# Quantum.

User's Guide

Quantum LTFS

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Contents

Contents

Chapter 3   **Using Quantum LTFS for Windows**   **7**

Chapter 4   **Troubleshooting**   **39**

Appendix A   **Frequently Asked Questions**   **43**

Figures

Figures

Tables

Tables

Preface

This manual introduces Quantum LTFS for Windows and discusses Quantum LTFS for Windows configuration and operation.

Audience

This manual is written for Quantum LTFS for Windows operators and administrators.

Document Organization

Following is a brief description of chapter contents.

- Chapter 1, Quantum LTFS for Windows Overview provides an overview of the features, benefits intended usage, architecture and supported configuration.

- Chapter 2, Installation and Configuration provides information about access, installation and configuration.

- Chapter 3, Using Quantum LTFS for Windows provides information about using LTFS for Windows.

- Chapter 4, Troubleshooting provides information about troubleshooting problems.

- Appendix A, Frequently Asked Questions provides answers to frequently asked questions.

Notational Conventions

This manual uses the following conventions:

Convention	Elements
Blue text	**Cross-reference links and email addresses**
Blue, underlined text	`Website addresses`
Bold text	• **Keys that are pressed** • Text typed into a GUI element • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
Italic text	`Text emphasis`
`Monospace` text	• **File and directory names** • System output • Code • Commands, their arguments, and argument values

Convention	Elements
`Monospace, bold` text	**Emphasized momospace text**

The following formats indicate important information:

Note: Note emphasizes important information related to the main topic.

Caution: Caution indicates potential hazards to equipment or data.

WARNING: Warning indicates potential hazards to personal safety.

Related Documents

The following Quantum documents are also available for Quantum LTFS for Windows:

Document No.	Document Title	Document Description
6-67739-xx	*Quantum LTFS for WIndows Release Notes*	Compatibility and support information about the latest release of Quantum LTFS for Windows.

For the most up to date information on Quantum LTFS for Windows, see:

http://www.quantum.com/ServiceandSupport/Index.aspx

Contacts

Quantum company contacts are listed below.

Quantum Corporate Headquarters

To order documentation on LTFS for Windows or other products contact:

> Quantum Corporation *(Corporate Headquarters)*
> 1650 Technology Drive, Suite 700
> San Jose, CA 95110-1382

Technical Publications

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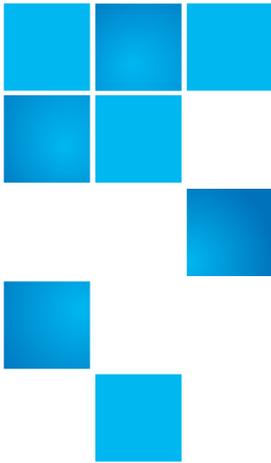
Chapter 1

Quantum LTFS for Windows Overview

This chapter provides and overview of Quantum LTFS for Windows.

- Introduction
- Features
- Benefits
- Intended Usage
- Architecture
- Supported Configurations

Introduction

This guide provides information about Quantum Linear Tape File System (LTFS) for Windows. Quantum LTFS for Windows makes tape self-describing, file-based, and easy-to-use, and allow users to use standard file operations on tape media to access, manage and share files with an interface that behaves like a hard disk. In addition, Quantum LTFS for Windows provides the ability to share data across platforms, as you would with a USB drive or memory stick.

> **Note:** A firmware update may be required. Quantum LTFS for Windows will check and tell you if your tape drive needs updating.

Features

Quantum LTFS for Windows includes the following features:

- Allows you to use LTO media as a disk.
- Based on Open Source LTFS software with Graphical User Interface (GUI) components added for usability.
- Pre-compiled application versions provided for supported platforms.
- Source code available for the open source Quantum LTFS for Windows software.
- Supported on Microsoft Windows.
- Supports mounting two tape drives concurrently.
- LTFS smart copy' utility for efficient data transfer from tape to disk.

Benefits

In addition to the wide range of benefits that Quantum LTO-5 or later tape drives have to offer, Quantum LTO-5 with Quantum LTFS for Windows functionality also delivers:

- **Faster access to data:** When a tape is mounted, the files and directories stored on it appear on your desktop in the same way as a disk directory listing.
- **Simple drag and drop:** Quantum LTFS for Windows increases ease of use; simply drag and drop files to and from the tape
- **Compatibility across your environment:** Tape media written using Quantum LTFS for Windows is self-describing so that data retrieval from tape is independent of any hardware or software platforms.
- **Increased data mobility:** Easily share content to increase data mobility. Tapes written with Quantum LTFS for Windows can be exchanged more easily between users working in different operating systems, using different software and in different locations.

- **A single storage media standard:** Unify organization-wide file sharing with Quantum LTO-5 or later tape drives. Tapes can move across libraries and vendors with the ease of video cassettes, while files on tape can be accessed using straightforward drag-and-drop.

Intended Usage

Quantum LTFS for Windows presents the contents of the tape as a disk volume. However it is important to bear in mind that it is not a true disk, and so there are some best practices to follow to ensure satisfactory performance and a good user experience:

- Quantum LTFS for Windows is designed to work best in a single-user environment, where only one user is copying files to or from the tape. Multiple users or processes trying to write or read at the same time will result in poor performance because of the sequential access nature of tape.

- For the same reasons, do not share the tape drive between different systems. A single tape drive should be connected to a single host bus adapter (HBA).

- The expected usage model is to transfer large files between systems, by mounting the tape on one system, writing the files, unmounting, mounting on the second system, and reading the files. Treating the tape volume as a true random access device (for example frequently reading and updating individual files) will not perform as well as streaming large files to and from tape.

Architecture

The various components in the Quantum LTFS for Windows application are shown in the following diagram.

Figure 1 Architectural
components
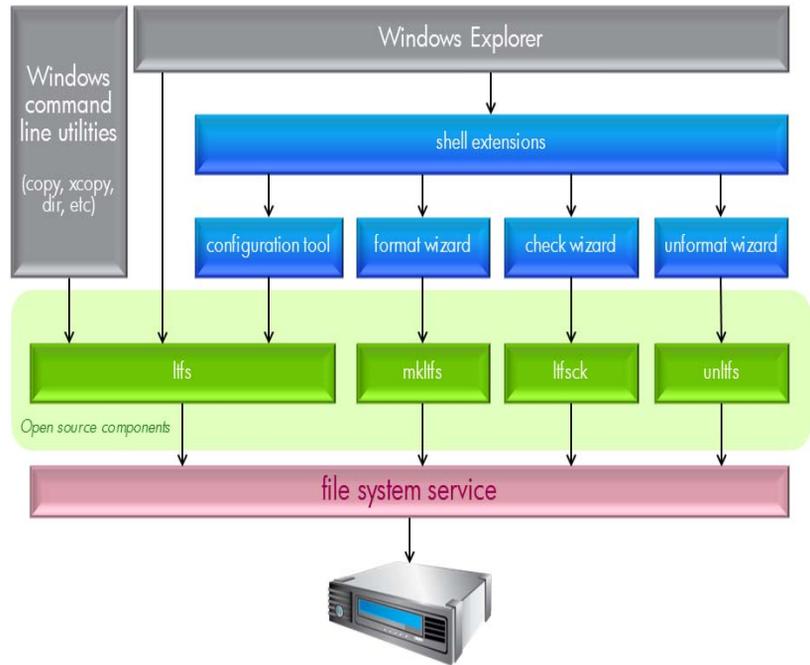
Supported Configurations

Quantum LTFS for Windows supports:

- Quantum LTO-5 or later Tape Drives with SAS interfaces

- Microsoft Windows 7, 8, 8.1 and 10 (x86 and x64)

- Microsoft Windows Server 2008 (x86 and x64), 2008 R2, 2012 and 2012 R2

Note: Only the binaries supplied by Quantum are supported, not those built from the source. For the latest details on supported operating system configurations and supported HBA and hardware configurations, go here: http://www.quantum.com/ ServiceandSupport/SoftwareandDocumentationDownloads/ ltfs/Index.aspx. Then select the **Specifications** tab, scroll down to the **Resources** section and click **Compatibility Guide**.
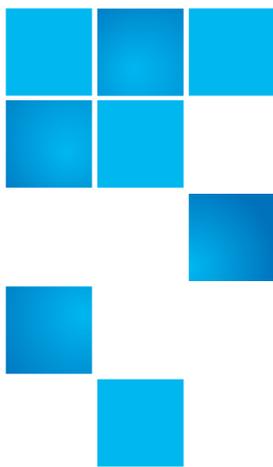
Chapter 2
Installation and Configuration

This chapter helps you to install and configure Quantum LTFS for Windows and contains the following sections:

- Getting Started
- Downloading and Installing Quantum LTFS for Windows
- Uninstalling Quantum LTFS for Windows

Getting Started

When using Quantum LTFS for Windows with Quantum LTO-5 tape drives, you need the following components:

- A Quantum LTO-5 tape drive connected to a supported SAS HBA
- A drive firmware revision that supports dual partitioning. Quantum LTFS will check and tell you if your tape drive firmware needs updating
- The latest tape driver (QLTOx64.sys or QLTOx32.sys) installed.

- The software package installer executable; this can be found here:
  http://www.quantum.com/ServiceandSupport/
  SoftwareandDocumentationDownloads/ltfs/Index.aspx

  (Scroll down on the page and click the **Software** tab.)

Note: xTalk version 6.4.1.1 or later provides a new "LTFS check" test
that determines whether or not dual partitioning and LTFS are
supported.

