayed by the LCD during normal operation:

Table 3-3 Normal Operating Condition LCD Messages

Drive Operating Condition	LCD Message
No cartridge in drive.	**Ultrium Tape Drive** **Drive Empty**
When loading or unloading a cartridge.	**Cartridge Loading** **In Progress** or: **Cartridge Unloading** **In Progress**
When cartridge is loaded.	**Volume Loaded DC WP** **Ready...** "DC"–indicates that drive data compression is enabled. "WP"–indicates that the tape cartridge is write-protected. Line two of the 2-line by 20-character LCD displays drive status at any particular time: "Ready," "Locating," "Writing," "Reading," "Rewinding," etc.

Loading the Tape Cartridge

Warnings

Before loading into a drive, ensure that all other items from this package are separated from the cartridge.

Never press in on the hub portion of the data cartridge.

Static electricity may cause the label or other items included in the package to occasionally cling to the data cartridge.

❒ In order to write data to, or erase data from the cartridge, check that the **Write-Protect** switch on the cartridge is in the write-enabled position—all the way to the left.
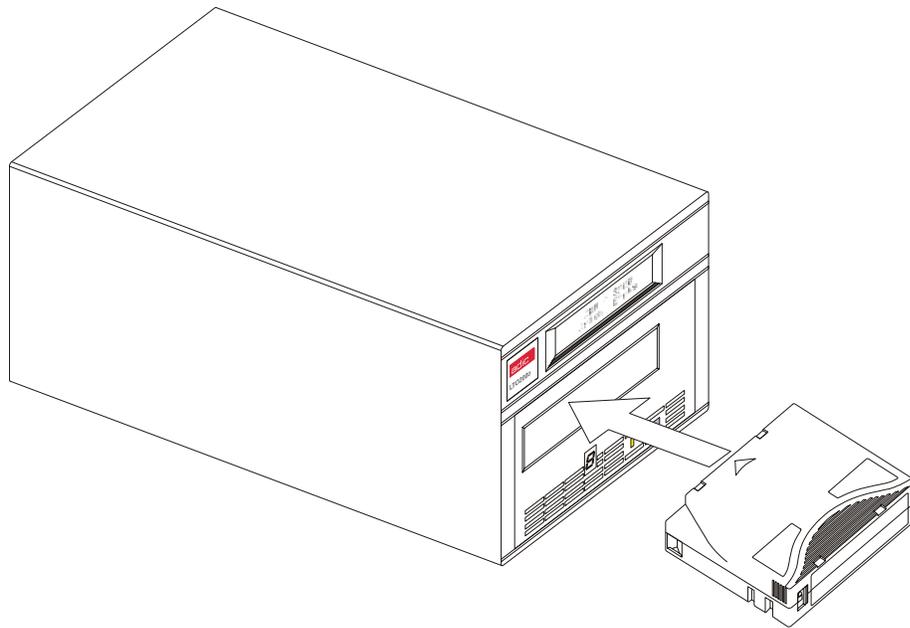
Figure 3-1 Loading a Data Cartridge

❐   Insert the tape cartridge into the slot.

❐   Grasp the cartridge so that the write-protect switch faces you as shown in the above illustration.

❐   Slide the cartridge into the tape load compartment of the drive.

❐   The load sequence begins and the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Green, flashing
Single-character display	Off
LCD	**Cartridge Loading In Progress**

Notes
If a cartridge is already in the ejected position and you want to reinsert it, remove the cartridge and then insert it again.
If a cartridge is already loaded and you cycle the power (turn it off, then on), the cartridge will reload.

❐   When the cartridge is finished loading, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Green, solid
Single-character display	Off
LCD	**Volume Loaded DC WP Ready...**

Data Protection

Write-Protection of the Data Cartridge While Inside the Drive

The **Write-Protect** switch on the data cartridge can be moved while the cartridge is loaded into the drive. The drive will turn on the **Write Protected** LED immediately. However, if the drive is writing to the cartridge, write protect does not take effect until the write operation is completed.

- If you move the **Write-Protect** switch from the write-protected position (to the right) to the write-enabled position (to the left), the cartridge becomes write-enabled immediately.

- If you move the **Write-Protect** switch from the write-enabled position (on the left) to the write-protected position (to the right), the cartridge becomes write-protected immediately.

Write-Protection of the Data Cartridge Outside of the Drive

Move the **Write-Protect** switch to the **right** to write-protect the cartridge. Data cannot be written to, or erased from the cartridge.