Downloading and Installing Quantum LTFS for Windows

To use the precompiled binaries, download the installer appropriate to
your operating system:

- *32-bit Windows platforms:* Download `LTFS_BINARIES_WINx86.exe`
- *64-bit Windows platforms:* Download `LTFS_BINARIES_WINx64.exe`

When the download has completed, run the installer. Note that
administrator privileges may be required depending on your system
configuration.

Follow the installer steps until the installation is complete.

The executables will be installed into a new menu group under
Quantum LTFS for Windows. For the next steps, see Chapter 3, Using
Quantum LTFS for Windows.

Uninstalling Quantum LTFS for Windows

If you want to remove the software from your system, follow these
steps:

1 Unmount any LTFS file system you currently have mounted (see
   Removing the LTFS volume on page 20).

2 Open the Windows Control Panel and select Uninstall a program.

3 From the list of installed software, select Quantum LTFS for
   Windows and then click the Uninstall button.
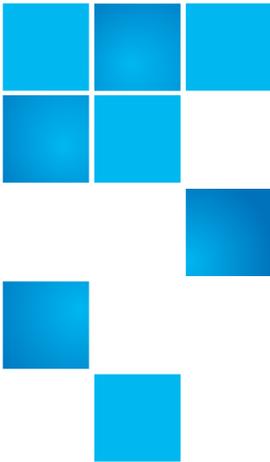
Using Quantum LTFS for Windows

This chapter describes how to work with Quantum LTFS for Windows and contains the following sections:

Mapping a Tape Drive to a Drive Letter

Before you can access the tape cartridge as a volume, you must first establish a mapping between the tape drive and a Windows drive letter. To do this, run the LTFS Configuration Tool located in the Quantum LTFS for Windows program group.

Note: The tool may request administrative privileges, depending on your system security policies.

The following configuration window will appear on your system:

Figure 2 Configuration
Window
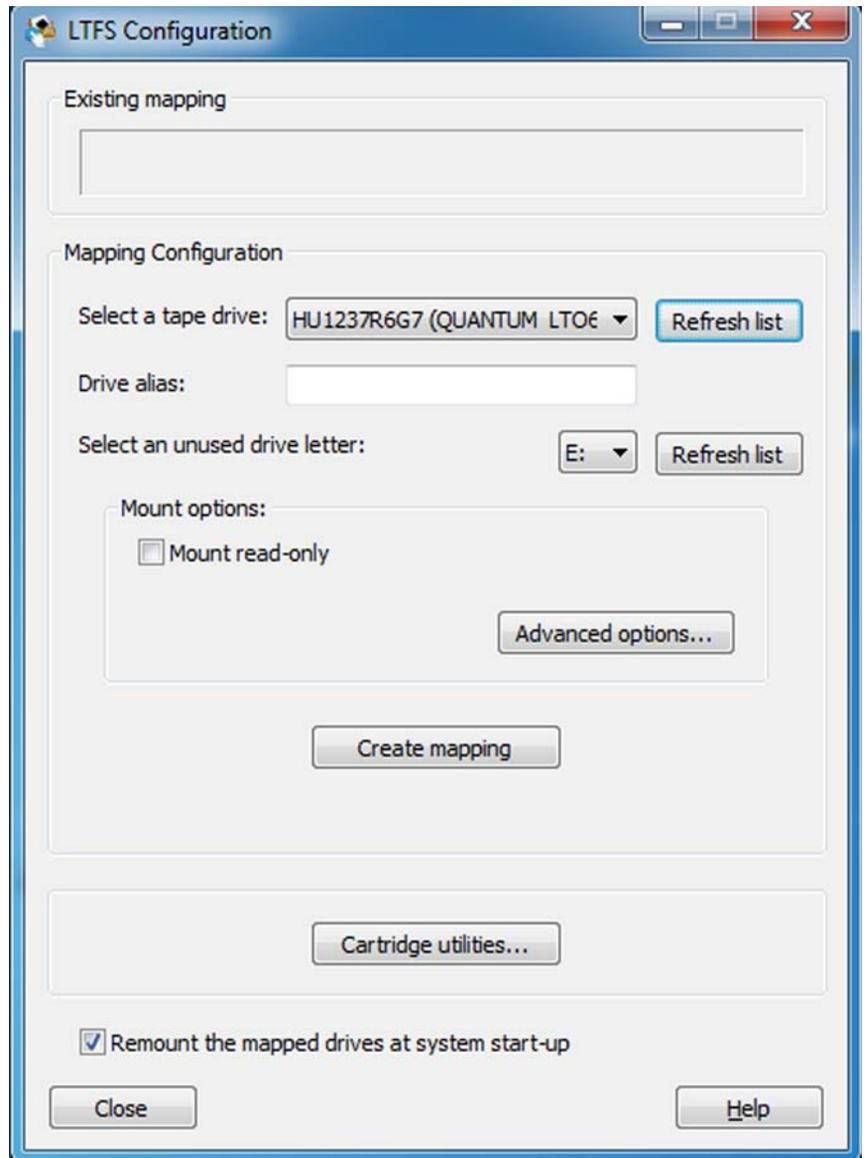
By default the first usable tape drive found on your system is selected, along with the first unused drive letter. Change the selections as desired, then to mount with all the default options, click Create mapping. This results in the following actions:

1 The configuration tool checks that the drive is accessible and usable.

2 The tool attempts to verify that your system has suitable HBA driver support for Quantum LTFS for Windows operation.

3 The tool looks for a currently loaded tape cartridge. If a cartridge is found, it is checked to see if it is formatted as an LTFS volume. If not, you are offered the option of formatting the cartridge before proceeding. It is recommended that you should accept this option.

4 Once a formatted cartridge is detected, or if no cartridge is present, the file system service is started and the window is updated to reflect the new configuration. The following screen illustrates a typical view after a mapping has been established:

Figure 3 View after mapping screen
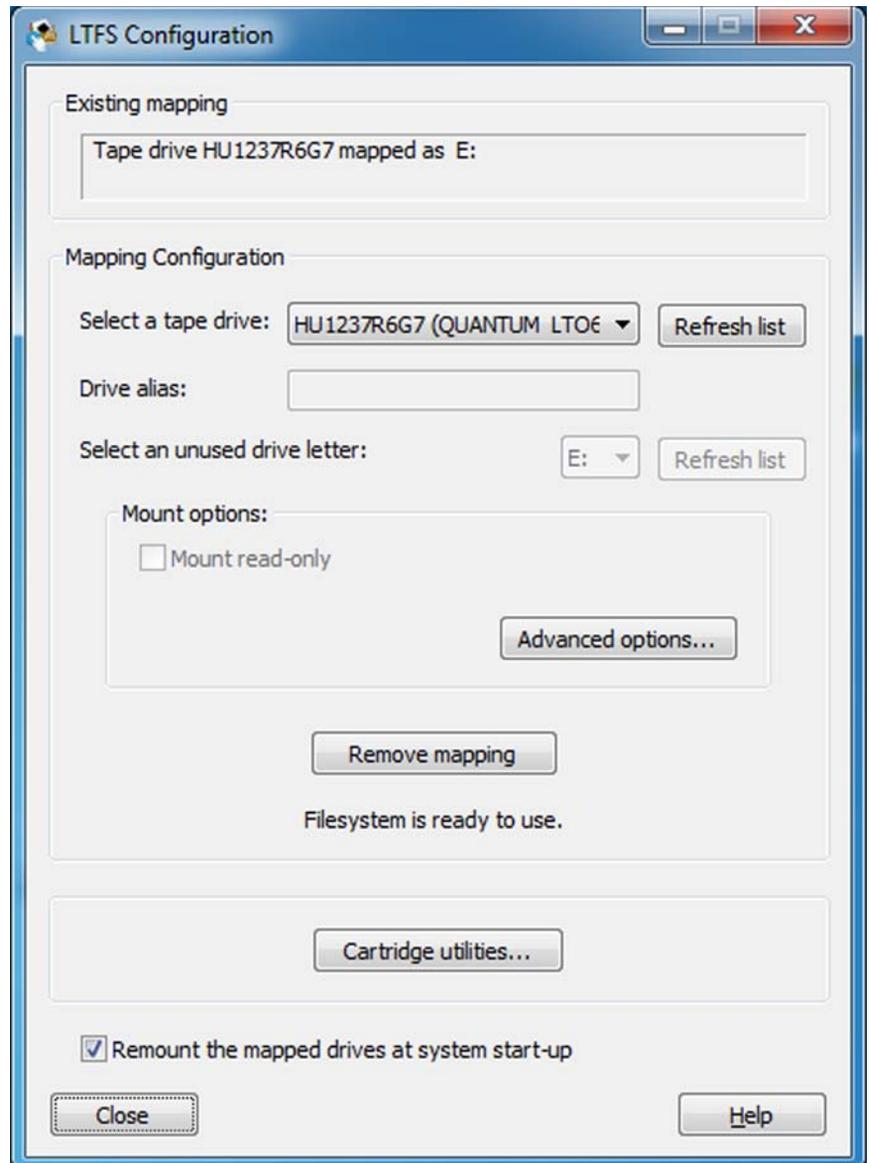
5 When the mapping has been established, you can close or minimize the configuration tool.

A Windows Explorer window will now include an LTFS volume. The first time you access this drive volume there will be a slight delay while the index is loaded and checked, but from then on the drive volume may be accessed as normal.

Note: If you insert a cleaning cartridge while a drive letter is assigned to the tape drive, LTFS SW will attempt to use the cartridge. This can degrade the life of the cleaning cartridge. In order to preserve the cleaning cartridge, remove the drive letter mapping for the tape drive by using the LTFS configurator before inserting the cleaning cartridge into the tape drive.

Mount Options

In most circumstances the default options are suitable and you do not need to change them. However for flexibility you can modify them if you wish. The options are as follows:

- **Mount read-only** – If you select this option, the cartridge contents are readable but cannot be modified. This provides a "software" write-protect mechanism; the same effect can be achieved using the "hardware" write protect tab on the tape cartridge.

- **Remount at system start-up** – The normal behavior is to configure the service so that it automatically restarts when the system boots up. Unselect this checkbox if you do not want this to happen (for example, if this is a temporary setup where the tapes drive will be removed after the system is shut down).

- **Advanced options** – this opens a further window where you can adjust less common options.

  Note: Some of these options may have a noticeable impact on performance and in general should not be changed

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  - **Support ticket folder**: This is the location where drive logs are stored. These logs are generated on each unmount and whenever an error is detected. The application will keep the ten most recent logs and automatically delete any older logs. These logs may be useful to Quantum support personnel but otherwise can be ignored.

  - **Enable verbose logging**: This is not required in normal operation and you should only use it when requested by

Quantum support personnel, as it will have an adverse effect on performance.

- **Enable extended verbose logging**: This adds a further level of detail to logfile entries.

- **Thumbnails**: When Windows encounters a folder full of files it attempts to build thumbnails to represent the content of each file. This is not desirable in an LTFS volume, because it may take many minutes or even hours to generate the thumbnails. So by default Quantum LTFS for Windows tells the operating system that the volume is in the "offline" state, which prevents automatic thumbnail creation. You can turn this off if desired, but be aware that it will have a severe effect on the time needed to open and browse folders.

- **Index capture:** This option allows you to keep a copy of the latest index from tape on the local disk. Enable the check box and enter the path to the folder where you would like to keep the index file after the tape is unmounted.

- **Index updates**: This allows you to control when indexes are written to tape; see

- **Index partition usage**: The Quantum LTFS for Windows format allows for data files to be written in the index partition, which if used carefully may improve access times for frequently-used files. However, in general you should leave this setting in its default state.

Index Updates

Accessing data stored on tape relies on an up-to-date index being available. Quantum LTFS for Windows offers three different mechanisms for updating the copy of the index stored on tape. The default setting is to write a copy of the index to tape periodically while writing data; the index is written every five minutes. You can change the time interval to every minute. This method of index update reduces the window of exposure to power-loss events, since there will be an index on tape no more than five minutes old (if using the default interval).

The second option is to write the index to tape only when a volume is removed. In normal operation this is sufficient, since the Quantum LTFS for Windows usage model requires the volume to be unmounted after use, so there is always a valid index. However, if power is removed from the drive without unmounting, for example, through an unplanned

power outage or accidental unplugging, the volume will be left in an inconsistent state, and all files added since the last dismount operation will be inaccessible. The CheckWizard utility *may* be able to recover the file data to the `_ltfs_lostandfound` directory, but the metadata (filename, access dates, and so on) will be lost.

The final mechanism provided in Quantum LTFS for Windows is to update the index every time a file is closed after writing. This further reduces the exposure window to a single file, or (if several processes are using the volume simultaneously) to the number of files being written concurrently. However, this does add some overhead, both in terms of the tape capacity used for each index, and also in terms of performance since the writing of the index will take bandwidth away from writing data. These overhead effects will become more severe with smaller file sizes.

In most cases the default behavior offers the best solution, but the options allow you to modify the behavior for a particular situation. The following table summarizes the options available for choosing when the index is updated:

Table 1 Updating the Index

Index is flushed to tape…	Potential benefits	Potential drawbacks
When the volume is unmounted.	Minimal capacity overhead.	Exposure to the risk of power failure during writing.
Every *n* minutes during writing *(default: n=5)*.	Exposure to the risk of power failure, limited to the last *n* minutes. Negligible impact on performance.	Some capacity overhead since the index is written more frequently.

Cartridge utilities

The cartridge utilities button opens a further window where you can access the utilities for formatting the tape, etc.

Figure 4 Tape cartridge utilities
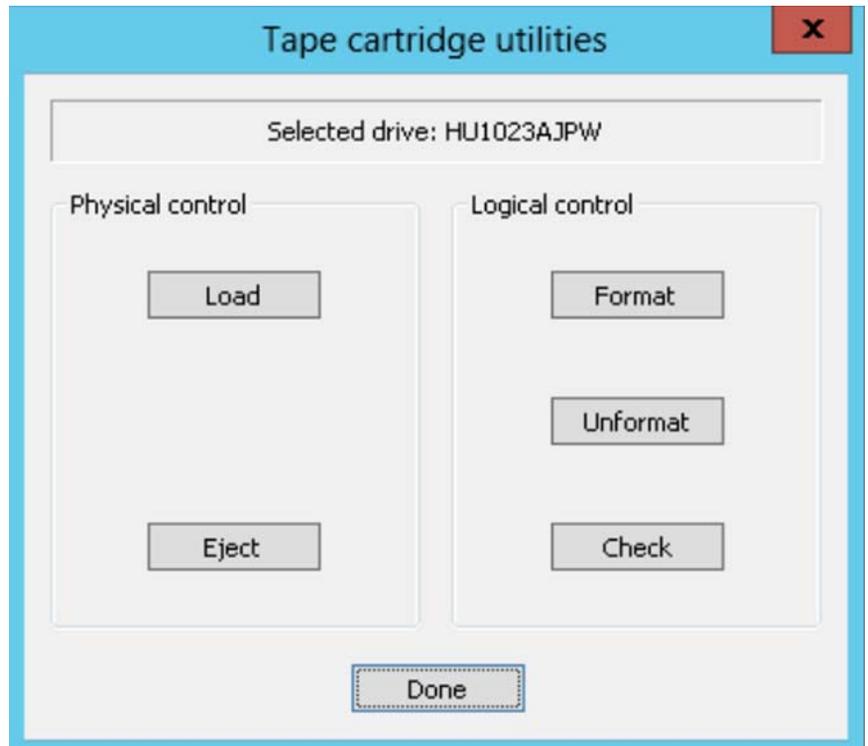
- **Load**: Physically loads the tape already present in the drive.
- **Unload**: Physically ejects the LTFS volume from the tape drive. The file system will continue to run, but attempting to access the volume while no cartridge is present will result in the error message "The device is not ready." When a formatted LTFS cartridge is loaded into the drive, the index will be read and checked prior to the volume being accessible.
- **Format**: Starts the **FormatWizard** to guide you through the steps and options of creating a fresh LTFS volume on the current cartridge. See Using the FormatWizard on page 21.
- **Unformat**: Runs the **UnformatWizard** to guide you through the steps and options of removing LTFS format from the tape.

- **Check**: Runs the Error-checking tool that scans the volume for consistency and can correct certain problems with the format. See Using the CheckWizard on page 25.

File Permissions

The Quantum LTFS for Windows application manages a common set of file permissions for all files and users; file and directory ownership is not recorded to tape media. The only permission that is tracked is write-protect information.

File Names

To maintain compatibility when copying files between multiple platforms, it is strongly recommended that do you do not use the following characters LTFS filenames, directory names, or extended attributes: * ? < > : " | / \

Limitations

- When the tape cartridge is almost full, further write operations will be prevented. The free space on the tape (for example, as reported by Explorer) will indicate that there is still some capacity available, but that is reserved for updating the index when the tape is unmounted.

- Future mounts of a cartridge that is almost full (that is, it has passed the point at which "early warning" is reported) will mount as Read Only, to prevent further modifications that may not fit on the tape. This status is cleared when the cartridge is reformatted (using `mkltfs`) or when the volume is rolled back, erasing the history.

Working with Windows Explorer

Once the mapping has been established and an LTFS-formatted cartridge loaded, you can access the contents of the cartridge either at a command prompt or through Windows Explorer. The following figure shows an LTFS volume viewed in an Explorer window:

Figure 5 Volume view in an Explorer window
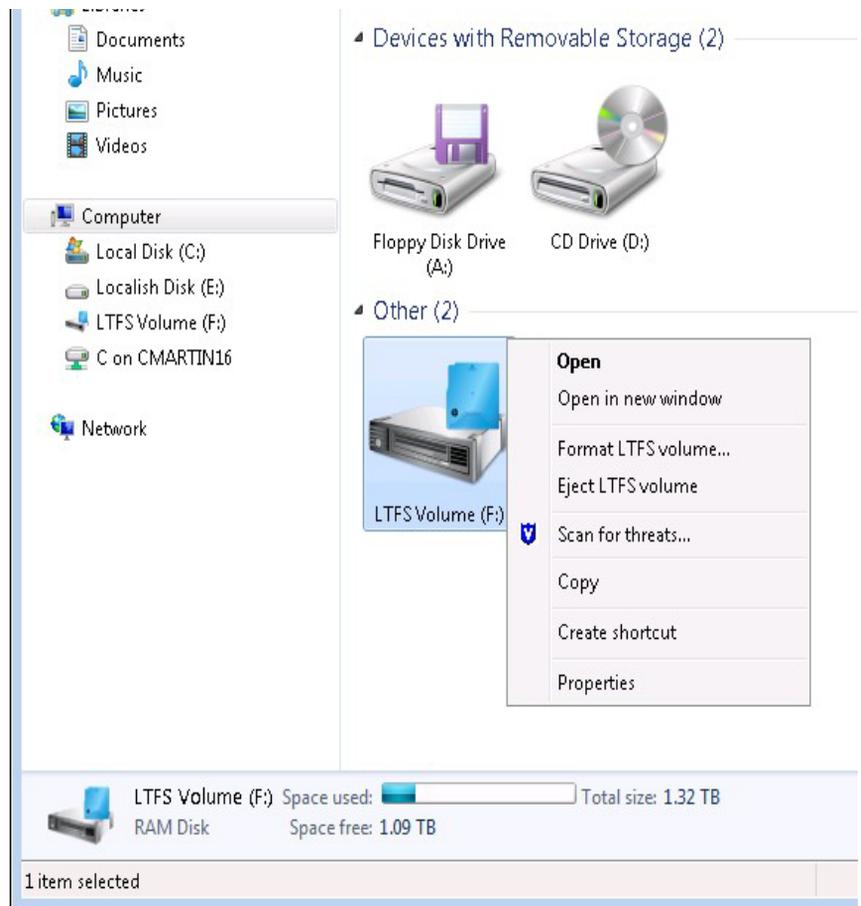
There are several points to note here:

- The volume type is shown as a "RAM Disk". This results from the way that the LTFS volume is linked into the operating system, and has no impact on operation.