Move the **Write-Protect** switch to the **left** to make the cartridge write-enabled. Data can now be written to, or erased from the cartridge, assuming it is not already software write-protected.

Removing the Data Cartridge

To unload a cartridge from the drive, perform the following steps:

❒ Push the **Unload** button.

The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Green, flashing
Single-character display	Off
LCD	**Cartridge Unloading In Progress**

❒ When the cartridge is ejected from the drive, remove the cartridge.

Caution
After the cartridge is removed from the drive, return it to its plastic case to prolong the cartridge life.

Cleaning the Drive Head

The LTO standalone is a highly sophisticated unit. No routine maintenance is required apart from periodically cleaning the drive head whenever C appears on the single-character display.

To clean the head, use an approved LTO Ultrium Cleaning Cartridge. Insert the cleaning cartridge in the drive following the *Loading the Data Cartridge* procedure described elsewhere in this chapter. The drive will automatically clean the head. When the cleaning operation is complete, the drive will automatically unload and eject the cleaning cartridge, indicating that the cleaning cartridge should be removed.

Follow the *Removing the Data Cartridge* procedure elsewhere in this chapter to remove the cleaning cartridge from the drive.

Note
Loading the cleaning cartridge into the drive at the end of its cleaning cycle will result in a failed or shortened cleaning operation. If C is still displayed on the single-character display, replace the cleaning cartridge and clean the drive again.

Cleaning the Enclosure

The outside of the enclosure can be cleaned with a damp towel. If a liquid all-purpose cleaner is used, **dry with a towel.** Do not spray the enclosure.

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Chapter
4

Troubleshooting and Diagnostics

This Chapter. . .

❒   Lists a number of common problems and the actions to take to correct them.

❒   Explains what to do when technical support is needed.

Troubleshooting Chart

If the LTO standalone fails during POST or operation, use the following table to determine the problem and the action to take:

Table 4-1 Troubleshooting Chart

Condition	Possible cause	Corrective action
The host system does not recognize the LTO standalone unit	The system may not be configured to recognize the SCSI ID	Configure the system to see the ID.
	The SCSI ID might not be unique	Change the SCSI ID and reconfigure the system. The new ID takes effect at the next power-on.
	The parameters for the SCSI adapter may be incorrect	Check the SCSI adapter installation.
	The SCSI cable may be loose	Make sure the connector on each end of the cable is fully seated and the jackscrews are secure.
	The SCSI terminator may not be present or might be loose	Install the terminator; make sure the terminator is fully seated and the jackscrews are secure.
	The SCSI bus may not be correctly terminated	If the LTO standalone unit is the last or only device on the bus, make sure the terminator is installed on the LTO standalone.
		If the LTO standalone unit is not the last or only device on the bus, check the cable connections and make sure the terminator is installed at the end of the bus.
	The SCSI terminator may not be at the end of the bus, or more than two terminators may be present	Be sure to install a terminator at each end of the bus. One terminator is usually installed at the host system.
	The SCSI bus might be too long	Limit the SCSI bus length to 12 meters (39.4 feet) for LVD configurations, and 25 meters (82 feet) for HVD configurations.
	Too many devices might be on the bus	Limit the number of devices on the bus. Check the system configuration rules.
The LTO standalone unit does not power up	The LTO standalone unit has no power	Check the LTO standalone unit power cable connections with the LTO standalone unit power switch OFF.
Undetermined fatal or nonfatal errors have been detected.	The bus termination or SCSI signal cable connections might be incorrect	Make sure the SCSI bus is terminated.
	The AC power source grounding might be incorrect	Use an AC outlet for the LTO standalone unit on the same AC circuit as the AC line powering the host system.
The single-character display presents any character other than $\mathcal{C}$.	A drive fault has occurred	Try to unload the tape and reinitialize the drive by pressing the **Unload** button or turn the LTO standalone unit power off and then on again.
		The single-character display will go blank and the drive will try to reinitialize. The single-character display will turn on and display several characters and then go off if the reinitialization succeeds.