- The "Total size" and "Space free" figures appear slightly lower than expected; this is due to the way that Windows calculates and report capacities in binary GB (2^{30} bytes) and TB (2^{40} bytes) instead of decimal GB (10^9 bytes) and TB (10^{12}) bytes. Note too that these are worst-case figures; if the volume is employing the drive's default lossless hardware data compression, then the actual capacity available may be significantly greater than that shown.

Right-click on the drive icon to display a menu with two LTFS-specific operations:

- **Format LTFS volume** — run the FormatWizard utility, which guides you through the steps and options of creating a fresh volume on the current cartridge. More information is given in Using the FormatWizard on page 21.

- **Eject LTFS volume** — physically eject the LTFS volume from the tape drive. The file system will continue to run, but attempting to access the volume while no cartridge is present will result in the error message "The device is not ready." When a formatted LTFS cartridge is loaded into the drive, the index will be read and checked, and then the volume may again be accessed.

In addition to these two menu options, there are a number of LTFS-specific additions to the "Properties" of the volume as illustrated in the following screen:

Figure 6 Volume properties
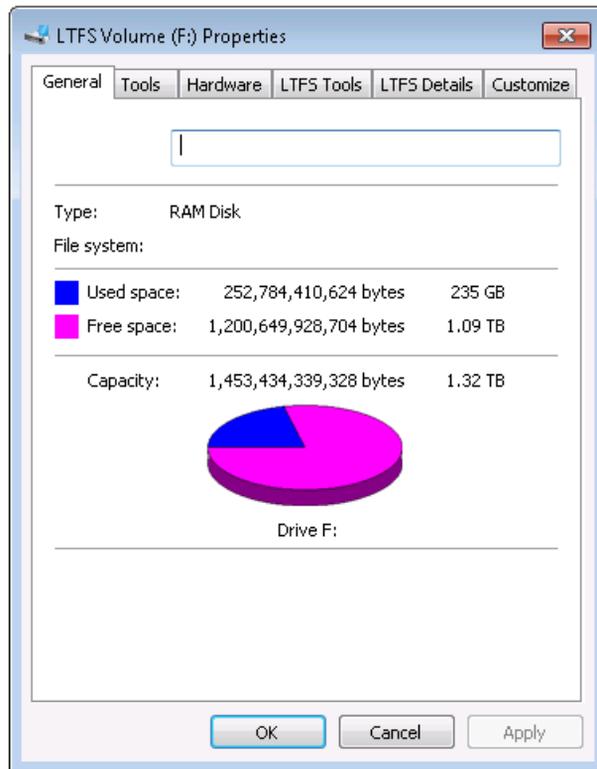
The comments given above about the Explorer view (file system type, capacity figures) also apply to the information shown on the General tab.

Figure 7 LTFS Tools tab
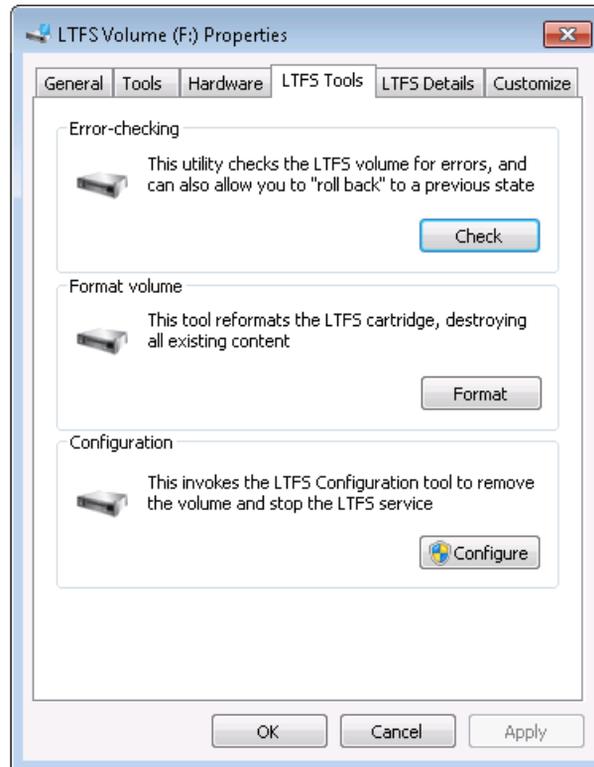
The LTFS Tools tab gives access to several utilities for interacting with the volume:

- The Error-checking tool scans the volume for consistency and can correct certain problems with the format; see Using the CheckWizard on page 25 for more details.

- The Format volume tool starts the FormatWizard to guide you through the steps and options of creating a fresh volume on the current cartridge; more information is given in Using the FormatWizard on page 21.

- The Configuration tool brings up the same window used when the volume was mapped, and is a convenient way to terminate and remove the volume.

> **Note:** This may require administrative privileges depending on your system's policies and settings.

Figure 8 LTFS Details Tab
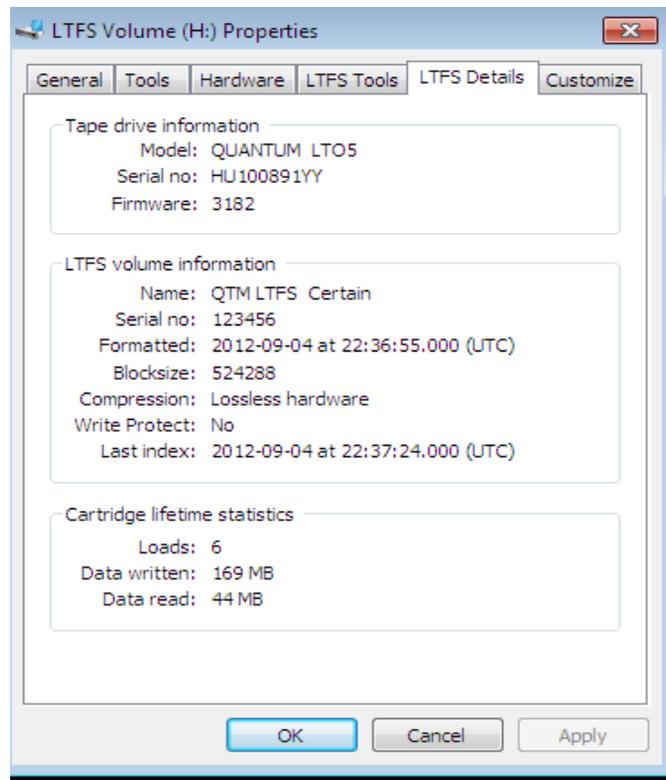
The LTFS Details tab provides information about the tape drive, the LTFS volume, and also the cartridge lifetime usage.

Removing the LTFS volume

There are two different ways of removing the LTFS volume:

- You can physically remove the cartridge from the drive by right-clicking on the drive and selecting the option to Eject LTFS volume. In this case the drive letter will remain reserved, although it cannot be accessed until another LTFS cartridge is loaded into the drive.

• You can run the configuration tool again, and click Remove at the top of the window. This will unmount the volume (but leave the cartridge in the tape drive) and then terminate the service. The drive letter is then released and can no longer be accessed. Follow the steps described in Mapping a Tape Drive to a Drive Letter on page 8 to set up a new LTFS volume.

Using the FormatWizard

Before you can use an Quantum LTO-5 cartridge with LTFS, it must be prepared by formatting according to the LTFS specification. The LTFSFormatWizard application helps to select appropriate options and settings and then formats the tape. You can run it from the context menu, from the LTFS Tools tab in the drive properties.

Caution: Read all the text on the wizard dialog windows carefully. Completing this wizard will irretrievably destroy all tape contents.

Note: If you execute the FormatWizard while no LTFS volume is mapped to a drive letter, the wizard may require administrative privileges (depending on system security policies and settings). Running with insufficient privileges will result in an inability to "see" the tape drive and consequently no formatting can be performed. If this occurs, right-click on the executable and select Run as administrator.

1 The initial screen presents information about the operation that has been started:

Figure 9 LTFS Format Cartridge
Wizard screen
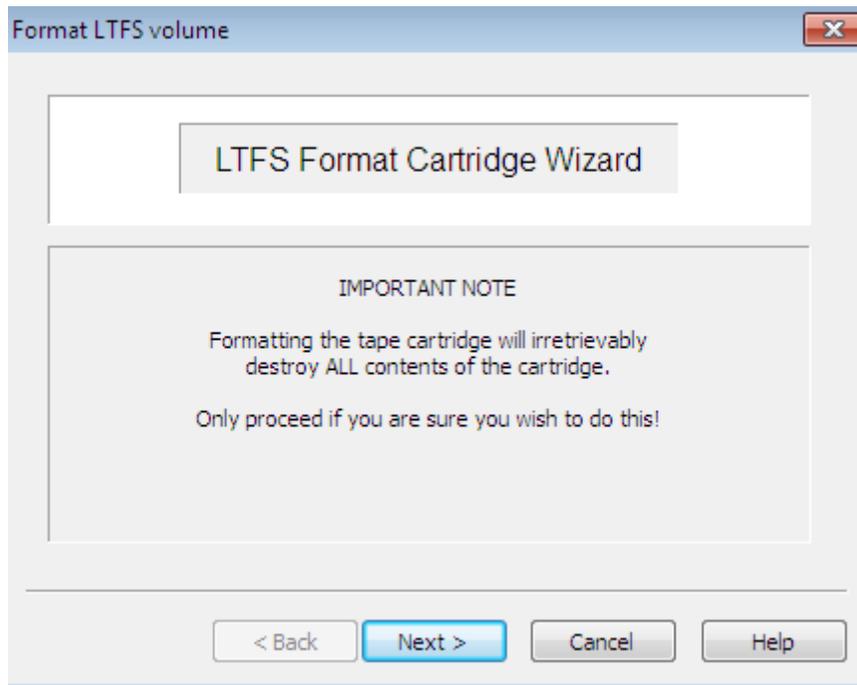
2 The next window allows you to select a tape drive and related
   options:
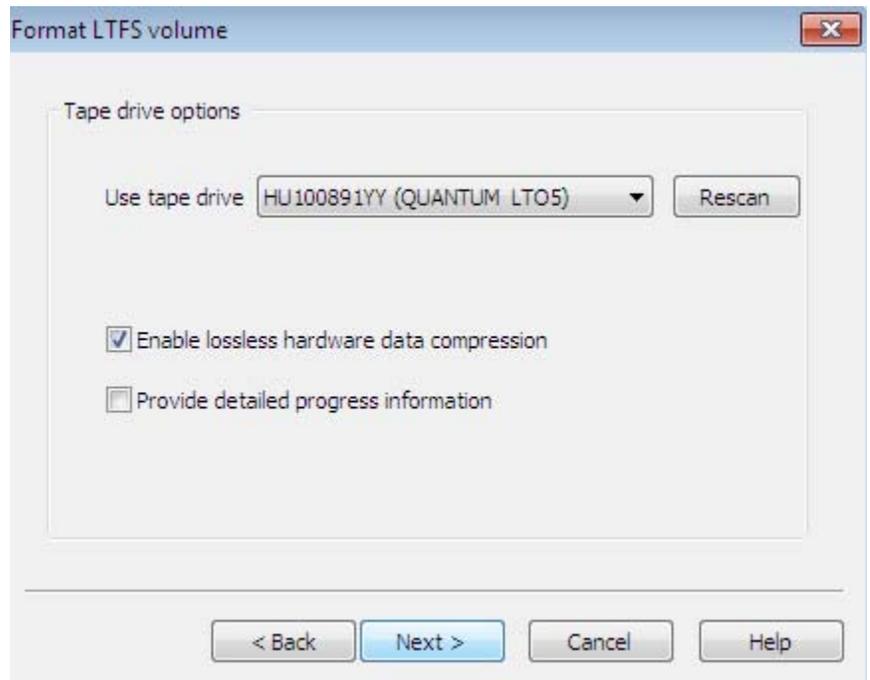
The first drive on the system (or the one being used by the mounted file system, if any) is selected by default; change the selection to use a different tape drive.

Note: Only drives suitable for use with LTFS are shown in the list.

By default the drive's lossless hardware data compression engine will be enabled. You can turn it off if desired, in which case all writes and reads to this cartridge will bypass the compression engine.

The other option on this screen allows you to request that more detail is shown during the format operation.

3 The next window contains options related to the cartridge format:

Figure 11 Cartridge Options
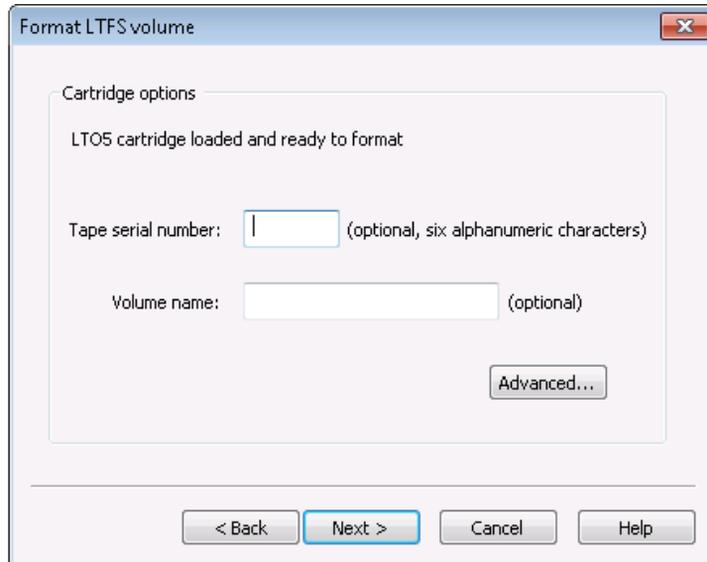
Both of these fields are optional, and are intended to provide a method of identifying the cartridge. Tape serial number should be no more than six alphanumeric characters (A–Z, 0–9). Volume name is a free-format text string.

The **Advanced** button leads to a further set of options; however it is recommended that you leave these at their default settings for all normal usage.

4 The final window summarizes the format operation that you have defined using the wizard:

Figure 12 Summary of selected formats
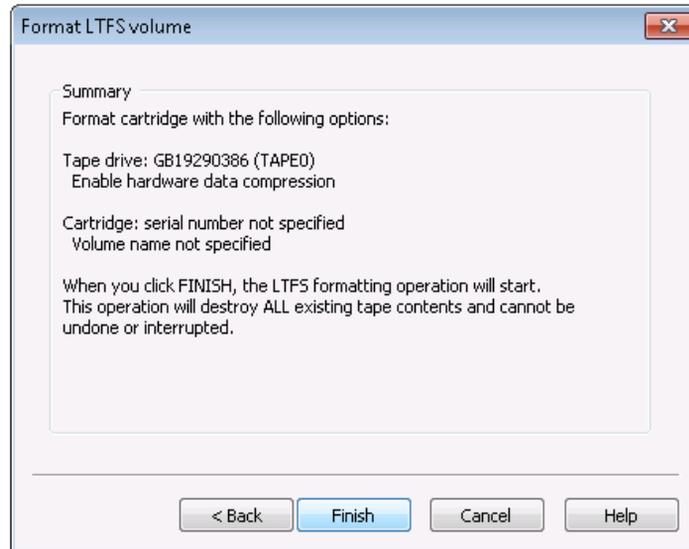
When you click Finish, the following operations take place:

a If the file system is currently mounted, it is unmounted

b A "Progress" dialog window is created.

c format operation starts.

d All tape contents are removed and a fresh (empty) index written to the cartridge.

e If the file system was mounted, the new cartridge is mounted.

f When the Progress dialog shows that the format is complete, you can close the window.

Using the CheckWizard

The LTFSCheckWizard application has two purposes:

• To check for problems with the format as written on the cartridge, and usually recover from them. This is not normally necessary but may be required for example if the drive was powered off without cleanly unmounting the volume.

• To facilitate the rolling back of the cartridge contents to an earlier state.

Caution: Read all the text on the wizard dialog windows carefully. Completing this wizard may irretrievably modify the tape contents.

Note: If you execute the CheckWizard while no LTFS volume is mapped to a drive letter, the wizard may require administrative privileges (depending on system security policies and settings). Running with insufficient privileges will result in an inability to "see" the tape drive and consequently no checking can be performed. If this occurs, right-click on the executable and select Run as administrator.

1 The initial screen presents information about the operation that has been started:

Figure 13 LTFS Volume Check Wizard screen
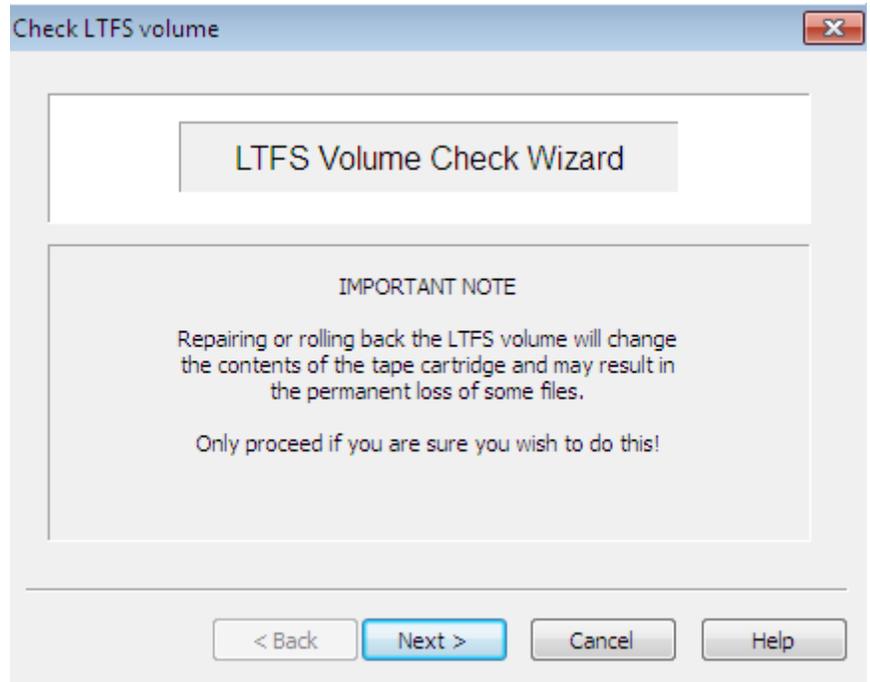
2 The next window allows you to select a tape drive:

Figure 14 Tape drive options
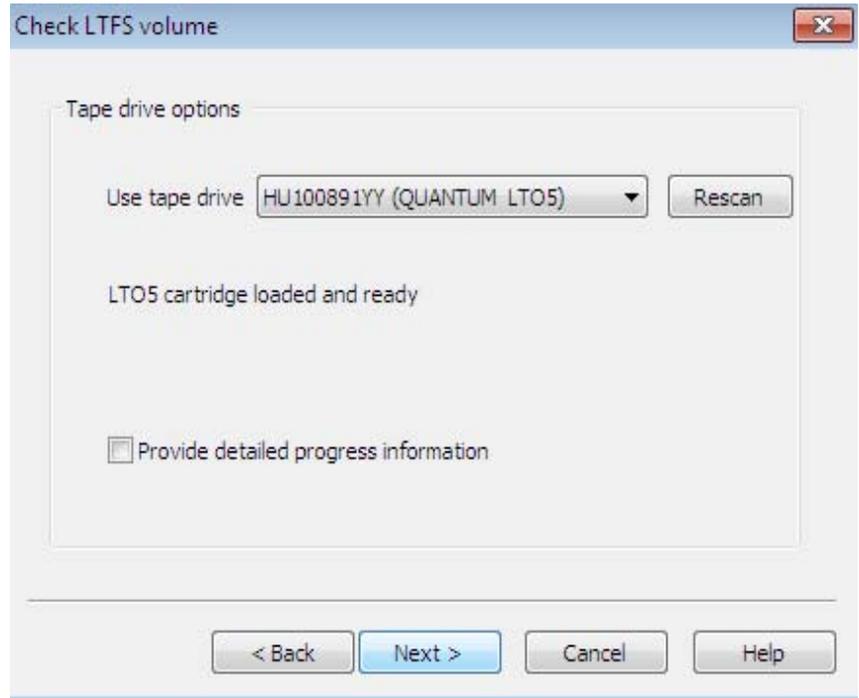
The first drive on the system (or the one being used by the mounted file system, if any) is selected by default; change the selection to use a different tape drive.

Note: Only drives suitable for use with LTFS are shown in the list.

Select **Provide detailed progress information** to display more detail during the checking operation.

3 The next window is where you select the desired mode of operation:

Figure 15 Mode of operation
selections menu
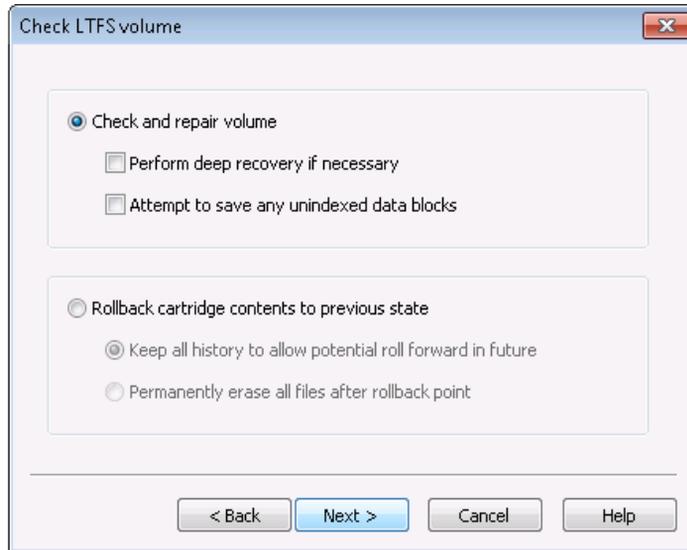
- Check and repair volume: Select this option to check the volume for consistency.

  - If you suspect the volume was not updated properly due to a power outage, select the Perform deep recovery if necessary option, which will attempt to verify and, if necessary, recover from a missing End Of Data (EOD) marker. This may take a long time and may result in the loss of unindexed data blocks written since the last good index.

  - If it is important to try to recover those unindexed data blocks, select the option Attempt to save any unindexed data blocks. The utility will try to save the blocks to a new folder _ltfs_lostandfound.

    Note: You need to identify and manipulate any recovered blocks manually, since there will be no identifying details (because they were not in any index).

- Rollback cartridge contents to previous state: Select this option if you want to change the view of the cartridge contents to a previous point in time. There are two choices:

  - Keep all history to allow potential roll forward in the future: The default is to roll back the contents as viewed in the index, but not erase any data — on other words, the view of the contents

is changed, but the actual contents are unchanged. This allows for a future operation to "roll forward" the contents again, recovering changes that occurred since the rollback point. Note that no storage space is freed up by this option.

- Permanently erase all files after rollback point: Roll back and erase the history. In this case, any changes since the rollback point will be lost irretrievably, so be sure that this is what you intend. This option will free up the storage space used by those changes.

If you opt to Rollback cartridge contents, an additional window is presented where you will be able to select a rollback point from those on the cartridge. Click Start scan to initiate a scan of the entire volume, looking for previous index points stored on tape. This operation may take many minutes or even several hours. When complete, the window is refreshed to show the available rollback points. For example:

Figure 16 Rollback control screen
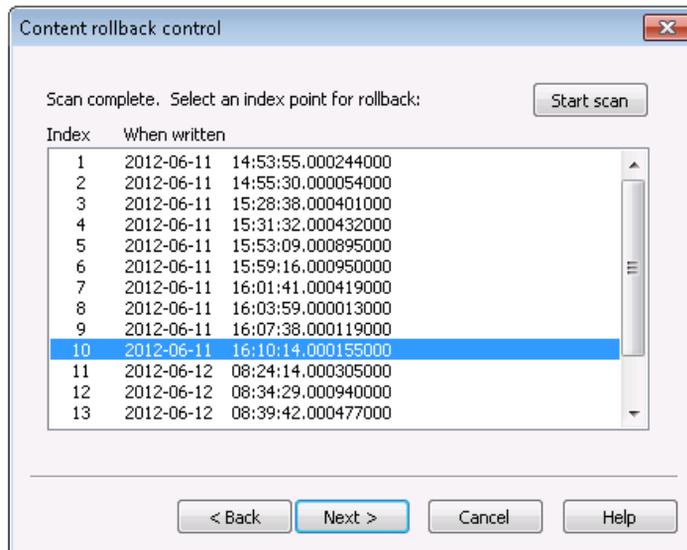
4 Select a rollback point and click **Next**. A summary of the operation to be carried out is displayed. For example:

Figure 17 Summary of
Rollback selections
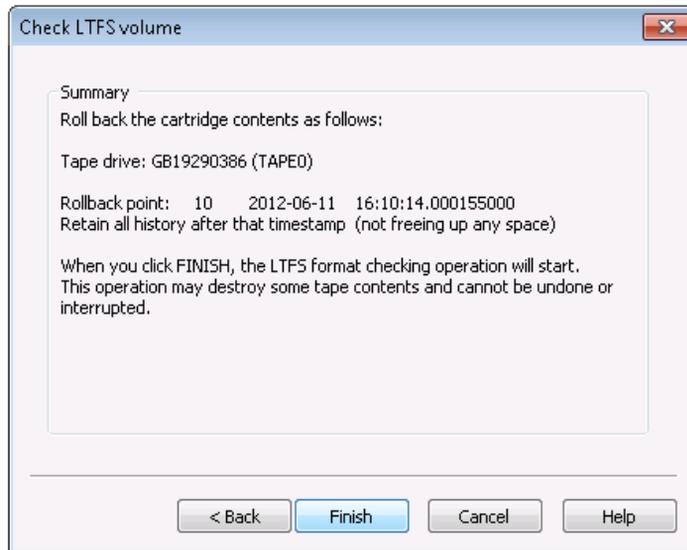
5 When you click **Finish**, the following operations take place:

   a If the file system is currently mounted, it is unmounted.

   b A Progress dialog window is created.

   c   The check or rollback operation starts.

   d The Progress dialog is updated as the operation proceeds to completion.

   e If the file system was mounted, the checked or updated volume will be re-mounted.

6 When the **Progress** dialog shows that the operation is complete, you can close the window.

Using the UnformatWizard

Caution: Read all the text on the wizard dialog windows carefully. Completing this wizard may irretrievably modify the tape contents.

You do not normally need to use the **UnformatWizard**. Its purpose is to remove the LTFS format from a cartridge and return it to a single partition, so that the cartridge can be used with a different software application. This utility is sim8ilar to the **FormatWizard**, but is much

simpler, since there is only one option affecting operation (to eject the cartridge from the drive once the format has been removed).

Note: The **UnformatWizard** may request administrative privileges to execute (depending on system security polices and settings).

Using the ltfsattr Utility

Quantum LTFS for Windows version 2.2.1 onwards includes the LTFSATTR utility which can be used to access the attributes from the LTFS volume. It is a Windows command line utility which provides similar functionality to the "attr" command in Linux and the "xattr" command in Mac OS X.

Running the ltfsattr utility with no parameters gives the usage information.