The **Status** LED or the single-character display never turns on.	The LTO standalone unit has no power	Check the LTO standalone unit power cable connections with the LTO standalone unit power switch OFF. If the problem persists, replace the drive.
The **Status** LED is on, but the single-character display is always blank (off).	The drive is defective	While watching for any character to appear on the single-character display, turn off power to the LTO standalone, then turn it on. If no character displays, replace the drive.
The drive will not load a tape cartridge.	One of the following has occurred: A cartridge is already inserted The tape cartridge was inserted incorrectly The cartridge is defective	To remove the cartridge, press the Unload button. If the cartridge does not eject, turn off power to the LTO standalone, then turn it on again. Remove the partially ejected cartridge. For a description of how to correctly insert a cartridge, see "Loading the Data Cartridge" on page 21. Insert another cartridge. If the problem persists, replace the drive. If the problem persists for multiple cartridges, the drive is defective. Replace the drive.
The drive won't unload the tape cartridge.	The cartridge is stuck or broken	Press the **Unload** button. If the cartridge does not eject, turn off power to the LTO standalone, then turn it on. If the cartridge still does not eject, contact ATAC.
Codes display on the single-character display, but the Status LED doesn't turn on..	The drive is defective	Replace the drive.

Maintenance Mode

You can direct the LTO standalone to run diagnostics, verify read and write operations, verify a suspect data cartridge, update its firmware, and perform other diagnostic and maintenance functions. You cannot perform maintenance functions concurrently with read or write operations.

Usually, whenever your LTO standalone is in **Maintenance Mode**, the **Status** LED will be solid amber. When an error is detected while a **Maintenance Mode** function is running, the **Status** LED will change to flashing amber.

> Note
>
> While in Maintenance Mode, your LTO standalone will not accept SCSI commands from the host.

Each **Maintenance Mode** function is identified by the function code (number in parenthesis below) that appears on the single-character display and the function name that appears on the second line of the LCD.

The following diagnostic or maintenance functions are available in **Maintenance Mode**:

Exit Maintenance Mode (0)   Display Err Code Log (9)

Drive R/W Diagnostic (1)   Clear Error Log (A)

Update Drive Firmware (2)   Test Media (E)

Create FMR Tape (3)   Fast R/W Diagnostic (F)

Force Drive Dump (4)   Test Head (H)

Copy Dump to Tape (5)   Reserved for Future Use (L)

SCSI Wrap Test (*6*)   For use by Support Personnel (*P*)

Test Not Supported (*7*)   For use by Support Personnel (*U*)

Unmake FMR Tape (*8*)

Putting the LTO Standalone in Maintenance Mode

Perform the following steps to place the drive in **Maintenance Mode**.

    1.   Verify that a cartridge is not in the drive.

    2.   Press the **Unload** button three times within a one second interval.

The state of the front panel indicators will be as shown in the following table:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	*0*
LCD	**Maint Mode: Select** **Exit Maint Mode**

> Note
>
> If a cartridge is in the drive, it will eject the cartridge 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 previous step.

Diagnostic or Maintenance Functions

To select a diagnostic or maintenance function:

    1.   Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

    2.   Press the **Unload** button once per second until the specific function code appears on the single-character display and the function name appears on the second line of the LCD, as shown in the following table:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	*1* ← Function Code
LCD Function Name →	**Maint Mode: Select** **Drive R/W Diagnostic**

> Note
>
> If you cycle past the desired function code, press the Unload button once per second until the function code reappears on the single-character display.

    3.   Press and hold the Unload button for three seconds. The drive will perform the function you selected.

    4.   If the function requires you to insert a cartridge, *C* will appear on the single-character display and the LCD will display a message that prompts you to insert a cartridge. Within 60 seconds, insert a cartridge or the drive will exit **Maintenance Mode**.

If the function is successfully completed, U appears temporarily on the single-character display and the drive exits **Maintenance Mode**.

If the function fails, the **Status** LED will flash amber, an error code will be shown on the single-character display, and the drive exits **Maintenance Mode**. To resolve an error refer to Table 4-2 Error Codes, elsewhere in this chapter.

To clear an error, cycle (remove, then reapply) power to the LTO standalone.

Exit Maintenance Mode

To select the **Exit Maintenance Mode** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	U
LCD	**Maint Mode: Select** **Exit Maint Mode**

2. With U on the single-character display, press and hold the **Unload** button for three seconds to force the drive to exit **Maintenance Mode** (the **Status** LED is solid green).

The drive also exits **Maintenance Mode** automatically after it has completed a function or after 10 minutes if no action has occurred.

Drive R/W Diagnostic

Use this function to direct the drive to execute built-in tests to determine whether it can properly load and unload cartridges, and read and write data.

To select the **Drive R/W Diagnostic**, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	1
LCD	**Maint Mode: Select** **Drive R/W Diagnostic**

3. Press and hold the **Unload** button for two seconds to select **Drive R/W Diagnostics**.

The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	1, flashing
LCD	**Drive R/W Diagnostic** **Drive Self Test**

After 60 seconds the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	C, flashing
LCD	**Drive R/W Diagnostic** **Load Scratch Tape**

4. Within 60 seconds, insert a scratch data cartridge that is not write-protected into the drive (or the drive will exit **Maintenance Mode**). Refer to *Convert FMR Tape to Scratch Tape* elsewhere in this chapter for a description of a valid scratch data tape.

Caution
Data on the cartridge will be overwritten. Insert only a scratch data cartridge for these tests.

After you insert the cartridge, the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	1, flashing
LCD	**Drive R/W Diagnostic** **Writing =====** which alternates with: **Drive R/W Diagnostic** **Locating =====** After several minutes: **Drive R/W Diagnostic** **Reading =====** which alternates with: **Drive R/W Diagnostic** **Locating =====** until the test finishes.

The drive takes approximately 20 minutes to complete the tests. If the diagnostics complete successfully, it will loop and begin again.

5. Press and hold the Unload button for several seconds. When the loop ends, 0 will appear temporarily on the single-character display. The drive will rewind, then unload the cartridge and exit **Maintenance Mode**. The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Off
Single-character display	Off
LCD	**Passed!** **Tape Unloading**

followed by:

Indicator	State, Character, or Message
Status LED	Off
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

If an error occurs while the drive is running the **Drive R/W Diagnostic**, the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	5, flashing
LCD	**Error!** **Drive Problem**

The drive will unload and eject the cartridge, exit **Maintenance Mode,** and the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	5, flashing
LCD	**Ultrium Tape Drive** **Drive Empty**

6. To resolve the error, refer to Table 4-2 Error Codes, later in this chapter. To clear the error, cycle (remove, then reapply) power to the LTO standalone.

Update Drive Firmware from FMR Tape

To select the **Update Drive Firmware from FMR Tape** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\sqsupset$
LCD	**Maint Mode: Select** **Update Drive FW**

3. Press and hold the **Unload** button for two seconds to select **Update Drive Firmware from FMR Tape**. The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\sqsubset$, flashing
LCD	**Update Drive FW** **Load Drive FMR Tape**

4. Within 60 seconds, insert the FMR cartridge (or the drive will exit **Maintenance Mode**).

When you have inserted the FMR cartridge, the drive begins loading the cartridge, and the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\sqsupset$, flashing
LCD	**Update Drive FW** **Tape Loading =====**

After the cartridge is loaded the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing at 2 Hz
Single-character display	$\sqsupset$, flashing
LCD	**Update Drive FW** **Locating =====**
	followed by: **Update Drive FW** **Reading =====**

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

If the update is completed successfully, the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	Ξ, flashing
LCD	**Update Drive FW** **Completed!**

The drive will rewind and unload the FMR tape while the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	Ξ, flashing
LCD	**Update Drive FW** **Unloading =====**

The drive will reset itself, and the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Off
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

5. Cycle (remove, then reapply) power to the LTO standalone. The drive begins to use the new firmware.

If the update fails, the drive posts an error code to the single-character display then retries the operation up to three times. If the update continues to fail, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	Υ, flashing
LCD	**Error!** **Firmware/Drive Prob**

The drive will unload the FMR tape and exit **Maintenance Mode**.

- To resolve the error, refer to Table 4-2 Error Codes, elsewhere in this chapter.

- To clear the error, cycle (remove, then reapply) power to the LTO standalone.

Create FMR Tape

Use this function to copy data from the drive to a scratch data cartridge.

To select the **Create FMR Tape** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** by observing that the **Status** LED is illuminated solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\exists$
LCD	**Maint Mode: Select** **Create FMR Tape**

Caution

If you select this function, the drive will overwrite existing firmware on the scratch data cartridge.

---

3. Press and hold the **Unload** button for two seconds to select **Create FMR Tape**. The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	C, flashing
LCD	**Create FMR Tape** **Load Scratch Tape**

4. Within 60 seconds, insert a scratch data cartridge that is not write-protected (or the drive will exit **Maintenance Mode**).