Usage:	ltfsattr -h
	ltfsattr -p attrname [-v] filename
	ltfsattr -w attrname attrvalue [-v] filename
	ltfsattr -l [-v] filename
	ltfsattr -x attrname [-v] filename

ltfsattr options:

-h	prints the usage information
-p	reads and displays the value of attrname for filename with -v, also displays the filename and the attribute name
-w	writes attribute attrname with value attrvalue for filename with -v, provides confirmation (otherwise silent on success)
-l	lists the user attributes for filename with -v, also lists the values (otherwise just the names)

-x	deletes attribute attrname for filename with -v, provides confirmation (otherwise silent on success)

Note: Filename may also refer to a directory or folder name. This utility manipulates extended attributes in conjunction with Quantum LTFS for Windows software and should only be used in that context with a mounted LTFS volume.

Using Cartridge Browser

Quantum LTFS for Windows version 2.2.1 onwards includes a Windows GUI utility to view the contents of LTFS index files. Users can select a folder which contains LTFS index files and the utility will list all the index files in that folder. The user can then open a detailed view displaying the contents of any index file.

Note: This utility does not interact with the tape drive or the LTFS software. Instead, it is an independent tool for viewing the stored LTFS index files which are generated when an LTFS volume is mounted and unmounted.

Figure 18 Cartridge Browser
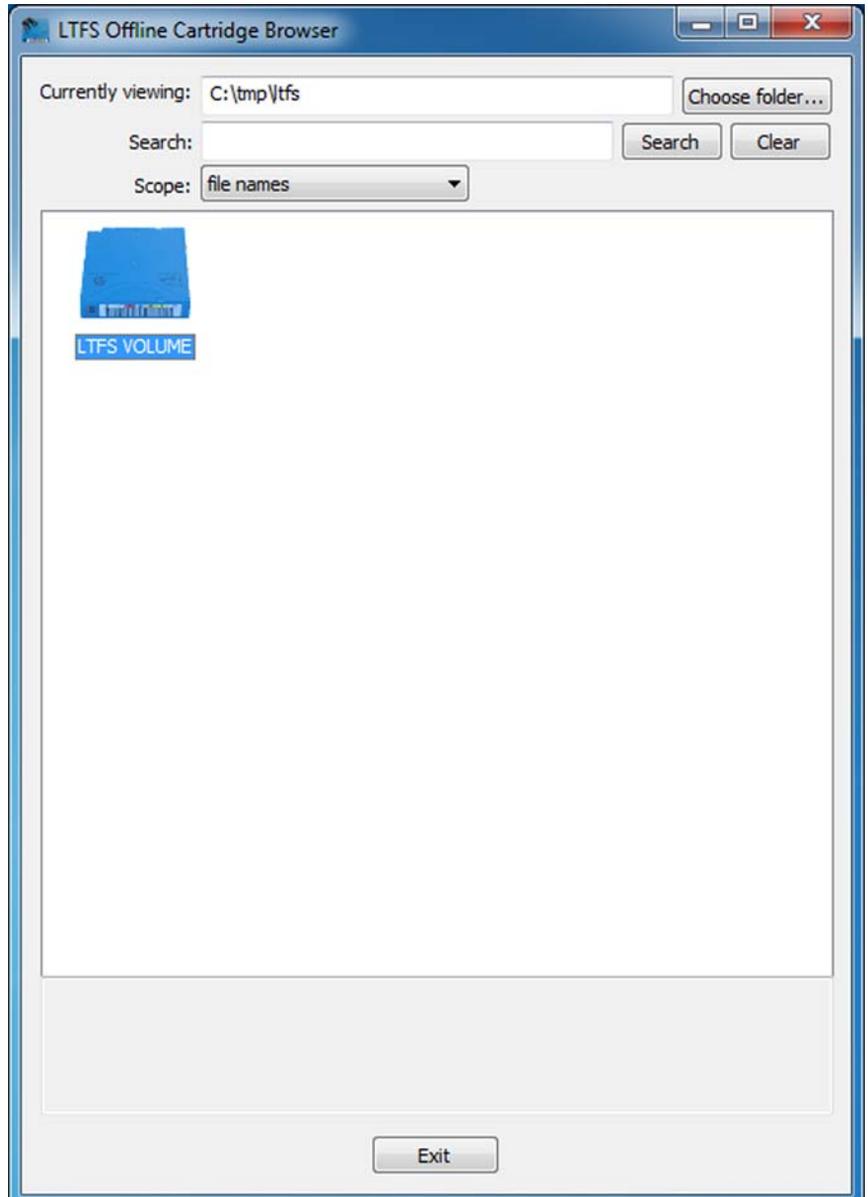
Users can select a folder where the index files are kept (in most setups this will be the directorypath selected for the 'index capture' setting in the advanced options of the LTFS configurationGUI). The Cartridge Browser utility then displays all the index files in the folder. When you

hover the mouse over a particular index file the details about the index will be shown.

If you double click on any of the index files, the utility will open another window which shows a detailed view of the selected index as a nested expandable tree. Selecting a particular file shows the information regarding that file.
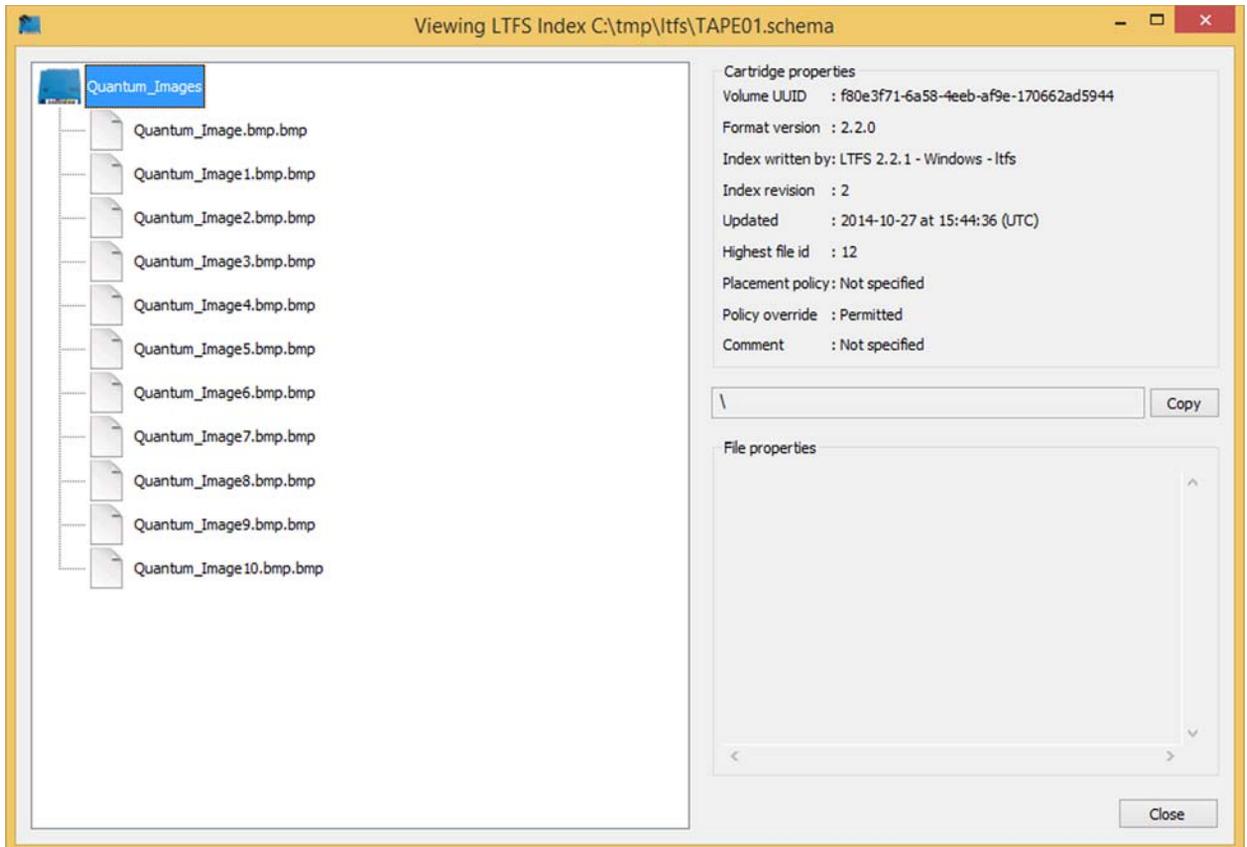
LTFS Smart Copy

The LTFS smart copy utility provides the binary ltfscopy command that provides the following benefits to the LTFS users:

- Faster data transfer from tape to disk and tape to tape.

- File verification using hash values.

LTFS Smart Copy for Fast Data Transfer from Tape

Tape being a sequential access medium, retrieving large number of files from the tape requires that the tape head has to seek the location of the file sequentially on the tape by winding the tape back and forth many times until it reads all the files that needs to be copied. This causes drastic delays when using the normal copy commands provided by the operating system because those commands do not care about the location of the files on tape. When these commands are used to copy multiple files from tape to disk or another tape it will result in poor data transfer rates. The LTFS smart copy tool overcomes this limitation by rearranging the files to copy in such a way that all files can be copied in just one pass of the head. This significantly reduces the total seek time thus improving the overall performance for multi-file copy operations.

Note: This utility does not offer any performance improvement when transferring data from disk to tape.

LTFS Smart Copy for Verifying Files

LTFS smart copy provides the facility to verify the files on tape using a hash generated from the original source on the disk or any other storage medium. Users can make use of this feature in two ways:

- Verify each file after copying to tape - When copying a large number of files from disk to tape or from tape to tape, enabling this feature will make sure that each file is verified using the hash immediately after copying the file to the target tape. After successfully verifying each file, smart copy will set the hash value as an extended attribute to the file. The tool aborts the copy operation if a file fails verification.