    After you insert the cartridge, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\exists$, flashing
LCD	**Create FMR Tape** **Tape Loading =====** Followed by: **Create FMR Tape** **Locating =====** Followed by: **Create FMR Tape** **Writing =====**

The drive will copy the FMR data to the scratch data cartridge.

If the drive creates the FMR tape successfully, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	0

Indicator	State, Character, or Message
LCD	**Create FMR Tape** **Completed!**

Followed by:

Cartridge Unloading
In Progress

Followed by:

Ultrium Tape Drive
Drive Empty

Then the drive will exit **Maintenance Mode**.

If the drive fails to create the FMR tape, it will retry the operation twice. If the failure continues, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	$\overline{7}$, flashing
LCD	**Error!** **Media Problem**

To resolve the error, refer to Table 4-2 Error Codes, elsewhere in this chapter. To clear the error, cycle (remove, then reapply) power to the LTO standalone.

Force a Drive Dump

To select the **Force a Drive Dump** function, perform the following steps:

1. Verify that the drive is in **Maintenance** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	4
LCD	**Maint Mode: Select** **Force Drive Dump**

3. Press and hold the **Unload** button for two seconds to select **Force a Drive Dump**. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	4, flashing which will change to: 0, solid

Indicator	State, Character, or Message
LCD	**Force Drive Dump** **Completed!**

which will change to:

	Ultrium Tape Drive **Drive Empty**

The single-character display will then blank (turn off), the drive will exit **Maintenance Mode** and the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Off
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

Note
You can also perform this function while the drive is in the normal operating mode. Simply press and hold the Unload button for 10 seconds.

Copy the Drive Dump to Tape [at Beginning of Tape (BOT)]

Use this function to direct the drive to copy data from a drive dump (refer to Function 4–Force a Drive Dump, above) to the beginning of a scratch tape.

To select the **Copy the Drive Dump to Tape** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	5
LCD	**Maint Mode: Select** **Copy Dump to Tape**

3. Press and hold the **Unload** button for two seconds to select **Copy Dump to Tape**. The front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	C, flashing
LCD	**Copy Dump to Tape** **Load Scratch Tape**

4. Within 60 seconds, insert a scratch data cartridge that is not write-protected (or the drive will exit **Maintenance Mode**).

Caution

Data on the cartridge will be overwritten. Insert only a scratch data cartridge for these tests.

After you insert the cartridge, the front panel indicators will display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	*5*
LCD	**Copy Dump to Tape** **Tape Loading ====▪** while the drive writes the dump data to the scratch data tape (at BOT).

When **Copy Dump to Tape** finishes copying the data to the scratch cartridge, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	*5*
LCD	**Copy Dump to Tape** **Passed!** Followed by: **Cartridge Unloading** **In Progress**

The drive will then unload the cartridge and exit **Maintenance Mode**. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Green, solid
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

If an error occurs while the drive is running the **Copy Dump to Tape** function, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Off
Single-character display	*7*, flashing
LCD	**Error!** **Media Problem**

To resolve the error, refer to Table 4-2 Error Codes elsewhere in this chapter. To clear the error, cycle (remove, then reapply) power to the LTO standalone.

After clearing error (cycle power if drive error), the LCD displays the following message:

Indicator	State, Character, or Message
Status LED	Green, solid
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

SCSI Wrap Test Function

This test performs a check of the SCSI circuitry from and to the SCSI connector.

To select the **SCSI Wrap Test** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	b
LCD	**Maint Mode: Select** **SCSI Wrap(Inst Plug)**

Before selecting this function, attach a SCSI wrap plug (not provided in accessory kit; contact ATAC) to the drive SCSI connector (in place of the SCSI cable).

3. Press and hold the **Unload** button for two seconds to select **SCSI Wrap Test**. The drive automatically starts the test. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	b, flashing
LCD	**SCSI Wrap** **Running!**

If the test is successful, the test will loop and begin again.

4. Press the **Unload** button. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	0
LCD	**Ultrium Tape Drive** **Drive Empty**
	Then the drive will exit **Maintenance Mode**.

If the test fails, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	$\mathcal{B}$, solid
LCD	**Error!** **Drive/SCSI Bus Error**

Then the drive will exit **Maintenance Mode**.

To resolve the error, refer to Table 4-2 Error Codes, elsewhere in this chapter. To clear the error, cycle (remove, then reapply) power to the LTO standalone.

Unmake FMR Tape

Use this function to direct the drive to erase the firmware data on a scratch data cartridge and rewrite the cartridge memory on tape. This turns the cartridge into a valid scratch data cartridge.

To select the **Unmake FMR Tape** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\mathcal{B}$
LCD	**Maint Mode: Select** **Unmake FMR Tape**

3. Press and hold the Unload button for two seconds to select **Unmake FMR Tape**. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\mathcal{C}$, flashing
LCD	**Unmake FMR Tape** **Load Drv FMR Tape**

4. Within 60 seconds, insert the FMR cartridge (or the drive will exit **Maintenance Mode**).

After you insert the cartridge, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\mathcal{B}$, flashing
LCD	**Unmake FMR Tape** **Tape Loading ====▸** while the drive loads the FMR tape, then erases the firmware on the tape, then rewrites the header in the cartridge memory to change the cartridge to a valid scratch data cartridge.

If the operation is successful, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\mathcal{O}$, solid
LCD	**Unmake FMR Tape** **Completed!** followed by: **Cartridge Unloading** **In Progress** followed by: **Ultrium Tape Drive** **Drive Empty**

The drive will then exit **Maintenance Mode**.

If the operation is not successful or the tape is already a valid scratch tape, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	$\mathcal{7}$, flashing
LCD	**ERROR!** **Media Error**

To resolve the error, refer to Table 4-2 Error Codes, elsewhere in this chapter. To clear the error, cycle (remove, then reapply) power to the LTO standalone.

Display Error Code Log

Use this function 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.)

To select the **Display Error Code Log** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** by observing that the **Status** LED is illuminated solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	9
LCD	**Maint Mode: Select** **Display Err Code Log**

3. Press and hold the **Unload** button for two seconds to select **Display Error Code Log**. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	9, flashing
LCD	**Display Err Code Log** **0. Media Error**

4. After you select this function:

> Press the **Unload** button to view the most recent error code.

> Press the **Unload** button again to view the successive error codes.

If you press the **Unload** button after the tenth error code is shown, the drive will exit this function as well as the **Maintenance Mode** function.

If there are no errors in the log, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	0
LCD	**Maint Mode: Select** **Exit Maint Mode**

5. To exit this function and **Maintenance Mode**, press and hold the **Unload** button for two seconds.

Clear Error Log

To select the **Clear Error Log** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	A
LCD	**Maint Mode: Select** **Clear Error Log**

3. Press and hold the **Unload** button for two seconds to select **Clear Err Log**.

The drive erases all errors from the error log, and the front panel indicators briefly display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	A, flashing
LCD	**Clear Error Log** **Completed!**

Then your LTO standalone exits **Maintenance Mode**, and the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Green, solid
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

Test Cartridge and Media

Use this function to perform tests to ensure that a suspect cartridge and its magnetic tape are acceptable.

To select the **Test Cartridge & Media** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	E
LCD	**Maint Mode: Select** **Test Media**

3. Press and hold the **Unload** button for two seconds to select **Test Cartridge & Media**. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	C, flashing
LCD	**Test Media** **Load Scratch Tape**

4. Within 60 seconds, insert the suspect cartridge (or the drive will exit **Maintenance Mode**).

    After you insert the cartridge, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	E, flashing
LCD	**Test Media** **Tape Loading ====** while the drive loads the suspect tape, followed by: **Test Media** **Locating ====** followed by: **Test Media** **Writing ====** followed by: **Test Media** **Reading ====**

Caution

Data on the suspect cartridge will be overwritten.

The drive will take approximately 15 minutes to run the tests.

If no error is detected, the test will loop and begin again.

5. Press the **Unload** button. The LTO standalone will rewind and unload the suspect tape. The front panel indicators display the following, and the LTO standalone exits **Maintenance Mode**:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	0
LCD	**Test Media** **Tape Unloading**

If an error is detected, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	7
LCD	**Error!** **Media Problem**

and your LTO standalone will exit **Maintenance Mode**.

To resolve the error, refer to Table 4-2 Error Codes, elsewhere in this chapter.

Fast R/W Diagnostic

Use this function to determine whether the drive can properly load and unload cartridges, and read and write data.