- Verify the files on a previously created LTFS volume - In this mode, the user provides a source path and the existing destination path on the LTFS volume. Smart copy verifies each file on the tape against the files on the source by generating hash for the file on source and the corresponding file on tape and comparing it. After the verify operation, smart copy will provide a summary indicating how many files passed the verification and how many failed. If there were failures, it provides the list of files that failed the verification.

LTFS Smart Copy Modes of Operation

LTFS smart copy has three available modes of operation. You will use the command line options described below with the ltfscopy command to define the mode of smart copy operations.

- **Copy Only** - In this mode the user provides a source path and path to the target LTFS Volume. Smart copy does not verify the file in this mode of operation. In this mode, smart copy only copies the source files to the target LTFS volume. If the source is on an LTFS tape, smart copy improves the performance by copying files based on their location on tape.

- **Copy and Verify** - In this mode the user provides a source path and the path to the LTFS Volume with --copy and --verify options. Smart copy copies each file on the source to the LTFS Volume and verifies the files immediately. It will abort the copy operation if a file fails verification.

- **Verify Only** - In this mode the user provides a source path and a destination path on tape and gives a --verify option. Smart copy generates hash values for each source file, and compares it with the hash generated for the file on tape.

LTFS Smart Copy Command Line Options

The command line options for the ltfscopy command are as follows:

--help	Displays the help for ltfscopy .
--version	Displays the version of the ltfscopy tool.
-s, --source[=path]	Path to source directory. Only the files in the source directory will be copied by default. The subdirectories and its contents will not be copied. If you would like to copy the entire source tree, use the --recursive option also.
-d, --destination[=path]	Path to destination directory. If the destination path does not exist, it will be created.

-r, --recursive	Use this option if you want to copy the entire source tree to the destination. In verify only mode, this option can be used if you want to verify all files and folders recursively.
-v, --verify	Verify the files at the destination by comparing the hash generated from the source file to the hash generated from the destination file. This option can be used along with --copy option or can be used independently. When used along with the --copy option, each destination files will be verified immediately after copying the file. If the destination is tape, then the generated hash value will be saved as an extended attribute to the file. **Caution:** Using the --verify option with --copy will slow down the copy operation because of the time taken to generate hash values for the source and the destination files.
-c, --copy	Use this option along with the --verify option to copy and verify the files. If you want to just copy the contents from source to destination, this option is not required.
-i, --interactive	Run in interactive mode. By default, ltfscopy will overwrite the existing files at the destination. Use this option if you want ltfscopy to prompt before overwriting existing files.
-p, --pattern[" "]	A search expression that describes the set of files to be copied or verified. The expression can include wildcards * and ?.
--verbose	Displays detailed messages on what is being done by ltfscopy.

Running ltfscopy on Windows

The ltfscopy tool is installed by default when you install Quantum LTFS for Windows. The executable name is ltfscopy.exe and it will be available in the installation folder where you installed the Quantum LTFS for Windows software.

Command examples:

> **Note:** In this example, assume that E:\ is where the tape drive is mapped.

To copy the files from the tape cartridge to C:\photos:

    ltfscopy.exe -s E:\photos\ -d C:\Photos

To copy files and all subfolders and files recursively:

    ltfscopy.exe -s E:\photos\ -d C:\Photos -recursive

To copy files and all subfolders and files recursively and verify:

    ltfscopy.exe -s E:\photos\ -d C:\Photos --copy --verify --
    recursive

To verify previously copied data by comparing it with source:

    ltfscopy.exe -s E:\photos\ -d C:\Photos --verify -recursive
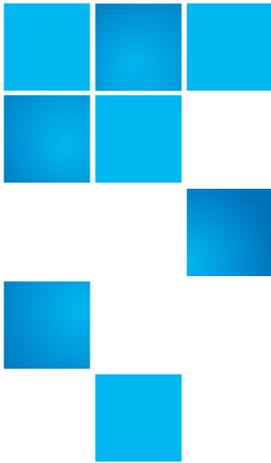
Troubleshooting

This chapter contains the following sections:

- [Errors During Configuration](#)
- [Explorer Windows Not Refreshing](#)

General

If problems occur during the operation of Quantum LTFS for Windows or the underlying LTFS utilities, entries may be made in the system log (either Application or System, depending on the nature of the problem). The Source may be shown as LTFS or as FUSE4WinSvc, again depending on exactly what the problem was.

If there is a problem with tape drive interaction, Quantum LTFS for Windows will attempt to create a snapshot of the Quantum drive's internal state at the time of failure. A snapshot may also be taken at unmount time. This will be stored in the log directory specified by the Configuration tool (by default this is `\ProgramData\Quantum\LTFS\`).

These files are not otherwise used by Quantum LTFS for Windows and you can safely remove them from the system, if they are not needed for troubleshooting. Note that the software only keep the ten most recent snapshots, deleting older logfiles as necessary.

Quantum LTFS for Windows requires the Quantum LTO-5 tape drive to be powered up and connected to the system. This can be verified using the Windows Device Manager. Quantum LTO-5 drive is not shown, then check cabling, power, and so on. Quantum LTFS for Windows will not be able to operate until the drive is detected.

Similarly, the Windows driver (QLTOx??.sys) must be installed and associated with the tape drive before Quantum LTFS for Windows can communicate with it. You can download it from http://www.quantum.com/Service and Support

Errors During Configuration

Ensure that no other application is using the tape drive. If another application has control of the tape drive when the configuration tool attempts to create a mapping, you may see one or more of the following error messages:

- `An error occurred while checking the drive status. Please try again.`

- `Operation failed, failed to get exclusive access. Device may be busy.`

- `Drive is inaccessible, The parameter is incorrect.`

In each case, a typical resolution is to find and close the other application that is accessing the tape drive. Other questions to consider are:

- Is the drive is connected and visible in Device Manager?

- Has the user the administrative privileges required to perform the operation?

If the configuration utility determines that the current cartridge is not formatted for use with LTFS, a question is displayed, asking you if you wish to format before proceeding. If you answer NO (do not format), the mapping will be created but the cartridge will not be formatted, and so will not be accessible. At this point you must either format the cartridge (starting the FormatWizard manually) or else eject the cartridge and replace it with one that is already formatted for LTFS.

Explorer Windows Not Refreshing

When the contents of the cartridge are altered by one of the Wizard utilities, any open Explorer windows may be closed automatically (for

example if the format is removed from a cartridge). However, in some cases the Explorer window may not be updated, even though a refresh was requested by the software. In this case you need to refresh the window manually (**F5** or **View > Refresh**).
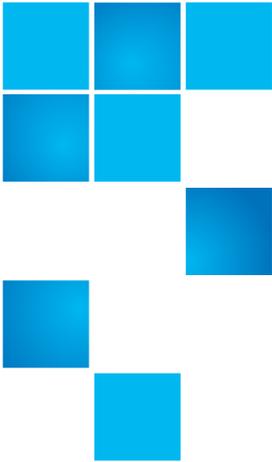
Appendix A
Frequently Asked Questions

This appendix provides answers to frequently asked questions for Quantum LTFS for Windows.

Q: How do I get Quantum LTFS for Windows?

A: All application downloads and documentation are available from the website at: http://www.quantum.com/ServiceandSupport/ SoftwareandDocumentationDownloads/ltfs/Index

Q: What are the minimum system requirements?

A: Any server that fulfills the needs of the supported configurations detailed in Supported Configurations on page 4.

Q: Does Quantum LTFS for Windows support DDS/DAT devices?

A: No. Only Quantum LTO-5 or later drives are supported with Quantum LTFS for Windows.

Q: Does Quantum LTFS for Windows support non-Quantum devices?

A: Although the application may recognize and work with LTO-5 or later drives from other manufacturers, Quantum is only able to support use with Quantum LTO-5 drives.

Q: Why doesn't LTFS work with my LTO-4 or earlier drives?

A: Quantum LTFS relies on a drive feature called partitioning, which was added to the Quantum LTO-5 format. It is not part of the LTO-4 or earlier tape formats and they cannot be used.

Q: Can I use LTO-4 media in my Quantum LTO-5 drive?

A: The Quantum LTO-5 drives can load, read and write LTO-4 media, but the LTO-4 format does not support partitioning. Therefore, LTO-4 media cannot be used with LTFS.

Q: Can I use WORM media with Quantum LTFS for Windows?

A: No, WORM media cannot be partitioned and so cannot be used with LTFS.

Q: Can I uninstall Quantum LTFS for Windows?

A: Yes. You can remove Quantum LTFS for Windows software using the normal Windows Control Panel procedures.

Q: Where do I go if I have a problem?

A: For most common issues, see Chapter 4, Troubleshooting. If this does not address the issue, contact Quantum support.

Q: Does Quantum LTFS for Windows replace my existing backup software?

A: In most cases Quantum recommends that you continue to use your existing backup application. Quantum LTFS for Windows provides a good method of storing and transporting large files but is not generally a direct replacement for a backup application.

Q: Is source code available for LTFS?

A: Yes. Source code for the LTFS Open Source components is released under the terms of the LGPLv2.1 and can be downloaded from www.hp.com/go/storeopen.

Q: Why are all my files on my LTFS volume shown with a gray cross in Windows Explorer?

A: This is because they are being reported in the Offline state to prevent Windows from trying to build thumbnails. See "Thumbnails" in Mount Options on page 12.