To select the **Fast R/W Diagnostic**, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	F
LCD	**Maint Mode: Select** **Fast R/W Diagnostic**

3. Press and hold the **Unload** button for two seconds to select **Fast R/W Diagnostic**.

   After a short time the front panel indicators display the following:

Indicator	State, Character or Message
Status LED	Amber, solid
Single-character display	C, flashing
LCD	**Fast R/W Diagnostic** **Load Scratch Tape**

4. Within 60 seconds, insert a scratch data cartridge that is not write-protected into the drive (or the drive will exit **Maintenance Mode**). Refer to **Convert FMR Tape to Scratch Tape** elsewhere in this chapter for the description of a valid scratch data tape.

Caution

Insert only a scratch data cartridge for these tests. Data on the cartridge will be overwritten.

After you insert the cartridge, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	F, flashing
LCD	**Fast R/W Diagnostic** **Tape Loading ======▸**
LCD	which will be followed by: **Fast R/W Diagnostic** **Writing ======▸** which will alternate with: **Fast R/W Diagnostic** **Locating ======▸** for several minutes, followed by: **Fast R/W Diagnostic** **Reading ======▸** which will alternate with: **Fast R/W Diagnostic** **Locating ======▸** which will loop back to Writing and continue for several minutes until the display changes to: **Fast R/W Diagnostic** **Erasing ======▸** And then it will repeat the previous steps until completed.

The drive takes approximately 20 minutes to complete the tests.

If the diagnostics are successfully completed, the test will loop and begin again.

5. Press the **Unload** button to exit **Maintenance Mode**. The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Off
Single-character display	Off
LCD	**Ultrium Tape Drive** **Drive Empty**

If an error occurs while the drive is running the **Fast R/W Diagnostic**, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	5, flashing
LCD	**Error!** **Drive Problem**

The drive unloads, ejects the cartridge, exits **Maintenance Mode,** and the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	5, flashing
LCD	**Ultrium Tape Drive** **Drive Empty**

To resolve the error, refer to Table 4-2 Error Codes, elsewhere in this chapter.

To clear the error, cycle (remove, then reapply) power to the LTO standalone.

Test Head

Use these tests to ensure that the drive head and tape-carriage mechanics are working correctly.

To select the **Test Head** function, perform the following steps:

1. Verify that the drive is in **Maintenance Mode** shown when the **Status** LED is solid amber.

2. Press the **Unload** button once per second until the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	H
LCD	**Maint Mode : Select** **Test Head**

3. Press and hold the **Unload** button for two seconds to select **Test Head**.

The front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	C, flashing
LCD	**Test Head** **Load Scratch Tape**

Within 60 seconds, insert a scratch data cartridge (or the drive will exit **Maintenance Mode**).

After you insert the scratch cartridge, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, solid
Single-character display	*H*, flashing
LCD	**Test Head** **Tape Loading ====▪** while the drive loads the scratch tape, followed by: **Test Head** **Writing ====▪** The drive takes approximately 10 minutes to run the tests.

If no error is detected, the test will loop and begin again.

4. Press the **Unload** button. The LTO standalone rewinds and unloads the scratch tape. The front panel indicators display the following, and the LTO standalone exits **Maintenance Mode**:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	*0*
LCD	**Test Head** **Tape Unloading**

If an error is detected, the front panel indicators display the following:

Indicator	State, Character, or Message
Status LED	Amber, flashing
Single-character display	*5*
LCD	**Error!** **Drive Problem**

And your LTO standalone will exit **Maintenance Mode**.

To resolve the error, refer to the following Error Code table.

Error Codes and Messages

Table 4-2 describes LTO standalone error codes, LCD messages, possible causes and suggested actions to correct the error.

Table 4-2 Error Codes and Messages.

Code	LCD Message	Possible cause	Corrective action
0	Maint Mode: Select Exit Maint Mode	No error. This code displays: • When power is cycled (turned off, then on) to the drive. • When diagnostics have finished running and no error occurred. **Note** The single-character display is blank during normal operation of the drive.	No action required.
1	Error! Cooling Problem	Maximum operating temperature was exceeded.	Remove any blockage that prevents air from flowing freely through the drive. Ensure that the operating temperature and airflow is within the specified range (refer to Appendix A Specifications, for the operating temperature range). If the operating temperature is within the specified range and the problem persists, contact ATAC.
2	Error! Power Problem	Externally supplied power exceeds the specified voltage limits.	Ensure that the power connector is properly seated. Ensure that the proper DC voltages are being applied within the tolerances allowed. If the proper voltages are being applied and the problem persists, contact ATAC.

3	Error!
	F/W Problem
		A firmware error occurred.	1. Collect a drive dump from one of the following:
			  • Server
			  • Ultrium Tape Drive (select Function code *5*)
			2. Power the 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 still persists, read a drive dump, then call your next level of support.

4	Error! Drive/FW Prob	Firmware or drive problem.	1. Collect a drive dump from one of the following: • Server • Ultrium Tape Drive (select Function code 5) Power the drive off then on, then retry the operation that produced the error. If the problem persists, download new firmware and retry the operation; if new firmware is not available, contact ATAC.
5	Error! Drive Problem	A drive hardware failure occurred. To prevent damage to the drive or tape, the drive may not allow you to insert a cartridge until you turn the drive off, then on.	If the problem persists, contact ATAC.
6	Error! Drive/Media Prob	The drive determined that an error occurred, but it cannot isolate the error to faulty hardware or the data cartridge.	If you know the cartridge volume serial number (located on the cartridge label), retry the operation with another cartridge: • If the operation succeeded, the original cartridge was defective. Copy data from the defective cartridge and discard it. • If the operation failed with the same error code, contact ATAC. • If the operation failed with a different error code, locate the code in this table. If you don't know the cartridge volume serial number, or if a problem occurs with multiple cartridges: • Run the drive diagnostics (function code 1). • If the drive diagnostics fail, contact ATAC. If the drive diagnostics are successful, run the Test Head diagnostic (Function Code H). • If the Test Head diagnostic fails, contact ATAC. • If the Test Head diagnostic is successful, replace the cartridge that caused the problem.
7	Error! Media Problem	An error occurred because of a faulty tape cartridge.	Replace the tape cartridge. If the problem occurs with multiple tape cartridges, contact ATAC.
8	Error! Drive/SCSI Problem	A failure occurred in the drive hardware or in the SCSI bus.	Contact ATAC.
9	Error! Drive/SCSI Problem	A failure occurred in the drive hardware or in the RS-422 connection.	Contact ATAC.
B, D, E, F, or H		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 illuminated.

A,		The performance of the drive is degraded, but the drive is still operational. .	To clear this error, cycle the drive power or place the drive in maintenance mode. If the problem persists, replace the drive.
C		The drive needs to be cleaned.	Clean the drive. Refer to *Cleaning the Tape Head* in Chapter 3. **Note** The code clears when you clean the drive, or place the drive in Maintenance Mode.

Appendix
A

Specifications

This Appendix . . .

❐   contains specification information on the LTO standalone.

	LTO 200D	LTO 400D
Drive		
Type	IBM® Ultrium™ Generation 1 LTO™ tape drive	Contains an IBM® TotalStorage™ LTO Ultrium 2 tape drive
Media Type	LTO-1	LTO-2
Data Capacity	100 GB per cartridge (200 GB compressed, assuming 2:1 compression)	200 GB per cartridge (400 GB compressed, assuming 2:1 compression)
Data Transfer Rate (compressed mode)	15 MB/sec (30 MB/sec, assuming 2:1 compression)	35 MB / sec (70 MB / sec, assuming 2:1 compression)
Enclosure		
Electrical Interface	LVD/SE Ultra-2 SCSI or HVD Ultra-2 SCSI	LVD Ultra-3 SCSI
Physical Interface	68-pin, shielded, high-density device connector	68-pin, shielded, high-density device connector
Reliability		
Maintenance	Periodic cleaning of drive head using LTO cleaning cartridge	Periodic cleaning of drive head using LTO cleaning cartridge
MTBF	250 000 power on hours at 100% duty cycle	250 000 power on hours at 100% duty cycle
Physical		
Dimensions	14.6 cm (5.75in.) height, 17.1 cm (6.75in.) width, 33.6 cm (13.25in.) depth	14.6 cm (5.75in.) height, 17.1 cm (6.75in.) width, 33.6 cm (13.25in.) depth
Weight	6.59 kg (14.3 lb)	6.59 kg (14.3 lb)
Environment		
Electrical	100–240 VAC, 50–60 Hz	100–240 VAC; 50–60 Hz
BTU/Hour	300	Under 250
Temperature	10 C to 38 C (50° to 100 F) Operating	10 C to 38 C (50° to100 F) Operating
Humidity	10% to 80% Operating	10% to 80% Operating
Vibration	0.5G (5–500 Hz) Operating	0.2 G (2–200 Hz) Operating
Shock	15G Operating	30G Operating

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